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Scientific, Technical and Economic Committee for Fisheries (STECF) - Economic Report of EU aquaculture sector (STECF-16-19)

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This report was reviewed by the STECF during its 53rd plenary meeting held from 24 to 28 October 2016 in Brussels, Belgium

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Abstract

Commission Decision of 25 February 2016 setting up a Scientific, Technical and Economic Committee for Fisheries, C(2016) 1084, OJ C 74, 26.2.2016, p. 4–10. The Commission may consult the group on any matter relating to marine and fisheries biology, fishing gear technology, fisheries economics, fisheries governance, ecosystem effects of fisheries, aquaculture or similar disciplines. The 2016 Annual Economic Report (AER) on the Economic Performance of the EU Aquaculture sector is the fifth report of its kind produced for the sector and provides a comprehensive overview of the latest information available on the production, economic value, structure and competitive performance of the aquaculture sector at the national and EU level. This report includes data for 2008 to 2014. The data collected is reported by national totals and by segments divided on species. Aquaculture data collected under the DCF showed that the EU aquaculture sales volume and value reached 1.3 million tonnes and €4.5 billion, in 2014. This corresponds to an increase of 15% in sales volume, while the sales value increased by 13% from 2013 due to increasing production in Italy, Spain and the United Kingdom, as well as a better coverage of the Greek aquaculture sector. DCF data has been complemented with Eurostat data to provide a full overview for all EU28 MS. The 20 countries covered under the DCF reported a number of more than almost 12 thousand aquaculture enterprises. It is estimated that the total number of enterprises in EU28 is between 14 and 15 thousand. Almost 90% of the enterprises in the aquaculture sector are micro-enterprises, employing less than 10 employees. The reported number of employees under the DCF reached 70 thousand in 2014. The total EU28 employment is estimated to be around 80 thousand people, while the number of FTE reported remained at 31.5 thousand. Profitability for the EU aquaculture sector was positive in 2014 and the Gross Value Added and EBIT of the sector increased by 16% and 3% compared to 2013, respectively. ROI decreased from 7% to 6.5%. The aquaculture sector in EU28 can be divided into three main sectors: Marine, Shellfish and Freshwater production. The most profitable of these three sectors are the shellfish sector with €165 million, followed by the Marine sector which generated €99 million in EBIT, and the freshwater sector with €87 million.

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Economic Report of EU aquaculture sector (STECF-16-19)

THIS REPORT WAS REVIEWED DURING THE PLENARY MEETING HELD IN BRUSSELS, BELGIUM, 24-28 OCTOBER 2016

Background

Following the latest DCF call for economic data on EU aquaculture, EWG 16-12 was requested to analyse and data for 2008-2014 and produce the bi-annual report on Economic Performance of the European Union Aquaculture sector.

The first three editions (2008, 2010 and 2012) of this report were fundamentally descriptive in nature and focused on presenting the data collected under the DCF. The 2014 report took a more analytical approach focusing on drivers and barriers to growth in the EU aquaculture sector. As for the previous reports, the data quality had remained an essential issue for the 2014 report.

In 2016, the Economic Report on EU aquaculture features a special chapter designed to deepen the economic analysis on this sector. This time the experts were asked to evaluate the effect of public support to the aquaculture sector under the EFF programme 2007-2014 using the DCF data collected from 2008-2014.

Request to STECF

STECF is requested to review the report of the STECF Expert Working Group meeting, evaluate the findings and make any appropriate comments and recommendations.

Introduction

The Expert Working Group 16-12 convened in September 2016 in Gavirate (Italy), to produce the 2016 Economic Performance of the European Union Aquaculture sector report. The report reflects the work by 28 external experts, and 2 experts of JRC that attended the meeting. Furthermore, two external experts were available by correspondence.

This is the fifth report focusing on the performance of the aquaculture sector and providing an overview of the latest available information on the structure, social, economic and competitive performance of the aquaculture sector at national and EU level.

The data used in this publication cover the period from 2008 to 2014, and were collected under the DCF. The call for data was issued by DG MARE on the 30th of May 2016. Member States were requested to submit the data within one month after the call, making the submission deadline the 30th of June 2016.

STECF observations

STECF acknowledges that the EWG addressed all of the Terms of Reference under demanding circumstances and a tight time schedule in order to produce this biannual report about the economic performance of the EU aquaculture sector.

The quality of the data submitted continues to improve, compared to the previous data calls. As previously, data checks were performed by JRC before the meeting and communicated to the Member States for possible corrections. Furthermore, experts at the EWG meeting also checked the submitted data.

The data coverage, compared to earlier data calls, improved for the data collected for 2013 and 2014. This was to some extent driven by the improvements in the Greek, UK and Cypriot data. This allows for an improved analysis of the EU aquaculture sector.

STECF notes that the following issues remained:

a) Some MSs submitted incomplete data sets with parameters missing (e.g. weight of raw materials, employment), thus limiting the value of the EU wide assessment of economic performance
b) In addition, there are minor data issues in other countries, as referred to in the report, which prevent analysis of time series data in several cases, especially at segment level.
c) Inconsistency in including/excluding freshwater aquaculture data from year to year also makes time series analysis at segment, national and EU level difficult.

STECF notes that some member states supplied DCF data for their freshwater aquaculture production, although this was not a mandatory requirement. However, several Member States with a large production from inland freshwater aquaculture did not supply data on this sector (e.g. Poland, Germany), thus limiting the possibilities to give a comprehensive overview of the economic performance of the aquaculture sector.

In order to partly handle this lack of information or to complete some of the incomplete datasets where possible, STECF observes that the EWG used EUROSTAT data in addition to DCF data in order to provide the most comprehensive picture of the contributions in volume and value from aquaculture within the EU28. The EUROSTAT data was used as following:

- To cover the freshwater aquaculture sector in landlocked countries (Austria, Czech Republic, Hungary, Luxemburg and Slovakia) accounting in total for 3.2% of weight and 2.3% of value produced in 2014.
- To include countries without marine aquaculture (Belgium, Latvia and Lithuania) accounted for 0.3% of weight and 0.2% of value of the total EU28 aquaculture production in 2014.
- To estimate freshwater aquaculture production for countries, which supplied data only for the obligatory marine sector (Germany, Slovenia and Estonia), while their aquaculture sector is mainly represented by fresh water aquaculture and accounts for 1.5% of weight and 2% of value of the total EU28 aquaculture production in 2014. Nevertheless the EWG considered that the EUROSTAT data for Germany were not reliable and did not include it in the analysis of EU fresh water aquaculture.
- To complete the overview of the Polish production, which contributes by 2.7% weight and 2.0% value to the total EU28.

STECF observes that the inclusion of EUROSTAT data allows providing a good overview of the EU28 overall production, and helps also mapping out the quality and coverage of the DCF data.

Nevertheless, for the aquaculture segments where only EUROSTAT data are available but not DCF data, a full analysis of economic performance indicators cannot be performed.

STECF observes thus that the EWG experienced difficulties in evaluating the effect of public funding supporting sustainable growth in the European aquaculture sector due to these data issues.

STECF observes that the conclusion from the analysis was that public spending, introduced to support the growth of the EU aquaculture sector and overcome the technical problems, does not seem to have a clear and visible effect on production growth. In the period investigated, production weight has been stable, value has been slightly increasing and employment has been slightly decreasing. Hence, the societal impact in terms of jobs creation in coastal communities and of provision of sustainable healthy food for European consumers has been limited. It still seems that providing better legal framework (e.g. licensing, environmental requirements, etc.) for the aquaculture industry is by far the most important limiting factor to be addressed to lay the foundation for future growth in the European aquaculture sector

With regards to the usefulness of the data collected, STECF observes that assessing the impact of public support has provided a useful stress test for evaluating the expediency of the DCF data. STECF observes that EUROSTAT data on weight and value of production could be more appropriate to use than DCF data for assessing the production growth, as they have a wider coverage by including all aquaculture enterprises. However the data are limited to production weight and value. STECF notes that the DCF data have a lower coverage, but include more detailed economic information on e.g. income, costs, GVA, profit, return on investment etc.

For a complete socio-economic analysis of public support to the sector, the DCF/EUMAP data should ideally be extended to cover the entire sector, including fresh water aquaculture.

STECF observes that introduction of thresholds in economic data collection for aquaculture in the future EUMAP might further reduce the coverage of the DCF data.

STECF observes that making publically available the current aquaculture data set, including public support data used by EWG in a user friendly electronic format, will possibly facilitate further analysis of public support.

Preparing the report on economic performance of aquaculture sector is a biannual activity (as with the report covering the processing industry). Data for the two most recent years (here 2013-2014) are requested in the data call, yet in the report the tables and text concentrated only on the development in last year. STECF suggests that the report make use of both years to display recent trends in a clearer way. STECF suggests thus to adjust the reporting and analytical templates accordingly to allow presentation of the last two years

Conclusions of STECF

STECF concludes that the report provides a good overview of the economic performance of the EU aquaculture sector. It also represents an improvement in terms of quality and coverage compared to previous reports, and the availability of a seven year time series improves the type of analysis that can be undertaken, for instance between various segments and production techniques within and between MS.

STECF concludes that taking into account time and resources available, the EWG analysis produced is of substantial standard.

STECF concludes that the use of EUROSTAT data is a valid approach in order to cover data gaps in the DCF collection of data for the aquaculture sector.

STECF suggests that further initiatives are taken by the Commission with respect to checking data and distributing templates to the participants before the meeting, so the work load and time frame of the analysis can be improved.

STECF suggests that the report display recent trends according to the last two years of data and not to the last year only.

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REPORT TO THE STECF

EXPERT WORKING GROUP ON
Economic Report of EU aquaculture sector
(EWG-16-12)

Gavirate, Italy, 19-23 September 2016

This report does not necessarily reflect the view of the STECF and the European Commission and in no way anticipates the Commission's future policy in this area

EXECUTIVE SUMMARY

The 2016 Economic Report on the Performance of the EU Aquaculture sector provides a comprehensive overview of the latest information available on the sector's structure and economic performance from 2008 to 2014.

Production of sea food for human consumption was almost equally divided between aquaculture and fishery, in 2014. Europe represents the largest market for fish in the world and sea food consumption has steadily increased over the past decades. Per capita consumption is estimated to be 25.5 kilo, in 2014. Consumption in the EU market is still dominated by fishing activities covering 75% however the share originating from aquaculture has been increasing. EU's self-sufficiency is currently estimated to around 47.5% and is therefore highly dependent on imported sea food to the EU market.

The future demand for fish is expected to increase due to increasing population and income and health benefits associated with fish consumption. The growing demand offers a unique opportunity to expand the aquaculture production in the EU. However this also implies that the EU farmers continuously most succeed in staying competitive on the global market for seafood products.

Aquaculture production is dominated by Asian countries covering almost 90% of the production volume. In contrast, the EU28 contribution to world aquaculture production has been decreasing significantly over time in both volume and value terms, representing only 1.7% and 3.2% of global production in 2014.

A precondition to move the European aquaculture sector forward is to establish and increase the knowledge of the existing aquaculture production. In that respect this report is an important contribution describing in detail the main species produced and technique used in the sector.

The report contains an executive summary including key findings (ToR 1) followed by an introduction chapter containing the Terms of reference, an overview of the data collected under DCF and a section on data coverage and quality. The next chapter includes an EU overview (ToR 2) followed by a detailed analyses of aquaculture sectors (i.e. marine, shellfish and freshwater) and main species produced in each of these segments (ToR 3). This is followed by national chapters (ToR 4) with an elaboration of economic performance, structure and main species produced by each country and outlook for future production trends.

Additionally, a special chapter (ToR 5) is provided on the public support spend on the EU aquaculture sector with special focus on the EFF programme and a national elaboration of the goals and achievements of the programme.

The EWG were able to adequately address all subject related to the TOR including writing a special chapter on the public support spend on the EU aquaculture sector.

KEY FINDINGS

Aquaculture data collected under the DCF showed that the sales volume and value reached 1.3 million tonnes and €4.5 billion, in 2014. This corresponds to a decrease of 4% in sales volume, however, the sales value increased by 3% due to increasing prices compared to 2012. DCF data has been complemented with Eurostat data to provide a full overview for all EU28 MS. Looking only at the data provided under DCF the sales volume was the same as in 2012, whereas the sales value increased by 8% from 2012 to 2014 partly due to better coverage of the Greek aquaculture sector.

EU aquaculture production is mainly concentrated in 5 countries: Spain, United Kingdom, France, Italy and Greece, making up 76% in weight and 75% in value of EU28 totals.

The 20 countries covered under the DCF reported almost 12 thousand aquaculture enterprises. It is estimated that the total number of enterprises in EU28 is between 14 and 15 thousand. Almost 90% of the enterprises in the aquaculture sector are micro-enterprises, employing less than 10 employees.

The reported number of employees under the DCF reached 70 thousand in 2014. The total EU28 employment is estimated to be around 80 thousand people. The number of FTE reported decreased by 5%, which might indicate a tendency towards higher specialization and less part-time employment in the sector. However, the use of part time labour still significantly contributes to the workforce in the European aquaculture sector. Female employment made up 24% of EU aquaculture employment and 19% of total FTE. The average yearly wage was €23 400, corresponding to a 6% increase compared to 2012.

Profitability for the EU aquaculture sector was positive in 2014 and the Gross Value Added and EBIT of the sector increased by 14% and 24%, respectively. ROI decreased from 7% to 6.5%. Furthermore, the labour productivity increased by 31% from 2012 to 2014.

The aquaculture sector in EU28 can be divided into three main sectors: Marine, Shellfish and Freshwater production. The most profitable of these three sectors are the shellfish sector with €165 million, followed by the Marine sector which generated €99 million in EBIT, and the freshwater sector with €87 million.

The main species produced in EU28 in terms of value are Atlantic salmon, oysters, seabream, seabass and trout, whereas the Mediterranean mussels dominate in weight.

In the marine sector within the EU, United Kingdom is the main producer of salmon covering 93% of the value, while Greece is the main producer of seabream and seabass covering 46% of the value.

In the shellfish sector France and Spain are the most important countries in terms of production volume and value, employment and numbers of enterprises. France is the main producer of oysters covering 88% of the total EU28 production, whereas Spain is the main producer of Mediterranean mussels covering 69% of the volume. The main producers of clam is Italy, however Portugal have the largest numbers of enterprises and employment in this sector.

The main species produced in freshwater is trout in terms of both volume 69% and value 64%. The most important producers in terms of value are Italy (27%), France (22%) and Denmark (19%). Carp is another important species mostly produced in Eastern Europe, where the main producer is Poland covering 28% in terms of total value.

The experts group tried to evaluate the effect of public support to the aquaculture sector. The evaluation was based on available data from DCF 2008-2014 and data on public support spend from 2007-2014 according to the EFF program.

The group concluded that it was not able to evaluate the economic and social results of public funding for the whole aquaculture sector and all MS as data are missing for fresh water aquaculture and also for other important categories, especially in the start of the DCF period, making the analysis of changes between years difficult.

It is clear that EU production has a weak development with respect to production growth compared to the countries that are leading the blue revolution[1] and makes aquaculture one of the world's fastest growing food production technologies. On the other hand, production value increases between 2008 and 2014, and this can be interpreted as an indication that the industry has increased the unit value and quality of its product. However, EU production is often a relatively small part of the total market, and production value will be strongly influenced by price changes on the global market so this growth might not develop in the same direction in the future. Some species like salmon with large price increases have obviously contributed to the increase in production value.

The support level in the sector is relatively low and less than €0.1 per kilo in most MS. The MS with substantially higher support levels are those with relatively limited production, where the primary objective of the investment seems to be to get the industry started.

The employment as measured by FTEs has declined by 17.5%. The decline in employment is negative from a social perspective as aquaculture has become less important in supporting activity in coastal communities. In a larger perspective this development is not necessarily bad given that production has not increased much, as it is a sign that labour productivity is increasing. This is a necessary development if the EU industry is to remain competitive.

It has not been possible to measure a clear social, economic or environmental result of public funding to the aquaculture sector. While there is anecdotal evidence of some success stories, they are limited in scale. The overall picture is a sector with sluggish growth compared to the competitors in the rest of the world. Few examples of sectors with critical mass can be observed in European aquaculture within or across the MS. Individual entrepreneurs and local employment in some coastal communities have possibly benefitted. However, there is, based on the available indicators little evidence that the supports have led to clear changes. In the period investigated, production volume is stable, value is slightly up and employment is slightly down. Hence, impact on coastal communities as well as providing healthy sustainable food for European consumers is limited.

For years the majority of the experts have pointed out that administrative issues are far more important to solve than the technical ones. Public funding to individual entrepreneurs can have little effect on this. Environmental regulations, difficulties in the licensing process due to multilevel governance and competition for space both on land and in the coastal zones continue to be the most important areas to be addressed to increase growth in the EU aquaculture sector. It still seems that providing better framework conditions for the aquaculture industry is by far the most important issue to solve to lay the foundation for future growth in the European aquaculture sector than providing public funding to individual entrepreneurs.

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[1] China is the world's leading aquaculture producer followed by Indonesia, India, Vietnam and several other developing countries in East Asia. For developed countries Norway and Chile are the leaders of marine aquaculture of salmon.

1 INTRODUCTION

The 2016 Annual Economic Report (AER) on the Economic Performance of the EU Aquaculture sector is the fifth report of its kind produced for the sector and provides a comprehensive overview of the latest information available on the production, economic value, structure and competitive performance of the aquaculture sector at the national and EU level.

The report has been produced by aquaculture economists from the JRC and a group of economic experts convened under the Scientific, Technical and Economic Committee for Fisheries (STECF). The data used to compile the various analyses contained within the report were collected under the data collection framework (DCF); cf. Council regulation (European Commission (EC) No 199/2008 of 25th February 2008).

This report includes data for 2008 to 2014. The data collected is reported by national totals and by segments divided on species (e.g. salmon, sea bass and sea bream, trout, carp, mussel, oyster and clam) and technique used for production (e.g. hatcheries and nurseries, on growing, combined, cages, rafts, long lines, bottom and others) The data analyzed covers Income (turnover, subsidies and other income), Personnel costs (Wages and salaries of staff and Imputed value of unpaid labour), Energy costs, Raw material costs (livestock costs and feed costs), Repair and maintenance costs, Other operational costs, Capital costs (depreciation of capital and financial costs), Extraordinary costs, Capital value, Net Investments, Debt, Raw material volume (livestock and feed), Volume of sales, Employment (Number of persons employed and FTE national) and Number of enterprises for the years 2008 to 2014. Moreover, turnover and volume of sales are detailed by species.

The expert group consisted of 30 experts (28 invited from 19 countries plus two JRC). The list of experts can be found in the Appendix 3 of this report. In addition 2 countries provided advice on their national chapters per correspondence.

The publication includes:

- An overview of the EU aquaculture sector and the economic performance of the sector
- A detailed economic and structural assessment of the EU aquaculture sector for the main production environment and species
- A National chapters for each country describing the economic performance and structure in the Member States, including an outlook for future production trends covering the period 2014 - 2020, correspond to the period covered by the European Maritime and Fisheries Fund (EMFF)
- A special chapter on public support and growth of the EU/National aquaculture sectors

1.1 Terms of Reference for EWG-16-12

Following the latest DCF call for economic data on the EU aquaculture, EWG 16-12 is requested to analyse and comment on the economic performance of the EU and national aquaculture sectors between 2008 and 2014.

Starting with the report in 2012 (EWG 14-10) the report should provide a more analytical approach notably on the drivers and aspects of policy relevance in aquaculture where previous editions of this report have been fundamentally descriptive and have focused more on the presentation of data.

In 2016, the Annual Economic Report on EU aquaculture should have a special chapter designed to deepen analysis on this sector. In this report an analysis of the effect of public support for the aquaculture sector has been carried out and indicators have been developed to try to assess the effect of the public support on production growth and employment to the extent possible with the available data from DCF.

Additionally, the issue of data quality remains essential for the 2016 report.

TERMS OF REFERENCE

STECF is requested to provide the Annual Economic Report on Aquaculture sector for 2016 including, at least, the following sections:

1. A summary containing key findings.

2. EU analyses of economic overview: Drivers and main trends. (It must include specific sections on aquaculture employment, economic performance, and productivity at EU level).

3. EU analyses of economic performance by aquaculture segments (marine, shellfish, freshwater).

4. National chapters on the economic performance of the aquaculture segments:

National aquaculture overview
- Recent developments
- Employment and average salaries
- Economic performance and indicators
- Structure and performance of aquaculture segments

Outlook for future production trends
Data coverage and quality

5. Special topic:
   The public support and growth of the EU/National aquaculture sectors:
   Public support spending (FIFG, EFF), if available, and planned spending (EMFF) spend on improving the performance in the aquaculture sector similar to the analysis done for the processing sector (build indicators, similar to the processing report, in order to enable comparability between member states):

   - What have we learnt?
   - Growth/decline main drivers and trends

- Diversification of aquaculture species
- Technical development - Sustainable development
- If possible also aspects of spatial planning
- Certification (ASC, Organic etc.)

1.2 Data collected under DCF

The economic variables to be collected for the aquaculture industry sector under the Data Collection are specified in section A of the Chapter IV and in Appendix X of Commission Decision 2010/93/EC of the 18th of December 2010, on Adopting a multiannual Community programme pursuant to Council Regulation (EC) No 199/2008 establishing a Community framework for the collection, management and use of data in the fisheries sector and support for scientific advice regarding the common fisheries policy.

Table 1.1: List of economic variables for the aquaculture sector.

Variable group	Variable	Unit
Income	Turnover	EUR
	Subsidies	EUR
	Other income	EUR
Personnel costs	Wages and salaries	EUR
	Imputed value of unpaid labour	EUR
Energy costs	Energy costs	EUR
Raw material costs	Livestock costs	EUR
	Feed costs	EUR
Repair and maintenance costs	Repair and maintenance	EUR
Other operational costs	Other operational costs	EUR
Capital costs	Depreciation of capital	EUR
	Financial costs, net	EUR
Extraordinary costs, net	Extraordinary costs, net	EUR
Capital value	Total value of assets	EUR
Net Investments	Net Investments	EUR
Debt	Debt	EUR
Raw material volume	Livestock	Tonne
	Fish feed	Tonne
Volume of sales	Volume of sales	Tonne
Employment	Number of persons employed, by gender	Number
	FTE National, by gender	Number
Number of enterprises	Number of enterprises <=5 employees	Number
	Number of enterprises 6-10 employees	Number
	Number of enterprises >10 employees	Number

Following DCF the statistical unit for the aquaculture data collection is defined as enterprise, which is the lowest legal entity for accounting purposes. The population refers to enterprises whose primary activity is defined according to the EUROSTAT definition under NACE Code

05.02: 'Fish Farming'. More detailed definitions of parameters can be found in the glossary (section 6). Data is requested to be reported by segment and in National totals. Segments are defined as a combination of the main species cultured and the technology used for their production.

Segments are classified by the following main species:

1. Salmon
2. Trout
3. Sea bass & Sea bream
4. Carp
5. Other freshwater fish
6. Other marine fish
7. Mussel
8. Oyster
9. Clam
10. Other shellfish

Segments are also classified by the technology used:

- Fish farming:
  - Land based:
    - Hatcheries and nurseries
    - On growing
    - Combined
  - Cages
- Shellfish farming
  - Rafts
  - Long line
  - Bottom
  - Other

1.3 Data coverage

Data on the EU aquaculture sector has been requested under the Data Collection Framework (DCF) (cf. Council regulation, European Commission (EC) No 199/2008 of 25th February 2008). The MS has been requested to provide data for the years 2008-2014 with the possibility to provide only 2013 and 2014 data and update 2008-2012 if needed. The call for data was issued by DG MARE, requesting Member States to submit the data from the 30th of May to the 30th of June, being that the submission deadline.

All EU Member States are required to collect and provide data on marine aquaculture, while the collection of data for freshwater aquaculture is not compulsory. The Data Collection Framework (DCF) requires data quality assurance by Member States. Data checks were performed by the JRC trough the comprehensive analysis of the data submitted and by experts attending the meeting to elaborate this report. As a consequence of these data checks data has been resubmitted by some of the countries after the deadline and during the EWG meeting. There have also been a few countries resubmitting data after the meeting due to discrepancies found during the meeting.

This was the fifth call for data on aquaculture. Although there was an improvement in the numbers of countries submitting data and the overall data quality compared to the previous calls, there are still issues that have to be improved by the Member States. The main data coverage concerns are summarised in the following points:

Under the DCF, the submission of marine aquaculture data is compulsory, while the submission of inland freshwater aquaculture data is voluntary. Therefore, aquaculture data is not requested from the landlocked countries Austria, Czech Republic, Hungary, Luxemburg and Slovakia. According to EUROSTAT aquaculture production in these countries accounted for 3% of weight and 2.1% of value of the total EU28 aquaculture production in 2014.

Belgium, Latvia and Lithuania only produce aquaculture products in freshwater, hence these MS did not carry out any data collection within the DCF framework. According to EUROSTAT, the production of these countries covered 0.3% of weight and 0.2% value of total EU aquaculture production in 2014.

Germany, Slovenia and Estonia only reported the mandatory marine aquaculture data, even though fresh water aquaculture production is dominating in these countries. The unreported production from these Member States accounted for 1.5% of the EU28 aquaculture production in terms of weight and 2% in terms of value in 2014.

Poland provided turnover and sales weight, structure and employment indicators for all aquaculture sector (using other administrative data sources), however costs, capital value and some other indicators are not collected for freshwater aquaculture, which is dominating in this country. The contribution from the Polish aquaculture sector in weight and value was 2.7% and 2.0% to the total EU28, respectively.

Other countries provided turnover and sales weight, but missed to provide other variables, which it did not allow to perform a full analysis of the county. We have here the cases of: 1) Netherlands did not submit employment data.

In addition, some data from certain countries was considered unreliable by the working group, and so that data were not used in the analysis. We have here the cases of: 1) the FTE for the Danish shellfish sector were considered to be underestimated, 2) the FTE in Italy were considered to be underestimated.

Finally, Greece only submitted 2013 and 2014 data. 2014 Greek data was for the full aquaculture sector, while 2013 was for a part of it. So data were not comparable. Similarly, 2014 Cypriot data incorporates data from the freshwater sector, which was missing in previous years, so 2014 and 2013 Cypriot data is not fully comparable.

Overall, the data coverage improved in 2014. This is to some extend driven by the improvement of Greek, UK and Cypriot data. The improvement makes the current analysis of the EU aquaculture sector more pertinent. However, there is still room for improvement especially on the economic indicators.

For the purpose of this analysis the EU aquaculture production for EU28 has been completed by including EUROSTAT data to fill in the gaps of missing turnover and volume of sales in this report. The EUROSTAT data is included in the tables by adding a line 'Other non DCF' in the countries list of tables presenting main production and employment indicators. The line includes all other EU countries (not in the list of each table) production, including landlocked countries and countries which doesn't report freshwater or overall production.

Table 1.2 compares the turnover for the period 2012-2014 submitted under the DCF data call with the Eurostat value of production for the period 2012-2014 by MS.

Table 1.2: Comparison of the DCF turnover provided for 2012-4 with EUROSTAT value of production.

	DCF			Eurostat		
Country	**2012**	**2013**	**2014**	**2012**	**2013**	**2014**
Austria				14.6	16.5	18.2
Belgium				1.0	0.7	
Bulgaria	11.0	14.7	17.2	19.7	17.5	13.2
Croatia	77.7	72.3	73.6	67.7	78.9	77.7
Cyprus	25.7	32.5	32.3	23.6	29.2	27.8
Czech Republic				36.8	35.3	42.5
Denmark	155.0	161.7	159.8	90.0	90.9	63.8
Estonia	1.1	1.4	1.5	1.2	1.6	2.9
Finland	53.6	63.2	59.7	44.6	54.2	53.7
France	875.9	826.4	833.9	713.0	708.2	
Germany*	9.5	8.7	15.0	81.5	101.4	105.5
Greece		370.9	613.3	456.2	434.8	443.4
Hungary				29.9	25.6	30.3
Ireland	130.3	117.7	116.3	119.9	104.8	102.9
Italy	464.9	481.3	566.9	372.1	416.5	385.7
Latvia				1.4	1.6	1.6
Lituania				6.9	8.5	7.4
Malta	83.2	105.9	97.3	93.0	105.9	97.3
Netherlands	91.2	60.6	69.7	89.4	110.2	98.1
Poland**	108.9	76.1	89.3	105.1	75.1	88.6
Portugal	57.5	51.0	53.0	53.7	53.8	50.3
Romania	18.1	20.2	19.1	18.1	20.6	19.2
Slovakia				3.2	3.2	3.2
Slovenia*	0.7	0.6	0.8	2.5	2.5	2.7
Spain	482.3	492.7	545.7	435.6	431.6	473.3
Sweden	49.8	50.3	56.9	45.6	43.6	47.7
United Kingdom	724.6	896.7	992.6	732.8	896.7	953.2
TOTAL	**3420.9**	**3904.8**	**4414.0**	**3659.2**	**3869.4**	**3210.4**

* Germany and Slovenia did not report the freshwater aquaculture sector under the DCF;
** Poland provided the total sales volume for the whole aquaculture sector under the DCF, but economic data only for the marine aquaculture sector;

From Table 1.2 it can be seen that even if most of the time similar values are reported by MS, Eurostat data seems to underestimate the EU aquaculture production. However, it is used to estimate the value of the aquaculture production of those countries that do not submit data (or submit partial data) under the DCF data collection.

Similarly, Table 1.3 compares the sales volume for the period 2012-2014 submitted under the DCF data call with the Eurostat weight of production for the period 2012-2014 by MS.

Table 1.3: Comparison of the DCF sales volume provided for 2012-4 with EUROSTAT weight of production.

Country	DCF 2012	DCF 2013	DCF 2014	Eurostat 2012	Eurostat 2013	Eurostat 2014
Austria				2.9	2.9	3.0
Belgium				0.2	0.2	0.2
Bulgaria	4.3	6.2	6.8	6.9	6.3	6.9
Croatia	12.7	11.2	12.7	13.9	13.7	13.8
Cyprus	4.4	5.4	4.9	4.3	5.3	4.8
Czech Republic				20.8	19.4	20.2
Denmark	44.2	46.3	46.4	34.2	32.0	23.0
Estonia	0.3	0.3	0.4	0.5	0.5	0.7
Finland	11.1	11.4	11.7	13.1	13.6	13.6
France	246.1	227.6	225.9	205.1	200.4	
Germany*	6.7	5.2	6.9	18.7	23.8	25.7
Greece		78.9	118.1	108.8	113.7	104.3
Hungary				14.6	14.4	15.4
Ireland	36.2	34.7	31.7	34.2	31.7	28.4
Italy	191.2	153.9	185.8	137.1	140.9	148.8
Latvia				0.6	0.6	0.6
Lituania				3.3	3.9	3.4
Malta	7.0	9.1	8.6	7.4	9.1	8.6
Netherlands	47.6	29.7	60.1	46.0	46.6	63.1
Poland**	34.4	31.3	36.3	33.2	31.3	36.3
Portugal	10.4	7.1	8.8	10.3	9.6	10.8
Romania	10.0	10.1	10.6	10.0	10.1	10.7
Slovakia				1.3	1.1	1.2
Slovenia*	0.4	0.4	0.5	0.7	1.0	1.2
Spain	271.3	231.7	288.2	266.6	226.3	285.0
Sweden	14.8	14.4	14.0	13.8	13.4	12.9
United Kingdom	203.7	203.3	214.7	205.6	203.3	214.6
TOTAL	**1156.8**	**1118.4**	**1293.1**	**1214.1**	**1175.1**	**1057.1**

* Germany and Slovenia did not report the freshwater aquaculture sector under the DCF;
** Poland provided the total sales volume for the whole aquaculture sector under the DCF, but economic data only for the marine aquaculture sector;

The data coverage by country and variable is presented in the Table 1.4. The table is showing partially missing data by country and on the National total level.

Table 1.4: Coverage of the data provided during the data calls at National total level 2008-2014 (Y = submitted).

	2008	2009	2010	2011	2012	2013	2014
Bulgaria	Y	Y	Y	Y	Y	Y	Y
Croatia	Croatia was not part of the EU				Y	Y	Y
Cyprus	Y	Y	Y	Y	Y	Y	Y
Denmark	Y	Y	Y	Y	Y	Y	Y
Estonia	Y	Y	Y	Y	Y	Y	Y
Finland	Y	Y	Y	Y	Y	Y	Y
France			Y	Y	Y	Y	Y
Germany	Y	Y	Y	Y	Y	Y	Y
Greece	The data collection program was interrupted					Y	Y
Ireland	Y	Y	Y	Y	Y	Y	Y
Italy	Y	Y	Y	Y	Y	Y	Y
Malta	Y	Y	Y	Y	Y	Y	Y
Netherlands	Y	Y	Y	Y	Y	Y	Y
Poland		Y	Y	Y	Y	Y	Y
Portugal	Y	Y	Y	Y	Y	Y	Y
Romania		Y	Y	Y	Y	Y	Y
Slovenia	Y	Y	Y	Y	Y	Y	Y
Spain	Y	Y	Y	Y	Y	Y	Y
Sweden	Y	Y	Y	Y	Y	Y	Y
United Kingdom	Y	Y	Y	Y	Y	Y	Y
Belgium	Only freshwater aquaculture, not compulsory to report						
Latvia	Only freshwater aquaculture, not compulsory to report						
Lithuania	Only freshwater aquaculture, not compulsory to report						
Austria	Not part of the DCF. Only freshwater aquaculture						
Czech Republic	Not part of the DCF. Only freshwater aquaculture						
Hungary	Not part of the DCF. Only freshwater aquaculture						
Slovakia	Not part of the DCF. Only freshwater aquaculture						
Luxembourg	Not part of the DCF. No aquaculture production						

Chapter 2 of this report refers to the EU overview is based on national total level data. Missing data for some countries or missing data from some years (as shown in Table 1.4) can affect the results of the time series analysis. In addition, the EU sector analysis in the chapter 3 is based on national aquaculture segment level data, which for each sector divided on production techniques and species produced. Again, missing data for some countries or missing data from some years (as shown in Table 1.4) can affect the results of the time series analysis. Thus, when reading this report, and in particular the EU overview in chapter 2 and the EU sector analysis in chapter 3, the following list of data issues should be taken into account:

- Germany, Poland and Slovenia only reported the marine/shellfish aquaculture sector. They did not report the freshwater aquaculture sector under the DCF.
- Belgium, Latvia and Lithuania only produce freshwater aquaculture, and they did not report it because it is not compulsory to report freshwater aquaculture.

- Austria, Czech Republic, Hungary, Luxemburg and Slovakia are landlocked countries, and they have not taken part in the DCF program; these countries only produce freshwater aquaculture.
- Croatia only submitted data from 2012 onwards because it became part of the EU only in 2013.
- Greece only submitted data for 2013 and 2014. 2014 Greek data was for the full aquaculture sector, while 2013 was for a part of it. Greece did not report the FTE variables (total FTE, male and female FTE) and the raw material volume: livestock for 2014.
- France provided a full set of economic variables on aquaculture segment level for 2010-2014 (missing 2008 and 2009), however due to some missing variables for some minor segments (representing around 5-7% of overall national turnover) it has not been possible for the country to provide all indicators on the national level representing 100% of the production.
- The United Kingdom started providing full datasets in 2011 and 2012 and significantly improved the quality of the data submitted. Most of economic variables are missing for the years 2008- 2010.
- Romania submitted all data for the period 2009-14, and did not report any data for 2008.
- Portugal submitted all data for the period 2009-14, but only partial data for 2008.
- The Netherlands did not submit employment data (total employment, as well as male and female employment for the whole period 2008-14).
- Italy reported FTE that the group considered underestimated and so they were not included in the analysis (e.g. labour productivity could not be estimated).
- Denmark reported FTE for the shellfish sector that the group considered underestimated and so they were not included in the analysis (e.g. average wage and labour productivity could not be estimated).

2 EU AQUACULTURE SECTOR OVERVIEW

Aquaculture is the fastest growing animal food producing sector in the world and is an increasingly important contributor to global food supply and economic growth. The share of global supply of fish and shellfish (i.e. crustacea and molluscs) increased from 13% in 1990 to 44% in 2014. The estimated global seafood[1] supply increased from 162 million tonnes in 2013 to 166 thousand tonnes in 2014. The increase was mainly driven by the aquaculture sector, which increased by 5.1%, while capture fisheries increased by 0.8%. Production from world capture fisheries of fish and shellfish has been fluctuating around 90 million tonnes per year during the last two decades. In contrast to this, the global aquaculture production has been increasing, as shown in Figure 2.1, producing 72.9 million tonnes in 2014.

The global value of fish and shellfish from aquaculture production reached €118 billion (156.5 billion USD)[2] in 2014 (FAO, 2016). The sector has increased production 76% since 2004 and more than 4 times since 1990 (see Figure 2.1). However, this growth has primarily been driven by Asian countries producing 89% of the world aquaculture products. China is the most important producer of aquaculture products in the world, producing 61% of the global fish and shellfish. European aquaculture production represented only 1.7% of the world aquaculture production in terms of weight and 3.2% in value.

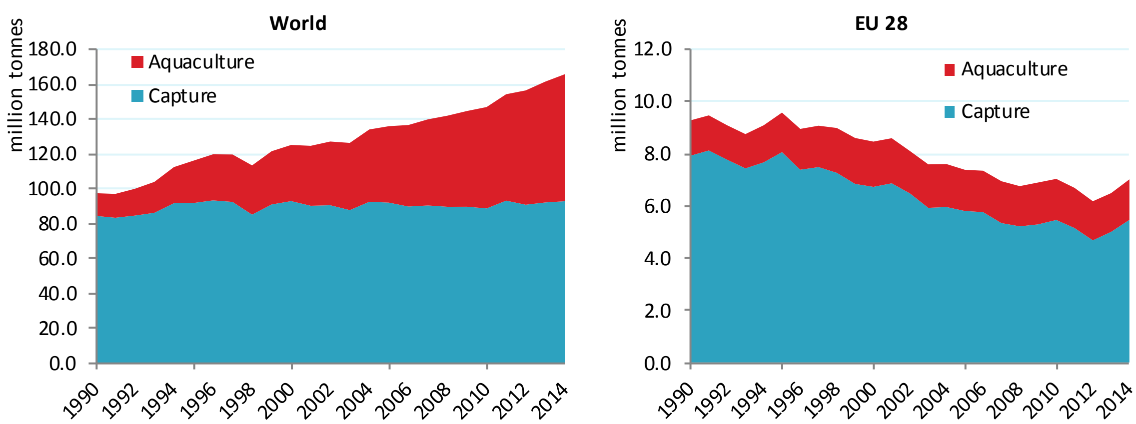

Figure 2.1: World and EU-28 seafood production (capture and aquaculture): 1990-2014.

Source: FAO, 2016

The aquaculture production in EU28 has increased by 15% from 1990, however; since 2004 the production has decreased by 6%. As EU capture fisheries production has been decreasing over the analysed period, aquaculture has become relatively more important to supply the seafood market. In 2014 the aquaculture sector provided 22% of the fish and shellfish supply in EU28.

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[1] Aquatic plants cover 27% of global weight in 2014. It is excluded as this is not covered by DCF. FAO estimates EU28 production at 633 tonnes (0.05% of total EU28 aquaculture production) in 2014.

[2] The exchange rates used for 2014 is 1 USD to 0.7527 Euro (European Central Bank).

2.1 The EU aquaculture sector

Aquaculture production in the EU28 reached 1.55 million tonnes and accounted for €3.8 billion in 2014 (FAO, 2016). The EU28 represents 1.7% of the world aquaculture production in volume and 3.2% in value[3].

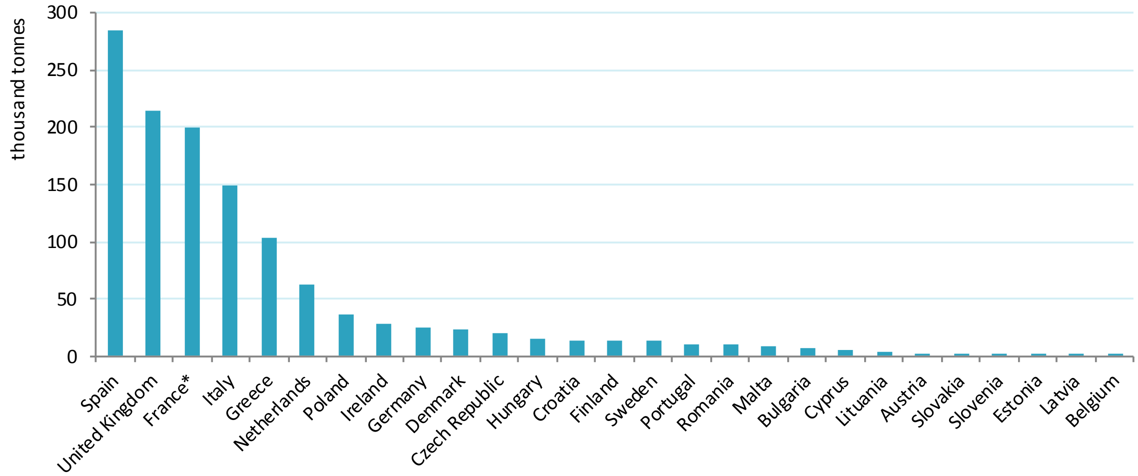
The reported sales weight and value of production collected under the DCF show a total of 1.3 million tonnes with a corresponding value of €4.5 billion in 2014.

EU aquaculture production is mainly concentrated in 5 countries: Spain, United Kingdom, France, Italy and Greece. Figure 2.2 and Figure 2.3 show the significance of the Member State's (MS) aquaculture production in the relation to the total EU28 aquaculture production in weight and value, respectively.

Spain, with 23% of the total EU production in volume, is the largest aquaculture producer in the EU, followed by United Kingdom 17%, France 16%, Italy 12%, and Greece with 8%. These five countries account for 76% of the total EU28 aquaculture production by weight.

In terms of value, United Kingdom is the largest producer in EU with 24% of the total production value, followed by France (18%), Spain (12%), Greece (11%) and Italy (10%). These five countries contribute 75% of the total EU aquaculture value.

[3] FAO Fishstat data for fish, crustaceans and molluscs, excluding aquatic plants and animals.



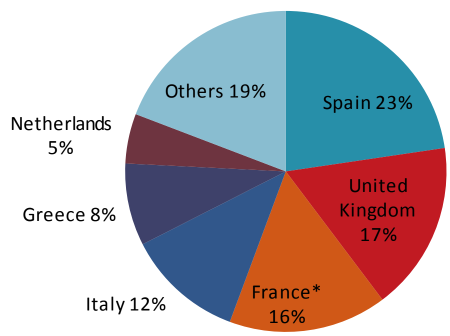
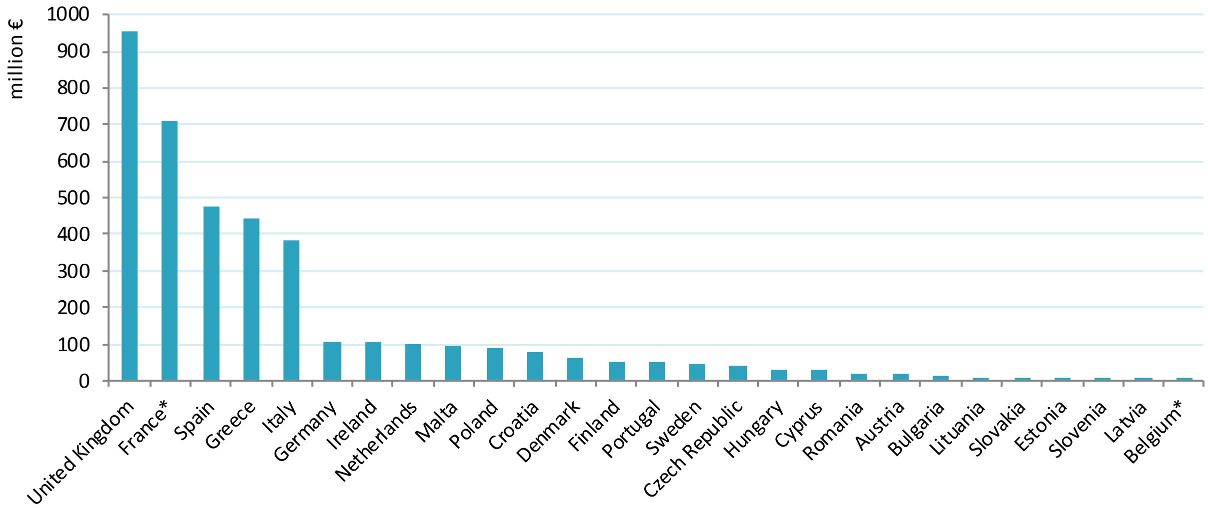


Figure 2.2: Aquaculture production in EU Member States in terms of weight: 2014.

* Note: 2013 data is used. Source: EUROSTAT, 2016

It should be noted that even though Spain has the largest aquaculture production volume (23%) it is only third in value (12%). This is due to the low market value of mussels, which represented 77% of the Spanish aquaculture production volume, but only 20% of the value.



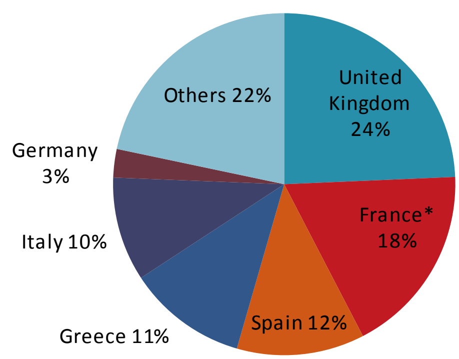


Figure 2.3: Aquaculture production in EU Member States in terms of value: 2014.

* Note: 2013 data is used. Source: EUROSTAT, 2016

From an employment perspective, the social importance of the aquaculture industry is not always reflected in the contribution, by volume or value, to the EU totals. Shellfish production employs more labour compared to the marine and freshwater production. The shellfish sector most often consist of small family owned businesses and have a large social importance for some regions in EU.

2.2 Economic performance of the EU aquaculture sector

Table 2.1 reports the number of enterprises, total sales volume, turnover, employment measures in FTE and mean wages for the analysed EU countries in 2014.

The values reported in Table 2.1, have been complemented with Eurostat data mainly to overcome the lack of data from MS not providing data for the freshwater aquaculture sector.

Table 2.1: Economic and employment indicators for the EU aquaculture sector: 2014.

Country	Number of enterprises (*number*)	Total sales volume (*thousand tonnes*)	Turnover (*million €*)	Employment (*number*)	FTE (*number*)	Average wage (*thousand €*)
Bulgaria	354 ▲	6.8 ▲	17.2 ▲	924 ▲	679 ▼	3.3 ▲
Croatia	175 ▲	12.7 ▲	73.6 ▲	2231 ▲	1117 ▼	22.1 ▲
Cyprus	16 ▲	4.9 ▼	32.3 ▬	388 ▲	337 ▲	10.5 ▬
Denmark	115 ▼	46.4 ▬	159.8 ▬	506 ▬	336 ▲	72.1 ▬
Estonia	9 ▬	0.4 ▲	1.5 ▲	36 ▲	30 ▲	10.7 ▼
Finland	170 ▲	11.7 ▲	59.7 ▼	515 ▼	329 ▼	39.5 ▲
France	2953 ▬	225.9 ▬	833.9 ▬	16454 ▼	9114 ▲	28.3 ▲
Germany*	10 ▬	6.9 ▲	15.0 ▲	60 ▲	60 ▲	55.0 ▲
Greece	248 ▲	118.1 ▲	613.3 ▲	5129 ▲	4640 ▲	21.4 ▲
Ireland	277 ▬	31.7 ▼	116.3 ▬	1821 ▬	941 ▬	31.9 ▲
Italy**	587 ▬	185.8 ▲	566.9 ▲	5112 ▬		
Malta	6 ▬	8.6 ▼	97.3 ▼	179 ▼	153 ▼	23.1 ▲
Netherlands	110 ▬	60.1 ▲	69.7 ▲		212 ▬	50.2 ▲
Poland**	1242 ▲	36.3 ▲	89.3 ▲	7764 ▲		11.8 ▲
Portugal	1428 ▬	8.8 ▲	53.0 ▲	2357 ▼	799 ▬	12.9 ▼
Romania	430 ▬	10.6 ▲	19.1 ▼	2542 ▲	2001 ▲	4.3 ▼
Slovenia*	7 ▼	0.5 ▲	0.8 ▲	20 ▼	19 ▼	14.5 ▼
Spain	3035 ▬	288.2 ▲	545.7 ▲	19914 ▲	5946 ▲	22.6 ▲
Sweden	142 ▬	14.0 ▬	56.9 ▲	411 ▬	278 ▼	44.5 ▲
United Kingdom	551 ▬	214.7 ▲	992.6 ▲	3310 ▲	2761 ▲	35.2 ▬
Freshwater not reported		19.5 ▬	92.4 ▼			
Other none DCF		43.9 ▲	103.3 ▲			
Total DCF reported	***11865*** ▲	***1293.1*** ▲	***4414.0*** ▲	***69673*** ▲	***31446*** ▲	***23.4*** ▲
Total EU		**1337.1** ▲	**4517.3** ▲			

Source: EU MS DCF data submission & EUROSTAT, 2016.
* German and Slovenian data only include the marine sector. The volume and value have been added under "Freshwater not reported" using Eurostat data.
** Italian data on FTE is not reported as the working group consider it unreliable.
*** Polish data on average wages only refers to the marine aquaculture sector.

Number of enterprises

The DCF data cover 20 countries which have reported a total of almost 12 thousand enterprises in 2014. It is estimated that the total number of enterprises in the EU28 aquaculture sector is between 14 and 15 thousand taking into account the EU countries not reporting data on the freshwater sector under the DCF.

The majority of the enterprises in the EU aquaculture sector are micro-enterprises with less than 10 employees. In 2014 these comprised almost 90% of all aquaculture enterprises in the EU. These micro-enterprises tend to be family owned and are using rather extensive production methods and systems. The number of enterprises with more than 10 employees has increased from 1 040[4] in 2012 to 1 230 in 2014 corresponding to an increase of 21% in the total number of enterprises with more than 10 employees.

Production and sales

The total EU28 sales volume for the aquaculture sector, using DCF data complemented with Eurostat production is estimated to be 1 337 million tonnes in 2014. This corresponds to a 4% decrease from 1.387 million tonnes reported in 2012. The DCF data on Total Sales Volume was also complemented with Eurostat production data to provide an overview of all 28 EU MS. According to Article 2, of the EC Regulation No 762/2008 of the European Parliament and of the Council of 9 July 2008 on the submission by MS of statistics on aquaculture and repealing Council Regulation (EC) No 788/96, defines “production” as the output from aquaculture at first sale, including production from hatcheries and nurseries offered for sale. It should be noted that total sales is used as an estimate of total production.

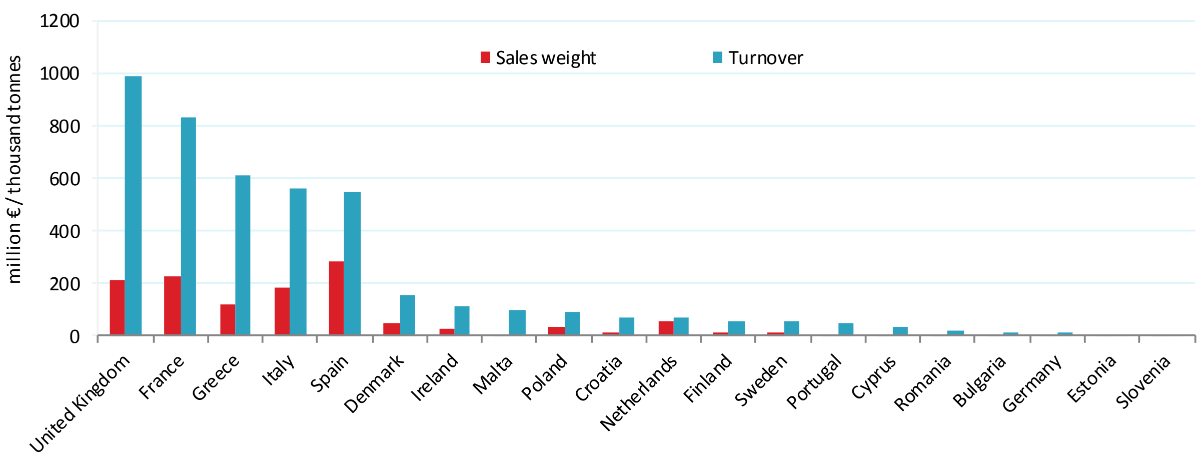


Figure 2.4: Total sales weight and turnover in the EU Aquaculture sector per MS: 2014.

Source: EU Member States DCF data submission, 2016

As can be seen in Figure 2.4 there are large differences in the volumes and turnovers from aquaculture among the 20 countries reporting to the DCF. Basically there are five large producers: United Kingdom, France, Greece, Italy and Spain with reported turnovers between

[4] This number is estimated by the EWG experts based on DCF data, excluding Greece, which did not report data for 2012.

€550 million and €1 000 million. All other countries have reported turnovers less than €200 million.

Turnover

The total value of sales (turnover) from the EU28 aquaculture sector is reported at €4 517 million in 2014. This represents a 3% increase to the €4 365 million reported in 2012. DCF data on turnover has been complemented with Eurostat production value data to provide an overview for all 28 EU MS.

Employment

The reported DCF data displays an employment of about 69 700 people in 2014. Based on the data available for both 2012 and 2014, the employment increase by 1% from the 68 700 employed estimated in 2012[5]. It is estimated that the EU28 aquaculture sector directly employs around 80 000 persons, taking into account the EU countries not reporting data on the freshwater sector under the DCF.From Figure 2.5 it can be seen that employment varies a lot between countries depending on the most important production in terms of species and technique used in each country.

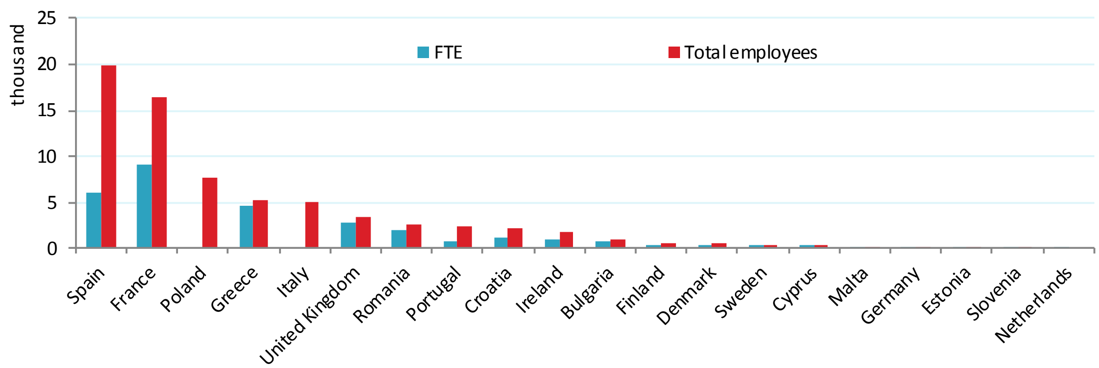


Figure 2.5: Numbers of Employees and FTE's in the Member States Aquaculture sector: 2014.

Source: EU Member States DCF data submission, 2016

Looking at the full time equivalents (FTEs) there has been a decrease of 5% from the 28 100[6] FTEs reported in 2012 to the 26 800 FTEs reported this year.

The EU aquaculture sector has a substantial component of part-time work. This can be seen from the ratio of full time equivalents (FTE) to total employees. The lower the ratio, the more part-time or seasonal work exists, while the higher (closer to 1) the ratio, the more occupation is full time. The current data from 17 countries (Excluding Greece in 2012 and

[5] Netherlands did not report numbers on employees in 2014 and is excluded from the calculation of change from 2012-2014 .

[6] Poland, Italy and Greece did not report the numbers of FTEs in either 2012 or 2014 and is excluded from the calculation of change from 2012-2014.

Italy, Poland and Netherlands in 2014) shows that the ratio for the EU aquaculture sector was 0.54 in 2012 and 0.55 in 2014. This might indicate a slight tendency towards less part-time employment in the aquaculture sector.

The large proportion of part-time and seasonal employment in the EU aquaculture sector is mainly due to the shellfish segments, which have a significant percentage of part-time and seasonal work.

Women accounted for the 24% of employees in the EU aquaculture sector, but only 19% of the FTEs in 2014, mainly because of their presence in the shellfish sector.

Mean wages

The average wage is calculated as the sum of the costs in wages and salaries and the imputed value of unpaid labour divided by the total number of employees and the total number of FTEs. DCF data from 18 countries (Italy and Polen did not report the number of FTE) show that the average wage per FTE for the EU aquaculture sector in 2014 was about €23 400 per year. This is an increase of 6% from the €22 100 reported in 2012.

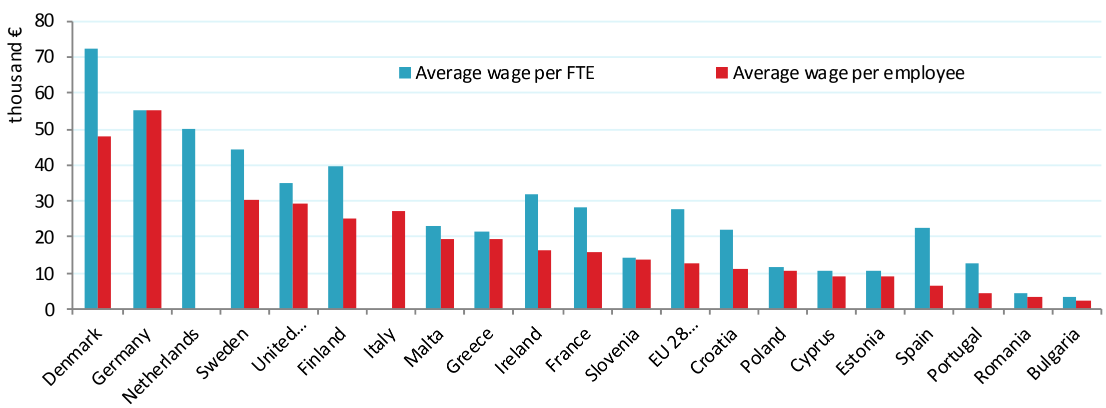


Figure 2.6: Average wage in the EU Aquaculture sector per MS: 2014.

Source: EU Member States DCF data submission, 2016

There are large differences between the average wages paid in each country. The average wages varied from €3 300 per year in Bulgaria to €72 100 per year in Denmark. The differences among countries and subsectors are being analysed in more detail in the next chapter.

Gross Value Added

DCF data from 19 countries (Poland did not submit the necessary data for calculation of GVA) show that the EU aquaculture sector provided about €1 596 billion in Gross Value Added in 2014. This is an increase of 14%[7] from the €1 294 billion reported in 2012.

[7] Greece did not report GVA in 2012 and is excluded from the calculation of change from 2012-2014.

Table 2.2: Economic performance Indicators for the EU aquaculture sector: 2014.

Country	GVA	EBIT	ROI	Labour productivity	Capital productivity	Future Expectations Indicator
	million €	*million €*	*%*	*thousand €*	*%*	*%*
Bulgaria	11.6	9.8	37.4	17.0	44.0	0.2
Croatia	-38.5	-69.5	-16.7	-34.5	-9.2	6.6
Cyprus	9.6	5.0	14.8	28.4	28.2	1.0
Denmark	36.5	5.7	3.1	108.7	20.0	4.6
Estonia	0.1	-0.4	-4.6	2.6	0.8	-1.2
Finland	16.6	0.1	0.1	50.5	17.4	-5.5
France	472.8	56.0	5.2	51.9	43.8	-9.2
Germany*	9.3	3.6	17.3	155.6	44.5	-2.9
Greece	119.0	4.2	0.4	25.6	9.9	-1.0
Ireland	49.2	15.8	7.9	52.2	24.6	7.7
Italy**	230.7	74.2	8.4		26.0	26.2
Malta	13.6	8.6	29.7	89.1	46.8	-1.6
Netherlands	39.6	23.6	71.0	186.8	119.2	-6.1
Poland*	1.1	0.3	4.2	21.3	14.2	21.3
Portugal	27.6	-13.0	-4.9	34.6	10.4	-0.3
Romania	43.1	30.8	16.3	21.6	22.8	0.2
Slovenia*	0.7	0.2	2.1	35.6	7.7	1.6
Spain	195.6	43.2	5.4	32.9	24.5	-1.2
Sweden	18.2	3.7	5.6	65.5	27.8	-3.3
United Kingdom	341.0	200.1	33.4	123.5	57.0	5.6
Total EU	**1598.4**	**402.3**	**6.5**	**49.6**	**26.0**	**-5.8**

* German, Polish and Slovenian data does not include the freshwater sector.
** Italian labour productivity is not reported as the Italian FTE is considered unreliable by the EWG.
Source: EU MS DCF data submission, 2016

EBIT (Earnings Before Interest and Taxes or Operating Profit)

DCF data from 19 countries (excluding Poland) show that the EU aquaculture sector was more profitable in 2014 with a reported total EBIT of €402 million, which is an increase of 24% from the €324 million reported in 2012.

ROI (Return On Investment)

ROI is a performance measure to evaluate the profitability of an investment. ROI is calculated as EBIT divided by total assets. DCF data from 19 countries (excluding Poland) shows an average ROI of the EU aquaculture sector of 6.5% in 2014, which is a decrease from the 7% reported in 2012. The operating profit margin or EBIT ratio can be obtained by dividing the EBIT by the turnover and is estimated at around 9% for 2014. However, the ROI for aquaculture is considered a better measure of long term viability.

Labour productivity

The labour productivity is calculated as the total costs in wages and salaries and the imputed value of unpaid labour divided by the total number of FTEs. DCF data from 19 countries (excluding Poland) shows that the labour productivity for the EU aquaculture sector was about €49.6 thousand per FTE in 2014. This represents a 34% increase from the €38 thousand per FTE reported in 2012.

There is a large variation between member states in the estimated labour productivity. Croatia had a negative GVA and therefore also a negative labour productivity. Estonia and Bulgaria had the lowest labour productivity of €2.6 and €17 thousand, whereas Netherlands had the highest with a labour productivity of €186.8 thousand.

Capital Productivity

Capital productivity is calculated as Gross Value Added (GVA) divided by Capital value (total value of assets) in percentage. The indicator describes the average value added to the economy per unit of capital invested in the aquaculture sector. DCF data from 19 countries (excluding Poland) shows that the capital productivity for the EU aquaculture sector was 26% in 2014, which was slightly lower than the 28% reported in 2012.

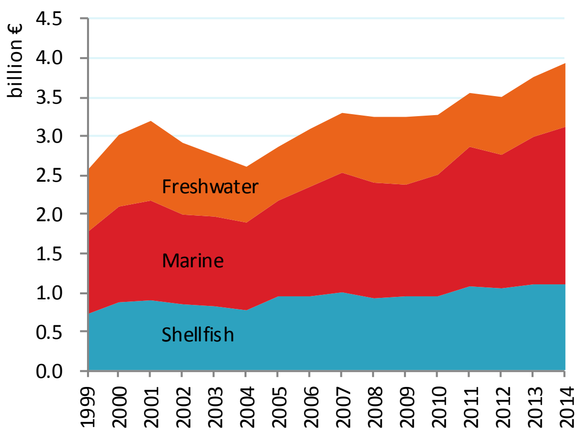
Future Expectations Indicator (FEI)

The FEI indicates whether the industry in a sector is investing more than the depreciation of their current assets. With DCF data from 19 countries (excluding Poland) the FEI for the EU aquaculture sector was estimated to be negative at 5.8% in 2014. This is a decrease from the 3% reported in 2012.

The industry seems to be investing less in itself, and consequently should have less positive expectations on the future development of the sector. However, the indicator should be interpreted with caution and there is a need to look and interpret this indicator in more detail on sector level, as it is done in next chapter.

3 THE STRUCTURE OF THE EU AQUACULTURE SECTOR

In 2014, marine fish accounted for 35% of the EU aquaculture production in weight, freshwater fish accounted for 24% and shellfish for 40%. While in value terms marine fishes accounted for 51% of the EU aquaculture production, freshwater fishes accounted for 21% and shellfish for 28%. The evolution of the EU aquaculture production in weight and value terms is represented in Figure 3.1.



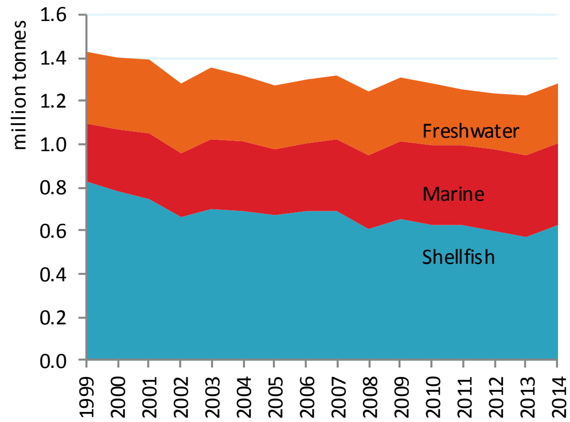


Figure 3.1: EU (28) aquaculture production in weight and value by subsector: 1999-2014.

Source: own elaboration from FAO, 2016

Figure 3.2 shows that income in the EU aquaculture sector is mainly generated in the marine sector (€2 290 million) and the shellfish sector (1 317 million) followed by the freshwater sector (€727 million).

Most of the GVA is generated in the shellfish sector (€758 million) followed by the marine sector (€483 million) and the freshwater sector (€258 million).

EBIT is mainly generated in the shellfish sector (€165 million) followed by the marine sector (€99 million) and the freshwater sector (€87 million).

Net profit are mainly generated in the shellfish sector (€133 million), followed by the freshwater sector (€68 million) and the marine sector (€43 million).

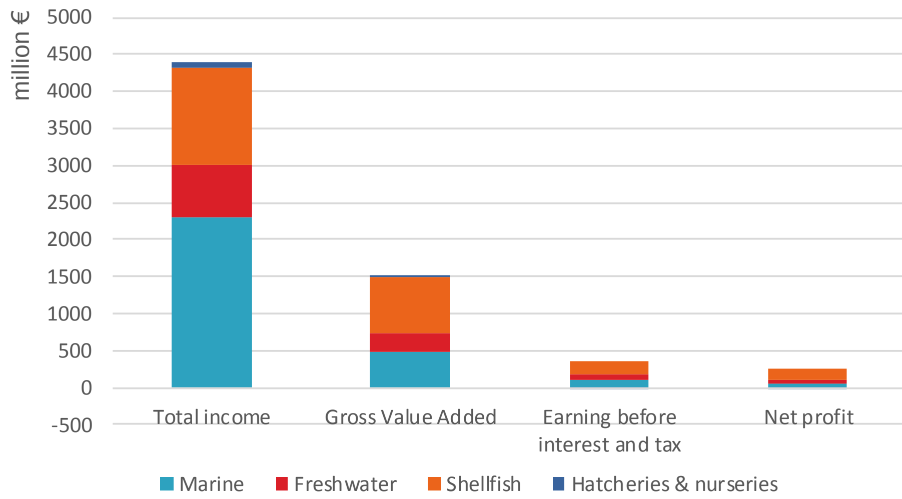


Figure 3.2: EU Aquaculture economic performance by subsector: 2014.

Source: EU Member States DCF data submission, 2016

Main species in the EU aquaculture

In 2014, according to DCF data, the production volume by specie for the EU aquaculture was 1.3 million tonnes and value over €4.5 billion. The main aquaculture species produced in weight terms were Mediterranean mussel (321 thousand tonnes, 25% of total EU production), Atlantic salmon (189 thousand tonnes, 15%), Blue mussels (147 thousand tonnes, 11%), Rainbow trout (137 thousand tonnes, 11%) and Pacific cupped oysters (128 thousand tonnes, 10%). These five species account for more than half (72%) of the total EU aquaculture production in weight.

The Mediterranean mussel was produced mainly in Spain (63% of the EU production), and Italy (27%). Atlantic salmon was mostly produced in the United Kingdom, with more than 94% of the total production and Ireland (5%). Pacific cupped oysters were mostly produced in France (88%) and Ireland (7%). Rainbow trout was produced mainly in Denmark (32%), France (25%), Spain (11%) and United Kingdom (10%).

In 2014, the main aquaculture species produced in value were Atlantic salmon (€957 million, 23% of total EU value), Pacific cupped oysters (€610 million, 14%), Gilthead seabream (€548 million, 13%), rainbow trout (€461 million, 11%) and European seabass (€325 million, 8%). These five species accounted for 69% of the total EU28 aquaculture production in value for 2014.

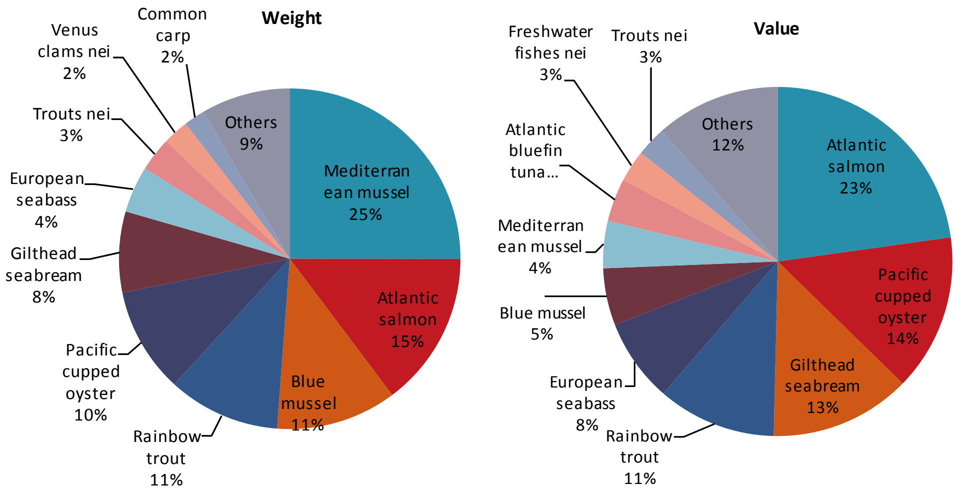


Figure 3.3: Main species produced in EU aquaculture: 2014.

Source: EU Member States DCF data submission, 2016

3.1 Marine aquaculture

Marine aquaculture producing fish is characterised by being capital intensive, in the sense that relative large investment is needed for the physical equipment and the stoking of cages compared to the input of labour. The labour productivity in the sea cage farms is high compared to other aquaculture segments in EU.

Table 3.1: Economic indicators for the EU marine aquaculture: 2014.

Country	Number of enterprises	Total sales volume	Turnover	Employment	FTE	Average wage
	number	*tonnes*	*million €*	*number*	*number*	*thousand €*
Bulgaria	18	1.6	6.3	92	73	3.7
Croatia	36	8.6	66.7	1052	685	26.5
Cyprus	8	4.8	31.5	338	327	10.4
Denmark	7	14.1	57.4	155	103	61.0
Finland	19	5.2	20.2	89	69	32.4
Greece			433.4			
Ireland	18	9.7	58.8	145	115	52.0
Italy*	70	24.0	181.0	630		
Malta	6	8.6	97.3	179	153	23.1
Portugal	56	4.6	29.6	450	443	14.5
Romania	3	0.0	0.1	4	4	29.7
Slovenia	1	0.1	0.4	4	4	14.9
Spain	88	49.1	352.6	2433	1862	33.4
Sweden	10					
United Kingdom	59	179.7	895.9	1752	1587	52.1
Other none DCF		0.0	0.0			
Total DCF reported	***399***	***310.1***	***2231.1***	***7323***	***5564***	***46.8***
Total EU		**310.1**	**2231.1**			

* Italian data on FTE and average wage are not reported as the working group consider it unreliable.
Source: EU Member States DCF data submission & EUROSTAT, 2016

The total sales volume for the EU28 marine aquaculture sector is estimated to be 310 thousand tonnes and the total value of sales (turnover) is estimated to be €2.23 billion in 2014, corresponding to 14.3% increase from 2013. Available data reports 399 enterprises in the EU marine aquaculture sector in 2014 (excluding Greece). Concerning employment in marine aquaculture sector, 7.7% annual increase to 7 323 employees was observed during 2013-2014. Enterprises had on average 18 employees.

The average wage for the EU marine aquaculture sector was €46.8 thousand in 2014. There is a significant variability in wages between countries. This variability in salaries can be explained by differences in labour productivity and the capital and production intensity of the different techniques. The highest average wage was observed in Denmark with €61 thousand per year.

Table 3.2: Economic Performance indicators for the EU marine aquaculture: 2014.

Country	GVA		EBIT		ROI		Labour productivity		Capital productivity		Future Expectations Indicator	
	million €		*million €*		*%*		*thousand €*		*%*		*%*	
Bulgaria	5.8	▲	5.4	▼	123.4	▼	79.9	▼	133.7	▼	13.7	▼
Croatia	-45.0	▲	-67.8	▲	-21.1	▲	-65.7	▲	-14.0	▲	7.8	▼
Cyprus	9.2	▼	4.8	▼	14.8	▼	28.1	▼	28.2	▼	1.0	▼
Denmark	9.0	▼	1.1	▼	2.4	▼	87.6	▼	19.7	▼	2.0	▼
Finland	4.8	▲	1.7	▼	8.3	▼	68.9	▲	23.0	▲	-8.5	▲
Greece	46.5	▼	-40.2	▲	-27.3	▼			31.6	▲	-8.3	▼
Ireland	16.7	▼	10.1	▼	11.3	▼	126.3	▼	18.8	▼	16.9	▼
Italy*	42.6	▲	15.7	▼	6.3	▼			16.9	▼	18.4	▲
Malta	13.6	▼	8.6	▼	29.7	▼	89.1	▬	46.8	▼	-1.6	▼
Poland	1.1	▲	0.3	▲	4.2	▲	21.3	▲	14.2	▲	-0.9	▬
Portugal	8.5	▼	-22.5	▼	-9.1	▼	19.1	▼	3.4	▼	0.6	▼
Romania	-0.3		-0.6		-12.6		-85.9		-6.8		-2.9	
Slovenia	0.1	▼	-0.1	▼	-2.6	▼	19.8	▼	2.2	▼	-3.1	▼
Spain	85.6	▲	5.9	▼	1.1	▼	45.9	▲	15.9	▲	-2.3	▼
United Kingdom	298.7	▲	177.2	▲	33.2	▲	188.2	▲	56.0	▲	6.0	▲
Total EU	**496.7**	▲	**99.6**	▼	**3.5**	▼	**73.3**	▲	**17.3**	▼	**0.0**	▼

* Italian data on labour productivity is not reported as the working group consider it unreliable.
Source: EU Member States DCF data submission, 2016

The EU marine aquaculture sector provided €496.7 million in GVA which was 10% higher compared to 2013. EBIT decreased by -20% to reach almost €100 million, mainly due to the poor economic performance of the Greek marine sector, while net investments increased by 16% from 2013-2014. ROI reached 3.5% in 2014 and labour productivity reached €73 300, which was almost 50% higher than the EU aquaculture average in 2014.

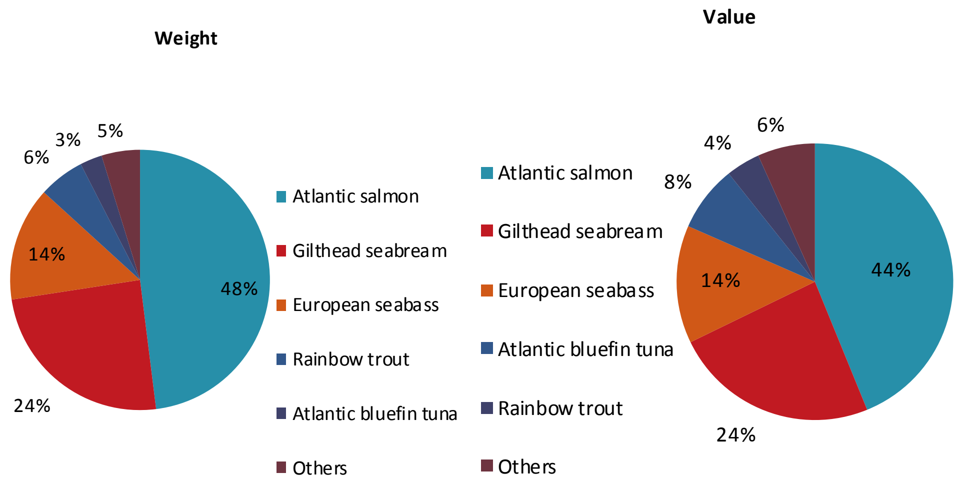


Figure 3.4: Main species produced in the EU marine aquaculture facilities: 2014.

Source: EU Member States DCF data submission, 2016

The most produced marine species in terms of total sales volume was Atlantic salmon representing 48% followed by Gilthead seabream (24%) and European seabass (14%). In terms of total sales value Atlantic salmon represented 44% followed by European seabass (24%) and Gilthead seabream (14%).

3.1.1 Salmon

According to FAO Statistics for 2014[1]: the main salmon species farmed world-wide and in the EU is Atlantic salmon (*Salmo salar*); minor farmed production of coho salmon (*Oncorhynchus kisutch*) and chinook salmon (*Oncorhynchus tshawytscha*) occurs outside the EU; the global production of farmed Atlantic salmon in 2014 was 2.3 million tonnes, valued at 14.7 billion US$ (€11.1 billion); Norway was the world's leading producer (54% of global volume) followed by Chile (27%); the EU (UK, Ireland, Denmark, France, Sweden, Spain) produced 7.5% of global farmed Atlantic salmon tonnage.

According to DCF data: the EU produced 190 466 tonnes of salmon, valued at €958 million in 2014; the main producer is the United Kingdom (179 397 tonnes), followed by Ireland (9 855 tonnes), Poland (1 210 tonnes) and Spain (4 tonnes). The Polish production represents a small volume (10 tonnes) of Atlantic salmon smolt and 1 200 tonnes of rainbow trout attributed to the salmon segment. The FAO salmon production data indicate additional EU salmon production in Denmark (405 tonnes), France (300 tonnes), Sweden (8 tonnes) and Greece (2 tonnes of coho salmon): the apparent disparities may reflect accounting in other (non-Salmon) segments or incorrectly coded production within databases.

The main indicators for EU Atlantic salmon aquaculture collated under the DCF are presented in Table 3.4Table 3.3**.** EU figures largely reflect the dominant UK industry: the UK is the main EU producer of Atlantic salmon with 94% of the production by weight and 93% by value. The UK also provides the greatest employment: 1 540 FTEs and 1 693 employees in 2014. The average annual wage in salmon aquaculture in the UK was €53 640. The second biggest producer was Ireland with 5% of the total production volume, 172 employees, 132 FTE and an average annual wage of €49 034. The similarity between the independent UK and Irish average wages gives some confidence in these derived indicators.

Table 3.3: Economic indicators for EU salmon aquaculture: 2014.

Country	Number of enterprises	Total sales volume	Turnover	Employment	FTE	Average wage
	number	*thousand tonnes*	*million €*	*number*	*number*	*thousand €*
Ireland	25	9.9	60.9	172	132.0	49.0
Poland	5	1.2	3.7	59	53.4	11.8
Spain	6	0.0	0.0	39	31.0	6.3
United Kingdom	47	179.4	893.6	1693	1540.0	53.6
Other none DCF		0.0	0.0			
Total DCF reported	***83***	***190.5***	***958.2***	***1963***	***1756***	***51.2***
Total EU		**190.5**	**958.2**			

Source: EU Member States DCF data submissions, 2016 & EUROSTAT, 2016

The salmon segment of EU aquaculture employed 1 963 persons in 2014. Part-time work is not significant, since the ratio between the employment measured in full time equivalents (FTE) and the total employment was 89% in 2014.

[1] http://www.fao.org/fishery/static/Yearbook/YB2014_CD_Master/root/aquaculture/b23.pdf.

Figure 3.5 shows the economic performance indicators by production technique for salmon aquaculture in 2014. The salmon combined segment makes up the majority of the turnover and the gross value added. Almost all of the net profit comes from the combined segment as the UK groups all salmon enterprises within this segment.

Figure 3.5: Economic performance indicators for salmon aquaculture: 2014.

Source: EU Member States DCF data submission, 2016

EU salmon aquaculture produced a GVA of €317 million and an EBIT (earnings before interest and tax) of €188 million. The ROI (return on investment) was 30%. Labour productivity was €180 200 per FTE. The capital productivity was 50%, and the Future Expectations indicator was 7.4%.

Table 3.4: Economic performance indicators for EU salmon aquaculture: 2014.

Country	GVA *million €*	EBIT *million €*	ROI *%*	Labour productivity *thousand €*	Capital productivity *%*	Future Expectations Indicator *%*
Ireland	16.7	10.1	11.3	126.3	18.8	16.9
Poland	1.1	0.3	4.2	21.3	14.2	-0.9
United Kingdom	298.7	177.2	33.2	194.0	56.0	6.0
Total EU	316.5	187.6	29.8	180.2	50.2	7.4

Source: EU Member States DCF data submissions, 2016

From Figure 3.6 it can be seen that the economic performance of the EU salmon segment has continued to improve to 2014: the GVA and net profit margin increased significantly. However, due to the limited time series of UK economic data (2012-2014), Figure 3.6 does not show the real evolution of the whole EU salmon segment from 2008.

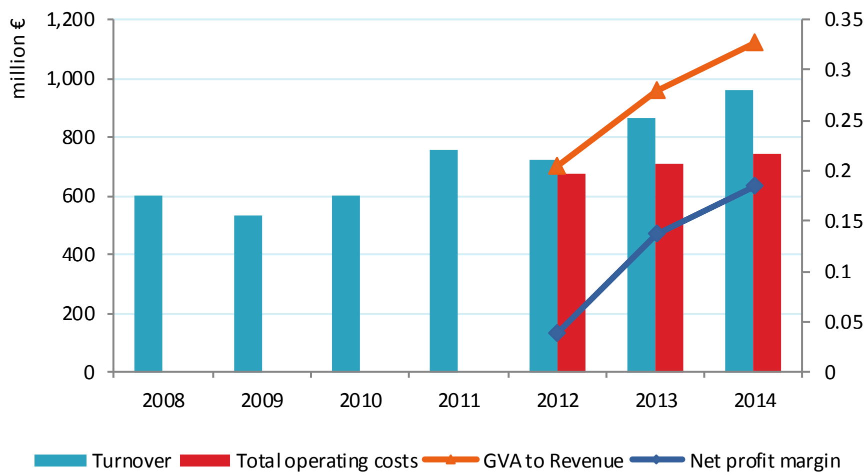


Figure 3.6: Economic performance indicators for salmon aquaculture: 2008-2014.

Source: EU Member States DCF data submission, 2016

From Figure 3.7 it can be seen that the salmon combined segment makes up the bulk of turnover, GVA, EBIT and net profit of the EU salmon segment. This is because the UK reports all its salmon production within the combined segment. The total income of the combined segment has risen since 2008 due to year-on-year increases in sales volume.

Total operating costs have increased year on year (2012-2014), but GVA and net profit have also increased reflecting increased production and turnover.

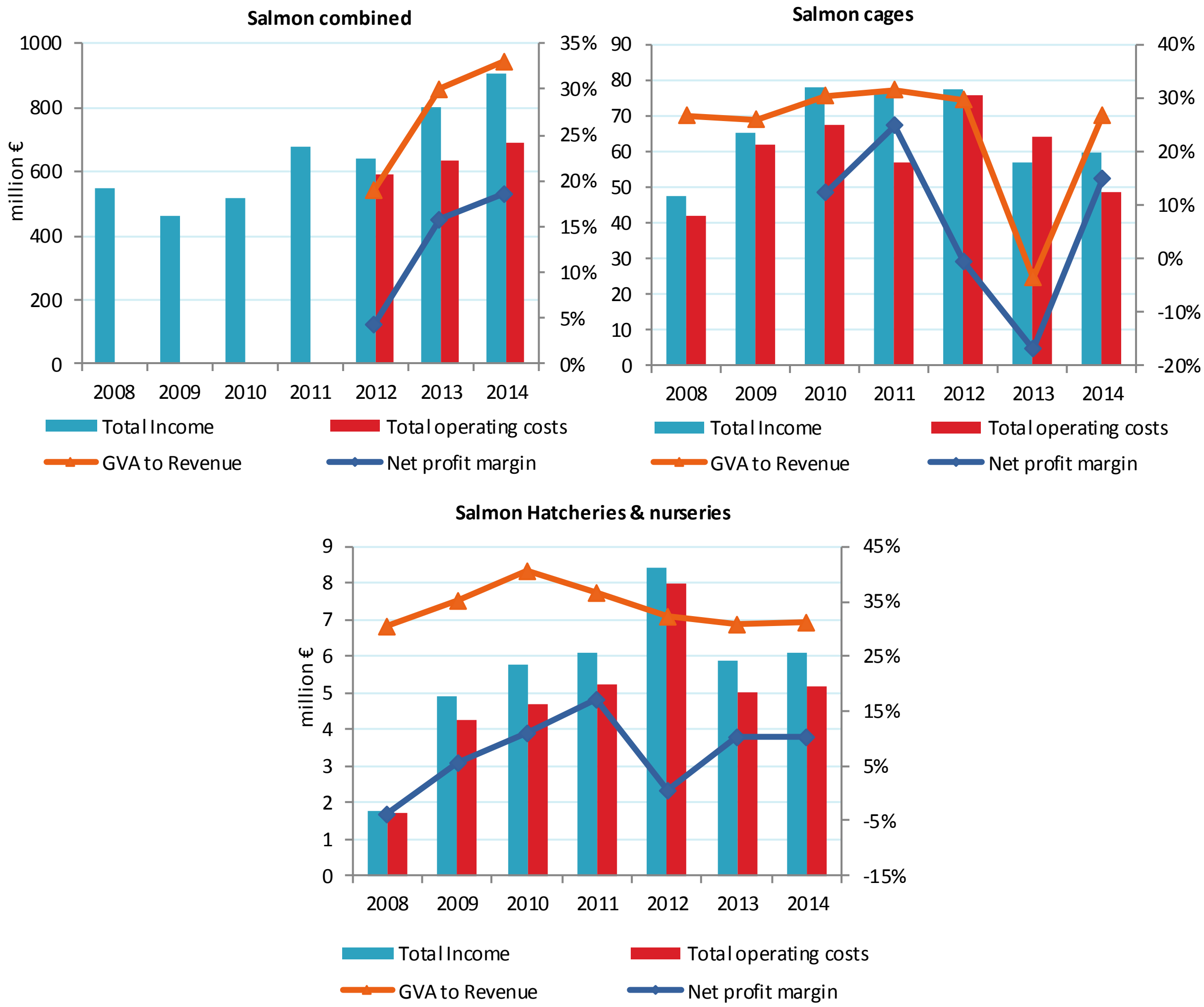


Figure 3.7: Development of economic performance for EU salmon aquaculture: 2008-2014.

Source: EU Member States DCF data submissions, 2016

The most important costs of the EU salmon aquaculture sector are feed costs (41% of total costs). Other operational costs constitute the next highest outgoing (36%), followed by labour (12%), repair and maintenance (4%), livestock (4%), and energy costs (2%). It is noteworthy that the value of unpaid labour is negligible (<0.1%) in comparison to paid labour costs; this reflects the highly professional nature of commercial salmon farming with a fully contracted workforce.

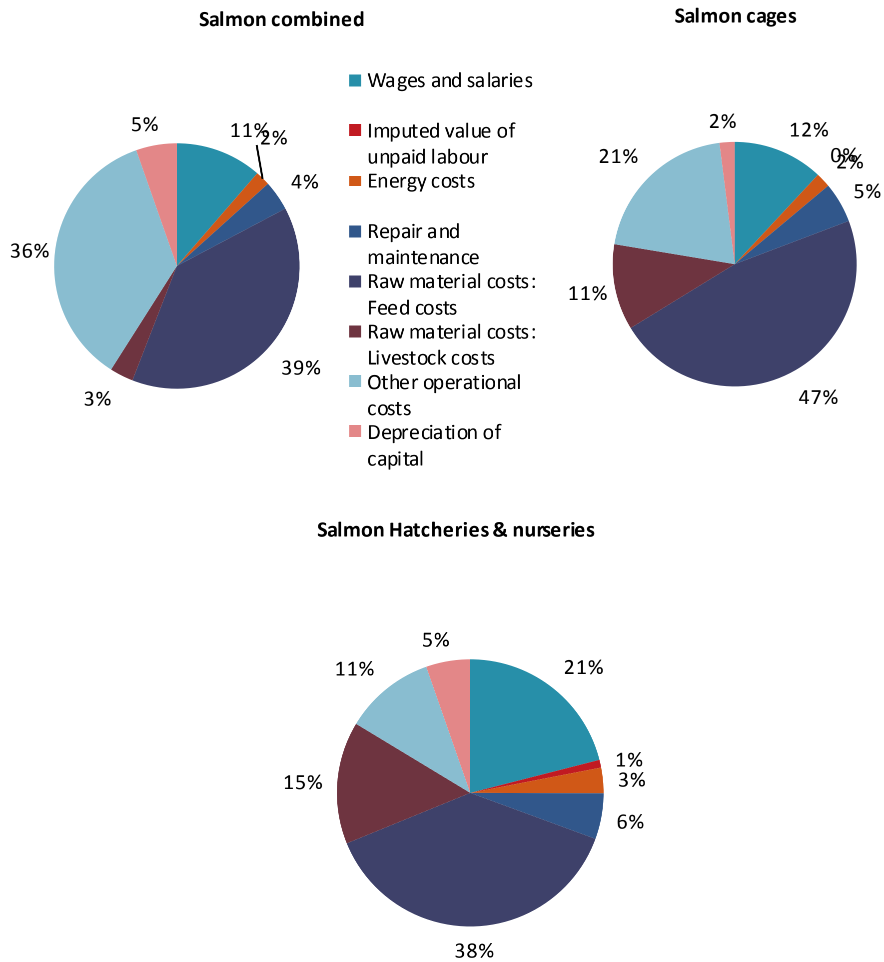


Figure 3.8: Costs breakdown for the EU salmon aquaculture: 2014.

Source: EU Member States DCF data submission, 2016

The average price of Atlantic salmon has shown moderate fluctuation over the period 2008-2014, showing a minimum in 2009-2010 (€3.4/kg) and a maximum recently in 2013-2014 (€5/kg). Prices for EU salmon are likely to reflect the global market, influenced by the larger industries in Norway and Chile.

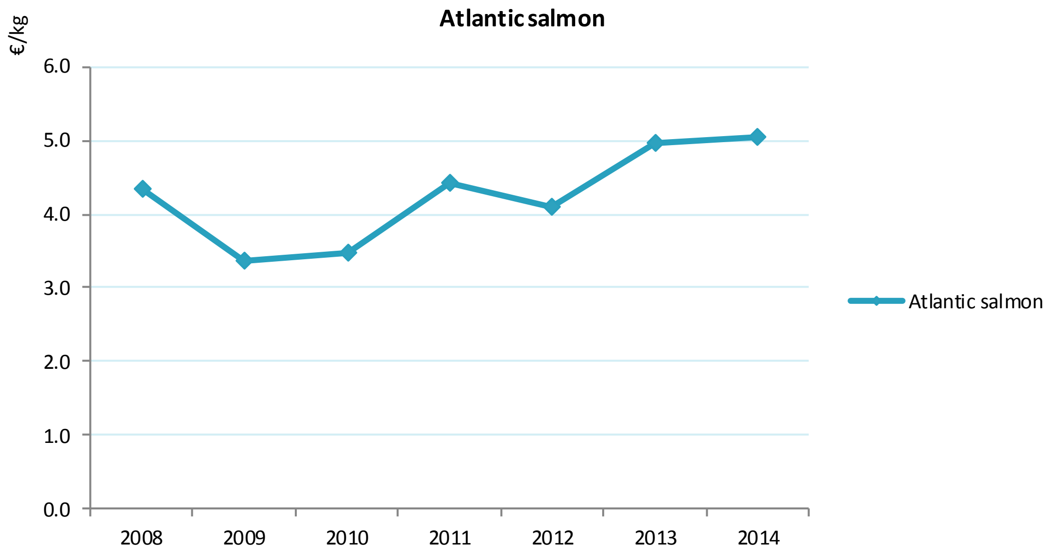


Figure 3.9: Price evolution of the main species of salmon group: 2008-2014.

Source: EU Member States DCF data submission, 2016

3.1.2 Seabass & Seabream

According to FAO production data, the combined production of European seabass (*Dicentrarchus labrax*) and Gilthead seabream (*Sparus aurata*) increased during the 2008 – 2014 period from 245.3 thousand tonnes valued 1 480 million USD in 2008 to 314.8 thousand tonnes valued 1 962 million USD in 2014. Leading production countries are Turkey and Greece producing 37% and 26% of the total volume and 32% and 28% of the total value in 2014, respectively. The 5 largest producing countries: Turkey, Greece, Spain, Egypt and Italy produced more than 84% of the total volume in 2014. Turkey, Egypt and Tunisia have considerably increased the production volume since 2008, whereas the Greek production volume decreased by 5% during the same period. The volume share of the EU producer countries have decreased from 60% in 2008 to 43% in 2014. Accordingly, the value share of the EU producer countries has decreased from 65% in 2008 to 54% in 2014 (FAO, 2016).

Global production of European seabass (*Dicentrarchus labrax*) according to FAO production data, increased during the 2008 – 2014 period from 115 thousand tonnes valued 782 million USD in 2008 to 156 thousand tonnes valued 991 million USD in 2014. Turkey and Greece are the world seabass leading producers with 48% and 21% of the volume and 42% and 23% of the value produced, respectively. The EU member states produced 64 thousand tonnes, valued 508 million USD, in 2014. The main European producer is Greece with 32.1 thousand tonnes, followed by Spain and Italy with 16.7 and 6.7 thousand tonnes, respectively. The volume share of the EU producer countries have decreased from 52% in 2008 to 41% in 2014. Accordingly, the value share of the EU producer countries has decreased from 61% in 2008 to 51% in 2014 (FAO, 2016).

Global production of Gilthead seabream (*Sparus aurata*) according to FAO production data, increased during the 2008 – 2014 period from 129 thousand tonnes valued 698 million USD in 2008 to 158 thousand tonnes valued 971 million USD in 2014. Greece and Turkey are the world gilthead seabream leading producers with 32% and 26% of the volume and 33% and 11% of the value produced, respectively. The EU member states produced 85.5 thousand tonnes, valued 561 million USD, in 2014. The main European producer is Greece with 50.7 thousand tonnes, followed by Spain and Italy with 17 and 5.4 thousand tonnes, respectively. The volume share of the EU producer countries have decreased from 58% in 2008 to 54% in 2014. Accordingly, the value share of the EU producer countries has decreased from 70% in 2008 to 58% in 2014 (FAO, 2016).

The vast majority of seabass and seabream is produced and consumed in Southern European and other Mediterranean countries. The European industry consists of more than 197 (we miss information from Greece), which is a decrease from the 2013. Most of these firms combine the production of the two species, and volumes of each may change yearly according to the demand and prices. When price of seabream decreases, producers usually increase the production of seabass and vise versa.

Table 3.5: Economic indicators for the EU seabass & seabream aquaculture: 2014.

Country	Number of enterprises *number*	Total sales volume *thousand tonnes*	Turnover *million €*	Employment *number*	FTE *number*	Average wage *thousand €*
Croatia	32	6.0	34.9	824	468	23.5
Cyprus	8	4.8	31.5	338	327	10.4
Greece			418.3			
Italy	51	18.8	147.8	464		
Malta	1	2.9	13.0	55	46	25.6
Portugal	46	1.9	16.1	223	210	13.9
Slovenia	1	0.1	0.4	4	4	14.9
Spain	57	37.2	242.3	1513	1142	34.0
Others		0.0	0.0			
Total DCF	***196***	***71.6***	***904.3***	***3421***	***2196***	***26.1***
Total EU		**71.6**	**904.3**			

* Italian data on FTE and average wage are not reported as the working group consider it unreliable.
Source: EU Member States DCF data submission, 2016.

Based on DCF data, EU production (excluding Greece), decreased during 2014 to 71.8 thousand tonnes. The value of EU production, including Greece, increased during 2014 at €904.3 million. Employment rose to 3 444 employees (excluding Greece) corresponding to 2 196 FTEs. On average the wages decreased in the EU seabass and seabream aquaculture segment.

Since 2012 onwards, the EU production of seabass and seabream has stabilised. The most important factors driving this stabilization refer to the 2008/2009 price decline and the weak demand in southern Europe as an effect of the lower income due to the recent debt crisis. Southern European member states have been influenced by the global economic crises (Italy, Slovenia, Croatia, Spain and Greece) during the recent years. Low credit availability in southern Europe also contributed to the stabilization of production. On top, rising feed costs have weakened the economic performance of the sector. Recent liquidity problems of the Greek producers did not allow the sector to recover from the 2008/2009 price decline. In Greece, the concentration process of the sector during the past years was mainly financed by loans. A large number of Greek SME's and larger aquaculture enterprises were unable to repay these loans and a new restructuring and concentration cycle has started in Greece during 2014. The ownership of the major seabass and seabream aquaculture companies was transferred to the Greek banks during 2015/2016. In the short run, rise of the production and rise of investment is expected for the Greek aquaculture. The Greek banks, as present major shareholders in the aquaculture are expected to transfer the shares to new investors. Further consolidation of the seabass and seabream sector is also likely, subject to authorization of the competition authorities. On the long run, more EMFF funds directed toward research and innovation (rather to the renovation of production facilities) is needed for the development of the sector.

Since 2008, non EU countries such as Turkey, Egypt and Tunisia have considerably increased production of the two species. Until 2012, approximately 10% of the Turkish production was controlled by Greek enterprises, but since then, most of these assets were transferred to new owners. While Turkish seabream production is significant, most of the quantities produced are consumed in the local market. On the other hand, Turkish seabass production is exported to EU countries. There exists a price premium for the European seabass production, which is attributed to the quality of the product. The delay of approximately one day for Turkish fresh seabass to reach the EU markets is reflected in the quality and the price of the product. The export subsidy that used compensate for the lower price of the Turkish product has also contributed to the lower price of the product in the EU market.

The Ukrainian conflict and the ban of the EU exports to Russia have recently restricted access to these markets for the EU aquaculture products.

While some southern EU countries have started recovering from the recent debt crisis, demand for seabass and seabream is expected to grow further in the near future. A rise of the production, mainly for seabass and seabream, is expected by 2017 and onwards mainly as an effect of the higher prices (and thus profit margins) received by the producers during the second half of 2014 and 2015. The restructuring of debt and the bank loans, the changes of the shareholders and the changes of management for the main Greek production companies (during 2015 and 2016) are also expected to facilitate the expected rise of the Greek production.

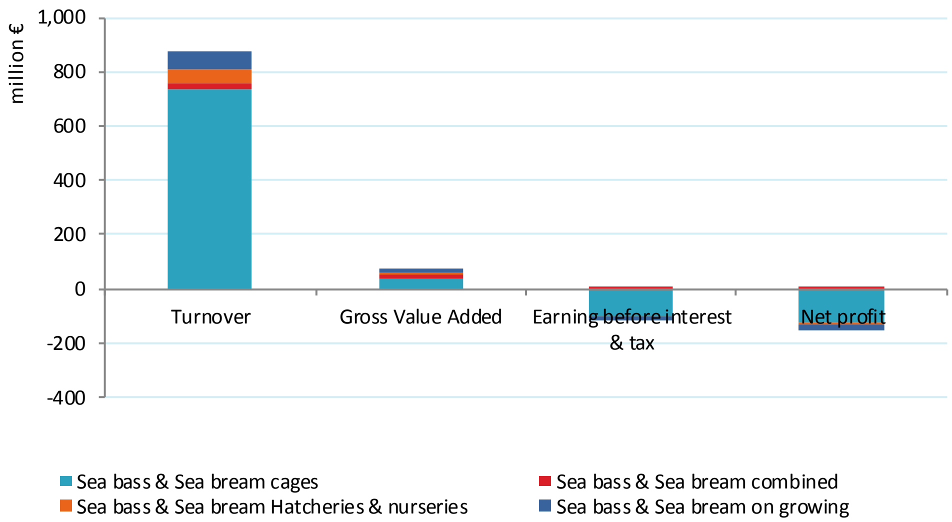


Figure 3.10: Economic performance indicators for sea bass and sea bream aquaculture: 2014.

Source: EU Member States DCF data submission, 2016

For the EU countries that reported seabass and seabream economic performance data by segment (Figure 3.10), the turnover reached €904 million in 2014, mainly originating (84% of the total) from the cages segment. For the same countries, GVA was positive during 2014 but EBIT and net profit are negative.

Performance indicators for the EU seabass and seabream producer countries are presented in the table below. It is obvious that for all the EU countries, the seabass and seabream segment recorded losses during 2014.

Table 3.6: Economic Performance indicators for the EU sea bass and sea bream aquaculture: 2014.

Country	GVA	EBIT	ROI	Labour productivity	Capital productivity	Future Expectations Indicator
	million €	*million €*	*%*	*thousand €*	*%*	*%*
Croatia	-53.7 ▲	-66.8 ▲	-31.8 ▼	-114.9 ▲	-25.6 ▼	10.6 ▲
Cyprus	9.2 ▼	4.8 ▼	14.8 ▼	28.1 ▼	28.2 ▼	1.0 ▼
Greece	44.9 ▼	-38.8 ▼	-5.5 ▼		0.7 ▼	-1.6 ▲
Italy*	34.3 ▼	11.5 ▼	5.5 ▼		16.4 ▼	17.9 ▲
Malta	-0.6 ▼	-2.1 ▼	-34.9 ▼	-13.4 ▼	-10.0 ▼	2.5 ▼
Portugal	4.5 ▼	-11.7 ▼	-39.4 ▼	21.5 ▼	15.2 ▼	15.0 ▼
Slovenia	0.1 ▼	-0.1 ▼	-2.6 ▼	19.8 ▼	2.2 ▼	-3.1 ▼
Spain	42.2 ▲	-4.9 ▼	-2.0 ▼	36.9 ▲	17.2 ▲	0.0 ▼
Total EU	80.8 ▼	-108.2 ▼	-14.7 ▼	0.7 ▲	4.9 ▼	8.8 ▬

* Italian data on labour productivity is not reported as the working group consider it unreliable.
Source: EU Member States DCF data submission, 2016

Despite partial recoveries of some minor producers in 2012, the economic performance of the seabass and seabream segment is still worsening and have not recovered. The recovery of the sector is still underway in Greece[2] where despite negative EBIT and net profit in 2014, the sector seems to improve since 2013. Despite general negative EBIT and ROI, the indicator of future expectation was positive in 2014, showing that there is investment in the segment.

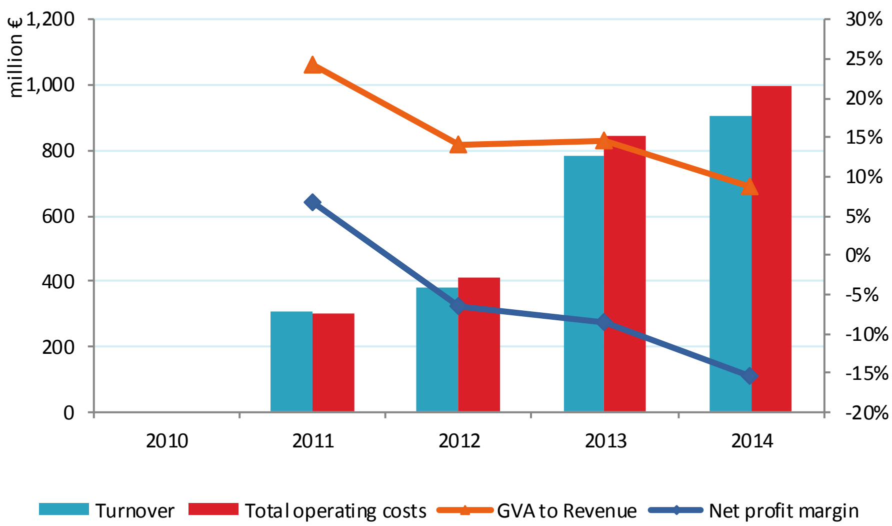


Figure 3.11: Economic performance indicators for sea bass and sea bream aquaculture: 2010-2014.

Source: EU Member States DCF data submission, 2016

As presented inFigure 3.11, the EU seabass and seabream sector since 2012, presents operating costs higher that the turnover thus growing losses are recorded for 2013 and 2014. The same trend may be identified for the largest segment, that is the cages segment, where losses are recorded in 2014 (Figure 3.12). In the case of hatcheries and nurseries, the downward trend seems to have reversed in 2014 while the on-growing segment is still suffering losses in 2014.

[2] Consolidated Financial Figures for the Mari-culture industry in 2014 (in Greek). Downloaded from http://www.inr.gr/?p=a2098&CB=1 on 21/09/2016.

Figure 3.12: Development of economic performance for the EU sea bass and sea bream aquaculture: 2008-2014.

Source: EU Member States DCF data submission, 2016

In Figure 3.13, the cost structure of the EU seabass & seabream aquaculture subsector is presented for 2014.

In the cage segment, the largest segment in terms of volume and value, raw material (feed costs and livestock) account for 59% of the total cost, relatively stable since 2008. Other operational costs and wages account for 16% and 11% of the total cost respectively in 2014. Other operational costs vary between 15% and 20% since 2008 while wages and salaries present a decreasing trend. Part of the decreasing trend may be attributed to the decreasing wages and salaries in the southern EU countries but also to the outsourcing of some activities in the segment. The energy costs share is the only cost that has increased considerably, from 1% in 2008 to 7% in 2014 reflecting the increasing fuel prices for the period 2008 to 2014.

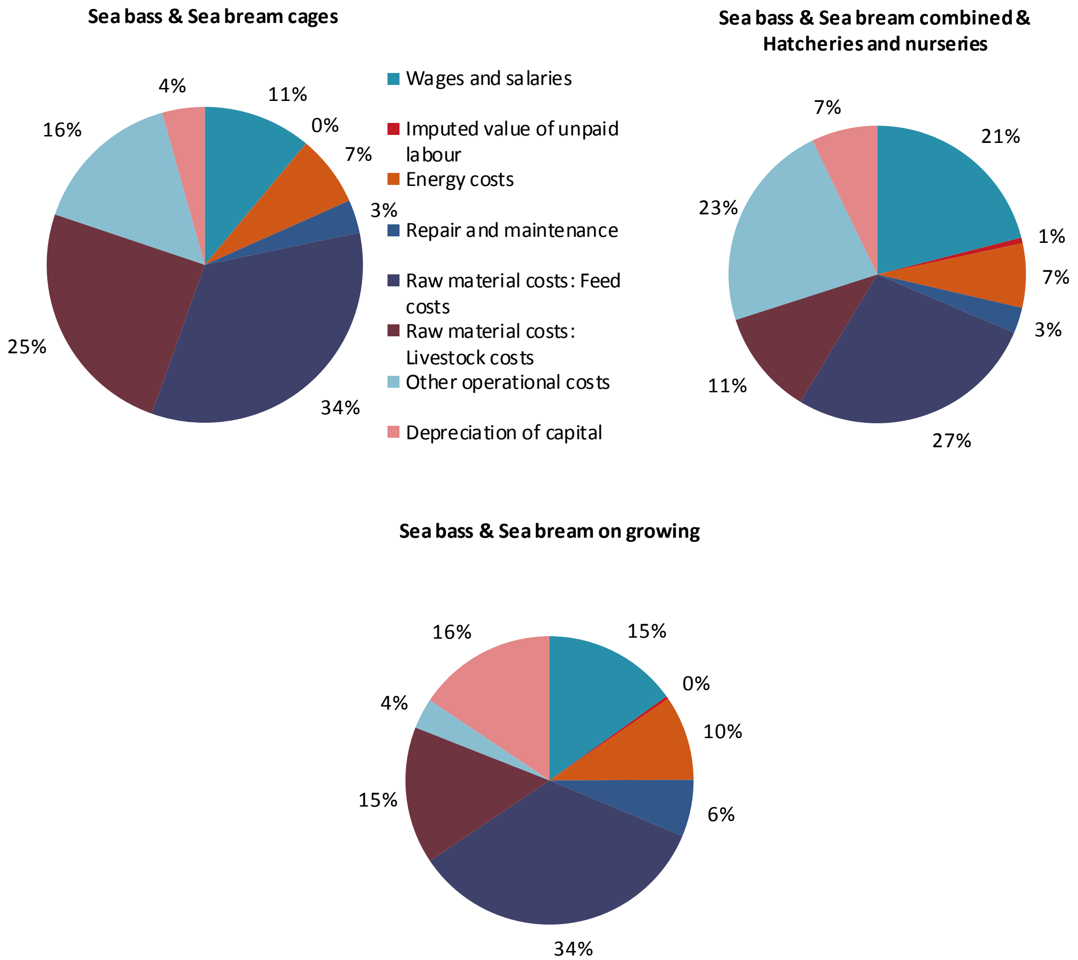


Figure 3.13: Costs breakdown for the EU sea bass and sea bream aquaculture: 2014.

Source: EU Member States DCF data submission, 2016

In Figure 3.14, the price evolution of European seabass and seabream is presented. Low seabream price for 2008-2009 is identified as well as an upward trend since 2010. On the other hand, seabass price presents downward trend since 2008 and, for both species, the price seems to converge in 2014 at approximately €5.3/kg. The downward trend of the seabass price is probably related to the vast increase of the seabass production and especially of the Turkish (more than 50% increase since 2008) production.

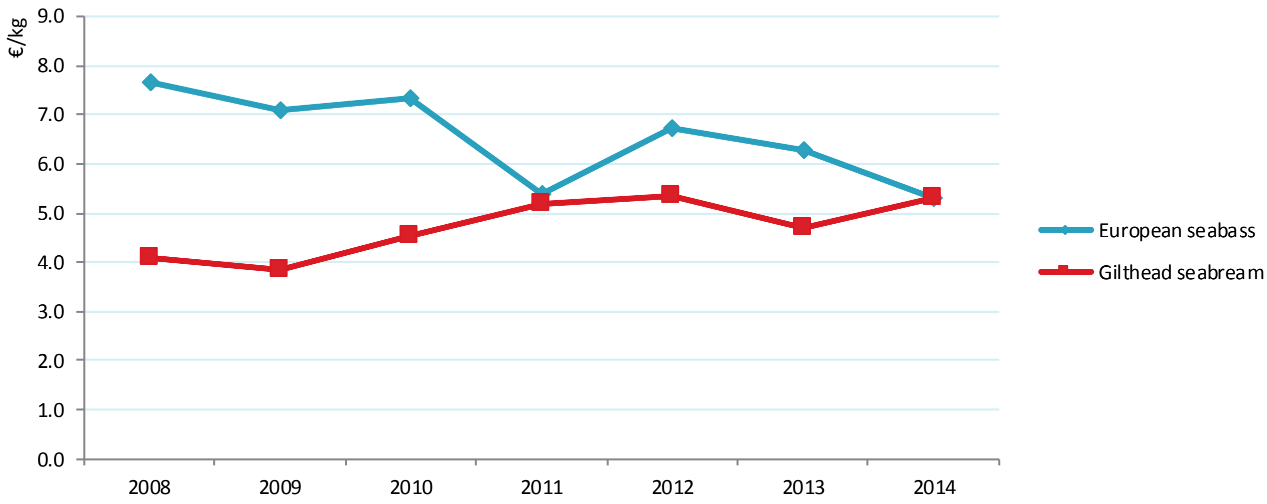


Figure 3.14: Price evolution of the main species of sea bass and sea bream group: 2008-2014.

Source: EU Member States DCF data submission, 2016

3.1.3 Other marine fish species

Current DCF segmentation classifies the enterprises according to the main species (or group of species) produced (e.g. salmon, trout, carp, mussels). However, there are a significant number of enterprises that produce species not specifically identified in the DCF segmentation. These species are grouped within other marine fish species.

Figure 3.15: Main species, produced in the other marine fish farming facilities: 2014.

Source: EU Member States DCF data submission, 2016

Figure 3.15 shows the divisions of other marine species produced in the EU. Atlantic Bluefin tuna is the most important species in terms of volume and value, contributing with €167.5 million (55% of the total) and more than 10 850 tonnes (39%). This production is based on the feeding of the wild Atlantic bluefin tuna caught in the Mediterranean Sea and highly dependent on the catch quotas available. Atlantic Bluefin tuna mainly fed in Malta and Spain. The second most valuable species is turbot, contributing 25% to the total value and 28% to the total volume. The top 5 valuable species are also red porgy, Senegalese sole and sharpsnout seabream. There are other marine species cultured in lower amounts, such as different seabreams, meagre, Atlantic halibut, Mugilidae etc.

3.2 Shellfish aquaculture

Sixteen Member States are involved in the shellfish sector. The shellfish aquaculture is to a large extend based on small scale family owned enterprises. This sector contributes actively to external trade and has a very important social dimension given the high number of persons employed. The shellfish sector does not face limiting environmental concerns in terms of nitrogen and phosphorus emission, because shellfish help to improve water quality by filtering the water for phytoplankton absorbing these nutrients. However, shellfish farmers dread other problems in terms of limitation of suitable production sites, competition for space (conflicts of interest) and spreading of diseases as France has been facing for oysters, as red ties in Spain for example. This sector knows high variability over the years depending on environment issues, seeds, prices, livestock purchases, species, technics etc. In European Union, the shellfish sector is very different.

The total sales volume for the EU28 aquaculture shellfish sector is estimated to be 0.64 million tonnes and the total value of sales (turnover) is estimated to be €1.2 billion in 2014 remaining stable since 2012, as can be seen in Table 3.7

Table 3.7: Economic indicators for the EU aquaculture shellfish subsector: 2014.

Country	Number of enterprises	Total sales volume	Turnover	Employment	FTE	Average wage
	number	*tonnes*	*million €*	*number*	*number*	*thousand €*
Bulgaria	23	1.3	1.0	77	60	4.6
Croatia	110	0.6	0.6	62	42	18.6
Cyprus	1	0.0		15	6	
Denmark*	6	1.6	1.3	6		
France	2655	191.5	720.8	15286	8167	28.6
Germany	11	6.9	15.0	60	60	55.0
Ireland	244	20.9	52.2	1620	788	29.1
Italy*	291	105.7	146.7	3422		
Greece			8.6			
Netherlands	74	60.1	69.7		212	50.2
Portugal	1364	3.8	21.3	1872	326	10.6
Romania	1	0.0	0.0	3	3	1.4
Slovenia	6	0.5	0.4	16	15	14.3
Spain	2774	222.6	142.7	16613	3450	17.4
Sweden	30	1.8	1.3	52	24	15.4
United Kingdom	225	21.6	44.1	706	495	12.8
Other none DCF		0.0	0.0			
Total DCF reported	***7815***	***638.8***	***1226.3***	***39810***	***13648***	***27.6***
Total EU		**638.8**	**1226.3**			

* Danish and Italian data on FTE are considered unreliable, therefore FTE and average wage are not reported for both countries.

Source: EU Member States DCF data submission, 2016 & EUROSTAT, 2016

Reported data shows the existence of more than 7.8 thousand enterprises in the EU aquaculture shellfish sector in 2014, a very slight decrease compared to 2013. Enterprises had on average 5.1 employees and 1.9 in FTE terms. The majority of the enterprises in the sector are micro-enterprises (with less than 5 employees), covering 80% of the EU aquaculture shellfish enterprises. This firm size could emphasis trends variations.

The most important costs items of the EU shellfish aquaculture sector are labour and livestock respectively 44% and 29% of the total operating costs in 2014. From the available data, the EU28 aquaculture shellfish sector employed more than 39 thousand people. The shellfish sector has an important share of part-time work, since the ratio between the employment measured in full time equivalents (FTE) and the total employment was 38% in 2014. The available data show that women accounted for 29% of the employment of the sector corresponding to 21% in FTE terms. This variable is volatile; for example in France, despite oysters' crisis, French shellfish sector hired more male short-term contracts (e.g. to clean) while female employment decreased due to the lower sales.

Available data suggest that the average wage per FTE was €27 580 in 2014, increasing by 37% since 2012. There is a large variability of wages between the EU countries. The salaries varied from 4 600 Euros in Bulgaria to €55 000 in Germany with a wage/FTE median at €16 384. This significant variability in the salaries for shellfish aquaculture by country corresponds in part to the estimation of unpaid labour and the use of different techniques, for example, more capital intensive techniques in Germany and in Netherlands. The unpaid labour could be very important in the shellfish aquaculture and imputed value of labour reached 51% for France and 66% for Spain of the total wages. However, these two countries do not represent overall shellfish sector: for example Germany does not have "non declared "FTE and the imputed value Italy represented only 2% of the total labour cost. A large part of the employment is not performed under a formal contract. The workers are either the owners of the enterprise or family members.

Table 3.8: Economic Performance indicators for the EU aquaculture shellfish subsector: 2014.

Country	GVA	EBIT	ROI	Labour productivity	Capital productivity	Future Expectations Indicator
	million €	*million €*	*%*	*thousand €*	*%*	*%*
Bulgaria	0.9	0.8	12.2	14.4	13.6	-15.8
Croatia	0.9	-0.1	-4.3	21.8	28.2	12.3
Cyprus	0.2	0.2	26.0	36.3	31.8	
Denmark*	1.0	0.5	34.1		61.6	33.0
France	437.5	50.2	5.1	53.6	44.8	-10.3
Germany	9.3	3.6	17.3	155.6	44.5	-2.9
Ireland	31.7	5.8	5.5	40.3	30.2	0.6
Italy*	97.9	18.2	11.6		62.4	25.8
Netherlands	40.8	28.0	84.4	192.2	122.7	50.8
Portugal	18.6	10.7	77.1	57.2	134.0	-12.9
Romania	0.0	0.0	-12.9	0.1	0.5	-2.9
Slovenia	0.6	0.3	5.4	39.9	11.7	5.1
Spain	96.9	37.5	15.3	28.1	39.6	1.7
Sweden	0.8	0.3	11.1	34.8	32.4	-5.3
United Kingdom	19.8	9.7	21.6	39.9	43.8	3.9
Total EU	756.9	165.7	10.3	48.2	46.8	-2.4

* Danish and Italian data on FTE are considered unreliable, therefore labour productivity is not reported for both countries.
Source: EU Member States DCF data submission, 2016

Available data show that the EU shellfish sector has obtained profits, Gross Value Added in 2014 was €765.9 million, a 11% increase from 2012. While measured in terms of EBIT it accounted for more than €165 million. Most Member States producing shellfish reported a positive profitability, with only Croatia and Romania having negative one. However French figures shows a decreasing of 41% since 2012 while Spanish and German EBIT, negative in 2012, are respectively €37.5 million and €3.6 million. The profitability measured in ROI terms was 10% in 2014. Since 2012, the economic situation has changed for Spain. After 2013 with red ties in Galicia and a very low sales production level, the 2014 Spanish shellfishes production (mostly Mediterranean Mussel) has increased (+34% from 2013). Since then, Spain has diversified its production with oysters to avoid such decreasing in the earnings.

Reported data shows that the labour productivity for the EU aquaculture shellfish sector was €48 200 per FTE. Reported data also shows that the capital productivity was 46.8% in 2014. Nevertheless, this figure hides a huge discrepancy between Member States from 0.5% in Bulgaria to 134% in Portugal.

The main species produces in EU shellfish farming facilities are in order of weight Mediterranean mussels, blue mussels, Pacific cupped oyster, venus clams and unidentified sea mussels (that are expected to be Mediterranean mussels or blue mussels). In value terms, the most important species are Pacific cupped oyster, blue mussels, Mediterranean mussels, venus clams and the unidentified sea mussels.

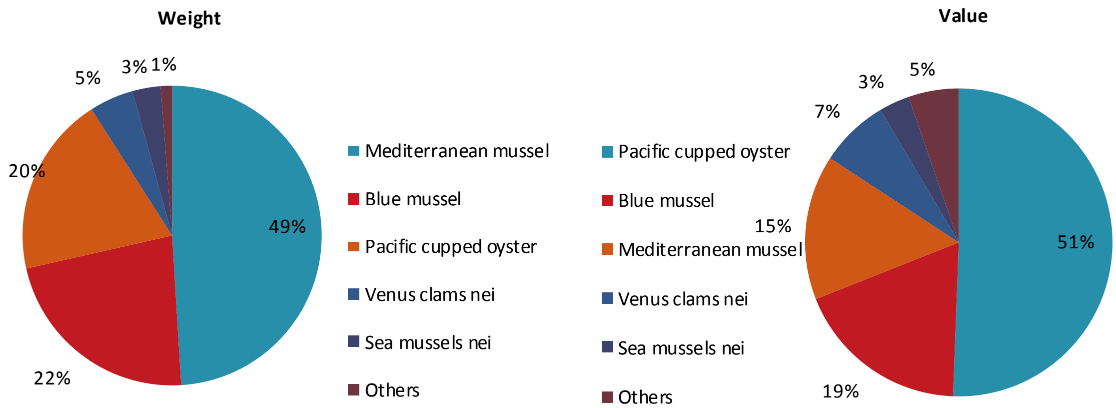


Figure 3.16: Main species, produced in the EU shellfish farming facilities: 2014.

Source: EU Member States DCF data submission, 2016

3.2.1 Mussel

The main species of mussels farmed in the EU are blue mussel (*Mytilus edulis*) and Mediterranean mussel (*Mytilus galloprovincialis*). Other species of mussels relevant in the international markets and farmed outside the EU are: Chilean mussel (*Mytilus chilensis)* or (*Mytilus edulis platiensis)*; the New Zealand green-lipped mussel, (*Perna canaliculus*); and the Korean mussel (*Mytilus Coruscus)* and (*Crenomytilus grayanus)*.

World´s total mussel production reached 2 million tonnes and 4.1 billion USD in 2014 (FAO, 2016). According to the data reported to FAO, the EU represents approximately 90% of world production of blue and Mediterranean mussel, both in volume and value. However, it is known that some countries do not report production per species, instead opting to refer to the country of production (e.g. Chilean mussel).

In Table 3.9 economic indicators for the mussel sector in the EU is shown. According to data collected under DCF, the volume of mussels produced in the EU is 454 thousand tonnes, valued at €422 million. In comparison to 2012, this represents a 2.1% decrease in volume but a 13.4% increase in value. Even if, compared to 2012, Denmark and Romania are now included in the figures, their small value of productin and turnover can not explain this development. Blue mussel prices are lower in 2014 compared to 2012, while Mediterranean mussel prices are significantly higher in 2014 than in 2012, when a very low price level was reached (cf.Figure 3.20). Three different species are reportedly produced: Mediterranean mussel (318 thousand tonnes), blue mussel (135 thousand tonnes) and sea mussel (20 thousand tonnes).

In the EU, the main producer is Spain, followed up by Italy and France.

Table 3.9: Economic indicators for the EU mussel aquaculture: 2014.

Country	Number of enterprises	Total sales volume	Turnover	Employment	FTE	Average wage
	number	*tonnes*	*million €*	*number*	*number*	*thousand €*
Bulgaria	23 ▼	1.3 ▲	1.0 ▲	77 ▼	60 ▼	4.6 ▲
Croatia	110 ▲	0.6 ▲	0.6 ▬	62 ▼	42 ▼	18.6 ▲
Denmark*	6 ▼	1.6 ▲	1.3 ▲	6 ▼		
France	287 ▲	59.9 ▬	116.1 ▬	1702 ▼	1079 ▬	33.3 ▲
Germany	10 ▬	6.9 ▲	15.0 ▲	60 ▲	60 ▲	55.0 ▲
Greece			8.5			
Ireland	87 ▼	11.4 ▼	9.6 ▼	380 ▼	219 ▼	20.7 ▲
Italy*	159 ▬	74.5 ▲	58.9 ▲	1045 ▲		
Netherlands	54 ▼	56.8 ▲	62.6 ▲		162 ▼	57.7 ▲
Portugal	22 ▼	0.5 ▼	1.2 ▼	92 ▼	86 ▼	11.5 ▼
Romania	1 ▬	0.0 ▲	0.0 ▲	3 ▲	3	1.4
Slovenia	6 ▼	0.5 ▲	0.4 ▲	16 ▼	15 ▼	14.3 ▼
Spain	2034 ▬	220.1 ▲	108.3 ▲	8555 ▬	2509 ▲	18.3 ▬
United Kingdom	116 ▬	20.0 ▼	38.7 ▼	386 ▬	293 ▼	21.6 ▼
Other none DCF		0.0	0.0			
Total DCF reported	***2915*** ▬	***454.0*** ▲	***422.3*** ▲	***12384*** ▼	***4528*** ▬	***24.8*** ▲
Total EU		**454.0** ▲	**422.3** ▲			

* Danish and Italian data on FTE are considered unreliable, therefore FTE and average wage are not reported for both countries.
Source: EU Member States DCF data submission, 2016

In terms of production value, France and Spain are by far the most important countries, standing for more than a half of mussel turnover in 2014. The average wages differ significantly among the countries, which could be interpreted as an indicator for the technological and organisational development in the different countries.

Social importance of mussel sector in Spain

The mussel is cultivated mostly in Galicia, where it is a traditional and consolidated sector. The industry has a significant impact on the Galician economy. Most of the people working in the sector is from the local area. It is a sector with a high volume of production. The mussels are cultivated on more than 3 200 rafts, which belong to around 2 000 owners. This shows that the property is divided into a large number of families. The workers are often self-employed people and there are a lot of part time workers; many of them belonging to the same family as the owner. Other workers are fishermen who work on the rafts during the season where the fisheries are closed.

It is important to highlight that the sector is closely related to the canning industry, also situated in the same areas, and in which most of the inputs are from the Galician. Furthermore, there are no external investments in the Spanish mussel sector.

Main techniques

Three main farming techniques are being used in the production of mussels in the EU. Rafts, long line and bottom harvest are well differentiated methods of production, which set further differences in terms of costs and market prices.

The bulk of the whole EU mussels' production is harvested in the Spanish North West region of Galicia where rafts are the dominant technique. A raft is a floating platform with pending ropes of around 30 meters in the form of a matrix, which can be folded according to the depth where the platform is located. The mussels are attached to the rope and covered with a net produced with organic materials that will be progressively disappearing until the mussel fixes to the rope in a natural way. Every row in the matrix corresponds to a particular harvest, which will be collected and replaced in the appropriate date maintaining a continued production along the whole year. Rafts require a minimum depth of around 8 to 10 meters in order to result in efficient outputs.

Long line cultivation shares with rafts the use of ropes where vertical ropes or mussel bags are hang, but instead of the vertical disposition used in rafts, the ropes are horizontally displayed. This fact results in larger needs of space which not are always available due to competing water usages. However, it allows mussel culture in shallow waters where rafts would not be suitable.

Finally, bottom cultivation uses beds or poles fixed in the bottom where the mussels are deposited or attached. It solves some of the problems with required space in long line, but it is still not as efficient as rafts.

The seed mussels are collected from special areas and are then carried to areas where the growth conditions are better for the mussels. These areas are assigned by state authorities for a certain fee and timely limited. The mussels are then, after 1-2 years collected from the cultural spots and mostly sold at the mussel auction at Yerseke in the Netherlands. The most important markets for mussels from Germany are the Benelux-countries, France and in Germany especially the Rhineland. The collection of the mussels is done by dredges or beam trawl. The volume of seed mussels varies from year to year. In some years in the last decade almost no seed fall could be noticed. With a time lag of one to two years the volume of mussels for consumption varies accordingly. This is the main reason for the fluctuation of income in this sector. The employment is relatively stable.

All the three techniques require the use of boats in order to collect the mussels and maintain the facilities. Whenever any member country did not report the technique used for mussel culture, the data were allocated into the generic "mussel other" category. The figures for this category should be considered cautiously since different techniques, including rafts, long line and bottom, could be mixed together.

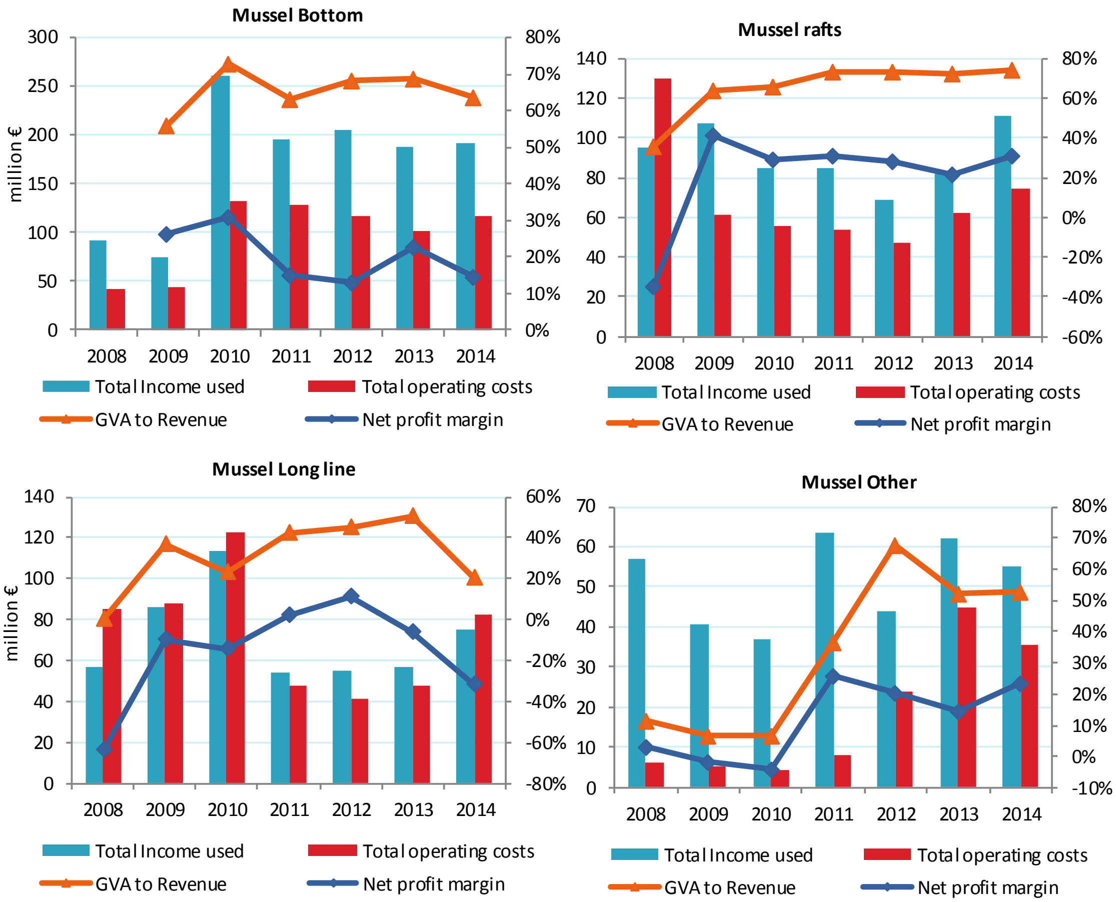


Figure 3.17: Development of economic performance for the EU mussel aquaculture: 2008-2014.

Source: EU Member States DCF data submission, 2016

The evolution of the operational costs sets shows different developments in the mussel segments. While mussel rafts show quite stable figures in GVA to revenue and net profit margin compared to 2012, with both higher income and operating costs, the segment mussel bottom shown similar stability in net profit margin and GVA to revenue but with almost stable figures for operating costs and total income. Mussel long line shows decreasing net profit margin and GVA to revenue, caused by an significant increase in operating costs. Mussel other have similar net profit margin 2014 compared to 2014, on a quite high level according the data since 2008, but GVA to return decreased from a peak in 2012, total operating costs are not fully covered by the in increase in total income. More information on the development of the time series in Figure 3.17 can be found in the last EU aquaculture report.

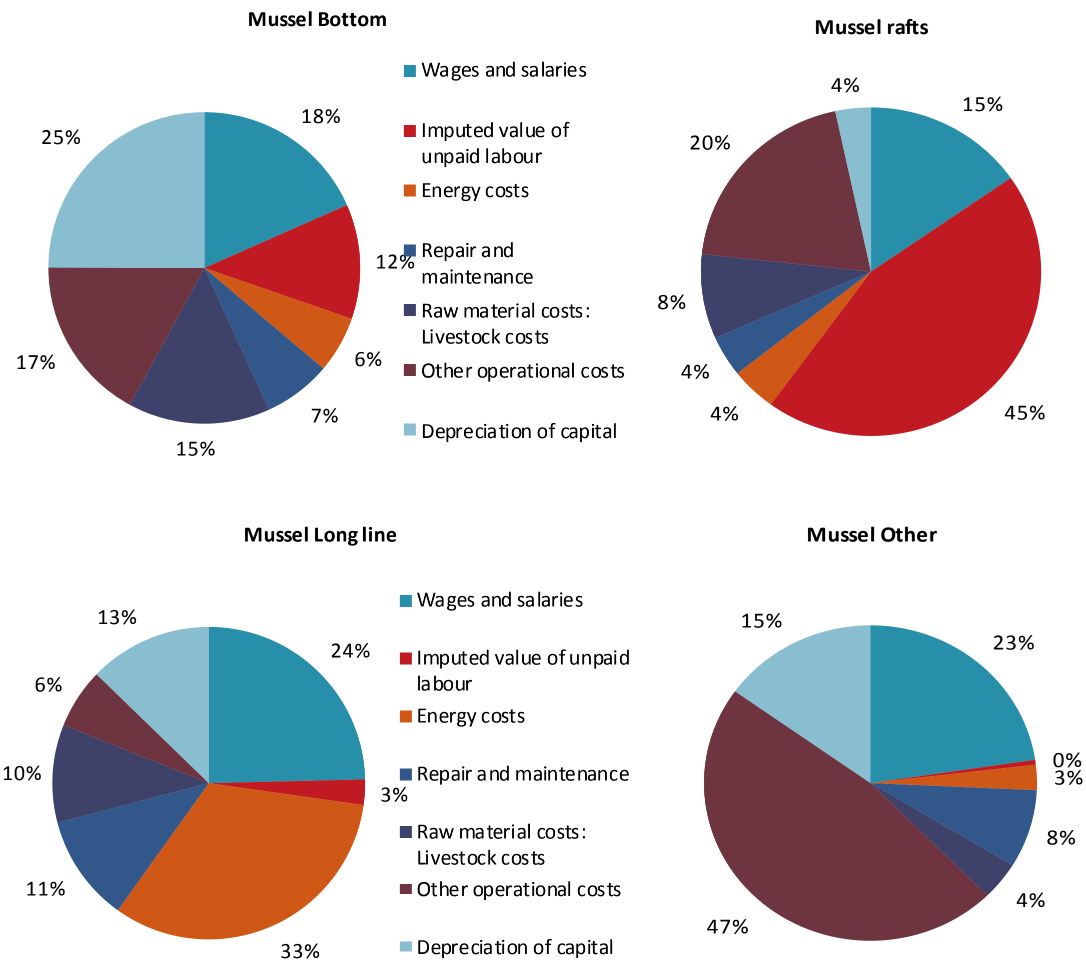


Figure 3.18: Costs breakdown for the EU mussel aquaculture: 2014.

Source: EU Member States DCF data submission, 2016

As it may be expected, the important technical differences across the three techniques results in significantly different cost structures in terms of what are the relevant items and their magnitudes.

One of the cost categories setting differences across techniques is the imputed value of unpaid labor. This has to do with the legal form of the enterprise. Raft and bottom culture records a large number of personal and family owned business in which other members of the family random or periodically contribute to the activity without a formal contract or salary. In contrast, the long line segment is mainly composed by corporations and such kind of informal labor is rarely present. Unpaid labor represents 45% of the total raft costs and 12% in bottom culture, but only 3% in long line. This is also reflected in the importance of the formal wages and salaries which are 24% in long line, 18% in bottom and 15% in rafts.

In Germany and the Netherlands each mussel enterprise has at least one vessel of about 45 m length with prices of about €4.5 million, meaning that the capital invested is quite high.

One half of the costs in case of the other mussel segment are other operational costs, while in the other segment is it far less. The reasons for this are unknown.

Finally, energy costs are quite similar except for the long line segment, where one third of the costs are energy costs. This fact can not be explained from the present experts.

Mussel production in Germany and Netherlands is based on relatively large, professionalised companies. The amount of unpaid labour in these companies is low or absent. In other countries the business is very much depending on smaller family owned companies with family members helping.

Table 3.10: Economic Performance indicators for the EU mussel aquaculture: 2014.

Country	GVA		EBIT		ROI		Labour productivity		Capital productivity		Future Expectations Indicator	
	million €		million €		%		thousand €		%		%	
Bulgaria	0.9	▽	0.8	▽	12.2	▽	14.4	△	14	▽	-15.8	▽
Croatia	0.9	▽	-0.1	▽	-4.3	▽	21.8	△	28	△	12.3	▽
Denmark*	1.0	△	0.5	▽	34.1	▽			62	△	33.0	▽
France	85.2	▽	13.8	▽	6.9	▽	79.0	▽	42	▽	-11.0	△
Germany	9.3	△	3.6	△	17.3	△	155.6	△	44	△	-2.9	▽
Ireland	2.5	▽	-4.2	▽	-9.4	▽	11.4	▽	6	▽	1.3	▽
Italy*	11.0	▽	-13.5	▽	-14.2	▽			12	▽	28.4	▽
Netherlands	35.4	△	24.3	△	86.4	△	218.8	△	126	△	59.3	△
Portugal	-0.5	▽	-6.0	△	-42.9	▽	-5.7	▽	-4	▽	-12.9	▽
Romania	0.0		0.0		-12.9		0.1		1		-2.9	
Slovenia	0.6	▽	0.3	▽	5.4	▽	39.9	▽	12	▽	5.1	▽
Spain	81.1	△	34.5	△	17.8	△	32.3	△	42	△	0.0	▽
United Kingdom	19.8	▽	9.7	△	21.6	△	67.4	▽	44	△	3.9	▽
Total EU	247.2	▭	63.8	▽	9.7	▽	52.0	▭	37.5	△	3.3	▽

* Danish and Italian data on FTE are considered unreliable, therefore labour productivity is not reported for both countries.
Source: EU Member States DCF data submission, 2016

For most mussel farmers, the total costs of production are almost fixed, given the absence of feed and livestock costs. With production, and thereby turnover, varying significantly per year, labour productivity shows high variation as well from year to year for a specific country. This however is not explained by changes in the workforce, instead reflecting natural variation in production only. The differences in labour productivity across countries show the different capital intensity in the reported countries. In Denmark, Germany and the Netherland production is based on a high input of physical capital, while in other countries the production is more labour intensive.

The EU mussel aquaculture gross value added reached more than €247 million. EBIT reached almost €64 million, showing a positive economic performance compared to 2012, while the ROI was at 9.7%. Labour productivity reached around €52 thousand per year compared to €40.3 thousand in 2012. A capital productivity of 37.5% in 2014 is a decrease compared to the 41% achieved in 2012.

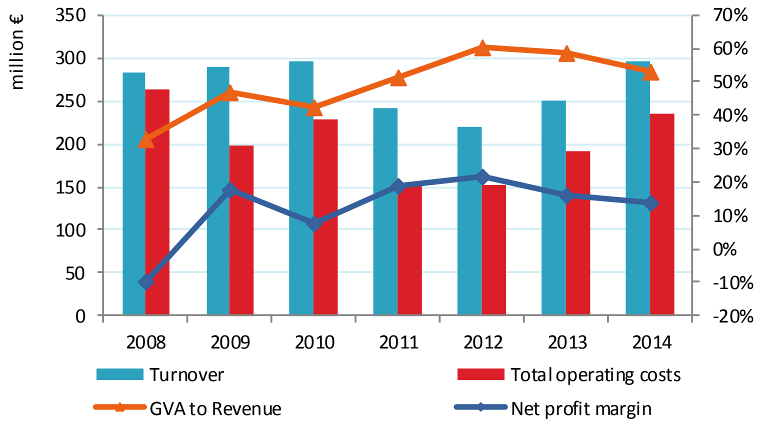


Figure 3.19: Economic performance indicators for mussel aquaculture: 2008-2014.

Source: EU Member States DCF data submission, 2016

Figure 3.19 show the performance of the mussels sector. Since the financial crises in 2008 the income, GVA and net profit margin has improved in the sector. However, the turnover and total operational cost has declined until 2012, indicating a lower activity in the sector. Obviously since then activities in the total sector increased with slightly decreasing GVA to turnover and lower net profit margins.

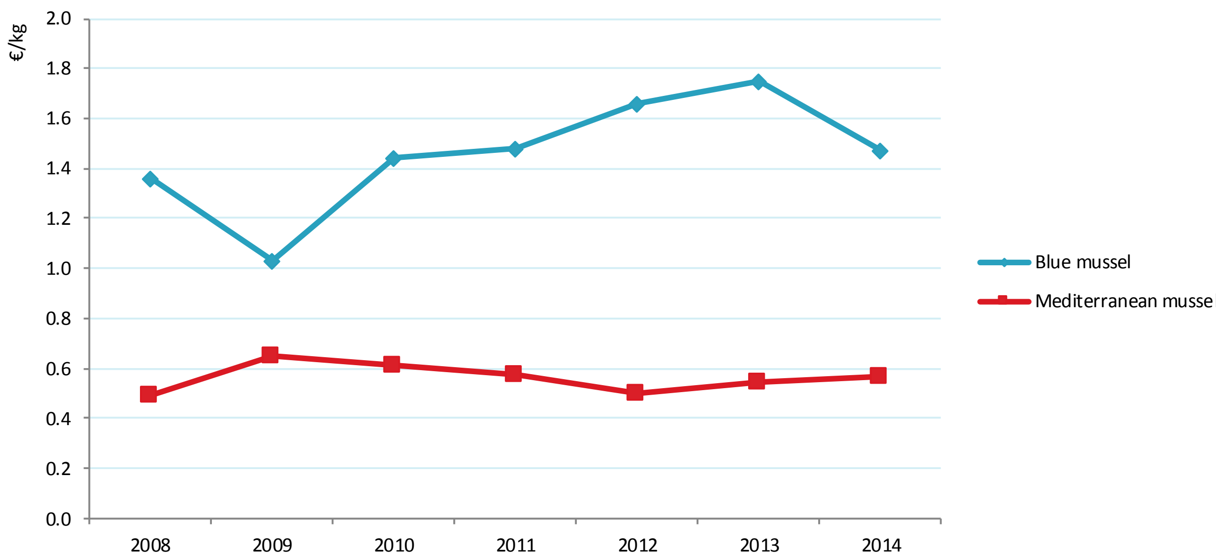


Figure 3.20: Price evolution of the main species of mussel group: 2008-2014.

Source: EU Member States DCF data submission, 2016

The market price for a kilo of blue mussels was more than €1 more expensive than for Mediterranean mussels in 2012, while in 2014 this difference became smaller, tending to about €0.85 per kilo. Mediterranean mussels had an average price around 60 cents per kilo along the period observed, and had a stable evolution. The peak in 2009 in Figure 3.21 is more due to absence of data for the year rather than a real significant increase in market price. The price for blue mussel increased 60 cents per kilo from 2009 until reaching almost

€1.8 per kilo in 2013. In 2014, prices for blue mussel have fallen down to almost €1.4 per kilo.

Table 3.11 shows the Future Expectations Indicator (FEI) which is simply the ratio of net investment and depreciation, meaning that positive values show more investments than depreciation of capital and vice versa. It is assumed that positive values reflect positive expectation about the future development in the sector, while negative values over consecutive years reflect insecurity or bad expectations and will lead to a decrease of the sector if it pertains for a longer period. One has to keep in mind that a lot of costs are fixed, meaning that bigger investments like buying a new vessel occurs once in two or three decades. This is not reflected in this short time series presented in the table. For example, 2009 figure for Ireland and 2012 figures for UK show a big investment while in the following years depreciation increased due to the big investments but no relevant new investment in the following years has been made, resulting in much smaller numbers for the FEI. Overall since 2008 the mussel sector shows positive FEI numbers, meaning that obviously the business is still attracting financial resources.

Table 3.11: Future Expectation Indicator

Country	2008	2009	2010	2011	2012	2013	2014
Bulgaria					24.7	16	-15.8
Croatia					-3.9	-5	12.3
Cyprus							
Denmark	28.5	14	-3.7	-1	-28.3	-7	33.0
Estonia							
Finland							
France			6.2	0	-13.3	-9	-11.0
Germany	-7.2	-2	-9.1	-5	-10.4	-7	-2.9
Greece							-1.6
Ireland	1.0	29	-14.8	-6	-5.6	-6	1.3
Italy	9.1	12	25.5	20	38.5	35	28.4
Malta							
Netherlands	11.3	5	4.6	-4	-2.8	49	59.3
Poland							
Portugal				-74	-11.4	21	-12.9
Romania			-1.8		0.0	-2	-2.9
Slovenia	3.5	-2	10.5	23	14.1	40	5.1
Spain	7.3	1	2.3	-2	-1.1	1	0.0
Sweden							
United Kingdom					39.6	13	3.9
Overall EU sector	7.4	11	6.0	1	0.2	4	2.0

Source: EU Member States DCF data submission, 2016

Outlook

Mussel production can be considered as an environmental friendly business, as no feed is necessary and the mussels take nutrients from the water column. This also includes stable production costs for the producers as the variation of feed and energy costs does not affect the business so much as in finfish aquaculture and recirculation systems. On the other hand it is an environmental depending production, which in some cases hinders a stable supply of seafood products from year to year. In some areas like France the problem of red tides is very relevant, in the Netherlands and Germany the problem of lacking seed mussels are an obstacle for stable and growing production. Bottom culture depend on the supply of mussel seed, either from the market or by own collection. There is natural variation in the amount of mussel seed available. Concerns about the ecological impact of mussel seed collection in the Wadden Sea have led to harvest restrictions.

The analysis of mussels still lacks from the data quality. Segmentation by species and technique cannot clearly be differentiated due to different understanding by MS when submitting data and due to different dominant technique in different countries. Some MS did not report data for all of the years covered by DCF data collection scheme (e.g. UK and Greece) and some joined EU later than 2008. This means, that all analysis of the European mussel sector must be taken with caution. The mussel business differs from country to country by technique and capital intensity. In all cases it contributes to rural development, either by direct employment, linkages to other industries or by providing positive external effects on tourism and regional gastronomy. More than this, mussels as an environmental friendly business contributes to food supply by providing valuable animal proteins and other nutrients, and the production itself improves the environmental conditions by taking nutrients from the water column.

3.2.2 Oyster

There are different species of oysters produced in aquaculture: Pacific cupped oyster, American cupped oyster, Slipper cupped oyster, Sydney cupped oyster, Indian backwater oyster, European flat oyster, Mangrove cupped oyster, Cortez oyster, Chilean flat oyster, etc. Total oyster production reached 5.20 million tonnes (+4.4%/2013) and €3.3 billion (+2.2%/2013) in 2014. China is the world leading producer of oysters with 83% of the weight and 59% of the value produced (FAO, 2016).

The main species of oysters produced in the world are Pacific cupped oyster (*Crassostrea gigas*) and European flat oyster (*Ostrea edulis*). Total production of Pacific cupped oyster and European flat oyster in 2014 is around 628 thousand tonnes, valued in €1 billion. Republic of Korea, Japan and France are the world Pacific cupped oyster and European flat oyster leading producers with 45%, 29% and 12% of the weight and 14%, 24% and 39% of the value produced.

The EU produced around 92 thousand tonnes, with a corresponding value of €446 million, in 2014. The EU produced 14.6% in weight and 45% in value of the global Pacific cupped oyster and European flat oyster production. In the EU, the main producer is France with 76 610 tonnes (-1% between 2013 and 2014, followed by Ireland with almost 9 442 tonnes (+9%/2013 - FAO, 2016).

Table 3.12: Economic indicators for the EU oyster aquaculture: 2014.

Country	Number of enterprises (number)	Total sales volume (thousand tonnes)	Turnover (million €)	Employment (number)	FTE (number)	Average wage (thousand €)
France	2276	118.9	565.4	12985	6708	27.7
Greece			0.1			
Ireland	143	9.4	42.1	1194	541	33.3
Netherlands	20	3.3	7.1		50	26.1
Portugal	58	0.9	2.7	93	32	11.0
Spain	66	1.3	3.9	481	101	21.1
United Kingdom	87	1.6	5.3	273	169	
Other none DCF		0.0	0.0			
Total DCF reported	***2650***	***135.4***	***626.6***	***15026***	***7601***	***28.0***
Total EU		**135.4**	**626.6**			

Source: EU Member States DCF data submission, 2016

Reported data under the DCF shows that oyster aquaculture reached 135.4 thousand tonnes, which is a decrease by 3% compared to 2013 and a value of €626.6 million in 2014, corresponding to a stability compared to 2013.

The number of UE oyster farmings reaches 2 650 enterprises in 2014. Eighty six percent of the enterprises are located in France, followed by Ireland (5%) and UK (3%). The enterprises employ near 7 600 FTE workers. If the evolutions of the number of enterprises, the turnover or the FTE are negative for France, other European countries are rather in a dynamic growth.

This dependency on the availability of French data is also present on the following figure where the extent of the economic performance of the EU oyster aquaculture sector can be seen for 2014. The production of oysters is mainly on bottom. This segment represents 86% of the UE oyster turnover and 84% of the UE GVA.

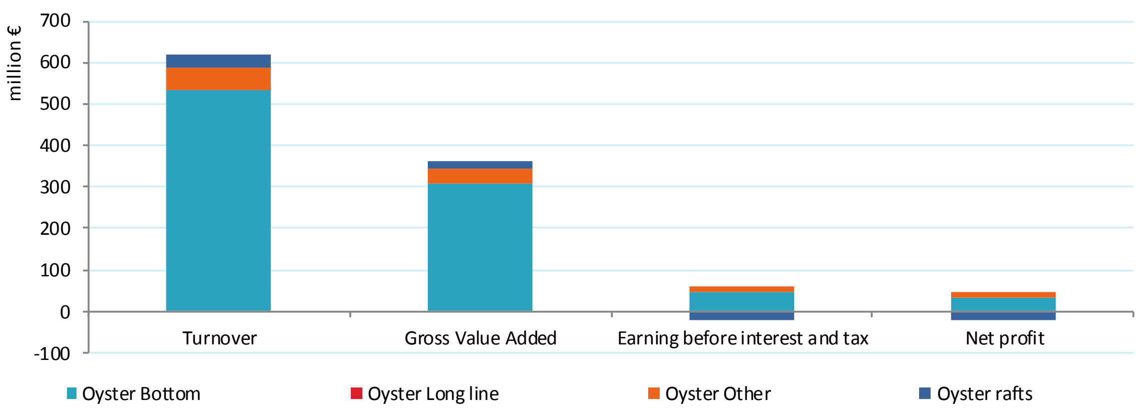


Figure 3.21: Economic performance indicators for oyster aquaculture: 2014.

Source: EU Member States DCF data submission, 2016

In 2014, the EU oyster aquaculture gross value added reached more than €369 million (3%/2013), EBIT reached €45.44 million (-29%/2013), showing a positive economic performance confirmed by a ROI of 5.3% (-3 points/2013). Nevertheless, it should be noted that a heterogeneity exist in the economic performance of enterprises producing oysters. The RIO varies within a range between 2.5 % (Spain) and 61% (Netherlands).

Labour productivity reached 48 200 Euros and a capital productivity of 46%. The future expectations indicator (FEI) of the industry is negative (-10%). If Ireland was characterized by a positive FEI, this one is near of 0 in 2014.

Table 3.13: Economic Performance indicators for the EU oyster aquaculture: 2014.

Country	GVA	EBIT	ROI	Labour productivity	Capital productivity	Future Expectations Indicator
	million €	*million €*	*%*	*thousand €*	*%*	*%*
France	329.7	28.9	4.0	49.2	45.4	-10.7
Greece	0.0	0.0	-5.5		6.3	-1.6
Ireland	29.3	10.5	18.5	54.1	51.3	0.2
Netherlands	5.3	3.7	73.4		105.5	2.8
Portugal	2.5	2.1		78.1		
Spain	2.4	0.2	2.5	23.3	35.4	-0.7
Total EU	369.2	45.4	5.7	49.7	46.2	-9.7

Source: EU Member States DCF data submission, 2016

The most important costs of the EU oyster aquaculture sector are livestock costs, which represented 33% of the total costs, wages and salaries represented 18%, imputed value of unpaid labour 15% and other operational costs 7%. Unpaid labour is an important workforce as can be seen from the importance of imputed value of unpaid labour compared to the total cost of wages and salaries. This reflects the importance of family structures of the European oyster farming. There is no feed cost. The feeding of oyster is exclusively of the nutrients available in the sea. The oyster producing enterprises generated a positive net profit, however, it has been declining between 2010 and 2014 (13% to 4%).

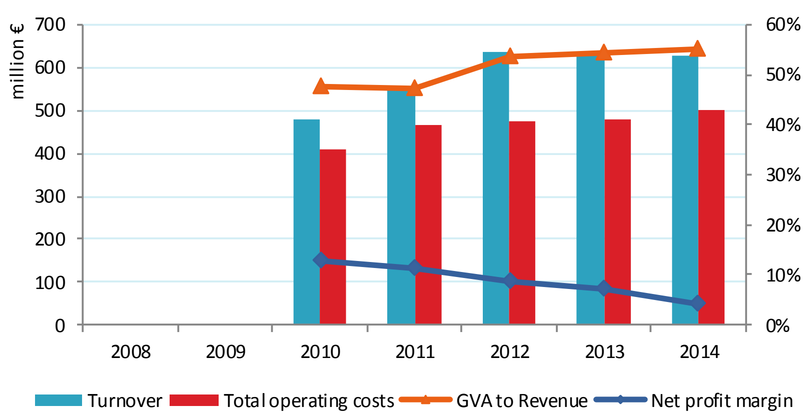


Figure 3.22: Economic performance indicators for oyster aquaculture: 2008-2014.

Source: EU Member States DCF data submission, 2016

The majority of the income and profits are generated in the oyster bottom segment with 86% and 73%, respectively. The gross value added of this segment reached more than €306.6 million, net profit margin reached more than €33 million in 2014. Furthermore, enterprises showed a positive economic performance with a positive net profit margin of 4%, compared to total income used. For the Other Oyster, total income shows a positive evolution. The ratio Gross value added net (60%) and profit margin (19%) decreased by 2 points compared 2013. For oyster raft, the decrease of income (-3%/2013) associated to a sharp increase in costs (+13%) led to a deterioration of GVA to Revenue (55%, -16points/2013) and net profit margin (-59%, -15 points/2013). The high mortalities on livestocks in Spain due to herpes-virus explain the deterioration. Since 2011, net profit margin of for the segment oyster raft is negative.

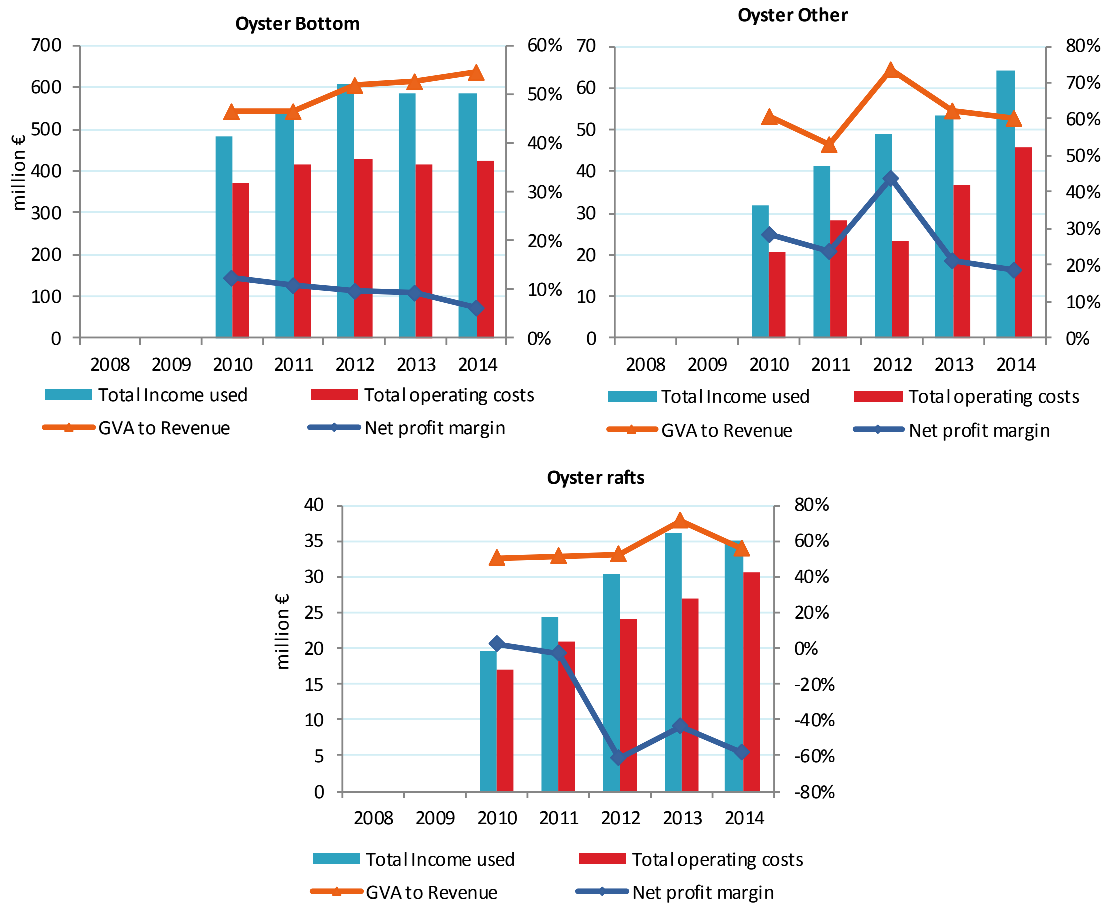


Figure 3.23: Development of economic performance for the EU oyster aquaculture: 2008-2014.

Source: EU Member States DCF data submission, 2016

The cost structure (including depreciation of capital) is very different between the segments. Three cost items characterize the oyster bottom segment: livestock costs, which represented 36% of the total costs, depreciation of capital (19%) and wages and salaries (17%). For the other oyster segment, wage and salaries represent 36% of total cost. The most important cost item for oysters on rafts is the depreciation of capital (44%). In order to compensate the high mortalities, oyster farmers have bought more oyster from Italye. The livestock costs increase by 224% between 2003 and 2014 and represent 16% of all cost structure (+7 points/2013).

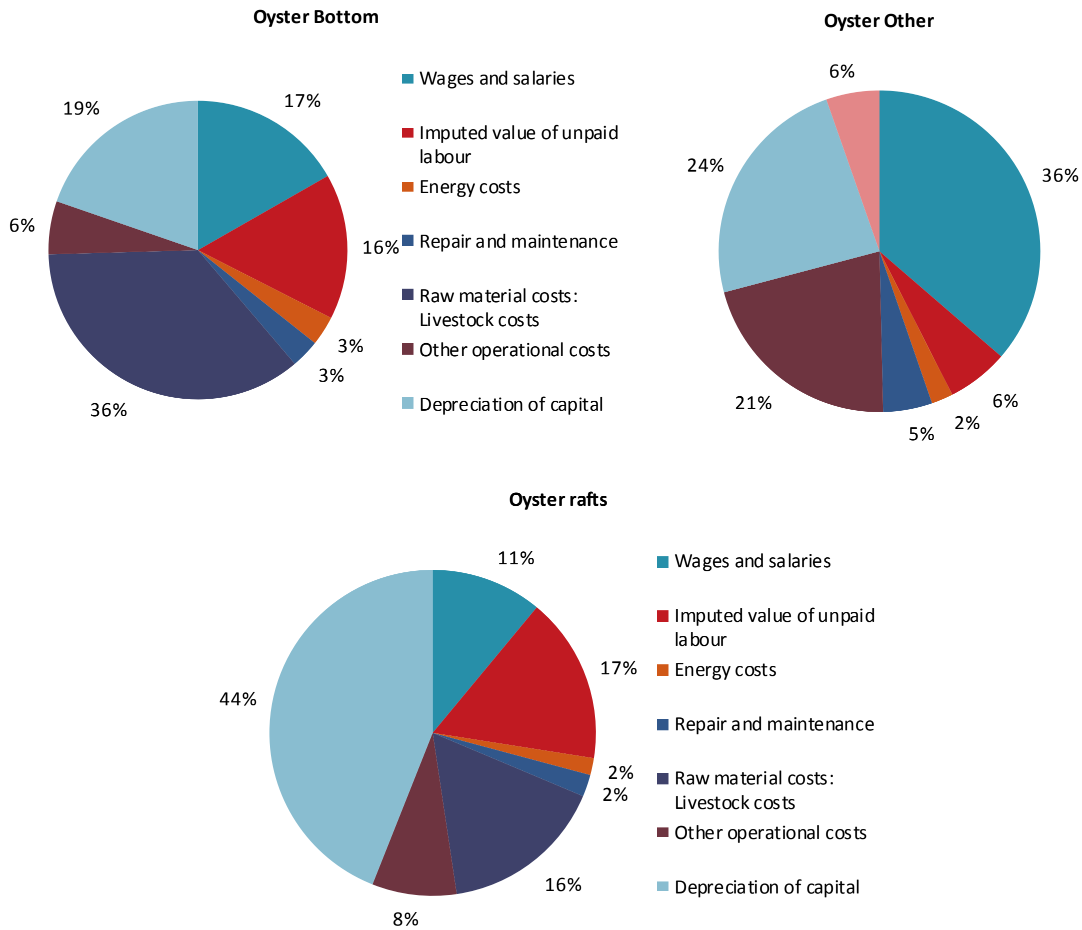


Figure 3.24: Costs breakdown for the EU oyster aquaculture: 2014.

Source: EU Member States DCF data submission, 2016

World and EU prices of cultured Pacific cupped oyster and European flat oyster show a common increasing trend, but EU prices are more than double of the world prices. Concerning Pacific cupped oysters, the decrease in production translates into an increase of the price of sale (+54%) between 2010 and 2014. Before 2010, the data concerning the EU price of the European flat oyster must be used with caution do to the lack of data. A negative trend is observed between 2013 and 2014 (-13%) and 2010 and 2011 (-7%), while a significant increase was observed between 2009 and 2010 (+59%) and between 2012 an 2013 (9%).

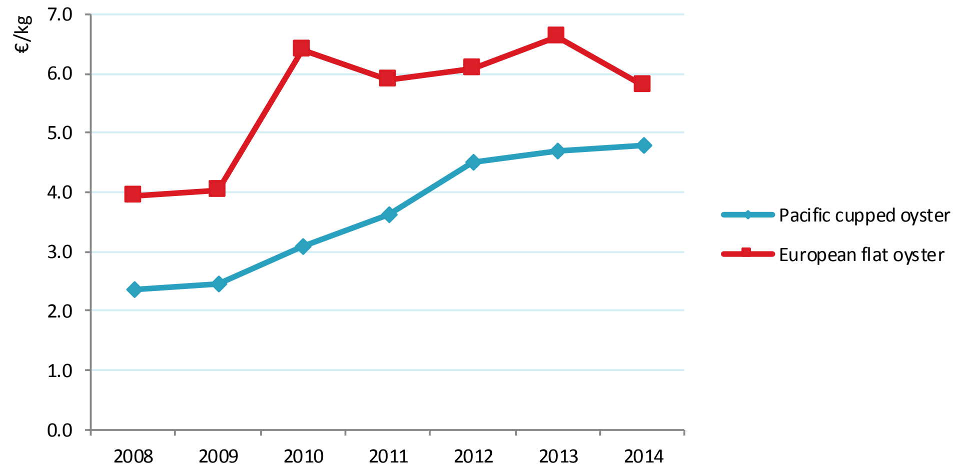


Figure 3.25: Price evolution of the main species of oyster group: 2008-2014.

Source: EU Member States DCF data submission, 2016

3.2.3 Clam

There are different species of clams and cockles produced in aquaculture: Japanese carpet shell, blood cockle, Japanese hard clam, Northern quahog, grooved carpet shell, common edible cockle, etc. The main clam species cultured in the EU are Japanese carpet shell (*Ruditapes philippinarum*) and grooved carpet shell (*Ruditapes decussatus*) (FAO, 2014).

Data reported under the DCF shows that clam aquaculture in EU experimented in 2014 and increase in its total production and value, with a production of of 34.4 thousand tonnes with a value of almost €133.5 million. In the EU, the main producer was Italy, with more than 31 000 tonnes, followed by Portugal with more than 2 000 thousand tonnes, and Spain with around 1 000 tonnes (Table 3.14).

Table 3.14: Economic indicators for the EU clam aquaculture: 2014.

Country	Number of enterprises	Total sales volume	Turnover	Employment	FTE	Average wage
	number	thousand tonnes	million €	number	number	thousand €
Italy*	132	31.2	87.8	2377		
Portugal	1269	2.1	17.1	1663	202	10.2
Spain	655	1.0	28.5	7424	761	9.8
Other none DCF		0.0	0.0			
Total DCF reported	***2056***	***34.4***	***133.5***	***11464***	***963***	***9.9***

* Italian data on FTE and average wage are not reported as the working group consider it unreliable.
Source: EU Member States DCF data submission, 2016

The collected data showed that at least 2 056 enterprises were producing clams in the EU. 62% of these companies were located in Portugal and 32% in Spain.

These enterprises employed 11 464 people. In Portugal and Spain these employment corresponds to 963 FTEs. Part time workers make up an important contribution in this segment, since the calculated number of FTEs in Spain and Portugal only adds up to 10.6% of the people actually employed in the segment.Portugal and Spain provided a similar average wage around €10 000. This is significant lower than the €22.7 thousand of average wage in the EU shellfish production.

Figure 3.27 shows that the main production technique in terms of turnover and GVA is clam bottom. EBIT and net profit are also positive.

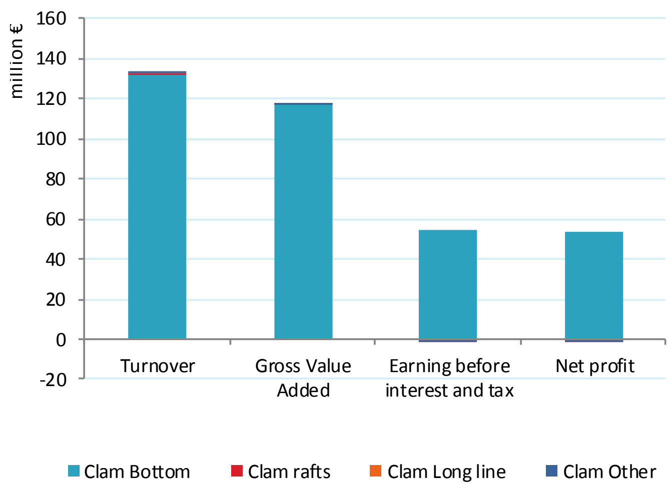


Figure 3.26: Economic performance indicators for clam aquaculture: 2014.

Source: EU Member States DCF data submission, 2016

The EU clam aquaculture gross value added reached €117 million; however, the EBIT was €53.2 million, and a positive ROI of 53.1%. Labour productivity reached €31.3 thousand. The capital productivity indicator increased compared to the previous year.

Table 3.15: Economic Performance indicators for the EU clam aquaculture: 2014.

Country	GVA	EBIT	ROI	Labour productivity	Capital productivity	Future Exp. Indicator
	million €	*million €*	*%*	*thousand €*	*%*	*%*
Italy*	86.9 ▲	31.7 ▲	51.0 ▲		139.8 ▲	21.7 ▼
Portugal	16.4 ▼	14.4 ▼		81.3 ▼		
Spain	13.7 ▲	7.1 ▲	64.9 ▲	18.0 ▲	124.7 ▲	-2.5 ▲
Total EU	117.0 ▲	53.2 ▲	53.1 ▲	31.3 ▲	137.6 ▲	18.0 ▲

* Italian data on labour productivity is not reported as the working group consider it unreliable.

Source: EU Member States DCF data submission, 2016

The most important costs of the EU clam aquaculture sector is labour cost, which represented 65% of the total costs. Other important cost items is livestoock (11%) and other operational cost (7%). This cost structure indicates a very low intensive technology activity, which is based in the labour force.

When interpreting the costs of the clam segment it is important to understand the dynamics within the sector. The clam farm often has the legal form of a cooperative, including both fishermen fishing for seed (livestock) and the actual clam farmers. One part of the year fishermen provide input in terms of seed (livestock) to the farms. This actually means that the purchase of seed is registered as a labour cost and not a purchase of livestock.

After a drastical decrease in the net profit in 2011, that achieved a negative value in 2012, the economic performance of the clam economic activity has increased during 2013 and 2014. In 2014, the turnover experimented a little increase. However, the main change occurred in the operational cost, which decreased around €30 million. This reduction in the production cost, together with the increase in the quantities produced, suggest and improvement in the production efficiency.

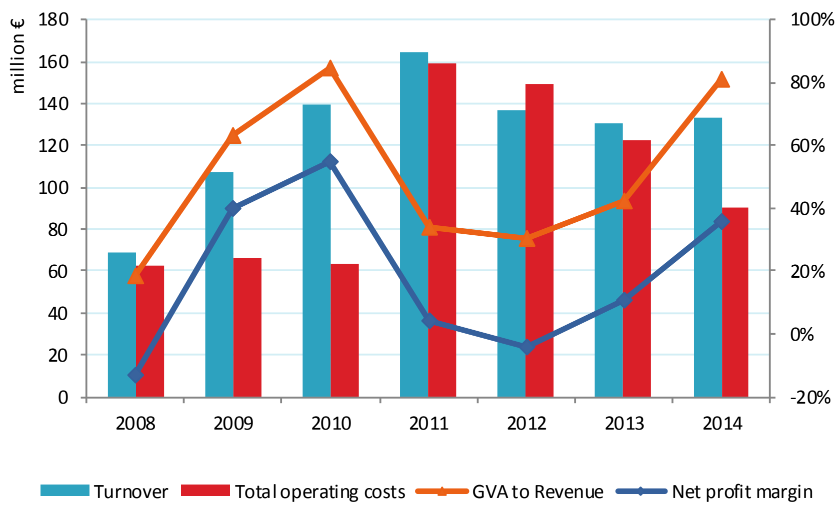


Figure 3.27: Economic performance indicators for clam aquaculture: 2008-2014.

Source: EU Member States DCF data submission, 2016

Figure 3.30 show the operating costs for clam bottom. Wages and salaries is the most important cost item (65%) followed by livestock costs (11%). This indicates that the clam production activity is very labour intensive with little use of machinery.

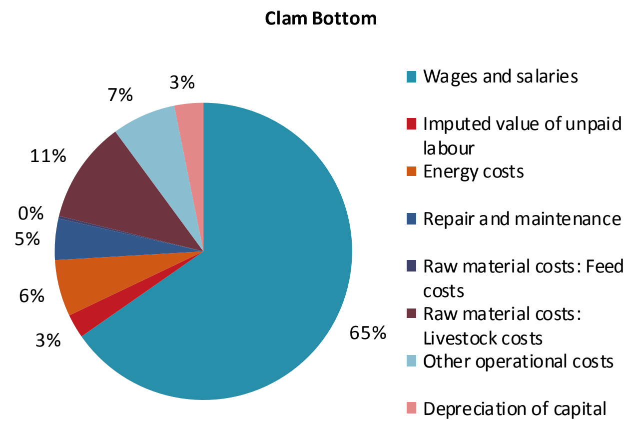


Figure 3.28: Costs breakdown for the EU clam aquaculture: 2014.

Source: EU Member States DCF data submission, 2016

EU prices (and world prices) of grooved carpet shell showed an increase during the period 2008 to 2010.Then during the 2011 and 2012 prices decreased, which is illustrated in the Figure 3.31. During 2013 and 2014 this species prices experimented a slow increase. On the other hand, the venus clams price show an opposite evolution thant the carpet shell. In this case, the species is suffering a reduction in its average prices since 2011 until the end of the period analysed.

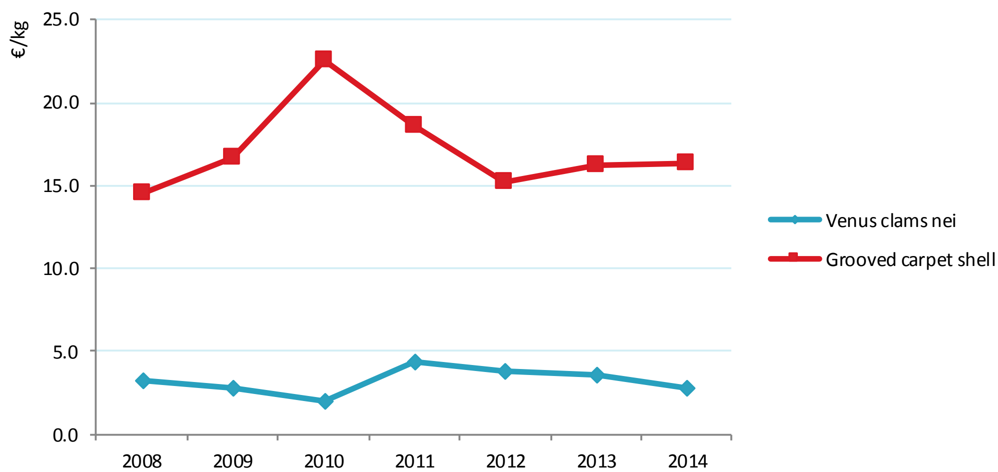


Figure 3.29: Price evolution of the main species of oyster group: 2008-2014.

Source: EU Member States DCF data submission, 2016

The price of €9/kg for grooved carpet shell is due to the characteristics of production. This species is reared in protected areas and the timing of growth is very similar to that of the natural life cycle. This production is perceived of high quality because it follows a natural growth. Production of this species is labour intensive rather than capital intensive.

3.2.4 Other shellfish segments

In 2014, the allocation of other shellfish species that were produced in the other shellfish farming facilities has remained almost the same. The segmentation include the blue and the Mediterranean mussels, the pacific cupped oyster, clams and other shellfish, while European flat oyster is appeared to dominate a place in sales value but not in production volume.

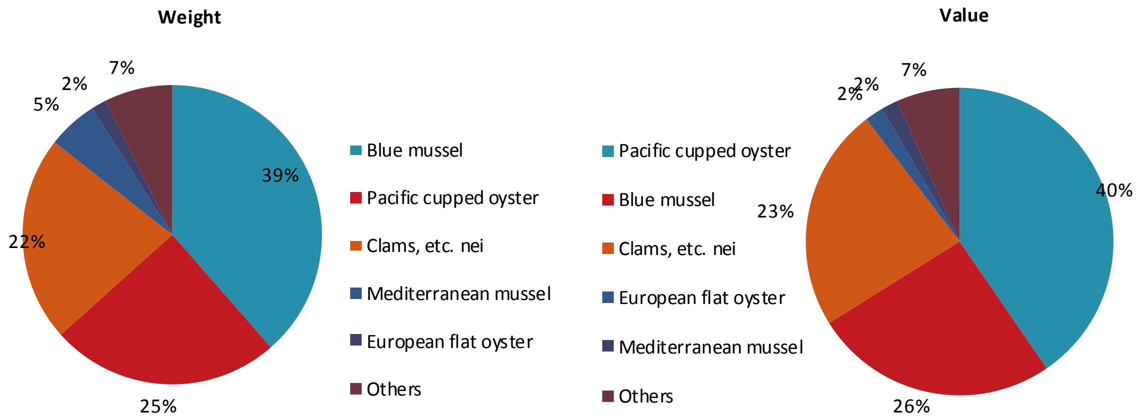


Figure 3.30: Main species, produced in the other shellfish farming facilities: 2014.

Source: EU Member States DCF data submission, 2016

In terms of weight, the blue mussel is the most important (39%), followed by Pacific cupped oyster (25%) and by clams (22%). The Mediterranean mussel production is the fourth most important in terms of weight (5%). Other shellfish species constitute the remainder. In terms of value however, the Pacific cupped oyster is the most important (40%), followed by the blue mussel (26%) and by the clams (23%). The Mediterranean mussel and the European flat oyster makes up the rest of the sales value with 2% each. The higher importance in terms of value shown for the Pacific cupped oyster is essentially because this species fetches very high prices whereas mussels obtain low prices.

3.3 Freshwater aquaculture

The total volume of EU freshwater aquaculture was 297 thousand tonnes in 2014 generating a value of €1 016 million. Compared to the EU marine aquaculture sector the volume was almost the same, but it only equals half of the production value.

Italy is the largest contributor to the EU freshwater production covering 19% of the volume and 24% of the value. Other major producers are Poland, France and Denmark covering 12%, 12% and 10% of the total EU production volume.

Table 3.16: Economic indicators for the EU aquaculture freshwater subsector: 2014.

Country	Number of enterprises	Total sales volume	Turnover	Employment	FTE	Average wage
	number	*thousand tonnes*	*million €*	*number*	*number*	*thousand €*
Bulgaria	313 ▲	3.9 ▲	9.9 ▲	755 ▲	547 ▼	3.2 ▲
Croatia	29 ▼	3.5 ▼	6.3 ▼	1117 ▲	390 ▼	14.9 ▲
Cyprus	7	0.0 ▼	0.4 ▼	35	9	11.6
Denmark	102 ▼	30.8 ▼	101.0 ▲	345 ▼	230 ▲	76.5 ▬
Estonia	9 ▬	0.4 ▲	1.5 ▲	36 ▲	30 ▲	10.7 ▼
Finland	151 ▬	6.5 ▼	39.5 ▼	426 ▼	260 ▼	41.4 ▲
France	298 ▬	34.5 ▬	113.1 ▬	1168 ▬	946 ▬	25.1 ▼
Greece			6.1			
Ireland	15 ▼	1.1 ▼	5.3 ▼	56 ▼	39 ▼	29.4 ▲
Italy*	226 ▬	56.1 ▲	239.2 ▬			
Netherlands	36 ▼	5.7 ▼	24.3 ▼			
Poland**	1242 ▲	36.3 ▲	89.3 ▲	7764 ▲		
Portugal	8 ▼	0.5 ▼	2.0 ▲	35 ▼	30 ▼	13.9 ▲
Romania	426 ▬	10.5 ▲	19.0 ▼	2535 ▲	1994 ▲	4.3 ▼
Spain	173 ▲	16.5 ▼	50.4 ▼	868 ▲	634 ▲	18.7 ▼
Sweden	102 ▼	12.3 ▼	55.6 ▲	359 ▬	254 ▲	47.3 ▲
United Kingdom	267 ▬	13.4 ▲	52.6 ▲	852 ▬	679 ▬	12.2 ▲
Other none DCF		63.0 ▲	176.9 ▬			
Total EU	**3404** ▲	**297.0** ▲	**1016.4** ▬	**17411** ▲	**6041** ▲	**16.9** ▼

Source: EU Member States DCF data submission, 2016 & EUROSTAT, 2016.
*Note: Italian average wage is not reliable due to an unsufficient number of FTE reported.

The economic performance of the freshwater sector is mainly dependent on the production of different kinds of trout covering 64% of total value in the freshwater segment (See Figure 3.33). The second major species produced in freshwater is carp covering 7%. The farming of these two species has some distinct economic and employment characteristics. Trout aquaculture production is mostly obtained from more intensive technologies, whereas carp producers use more extensive technologies.

There were more than 3 400 enterprises in the EU freshwater sector. The sector employed around 17 400 people, as shown in Table 3.16, which approximately correspond to more than 11 thousand FTEs. On average, each enterprise employed 5 persons. Average wage was around €17 thousand in 2014, but among countries it varied significantly. Salaries are dependent on the technique used and the species produced. The highest salaries were reported in Denmark and UK, where intensive trout aquaculture dominates. The lowest salaries were paid in Bulgaria and Romania, where extensive carp production dominate.

Table 3.17: Economic Performance indicators for the EU aquaculture freshwater subsector: 2014.

Country	GVA	EBIT	ROI	Labour productivity	Capital productivity	Future Expectations Indicator
	million €	*million €*	*%*	*thousand €*	*%*	*%*
Bulgaria	4.9 ▲	3.7 ▲	23.6 ▼	9.0 ▲	31.4 ▲	3.0
Croatia	5.6 ▼	-1.6 ▲	-1.7 ▲	14.4 ▲	6.0 ▬	2.1 ▼
Cyprus	0.2	0.1	7.0	21.4	25.6	-0.3
Denmark	26.5 ▲	4.1 ▲	3.0 ▲	115.6 ▲	19.6 ▲	5.1 ▲
Estonia	0.1 ▼	-0.4 ▼	-4.6 ▼	2.6 ▼	0.8 ▼	-1.2 ▼
Finland	11.9 ▼	-1.6 ▼	-2.1 ▼	45.6 ▲	15.8 ▲	-4.6 ▲
France	35.3 ▼	5.8 ▼	5.7 ▼	37.3 ▼	34.3 ▼	1.1 ▼
Greece	0.7	-0.6	-5.5		6.3	-1.6
Ireland	1.5 ▲	0.2 ▼	2.7 ▼	39.3 ▲	18.1 ▲	-2.9 ▼
Italy*	90.2 ▼	40.2 ▼	8.4 ▼		18.9 ▼	30.4 ▼
Poland	1.1 ▲	0.3 ▲	4.2 ▲	21.3 ▲	14.2 ▲	
Portugal	0.5 ▲	-1.2 ▼	-34.5 ▼	17.9 ▲	15.1 ▲	-14.2 ▼
Romania	43.5 ▲	31.4 ▲	17.1 ▲	21.8 ▲	23.6 ▲	0.2 ▼
Spain	13.2 ▼	2.3 ▼	14.2 ▲	20.8 ▼	81.4 ▲	-6.2 ▼
Sweden	17.4 ▼	2.7 ▼	4.3 ▼	68.5 ▼	27.6 ▼	-3.2 ▲
United Kingdom	10.2 ▲	0.8 ▼	4.1 ▼	15.1 ▲	50.7 ▲	-0.4 ▼
Total EU	262.7 ▼	86.3 ▼	7.1 ▼	43.1 ▼	21.5 ▼	12.1 ▼

Source: EU Member States DCF data submission, 2016.
**Note: Italian labour productivity is not reliable due to an insufficient number of FTE reported.

The EU freshwater aquaculture sector provided €263 million in GVA in 2014, which corresponded to a 12% decrease from 2013. Measured in terms of EBIT profitability reached almost €86 million. Overall profitability measured in terms of ROI reached 7.1% in 2014. Labour productivity was on average €21 500 per FTE, as shown in Table 3.17.

Figure 3.31: Main species, produced in the EU Member States excluding land lock countries freshwater farming facilities: 2014.

Source: EU Member States DCF data submission, 2016

In terms of weight, rainbow trout dominate this segment with 50% of the volume and 49% of the value. The combined group trout nei is the second most important in terms of volume and value contributing with 19% and 15%, respectively. In terms of weight carp is the third most important species with a volume of 11% and a value of 7% of total EU production.

3.3.1 Trout

The submitted DCF data shows that the EU freshwater trout production reached 168.1 thousand tonnes valued at €543.6 million in 2014. The DCF data represented 91% of total EU28 sales volume and 86% of turnover. There is a large variation in freshwater trout production within the Member States. The total sales volume varied from a bit more that 43 tonnes in Cyprus to about 41.6 thousand tonnes in Italy. The total turnover varied from almost €0.4 million in Cyprus to about €115.6 million in Italy, followed shortly by France with €113.1 million.

Table 3.18: Economic indicators for the EU trout aquaculture: 2014.

Country	Number of enterprises	Total sales volume	Turnover	Employment	FTE	Average wage
	number	*thousand tonnes*	*million €*	*number*	*number*	*thousand €*
Bulgaria	60	1.4	5.3	189	143	3.8
Croatia	13	0.2	0.7	33	27	8.8
Cyprus	7	0.0	0.4	35	9	11.6
Denmark	93	29.1	91.3	303	202	77.4
Estonia	9	0.4	1.5	36	30	10.7
France	298	34.5	113.1	1168	946	25.1
Ireland	5	0.8	2.6	20	15	33.4
Italy*	173	41.6	115.6	594		
Poland	131	14.0	39.7	1296		
Portugal	8	0.5	2.0	35	30	13.9
Romania	99	1.1	3.8	359	278	5.1
Spain	83	15.6	43.0	648	519	16.2
Sweden	6	0.3	1.7	45	33	19.4
United Kingdom	164	13.0	47.9	599	489	16.9
Other none DCF		15.6	74.9			
Total DCF reported	***1149***	***152.5***	***468.7***	***5360***	***2721***	***27.1***
Total EU		**168.1**	**543.6**			

*Note: Italian labour productivity is not reliable due to an insufficient number of FTE reported.
Source: EU Member States DCF data submission, 2016.

The numbers of enterprises engaged in trout production in the EU was 1 149. The enterprises employed 5 360 people, corresponding to 2 721 FTEs. The freshwater trout sector has an important component of part-time work (0.51 ratio between FTE and employment). There is a large variation in the average wages between the countries. The salaries varied from €3.8 thousand in Bulgaria to €77.4 thousand in Denmark.

In 2014, income and GVA in the trout sector was generated almost equally by the on-growing and combined segments, representing 50% of the income each and 48% and 52% of the GVA, respectively. Positive EBIT and net profit were obtained in the both major segments. In economic terms, the hatcheries and nurseries segment has no significant economic importance. This is mainly because most of the activities related to hatcheries and nurseries are integrated in the combined segment.

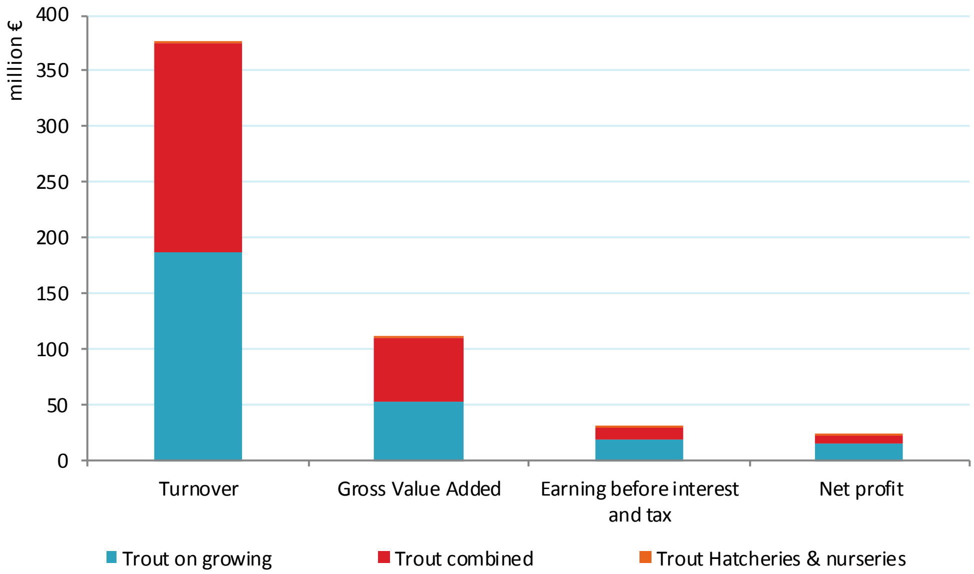


Figure 3.32: Economic performance indicators for trout aquaculture: 2014.

Source: EU Member States DCF data submission, 2016.

The reported DCF data shows that the trout sector has obtained a profit in 2014. The gross value added reached €124 million. EBIT reached more than €33 million, showing a positive economic performance confirmed by the ROI indicator of 6.9%. Labour productivity reached €34.4 thousand and capital productivity was 25.7%. The future expectations of the industry were 16.8%.

The economic performance in the different Members States shows large variation in the economic performance indicators. The GVA varied from about €0.1 million in Estonia to €35.3 million in France. The EBIT varied from -€1.2 million in Portugal to €14.9 million in Italy. Labour productivity varied from around €2.6 thousand in Estonia to €119.2 thousand in Denmark. Capital productivity varied from 0.8% for Estonia to 147.5% for Spain. For the 13 Member States that produced freshwater trout only 4 reported a positive future expectations indicator.

Table 3.19: Economic Performance indicators for the EU trout aquaculture: 2014.

Country	GVA	EBIT	ROI	Labour productivity	Capital productivity	Future Expectations Indicator
	million €	*million €*	*%*	*thousand €*	*%*	*%*
Bulgaria	3.2 ▲	2.5 ▲	39.4 ▼	22.7 ▲	50.4 ▼	-3.5 ▼
Croatia	0.4 ▲	0.1 ▼	4.0 ▼	14.1 ▲	15.8 ▲	-2.8 ▼
Cyprus	0.2	0.1	7.0	21.4	25.6	-0.3
Denmark	24.1 ▲	4.0 ▲	3.4 ▲	119.2 ▲	20.2 ▲	4.9 ▲
Estonia	0.1 ▼	-0.4 ▼	-4.6 ▼	2.6 ▼	0.8 ▼	-1.2 ▼
France	35.3 ▼	5.8 ▼	5.7 ▼	37.3 ▼	34.3 ▼	1.1 ▼
Ireland	0.6 ▲	0.0 ▼	0.9 ▼	43.3 ▲	12.7 ▲	-1.9 ▼
Italy*	30.3 ▼	14.9 ▼	8.0 ▼		16.3 ▼	40.8 ▼
Portugal	0.5 ▲	-1.2 ▼	-34.5 ▼	17.9 ▲	15.1 ▲	-14.2 ▼
Romania	5.3 ▲	3.0 ▼	20.2 ▼	19.1 ▲	35.6 ▲	-3.2 ▼
Spain	12.8 ▼	3.3 ▼	37.9 ▲	24.7 ▼	147.5 ▲	-8.6 ▲
Sweden	0.9 ▼	0.2 ▼	7.7 ▼	27.0	43.2 ▼	2.0 ▼
United Kingdom	10.2 ▲	0.8 ▼	4.1 ▼	20.9 ▲	50.7 ▲	-0.4 ▼
Total EU	124.0 ▼	33.1 ▼	6.9 ▲	34.4 ▼	25.7 ▼	16.8 ▲

Source: EU Member States DCF data submission, 2016.
*Note: Italian labour productivity is not reliable due to an insufficient number of FTE reported.

The economic performance of the freshwater trout enterprises have been decreasing between 2010-2011 and 2013-2014 in terms of GVA to revenue. The net profit margin follows the same development and is positive for all the years.

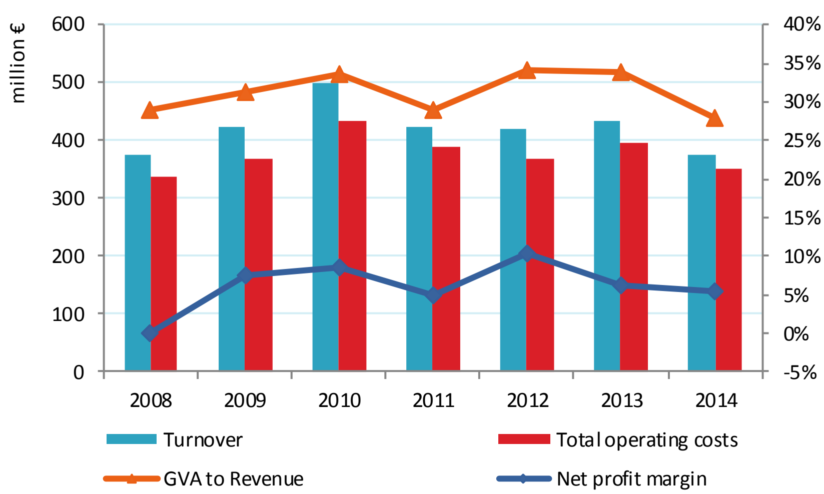


Figure 3.33: Economic performance indicators for trout aquaculture: 2008-2012.

Source: EU Member States DCF data submission, 2014

The economic performance of the on growing enterprises have been decreasing in terms of GVA and net profits margins between 2013 and 2014 and have been able to reduce total operating costs in 2014 compared to 2013. The enterprises in the combined segment have experienced a minor increase in GVA and net profit margins from 2012 to 2014. This was mainly due to the fact that total operating cost decreased in this segment in 2014.

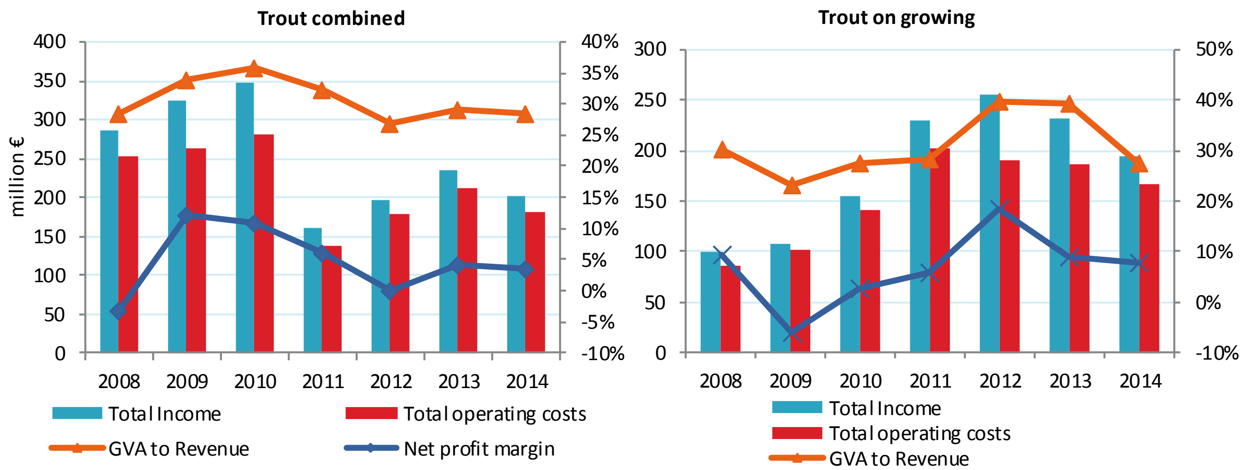


Figure 3.34: Development of economic performance for the EU trout aquaculture: 2008-2012.

Source: EU Member States DCF data submission, 2014

The most important costs of the EU freshwater trout sector are the feed costs, which represented 51% of the total costs in the on growing segment and 40% in the combined segment. Wages and salaries represented a similar share (14% and 16%, respectively), as well as other operational costs (10% and 15%, respectively), livestock costs (10% and 14%, respectively). Depreciation of capital and repair and maintenance costs are the same for both sectors – respectively 5% and 2%. The cost of energy is higher in the on growing sector than in the trout combined sector, because most of the intensive production systems using recirculation are placed in this segment. On the other hand, the imputed value of unpaid labour is lower.

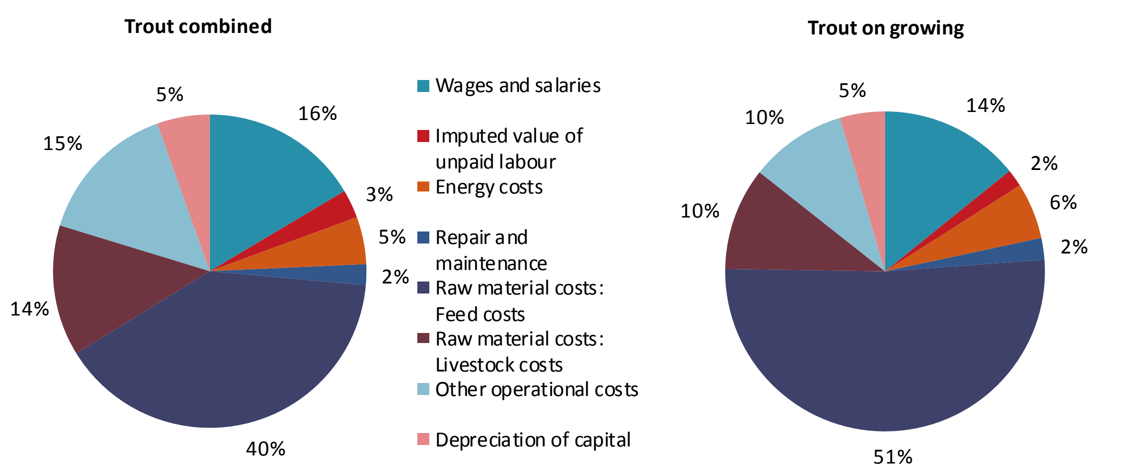


Figure 3.35: Costs breakdown for the EU trout aquaculture: 2014.

Source: EU Member States DCF data submission, 2016

The average prices of rainbow trout have been quite stable over the period examined with a price just about €3/kg. The group of trout named trout nei is a mixture of different trout species, however; it seem that they are following the same price development as rainbow trout more and more closely, suggesting that this group mostly contains rainbow trout or close substitutes.

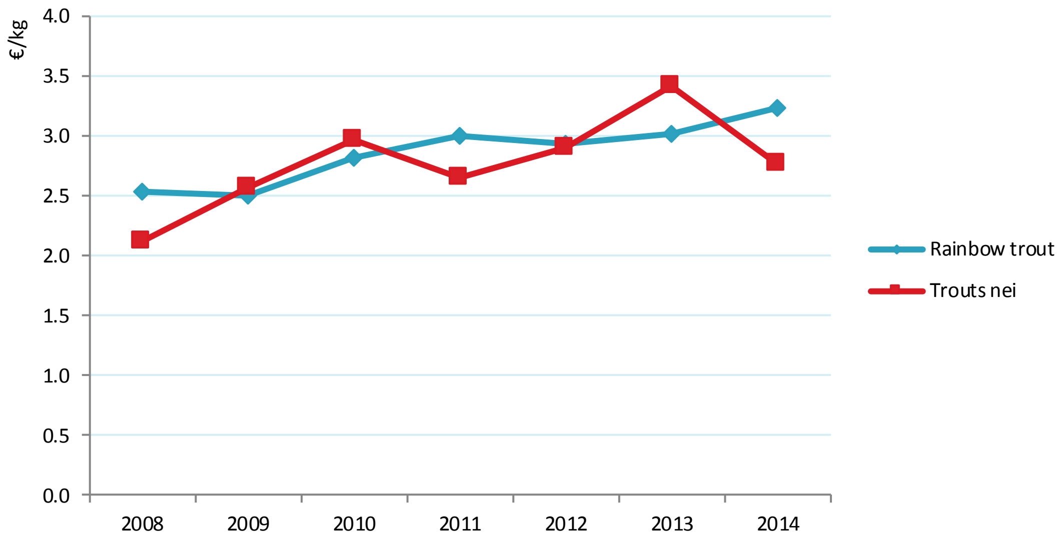


Figure 3.36: Price evolution of the main species of trout group: 2008-2014.

Source: EU Member States DCF data submission, 2016

3.3.2 Carp

Various species of carp are produced in the European aquaculture sector. The main species produced by weight are silver carp, grass carp, common carp, bighead carp and crucian carp.

Due to the lack of freshwater aquaculture data reported under the DCF, especially for landlocked countries, it is difficult to give a detailed picture of the EU carp aquaculture sector. Based on submitted information under the DCF data call, it is possible to analyse only six countries included in the Table 3.20. Therefore, total sales volume and turnover data from EUROSTAT were combined with the DCF data. The following countries were included in the table as "Other none DCF" from the EUROSTAT database: Austria, Czech Republic, Germany, Hungary, Latvia, Lithuania, Slovakia and Slovenia. Their share is 55% and 53% of the total EU turnover and total sales volume, respectively. In 2014, the EU aquaculture sector consisted of 1 656 registered enterprises, with a total sales volume of 35.1 thousand tonnes according to DCF data. The majority of the enterprises (77%) were situated in Poland and Romania. In 2014, the carp segment employed 9 738 people corresponding to 2 474 FTEs (Table 3.20).

DCF and EUROSTAT data show a total sales volume of €75 million, including €39.8 million from 'Other none DCF countries'. Total turnover was €154.9 million including €70.2 million from EUROSTAT data.

Table 3.20: Economic indicators for the EU carp aquaculture: 2014.

Country	Number of enterprises	Total sales volume	Turnover	Employment	FTE	Average wage
	number	*thousand tonnes*	*million €*	*number*	*number*	*thousand €*
Bulgaria	207 ▲	1.7 ▼	2.5 ▼	403 ▲	274 ▼	3.0 ▲
Croatia	14 ▼	3.2 ▼	5.4 ▼	1074 ▲	348 ▼	15.8 ▲
Poland	956 ▲	20.4 ▲	42.9 ▲	5830 ▲		
Romania	319 ▬	9.3 ▲	15.0 ▼	2131 ▲	1674 ▲	4.1 ▲
Spain	80 ▲	0.4 ▲	1.7 ▲	114 ▼	40 ▬	30.1 ▲
United Kingdom	80 ▲	0.2 ▲	2.8 ▲	186 ▲	138 ▲	
Other none DCF		39.8 ▬	84.7 ▲			
Total DCF reported	***1656*** ▲	***35.1*** ▲	***70.2*** ▬	***9738*** ▲	***2474*** ▬	***6.1*** ▲
Total EU		**75.0** ▲	**154.9** ▲			

Source: EU Member States DCF data submission, 2016

Total turnover for carp on growing was around €46.1 million in 2014, while Carp combinated and Carp Hatcheries & nurseries reached €41.7 million and €0.2 million, respectively. Carp combined segment shows a better economic performance than the other segments included. Carp combined and carp on growing had a positive EBIT and Net profit, while carp Hatcheries & nurseries shows a negative economic performance in the EBIT and Net profit.

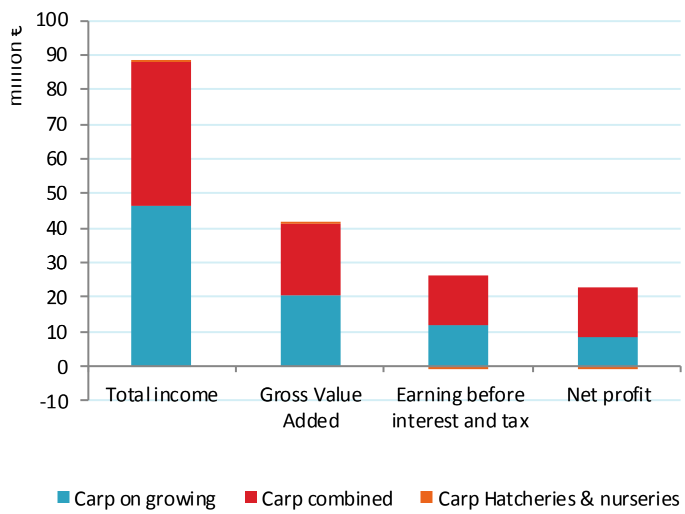


Figure 3.37: Economic performance indicators for carp aquaculture: 2014.

Source: EU Member States DCF data submission, 2016

Table 3.21 only includes data for Bulgaria, Croatia, Romania and Spain.

Table 3.21: Economic performance indicators for EU carp aquaculture: 2014.

Country	GVA	EBIT	ROI	Labour productivity	Capital productivity	Future Exp. Indicator
	million €	*million €*	*%*	*thousand €*	*%*	*%*
Bulgaria	0.7 ▲	-0.3 ▼	-7.2 ▼	2.4 ▲	14.4 ▲	6.4 ▼
Croatia	5.2 ▼	-1.7 ▲	-1.8 ▲	14.9 ▲	5.7 ▼	2.3 ▼
Romania	36.6 ▲	27.1 ▲	16.3 ▲	21.9 ▲	22.0 ▼	0.6 ▼
Spain	-1.0 ▲			-24.1 ▲	-99.1 ▲	0.0
Total DCF reported	41.5 ▲	25.1 ▲	9.6 ▲	16.8 ▲	15.8 ▲	1.3 ▼

Source: EU Member States DCF data submission, 2016

In terms of economic indicators, the amount of GVA, EBIT and Labour productivity generated by EU carp aquaculture sector in 2014 was €41.5 million, €25.1 million and €16.8 million, respectively, as can be seen in Table 3.21. ROI and Capital productivity achieved 9.6% and 15.8% in the same year.

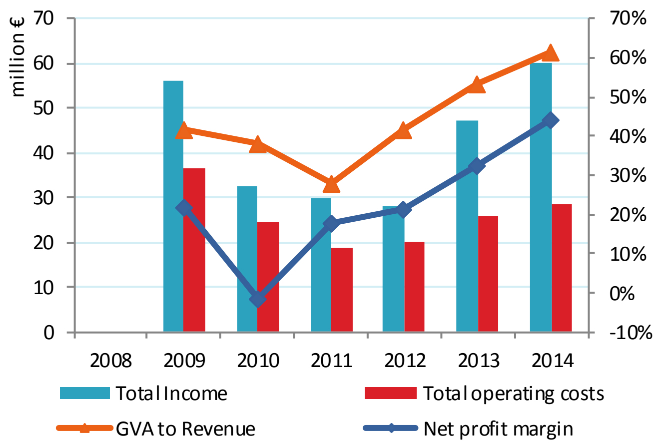


Figure 3.38: Economic performance indicators for carp aquaculture: 2008-2014.

Source: EU Member States DCF data submission, 2016

From the data provided to DCF it could be stated that carp aquaculture is very extensive in the on growing segment as feed costs were only 17% of the total cost structure. The largest part of costs according to the provided data were wages and salaries which varying from 10% to 34% depending on segment, being slightly higher for the carp on growing segment. The carp on growing segment had slightly higher livestock costs compared to the carp combinated segment (15% vs 14%). The carp combinated segment also had lower capital costs. The reason for this might be that the enterprises in this segment consist of old extensive pond systems with low capital value and low needs for further investments in pond infrastructure. Energy costs in both segments were not important in terms of total costs, comprising only 5%.

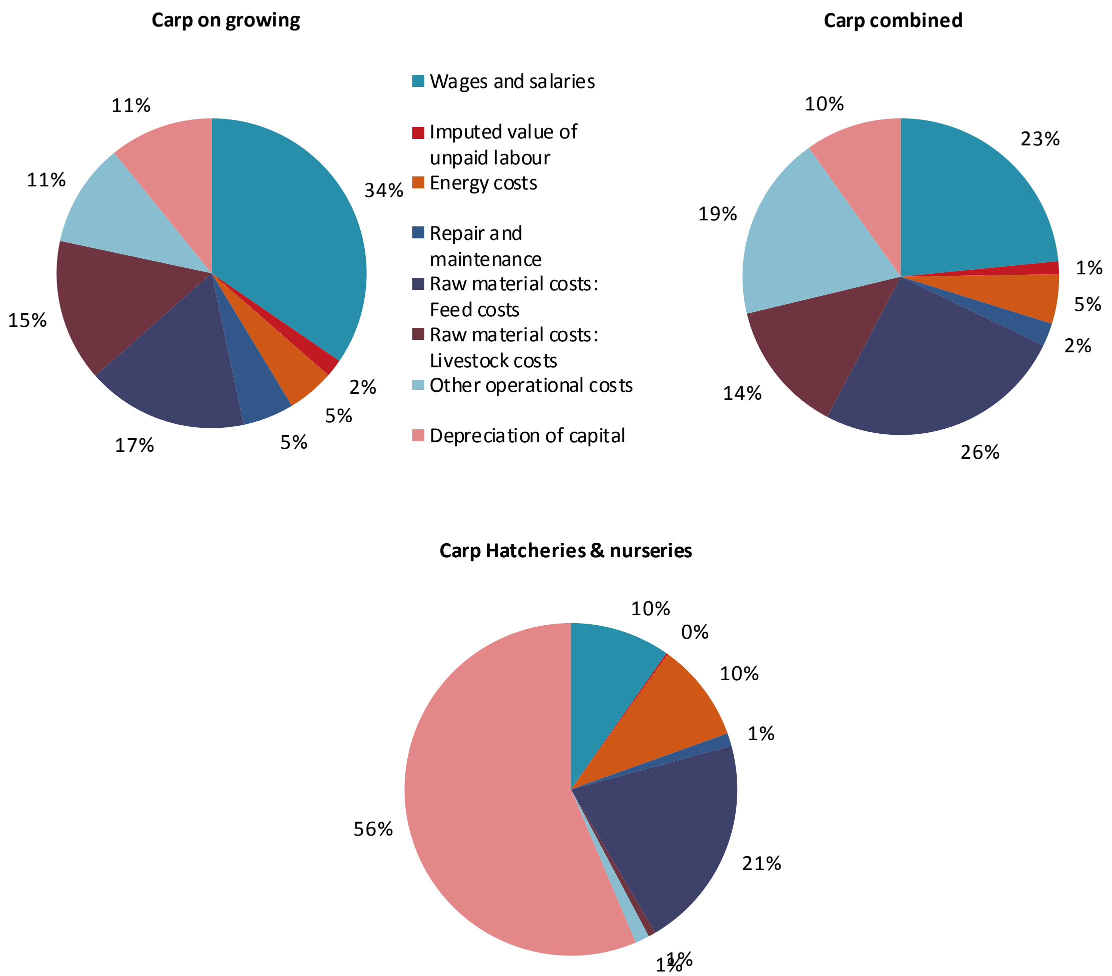


Figure 3.39: Costs breakdown for the EU carp aquaculture: 2014.

Source: EU Member States DCF data submission, 2016

The price for cultured common carp shows a decreasing trend, as illustrated in Figure 3.40; this is in common with world (FAO) prices for carp. The price on common carp in EU is almost twice as high as the price on the world market. This price differential is likely to reflect the difference between European and Asian consumer incomes, and the incorporation of lower value cyprinid species (big head carp, silver carp and grass carp) within the world price for carp.

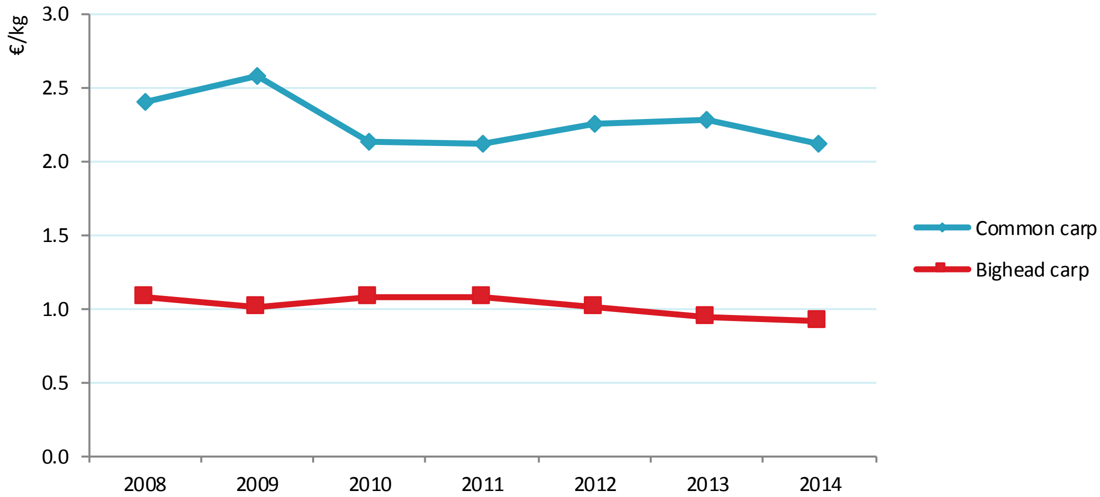


Figure 3.40: Price evolution of the main species of carp group: 2008-2014.

Source: EU Member States DCF data submission, 2016

3.3.3 Other fresh water species

Current DCF segmentation classifies the enterprises according to the main species (or group of species) produced (e.g. salmon, trout, carp, mussels). However, there are a number of enterprises that produce species not specifically identified in the DCF segmentation. Figure 3.41 shows the divisions of other freshwater species produced in the EU. The mixed groups of Other freshwater fish and Freshwater fish nei are the most important in terms of volume and value, contributing 59% and 70% of the total, respectively. Of the identified species, Rainbow trout produced in combination with other species where other species dominate the turnover is also added to this group. European eel and Rainbow trout contribute 13% and 11% to the total value, respectively. In terms of weight, Rainbow trout contributed 14% and European eel 10% of the total weight.

In total, the production was around 43.0 tonnes, valued €217.6 million in 2014. The main contributors to this segment were Italy, Romania and Denmark.

Figure 3.41: Main species, produced in the other freshwater farming facilities: 2014.

Source: EU Member States DCF data submission, 2016

4 NATIONAL CHAPTERS

4.1 Austria

4.1.1 Summary

Austria is a landlocked country producing only freshwater aquaculture products. The freshwater data collection is not mandatory under the DCF, and landlocked countries are therefore not requested to provide economic data for this report.

Production volume and value

The Austrian aquaculture sector produced 3.0 thousand tonnes in 2014 and the estimated production value was €18.2 million (Eurostat, 2016). Austria doesn't have marine or shellfish aquaculture production.

The total weight of production in last three years of analysed period is stable. In 2014 the total weight increased by 3% compared to 2013 and 22% compared over the period 2008-2013. The value of the production in 2014 also increased, by 10% compared to 2013 and 16% compared over the period 2008-2013. The development over the last 7 years shows an increase in production, while the value seems to be driven mostly by the species with the highest prices. The value of production are highest in 2010 and decrease until 2013 where it is increasing again.

From 2011, where data for hatcheries and nurseries was provided for the first time there is a significant increase in 2014 with the amount of 241 million units.

Table 4.1.1 Production and sales for Austria: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 13-14	Develop. 2014/(08-13)
Production weight (thousand tonnes)	***2.1***	***2.1***	***2.2***	***2.7***	***2.9***	***2.9***	***3.0***	***3%***	***22%***
Marine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*
Shellfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*
Freshwater	2.1	2.1	2.2	2.7	2.9	2.9	3.0	*3%*	*22%*
Production value (million €)	***12.7***	***13.9***	***20.4***	***16.5***	***14.6***	***16.5***	***18.2***	***10%***	***16%***
Marine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*
Shellfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*
Freshwater	12.7	13.9	20.4	16.5	14.6	16.5	18.2	*10%*	*16%*
Hatcheries & nurseries (million units)				***45***	***29***	***22***	***241***	***996%***	***654%***
Eggs				8	13	10	69	*586%*	*175%*
Juveniles				37	16	12	173	*1338%*	*191%*

Source: EUROSTAT

Main segments

Rainbow trout was the main species produced by the Austrian aquaculture sector representing 42% of the total weight and 42% of the total value of production in 2014. Other important species are common carp covering 19% of the weight and 11% of the value and brook trout accounting for 14% of the weight and 15% of the value.

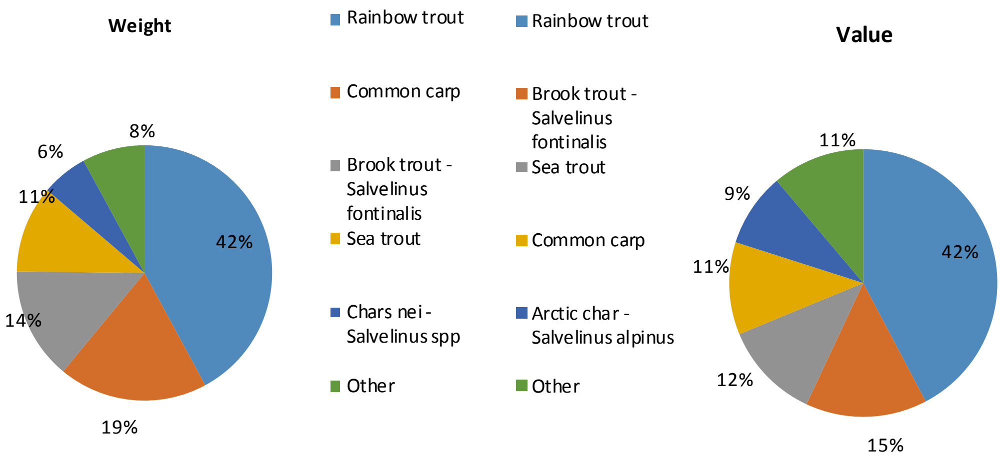


Figure 4.1.1 Main species in terms of weight and value in Austrian production: 2014.

Source: EUROSTAT

All aquaculture prices have had a similar trend over the period 2008 to 2014. The only stable price in the last years is the price of brook trout. Prices of the 5 main species (arctic char, bighead carp, brook trout, catfish nei and char nei) have diversified year by year, however afterwards prices seem to be stable in 2013 and 2014.

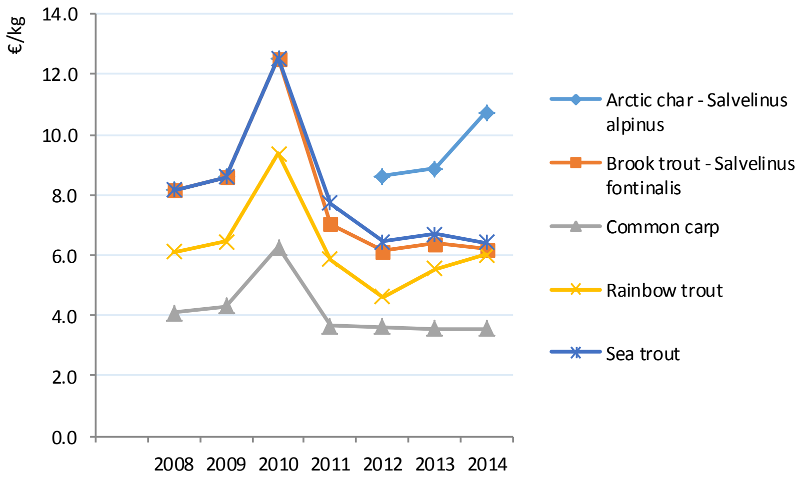


Figure 4.1.2 Average prices for the main species produced in Austria: 2008-2014.

Source: EUROSTAT

4.1.2 Data Coverage and Data Quality

Austria is a landlocked country producing only freshwater aquaculture products. The freshwater data collection is not mandatory under the DCF and landlocked countries are therefore not requested to provide economic data for this report. Data for the Austrian aquaculture sector is therefore provided by Eurostat.

4.2 Belgium

4.2.1 Summary

Although not landlocked, Belgium only produces freshwater aquaculture products. The freshwater data collection is not mandatory under the DCF, and therefore Belgium is not obliged to provide economic data for this report. The analysis below is based on the EUROSTAT data. However EUROSTAT does not provide information for volume for this country in 2010, due to low disaggregation of the production data, and value of production for 2010 and 2014 is considered to be confidential.

Production volume and value

The main product of the Belgian aquaculture sector is rainbow trout, and from 2010 this is the only species in the EUROSTAT data with a total production of 175 tonnes in 2014, which is the almost identical to the production reported in 2013.

Table 4.2.1 Production and sales for Belgium: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 13-14	Develop. 2014/(08-13)
Production weight (thousand tonnes)	***0.1***	***0.6***	***0.0***	***0.1***	***0.2***	***0.2***	***0.2***	***1%***	***-10%***
Marine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*
Shellfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*
Freshwater	0.1	0.6	0.0	0.1	0.2	0.2	0.2	*1%*	*-10%*
Production value (million €)	***0.3***	***4.2***	***0.0***	***0.4***	***1.0***	***0.7***	***0.0***	***-100%***	***-100%***
Marine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*
Shellfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*
Freshwater	0.3	4.2	0.0	0.4	1.0	0.7	0.0	*-100%*	*-100%*
Hatcheries & nurseries (million units)	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0%***	***0%***
Eggs	0	0	0	0	0	0	0	*0%*	*0%*
Juveniles	0	0	0	0	0	0	0	*0%*	*0%*

Source: EUROSTAT

The price of rainbow trout seems stable from 2008 to 2013 at a level of €4.3 per kilo level.

4.2.2 Data Coverage and Data Quality

Belgium only produces freshwater aquaculture products. The freshwater data collection is not mandatory under the DCF and landlocked countries are therefore not requested to provide economic data for this report.

4.4 Bulgaria

4.4.1 Summary

Production volume and value

In 2014, the turnover was €17.2 million, which is 16% more than the turnover in 2013, and increased by 59% compared over the period 2008-2013. The total sales volume in 2014 also increased by 9% compared to 2013, reaching 6.8 thousand tonnes, and increased by 57% compared over the period 2008-2013.

Overall industry structure and employment

In 2014, Bulgaria had 318 companies with 5 or less employees, 30 companies with 6-10 employees and 6 companies with more than 10 employees. Total employment in 2014 was 924 jobs, corresponding to 679 FTEs. The level of employment decreased between 2009 and 2012 but increased in 2013 and 2014. Male employees increased with 32% from 2013 to 2014, but female employees decreased by 33%, which may be explained by the nature of the work. Men are still predominated in the aquaculture sector and in 2014 they represented the 88% of all employment. Total employment increased by 19%, while the number of FTEs decreased by 10%. In general, the number of total employees increased by 20% compared to the average for the period 2009-2013, but the FTEs decreased by 11%. Average salary per FTE in 2014 increased visibly in the last three years.

Main segments

The production in Bulgaria can be divided into four main segments. The largest segment, regarding sales value and volume, remain the trout cages followed by mussel long line, carp on growing and trout combined.

Current production trends and main drivers (Trends and triggers)

The significant part of Bulgarian aquaculture is based on the production of non-native (introduced) species. This trend has remained over the years and it is confirmed by the growing cultivation of *Oncorhynchus mykiss*. Another segment, which is important for Bulgarian aquaculture sector is mussel long line. The production of the segment and the total sales value are stable in 2013 and 2014 and both variables have increased compared with the average values in 2009-2013.

Outlook

In regards to Bulgarian national strategy on aquaculture there is a potential to increase the aquaculture production, especially through diversified production of species with high market price, as well as organic produce based on the traditional extensive technologies; another venue for increase is the adding of value to own production by processing or direct sales from the aquaculture farm. Possibilities should also be sought by the introduction of innovations and the development and market introduction of new or significantly improved products, new or improved processes, new or improved management and organization systems.

According to the analysed period, we can expect better future for the Bulgarian aquaculture sector. The reason is that the Bulgarian aquaculture sector opportunities are at a higher level, making a historical analysis on production volume and value. In terms of expansion and modernization of existing farms and diversification of the production of new species is expected FTE to stay stable or to increase. Also, these measures are expected to affect positively on the competitiveness of the sector. By the applying of environmental measures and subsidies for new farms for organic production is expected to reduce the impact of aquaculture on the environment.

4.4.2 Production and sales

The aquaculture sector in Bulgaria is characterized to be stable over the period 2008-2012 and in 2013-2014 were registered increases in the sales value and volume.

In 2009, the turnover was €8.3 million and in 2014 the turnover has increased by 59% regarding over the period 2009-2013 and amounted €17.2 million. Compared to 2013, the turnover in 2014 increased by 16%. The total sales volume in 2014 increased by 57% over the period 2009-2013 and was 6.8 thousand tonnes. Compared to 2013, the total sales volume in 2014 increased by 9%.

Despite the decline that was seen in the volume of total sales during the period 2008-2012, the situation in 2013 and 2014 is better. Sales volume in 2014 is 112% higher than in 2009 and 57% higher than the average value for 2009-2013. There has been an increase in the sales volume in marine, shellfish and freshwater sectors. The values of sales weight and sales value for hatcheries and nurseries sector remain zero since this is not a popular activity in aquaculture sector in Bulgaria, but it should be mentioned that some part of the enterprises used to produce eggs and fingerlings for their own.

The situation is similar with the total sales value - there is a decrease in the period 2008-2011. After 2012, there is a significant increase in the value of sales and the value in 2014 is 106% higher compared to the value in 2009 and 59% more than the average for the period 2009-2013.

Table 4.1 Production and sales for Bulgaria: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Sales weight (thousand tonnes)	***4.5***	***3.2***	***3.8***	***3.9***	***4.3***	***6.2***	***6.8***	*9%*	*57%*
Marine	0.9	1.0	1.1	1.2	1.2	1.7	1.6	*-4%*	*36%*
Shellfish	0.6	0.3	0.5	0.6	0.8	1.0	1.3	*22%*	*74%*
Freshwater	3.0	1.9	2.1	2.1	2.2	3.5	3.9	*11%*	*56%*
Hatcheries & nurseries					0.0	0.0	0.0		*0%*
Sales value (million €)	***10.5***	***8.3***	***9.6***	***10.5***	***11.0***	***14.7***	***17.2***	*16%*	*59%*
Marine	2.9	3.3	3.9	4.5	4.5	6.2	6.3	*1%*	*49%*
Shellfish	0.2	0.3	0.4	0.5	0.6	0.9	1.0	*9%*	*75%*
Freshwater	7.4	4.7	5.3	5.4	5.8	7.6	9.9	*31%*	*64%*
Hatcheries & nurseries					0.0	0.0	0.0		*0%*

Source: EU Member States DCF data submission

4.4.3 Industry structure and employment

In 2014, Bulgaria had 318 active aquaculture enterprises with 5 or less employees, 30 enterprises with 6-10 employees and 6 enterprises with more than 10 employees. Total employment in 2014 was 924 jobs, corresponding to 679 FTEs. The level of employment decreased between 2009 and 2012, but increased in 2013 and 2014. Among the possible reasons for these fluctuations is the unstable economic situation in the country. The number of enterprises in 2014 with less than five employees and between 6-10 employees has increased by 12% and 20% respectively compared with 2013, while the number of enterprises with more than 10 employees decreased by 33%. The average wage in 2014 increased by 46% compared to 2013, and it was 84% more than the average for the period 2008-2013.

Table 4.2 Structure of the Bulgarian aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Structure (number)									
Total enterprises	*274*	*336*	*347*	*388*	*163*	*317*	*354*	*12%*	*16%*
<=5 employees	241	316	339	377	151	283	318	*12%*	*12%*
6-10 employees	25	13	4	7	8	25	30	*20%*	*120%*
>10 employees	8	7	4	4	4	9	6	*-33%*	*0%*
Employment (number)									
Total employees	1,110	1,375	436	470	454	777	924	*19%*	*20%*
Male employees	801	930	374	419	345	624	821	*32%*	*41%*
Female employees	309	445	62	51	109	153	103	*-33%*	*-46%*
FTE	1,110	1,375	436	470	454	756	679	*-10%*	*-11%*
Male FTE	801	930	374	419	345	613	605	*-1%*	*4%*
Female FTE	309	445	62	51	109	143	74	*-48%*	*-60%*
Indicators									
FTE per enterprise	4.1	4.1	1.3	1.2	2.8	2.4	1.9	*-19%*	*-27%*
Average wage (thousand €)	1.8	2.1	1.2	1.4	2.2	2.3	3.3	*46%*	*84%*
Labour productivity (thousand €)	-9.7	-12.1	17.3	18.1	19.6	12.2	17.0	*40%*	*126%*

Source: EU Member States DCF data submission

The employment trends, regarding the gender, show significant fluctuation. While in 2009 the employed women in aquaculture enterprises were 445, in 2014 their number was 103, which is 46% less than the average for the 2009-2013 period. The number of the employed men increased by 32% between 2013 and 2014, and their number in 2014 was 41% higher than the average of the period 2009-2013. Total FTEs in 2014 decreased by 10% compared with 2013 and 11% compared to the average of the period 2009-2013.

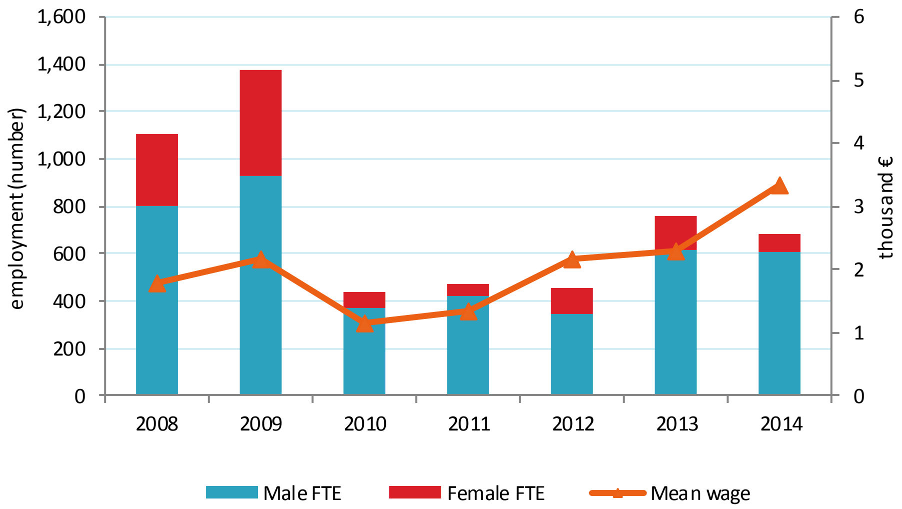


Figure 4.1 Employment trends for Bulgaria: 2008-2014.

Source: EU Member States DCF data submission

The total income in 2014 has increased compared to 2013 and to the average for 2009-2013. The total operating costs have importantly decreased between 2009 and 2010, but after 2010 their value is increasing proportionally to the increase of the total income. Labour productivity has been stable between 2010 and 2014, with a small decrease in 2013.

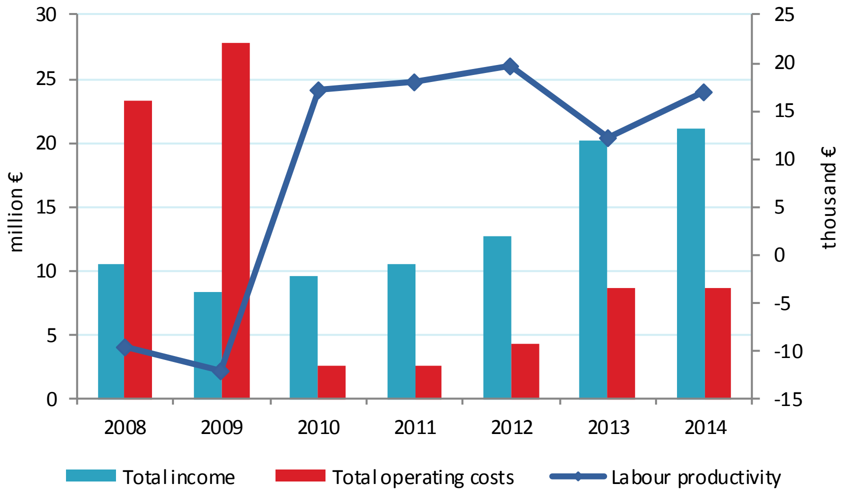


Figure 4.2 Income, costs, wages and labour productivity trends for Bulgaria: 2008-2014.

Source: EU Member States DCF data submission

4.4.4 Economic performance

The economic performance of Bulgarian aquaculture sector has deteriorated between 2008 and 2010, but in the last four years, the situation significantly improves. The amount of total income generated by the Bulgarian aquaculture sector in 2014 was €21.1 million. The Total income value in 2013 increased by 5% compared to 2013, and it is 76% higher than the average value for the period 2008-2013. The largest part of the income comes from the turnover with 81%, followed by subsidies with 15%. The income from subsidies in 2014 decreased by 21% compared to 2013. Unlike the turnover for 2014, which was 16% higher than in 2013, the other income decreased by 46%.

Table 4.3 Economic performance of the Bulgarian aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	% of total income	Change 2014-13	Development 2014/(2008-13)
Income (million €)										
Turnover	10.5	8.3	9.6	10.5	11.0	14.7	17.2	81%	16%	59%
Other income	0.0	0.0	0.0	0.0	1.3	1.4	0.8	4%	-46%	72%
Subsidies	0.0	0.0	0.0	0.0	0.5	4.0	3.1	15%	-21%	325%
Total income	*10.5*	*8.3*	*9.6*	*10.5*	*12.7*	*20.1*	*21.1*	100%	5%	76%
Expenditures (million €)										
Wages and salaries	1.8	2.5	0.4	0.6	0.9	1.6	2.0	10%	24%	57%
Imputed value of unpaid labour	0.1	0.5	0.1	0.1	0.1	0.1	0.2	1%	157%	38%
Energy costs	0.4	0.4	0.1	0.1	0.1	0.6	0.5	2%	-17%	76%
Repair and maintenance	0.4	0.4	0.2	0.1	0.3	1.4	0.4	2%	-71%	-11%
Raw material: Feed costs	3.0	3.5	1.5	1.4	2.0	3.4	4.1	19%	21%	66%
Raw material: Livestock costs	16.5	19.5	0.3	0.4	0.9	0.7	0.8	4%	11%	-87%
Other operational costs	1.0	1.0	0.1	0.0	0.0	0.9	0.6	3%	-32%	14%
Total operating costs	*23.2*	*27.8*	*2.6*	*2.6*	*4.3*	*8.7*	*8.6*	41%	-1%	-25%
Capital Costs (million €)										
Depreciation of capital	0.6	0.7	0.3	0.3	0.8	0.9	2.6	12%	205%	340%
Financial costs, net	1.6	1.5	0.2	0.3	0.3	0.3	0.5	2%	43%	-33%
Extraordinary costs, net	0.2	0.2	0.0	0.0	0.1	0.6	0.3	1%	-50%	56%
Capital Value (million €)										
Total value of assets	38.2	26.0	6.6	6.5	15.8	16.7	26.3	125%	58%	44%
Net Investments	5.3	1.5	0.8	1.2	2.8	5.1	2.7	13%	-48%	-4%
Debt	28.2	35.9	2.0	2.7	4.9	6.8	9.4	44%	38%	-30%
Input & Production (thousand tonnes)										
Raw material: Feed	7.2	9.3	10.8	0.9	2.9	12.3	14.0		14%	94%
Raw material: Livestock	7.2	7.9	0.9	1.2	1.7	14.5	10.0		-31%	80%
Performance Indicators(million €)										
Gross Value Added	-10.7	-16.6	7.5	8.5	8.9	9.2	11.6	55%	26%	930%
Operating cash flow	-12.7	-19.6	7.0	7.8	8.4	11.4	12.4	59%	9%	3047%
Earning before interest and tax	-13.3	-20.3	6.7	7.6	7.6	10.6	9.8	47%	-7%	5026%
Net profit	-15.0	-21.8	6.5	7.2	7.3	10.2	9.3	44%	-9%	1118%
Capital productivity (%)	-28.1	-64.0	113.6	131.4	56.4	55.2	44.0		-20%	0%
Return on Investment (%)	-34.9	-78.2	101.9	117.0	48.0	63.5	37.4		-41%	3%
Future Expectation Indicator (%)	12.3	3.2	7.8	14.2	12.9	25.7	0.2		-99%	-98%

Source: EU Member States DCF data submission

The total operating costs by the Bulgarian aquaculture sector in 2014 were €8.6 million and represented 41% of the total income. The total operating costs in 2014 decreased by 25% compared to the average of the period 2008-2013. The largest expenditure item in 2014 was raw material: feed costs with €4.1 million and wages and salaries with €2 million (Table 4.3). Expenditures for raw material: feed costs and wages and salaries in 2014 increased by 21% and 24% compared to 2013, respectively, and 66% and 57% compared over the period 2008-2013.

According to capital cost, depreciation of capital is the main cost with the amount of €2.6 million. In 2014, the depreciation of capital increased by 205% compared to 2013, and by 340% over the period 2008-2013. In regards to capital value, the total value of assets and debt are the main costs with the amount of €26.3 million and €9.4 million, respectively. The total value of assets in 2014 increased by 58% compared to 2013, and by 44% compared to the average of the period 2008-2013. Debts in 2014 increased by 38% compared to 2013, but decreased by 30% compared to the average of the period 2008-2013.

The amount of raw material volume: feed and raw material volume: livestock in 2014 were 14 thousand tonnes and 10 thousand tonnes respectively. Raw material volume: feed in 2014 increased by 14% compared to 2013, and 94% over the period 2008-2013. Raw material volume: livestock in 2014 decreased by 31% compared to 2013, but increased by 80% compared over the period 2008-2013.

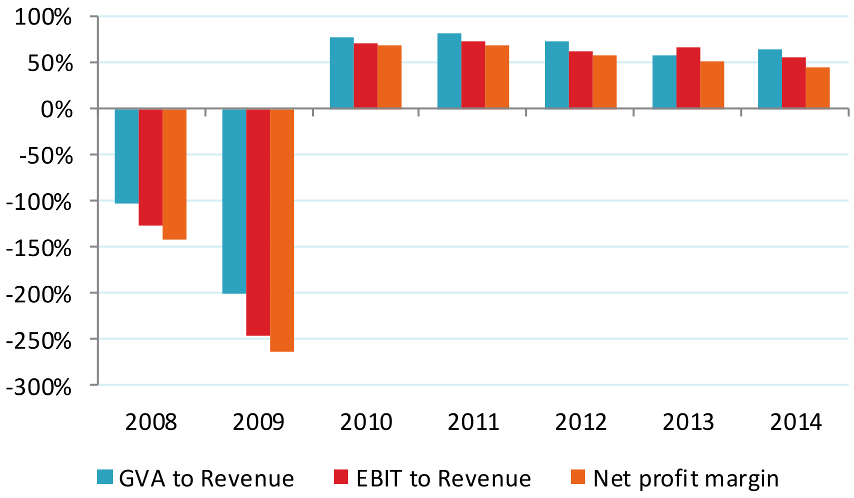


Figure 4.3 Economic performance for Bulgaria: 2008-2014

Source: EU Member States DCF data submission

The GVA generated by the Bulgarian aquaculture sector was €11.6 million in 2014, representing 55% of the total income. The GVA in 2014 increased by 26% compared to 2013. The operating cash flow amounted, in 2014, to €12.4 million, increasing by 9% compared to 2013. EBIT was equal to €9.8 million in 2014 and decreased by 7% compared to 2013 while increasing significantly regarding over the period 2008-2013. The net profit generated by the Bulgarian aquaculture sector in 2014 was €9.3 million and decreased by 9% compared to 2013.

4.4.5 Main species produced and economic performance by segment

The production in Bulgaria can be divided into four main segments. The largest segment, regarding sales value and volume, is the trout cages, followed by mussel long line, trout combined and carp on growing.

Figure 4.4 Main species in terms of weight and value in Bulgarian production: 2014.

Source: EU Member States DCF data submission

In terms of sales volume, the volume of the rainbow trout represented 44% of the total sales volume of Bulgarian aquaculture sector in 2014, followed by Mediterranean mussel (19%) and common carp (16%). Turnover from rainbow trout represents 67% of the total turnover in the same year, followed by others (15%), common carp (12%) and Mediterranean mussel (6%).

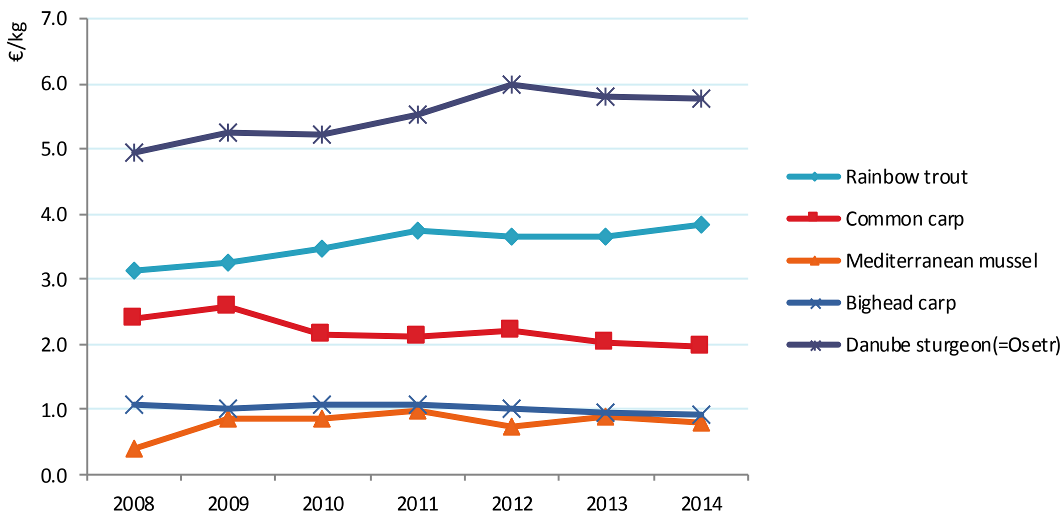


Figure 4.5 Average prices for the main species produced in Bulgaria: 2008-2014.

Source: EU Member States DCF data submission

The average price of rainbow trout was €3.66/kg in 2013. In 2014 average price increased by 4% and amounted €3.84/kg. The average price of common carp was €2.03/kg in 2013 and decreased by 3% and amounted €1.98 in 2014. The average price of Mediterranean mussel was €0.89/kg in 2013 and also decreased by 11% over the same period.

The economic performance of the four Bulgarian segments is shown in Figure 4.6 and Table 4.4. The data provided are from 2012 to 2014, because before 2012 the questionnaires for data collection were anonymous and voluntary, so data could not be divided into segments.

Another reason for which these segments are important is that they can ensure the resumption of high-quality products and satisfy the domestic demand for aquaculture product if they reach a new point of economic and financial stability.

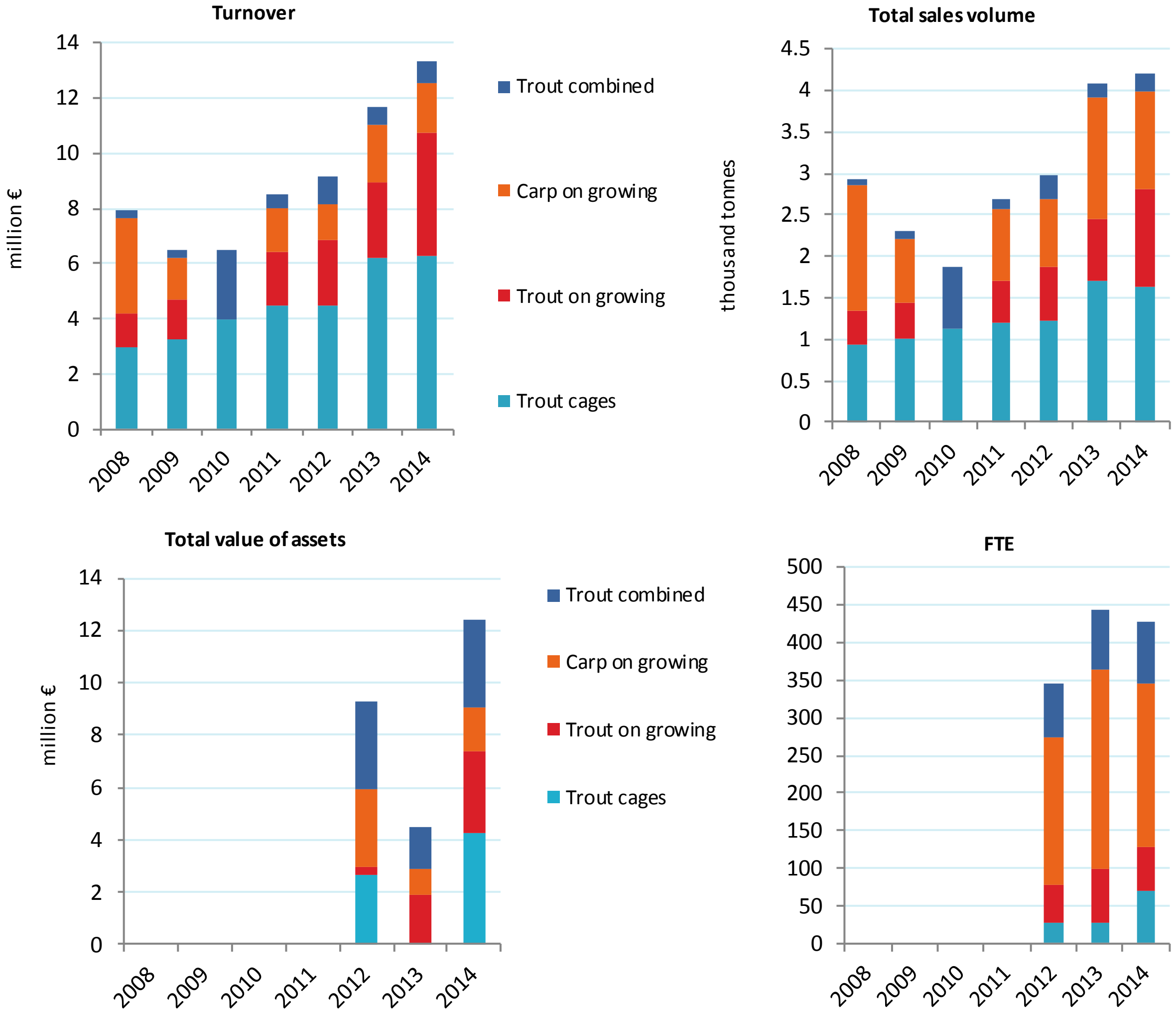


Figure 4.6 Structural development Bulgarian aquaculture sector: 2008-2014.

Source: EU Member States DCF data submission

Segment 1: Trout cages

The most important segment regarding the sales value and volume is trout cages. This segment consists of 17 active enterprises, which production was 99.7% rainbow trout and 0.3% brown trout. The value of total income in 2014 was €6.8 million with the amount of total sales volume 1.6 thousand tonnes. The value of the total income in 2014 increased by 9% compared to 2013, and 20% compared to the average of the period 2008-2013. Total sales volume in 2014 decreased by 4% compared to 2013, but increased by 36% compared to the average of the period 2008-2013.

In terms of economic indicators, the amount of GVA generated by the trout cages segment in 2014 was €5.8 million and has decreased by 1% compared to 2013 and increased by 17% over the period 2008-2013. The amount of OCF in 2014 was €5.9 million and increased by 1% compared to 2013 and 19% over the period 2008-2013. The amount of EBIT and Net profit in 2014 were €5.4 million for both of them and decreased by 7% and 9% respectively compared to 2013 and both increased by 13% over the period 2008-2013.

The largest cost item of the trout cages segment in 2014 was the depreciation of capital with the 37% of all the operational costs. Raw material costs: feed costs made up 26% of all operational costs and wages and salaries were the 18%.

Table 4.4 Economic performance of main Bulgarian aquaculture segments: 2008-2014 (in million €).

Variable	2008	2009	2010	2011	2012	2013	2014	*% of total income*	Change 2014/13	Development 2014/(2008-13)
Trout cages										
Total income					*5.1*	*6.2*	*6.8*	*100%*	*9%*	*20%*
Gross Value Added					*4.1*	*5.9*	*5.8*	*86%*	*-1%*	*17%*
Operating cash flow					*4.1*	*5.9*	*5.9*	*88%*	*1%*	*19%*
Earning before interest and tax					*3.8*	*5.9*	*5.4*	*80%*	*-7%*	*13%*
Net profit					*3.6*	*5.9*	*5.4*	*79%*	*-9%*	*13%*
Total sales volume (thousand tonnes)	*0.9*	*1.0*	*1.1*	*1.2*	*1.2*	*1.7*	*1.6*		*-4%*	*36%*
Trout combined										
Total income					*1.1*	*1.2*	*1.1*	*100%*	*-11%*	*-9%*
Gross Value Added					*0.2*	*-0.3*	*0.2*	*15%*	*160%*	*518%*
Operating cash flow					*0.1*	*0.1*	*0.0*	*0%*	*-97%*	*-97%*
Earning before interest and tax					*0.0*	*0.1*	*-0.2*	*-17%*	*-275%*	*-338%*
Net profit					*0.0*	*0.1*	*-0.3*	*-26%*	*-379%*	*-507%*
Total sales volume (thousand tonnes)	*0.1*	*0.1*	*0.7*	*0.1*	*0.3*	*0.2*	*0.2*		*20%*	*-15%*
Carp on growing										
Total income					*1.9*	*4.1*	*2.0*	*100%*	*-50%*	*-32%*
Gross Value Added					*1.1*	*1.4*	*0.7*	*36%*	*-49%*	*-42%*
Operating cash flow					*0.7*	*2.6*	*0.2*	*11%*	*-91%*	*-87%*
Earning before interest and tax					*0.7*	*2.5*	*0.1*	*4%*	*-97%*	*-95%*
Net profit					*0.7*	*2.5*	*0.0*	*2%*	*-98%*	*-97%*
Total sales volume (thousand tonnes)	*1.5*	*0.8*		*0.9*	*0.8*	*1.5*	*1.2*		*-20%*	*9%*
Mussel Long line										
Total income					*0.9*	*2.9*	*2.4*	*100%*	*-18%*	*24%*
Gross Value Added					*0.6*	*1.0*	*0.9*	*36%*	*-15%*	*10%*
Operating cash flow					*0.7*	*2.4*	*1.9*	*79%*	*-22%*	*19%*
Earning before interest and tax					*0.4*	*1.9*	*0.8*	*32%*	*-59%*	*-33%*
Net profit					*0.4*	*1.8*	*0.7*	*27%*	*-64%*	*-39%*
Total sales volume (thousand tonnes)	*0.6*	*0.3*	*0.5*	*0.6*	*0.8*	*1.0*	*1.3*		*22%*	*98%*

Source: EU Member States DCF data submission

Segment 2: Mussels long line

The second important segment regarding the sales value and volume is the mussels long line, which unites 23 enterprises. The production from this segment is only Mediterranean mussel. The value of the total income in 2014 was €2.4 million, 42% of the income came from the turnover, 54% are from subsidies and 3% are from other income. The amount of total sales volume was 1.3 thousand tonnes in 2014, which was 22% more that in 2013, and 98% more that the average value for 2008-2013.

In terms of economic indicators, the amount of GVA generated by the mussel long line segment in 2014 was €0.9 million and has decreased by 15% compared to 2013 and increased by 10% over the period 2008-2013. The amount of OCF in 2014 was €1.9 million and decreased by 22% compared to 2013 but increased 19% over the period 2008-2013. The amount of EBIT in 2014 was €0.8 million decreased by 59% compared to 2013 and 33% over the period 2008-2013. The amount of net profit in 2014 was €0.7 million decreased by 64% compared to 2013 and 39% over the period 2008-2013.

The largest cost item of mussel long line segment in 2014 was the depreciation of capital with 68%. Wages and salaries represented the 17% of all operational costs and other operational costs were the 9%.

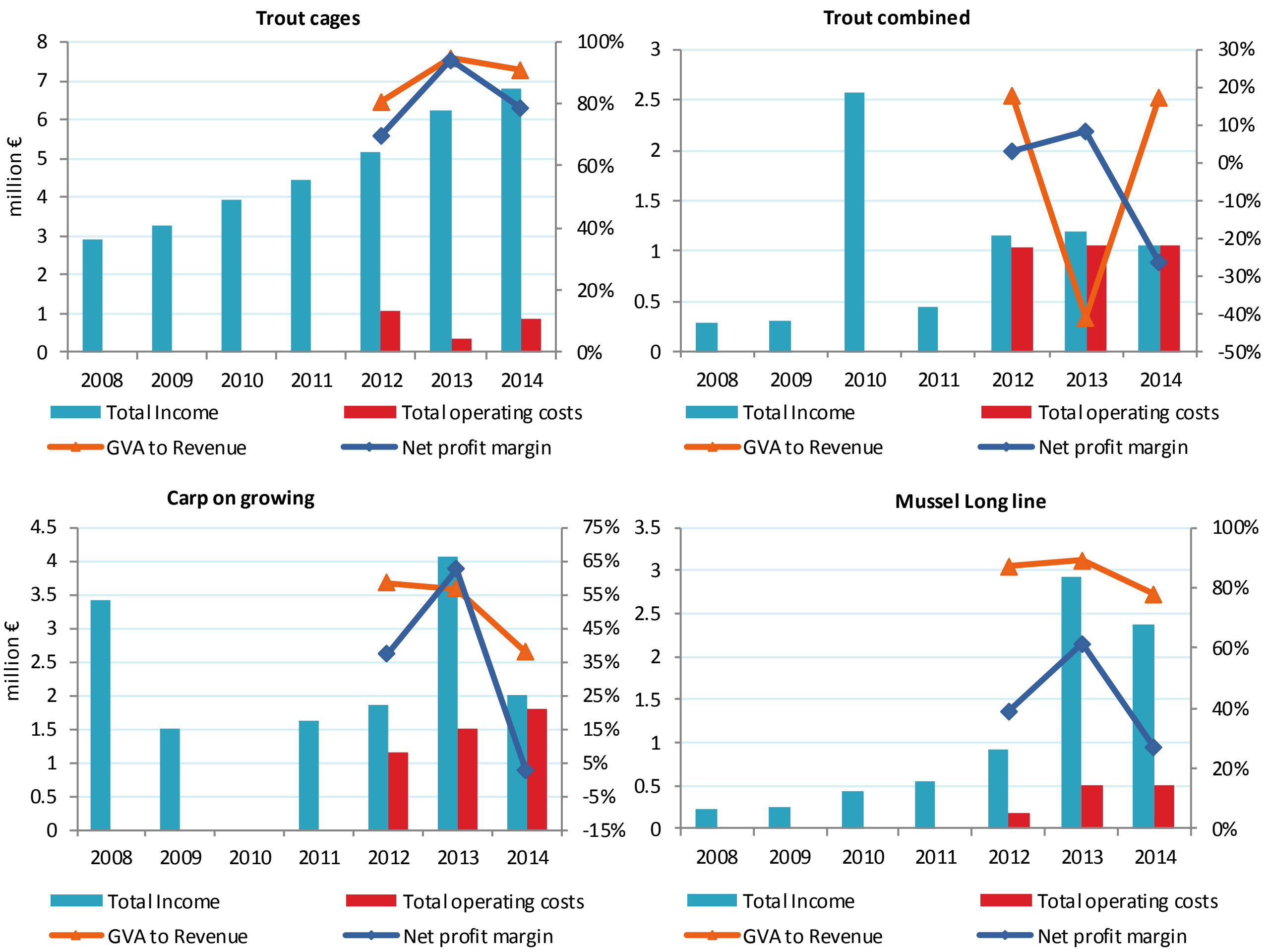


Figure 4.7 Economic performance indicators for the main Bulgarian segments: 2008-2014.

Source: EU Member States DCF data submission

Segment 3: Carp on growing

This segment is the biggest one in terms of the number of enterprises in it, with 170. It represented 48% of all the active enterprises in Bulgaria and it also employed 33% of the employees in the sector. Almost all of the enterprises in this segment can be characterized as extensive and their production and income were extremely small. The value of total income in 2014 was €2 million, which was 50% less compared to 2013, and 32% less than the average for 2008-2013. The amount of total sales volume was 1.2 thousand tonnes in 2014, which represented a 20% decrease compared to 2013, but 9% more than the average value for 2008-2013.

In terms of economic indicators, the amount of GVA generated by the carp on growing segment in 2014 was €0.7 million and has decreased by 49% compared to 2013 and 42% over the period 2008-2013. The amount of OCF in 2014 was €0.2 million and decreased by 91% compared to 2013 and 87% over the period 2008-2013. The amount of EBIT in 2014 was €0.1 million decreased by 97% compared to 2013 and 95% over the period 2008-2013. The amount of net profit in 2014 was €0 million decreased by 98% compared to 2013 and 97% over the period 2008-2013.

The largest cost item of carp on growing segment in 2014 was the raw material costs: feed cost with the 37%. Wages and salaries represented the 25 % of all operational costs and other operational costs were the 9%.

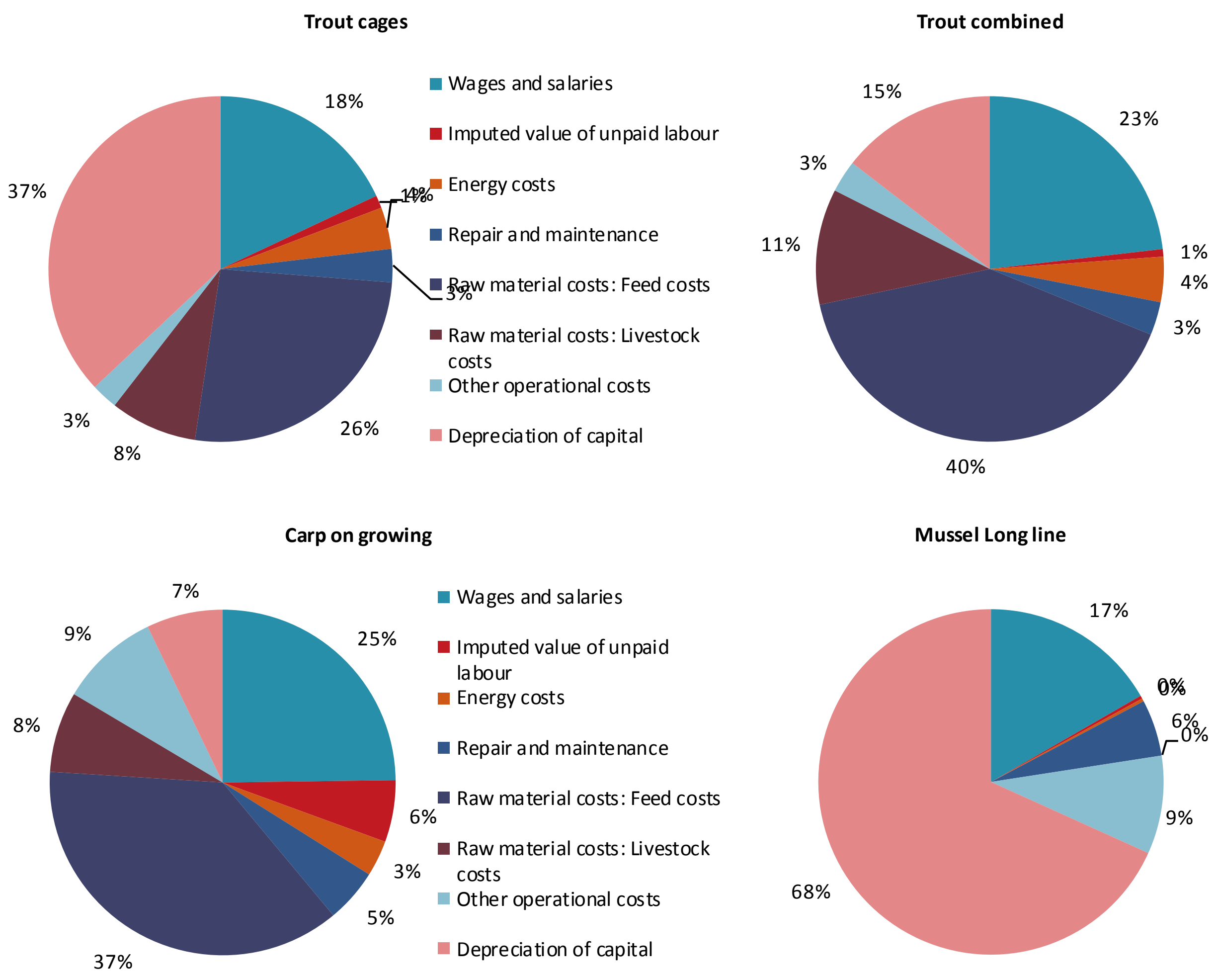


Figure 4.8 Cost structure of the main segments in Bulgaria: 2014.

Source: EU Member States DCF data submission

Segment 4: Trout combined

This segment consisted of 22 active enterprises and, as in the trout cages segment, the main produced species is rainbow trout with the 98.8% followed by the brown trout with 1.2%. The value of total income in 2014 was €1.1 million, which is 11% and 9% lower than in 2013 and the average for 2008-2014, respectively. The amount of total sales volume in 2014 remained the same as in 2013, at 0.2 thousand tonnes.

In terms of economic indicators, the amount of GVA generated by the trout combined segment in 2014 was €0.2 million and has increased by 160% compared to 2013 and 518% over the period 2008-2013. The amount of EBIT in 2014 was -€0.2 million and decreased by 275% compared to 2013 and 338% over the period 2008-2013. The amount of net profit in 2014 was -€0.3 million and decreased by 379% compared to 2013 and 507% over the period 2008-2013.

The largest cost item of trout combined segment in 2014 was the raw material costs: feed cost with the 40% of all operational costs. Wages and salaries represented the 23 % and depreciation of capital the 15%.

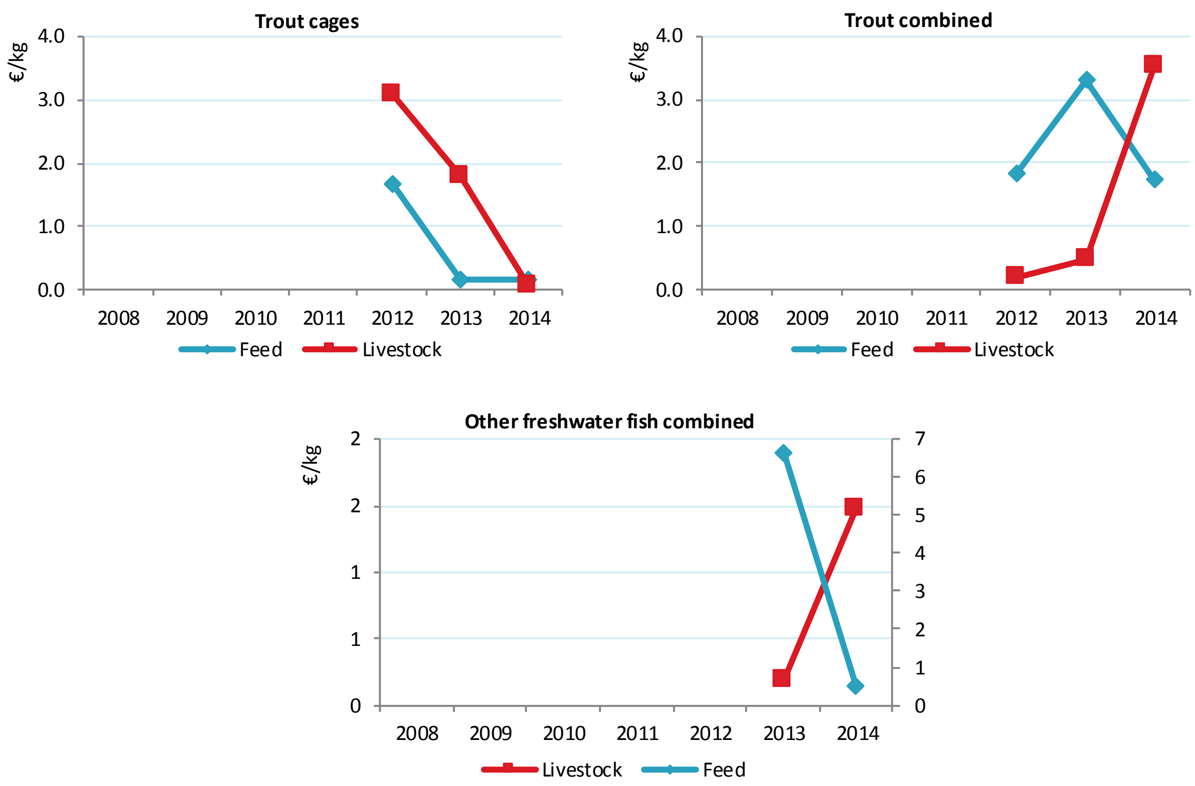


Figure 4.9 Feed and livestock prices for the main Bulgarian segments: 2008-2014.

Source: EU Member States DCF data submission

4.4.6 Trends and triggers

Current production trends and main drivers

The significant part of Bulgarian aquaculture consists of the production of rainbow trout, carp and Mediterranean mussel. The production of carp is a stable trend, due to the culture and traditions of the people. The cultivation of rainbow trout and Mediterranean mussel continues to grow as the demand for these species is also growing not only for the domestic market but also for export. In recent years investments were made in the construction of new and modernization of existing aquaculture enterprises. In regards to the production trends during the last five years and the increasing interest in cage farming and recirculation system farming, it can be expected gradual growth of the economically valuable species.

Market structure

Still marketing structure in the country is not well developed. There is a need for organization and construction of retail stores and wholesale distribution network of fish and fish products, including exchanges and specialized centres for purchasing fish not only near the seaside but also in the middle of the country. In some mountain and rural regions, the distribution of fresh fish is absent so that the consumption of fish in these regions is much lower than the average per capita in the country.

Some aquaculture farms have their own processing facilities located near the production enterprises, which helps them to add the value of their products.

The main kinds produced for consumption are the rainbow trout, the species from the carp family from the freshwater kinds, and Mediterranean mussel from the marine species. The production volume is relatively stable and their demand on the domestic market is constant, because of their low market price.

The whole aquaculture sector is characterized by many small producers at the primary level, enterprises with less than 5 employees are 90% of all aquaculture farms. The market structure can be a hindrance in the future because the market is not well functioning and it is not competitive compared to other markets on the Balkans.

In recent years few farms specialized for sturgeon species has been established. However, they are producing less than 300 tonnes and we will see in future how large the production volume will grow and will it become a large proportion of the national production.

The Bulgarian market is still developing; the facilities for fish and fish products are not well organized. A big quantity of fish and fish products are imported every year by the supermarkets and the prices are generally lower than the offered by the local producers.

Issues of special interest

Despite the increasing interest in cage farming and recirculation system farming, only few enterprises take the initiative to produce new species like an eel, coho salmon and African catfish. The object of special interest remains the farming of rainbow trout and Mediterranean mussel.

Outlook for future

In regards to Bulgarian national strategy on aquaculture there is a potential to increase the aquaculture production, especially through diversified production of species with high market price, as well as organic produce based on the traditional extensive technologies; another venue for increase is the adding of value to own production by processing or direct sales from the aquaculture farm. Possibilities should also be sought by the introduction of innovations and the development and market introduction of new or significantly improved products, new or improved processes, new or improved management and organization systems.

Improving the competitiveness of the enterprises can be achieved also by the general modernization of the enterprises, improving their resource efficiency and fulfilling the measures to protect waters and their conversion to intensive or super-intensive innovative technologies.

Another opportunity for Bulgarian aquaculture is diversification of cultivated species, an introduction of aquaculture species with high foreign market value; growing new organisms for industries other than the food industry.

In accordance with the multiannual national strategic plan for aquaculture (2014-2020) the aquaculture development will be supported primarily through investment in the expansion and modernization of existing farms and diversification of the production of new species, and activities will be supported related to the improvement of production efficiency - adding value to production, utilization of waste, improving the working conditions, including protection against loss of production from predators and poachers. Support is needed also for the development of technical innovations and knowledge in the field of aquaculture and processing of aquaculture products and the opportunity to ensure aquaculture stock in order to prevent losses from natural disasters.

Support for creating and improving infrastructure for the needs of the fisheries will also contribute to increasing the competitiveness of the sector.

In terms of challenges to the fish and fish products market, it is necessary to encourage and support the establishment of producer organizations in fisheries and aquaculture, which then should be able to improve the management of their activities, increase their sells and raise the demand for their products. In regard to this, the development production and marketing plans will be supported. The successful operation of the producer organisations depends on the existence of complete market information and the possibility of carrying out joint promotional or advertising campaigns on the Bulgarian market.

According to the analysed period, we can expect better future for the Bulgarian aquaculture sector. The reason is that the Bulgarian aquaculture sector opportunities are at a higher level, making a historical analysis on production volume and value. In terms of expansion and modernization of existing farms and diversification of the production of new species is expected FTE to stay stable or to increase. Also, these measures are expected to affect positively on the competitiveness of the sector. By the applying of environmental measures and subsidies for new farms for organic production is expected to reduce the impact of aquaculture on the environment.

The most of the expected results seem to be reachable and realistic because by subsidizing the construction of new enterprises the level of production should grow and the number of total employees should also increase.

4.4.7 Data Coverage and Data Quality

Data quality

Achieved sample rate for economic data for 2014 was 100%, in 2013 this percent was 28%. This significant change in the achieved sample rate became possible, because of the last changes in the Fisheries and Aquaculture Act, which made the filling of the questionnaire obligatory for every enterprise.

Data availability

Data for the aquaculture sector is published once a year. The aquaculture statistic is published on Agricultural Report and on the website of the Executive agency for fisheries and aquaculture approximately 12 months after the end of the reference year.

Confidentiality

In 2014 there was only one segment with one enterprise, and data for it will not be published. In other nine segments number of enterprises is more than five and data are available.

All segments are divided by the species and technique. If an enterprise produces more than one species, then it is allocated to the segment of the species that represents the biggest volume of sales.

Some enterprises own more than one farm using different techniques, but these activities are grouped together because the company is used as data collection unit. There are very few examples of enterprises using more than one production technique.

Differences in DCF data compared with other official data sources

The main reason for the discrepancy between the DCF data, FAO and Eurostat is that the DCF data includes only the sales that the owner of every company had declared by the annual questionnaire. The data that the agency provides to Eurostat regarding the produced fish includes the quantity of unsold fish and the quantity of fish which have not reached consumptive size yet. Another possible problem, which can lead to the differences in the values is that the agency can not verify the authenticity of the submitted values in the questionnaire for each indicator for each enterprise.

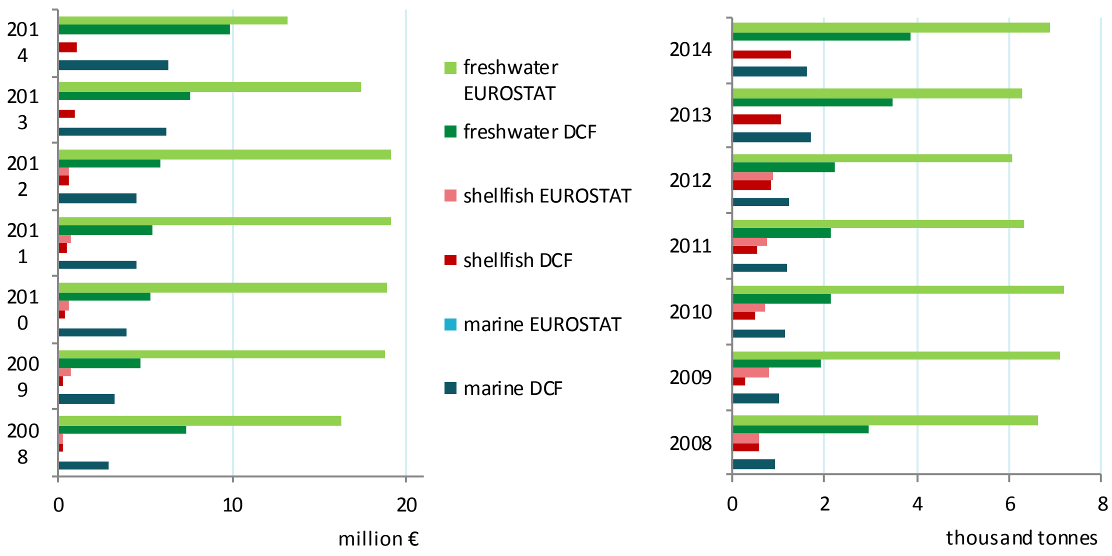


Figure 4.10 Comparison of DCF data with EUROSTAT data for Bulgaria: 2008-2014

4.4 Croatia

4.4.1 Summary

Production volume and value

Croatian aquaculture sector, altogether marine and freshwater, produced 11.2 tonnes in 2013 and 12.7 tonnes in 2014. The total value of production was €73.6 million in 2014, which corresponds to an increase of 1% over the same period in 2013. During period 2012-2014, Croatian aquaculture sector stayed stable. In earlier years there was no data collection under DCF in Croatia as country joined the EU in July 2013.

Overall industry structure and employment

During all referent years total population ranged around the same number of enterprises with very little fluctuation. Significant is that 77% of entire population are small producers with less than 5 employees. Approximately the same percentage is in all period.

Main segments

The production in Croatia can be divided into a few main segments, distributed among marine and freshwater segments.

Speaking in terms of freshwater segments, the largest one is the land based production of Carp with combination of hatcheries, nurseries and raceways ponds for on growing. Other freshwater segments are Trout producing in the land based farms, which is mostly small scale production. In freshwater aquaculture main production technique are ponds and raceways.

Marine production consists on finfish, Bluefin tuna and shellfish. As in previous years, only few farms produce a combination of all mentioned species. Economically the most important are tuna farms although this segment consists on just 4 enterprises in 2014. Shellfish farms are mainly small-scale family owned production and they are producing equally Oysters and Mussels. Finfish farms are in general small and they are producing Sea bass and Sea bream.

Current production trends and main drivers (Trends and triggers)

Croatian main export product is Bluefin tuna, exported to Japan. Other aquaculture products are mostly for the domestic market and some for other EU countries.

In the context of the constant economic crises, which Croatia felt the most in the period 2012-2014, the consumption of domestic fresh fish products has been decreased compared to previous years, while the marine market felt less changes.

Outlook

Croatian National Strategic plan for aquaculture 2014-2020 predicts a significant increase of aquaculture in the future mentioning improvements in wide area, from organic production, medicaments, environment protection, diseases and predators prevention, sustainable development to enforcement of social business-political environment, increase of national consumption, aquaculture products etc. Beside this, it is expected to improve aquaculture sector due still newly established access to the EU market.

4.4.2 Production and sales

Croatian marine aquaculture recorded a significant increase in 2014, where is noted a 22% increase in sales volumes compared to the previous year, also in the context of sales values.

The most important species, in this context, are European sea bass (*Dicentrarchus labrax*), Gilthead sea bream (*Sparus aurata*) and Atlantic Bluefin tuna (*Tunnus thynnus*) of fish species and Mediterranean mussel (*Mytilus galoprovincialis*) and European flat oyster (*Ostrea edulis*) of shellfish species.

Freshwater aquaculture showed good results in terms of production sales, but not so good in the long term. Shellfish production showed a recovery after a significant decrease in 2013. The most important species in freshwater farming are common carp (*Cyprinus carpio*) and rainbow trout (*Oncorhynchus mykiss*).

Table 4.4.1 Production and sales for Croatia: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Sales weight (thousand tonnes)					***12.7***	***11.2***	***12.7***	*13%*	*6%*
Marine					6.6	7.0	8.6	*22%*	*27%*
Shellfish					1.3	0.5	0.6	*22%*	*-28%*
Freshwater					4.8	3.7	3.5	*-7%*	*-18%*
Hatcheries & nurseries					0.0	0.0	0.0	*8%*	*116%*
Sales value (million €)					***77.7***	***72.3***	***73.6***	*2%*	*-2%*
Marine					68.4	63.5	66.6	*5%*	*1%*
Shellfish					1.6	0.6	0.6	*1%*	*-35%*
Freshwater					7.7	8.1	6.2	*-23%*	*-21%*
Hatcheries & nurseries					0.0	0.1	0.1	*-17%*	*66%*

Source: EU Member States DCF data submission

The period 2012-2014 has been stable in terms of sales weight and sales values. Therefore, 2014 has 13% more sales weight than in previous year. Also sales value has slightly increased during the same period, with €73.6 million.

4.4.3 Industry structure and employment

Majority of Croatian total number of enterprises are small family owned shellfish farms. As it is shown in the table below, the largest part of the enterprises belong to the segment with 5 or less employees. The number of enterprises with more than 10 employees is increasing: in 2012 there were 17 of them, in 2013 two more, and in 2014 even 21. At the same time, total number of employees is increasing. Although the number of male employees has notable increased, female employees slightly decreased.

Average wage and labour productivity stayed at the same level all the 3 reference years. In general, indicators on the industry structure and employment show increasing trends.

Table 4.4.2 Structure of the Croatian aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Structure (number)									
Total enterprises					*174*	*169*	*175*	*4%*	*2%*
<=5 employees					137	132	135	*2%*	*0%*
6-10 employees					20	18	19	*6%*	*0%*
>10 employees					17	19	21	*11%*	*17%*
Employment (number)									
Total employees					1,882	1,786	2,231	*25%*	*22%*
Male employees					1,497	1,415	1,937	*37%*	*33%*
Female employees					385	371	294	*-21%*	*-22%*
FTE					12	1,401	1,117	*-20%*	*58%*
Male FTE					7	1,142	950	*-17%*	*65%*
Female FTE					6	259	167	*-35%*	*26%*
Indicators									
FTE per enterprise					0.1	8.3	6.4	*-23%*	*53%*
Average wage (thousand €)					2,073.7	13.6	22.1	*63%*	*-98%*
Labour productivity (thousand €)					1,416.1	4.6	-34.5	*-848%*	*-105%*

Source: EU Member States DCF data submission

The total number of persons employed in the Croatian aquaculture sector was 2 231, corresponding to 1 117 FTEs. The number of employees have variations primarily because lot of workers in aquaculture have temporary job, some of them are working as seasonal employees, part of employees with full time job are working partly in aquaculture and partially in other activities in the same enterprise. In the long term, it is expected that there will be more female employees and that the ratio between male and female employees will be more balanced.

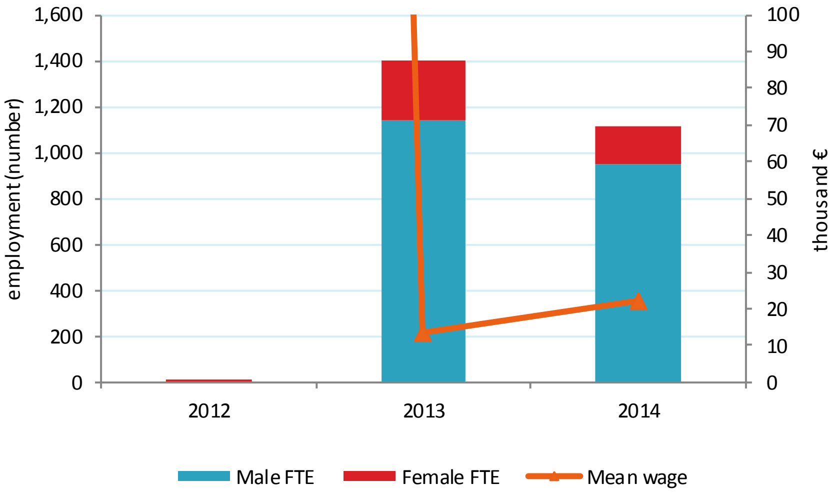


Figure 4.4.1 Employment trends for Croatia: 2008-2014.

Source: EU Member States DCF data submission

Total operating costs follow total income in 2012 and 2013. In that period labour productivity decreased but in year 2014 has become balanced. Although total income increased significantly in 2014, still operating costs crashes good results.

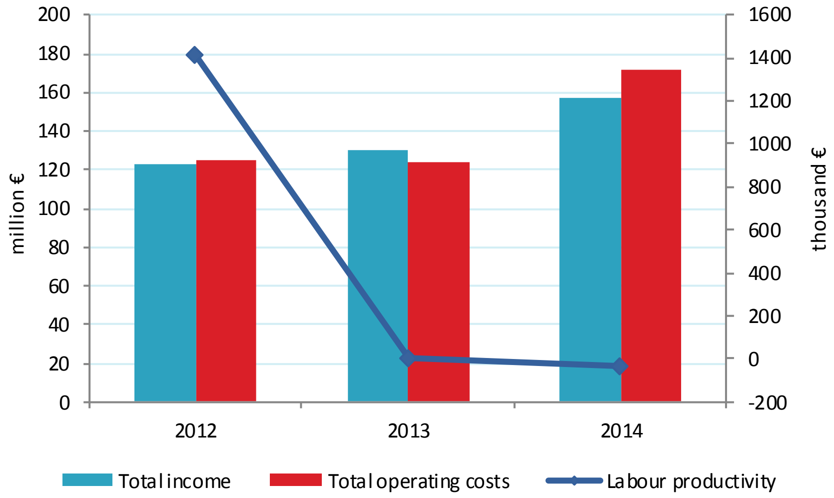


Figure 4.4.2 Income, costs, wages and labour productivity trends for Croatia: 2008-2014.

Source: EU Member States DCF data submission

4.4.4 Economic performance

It is evident that the economic performance, over the years, tends to slower growth. Partly due to the global crisis that is in full force arrived in Croatia 2012 year and in the coming years caused enormous damage. With the growth in investment, there has been a growth in debt too. Increasing revenue is leading to growth of expenses. Some companies have turned to larger production, the purchase and development of existing generating units, which could lead to better results in the coming years. Also, the capital value and net investment increased which partly leads to the growth of total debt.

Total revenue fell from €123.3 million in 2012 to €113.8 million in 2014. At the same time, certain costs have increased as a result of a weak performance in general which leads to bad indicators, from net profit to return on investment. Extraordinary costs, repairs and maintenance costs along with other operational costs in 2014 partly are the result of catastrophic floods which is made damage to some number of companies.

Table 4.4.3 Economic performance of the Croatian aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	% of total income	Change 2014-13	Development 2014/(2008-13)
Income (million €)										
Turnover					77.7	72.3	73.6	*65%*	*2%*	*-2%*
Other income					38.7	39.5	35.2	*31%*	*-11%*	*-10%*
Subsidies					6.9	4.6	5.1	*4%*	*10%*	*-12%*
Total income					*123.3*	*116.4*	*113.8*	*100%*	*-2%*	*-5%*
Expenditures (million €)										
Wages and salaries					25.7	18.9	24.7	*22%*	*30%*	*11%*
Imputed value of unpaid labour					0.0	0.1	0.0	*0%*	*-34%*	*31%*
Energy costs					6.6	5.6	5.7	*5%*	*3%*	*-6%*
Repair and maintenance					2.5	2.5	3.5	*3%*	*43%*	*42%*
Raw material: Feed costs					41.3	36.5	15.9	*14%*	*-56%*	*-59%*
Raw material: Livestock costs					6.7	9.5	77.7	*68%*	*721%*	*862%*
Other operational costs					41.7	51.3	44.4	*39%*	*-13%*	*-5%*
Total operating costs					*124.6*	*124.3*	*172.0*	*151%*	*38%*	*38%*
Capital Costs (million €)										
Depreciation of capital					8.4	7.9	11.4	*10%*	*44%*	*39%*
Financial costs, net					9.6	18.0	9.2	*8%*	*-49%*	*-33%*
Extraordinary costs, net					1.1	0.8	1.1	*1%*	*45%*	*17%*
Capital Value (million €)										
Total value of assets					309.4	312.3	417.1	*366%*	*34%*	*34%*
Net Investments					20.3	35.2	38.8	*34%*	*10%*	*40%*
Debt					119.8	119.5	157.3	*138%*	*32%*	*31%*
Input & Production (thousand tonnes)										
Raw material: Feed					62.8	12.1	86.2		*612%*	*130%*
Raw material: Livestock					2.3	1.6	1.8		*13%*	*-8%*
Performance Indicators(million €)										
Gross Value Added					17.5	6.5	-38.5	*34%*	*-697%*	*-421%*
Operating cash flow					-1.2	-7.9	-58.1	*51%*	*-636%*	*-1175%*
Earning before interest and tax					-9.7	-15.8	-69.5	*61%*	*-339%*	*-445%*
Net profit					-19.2	-33.8	-78.7	*69%*	*-133%*	*-197%*
Capital productivity (%)					5.7	2.1	-9.2		*-546%*	*-339%*
Return on Investment (%)					-3.1	-5.1	-16.7		*-229%*	*-307%*
Future Expectation Indicator (%)					3.8	8.7	6.6		*-25%*	*5%*

Source: EU Member States DCF data submission

Relatively high contribution of other income was caused by large companies that have other types of production beside aquaculture, like agriculture, fishing or fish processing.

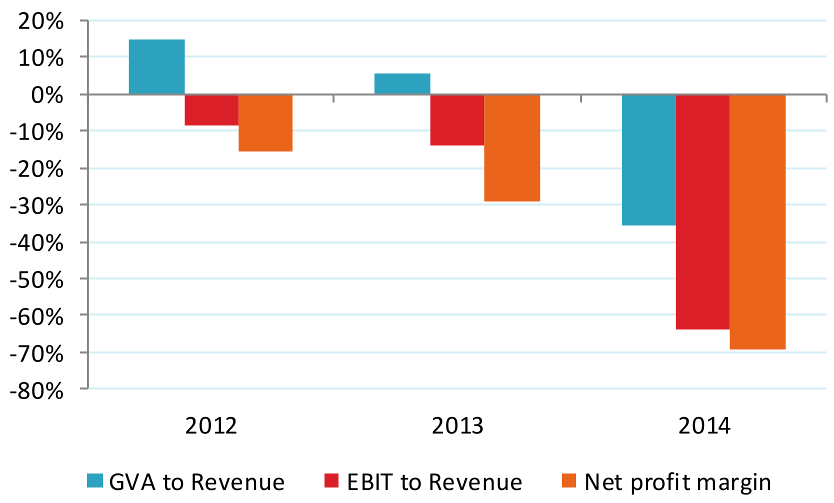


Figure 4.4.3 Economic performance for Croatia: 2008-2014

Source: EU Member States DCF data submission

The worst performance indicators have Gross Value Added and operating cash flow as a result of multiplied livestock costs and high other operational costs. The GVA for the sector as a whole decreased from 6% in 2013 to -35% in 2014. Also the EBIT to Revenue and Net profit margin dropped down because of the increasing total costs and decreasing total income.

4.4.5 Main species produced and economic performance by segment

The most important species in Croatian aquaculture is Bluefin tuna, covering the 41% of the total value. There were only 4 tuna farms in Croatia, and they are exporting all of their products to Japan. Since tuna farming is based on catching wild juveniles, and it is under the strict ICCAT surveillance, further increase of production is relying on the available quota.

The second most important species is seabass, which is most often farmed in combination with sea bream. Most farms are located on the middle part of coast, on the Zadar area. About half of seabass production has been exported on the EU market, and the rest is sold on the local market. Before Croatia joint the EU export was restricted by quotas. For that reason it is expected that export and production will increase in the next years. In 2012, total production of oysters and mussels was sold on the national market due to export restrictions for the non EU members. From 2013, the EU market has been open for Croatian producers since Croatia became member of EU. Almost all shellfish farm are producing both oysters and mussels, but dominated by mussels in value and weight. It is expected that shellfish production will increase in the next years.

The freshwater aquaculture production is mostly sold at the national market, and only a small fraction is exported to the EU market. Main species in freshwater aquaculture is carp with 17% of total weight. All carp farms are located in inland part of Croatia, and most of enterprises have its own production of eggs and larva with combined production. Second most common species is trout. Beside carp and trout most farms are growing some other freshwater species, like grass carp, bighead carp, silver carp, wels catfish, pike and zander, but in smaller quantities.

Figure 4.4.4 Main species in terms of weight and value in Croatian production: 2014.

Source: EU Member States DCF data submission

The importance of Atlantic blue fin tuna in terms of total value of aquaculture production could be seen from Figure 4.4.4. But it should be mention that Atlantic blue fin tuna sector depends on the world market and the price can vary significantly between years. In terms of value it is followed by the seabass and seabream. These three species represent more than 90% of total Croatian aquaculture production in value, arriving to the 97% when considering also common carp.

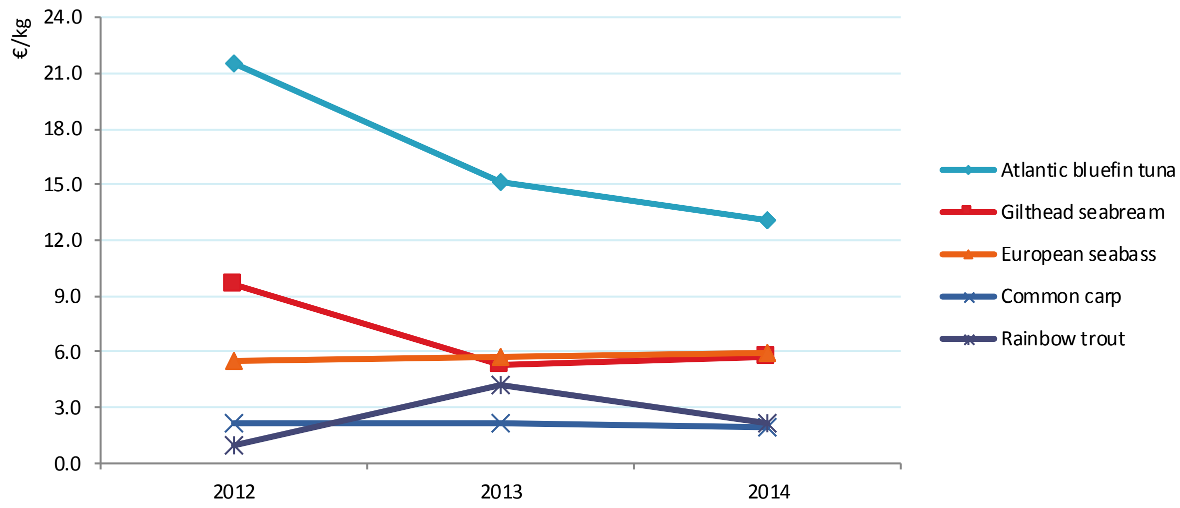


Figure 4.4.5 Average prices for the main species produced in Croatia: 2008-2014.

Source: EU Member States DCF data submission

Average prices for all species stayed at the same level between 2013 and 2014, a slight decrease of 7% had just Bluefin tuna from 2013 to 2014. From 2012 to 2013, Carp and Sea bass stayed stable, Oysters increased average price for 26% while Sea bream decreased in same period but stayed stable 2013/2014.

In Croatia, the aquaculture production has been divided into 11 segments in 2013, and 10 segments in 2014 based on the species produced and the technique used.

There is only a few dominate species in Croatian aquaculture; carp and trout in freshwater; Blue fin tuna, seabass and seabream in marine aquaculture; mussel and oysters in shellfish production. In terms of volume the most important are seabass (24%), seabream (26%) and tuna (40%). Seabass is in general grown in combination with seabream and they are represented in 3 segments. First is cage on "hatcherie&nurseries", second "on growing" and third "combined". Most of the enterprises belong to the "hatcherie&nurseries" and "cages" segments, and only a few is in the "combined" segment.

The most relevant segments in the Croatian aquaculture are analysed below.

Segment 1: Other marine fish cages: Bluefin tuna

The most important segment in terms of value is tuna farming; however, it is not the largest segment measured in terms of quantity. Beside value it is also important to point out that large part of small pelagic fishery that is directly related to tuna farming, since tuna can be fed only with the small pelagic fish. The fact that all tuna production is being exported, gives additional importance to this segment. Limiting factor is the fact that this kind of production is based on the catch of wild juvenile tuna, and it is under the strict ICCAT surveillance and restricted by quota. In Croatia there is large potential and interest for this production and it can be expected further growth of this sector in case ICCAT increase quota for Bluefin tuna fishing.

In 2014, there were 4 active tuna farms, and they had a production of 2 302 tones with a value of more than €30 million. The production value of this segment corresponds to 43% of the total Croatian aquaculture production.

Segment 2: Seabass and seabream cages

This is the segment with the largest production, which covers 46% of total sales volume in 2014. All of these farms are growing both sea bass and sea bream, with a small quantity of other marine finfish species. It is remarkable, that this segment has almost half of the value of the total value of assets - with 48%.

An increase in production was noted between 2013 and 2014 in terms of weight and value for this segment, and the same trend is expected in the following years. A significant increase in production of other marine fish species in this segment should also be noticed. This segment consists of 28 enterprises, which produces 5 822 tons of fish.

Segment 3: Seabass and seabream combined

This segment has suffered a decrease in terms of FTE, turnover, total value of assets, as well as other indicators, primarily because some enterprises that previously belonged to this segment changed their production. Most of them were placed in "cages" segment but now belongs to "combined". Anyhow, from Structural development Croatian aquaculture sector (Figure 4.4.6.) it obviously that still has importance in total Croatian aquaculture sector.

In general, enterprises in this seabass and seabream segment do not have production of eggs and larvae; therefore, they are buying juveniles partly from other Croatian hatcheries and partly importing from other EU countries.

Segment 4: Mussels long line

Although the mussel long line segment represents only 6% of the total weight, and less than 2% of the value, it is an important segment in terms of number of enterprises and employees. The segment contains 110 enterprises, but since almost all of these enterprises are small scale families businesses, it can be assumed that more people are involved and depend on this segment production.

Almost all enterprises are producing mussels and oysters, but even 66% of turnover comes from mussel production. The production is based on the collecting of shellfish in early stages from the nature, but some of the producers are buying additional juvenile shellfish's from other farms in order to increase production. The Increase of production of this segment is expected due to Croatian accession to the EU as shellfish export to the EU market has been restricted by regulations for non-member countries.

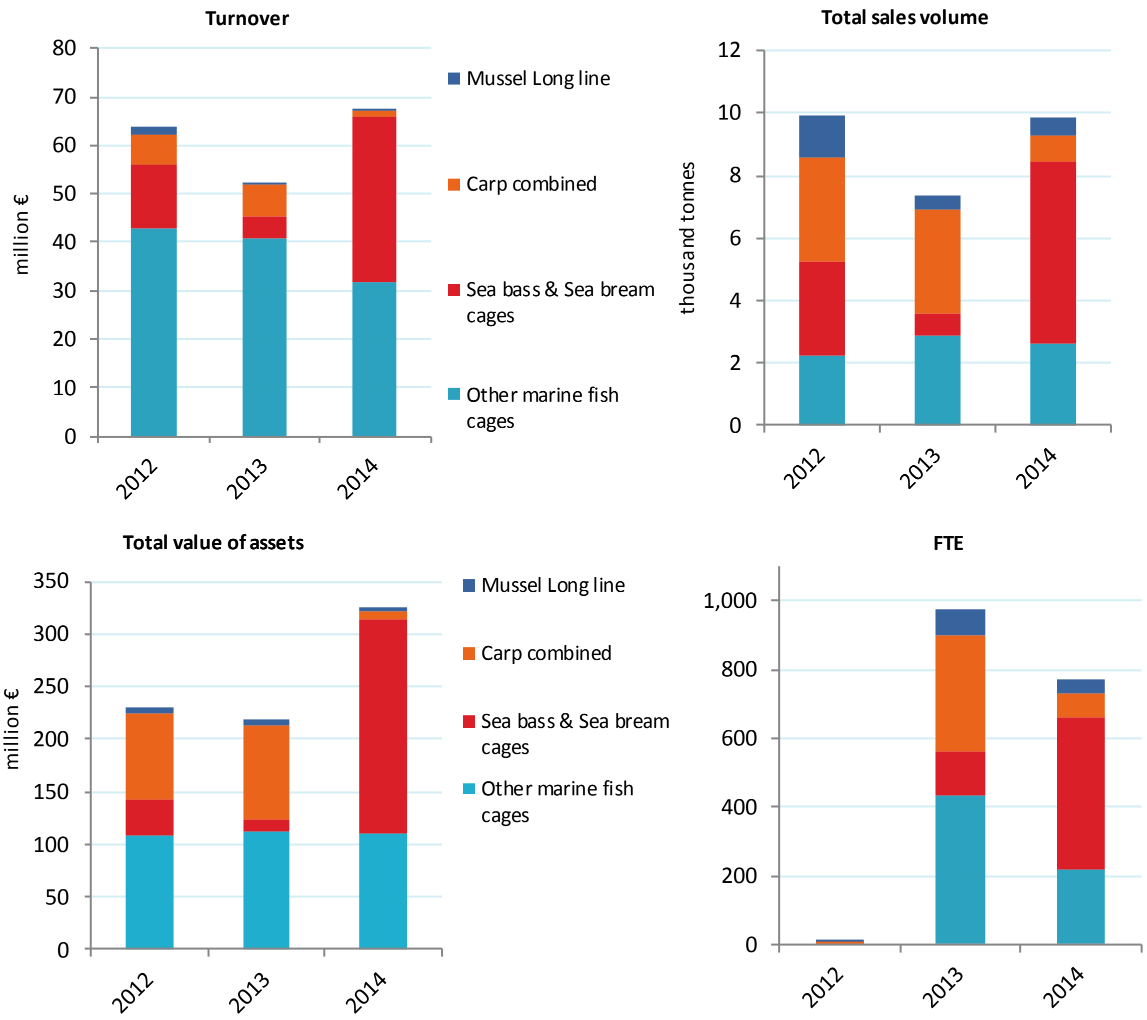


Figure 4.4.6 Structural development Croatian aquaculture sector: 2008-2014.

Source: EU Member States DCF data submission

From Figure 4.4.6, it is evident that Bluefin tuna, Sea bass, Sea bream and Carp contain almost all aquaculture sector in Croatia. Altogether contain 97% in 2013 and 92% in 2014. The rest is Trout and Mussels.

Table 4.4.4 Economic performance of main Croatian aquaculture segments: 2008-2014 (in million €).

Variable	2008	2009	2010	2011	2012	2013	2014	% of total income	Change 2014/13	Development 2014/(2008-13)
Mussel Long line										
Total income					2.7	4.2	4.3	100%	3%	26%
Gross Value Added					1.6	1.1	0.9	21%	-14%	-32%
Operating cash flow					1.0	0.6	0.3	7%	-51%	-63%
Earning before interest and tax					0.5	0.2	-0.1	3%	-170%	-137%
Net profit					0.5	0.2	-0.3	7%	-269%	-184%
Total sales volume (thousand tonnes)					1.3	0.5	0.6		22%	-37%
Carp combined										
Total income					18.2	19.8	4.2	100%	-79%	-78%
Gross Value Added					5.3	3.8	-0.4	-10%	-111%	-109%
Operating cash flow					1.7	0.1	-1.0	-24%	-1100%	-208%
Earning before interest and tax					-0.7	-2.4	-1.7	-40%	28%	-11%
Net profit					-3.7	-5.3	-1.7	-40%	68%	62%
Total sales volume (thousand tonnes)					3.3	3.4	0.9		-74%	-74%
Sea bass & Sea bream cages										
Total income					21.4	15.3	72.7	100%	374%	296%
Gross Value Added					5.4	3.6	-55.6	-76%	-1651%	-1336%
Operating cash flow					4.8	3.0	-63.2	-87%	-2214%	-1713%
Earning before interest and tax					4.0	2.4	-68.4	-94%	-2935%	-2217%
Net profit					3.2	2.4	-68.6	-94%	-3012%	-2563%
Total sales volume (thousand tonnes)					3.0	0.7	5.8		778%	217%
Other marine fish cages										
Total income					52.7	56.8	42.1	100%	-26%	-23%
Gross Value Added					22.3	24.7	8.7	21%	-65%	-63%
Operating cash flow					16.7	18.8	1.8	4%	-91%	-90%
Earning before interest and tax					14.2	16.8	-1.0	-2%	-106%	-106%
Net profit					8.7	3.6	-6.4	-15%	-277%	-204%
Total sales volume (thousand tonnes)					2.2	2.9	2.6		-10%	2%

Source: EU Member States DCF data submission

The economic performance analysis shows that total income has been increasing for the segment Mussel long line during last years (with a rise of 26%), but other indicators are showing certain imbalance, except for total sales volume (comparatively 2013 and 2014) (see Table 4.4.4).

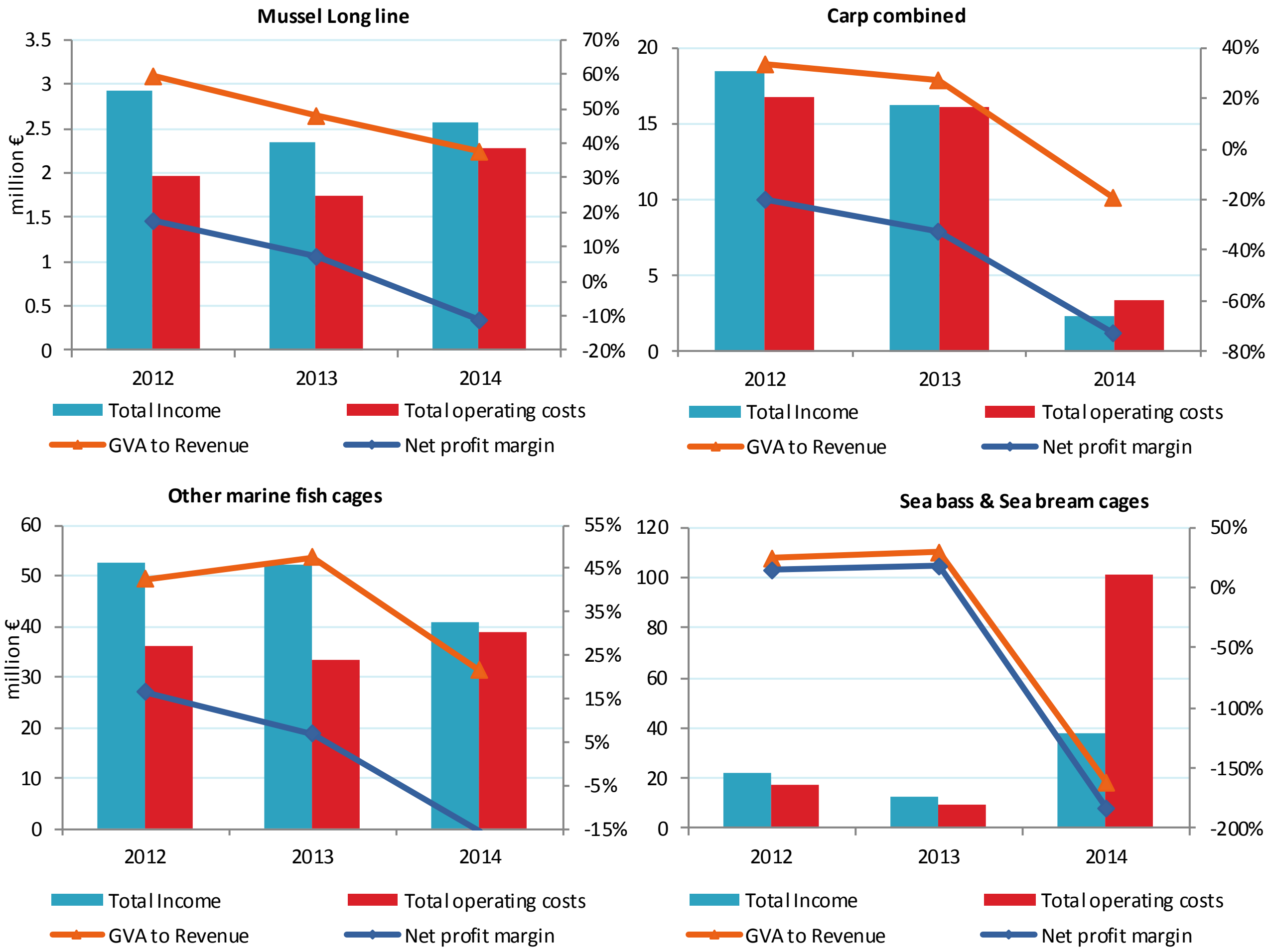


Figure 4.4.7 Economic performance indicators for the main Croatian segments: 2008-2014.

Source: EU Member States DCF data submission

In Figure 4.4.7, total operating costs are decreasing in the segment of "Carp combined", stayed balanced in segment "Other marine fish cages", and increasing in "Sea bass & Sea bream cages" segment were GVA to Revenue indicated bad economic performance indicators.

Segment 1: Mussel long line

All period from 2012 to 2014 stayed stable with higher total income than total operating costs. Large part in costs structure refers to depreciation of capital (16%) together with wages and salaries costs (28%).

Segment 2: Carp combined

Other operational costs with 47% in total costs structure could be explained by many other activities which enterprises in this segment have. Also high percentage of other operational costs, and smaller cost of feed, are result of company's activity in agriculture production for fish feed. Some of the largest companies have their own feed production, along with other agriculture activities. With decreasing of total income do not follow the same decrease of total operating costs.

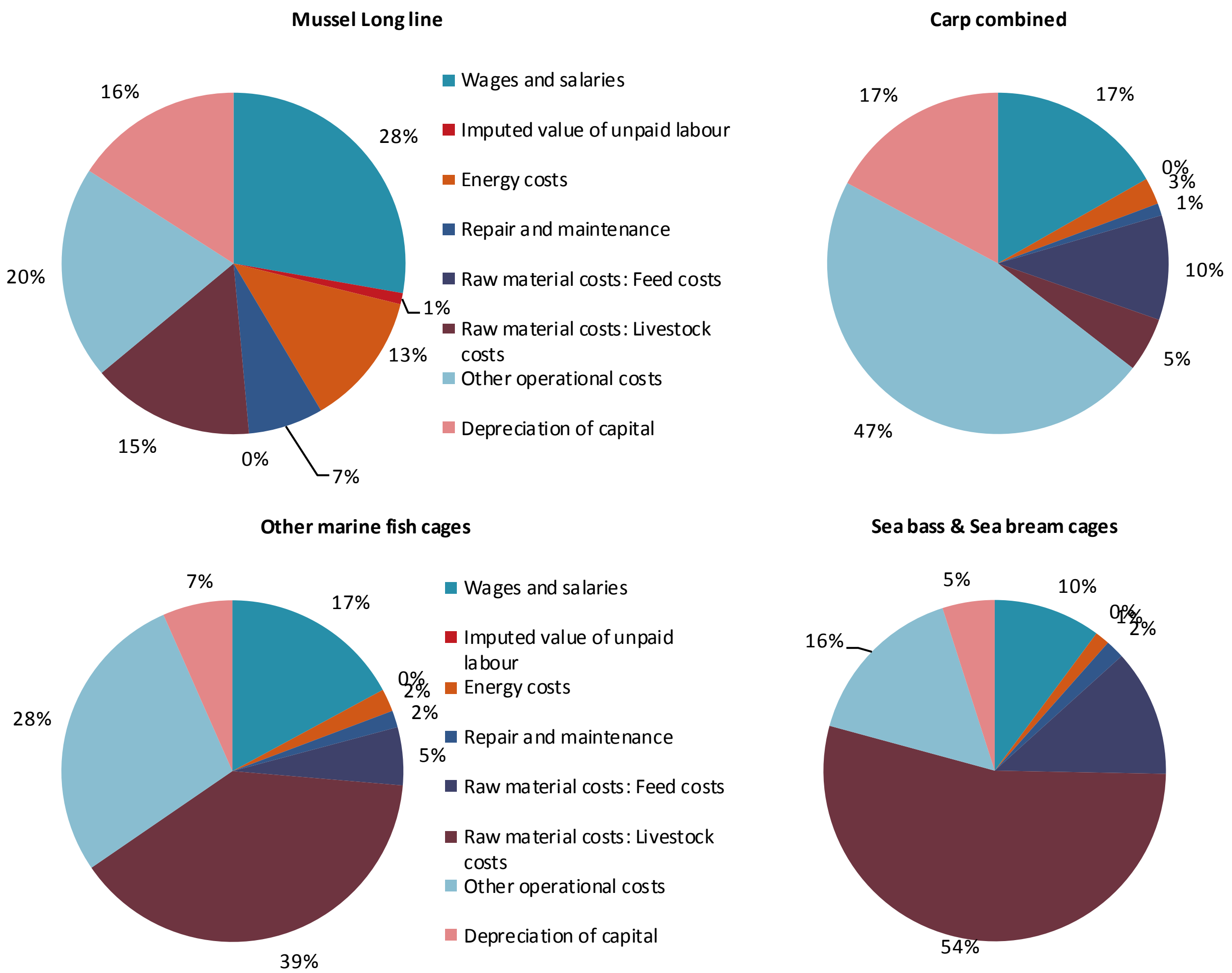


Figure 4.4.8 Cost structure of the main segments in Croatia: 2014.

Source: EU Member States DCF data submission

Segment 3: Other marine fish cages

The net profit margin indicates a relatively positive trend, but the GVA to Revenue shows the opposite trend. Livestock costs rose in 2014 and feed cost went down, unlike previous year.

Segment 4: Sea bass and Sea bream cages

The largest part of total costs are livestock costs (54%), much more than in previous years as a result of purchasing juveniles and medicaments after transmission of disease from farm to farm in 2014. There are no Feed costs as some of the largest companies have their own feed production. GVA and net profit margin goes down from 2013 to 2014 while new extraordinary, livestock and other operational costs increasing.

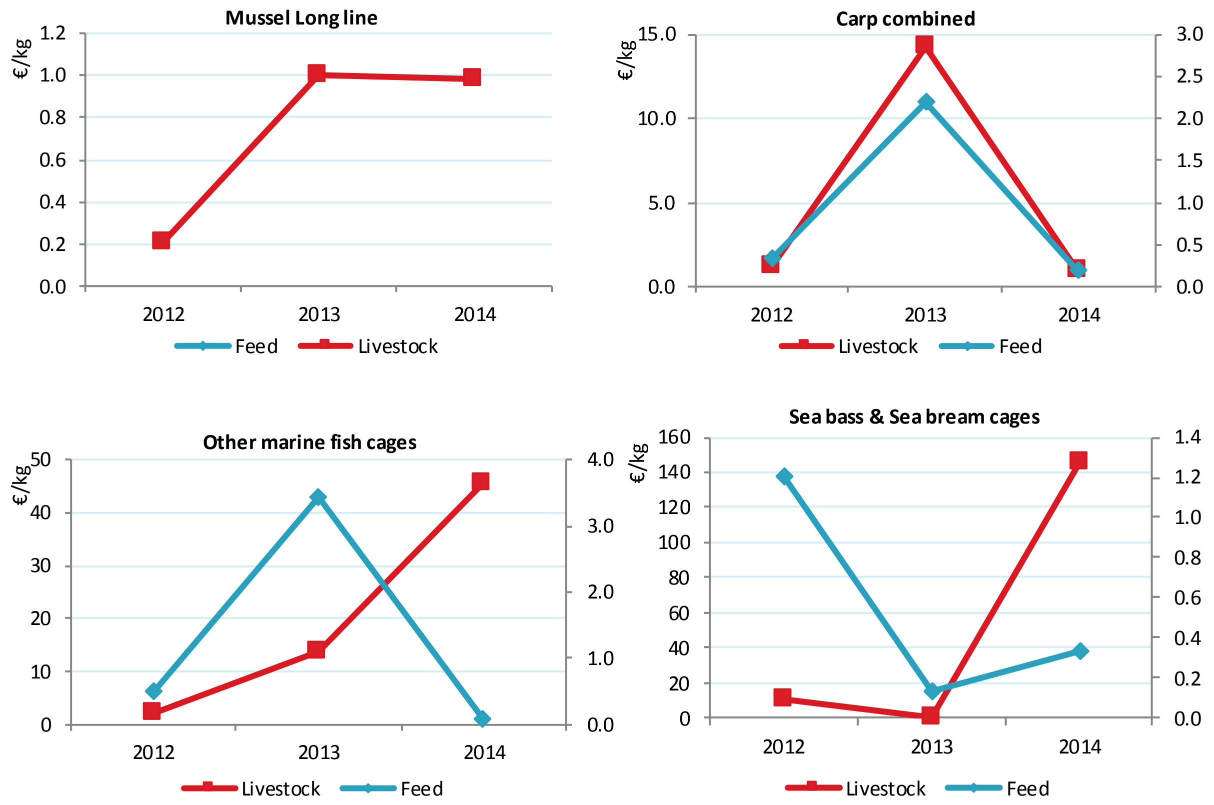


Figure 4.4.9 Feed and livestock prices for the main Croatian segments: 2008-2014.

Source: EU Member States DCF data submission

4.4.6 Trends and triggers

Current production trends and main drivers

Because of the initial problems with Croatian adjustment to conditions of the EU market, as well as the global economic crisis, there have been unexpected problems which affected to economic indicators, more than was planned. It is expected that in the upcoming years the market will be better formed and organized to global market.

The most important production in marine aquaculture is Bluefin tuna. Its production is determined by ICCAT quotas and prices on the world market, so this production follows world market trends. It is expected development and further growth in this area. Other marine aquaculture segments after lot of investments expect return of investment in upcoming period, especially Mussel long line segment.

Freshwater aquaculture until now was targeting most on domestic market, now most enterprises trying to break into to EU market.

Market structure

The Croatian market went through period of intensive changes and improvements over the last several years. First of all, there has been improvement in public perception of aquaculture products, which is reflected on domestic consumption. Producers are making progress in marketing and production technologies, as well as in processing and placing aquaculture products. This is especially the case with large companies, resulting in increased investments.

The majority of Croatian aquaculture sector consists out of small-scale companies, and the need for joining a producers association has been recognized. This is necessary for addressing the future challenge of approaching the EU market.

Small businesses have a major role in economic growth and creating new jobs because they represent a significant amount of business in Croatian economy and have a major role in employment, revenues and export. One of the main problems which small businesses are facing is a lack of financial funding for business. Bank loans are the most common way of funding small businesses in Croatia as well as in majority other countries. However, as it turned out during the recent global economic crisis (in Croatia from 2012 onwards), the exclusivity of this form of financing small and medium enterprises is not the best solution. Optimal solution is to provide entrepreneurs with easier access to different sources of financing, in order to maintain the flexibility of funding that is needed, especially in the stages of development and growth.

Issues of special interest

According to Croatian National Strategic Plan for Aquaculture Development 2014-2020, development of organic and ecological fish growing is placed in square - Opportunities. In a part of general priorities, among other things, ensuring sustainable development and growth through coordinated regional planning and the providing of the necessary locations for farmers, also locations for supporting infrastructure, the use of environmentally friendly technologies are underline as main tasks.

Considering the insufficiently explored markets, domestic and EU, there is a need to establish effective communication with consumers, and better organization of the sector in terms of setting up producer organizations, a prerequisite for the successful placement of products in the common market and the further development of freshwater aquaculture activities in Croatia. In order to achieve the required cooperation, and to define the needs of the sector, farmers should be organized in producer organizations and develop its own development policy.

Another thing – medicaments. The biggest problem are distributors who do not have the economic basis for the import of prescribed drugs, registration of new drugs is expensive so that they are not profitable. With the accession to the EU we applied EU legislation with all the regulations so there are improvements in this field. On the other hand, the existence of new species and diseases that have not been recorded represent threat. Furthermore, drugs and antibiotics which are used as a food supplement, which our farmers used to have, were imported many years from third countries for low prices. But those are no longer allowed because harmful effects.

Outlook for future production trends

Since Bluefin tuna is representing more than half of total Croatian production value, there is strong interest in further development of this sector. Croatian coast line is suitable for further development of marine aquaculture in generally, but it is necessary to establish good practice in coastal zone management in order to ensure sustainable development of aquaculture production. This also applies for seabass and sebream production, and shellfish farms. At the same time it is necessary to improve market organisation and legal framework to assure further development and control.

It is noticed that some marine aquaculture segments have increased their investment in new technologies, and start with introducing new species beside seabass and sea bream. It can be expected that this trend will have further development.

In freshwater aquaculture development is restricted by available area, but with successful improvements in production technologies it can be expected to increase in production.

In aquaculture, especially in marine aquaculture, over recent years there has been a steady increase in the production of new species due to increased consumption in the domestic market, as well as the stabilization of prices in the EU market, but on the other hand, there is a low purchase price.

According to SWOT analysis of freshwater aquaculture, threats are transmission of disease and the damage from predators. General priorities are establishing and implementing protocols to prevent and control diseases and welfare of aquatic animals in farms, protection and compensation for damages caused by predators.

4.4.7 Data Coverage and Data Quality

Data quality

The account statistics for 2014 is based on the sample of 87 enterprises, which covers 50% of the total population of 195 enterprises. Data for all segments have been collected by census, except shellfish farms, where collection has been based on the probability sampling survey.

Data collection was performed through questioners created for this purpose. To ensure data consistency for all segments, together with definition of each variable in guidelines, link was made to accounting code in balance sheets. Some of variables were collected from Croatian Directorate of Fishery (DoF) database and subsidies register, since it is mandatory for all aquaculture producers in Croatia to report the production in volume and value each year at the farm level. But some of the variables were taken from questioners although it was planned to use DoF data. It was detected that DoF register is not complete and that some information is not suitable for this purpose. Some other variables, e.g. subsidies, were collected through DoF register and questioner. One of the main problems was low response and cooperation. Since 2014 was second year of data sampling, it is foreseen that this situation will improve in the future. This is especially important for some segments with small-scale companies where it will be necessary to put additional effort in future data collection.

Data availability

Data for the aquaculture sector is going to be published on the segment level approximately 12 months after the end of the reference year.

Confidentiality

All segments are distinguished both concerning the species and technique. If an enterprise produces more than one species, then it is allocated to the segment of the species that contributes the most to the turnover.

Some enterprises own more than one farm using different techniques, but these activities are grouped together, because the enterprise is used as data collection unit. There are very few examples of enterprises using more than one production technique.

Differences in DCF data compared with other official data sources

The Croatian data for DCF is, in most cases, in line with both value and production registered in FAO and EUROSTAT. Only in the shellfish production there is significant difference between the data sources. However, explanation for that is probably difference in methodology. While shellfish data delivered for EUROSTAT are result of Croatian Chamber of Economy and Chamber of Trades and Crafts estimates, on the other hand DCF data for shellfish farms are estimation based on the sample. Since shellfish farms in Croatia are mostly small family-run farms, they have poor data sources and large part of result was based on the estimation. This was recognised as one of the main issues in the Croatian annual report and something that has to be improved in the following years. On the other hand EUROSTAT data are as well product of estimation, but methodology is unknown.

Regarding marine and freshwater fish production, data between EUROSTAT and DCF are mostly in line. Differences that appear are again the result of different methodology. While data delivered for EUROSTAT refers only on market size commercial fish for human consumption, in the DCF data eggs, larva and juveniles are also enrolled with result of production per species. Furthermore, data for some of the segments from the freshwater aquaculture could not be presented due to confidently. In some marine fish segments results are also product of estimation based on the field collected data. Since this was first year of collecting and comparing data, it should be paid more attention to occurred differences in order to determent real reasons for this in the next programming period.

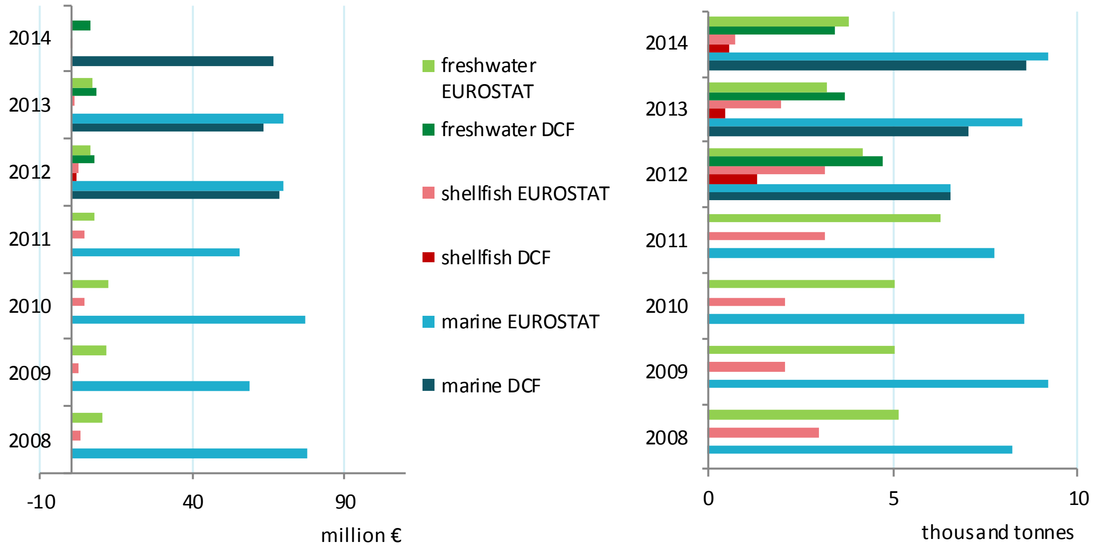


Figure 4.4.10 Comparison of DCF data with EUROSTAT data for Croatia: 2008-2014

4.5 Cyprus

4.5.1 Summary

Production volume and value

The aquaculture industry in Cyprus is mainly based on marine fish production. While total sales volume decreased to 4.9 thousand tonnes in 2014 (9% decrease since 2013) an incremental trend may be identified resulting, on average, in 14% development for the period 2008 to 2014. This rise in production volume is attributed mainly to marine fish segment which also developed on average by 14% at the same period.

Overall industry structure and employment

The number of enterprises in the Cypriot aquaculture industry remained stable in 2014. Since 2011, Cyprus has 5 enterprises for Sea Bass & Sea Bream on Growing, 3 enterprises for Sea Bass & Sea Bream combined, 1 enterprise for Other Shellfish and 7 enterprises for Trout on Growing. Employment in the aquaculture sector increased from 338 (FTE 313) in 2013 to 388 (FTE 341) in 2014. In relation to the above, it has to be noted that in 2013 employment for the freshwater aquaculture sector is not included, as the submission of data for freshwater aquaculture was not mandatory. Based on the national database, employment (both freshwater and marine aquaculture) still exhibits a small overall increase for 2014 compared to 2013.

Main segments

Sea bream is the main specie cultured in Cyprus and accounts for 61% of the total volume and 59% of total value of production in 2014. Sea bass on the other hand accounts for 37% of the total volume and 38% of the value produced in 2014. Other species produced are of less importance and account for 2% and 3% of the volume and value produced during 2014 respectively.

Current production trends and main drivers (Trends and triggers)

In the last decade Cyprus aquaculture and specifically marine aquaculture has been exhibiting an overall increase in production at an average annual rate of 5%. This is mainly attributed to the European funds support for productive investments in aquaculture as well as to the opening of new markets in conjunction with the global increase in demand for fisheries products.

In contrast, freshwater aquaculture production decreased in the last decade. Freshwater aquaculture production has been stable at low numbers the last 4 years. The main reason for the decreasing trend is the limited sources of fresh water availability on the island and the serious drought that Cyprus has been experiencing especially the last 3 years. The scarcity of fresh water lead to high mortalities as well as high energy costs for the companies a fact that results in high cost of production thus reducing the competitiveness of the products. All the production is been marketed locally or in conjunction with on-site restaurants. It has to be mentioned that freshwater aquaculture represents in approximately only 1% both in volume and value of the total national aquaculture production.

Outlook

For the next years marine aquaculture in Cyprus is expected to continue increasing its production due to the increase of the global demand and the new markets. There are however risks that may affect this increasing trend which are associated with the price of the main products (sea bass and sea bream), that in great extend are determined by big producing countries like Greece and Turkey. Additionally an important role for maintaining this increasing trend has the continuance of the support from the European funds for productive investments in aquaculture as well the implementation of the national multiannual aquaculture strategic plan.

As regards the freshwater aquaculture production, it expected that it will remain relative stable as it has been for the last 3 years. Due to the high cost of production the products will be marketed nationally as it cannot compete with equivalent products that are produced in other countries that have more adequate fresh water sources.

4.5.2 Production and sales

The aquaculture industry in Cyprus is mainly based on marine fish production. While total sales volume decreased to 4.9 thousand tonnes in 2014 (9% decrease since 2013) an incremental trend may be identified resulting, on average, in 14% development for the period 2008 to 2014. This rise in production volume is attributed mainly to marine fish segment which also developed on average by 14% at the same period.

Sales value decreased by 1% in 2014 when compared to 2013 suggesting that the reduced sales volume did not significantly affect the total sales value. It is obvious that marine fish production is the dominant sector amounting €31.5 million out of €32.3 million of total sales value in 2014. Nevertheless, production value for the marine fish segment is still lower than the value of the same segment for the year 2008. Shellfish and freshwater production have a rather limited contribution in total sales value.

Table 4.5.1 Production and sales for Cyprus: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Sales weight (thousand tonnes)	***3.8***	***3.4***	***4.1***	***4.7***	***4.4***	***5.4***	***4.9***	*-9%*	*14%*
Marine	3.7	3.3	4.1	4.6	4.3	5.3	4.8	*-9%*	*14%*
Shellfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*23%*	*101%*
Freshwater	0.1	0.1	0.1	0.1	0.1	0.1	0.0	*-22%*	*-34%*
Hatcheries & nurseries	0.0	0.0	0.0	0.0	0.0	0.0	0.0		*0%*
Sales value (million €)	***34.8***	***18.0***	***21.8***	***30.8***	***25.7***	***32.5***	***32.3***	*-1%*	*18%*
Marine	34.2	17.4	21.2	30.1	25.1	31.7	31.5	*-1%*	*18%*
Shellfish	0.2	0.1	0.0	0.1	0.1	0.3	0.4	*20%*	*123%*
Freshwater	0.4	0.6	0.6	0.6	0.5	0.5	0.4	*-19%*	*-24%*
Hatcheries & nurseries	0.0	0.0	0.0	0.0	0.0	0.0	0.0		*0%*

Source: EU Member States DCF data submission

4.5.3 Industry structure and employment

The number of enterprises in the Cypriot aquaculture industry remained stable in 2014 compared with 2013. Employment in the aquaculture sector increased from 338 (FTE 313) in 2013 to 388 (FTE 341) in 2014.

Table 4.5.2 Structure of the Cyprian aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Structure (number)									
Total enterprises	*12*	*10*	*10*	*10*	*10*	*10*	*16*	*60%*	*55%*
<=5 employees	1	0	0	0	1	0	2		*500%*
6-10 employees	3	1	3	1	0	1	6	*500%*	*300%*
>10 employees	8	9	7	9	9	9	8	*-11%*	*-6%*
Employment (number)									
Total employees	319	251	228	260	259	338	388	*15%*	*41%*
Male employees	242	176	162	183	190	220	266	*21%*	*36%*
Female employees	77	75	66	77	69	118	122	*3%*	*52%*
FTE	247	223	223	240	248	314	341	*9%*	*37%*
Male FTE	172	150	165	166	180	199	213	*7%*	*24%*
Female FTE	75	74	59	74	68	114	129	*12%*	*66%*
Indicators									
FTE per enterprise	20.6	22.3	22.3	24.0	24.8	31.4	21.3	*-32%*	*-12%*
Average wage (thousand €)	10.7	12.1	11.0	12.8	12.8	10.5	10.4	*-1%*	*-11%*
Labour productivity (thousand €)	75.2	27.6	39.1	61.9	33.9	50.8	34.4	*-32%*	*-28%*

Source: EU Member States DCF data submission

The total number of employees rose from 338 people in 2013 to 388 people in 2014, an increase of 15% between the two years, achieving the highest level of employment since 2008. In FTE terms, the increase between the years 2013 and 2014 is estimated at 7%. On the other hand, in 2014 the FTE per enterprises declined by 33%.

Employment in Cyprian aquaculture industry was dominated by males who accounted for 69% of total employees in 2014. The number of male employees increased by 21% in 2014, while the number of female employees increased by 3% during the same year. Although, female FTE increased by 12% between 2013 and 2014, male FTE increased only by 5%. On average, female FTE rose by 66% for the period 2008 to 2014, whereas average male FTE increased by 23% during the same period.

The average wage in the industry remained stable since 2013 at €10.5 thousand. Between 2008 and 2014, average wage declined by 17% on average, probably affected by the financial problems faced by the Cyprian economy.

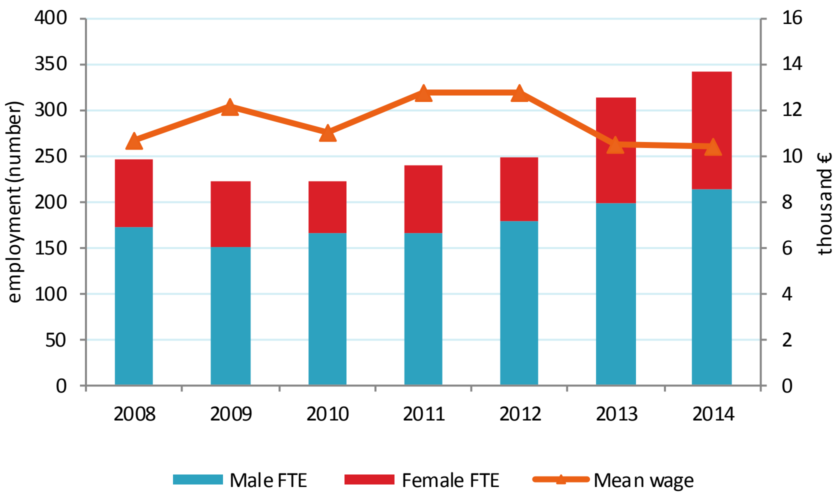


Figure 4.5.1 Employment trends for Cyprus: 2008-2014.

Source: EU Member States DCF data submission

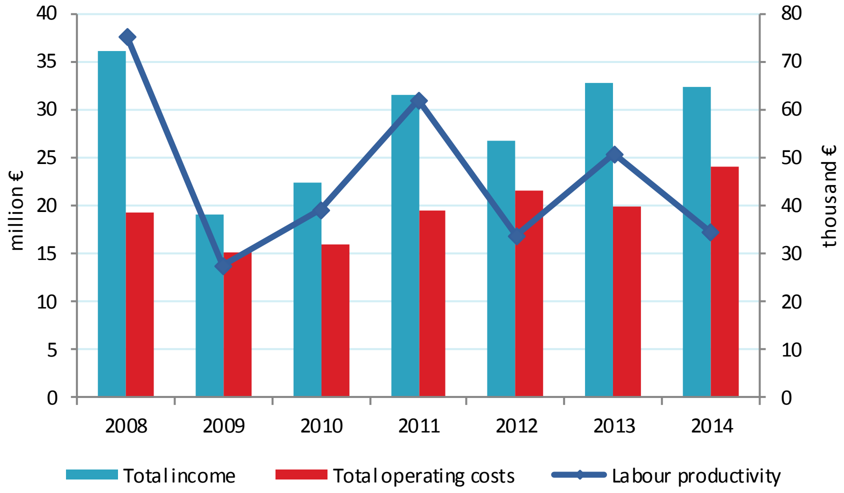


Figure 4.5.2 Income, costs, wages and labour productivity trends for Cyprus: 2008-2014.

Source: EU Member States DCF data submission

In 2014, total income declined by 2% at €32.3 million, whereas total operating cost rose from €21.5 in 2013 to €26.3 mainly due to increased feed costs. Consequently, labour productivity decreased to the 2012 level.

4.5.4 Economic performance

In 2014, the total income of aquaculture in Cyprus amounted to €32.3 million, fully originating from turnover. Operating costs accounted for 81% of the total income. Almost 50% of the total income was the feed cost. Wages and salaries and livestock costs accounted for 11% and 10% of the total income, respectively.

The Cyprian aquaculture sector, as suggested by the net profit indicator, was profitable for the period 2008 to 2014 presenting yearly variations mainly subject to the yearly production/sales.

All performance indicators worsened from 2013 to 2014, as well as, the average development of the indicators since 2008. Nevertheless, based on the increased net investment in the sector, the increased FTE employment and the increased inputs in the production, higher production levels are expected in 2015. Since the price of the main species produced increased during 2015 in the EU, most of the performance indicators are also expected to improve in 2015.

Table 4.5.3 Economic performance of the Cyprian aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	*% of total income*	Change 2014-13	Development 2014/(2008-13)
Income (million €)										
Turnover	34.8	18.0	21.8	30.8	25.7	32.5	32.3	*100%*	*-1%*	*18%*
Other income	0.4	0.4	0.4	0.4	1.1	0.1	0.0	*0%*	*-92%*	*-99%*
Subsidies	0.8	0.6	0.2	0.3	0.0	0.2	0.0	*0%*	*-100%*	*-100%*
Total income	*36.1*	*19.1*	*22.3*	*31.5*	*26.8*	*32.8*	*32.3*	*100%*	*-2%*	*15%*
Expenditures (million €)										
Wages and salaries	2.6	2.7	2.5	3.1	3.2	3.3	3.5	*11%*	*7%*	*21%*
Imputed value of unpaid labour	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0%*		
Energy costs	1.1	0.4	0.4	0.4	0.4	0.7	0.9	*3%*	*35%*	*63%*
Repair and maintenance	0.3	0.4	0.3	0.4	0.3	0.4	0.8	*2%*	*103%*	*130%*
Raw material: Feed costs	9.6	8.5	8.8	11.6	13.3	12.6	13.6	*42%*	*8%*	*26%*
Raw material: Livestock costs	1.9	1.6	1.7	1.8	2.1	1.8	3.2	*10%*	*77%*	*72%*
Other operational costs	3.7	1.4	2.2	2.0	2.1	1.2	2.1	*6%*	*76%*	*-2%*
Total operating costs	*19.3*	*15.0*	*15.9*	*19.4*	*21.5*	*19.9*	*24.1*	*75%*	*21%*	*30%*
Capital Costs (million €)										
Depreciation of capital	0.7	0.7	1.0	1.1	0.9	0.9	1.0	*3%*	*10%*	*12%*
Financial costs, net	0.2	0.2	0.2	0.2	0.2	0.4	0.3	*1%*	*-27%*	*16%*
Extraordinary costs, net	1.4	1.4	0.0	0.0	0.1	0.7	0.0	*0%*	*-100%*	*-100%*
Capital Value (million €)										
Total value of assets	23.8	31.9	36.6	34.6	39.3	27.9	33.9	*105%*	*21%*	*5%*
Net Investments	3.0	1.9	1.4	2.1	1.6	0.5	1.3	*4%*	*164%*	*-25%*
Debt	8.8	2.5	4.0	5.2	8.6	7.2	9.7	*30%*	*36%*	*61%*
Input & Production (thousand tonnes)										
Raw material: Feed	9.9	8.5	9.6	10.5	11.9	10.1	11.5		*14%*	*14%*
Raw material: Livestock	0.7	0.1	0.1	0.1	0.1	0.1	0.1		*64%*	*-39%*
Performance Indicators(million €)										
Gross Value Added	18.5	6.2	8.7	14.8	8.4	15.9	11.7	*36%*	*-26%*	*-3%*
Operating cash flow	16.7	4.1	6.5	12.1	5.2	12.9	8.2	*25%*	*-36%*	*-15%*
Earning before interest and tax	16.0	3.4	5.5	11.0	4.3	12.0	7.2	*22%*	*-40%*	*-17%*
Net profit	15.8	3.2	5.2	10.8	4.1	11.6	6.9	*21%*	*-40%*	*-18%*
Capital productivity (%)	77.9	19.3	23.8	42.9	21.4	57.0	34.6		*-39%*	*-14%*
Return on Investment (%)	67.4	10.7	14.9	31.7	11.0	42.8	21.2		*-51%*	*-29%*
Future Expectation Indicator (%)	9.8	3.8	1.2	2.7	1.7	-1.4	1.0		*168%*	*-67%*

Source: EU Member States DCF data submission

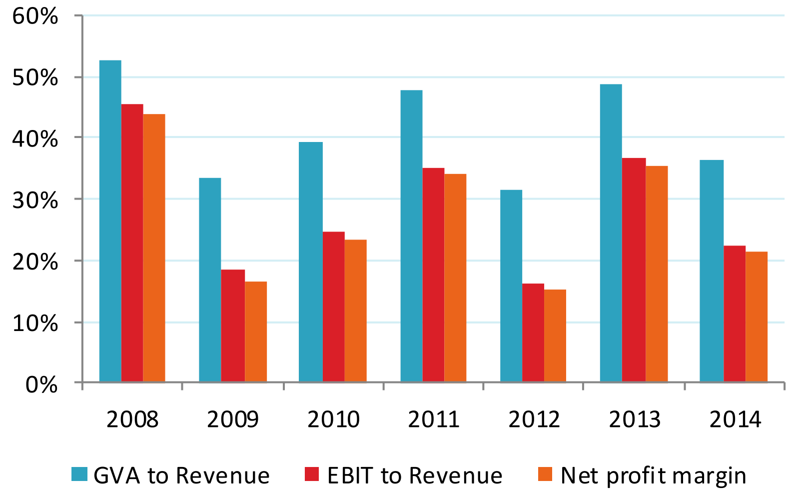


Figure 4.5.3 Economic performance for Cyprus: 2008-2014

Source: EU Member States DCF data submission

4.5.5 Main species produced and economic performance by segment

Based on the 2014 report, the main cultured marine species in Cyprus are seabream (*Sparus aurata*), seabass (*Dicentrarchus labrax*), meagre (*Argyrosomus regius*) and other fish in much smaller quantities (such as *Siganus rivulatus* and *Pagellus erythrinus*). In fresh water the species cultured are rainbow trout (*Oncorhynchus mykiss*) and sturgeon (*Asipenser baeri*).

Sea bream is the main specie cultured in Cyprus and accounts for 61% of the total volume and 59% of total value of production in 2014. Sea bass on the other hand accounts for 37% of the total volume and 38% of the value produced in 2014. Other species produced are of less importance and account for 2% and 3% of the volume and value produced during 2014 respectively.

Figure 4.5.4 Main species in terms of weight and value in Cyprian production: 2014.

Source: EU Member States DCF data submission

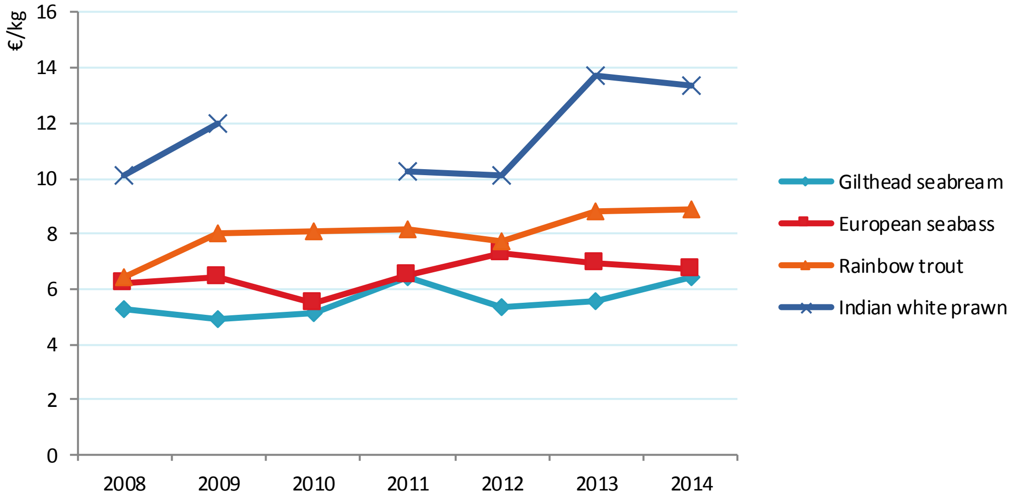


Figure 4.5.5 Average prices for the main species produced in Cyprus: 2008-2014.

Source: EU Member States DCF data submission

The average price of sea bream increased since 2012 to reach €6.4 per kilo in 2014. A slight upward trend is identified for the average price of sea bream since 2008. Contrary to sea bream, the average price of sea bass decreased since 2012 to reach €6.7 per kilo in 2014. The average price of meagre exhibits a downward trend since 2010 and reached €6.4 per kilo in 2014, at the same magnitude of the sea bream and sea bass average price. The average price of rainbow trout increased since 2012 to reach €8.9 per kilo in 2014.

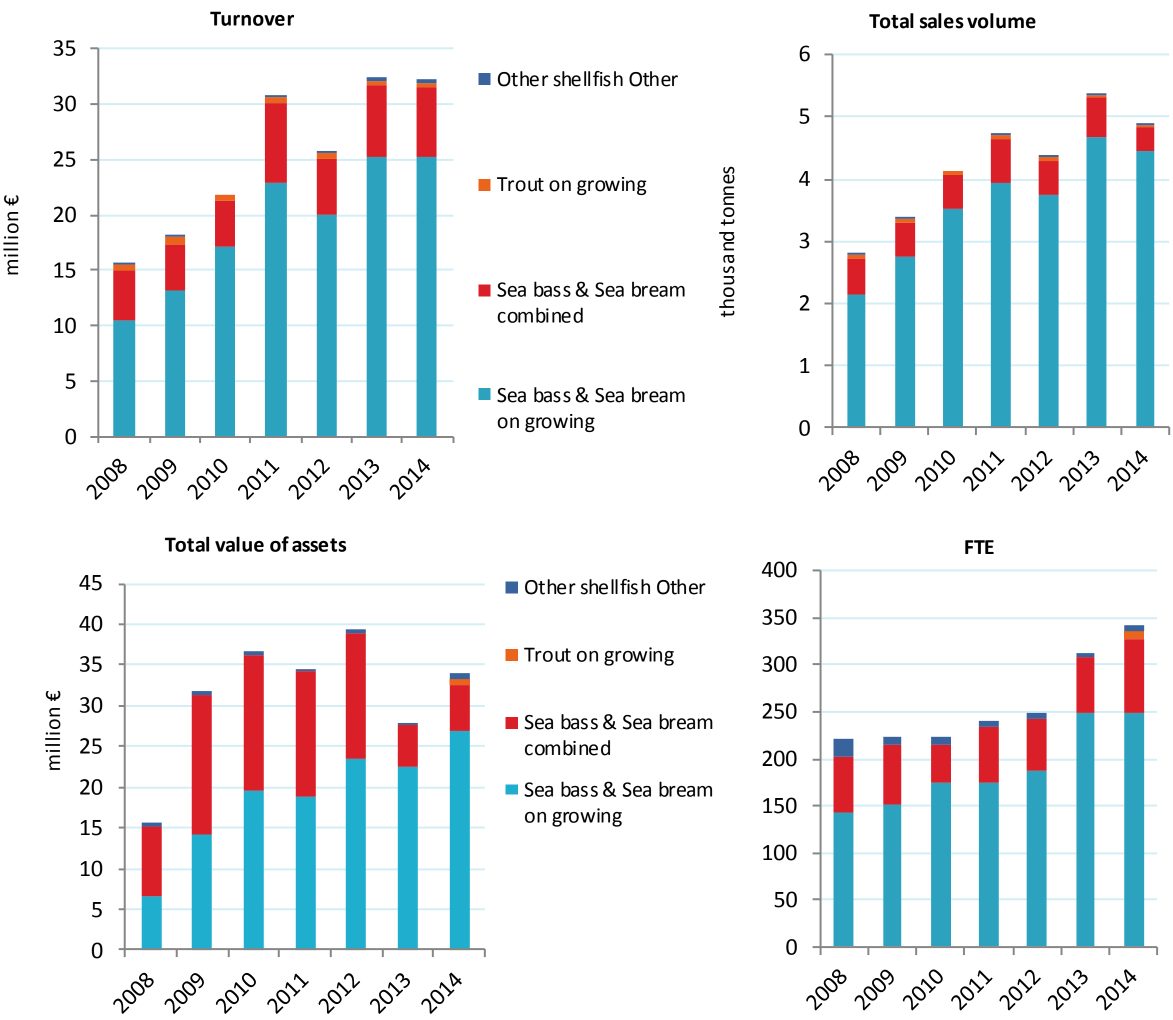


Figure 4.5.6 Structural development Cyprian aquaculture sector: 2008-2014.

Source: EU Member States DCF data submission

The dominance of the sea bream and sea bass in the Cyprian aquaculture sector is evident in all the indicators presented in the figures above. Essentially, all the variation of the indicators throughout the years is mainly attributed to the sea bream and sea bass segment.

Table 4.5.4 Economic performance of main Cyprian aquaculture segments: 2008-2014 (in million €).

Variable	2008	2009	2010	2011	2012	2013	2014	% of total income	Change 2014/13	Development 2014/(2008-13)
Other shellfish Other										
Total income	0.2	0.1	0.0	0.1	0.1	0.3	0.4	100%	20%	180%
Gross Value Added	0.2	0.1		0.1	0.1	0.2	0.2	58%	28%	81%
Operating cash flow	0.2	0.1		0.1	0.0	0.1	0.2	47%	49%	87%
Earning before interest and tax	0.1	0.1		0.1	0.0	0.1	0.2	47%	49%	106%
Net profit	0.1	0.1		0.1	0.0	0.1	0.2	47%	49%	106%
Total sales volume (thousand tonnes)	0.0	0.0	0.0	0.0	0.0	0.0	0.0		23%	141%
Sea bass & Sea bream combined										
Total income	4.7	4.6	4.3	7.4	6.0	6.7	6.3	100%	-5%	13%
Gross Value Added	0.8	0.8	-0.5	2.7	1.3	3.0	2.1	33%	-31%	54%
Operating cash flow	-0.4	-0.4	-1.5	1.3	0.1	2.0	0.8	12%	-60%	330%
Earning before interest and tax	-0.7	-0.6	-1.8	1.0	-0.2	1.8	0.6	9%	-69%	751%
Net profit	-0.7	-0.7	-1.8	1.0	-0.2	1.7	0.5	9%	-68%	542%
Total sales volume (thousand tonnes)	0.5	0.5	0.5	0.7	0.5	0.6	0.4		-40%	-36%
Sea bass & Sea bream on growing										
Total income	11.5	13.8	17.5	23.5	20.2	25.3	25.2	100%	0%	35%
Gross Value Added	4.1	4.7	8.7	11.6	6.6	12.3	9.1	36%	-25%	15%
Operating cash flow	3.9	3.8	7.4	10.2	4.6	10.3	7.0	28%	-32%	5%
Earning before interest and tax	3.7	3.4	6.7	9.3	3.9	9.6	6.3	25%	-34%	3%
Net profit	3.6	3.2	6.5	9.2	3.7	9.3	6.1	24%	-35%	2%
Total sales volume (thousand tonnes)	2.2	2.7	3.5	3.9	3.7	4.7	4.5		-5%	29%

Source: EU Member States DCF data submission

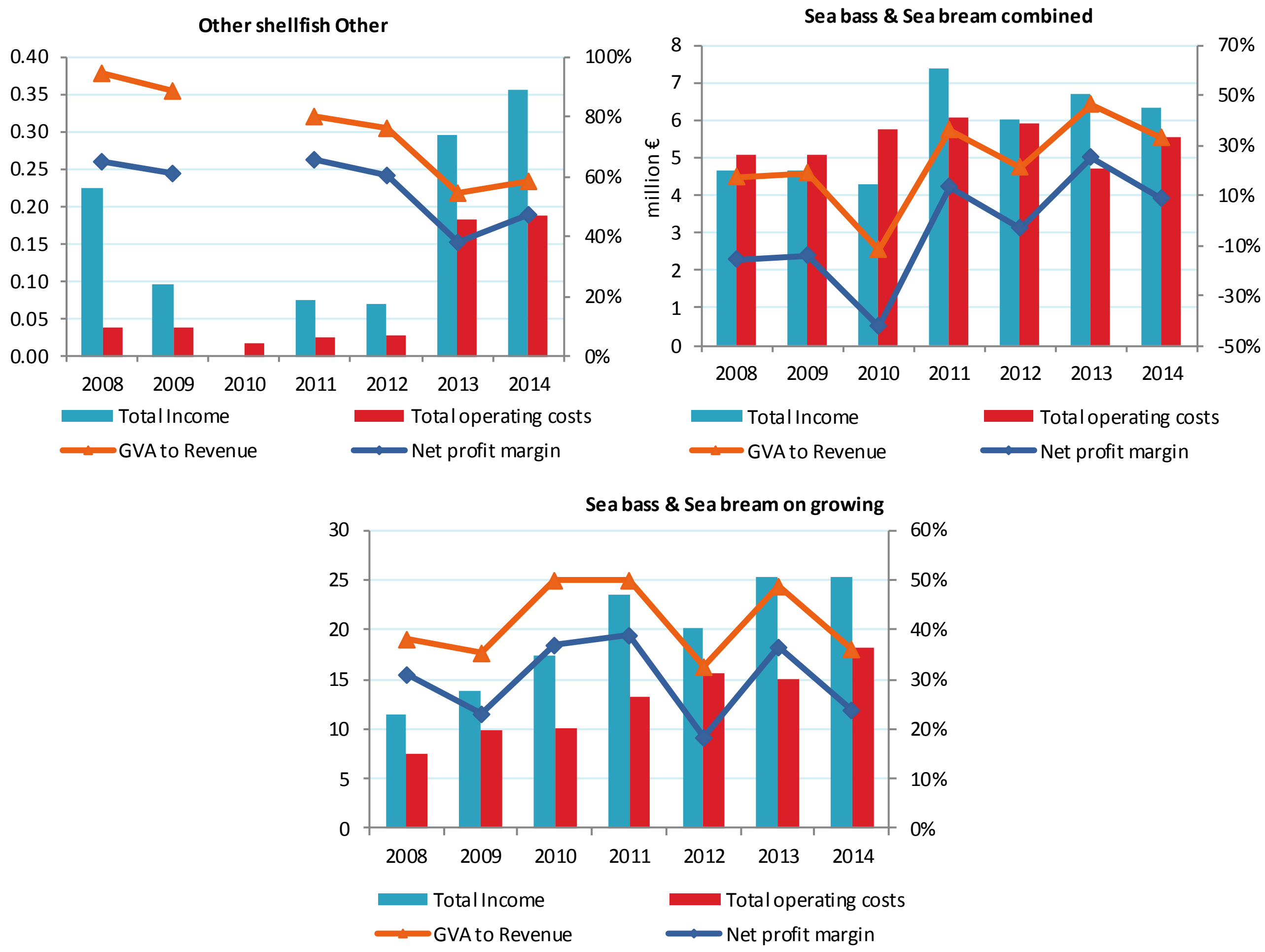


Figure 4.5.7 Economic performance indicators for the main Cyprian segments: 2008-2014.

Source: EU Member States DCF data submission

The total income of the sea bream and sea bass on growing segment rose since 2008 and remained stable between the years 2013 and 2014. As expected, total cost also exhibits an upward trend since 2008 nevertheless the ratio to the total income varies between the years. Net profit margin exhibited an upward trend until 2010. Since 2012 a downward trend me be identified, nevertheless, net profit margin remained positive, over 20% since 2012.

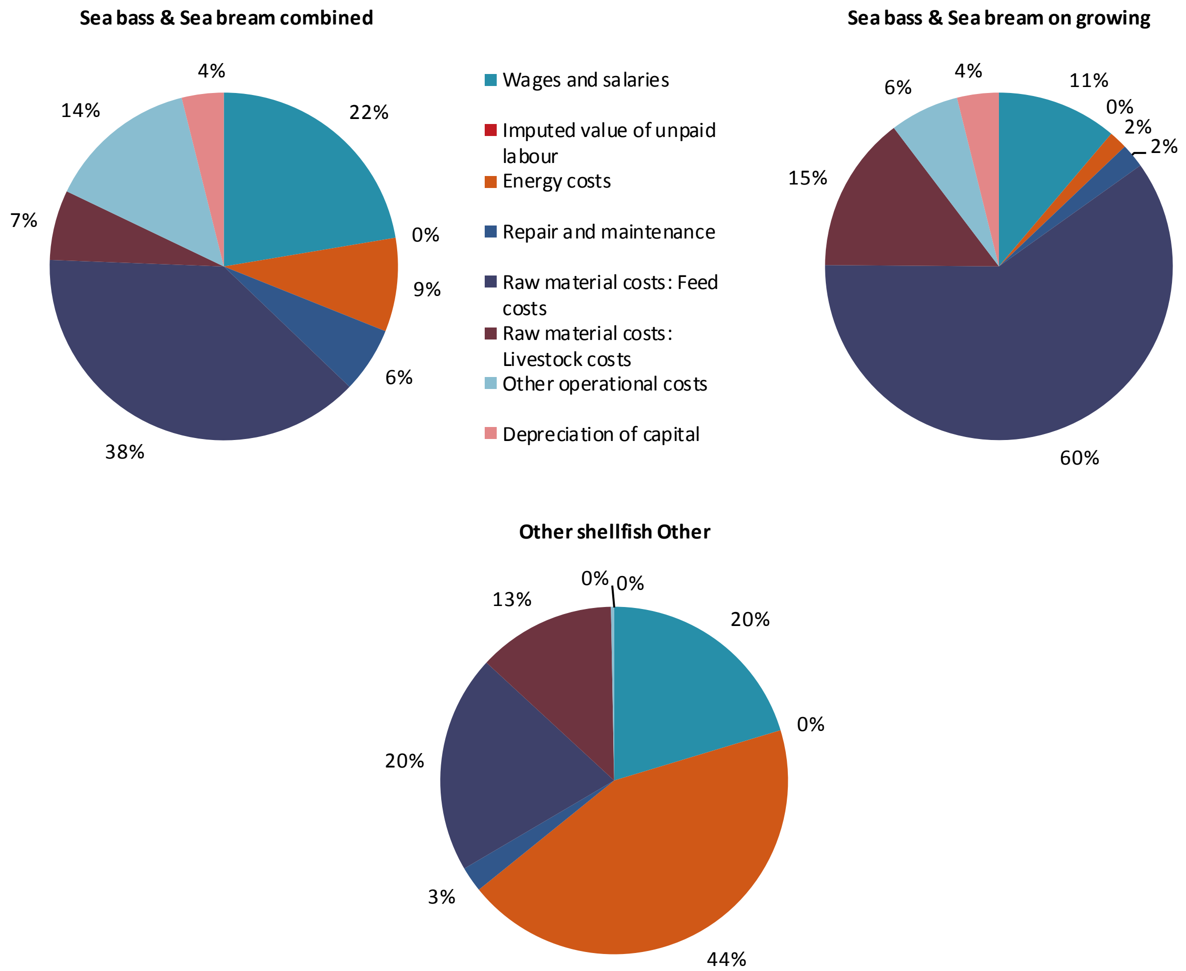


Figure 4.5.8 Cost structure of the main segments in Cyprus: 2014.

Source: EU Member States DCF data submission

The main cost component of the sea bream and sea bass on growing segment is the raw material cost which makes up to 75% of the total cost for 2014. Feed cost being the most important cost component, contributes 60% to the total cost while livestock cost contributes 15% to the total cost. The remaining cost is allocated 11% in wages and salaries, 6% in other operational costs, 4% for the depreciation of capital, 2% energy costs and 2% for repair and maintenance.

Figure 4.5.9 Feed and livestock prices for the main Cyprian segments: 2008-2014.

Source: EU Member States DCF data submission

The variation of feed and livestock costs for the sea bream and sea bass on growing segment is presented in the figure above. After reaching a peak in 2012, per kg feed cost has decreased in 2013 and 2014.

4.5.6 Trends and triggers

In the last decade Cyprus aquaculture and specifically marine aquaculture has been exhibiting an overall increase in production at an average annual rate of 5%. This is mainly attributed to the European funds support for productive investments in aquaculture as well as to the opening of new markets in conjunction with the global increase in demand for fisheries products.

In contrast, freshwater aquaculture production decreased in the last decade. Freshwater aquaculture production has been stable at low numbers the last 4 years. The main reason for the decreasing trend is the limited sources of fresh water availability on the island and the serious drought that Cyprus has been experiencing especially the last 3 years. The scarcity of fresh water lead to high mortalities as well as high energy costs for the companies a fact that results in high cost of production thus reducing the competitiveness of the products. All the production is been marketed locally or in conjunction with on-site restaurants. It has to be mentioned that freshwater aquaculture represents in approximately only 1% both in volume and value of the total national aquaculture production.

For the next years marine aquaculture in Cyprus is expected to continue increasing its production due to the increase of the global demand and the new markets. There are however risks that may affect this increasing trend which are associated with the price of the main products (sea bass and sea bream), that in great extend are determined by big producing countries like Greece and Turkey. Additionally an important role for maintaining this increasing trend has the continuance of the support from the European funds for productive investments in aquaculture as well the implementation of the national multiannual aquaculture strategic plan.

As regards the freshwater aquaculture production, it expected that it will remain relative stable as it has been for the last 3 years. Due to the high cost of production the products will be marketed nationally as it cannot compete with equivalent products that are produced in other countries that have more adequate fresh water sources.

4.5.7 Data Coverage and Data Quality

Data have been collected on by Census and it covered 100% of the population. Some common variables when compared / crosschecked with the data maintained in other national and international data bases there were no inconsistencies detected.

The number of enterprises in the Cypriot Aquaculture industry did not increase from 10 enterprises since 2009 to 16 enterprises in 2014. Since 2011, Cyprus has 5 enterprises for Sea Bass & Sea Bream on Growing, 3 enterprises for Sea Bass & Sea Bream combined, 1 enterprise for Other Shellfish and 7 enterprises for Trout on Growing.

It was not required (i.e., not mandatory) to collect economic data on the Trout on growing segment during the period 2008-2013. However, the Trout enterprises were operating those years, and Cyprus provided only their income data based on the sales. Cyprus did not provide the cost data, number of enterprises or employment.

Hence, the evolution of the number of enterprises in the Cypriot Aquaculture industry was as follow:

- 2009: 15 enterprises (5 enterprises for Sea Bass & Sea Bream on Growing, 3 enterprises for Sea Bass & Sea Bream combined, 1 enterprise for Other Shellfish and 6 enterprises for Trout on Growing);
- 2010: 15 enterprises (5 enterprises for Sea Bass & Sea Bream on Growing, 3 enterprises for Sea Bass & Sea Bream combined, 1 enterprise for Other Shellfish and 6 enterprises for Trout on Growing);
- 2011: 16 enterprises (5 enterprises for Sea Bass & Sea Bream on Growing, 3 enterprises for Sea Bass & Sea Bream combined, 1 enterprise for Other Shellfish and 7 enterprises for Trout on Growing);
- 2012: 16 enterprises (5 enterprises for Sea Bass & Sea Bream on Growing, 3 enterprises for Sea Bass & Sea Bream combined, 1 enterprise for Other Shellfish and 7 enterprises for Trout on Growing);
- 2013: 16 enterprises (5 enterprises for Sea Bass & Sea Bream on Growing, 3 enterprises for Sea Bass & Sea Bream combined, 1 enterprise for Other Shellfish and 7 enterprises for Trout on Growing);
- 2014: 16 enterprises (5 enterprises for Sea Bass & Sea Bream on Growing, 3 enterprises for Sea Bass & Sea Bream combined, 1 enterprise for Other Shellfish and 7 enterprises for Trout on Growing);

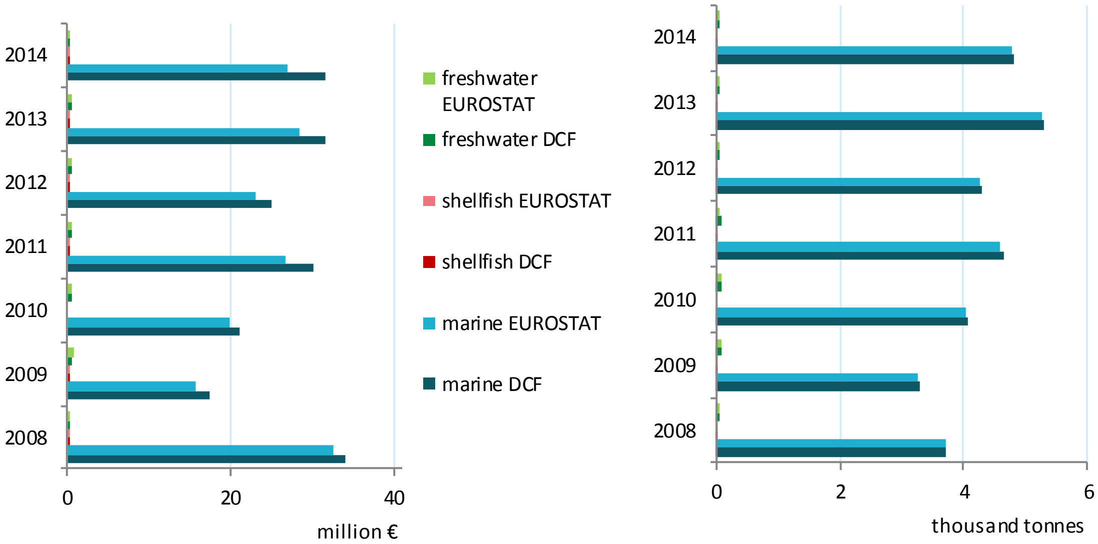


Figure 4.5.10 Comparison of DCF data with EUROSTAT data for Cyprus: 2008-2014

4.6 Czech Republic

4.6.1 Summary

Aquaculture in the Czech Republic is a highly traditional activity starting in the late middle age and supported by the religious authorities for several centuries. Being a landlocked country only freshwater species can be risen in the country, being common carp (*Ciprinius carpio*), farmed in extensive pond aquaculture, the most relevant species in the country.

Carp aquaculture is based on a seasonal demand, with the peek in Christmas and very low sale levels in the rest of the year. This activity results in an important seasonal employment demand and additional sources of income in rural areas.

Production volume and value

Total aquaculture production in the Czech Republic was 20.2 thousand tonnes in 2014 which represents a small 4% increase with regard the previous year, and maintains the production levels around 20 thousand tonnes in the period between 2008 and 2014.

The stable trend in production volumes is not replicated in the case of value. An increase of 20% in the last observed year, 11% in the full period, indicates a rise in prices. Imports from inside and outside the EU, have contributed to an increase in supply of fish in the last years.

Table 4.6.1 Production and sales for Czech Republic: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change (13-14)	Develop. 2014/(08-13)
Production weight (thousand tonnes)	***20.4***	***20.1***	***20.4***	***21.0***	***20.8***	***19.4***	***20.2***	***4%***	***-1%***
Marine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*
Shellfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*
Freshwater	20.4	20.1	20.4	21.0	20.8	19.4	20.2	*4%*	*-1%*
Production value (million €)	***41.5***	***39.3***	***37.1***	***39.9***	***36.8***	***35.3***	***42.5***	***20%***	***11%***
Marine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*
Shellfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*
Freshwater	41.5	39.3	37.1	39.9	36.8	35.3	42.5	*20%*	*11%*
Hatcheries & nurseries (million units)		***9,920***	***8,322***	***8,519***	***4,828***	***6,142***	***6,324***	***3%***	***-16%***
Eggs		9,920	1,988	2,036	760	750	434	*-42%*	*-84%*
Juveniles			6,334	6,483	4,068	5,392	5,890	*9%*	*5%*

Source: EUROSTAT

Egg production is always difficult in extensive inland aquaculture. Despite the majority of farmers produce their own eggs; there is an active market for freshwater fish eggs in Eastern Europe which includes human consumption and other usages. This alternative market for carp eggs may help understanding the variations in the production levels recorded in the table. Moreover, 6.3 billion units of eggs and juveniles (mostly juveniles) were produced in 2014, a 3% increase compared to the previous year.

Main segments

Common carp concentrates the 89% of the total aquaculture production in weight and the 85% in value. Other species farmed in the country are other carps, like grass or bighead carps, and trout. Trout production is formed of rainbow and brook trout. The contribution to total production of these minor species is about 2% in volume and 3% in value of the production.

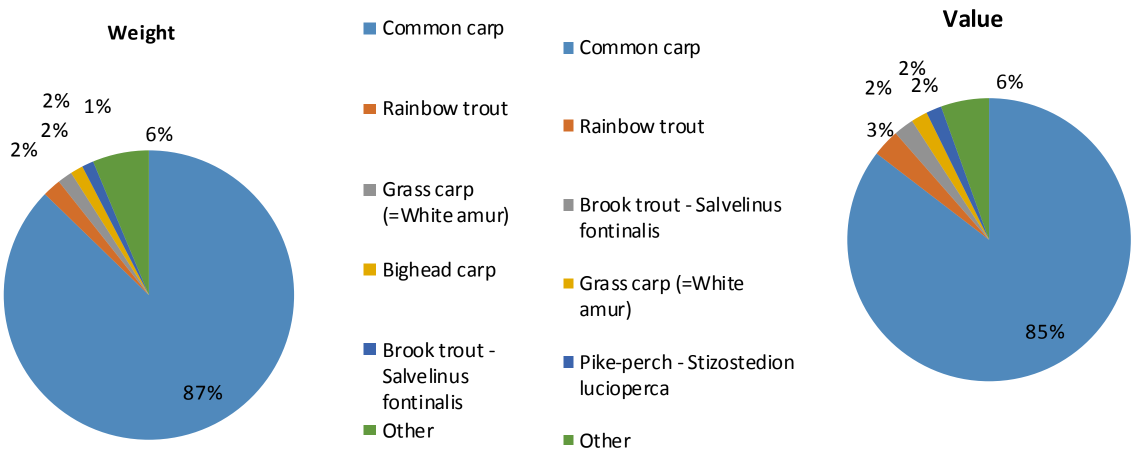


Figure 4.6.1 Main species in terms of weight and value in Czech Republic production: 2014.

Source: EUROSTAT

The highest prices are observed for trout species, with an average in 2011-2014 around €3.7 per kilo. Average price for European perch in 2014 were €1.7 per kilo and it is decreasing from 2012. Common carp prices are increasing from 2012 and in 2014 the average was €2 per kilo. The lowest prices, less than €1 per kilo, correspond to the bighead carp.

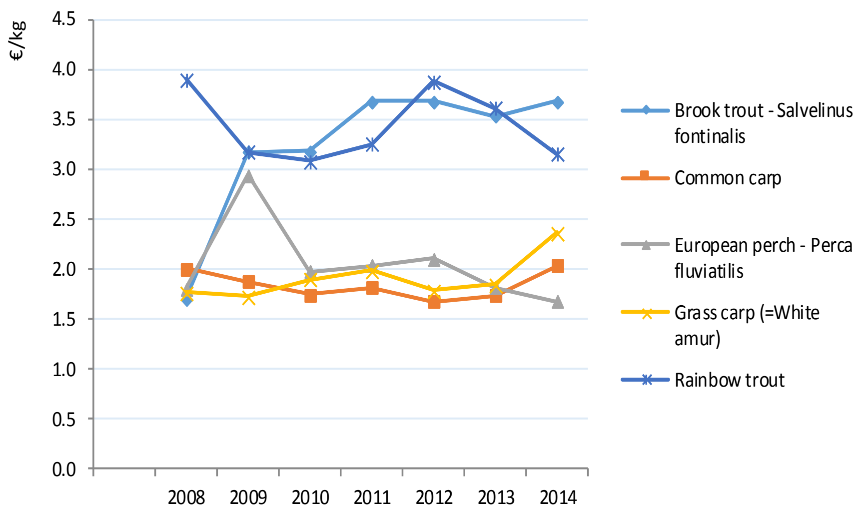


Figure 4.6.2 Average prices for the main species produced in Czech Republic: 2008-2014.

Source: EUROSTAT

4.6.2 Data Coverage and Data Quality

The Czech Republic is a landlocked country producing only freshwater aquaculture products. The freshwater data collection is not mandatory under the DCF and landlocked countries are therefore not requested to provide economic data for this report.

4.7 Denmark

4.7.1 Summary

Production volume and value

In total, the Danish aquaculture sector produced 46 400 tonnes in 2014, which at the same level as the production in 2013. The total value of the production was €160 million in 2014, which is a decrease of 1% from 2013. Compared to the average from 2009 to 2013, the total volume increased by 6%, whereas the total sales value increased by 11%.

Overall industry structure and employment

In 2014, the total population of aquaculture farms was 221, which was distributed on 115 enterprises. The Danish aquaculture sector is dominated by small enterprises with less than 5 employees. 86% of the Danish enterprises had less than 5 employees in 2014.

Main segments

The production in Denmark can be divided into four main segments. The largest segment is the land based production of trout, which consists of a combination of hatcheries, nurseries and grow-out farms. The production in the land based farms is typically small portion size trout for consumption. The production techniques used are primarily ponds, tanks, raceways and recirculation systems.

The second most important segment is the marine production of trout and trout eggs, which are produced in sea cage farms. The third segment consists of land based recirculation farms producing European eel, pike-perch, salmon and turbot. Finally, the forth segment is producing blue mussels on long lines.

Current production trends and main drivers (Trends and triggers)

The portion sized fresh water rainbow trout is mainly exported to Germany (90%), whereas the trout eggs harvested from the marine sea cage farms are exported to Japan. Eel, pike perch and turbot are exported to other EU countries.

Outlook

For the Danish trout producers 2015 the outcome is expected to about the same as in 2014. Even though the Danish regulation for aquaculture production was changed in 2012, and that this change in regulation should provide the producers with an incentive to introduce more environmental friendly technology in order to raise production, there has only been a small increase in production and, in turn, a small decrease in prices.

The eel farmers are expected to decrease production due to the restriction on the harvesting of glass eels. Furthermore, this restriction drives up prices on glass eels making it less profitable to produce eel. The mussel farmers are expected to increase production and turnover, but it is still questionable if the profit will be positive.

4.7.2 Production and sales

In total, the Danish aquaculture sector produced 46 400 tonnes in 2014, which at the same level as the production in 2013. The total value of the production was €160 million in 2014, which is a decrease of 1% from 2013. Compared to the average from 2009 to 2013, the total volume increased by 6%, whereas the total sales value increased by 11%.

Table 4.7.1 Production and sales for Denmark: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Sales weight (thousand tonnes)	***44.1***	***47.5***	***42.6***	***38.9***	***44.2***	***46.3***	***46.4***	*0%*	*6%*
Marine	7.9	12.1	11.0	10.8	14.0	13.3	14.1	*6%*	*22%*
Shellfish	1.5	2.5	1.1	0.8	1.1	0.8	1.6	*90%*	*16%*
Freshwater	34.7	32.8	30.4	27.3	29.1	32.2	30.8	*-4%*	*-1%*
Hatcheries & nurseries									
Sales value (million €)	***130.0***	***135.0***	***136.1***	***145.8***	***155.0***	***161.7***	***159.8***	*-1%*	*11%*
Marine	36.2	41.3	45.9	49.8	57.2	62.9	57.4	*-9%*	*17%*
Shellfish	1.3	1.7	0.7	0.5	0.9	0.8	1.3	*66%*	*30%*
Freshwater	92.5	92.0	89.5	95.5	96.9	98.0	101.0	*3%*	*7%*
Hatcheries & nurseries									

Source: EU Member States DCF data submission

4.7.3 Industry structure and employment

In 2014, the total population of aquaculture farms was 221, which was distributed on 115 enterprises. The Danish aquaculture sector is dominated by small enterprises with less than 5 employees. 86% of the Danish enterprises had less than 5 employees in 2014.

Table 4.7.2 Structure of the Danish aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Structure (number)									
Total enterprises	*162*	*160*	*154*	*135*	*130*	*130*	*115*	*-12%*	*-21%*
<=5 employees	141	141	138	118	117	115	99	*-14%*	*-23%*
6-10 employees	13	9	4	6	4	8	2	*-75%*	*-73%*
>10 employees	8	10	12	11	9	7	14	*100%*	*47%*
Employment (number)									
Total employees	606	490	468	477	490	513	506	*-1%*	*0%*
Male employees	530	432	412	427	440	463	450	*-3%*	*0%*
Female employees	76	58	56	50	50	50	56	*12%*	*-1%*
FTE	349	311	282	292	304	311	336	*8%*	*9%*
Male FTE	305	274	248	262	273	281	299	*7%*	*9%*
Female FTE	44	37	34	30	31	30	37	*22%*	*7%*
Indicators									
FTE per enterprise	2.2	1.9	1.8	2.2	2.3	2.4	2.9	*22%*	*37%*
Average wage (thousand €)	61.1	71.1	75.3	71.7	72.4	72.6	72.1	*-1%*	*2%*
Labour productivity (thousand €)	87.6	90.1	124.8	126.4	127.1	126.2	108.7	*-14%*	*-4%*

Source: EU Member States DCF data submission

The total number of persons employed in the Danish aquaculture sector in 2014 was 506, corresponding to 336 FTEs. From 2013 to 2014, the number of employees decreased by 1%; however, compared to the average from 2009 to 2013, the number of persons employed is unchanged. In 2014, only 12% of the employees in the sector were women. The average FTE per enterprise increased 22% from 2013 to 2014, whereas the average wage decreased by 1% from €72.6 thousand to €72.1 thousand, corresponding to a decrease of 2% when compared to the average from 2009 to 2013.

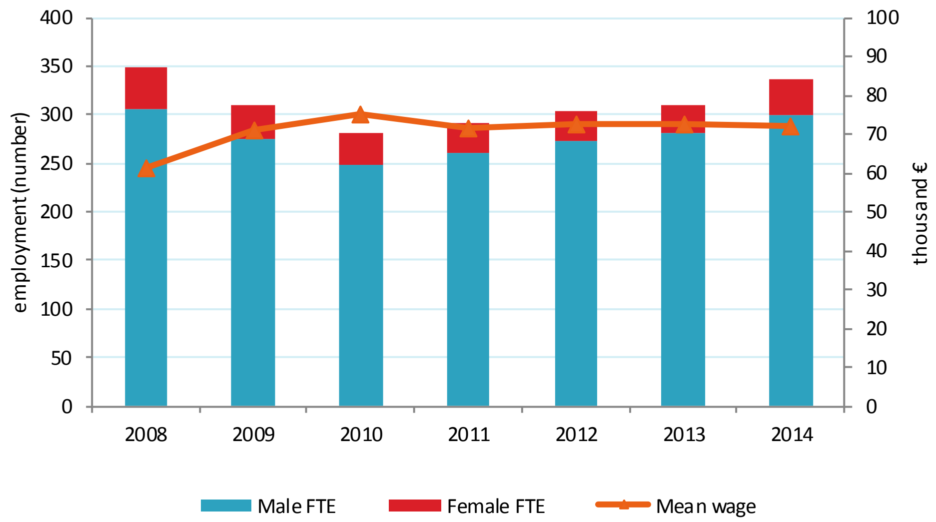


Figure 4.7.1 Employment trends for Denmark: 2008-2014.

Source: EU Member States DCF data submission

The number of enterprises and FTEs has decreased from 2008 to 2014, but the average number of FTE per enterprise has been slightly increasing over the same period. At the same time, the average wage has been almost constant; however, until 2013 the enterprises have managed to increase labour productivity. The labour productivity is measured as gross value added per full time employee. From 2013 to 2014, the labour productivity decreased by 14% and compared to the average from 2009 to 2013 the labour productivity decreased by 4% in 2014.

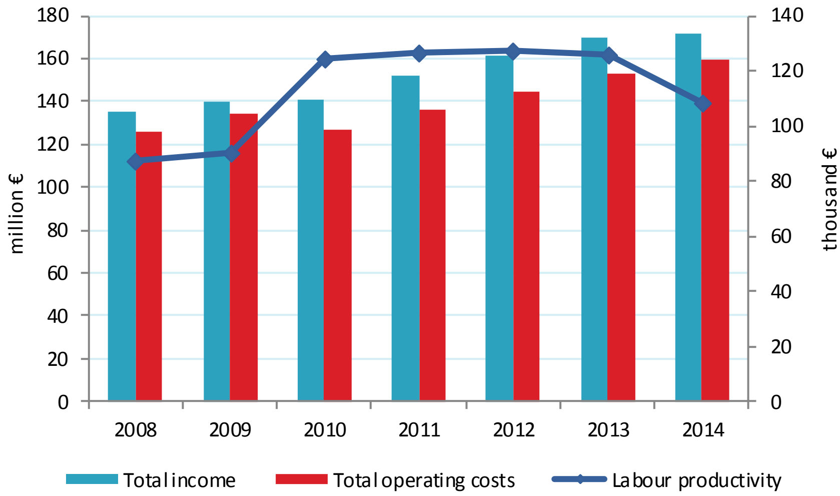


Figure 4.7.2 Income, costs, wages and labour productivity trends for Denmark: 2008-2014.

Source: EU Member States DCF data submission

4.7.4 Economic performance

From 2013 to 2014, total income increased by 1%, while the operational cost increased by 7%. The total income is dominated by the turnover from the sale of fish from the farms, which contributes 93% of total income, leaving 7% to other sources of income.

Table 4.7.3 Economic performance of the Danish aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	% of total income	Change 2014-13	Development 2014/(2008-13)
Income (million €)										
Turnover	130.0	135.0	136.1	145.8	155.0	161.7	159.8	*93%*	*-1%*	*11%*
Other income	4.8	5.2	4.8	6.0	6.5	7.8	11.6	*7%*	*48%*	*98%*
Subsidies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*	*0%*
Total income	*134.8*	*140.1*	*140.9*	*151.8*	*161.5*	*169.6*	*171.4*	*100%*	*1%*	*14%*
Expenditures (million €)										
Wages and salaries	16.5	16.2	15.6	15.8	17.0	17.5	19.4	*11%*	*11%*	*18%*
Imputed value of unpaid labour	4.9	5.9	5.6	5.1	5.0	5.1	4.9	*3%*	*-5%*	*-8%*
Energy costs	6.4	6.8	6.5	7.1	7.7	7.2	7.1	*4%*	*-2%*	*1%*
Repair and maintenance	4.7	4.3	4.7	5.7	5.6	5.3	5.9	*3%*	*11%*	*17%*
Raw material: Feed costs	45.7	43.3	41.3	49.7	50.7	54.5	58.1	*34%*	*6%*	*22%*
Raw material: Livestock costs	24.1	34.9	32.0	31.2	34.8	38.8	36.4	*21%*	*-6%*	*12%*
Other operational costs	23.3	22.8	21.3	21.2	24.0	24.4	27.4	*16%*	*12%*	*20%*
Total operating costs	*125.5*	*134.2*	*127.0*	*135.9*	*144.8*	*152.9*	*159.1*	*93%*	*4%*	*16%*
Capital Costs (million €)										
Depreciation of capital	6.5	7.9	7.2	6.3	7.3	7.1	6.6	*4%*	*-7%*	*-7%*
Financial costs, net	7.0	6.1	6.5	3.9	4.2	2.8	2.7	*2%*	*-5%*	*-48%*
Extraordinary costs, net	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*	*0%*
Capital Value (million €)										
Total value of assets	193.8	188.1	175.7	168.1	165.8	174.8	182.5	*106%*	*4%*	*3%*
Net Investments	13.1	7.9	9.1	10.7	5.5	14.3	14.9	*9%*	*5%*	*48%*
Debt	149.3	147.2	132.1	118.7	111.6	113.5	128.0	*75%*	*13%*	*-1%*
Input & Production (thousand tonnes)										
Raw material: Feed	42.6	38.5	38.6	40.0	42.6	41.8	44.0		*5%*	*8%*
Raw material: Livestock	7.3	11.2	9.7	8.6	9.0	11.9	9.1		*-23%*	*-5%*
Performance Indicators(million €)										
Gross Value Added	30.6	28.0	35.2	36.9	38.6	39.2	36.5	*21%*	*-7%*	*5%*
Operating cash flow	9.3	5.9	13.9	16.0	16.6	16.7	12.3	*7%*	*-26%*	*-6%*
Earning before interest and tax	2.8	-2.0	6.7	9.7	9.4	9.6	5.7	*3%*	*-40%*	*-5%*
Net profit	-4.3	-8.1	0.2	5.7	5.2	6.8	3.1	*2%*	*-55%*	*231%*
Capital productivity (%)	15.8	14.9	20.0	22.0	23.3	22.5	20.0		*-11%*	*1%*
Return on Investment (%)	1.4	-1.1	3.8	5.7	5.7	5.5	3.1		*-43%*	*-11%*
Future Expectation Indicator (%)	3.4	0.0	1.0	2.6	-1.1	4.1	4.6		*12%*	*173%*

Source: EU Member States DCF data submission

In 2014 the expenditures are dominated by cost of feed (34%), cost of livestock (21%) and cost of wages and salaries (11%). The expenditures on feed have increased by 6% and expenditures on livestock have decreased by 6%. Expenditures on wages and salaries have increased by 18% compared to the average from 2008 to 2013. The total expenditures make up for 93% of the total income.

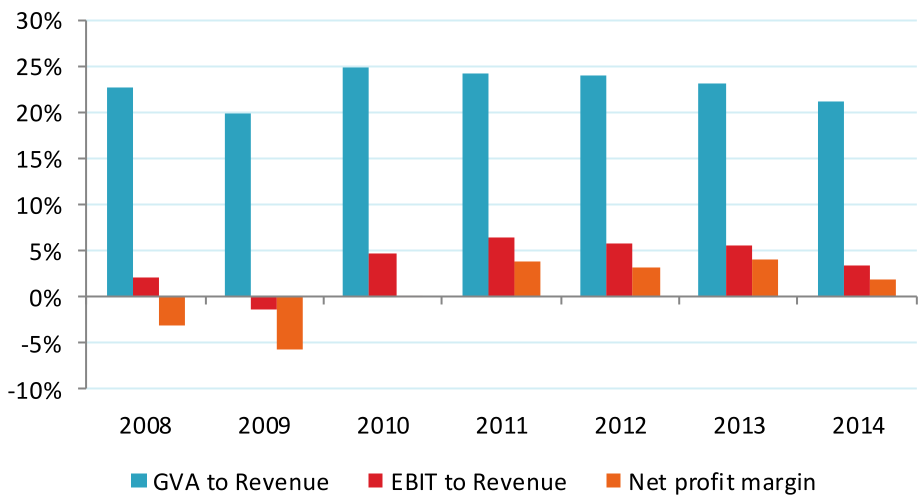


Figure 4.7.3 Economic performance for Denmark: 2008-2014

Source: EU Member States DCF data submission

The gross value added for the sector as a whole decreased by 7% but still both EBIT and net profit were positive. The total value of assets and debts increased by 4% and 13%, respectively. This is mainly due to the decreasing number of farms in Denmark. The net investment increased 5% and is now 48% above the average from 2009 to 2013.

4.7.5 Main species produced and economic performance by segment

The production in Denmark can be divided into four main segments. The largest segment is the land based production of trout, which consists of a combination of hatcheries, nurseries and grow-out farms. The production in the land based farms is typically small portion size trout for consumption. The production techniques used are primarily ponds, tanks, raceways and recirculation systems.

The second most important segment is the marine production of trout and trout eggs, which are produced in sea cage farms. The third segment consists of land based recirculation farms producing European eel, pike-perch, salmon and turbot. Finally, the fourth segment is producing blue mussels on long lines.

In Denmark, the land based fresh water aquaculture production is mainly located in Jutland. The marine production of trout is located in the Baltic Sea along the southern cost of Jutland and a few production sites along the cost of Zealand. The production of blue mussels is located in the Baltic Sea and fjords along the cost of Jutland.

The portion sized fresh water rainbow trout is mainly exported to Germany (90%), whereas the trout eggs harvested from the marine sea cage farms are exported to Japan. Eel, pike perch and turbot are exported to other EU countries.

The main species produced in Denmark is rainbow trout, which makes up 93% of the total volume and value of production. The second most important species is European eel, which makes up 6% of the total value but only 4% of the volume. Blue mussels make up 3% of the total weight of production, but the value is only 1%.

Figure 4.7.4 Main species in terms of weight and value in Danish production: 2014.

Source: EU Member States DCF data submission

Large trout produced in cages in marine waters follow the price of salmon, which has been increasing over the period from 2008 to 2011 but then decreased slightly in 2012. However, some of the income from the Danish sea cage farms is coming from the production of trout eggs, which are sold to Japan.

The price of blue mussels has been decreasing from 2008 to 2011 but increased slightly in 2012 and 2013. Still, the mussel farmers in Denmark are struggling to survive.

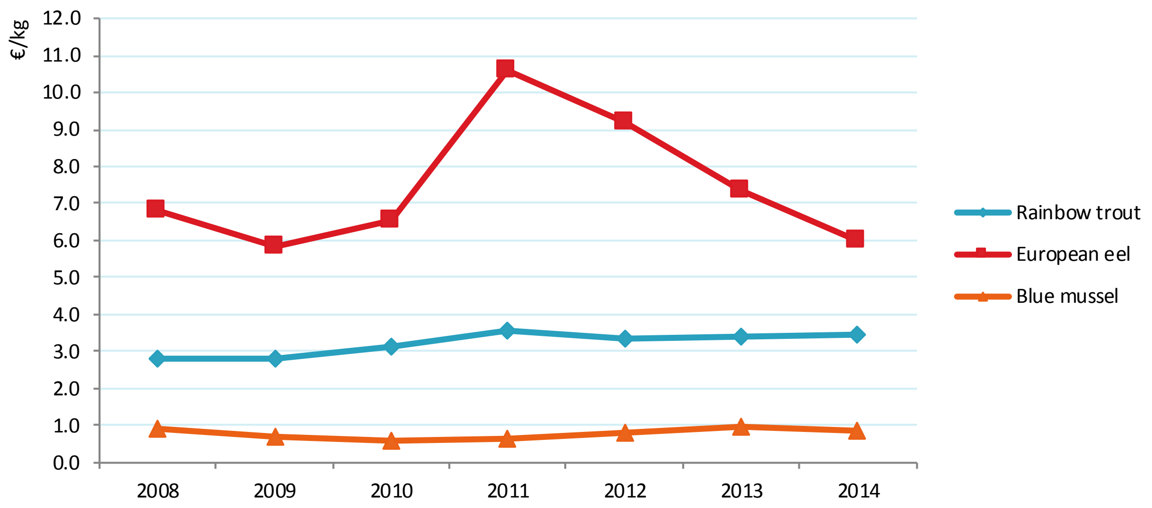


Figure 4.7.5 Average prices for the main species produced in Denmark: 2008-2014.

Source: EU Member States DCF data submission

In Denmark, the aquaculture production can be divided into four segments based on the species produced and the technique used.

The Danish sector is dominated by one species; rainbow trout. The production volume of trout was 43 000 tonnes with a corresponding income of €149 million in 2014. The production of trout covers 93% of the total production volume as well as the total value. The production of trout is divided into two segments based on technique and production environment.

The most relevant segments in the Danish aquaculture are presented below.

Segment 1: Trout combined

The most important segment is land based fresh water trout farms (Trout combined). In most cases enterprises in Denmark combine the production in hatcheries and nurseries with grow out farms. The techniques used are ponds, raceways and recirculation systems. The product from theses farms are mainly portion size trout 300 to 400 grams with white meat. The segment consists of 93 enterprises running 177 farms. The production volume was 29 100 tonnes with a corresponding income of €98.3 million. This corresponds to 63% of the total production volume and 57% of the total production value in 2014.

Segment 2: Trout cages

The second most important segment is the sea cage farms producing trout (Trout cages). The main product, besides the fish meat, is trout eggs. In 2014 there were 21 farms distributed among 7 enterprises. The production volume was 14 100 tonnes bringing about a total income of €57.4 million. This segment covers 30% of the volume and 36% of the value of total Danish production.

Segment 3: Other freshwater fish species combined

Denmark also has a minor land based production of other freshwater species (Other freshwater fish combined). The main species produced in this segment is European eel in land based recirculation farms. The eel production enterprises are dependent on wild caught glass eel for production. There are 5 enterprises left producing eel representing one farm each. In this segment there are also 4 enterprises running 7 farms with a minor production of pike-perch, turbot and salmon. The production technique is intensive recirculation where more than 95% of the water is recirculated. The production volume was 1 600 tonnes with a corresponding income of €9.7 million in 2014.

Segment 4: Mussels long line

The last segment is blue mussels on long lines, which has been introduced in recent years. The production was 1 500 tonnes with a corresponding income of €1.3 million in 2014. The segment had 6 enterprises running 11 farms. The farms are mostly located in Limfjorden in the northern part of Jutland and in other fjords along the Baltic cost of Jutland. Blue mussel farming is a relatively new and small segment both in terms of volume and value in the Danish aquaculture sector. The segment is struggling to increase production and productivity, but so far the conditions and competition in this sector have not been favourable to the Danish producers. The blue mussel farmers have been represented in The Danish Account Statistics for Aquaculture since 2006, but only in 2014 did the segment show a small positive net profit.

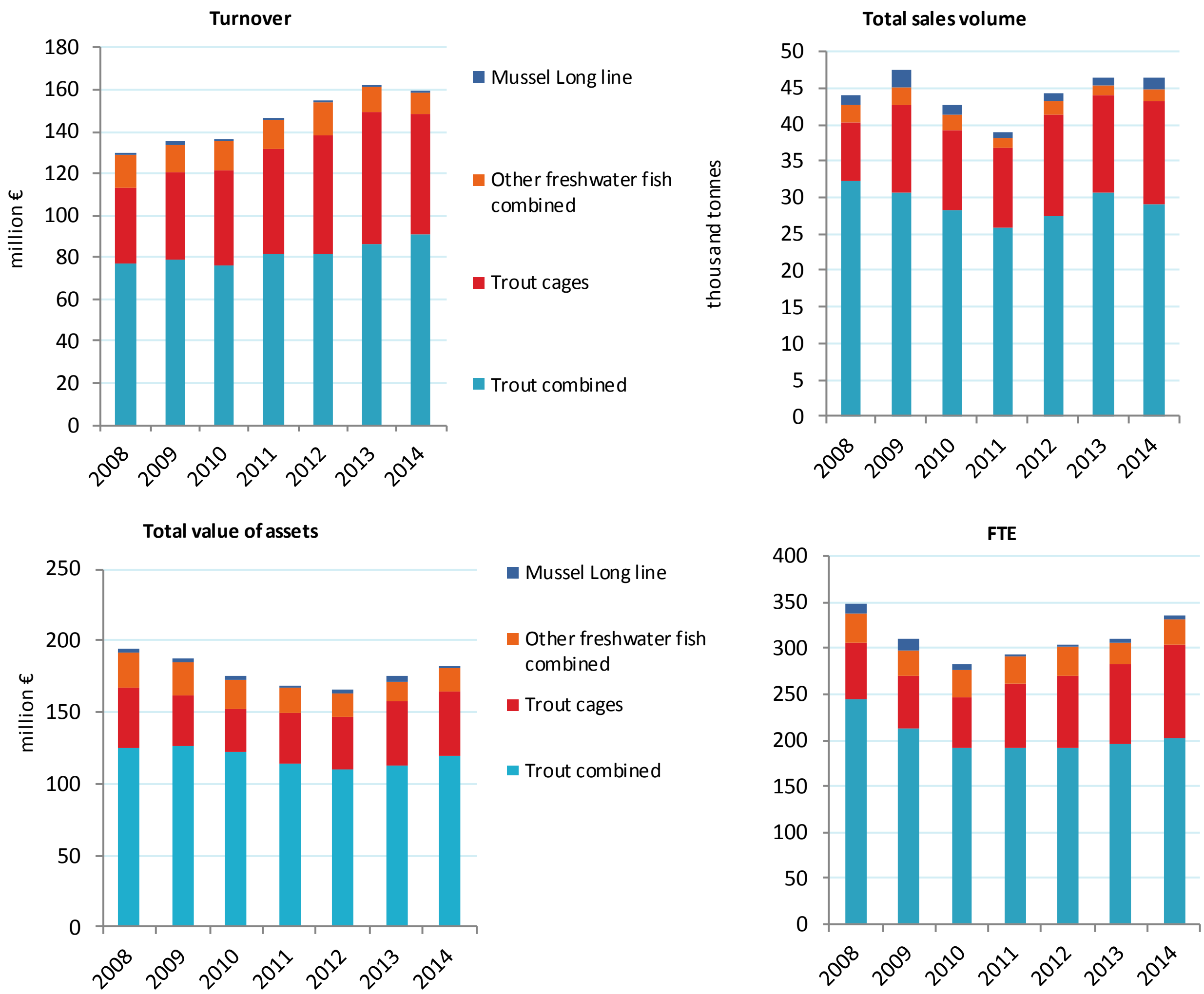


Figure 4.7.6 Structural development Danish aquaculture sector: 2008-2014.

Source: EU Member States DCF data submission

In Table 4.7.4, the economic performance of the four Danish segments is shown. From the table it can be seen that the gross value added is positive for all segments, but the net profit is negative in many years from 2008 to 2014 except for the Trout cages segment.

Table 4.7.4 Economic performance of main Danish aquaculture segments: 2008-2014 (in million €).

Variable	2008	2009	2010	2011	2012	2013	2014	% of total income	Change 2014/13	Development 2014/(2008-13)
Trout cages										
Total income	36.4	42.7	46.7	51.3	58.2	67.4	61.1	100%	-9%	21%
Gross Value Added	4.3	3.8	9.5	11.5	11.3	15.6	9.0	15%	-42%	-3%
Operating cash flow	1.1	0.5	6.2	7.5	6.6	10.5	2.7	4%	-74%	-49%
Earning before interest and tax	-0.2	-0.6	5.0	6.2	5.0	8.6	1.1	2%	-87%	-73%
Net profit	-1.6	-1.0	3.7	5.9	3.8	8.5	1.0	2%	-89%	-70%
Total sales volume (thousand tonnes)	7.9	12.1	11.0	10.8	14.0	13.3	14.1		6%	22%
Trout combined										
Total income	81.0	82.6	79.9	85.6	86.1	89.1	98.3	100%	10%	17%
Gross Value Added	21.9	20.7	22.5	22.0	23.0	19.9	24.1	24%	21%	11%
Operating cash flow	6.3	4.9	7.2	7.4	8.2	4.6	8.4	9%	83%	31%
Earning before interest and tax	1.9	-0.6	2.3	2.9	3.7	0.1	4.0	4%	3363%	133%
Net profit	-2.9	-5.4	-1.9	-0.3	1.1	-2.1	1.8	2%	185%	194%
Total sales volume (thousand tonnes)	32.4	30.6	28.3	26.0	27.4	30.6	29.1		-5%	0%
Mussel Long line										
Total income	1.4	1.8	0.7	0.5	1.1	0.9	1.4	100%	48%	29%
Gross Value Added	0.7	0.6	0.2	0.2	0.7	0.4	1.0	70%	118%	100%
Operating cash flow	0.0	-0.5	-0.3	0.0	0.5	0.1	0.6	43%	862%	1317%
Earning before interest and tax	-0.2	-0.9	-0.4	-0.1	-0.1	-0.2	0.5	39%	360%	264%
Net profit	-0.3	-1.2	-0.7	-0.1	-0.3	-0.4	0.4	33%	214%	193%
Total sales volume (thousand tonnes)	1.5	2.5	1.1	0.8	1.1	0.8	1.6		90%	19%
Other freshwater fish combined										
Total income	15.9	13.1	13.7	14.5	16.1	12.1	10.7	100%	-12%	-25%
Gross Value Added	3.7	3.0	3.0	3.2	3.7	3.3	2.5	23%	-25%	-25%
Operating cash flow	1.8	1.0	0.8	1.2	1.4	1.5	0.5	5%	-66%	-60%
Earning before interest and tax	1.2	0.1	-0.1	0.6	0.8	1.0	0.1	1%	-92%	-86%
Net profit	0.6	-0.5	-0.9	0.2	0.5	0.8	-0.2	-2%	-123%	-240%
Total sales volume (thousand tonnes)	2.3	2.2	2.1	1.3	1.7	1.6	1.6		3%	-13%

Source: EU Member States DCF data submission

In Figure 4.7.7, the economic indicators for the four Danish segments are presented. From the figures it can be seen that Net profit margin is positive for all segments including the blue mussel in 2014. Furthermore, net profit margin is positive for all segments in 2014.

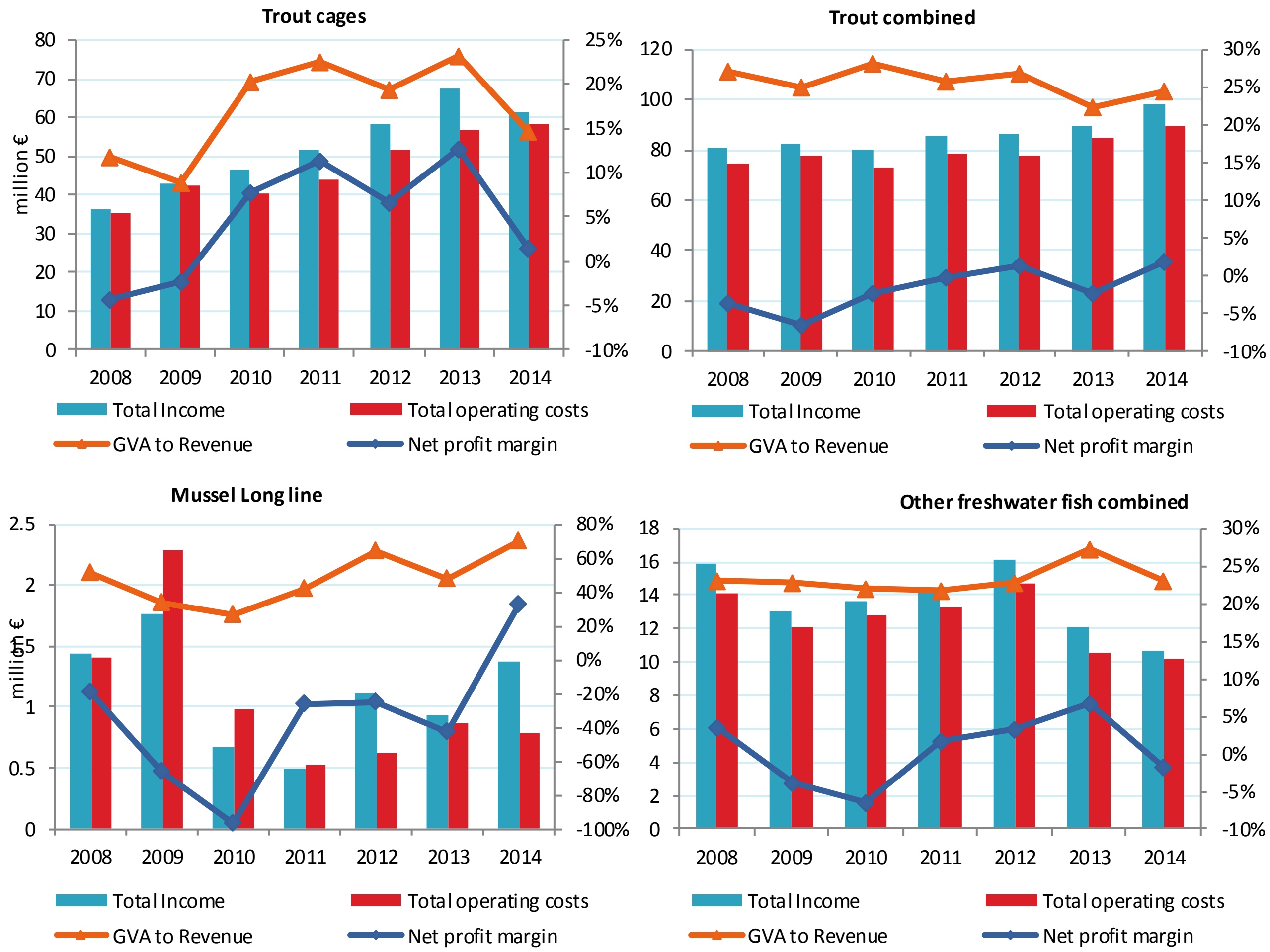


Figure 4.7.7 Economic performance indicators for the main Danish segments: 2008-2014.

Source: EU Member States DCF data submission

In Figure 4.7.8, the operational cost structures for the four Danish segments are presented.

Segment 1: Trout combined

The Trout combined segment shows a traditional cost composition for a land based finfish aquaculture industry where the main cost components are feed and livestock, which cover 57% of the total operational costs.

Segment 2: Trout cages

In the Trout cages at sea, the cost components feed and livestock are also the most important covering 59% of the total operational costs. In sea cage farming, the cost of livestock is more important than feed, which is the opposite of the composition in the land based farms. The fish (smolt) bought for sea cage production are larger than for land based production, which explains the difference in the cost compositions. Also the other operational costs are higher due to the cost associated with the transport of feed, fish and equipment to the production site.

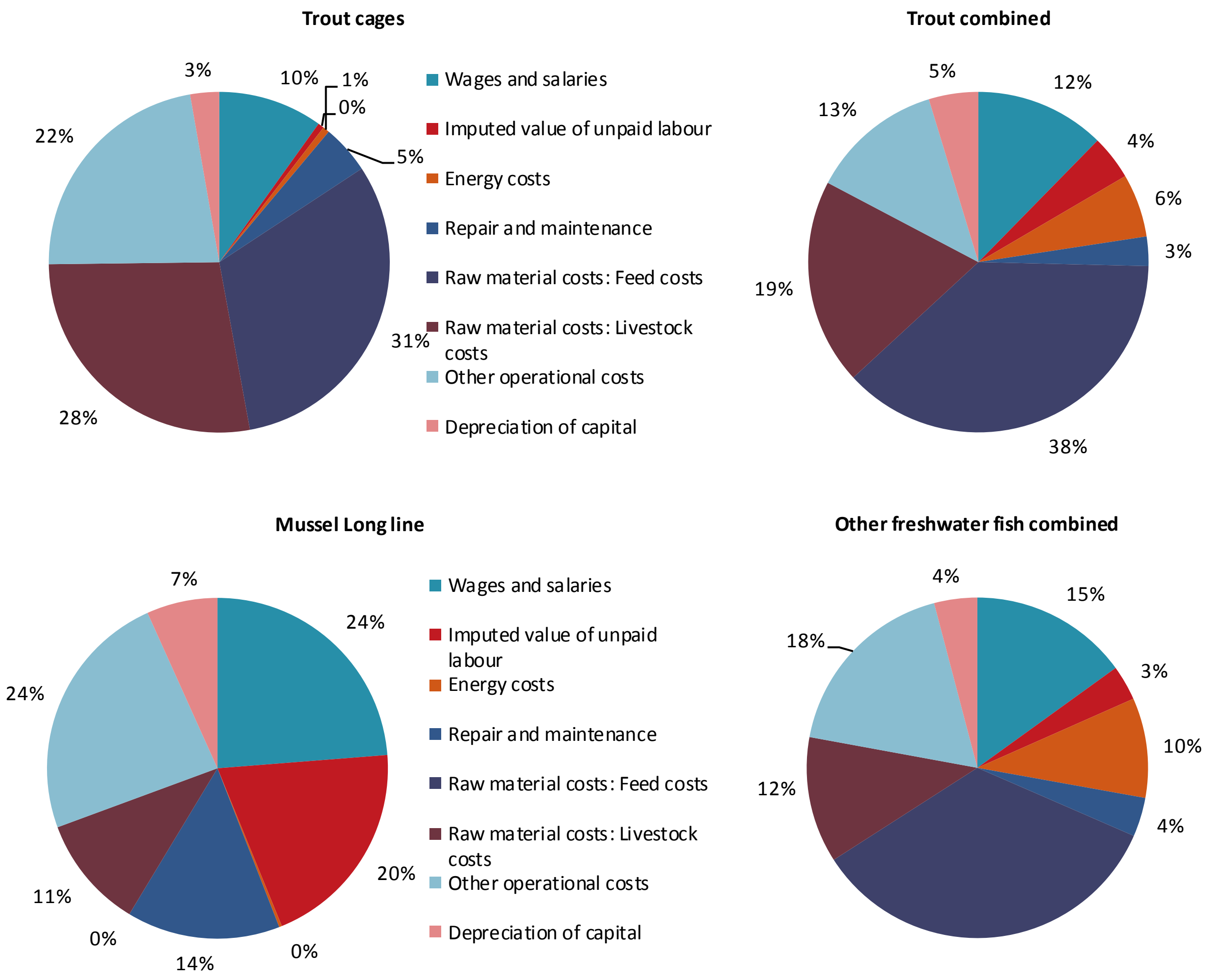


Figure 4.7.8 Cost structure of the main segments in Denmark: 2014.

Source: EU Member States DCF data submission

Segment 3: Other freshwater fish combined

In the segment Other freshwater fish combined, the main cost components are also feed and livestock, which cover 46% of the total operational costs. The energy cost covers 10% of the total cost, which is twice as much as the segment Trout combined. The reason for the higher energy cost is the use of highly recirculated systems in this segment.

Segment 4: Mussel long line

The segment Mussel long line has a completely different cost structure because there is no feed in the production costs. The single most important cost item is Wages and salaries which in 2014 cover 24% of the costs.

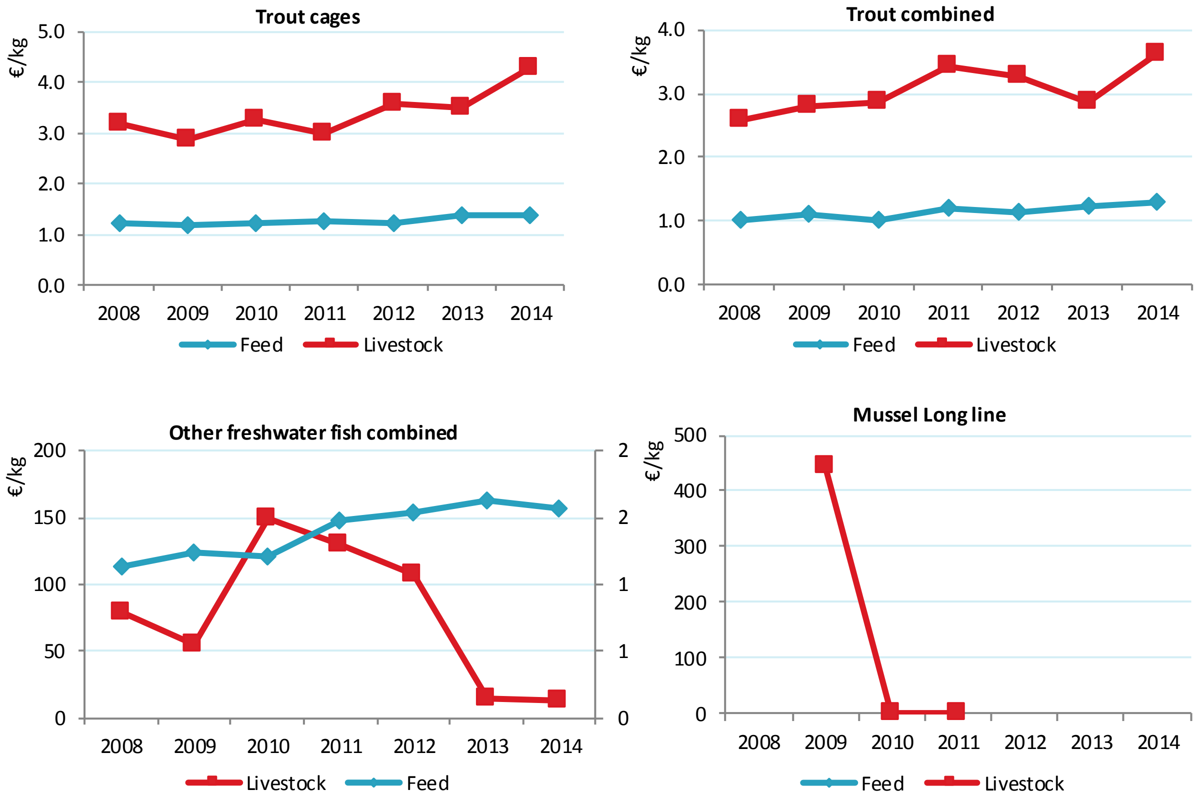


Figure 4.7.9 Feed and livestock prices for the main Danish segments: 2008-2014.

Source: EU Member States DCF data submission

4.7.6 Trends and triggers

Current production trends and main drivers

The main reason for the increase in the marine production in Denmark is the higher prices on larger trout produced in sea cages. The price is driven by the salmon price, which has been high since the disease crises in Chile. However to expand the production further the industry needs new licenses. If no new licenses are issued the industry production will stay at the current level around 10 000 tonnes.

The land based production has shown a downward trend of production over the years. The production was expected to increase slightly when the new regulation going from feed quotas to nitrogen quotas are fully implemented, however, the transition takes time and the results of the change will most likely first show in a couple of years. Furthermore, if the sector is to expand more than a few thousand tonnes, new licenses have to be given to the farmers.

Mussel farming in Denmark is struggling and the future for this segment is very unpredictable. However, mussel and sea weed farming as a mean to reduce the environmental impact from the sea cage farms are expected to grow, if the farms are allowed to expand production.

Market structure

The Danish aquaculture sector has managed to increase labour productivity over the period investigated. The labour cost per unit of output is also relatively low compared to other countries producing trout.

The Danish sector consists of many small producers at the primary level, where there are only two enterprises buying and processing the trout. This market structure can be a hindrance because the market is not well functioning and competitive.

In recent years a segment of organic aquaculture producers has been established. In total, there is a total are nine land based farms and two sea cage farms all producing trout and six blue mussel farms. The organic producers have higher costs for feed and fry and for water analysis at sea, but they are also receiving a price premium for their products. The segment is producing a little more than 1 800 tonnes which is an increase of 300% compared to 2013. It is, however, questionable how large the production volume can grow before the price premium will disappear.

Issues of special interest

In Denmark, a few farms are experimenting on the production of new species and using new technology. So far, the most successful project is the production of pike perch in recirculating systems. Furthermore a minor production of turbot fingerlings exists, where the fingerlings are used for restocking and some are exported to Holland and Spain. Two new large land based recirculation systems have been set up for the production of Atlantic salmon. In a land based facility the control of the production process is higher than in a sea cage farm and there is a better opportunity to control the pollution of nitrogen, phosphorus and organic material etc., on the other hand, the operational cost is expected to be higher than in the sea cage farms. When the two farms are fully operational they will produce up to 8 000 tonnes per year.

Outlook for future production trends

Before 2012, all farms in Denmark were regulated by a feed quota system. Under this regulation the farmer’s main focus was to optimize production under this restriction of input (feed), whilst the farmer had no incentive to reduce the pollution discharged from the farm. A regulatory change in 2012 to individual pollution rights on nitrogen was implemented to give the farmers an incentive to reduce pollution in order to increase production and profitability. This should also secure a further development and adoption of new environmentally friendly production methods and technologies. It is questionable if this change has had any effect on the production volume in 2013 and 2014, because of the bureaucratic procedures of changing from the old system to the new one, but it is expected that an increase in production volume will be seen in the future.

According the governmental *Strategy for sustainable development of the aquaculture sector in Denmark 2014-2020*[1] the production goal was to be raised by 25% from 44 000 tonnes in 2012 to 55 000 tonnes in 2020. This was to be helped trough means of *Simplifying administrative procedures*, *Enhancing competitiveness* and *Coordinating spatial planning*.

Even though, the goal for increasing production is less ambitious than in previous plans, it is still questionable whether it will be possible to achieve these goals. From 2012 to 2014, the production volume was raised by 2 200 tonnes from 44 200 to 46 400 tonnes, which was mainly due to an increase of sea cage farming. The administrative procedures are still perceived by the farmers to be the main hindrance for raising production volume, as it has been very time consuming to go from the existing feed quota system to the new output based regulation focusing on nitrogen emissions.

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[1] Strategi for bæredygtig udvikling af akvakultursektoren i Danmark 2014-2020

by: NaturErhvervstyrelsen, Ministeriet for Fødevarer, Landbrug og Fiskeri, Miljøstyrelsen og Naturstyrelsen, Miljøministeriet

The eel farmers are expected to decrease production due to the restriction on the harvesting of glass eels. Furthermore, this restriction drives up prices on glass eels making it less profitable to produce eel. The mussel farmers are expected to increase production and turnover, but it is still questionable if the profit will be positive.

4.7.7 Data Coverage and Data Quality

Data quality

The account statistic for 2014 is based on a sample of 123 aquaculture farms, which covers 56% of the total population of 221 farms. The sample covers 78% of the total income of the population. Furthermore, data on sales volume and value, purchase of livestock raw material of fish are available for all farms.

The Danish AgriFish Agency (formerly The Danish Directorate of Fisheries) has registered the total population of farms and enterprises engaged in aquaculture production in Denmark. It is mandatory for all aquaculture producers in Denmark to report the production in volume and value each year at the farm level. Furthermore, the species produced and the technique used in the production is reported.

The data for The Danish Account Statistics for Aquaculture is collected by Statistics Denmark. The collection is based on the total population of farms provided by The Danish AgriFish Agency. The data is collected at farm level, and can be aggregated to the enterprise level. The data is collected at farm level to get the most homogeneous segments in terms of species and technique. The Danish Account Statistics for Aquaculture collects economic data for costs and earnings and balance sheets. Data is collected on a voluntary basis from the owner’s chartered accountant. The accountant’s task is to report the accounts of his aquaculture clients to Statistics Denmark in a special form where the account information is harmonized for statistical use. Statistics Denmark validates the data from each account in a specially designed data system for quality control.

The extrapolation of the sample to the total population is done in two steps. In the first step all results from the collected accounts are entered into a database containing information on all existing aquaculture producers in Denmark. From the collected accounts an average is calculated for all indicators in each segment. In the second step, an account for the remaining population is estimated based on the average calculated in the first step and the information collected by the The Danish AgriFish Agency. The underlying assumption for this calculation is that the production function for each farm is identical within each segment. If the production function is identical, the costs and earnings can be distributed from the sales volume and value in each account.

Data availability

Data for the aquaculture sector is published once a year in an aggregated form at farm level as well as enterprise level for each segment. The aquaculture statistics are published on Statistics Denmark’s website approximately 12 months after the end of the reference year.

Confidentiality

The 4 segments that are surveyed in Denmark are presented in Table 4.7.4. To avoid problems with confidentiality, segments should in general include more than 10 enterprises. In Denmark, both the production of the sea cages farms and the production of eel and other species in land based recirculation systems are quite significant in terms of value, and even though these two segments include less than 10 companies, they are surveyed. In order to present detailed data collected from these two segments, nearly all enterprises have agreed to participate in the survey.

All segments provided by Statistics Denmark have a high degree of homogeneity both concerning the species and technique. At farm level the separation of species into segments is 100%, but if an enterprise produces more than one species, then it is allocated to the segment of the species that contributes the most to the turnover.

Some enterprises own more than one farm using different techniques. In Denmark these activities are split up, because the farm is used as data collection unit. When farms are aggregated into enterprises again, the enterprise is allocated to the segment, where its turnover is highest. There are very few examples of enterprises using more than one technique.

Differences in DCF data compared with other official data sources

The Danish data for DCF is, in most cases, in line with both value and production registered in FAO and EUROSTAT. However, the Danish data for the freshwater sector provided for the DCF also contains value and volume for the Danish hatcheries and nurseries and production of smolts for the sea cage farms. The volume and value therefore exceeds the volume and value registered in FAO and EUROSTAT, which only contains the value and volume for fish for consumption. Furthermore, the value registered for the marine production is also a bit higher due to the income registered for DCF is turnover where the calculated value for the fish in FAO and EUROSTAT is first sale prices of the fish sold.

Furthermore, there are some differences in the volume and value collected by the Danish AgriFish Agency, who reports to EUROSTAT and FAO, and Statistics Denmark which reports to DCF. In general, both volume and value are higher in Statistics Denmark Aquaculture Account Statistics. The reason is that the value and volume in the Account Statistics are measured in enterprise sales, while the numbers from the Danish Directorate of Fisheries are measured as farm production and revenue as production value in farm gate prices. Secondly, the data collected by Statistics Denmark are account data and the account year does not necessarily coincide with the calendar year.

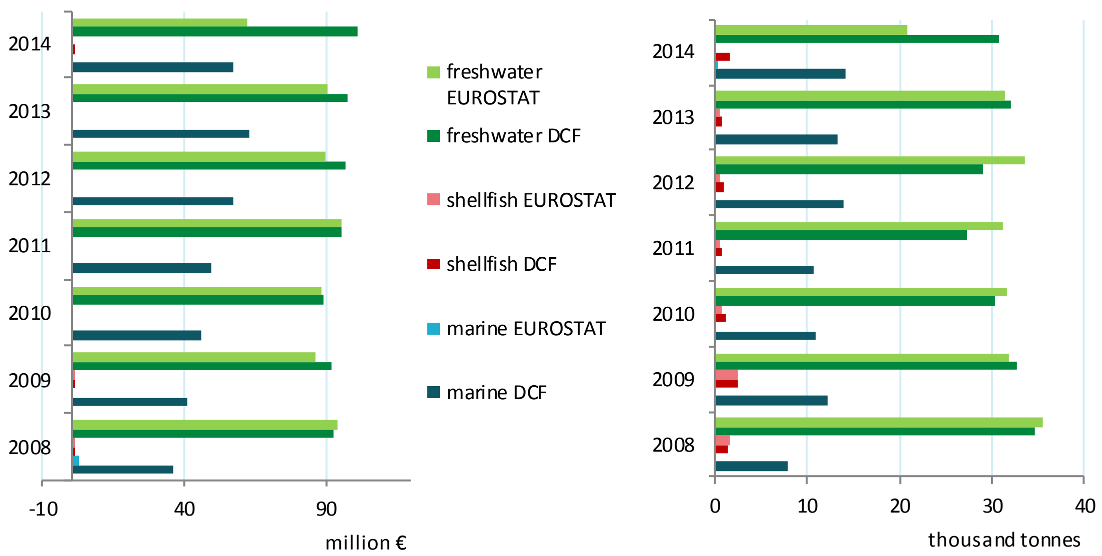


Figure 4.7.10 Comparison of DCF data with EUROSTAT data for Denmark: 2008-2014

4.8 Estonia

4.8.1 Summary

Production volume and value

Enterprises whose primary activity was defined "Fish farming" produced 364 tonnes rainbow trout in 2014, which corresponded to an increase of 5% from 2013 to 2014. On the other hand, the total value of the production was €1.54 million in 2014, which corresponded to an increase of 14% over the same period. From 2009 to 2014, the total volume increased by 18%, whereas the total value increased by 33%.

Overall industry structure and employment

In 2014, the total population of primary trout farming enterprises was nine and dominated by small enterprises with less than five employees. 89% of those enterprises had less than five employees. The total number of persons employed was 36, corresponding to 30 FTEs.

Main segments

The production of trout is divided into two segments based on fish farming technique. The largest segment is the land based fresh water trout combined farms, which consists of a combination of hatcheries, nurseries and grow-out farms. The second segment is the land based fresh water trout on growing farms.

Current production trends and main drivers (Trends and triggers)

Due to the small volume the rainbow trout are mainly marketed domestically. The production volume of primary trout farming sector has been greatly affected by weather conditions. The production of Estonian aquaculture sector decreased significantly in 2011. The reason for that was heat wave in 2010 which caused a great loss in rainbow trout production. Undoubtedly this event has had an impact on production also in the following (2012-2014) years. However, current data show that production volumes of the Estonian trout producers are recovering. In addition to already operating fish farms the growth in production from the new farms, which have been created with support from the European Fisheries Fund, is increasing. Companies have begun to invest in indoor fish farming (closed) aquaculture systems. Although these farms are energy consuming, they give the opportunity to grow and deliver production throughout the year and more environmentally friendly. Also they are no longer dependent on environmental conditions.

Outlook for future production trends

Currently, Estonian fish farmers have difficulties to compete with imported trout and salmon products in the domestic market. According to the Estonian multiannual national plan for the development of sustainable aquaculture the vision for 2020 is to build up a leading position in the domestic market of Estonia and become a successful exporter of species that suit local farming conditions and have a high demand in foreign markets (e.g. eel, sturgeons, whitefish, perch, pike-perch, crayfish). Priority is given to developing the competitiveness of already existing businesses and to investing in the expansion of companies which are successful on the market. In 2020, the Estonian aquaculture sales volume should to reach 3 000 tonnes. This number is consistent with the investments are made in aquaculture sector.

4.8.2 Production and sales

Enterprises whose primary activity was defined "Fish farming" produced 364 tonnes rainbow trout in 2014, which corresponded to an increase of 5% from 2013 to 2014. On the other hand, the total value of the production was €1.54 million in 2014, which correspond to an increase of 14% over the same period. From 2008 to 2014, the total volume increased by 18%, whereas the total value increased by 33%.

Table 4.8.1 Production and sales for primary trout farming enterprises in Estonia: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Sales weight (thousand tonnes)	***0.3***	***0.4***	***0.3***	***0.2***	***0.3***	***0.3***	***0.4***	*5%*	*18%*
Marine	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Shellfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Freshwater	0.3	0.4	0.3	0.2	0.3	0.3	0.4	*5%*	*18%*
Hatcheries & nurseries	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Sales value (million €)	***1.4***	***1.3***	***1.1***	***0.7***	***1.1***	***1.4***	***1.5***	*14%*	*33%*
Marine	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Shellfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Freshwater	1.4	1.3	1.1	0.7	1.1	1.4	1.5	*14%*	*33%*
Hatcheries & nurseries	0.0	0.0	0.0	0.0	0.0	0.0	0.0		

Source: EU Member States DCF data submission

4.8.3 Industry structure and employment

In 2014, the total population of primary trout farming enterprises was nine and dominated by small enterprises with less than five employees. 89% of those enterprises had less than five employees.

Table 4.8.2 Structure of the Estonian aquaculture sector (primary trout farming enterprises): 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Structure (number)									
Total enterprises	*8*	*8*	*7*	*7*	*8*	*9*	*9*	*0%*	*15%*
<=5 employees	8	8	7	7	7	8	8	*0%*	*7%*
6-10 employees	0	0	0	0	1	1	1	*0%*	*200%*
>10 employees	0	0	0	0	0	0	0		*0%*
Employment (number)									
Total employees	24	20	20	21	28	32	36	*13%*	*49%*
Male employees	17	14	14	15	20	23	26	*13%*	*51%*
Female employees	7	6	6	6	8	9	10	*11%*	*43%*
FTE	15	12	14	16	24	27	30	*11%*	*67%*
Male FTE	11	9	10	12	17	19	22	*16%*	*69%*
Female FTE	4	3	4	4	7	8	8	*0%*	*60%*
Indicators									
FTE per enterprise	1.9	1.5	2.0	2.3	3.0	3.0	3.3	*11%*	*46%*
Average wage (thousand €)	9.4	9.6	8.3	9.5	9.8	12.1	10.7	*-11%*	*10%*
Labour productivity (thousand €)	48.7	34.7	15.6	3.6	5.6	-0.5	2.6	*-670%*	*-85%*

Source: EU Member States DCF data submission

The total number of people employed was 36, corresponding to 30 FTEs. From 2013 to 2014, the number of employees increased by four people. From 2008 to 2014, the development trend of total employees increased by 49%. In 2014, 28% of the employees in the sector were women. The average FTE per enterprise increased by 11% from 2013 to 2014, whereas the average wage decreased by 11% over the same period.

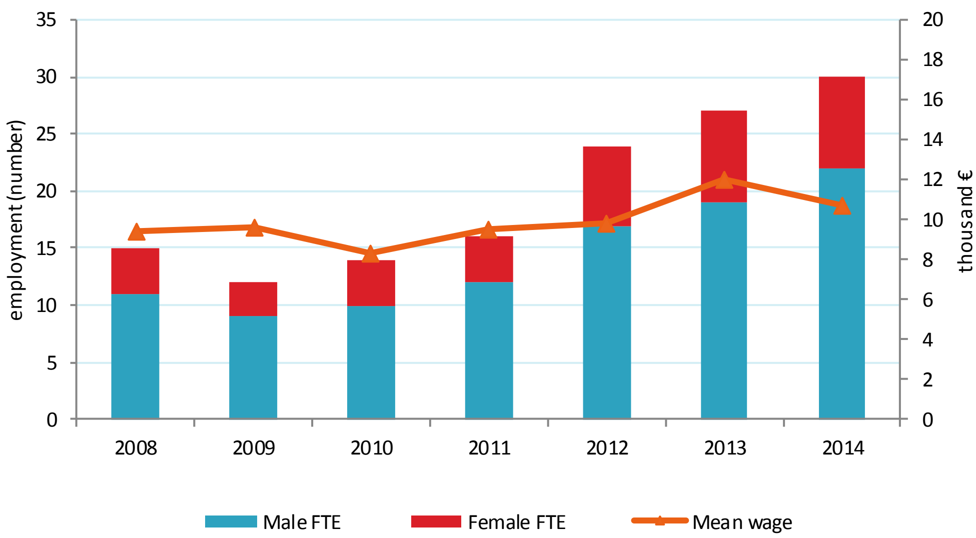


Figure 4.8.1 Employment trends for Estonia (primary trout farming enterprises): 2008-2014.

Source: EU Member States DCF data submission

The number of enterprises and the average number of FTE per enterprise have increased compared to 2008. However, the labour productivity decreased over the same period.

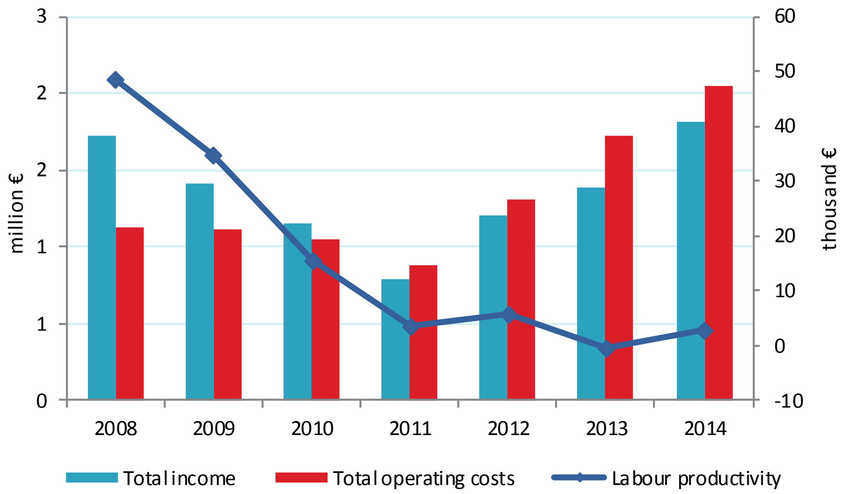


Figure 4.8.2 Income, costs, wages and labour productivity trends for primary trout farming enterprises in Estonia: 2008-2014.

Source: EU Member States DCF data submission

4.8.4 Economic performance

After the heat wave in 2010, which caused a great loss in rainbow trout production, the production volumes of the Estonian trout producers are recovering. Also the starting of production in new trout farms is behind the current figures of economic performance. Due to peculiarities of the aquaculture sector, it will take several years to achieve the capacity of maximum production, while production start-up costs continue to exceed income.

Table 4.8.3 Economic performance of the Estonian aquaculture sector (primary trout farming enterprises): 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	% of total income	Change 2014-13	Development 2014/(2008-13)
Income (million €)										
Turnover	1.4	1.3	1.1	0.7	1.1	1.4	1.5	85%	14%	33%
Other income	0.3	0.1	0.1	0.1	0.1	0.0	0.3	15%	872%	135%
Subsidies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0%	0%	0%
Total income	*1.7*	*1.4*	*1.2*	*0.8*	*1.2*	*1.4*	*1.8*	100%	31%	42%
Expenditures (million €)										
Wages and salaries	0.1	0.1	0.1	0.1	0.2	0.3	0.3	17%	-1%	92%
Imputed value of unpaid labour	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1%	-1%	-11%
Energy costs	0.1	0.1	0.1	0.1	0.2	0.3	0.3	16%	5%	99%
Repair and maintenance	0.0	0.1	0.1	0.0	0.1	0.0	0.0	3%	117%	3%
Raw material: Feed costs	0.7	0.6	0.6	0.4	0.6	0.6	0.8	47%	30%	44%
Raw material: Livestock costs	0.1	0.0	0.1	0.0	0.1	0.1	0.1	7%	15%	98%
Other operational costs	0.1	0.1	0.1	0.2	0.2	0.3	0.4	23%	24%	141%
Total operating costs	*1.1*	*1.1*	*1.0*	*0.9*	*1.3*	*1.7*	*2.1*	113%	19%	71%
Capital Costs (million €)										
Depreciation of capital	0.1	0.1	0.1	0.1	0.1	0.1	0.2	11%	31%	73%
Financial costs, net	0.1	0.1	0.0	0.1	0.1	0.2	0.2	9%	-14%	98%
Extraordinary costs, net	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0%	0%	-100%
Capital Value (million €)										
Total value of assets	3.5	3.4	3.0	3.4	7.2	8.9	9.5	523%	7%	94%
Net Investments	0.1	0.1	0.1	0.6	0.2	0.3	0.1	4%	-77%	-67%
Debt	1.4	1.5	1.2	2.2	5.5	5.8	5.7	316%	-2%	95%
Input & Production (thousand tonnes)										
Raw material: Feed	0.5	0.5	0.4	0.3	0.5	0.5	0.6		24%	36%
Raw material: Livestock	0.1	0.1	0.1	0.0	0.0	0.0	0.0		25%	-33%
Performance Indicators(million €)										
Gross Value Added	0.7	0.4	0.2	0.1	0.1	0.0	0.1	4%	733%	-69%
Operating cash flow	0.6	0.3	0.1	-0.1	-0.1	-0.3	-0.2	13%	28%	-417%
Earning before interest and tax	0.5	0.2	0.0	-0.2	-0.2	-0.5	-0.4	24%	10%	-1207%
Net profit	0.4	0.1	-0.1	-0.2	-0.3	-0.7	-0.6	33%	11%	-421%
Capital productivity (%)	21.0	12.4	7.3	1.7	1.9	-0.1	0.8		693%	-89%
Return on Investment (%)	14.0	5.8	-0.3	-5.0	-3.0	-5.5	-4.6		16%	-555%
Future Expectation Indicator (%)	-1.4	0.4	-1.5	16.1	1.6	2.1	-1.2		-156%	-141%

Source: EU Member States DCF data submission

From 2013 to 2014, total income increased by 31%, while the operational cost increased by 19%, see Table 4.8.3. Taking into account the share to the total income the expenditures are dominated by cost of feed (47%), other operational costs (23%) and cost of wages and salaries (17%), in 2014. The total expenditures make up for 113% of the total income. Except for imputed value of unpaid labour all other expenditure variables have increased from 2008 to 2014.

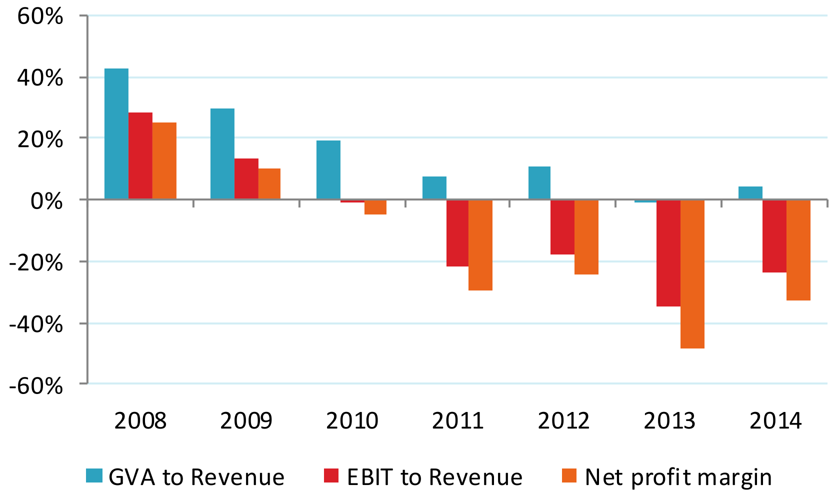


Figure 4.8.3 Economic performance for Estonia (primary trout farming enterprises): 2008-2014

Source: EU Member States DCF data submission

From 2013 to 2014, the gross value added (GVA) increased, but both EBIT and net profit were negative. The total value of assets increased by 7%. The net investments and debts decreased by 77% and 2%, respectively.

4.8.5 Main species produced and economic performance by segment

According to the Eurostat the rainbow trout is the main species produced by the Estonian aquaculture sector, representing almost 66% (570 tonnes) in quantity and 55% (€1.94 million) in value of total production in 2014. Other less important fish species are eel, common carp and sturgeons. Additionally, a few enterprises provide very limited production of some local fish species mainly for restocking. Salmonids are reared for restocking by two state-financed farms. Also some crayfish farms are operating in Estonia.

The average price for trout produced in Estonia decreased in 2009, see Figure 4.8.4. This decrease was probably due to the economic crisis. However, the average price has been increasing afterwards, for the period from 2009 to 2014.

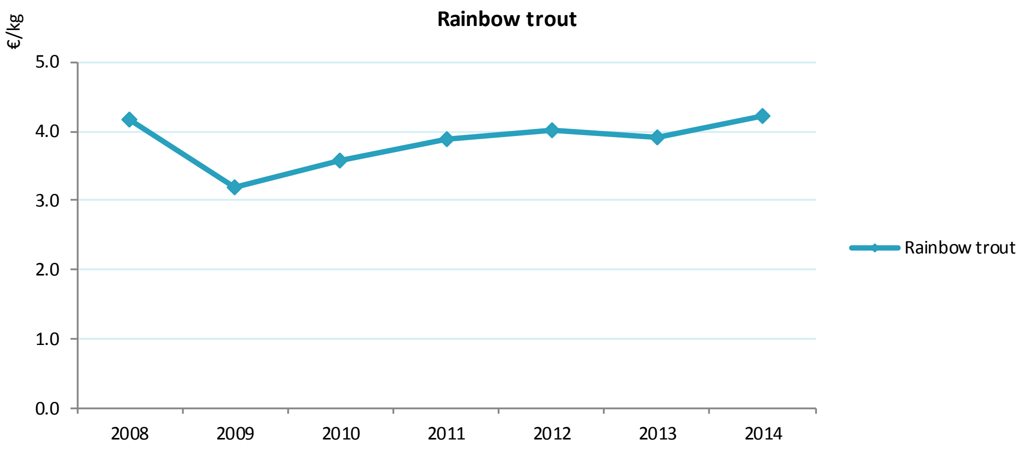


Figure 4.8.4 Average prices for the main species produced in Estonia: 2008-2014.

Source: EU Member States DCF data submission

The production of trout is divided into two segments based on the technique. Those segments are described below.

Segment 1: Trout combined

The most important segment was land based fresh water trout combined farms in 2014. In most cases enterprises in Estonia combine the production in hatcheries and nurseries with grow out farms. The segment consists of six enterprises. The production volume was 310 tonnes with a corresponding income of €1.3 million. The production volume accounts for 83% and the value accounts for 81% of the total trout production.

Segment 2: Trout on growing

The second segment was land based fresh water trout on growing farms in 2014. The segment consists of three enterprises. The production volume was 54 tonnes with a corresponding income of €0.3 million.

Observing the structural development of primary trout farming enterprises in Figure 4.8.5, it can be seen that the share of trout combined segment increased in 2012. Reasons for that were the moving of a larger enterprise from the trout on growing segment to the trout combined segment, but also the addition of new companies.

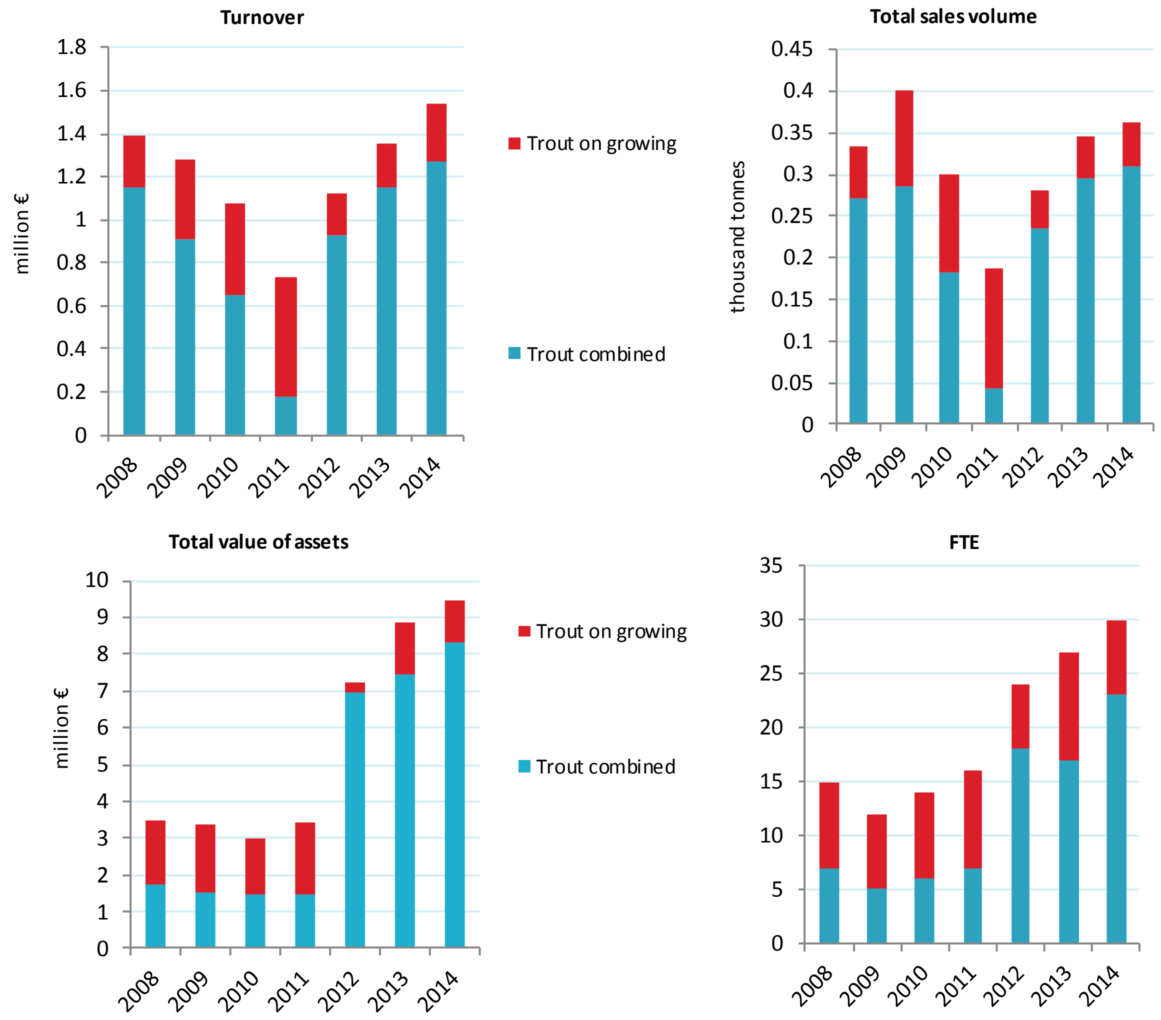


Figure 4.8.5 Structural development Estonian aquaculture sector: 2008-2014.

Source: EU Member States DCF data submission

The economic performance of the two Estonian segments is shown in Table 4.8.4 and Figure 4.8.6. It can be seen that the developments of the different variables are quite different. The economic performance of the trout combined segment was mainly affected by the heat wave in 2010. Both segments were also affected by the economic crisis and changes of enterprises in the segments.

Table 4.8.4 Economic performance of main Estonian aquaculture segments: 2008-2014 (in million €).

Variable	2008	2009	2010	2011	2012	2013	2014	*% of total income*	Change 2014/13	Development 2014/(2008-13)
Trout combined										
Total income	*1.3*	*1.0*	*0.7*	*0.2*	*1.0*	*1.2*	*1.5*	*100%*	*31%*	*74%*
Gross Value Added	*0.6*	*0.4*	*0.1*	*-0.1*	*0.1*	*0.1*	*0.2*	*13%*	*163%*	*0%*
Operating cash flow	*0.5*	*0.3*	*0.1*	*-0.2*	*0.0*	*-0.2*	*-0.1*	*4%*	*60%*	*-170%*
Earning before interest and tax	*0.5*	*0.3*	*0.0*	*-0.2*	*-0.2*	*-0.3*	*-0.2*	*15%*	*15%*	*-1187%*
Net profit	*0.5*	*0.2*	*0.0*	*-0.2*	*-0.2*	*-0.4*	*-0.3*	*23%*	*18%*	*-851%*
Total sales volume (thousand tonnes)	*0.3*	*0.3*	*0.2*	*0.0*	*0.2*	*0.3*	*0.3*		*5%*	*42%*
Trout on growing										
Total income	*0.5*	*0.4*	*0.5*	*0.6*	*0.2*	*0.2*	*0.3*	*100%*	*32%*	*-31%*
Gross Value Added	*0.1*	*0.1*	*0.1*	*0.2*	*0.0*	*-0.1*	*-0.1*	*-43%*	*-35%*	*-295%*
Operating cash flow	*0.1*	*0.0*	*0.0*	*0.1*	*-0.1*	*-0.2*	*-0.2*	*-67%*	*2%*	*-1714%*
Earning before interest and tax	*0.0*	*-0.1*	*-0.1*	*0.0*	*-0.1*	*-0.2*	*-0.2*	*-75%*	*4%*	*-274%*
Net profit	*0.0*	*-0.1*	*-0.1*	*0.0*	*-0.1*	*-0.2*	*-0.2*	*-90%*	*0%*	*-174%*
Total sales volume (thousand tonnes)	*0.1*	*0.1*	*0.1*	*0.1*	*0.0*	*0.0*	*0.1*		*8%*	*-40%*

Source: EU Member States DCF data submission

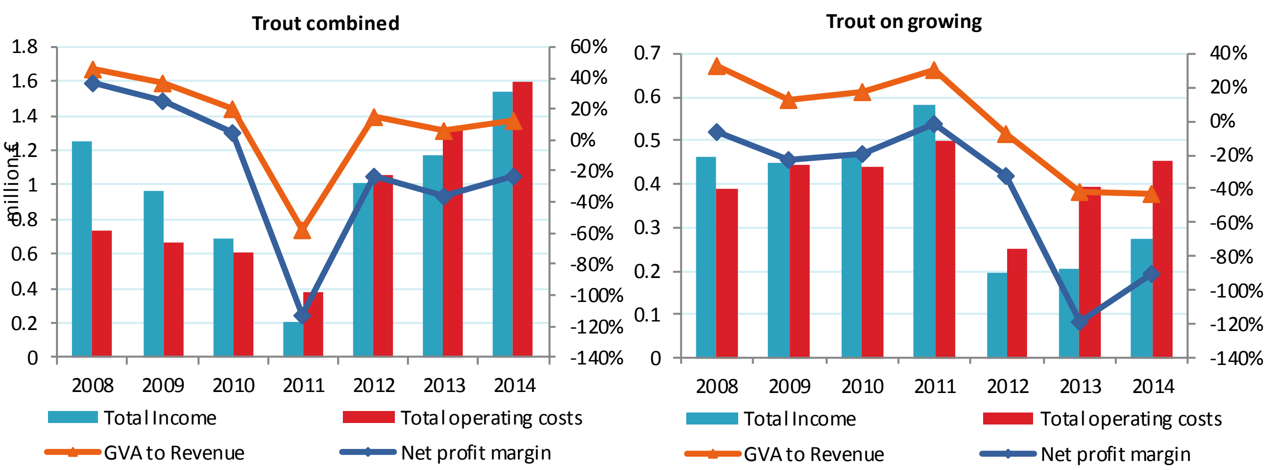


Figure 4.8.6 Economic performance indicators for the main Estonian segments: 2008-2014.

Source: EU Member States DCF data submission

In Figure 4.8.7, the operational cost structures for the two segments are presented.

Segment 1: Trout combined

The main cost components are feed costs (39%), other operational costs (20%), and costs of wages and salaries and energy costs (14% each).

Segment 2: Trout on growing

The shares of cost components are rather similar to previous segment. The feed costs are also the most important covering 31% of the total operational costs. However, the share of livestock costs (24%) is much higher.

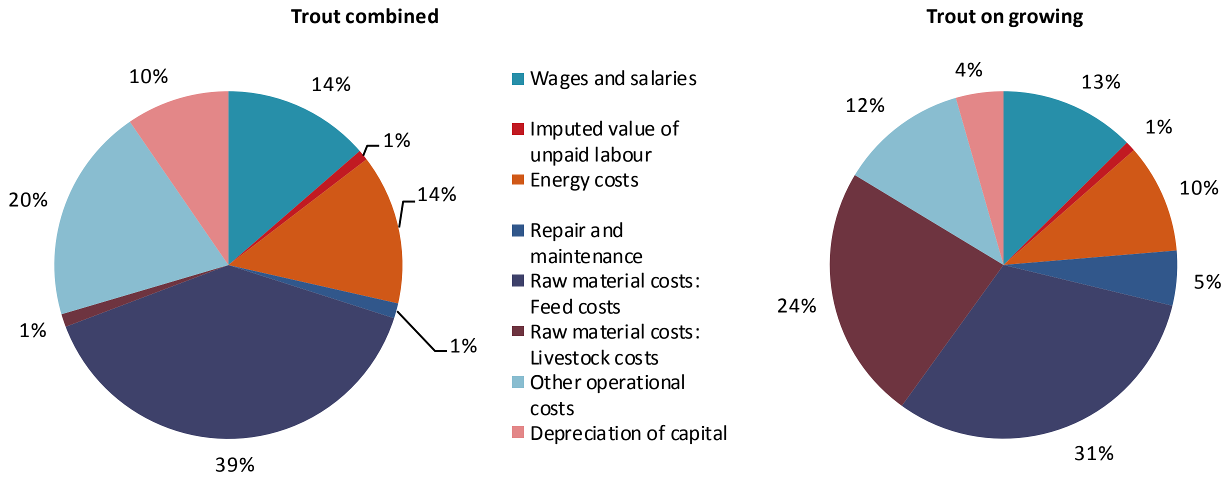


Figure 4.8.7 Cost structure of the main segments in Estonia: 2014.

Source: EU Member States DCF data submission

In Figure 4.8.8, the feed and livestock prices for the two segments are presented. Figures reveal that the price of feed has maintained its level through the years 2008-2014, but same time the price of livestock has increased.

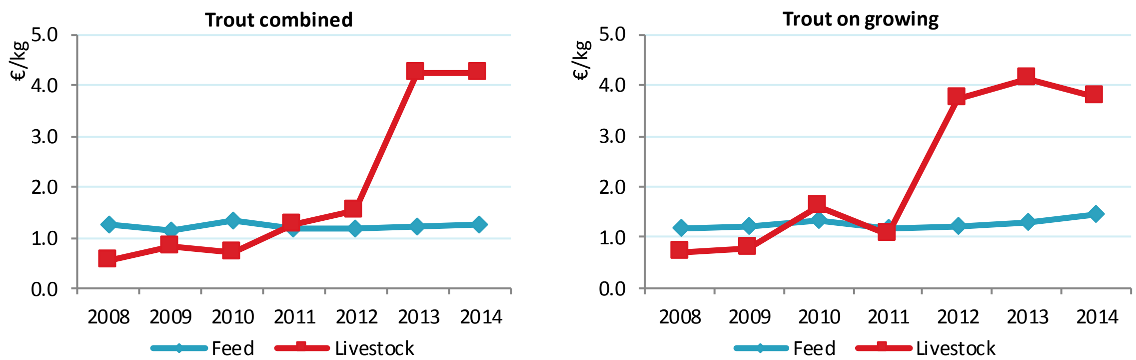


Figure 4.8.8 Feed and livestock prices for the main Estonian segments: 2008-2014.

Source: EU Member States DCF data submission

4.8.6 Trends and triggers

Current production trends and main drivers

Due to the small volume the rainbow trout are mainly marketed domestically. The production volume of primary trout farming sector has been greatly affected by weather conditions. The production of Estonian aquaculture sector decreased significantly in 2011. The reason for that was heat wave in 2010 which caused a great loss in rainbow trout production. Undoubtedly this event has had an impact on production also in the following (2012-2014) years. However, current data show that production volumes of the Estonian trout producers are recovering. In addition to already operating fish farms the growth in production from the new farms, which have been created with support from the European Fisheries Fund, is increasing.

Natural resources such as water and land do not limit development of fish farming in Estonia. However, the lack of investment capital and know-how has been the main factors restricting the development of fish farming in Estonia. The majority of Estonian fish farms are family owned and run, therefore success depends on the owner's knowledge and financial capacity. To some extent support from European Fisheries Fund (EFF) helps to solve the problem of investment capital. Around €13 million was allocated from EFF for the establishment and modernization of fish farms.

Market structure

Due to its small size, the aquaculture sector has little influence on the national economy in Estonia. Low production volumes cannot secure year-round supply for large supermarket chains or attract the interest of exporters. The relatively high production cost of red-flesh trout makes it difficult to compete with similar products imported from Norway. However, some fish farms have started to add value for products through processing and increasing the quality (filleting, salting, marinating, smoking) which can help to broaden the market and raise profitability. The rainbow trout and common carp are mainly marketed domestically. Eel production has increased and most is exported. Aquaculture has a little more influence on the economy through tourism, because they supply put-and-take ponds which are an attractive part of leisure time activities in many holiday houses. There are over 60 fishing tourism enterprises in Estonia that buy fish from fish farms and offer angling services in their ponds. Some enterprises are testing the cultivation of new fish species which may also expand marketing possibilities (e.g. African catfish, Arctic char, tilapia).

Issues of special interest

Currently, Estonian fish farmers have difficulties to compete with imported trout and salmon products in the domestic market. According to the aquaculture development strategy the areas to be addressed for production growth are:

- Strengthen the competitiveness through targeting investments to the technologies and solutions that improve efficiency and quality of production;
- The use of domestic market advantage;
- Aquaculture business collaboration and strategic partnerships;
- Development of value-added and differentiated products;
- Cultivation of species which are suitable for Estonian natural conditions and have high foreign demand (e.g. eel, sturgeons, whitefish, perch, pike-perch, crayfish);
- Development of a supportive business environment for the promotion of aquaculture;
- Specific knowledge and skills acquisition.

In the last years companies have begun to invest in indoor fish farming (closed) aquaculture systems. Although these farms are energy consuming, they give the opportunity to grow and deliver production throughout the year and more environmentally friendly. Also they are no longer dependent on environmental conditions.

Outlook for future production trends

According to the Estonian multiannual national plan for the development of sustainable aquaculture the vision for 2020 is to build up a leading position in the domestic market of Estonia and become a successful exporter of species that suit local farming conditions and have a high demand in foreign markets (e.g. eel, sturgeons, whitefish, perch, pike-perch, crayfish). Priority is given to developing the competitiveness of already existing businesses and to investing in the expansion of companies which are successful on the market. In 2020, the Estonian aquaculture sales volume should to reach 3 000 tonnes. This number is consistent with the investments are made in aquaculture sector.

4.8.7 Data Coverage and Data Quality

Due to the small number of commercial fish farming companies it was reasonable to collect data only concerning rainbow trout (enterprises whose primary activity was defined "Fish farming"); concerning other species the value of production was too small to justify any sampling activities. There was also a threat to confidentiality. That is a reason why DCF and EUROSTAT data may be different (Figure 4.8.9). The data were collected through Statistics Estonia and the questionnaires by Estonian Marine Institute.

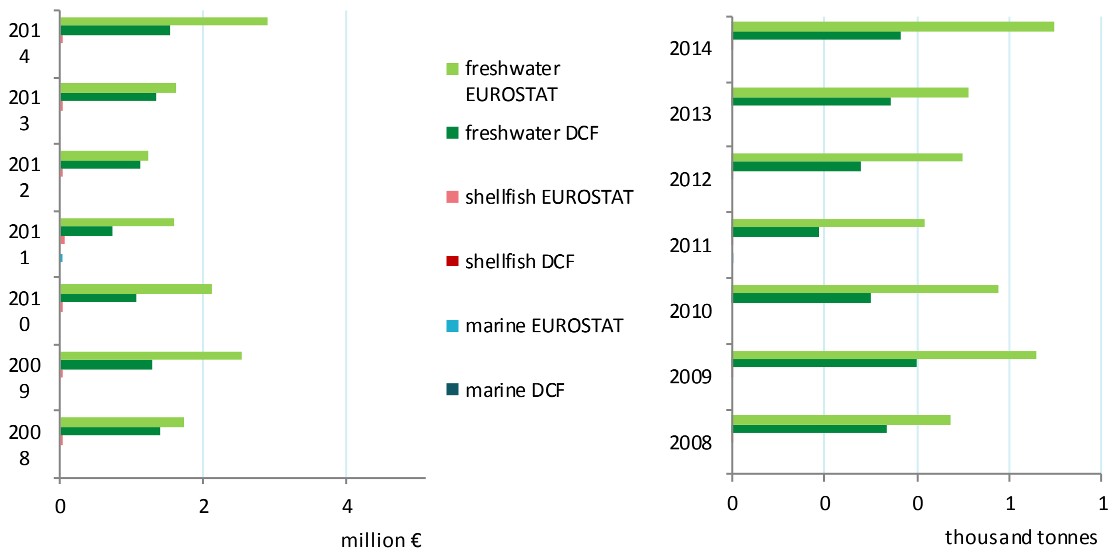


Figure 4.8.9 Comparison of DCF data with EUROSTAT data for Estonia: 2008-2014

4.9 Finland

4.9.1 Summary

Production volume and value

The Finnish aquaculture sector produced 11 722 tonnes of fish and fry in 2014, while the total value of the production was €54 million creating turnover of €60 million. The volume of production increased by 3%, but the value of production remained at the 2013 level. The aquaculture sector is getting more and more concentrated. The ten biggest companies in the sector in terms of turnover made up half of the total revenues in 2014.

The food fish supply consisted mainly of rainbow trout. Around 80% of the total production value and 90% of the production volume was rainbow trout in 2014. European whitefish production is also important part of the Finnish food fish supply. European whitefish accounted for 10% of the production value and 5% of the total production volume in 2014. The production of fry in fish farms consists mainly of rainbow trout fry for food fish farming. Fish farms produce also Baltic salmon, landlocked salmon, brown trout, sea trout, char and brook trout fry. Hatcheries and nurseries generated 11% of the total turnover of the sector.

Overall industry structure and employment

There were 170 main activity aquaculture companies in operation in Finland in 2014. This was 5 companies more than in 2013. The employment of the sector decreased. The aquaculture sector employed 329 FTEs which was 11% less than in 2013.

Main segments

Finnish aquaculture sector has been disaggregated into 4 segments. Three of them are segments of other fresh water fish; the combined production of juveniles and food fish, food fish production inland (on growing) and hatcheries and nurseries. The fourth and one of the most important segments is the marine aquaculture of trout (in cages). The hatcheries and nurseries segment includes natural food ponds. The trout cages segment includes rainbow trout production at sea and the European whitefish production in fresh water cages.

Current production trends and main drivers (Trends and triggers)

The Finnish environmental policy has been preventing from intensifying the Finnish aquaculture production and consequently the sector has not been able to benefit from the economies of scale. Due to the tight environmental permit policy, some of the Finnish aquaculture producers have moved their production to Sweden where the environmental regulation is more favorable for the aquaculture production.

Finland has a national spatial planning program of aquaculture in order to direct the aquaculture production into areas where it is suitable for both the environment and the aquaculture industry. In this way, the environmental effects can be minimized together with creating possibilities for production growth and improving the profitability of the sector.

Number of recirculating systems units have increasing in the recent years. There were 9 recirculating systems units in operation in 2014 in Finland producing 300 tonnes of fish with a value of €2 million. However, high production costs as well as risks related to introducing new technologies impose challenges for this technology. Already two of the production units have been forced to close their production for financial reasons.

The competitiveness and performance of the sector is mostly connected to the price developments of fish, mainly rainbow trout and salmon, but also developments of the feed cost play an important role. Almost all aquaculture production in Finland is consumed in the domestic market. Imports of aquaculture product account for about 40% of the total fish consumption in Finland.

Outlook

The total food fish production was 14 900 tonnes and €56 million in 2015. There was an increase in both, the value and volume of production. These figures include all aquaculture fish production for human consumption in Finland, not only the production of the main activity companies. In addition to food fish, aquaculture sector produced fry totaling 50 million individuals of different ages, both for stocking and further rearing.

The administration of national environmental control system is being developed and reorganized in order to make the system more predictable to attract more investments in the sector. The Finnish government, research organizations and aquaculture industry are working together to find new innovative ways for increasing the marine aquaculture production without increasing the nutrient load in the Baltic Sea. Nowadays the nutrient load of aquaculture production per tonne of fish produced is only one third of what it was in the 1980s. Better spatial planning and transferring marine aquaculture production in big production units further to the open sea have potential for increasing the production. Offshore open sea production has been piloted in the recent years, but it still faces some technical challenges.

Another potential for increasing the production environmentally friendly is using Baltic Sea fish feed for nutrient neutral aquaculture production. Nutrients of the Baltic Sea are recycled by using Baltic Sea fish feed made of Baltic herring for aquaculture production. In this way, companies can increase their production without getting new environmental permits.

Recirculating aquaculture systems have become more common in Finland in the recent years. The recirculating systems have a great potential as the nutrient load can be easily managed while it is possible to maintain optimal culturing conditions all year round. However, high production costs as well as risks related to introducing new technologies impose challenges for this technology.

4.9.2 Production and sales

The Finnish aquaculture sector produced 11 722 tonnes of fish and fry in 2014 with the total production value of €54 million. The volume of production increased by 3%, but the value of production remained at the 2013 level. The volume of production has increased in the period from 2009 to 2014. The price of rainbow trout has increased in 2013 and 2014 and affected favorably the profitability of the Finnish marine aquaculture.

Table 4.9.1 Production and sales for Finland: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Sales weight (thousand tonnes)	***11.2***	***8.1***	***10.1***	***10.0***	***11.1***	***11.4***	***11.7***	*3%*	*14%*
Marine	6.0	2.1	5.5	5.7	4.3	4.3	5.2	*22%*	*12%*
Shellfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0		*0%*
Freshwater	4.7	5.4	3.9	3.6	6.3	6.6	5.8	*-12%*	*15%*
Hatcheries & nurseries	0.5	0.7	0.7	0.7	0.5	0.6	0.7	*23%*	*17%*
Sales value (million €)	***50.0***	***55.1***	***59.4***	***56.7***	***53.6***	***63.2***	***59.7***	*-5%*	*6%*
Marine	21.8	16.6	30.9	27.0	12.4	18.1	20.2	*11%*	*-4%*
Shellfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0		*0%*
Freshwater	19.6	27.8	15.9	14.7	32.3	36.9	33.0	*-10%*	*35%*
Hatcheries & nurseries	8.6	10.7	12.5	14.9	8.9	8.2	6.5	*-20%*	*-39%*

Source: EU Member States DCF data submission

The food fish supply has consisted mainly of rainbow trout. Around 80% of the production value and 90% of the production volume was rainbow trout in 2014. The rainbow trout production is both combined freshwater production of food fish and juveniles and food fish production in the cages at sea. European whitefish production is also important part of Finnish food fish supply. European whitefish accounted for 10% of the production value and 5% of the total production volume in 2014.

The hatcheries and nurseries produced over 700 tonnes of fry for stocking and further rearing. The production of rainbow trout fry on fish farms was supplied almost exclusively for food fish farming. Fish farms also produced fry of Baltic salmon, landlocked salmon, sea trout, brown trout, char and brook trout.

4.9.3 Industry structure and employment

There were 170 main activity aquaculture companies in operation in Finland in 2014. The number of aquaculture companies has been quite steady between 2009 and 2014. In 2014 the number increased by 3%. The Finnish aquaculture companies have mainly 5 employees or less. There were only 8 bigger companies employing more than 10 persons in 2014.

Table4.9.2 Structure of the Finish aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Structure (number)									
Total enterprises	*180*	*160*	*163*	*166*	*164*	*165*	*170*	*3%*	*2%*
<=5 employees	164	141	143	150	146	140	152	9%	3%
6-10 employees	10	12	12	9	11	16	10	-38%	-14%
>10 employees	6	7	8	7	7	9	8	-11%	9%
Employment (number)									
Total employees	387	449	464	461	430	562	515	-8%	12%
Male employees	296	337	353	355	317	421	387	-8%	12%
Female employees	91	112	111	106	113	141	129	-9%	15%
FTE	300	384	355	360	339	371	329	-11%	-6%
Male FTE	230	288	270	277	250	278	246	-12%	-7%
Female FTE	70	96	85	82	89	93	82	-12%	-4%
Indicators									
FTE per enterprise	1.7	2.4	2.2	2.2	2.1	2.3	1.9	-14%	-9%
Average wage (thousand €)	34.9	34.5	35.8	36.4	39.3	37.7	39.5	5%	8%
Labour productivity (thousand €)	53.4	48.6	55.9	48.2	40.5	40.1	50.5	26%	6%

Source: EU Member States DCF data submission

Employment of the aquaculture sector has decreased since 2009. The aquaculture sector employed 515 persons in 2014 corresponding 329 full time equivalent. The employment decreased by 8% and around 75% of the aquaculture employees were men. On average, there are 1.9 FTEs employed per enterprise. The average annual wage per FTE was €39 500 and the labour productivity €50 500 in 2014. The mean wage has been increasing from 2008 on.

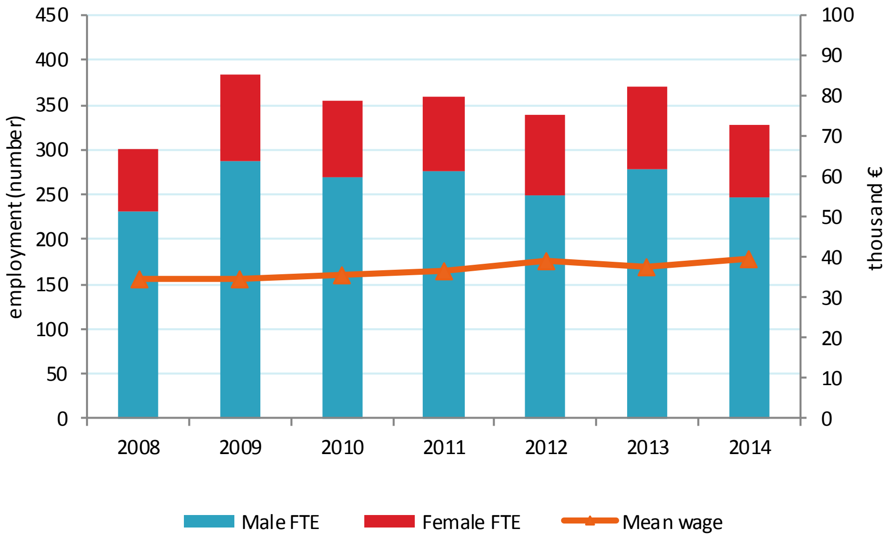


Figure.4.9.1 Employment trends for Finland: 2008-2014.

Source: EU Member States DCF data submission

The total income of the Finnish aquaculture sector has increased from 2008 to 2014. The annual price development of rainbow trout affects greatly on the total income. The most productive year was 2013, when the price of rainbow trout increased. In 2012 the price was low decreasing the total income. In 2014, the total income was €62 million and the operational costs €58 million. Total operating costs increased from 2008 to 2013 and decreased in 2014. The labour productivity decreased from 2010 to 2013, but increased again in 2014.

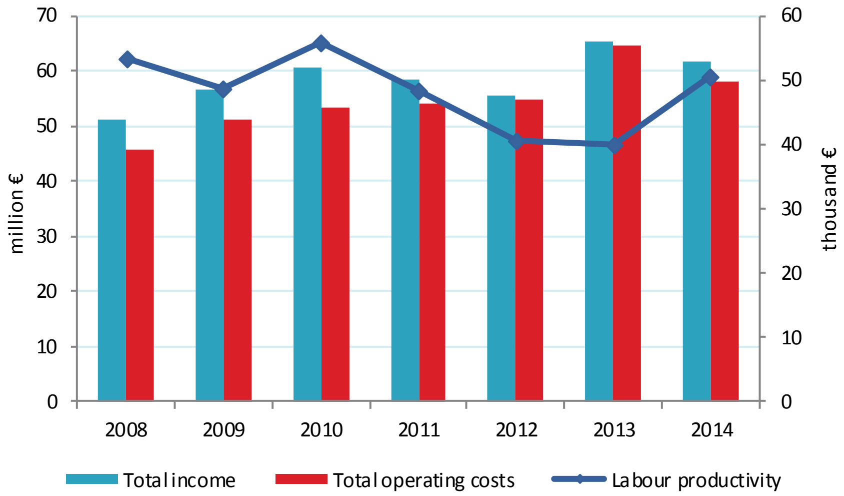


Figure 4.9.2 Income, costs, wages and labour productivity trends for Finland: 2008-2014.

Source: EU Member States DCF data submission

4.9.4 Economic performance

Since 2010, the economic performance of the Finnish aquaculture sector has gotten worse. Although the total income has been high in 2013 and 2014, the total costs have also been high and the sector has been making losses in the recent years. The Finnish aquaculture companies made €60 million turnover and €62 million total income in 2014. Total income is dominated by the turnover from the sale of fish from the farms, which contributes 97% of total income, leaving only 3% to other sources of income. There are very little direct subsidies for the Finnish aquaculture enterprises. Companies receive investment subsidies, but they are not regarded as direct subsidies in the DCF.

Table4.9.1 Economic performance of the Finish aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	% of total income	Change 2014-13	Development 2014/(2008-13)
Income (million €)										
Turnover	50.0	55.1	59.4	56.7	53.6	63.2	59.7	97%	-5%	6%
Other income	1.3	1.3	1.1	1.6	1.8	2.1	1.9	3%	-13%	21%
Subsidies	0.1	0.0	0.1	0.1	0.1	0.0	0.1	0%	40%	-9%
Total income	*51.3*	*56.4*	*60.5*	*58.3*	*55.4*	*65.3*	*61.6*	*100%*	*-6%*	*6%*
Expenditures (million €)										
Wages and salaries	9.1	11.6	11.5	11.4	11.7	12.5	11.5	19%	-8%	2%
Imputed value of unpaid labour	1.3	1.6	1.2	1.7	1.6	1.5	1.5	2%	1%	-2%
Energy costs	1.3	1.4	1.6	1.6	1.6	1.9	3.3	5%	71%	110%
Repair and maintenance	1.7	1.8	2.0	2.0	2.0	2.4	2.3	4%	-8%	14%
Raw material: Feed costs	19.5	20.9	22.5	22.7	23.1	28.0	23.7	38%	-15%	4%
Raw material: Livestock costs	5.0	5.3	5.7	5.8	5.9	7.1	10.6	17%	48%	82%
Other operational costs	7.7	8.2	8.8	8.9	9.1	11.0	5.1	8%	-53%	-42%
Total operating costs	*45.7*	*51.0*	*53.3*	*54.0*	*54.9*	*64.4*	*58.0*	*94%*	*-10%*	*8%*
Capital Costs (million €)										
Depreciation of capital	2.6	2.3	2.6	3.1	3.4	3.2	3.5	6%	11%	24%
Financial costs, net	-0.4	0.4	-0.5	0.0	-0.2	0.8	1.2	2%	43%	3274%
Extraordinary costs, net	-0.5	0.0	-2.0	-0.9	-1.7	-0.5	-0.9	1%	-89%	7%
Capital Value (million €)										
Total value of assets	68.3	58.3	87.8	99.0	99.3	104.3	95.7	155%	-8%	11%
Net Investments	-1.8	-1.9	-2.0	-9.3	-6.5	-1.6	-1.7	-3%	-9%	56%
Debt	37.7	26.7	41.2	55.4	59.6	70.3	64.3	104%	-9%	33%
Input & Production (thousand tonnes)										
Raw material: Feed	15.3	14.2	13.8	15.4	14.3	14.7	13.8		-6%	-6%
Raw material: Livestock	0.6	0.6	0.8	0.9	0.8	0.8	0.9		16%	27%
Performance Indicators(million €)										
Gross Value Added	16.0	18.7	19.8	17.4	13.7	14.9	16.6	27%	12%	-1%
Operating cash flow	5.6	5.4	7.2	4.3	0.5	0.9	3.7	6%	290%	-8%
Earning before interest and tax	3.0	3.1	4.6	1.2	-2.8	-2.2	0.1	0%	106%	-89%
Net profit	3.4	2.7	5.1	1.2	-2.7	-3.1	-1.1	2%	66%	-195%
Capital productivity (%)	23.5	32.0	22.6	17.5	13.8	14.3	17.4		22%	-16%
Return on Investment (%)	4.4	5.4	5.3	1.2	-2.9	-2.2	0.1		107%	-93%
Future Expectation Indicator (%)	-6.4	-7.3	-5.2	-12.5	-9.9	-4.6	-5.5		-20%	28%

Source: EU Member States DCF data submission

The total operating costs were €58 million in 2014. The operating costs were dominated by cost of feed (41%), wages and salaries (20%) and other operational costs (9%). The total operating costs make up for 94% of the total income.

The gross value added decreased and the profitability of the sector got worse from 2010 to 2013. The sector made most losses in 2013, over €3 million. The gross value added increased and the profitability of the sector improved in 2014. The gross value added was €16.6 million and companies made around €1 million of losses. The total value of assets of the Finnish aquaculture sector was €96 million and net investments were €-1.7 million. Total debt of aquaculture companies decreased to €64 million.

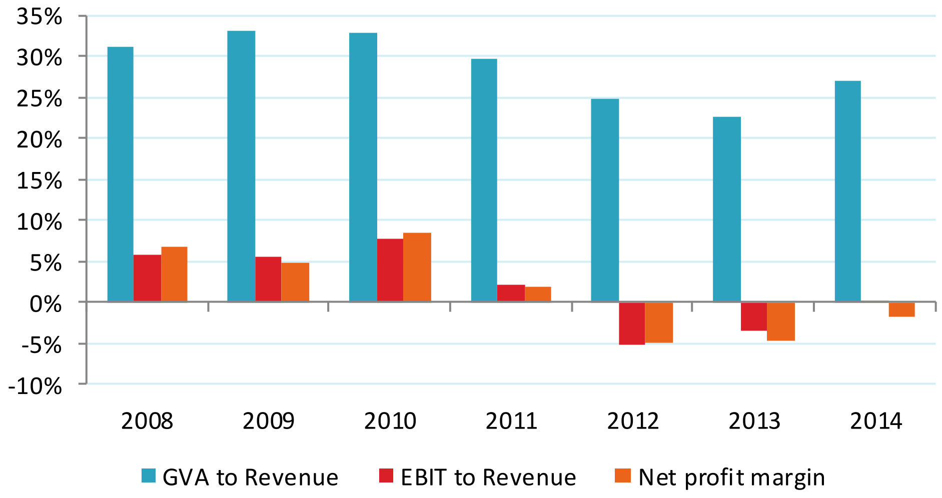


Figure 4.9.3 Economic performance for Finland: 2008-2014

Source: EU Member States DCF data submission

In terms of GVA and EBIT to revenue and net profit margin, years 2012 and 2013 had the lowest records. In 2014 the economic situation improved some, but the aquaculture companies were still making losses.

4.9.5 Main species produced and economic performance by segment

Finnish aquaculture sector is disaggregated into 4 segments.

- Segment 1: Other freshwater fish combined production of juveniles and food fish;
- Segment 2: Trout marine production in cages;
- Segment 3: Other freshwater fish hatcheries and nurseries (including natural food ponds);
- Segment 4: Other freshwater fish on growing (food fish production inland)

The largest segment in terms of production value is the combined production of juvenile and food fish of the fresh water fish. Salmon, trout and rainbow trout production are included in the other fresh water fish category in the Finnish data collection, except for the marine aquaculture. The marine aquaculture production of rainbow trout and European whitefish are included in the trout cages segment.

The main species produced in Finland is rainbow trout, which makes up around 80% of the total value and 90% of the total volume of production. The second important species is European whitefish, which makes up 10% of the total value and 6% of the volume. Sea trout makes up 5% of the production value and 1% of the production volume.

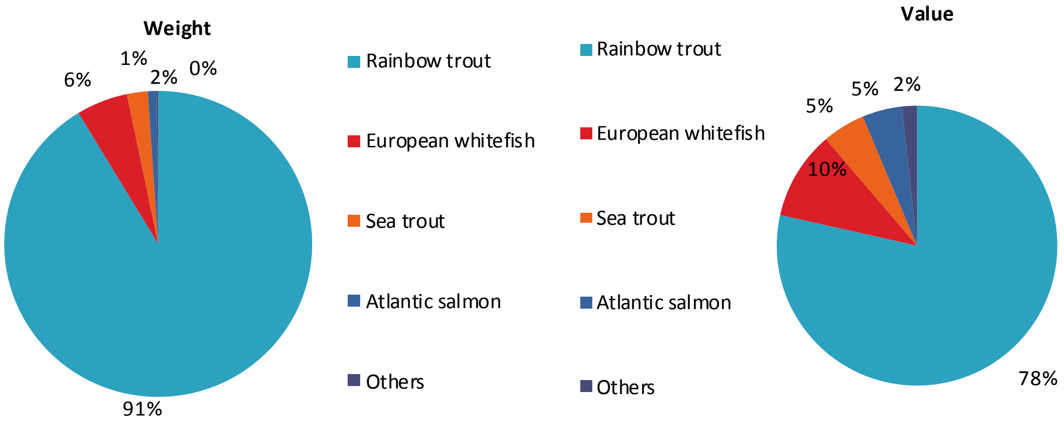


Figure 4.9.4 Main species in terms of weight and value in Finish production: 2014.

Source: EU Member States DCF data submission

The average food fish price for rainbow trout and European whitefish in 2014 was €4.00/kg and €4.20/kg respectively. The average price of Atlantic salmon as food fish was €4.40/kg. The Finnish production of Atlantic salmon and sea trout is mainly juveniles. The average prices in the Figure 4.9.5 are calculated based on the turnover and production volume of all aquaculture production (including both food fish and juveniles/fry) rather than real prices and they should consequently not be regarded as food fish market prices.

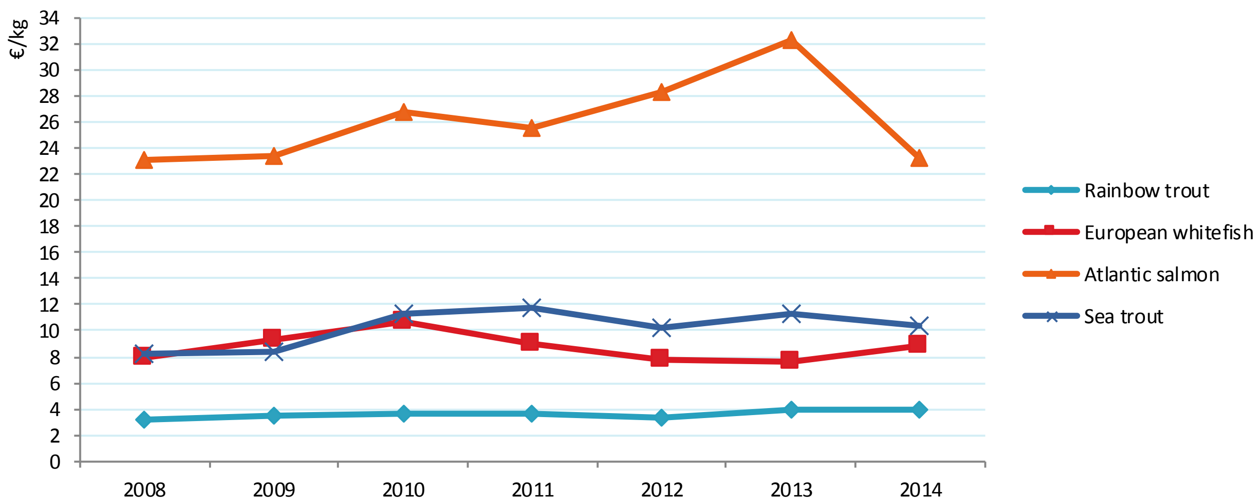


Figure 4.9.5 Average prices for the main species produced in Finland: 2008-2014.

Source: EU Member States DCF data submission

The combined production of juveniles and food fish made up most of the turnover of the Finnish aquaculture sector, but the total sales volume comes equally from the cages at sea. The total assets are relatively high for hatcheries and nurseries, though combined segment has the highest value of assets. The combined segment also employs the most.

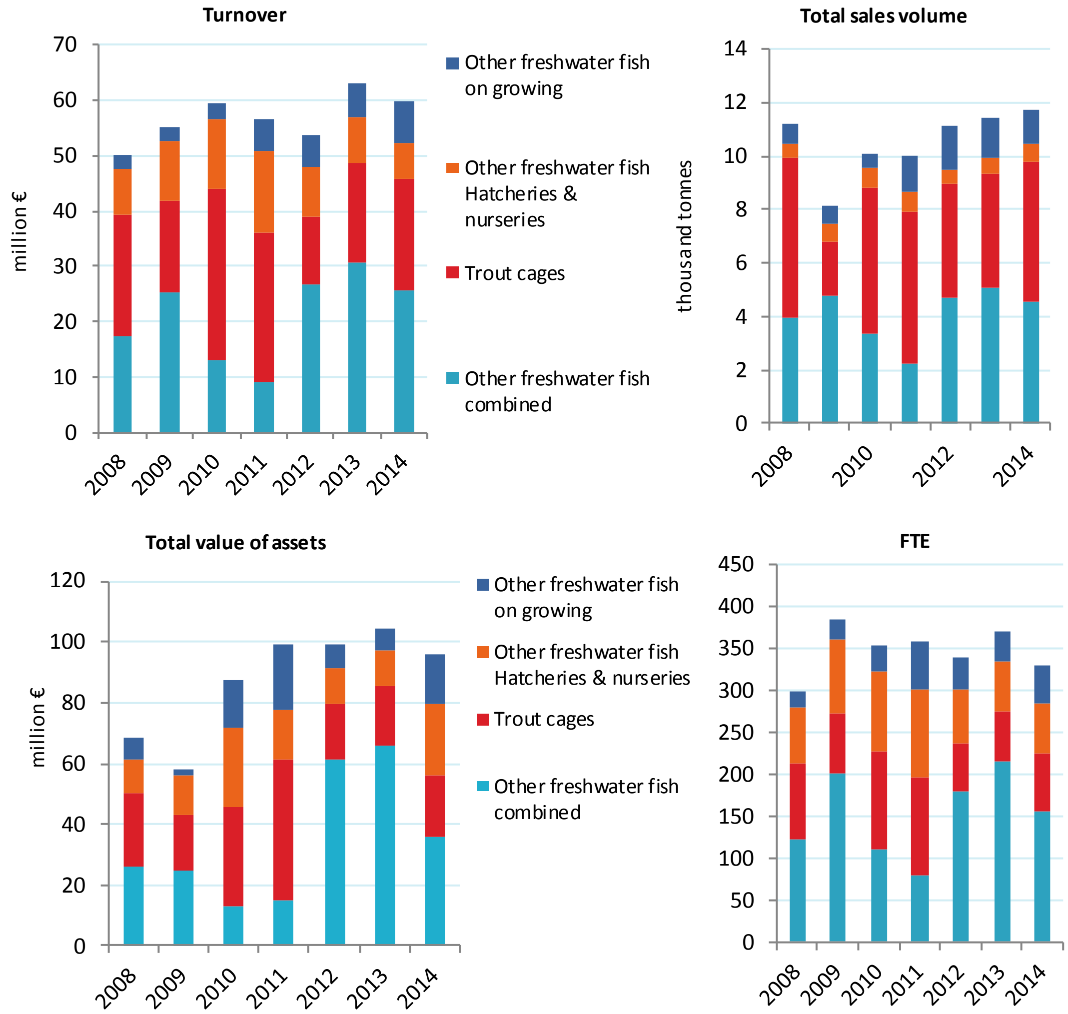


Figure 4.9.6 Structural development Finish aquaculture sector: 2008-2014.

Source: EU Member States DCF data submission

Segment 1: Other fresh water fish combined production of juveniles and food fish

The biggest segment in terms of total income was other fresh water fish combined production of juveniles and food fish with €27 million in 2014. The production of combined segment consists mainly of rainbow trout, European whitefish and Atlantic salmon. The gross value added of the segment was around €8 million and the sector made zero profits. The total income of the segment fell by 16% and the net profit increased. The combined segment produced second most fish in terms of volume of total production. In 2014 the production was 4.6 thousand tonnes.

Segment 2: Trout marine production in cages

The second biggest segment in terms of total income was marine production of rainbow trout and European whitefish in cages with €21 million in 2014. The production consisted mostly of rainbow trout (4.9 thousand tonnes), but also 251 tonnes of European whitefish was produced.

The gross value added of the segment was €4.8 million, which is about double the GVA in 2013. The income of the segment increased by 10% and the segment made a net profit of €1.5 million in 2014. The total sales volume was 5.2 thousand tonnes.

Segment 3: Other fresh water fish hatcheries and nurseries (including natural food ponds)

The total income of hatcheries and nurseries of other fresh water fish was €6.9 million in 2014 with a fall of €1.7 million from the previous year. The production of fry in fish farms consists mainly of rainbow trout fry for food fish farming. Fish farms also produce Baltic salmon, landlocked salmon, brown trout, sea trout, char and brook trout fry. The gross value added of the segment was €2.1 million and the segment made losses of €1.3 million. The total sales volume of hatcheries and nurseries was 0.7 thousand tonnes in 2014.

Segment 4: Other fresh water fish on growing (food fish production inland)

The total income of food fish production inland (on growing) was €7.4 million in 2014. There was an increase of 17% from the previous year. The fish food production inland consisted mainly of rainbow trout, but also European whitefish was produced. The gross value added of the segment was €2.1 million. The segment made losses of €1.3 million. The total sales volume was 1.2 thousand tonnes.

Table4.9.2 Economic performance of main Finish aquaculture segments: 2008-2014 (in million €).

Variable	2008	2009	2010	2011	2012	2013	2014	*% of total income*	Change 2014/13	Development 2014/(2008-13)
Trout cages										
Total income	*22.4*	*16.6*	*31.0*	*27.4*	*12.9*	*18.8*	*20.8*	*100%*	*10%*	*-4%*
Gross Value Added	*5.5*	*4.1*	*8.8*	*7.5*	*2.8*	*2.5*	*4.8*	*23%*	*87%*	*-9%*
Operating cash flow	*2.5*	*1.6*	*4.5*	*2.8*	*0.7*	*0.6*	*2.5*	*12%*	*354%*	*20%*
Earning before interest and tax	*1.6*	*0.8*	*3.3*	*1.5*	*0.0*	*-0.2*	*1.7*	*8%*	*955%*	*49%*
Net profit	*1.3*	*0.4*	*3.1*	*1.8*	*-0.2*	*-0.4*	*1.5*	*7%*	*470%*	*52%*
Total sales volume (thousand tonnes)	*6.0*	*2.1*	*5.5*	*5.7*	*4.3*	*4.3*	*5.2*		*22%*	*12%*
Other freshwater fish combined										
Total income	*17.8*	*26.3*	*13.9*	*9.8*	*27.8*	*31.6*	*26.6*	*100%*	*-16%*	*25%*
Gross Value Added	*6.7*	*9.9*	*5.2*	*3.6*	*6.5*	*8.1*	*7.7*	*29%*	*-4%*	*16%*
Operating cash flow	*2.1*	*2.8*	*0.9*	*0.6*	*-0.6*	*-0.4*	*1.5*	*6%*	*485%*	*65%*
Earning before interest and tax	*1.3*	*2.2*	*0.4*	*0.2*	*-2.2*	*-2.1*	*0.4*	*2%*	*120%*	*1467%*
Net profit	*2.2*	*2.1*	*0.3*	*0.1*	*-1.8*	*-2.9*	*0.0*	*0%*	*99%*	*-4049%*
Total sales volume (thousand tonnes)	*3.9*	*4.7*	*3.4*	*2.3*	*4.7*	*5.0*	*4.6*		*-9%*	*14%*
Other freshwater fish Hatcheries & nurseries										
Total income	*8.8*	*10.9*	*12.6*	*15.4*	*9.1*	*8.6*	*6.9*	*100%*	*-19%*	*-36%*
Gross Value Added	*3.4*	*3.7*	*4.8*	*5.4*	*3.3*	*2.7*	*2.1*	*30%*	*-24%*	*-47%*
Operating cash flow	*1.4*	*0.7*	*1.4*	*2.2*	*0.6*	*0.5*	*-0.3*	*-5%*	*-172%*	*-129%*
Earning before interest and tax	*0.7*	*0.0*	*0.8*	*1.3*	*-0.1*	*0.0*	*-1.2*	*-18%*	*-9538%*	*-372%*
Net profit	*0.7*	*0.1*	*1.7*	*1.3*	*-0.1*	*0.2*	*-1.3*	*-19%*	*-650%*	*-298%*
Total sales volume (thousand tonnes)	*0.5*	*0.7*	*0.7*	*0.7*	*0.5*	*0.6*	*0.7*		*23%*	*17%*
Other freshwater fish on growing										
Total income	*2.2*	*2.6*	*2.9*	*5.7*	*5.6*	*6.3*	*7.4*	*100%*	*17%*	*75%*
Gross Value Added	*0.4*	*1.0*	*1.0*	*0.8*	*1.2*	*1.6*	*2.1*	*28%*	*31%*	*109%*
Operating cash flow	*-0.3*	*0.3*	*0.4*	*-1.3*	*-0.3*	*0.3*	*-0.1*	*-1%*	*-117%*	*63%*
Earning before interest and tax	*-0.6*	*0.2*	*0.1*	*-1.8*	*-0.5*	*0.1*	*-0.8*	*-10%*	*-1548%*	*-77%*
Net profit	*-0.8*	*0.2*	*0.1*	*-2.0*	*-0.6*	*0.0*	*-1.3*	*-17%*	*-101924%*	*-136%*
Total sales volume (thousand tonnes)	*0.7*	*0.7*	*0.5*	*1.4*	*1.6*	*1.5*	*1.2*		*-20%*	*15%*

Source: EU Member States DCF data submission

In Figure 4.9.7, the economic indicators for the four Finnish segments are presented. Although the time series have developed quite steadily for the aquaculture sector as a whole, there are big fluctuations inside the segments. This is due to the fact that the number of companies in the segments is changing in time and some of the companies are changing from one segment to another making it difficult to make any segment level analysis. In 2010 and 2011 some of the companies from combined segment have shifted to the trout cages segment. The total income and operating costs for hatcheries and nurseries increased from 2008 to 2011 and decreased dramatically after that. The segment was making losses in 2014, although the GVA to revenue was around 30%. The inland food fish aquaculture companies (on growing) have increased the total income and total operating costs since 2012. In 2014, the operating costs were higher than the total income and the segment was making losses.

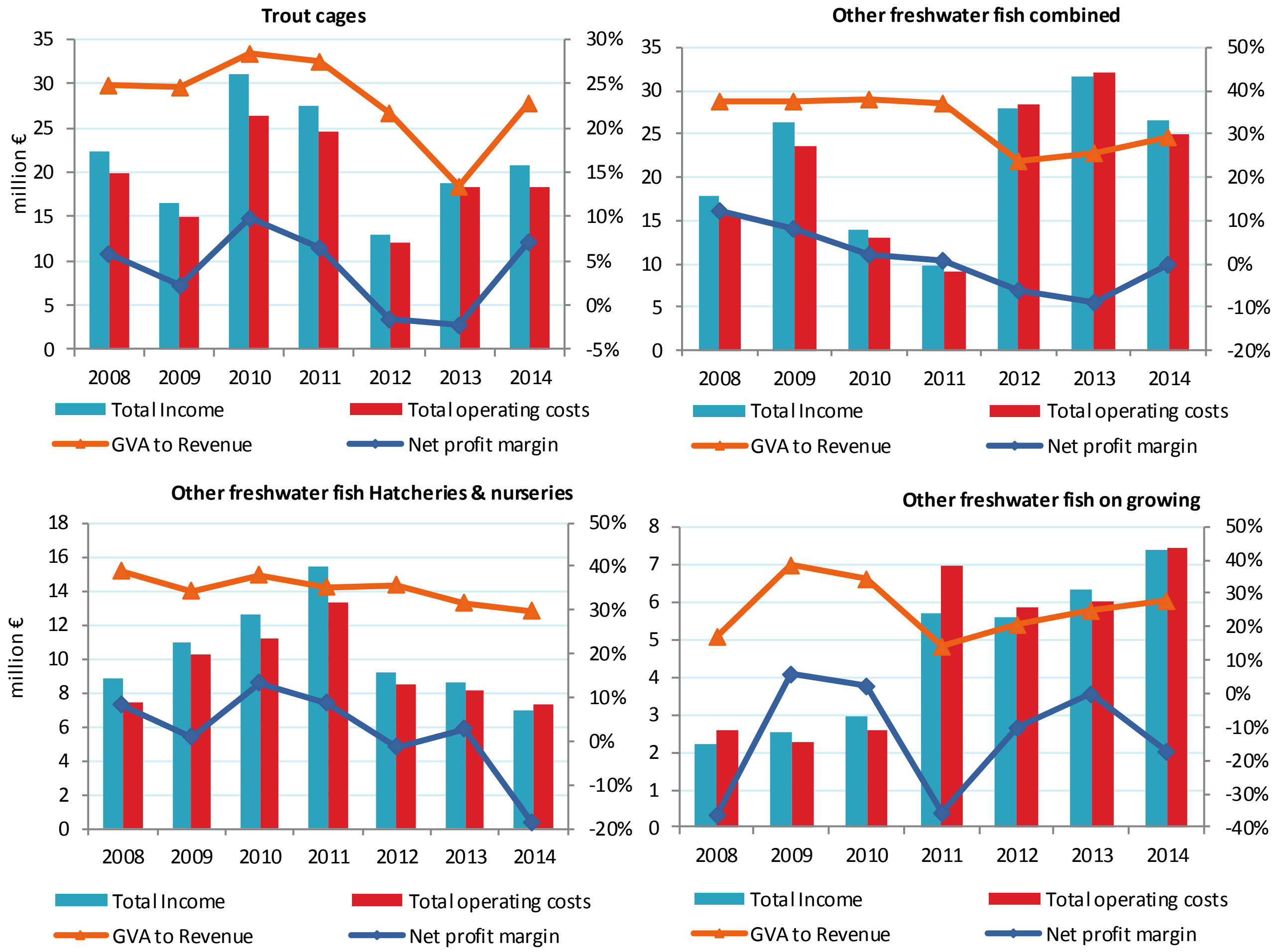


Figure 4.9.7 Economic performance indicators for the main Finish segments: 2008-2014.

Source: EU Member States DCF data submission

The cost structures for the four Finnish aquaculture segments are presented in the Figure 4.9.8. Feed costs made up around 40% of the total operational costs of food fish production and it is the largest cost item in all segments, except for the hatcheries and nurseries. Trout cages segment has relatively highest feed costs (45%) and livestock costs (22%). The segment seems less labour intensive than the others as the wages and salaries make up only 11% of the total operating costs.

Hatcheries and nurseries have different cost structure from the other segments. It has relatively low raw material costs (feed 7%, livestock 18%), and higher energy costs (11%), other operational costs (16%) and depreciation of capital (11%). The combined segment has the highest share of labour costs (23%) while most of the costs comprises of raw material purchases. The main cost items for food fish producers inland (on growing) are the feed costs (41%), wages and salaries (21%) and livestock costs (13%).

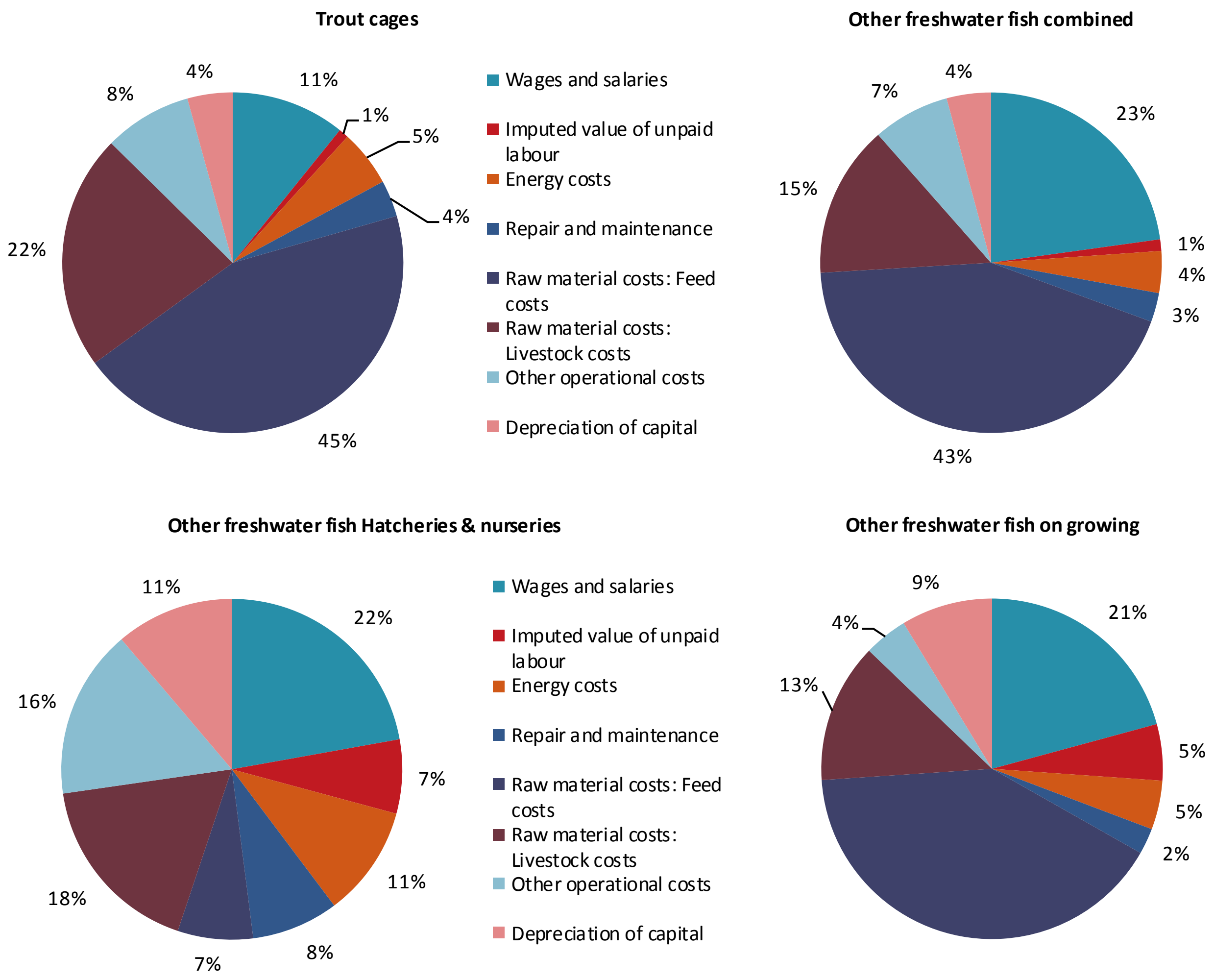


Figure 4.9.8 Cost structure of the main segments in Finland: 2014.

Source: EU Member States DCF data submission

The feed and livestock prices for the four Finnish segments are presented in the Figure 4.9.9. The livestock prices for food fish production have decreased from 2008 to 2011 and increased after that. In 2014, the average price of food fish livestock was around €10/kg. Livestock prices for hatcheries and nurseries increased in the period of 2008-2013, but decreased in 2014 to €53/kg. The fish feed prices for food fish production was around €1.2/kg for marine aquaculture in cages and over €2/kg for other food fish production. In hatcheries and nurseries segment, there are huge fluctuations in the average prices of fish feed due to data issues. The average feed price for hatcheries and nurseries was around €1/kg in 2014.

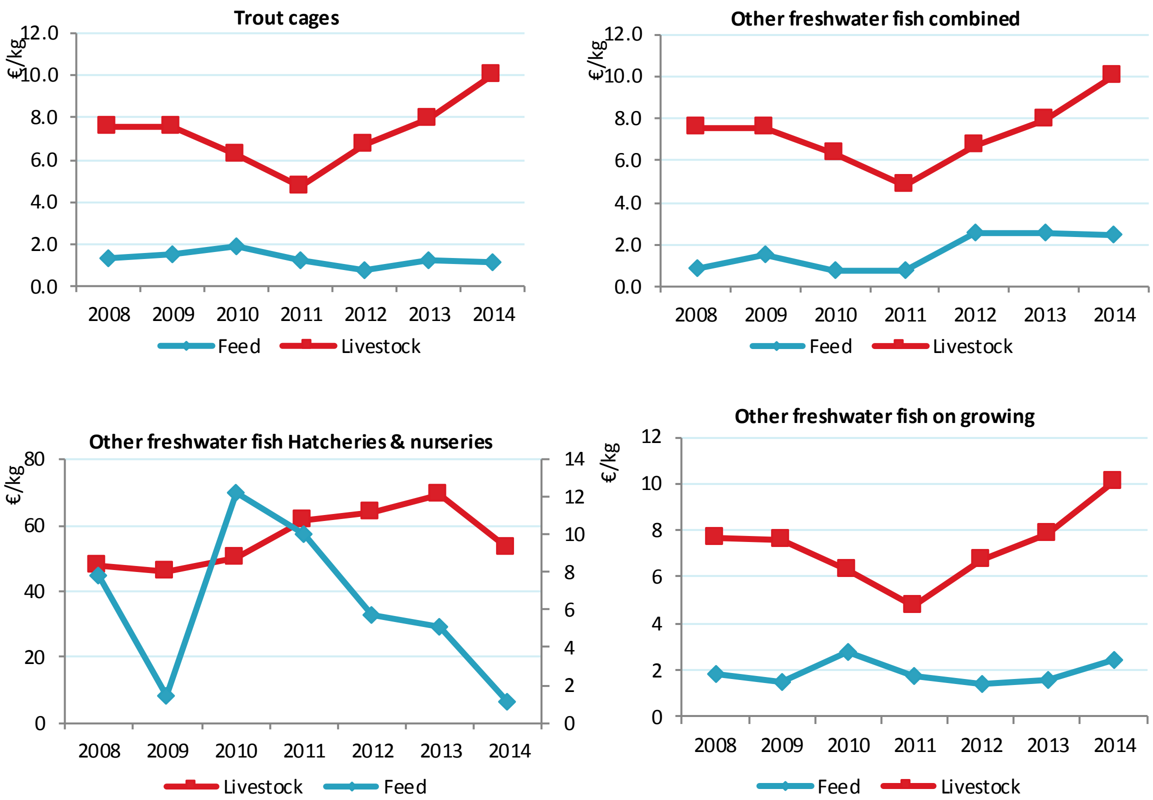


Figure 4.9.9 Feed and livestock prices for the main Finish segments: 2008-2014.

Source: EU Member States DCF data submission

4.9.6 Trends and triggers

Current production trends and main drivers

The Finnish aquaculture sector has been strongly affected by the environmental permit policy. Almost all aquaculture producers need to have an environmental permit in order to operate in the aquaculture sector. The main reason for introducing the environmental permit mechanism has been the desire to diminishing the nutrient load in the Baltic Sea. As marine production in cages has been economically very relevant, the environmental permit policy has affected the total production volumes and values of the Finnish aquaculture sector restricting the production.

The Finnish government, in cooperation with the research institutes and the aquaculture industry, are working together in combining the interests of the industry with environmental goals and developing a new environmental permit system which would allow increasing Finnish aquaculture production environmentally friendly. The administration of national environmental control system is being reorganized in order to make the system more predictable to attract more investments in the sector.

Finland has a National spatial planning program that aims to concentrate the aquaculture production in marine areas into bigger production units and to direct the production in areas where the use of marine areas can be optimally accommodated. Nowadays the nutrient load of aquaculture production per tonne of fish produced is only one third of what it was in the 1980s. This reduction has been possible thanks to fish feed development, developing new culturing techniques and selective breeding of fish. Transferring marine aquaculture production in big production units further offshore to the open sea has potential for increasing the production.

Recirculating aquaculture systems have become more common in Finland in the recent years. The recirculating systems have a great potential as the nutrient load can be easily managed while it is possible to maintain optimal culturing conditions all year round. However, high production costs as well as risks related to introducing new technologies impose challenges for this technology. In 2014, there were 9 production units in operation producing 300 tonnes of fish with a value of €2 million. Already two of the production units have been forced to close their production for financial reasons. One of the biggest recirculating systems units in the world is starting to operate in 2016 in Ahvenanmaa, Finland.

Market structure

The Finnish aquaculture sector has been increasingly concentrated. The ten biggest companies of the sector made up around half of the total revenues in 2014. The competitiveness and performance of the sector is mostly connected to the price developments of fish, mainly rainbow trout and salmon, but also developments of the feed cost play an important role. The recent investments have been limited mostly to recirculating aquaculture systems.

Almost all aquaculture production in Finland is consumed in the domestic market and the demand for domestic aquaculture products is growing further. Only a few special products (fry and roe) are exported. Imports of aquaculture product account for about 40% of the total fish consumption in Finland. Aquaculture imports consist mostly of Norwegian salmon and Swedish rainbow trout.

Issues of special interest

Finland has a national spatial planning program of aquaculture which takes into account the different uses of marine areas in order to direct the aquaculture production into areas where it is suitable for both the environment and the aquaculture industry. In this way, the environmental effects can be minimized together with creating possibilities for production growth and improving the profitability of the sector. Spatial planning plans were incorporated in the multiannual national plan for the development of sustainable aquaculture.

Another potential for increasing the production environmentally friendly is using Baltic Sea fish feed for nutrient neutral aquaculture production. Nutrients of the Baltic Sea are recycled by using Baltic Sea fish feed made of Baltic herring for aquaculture production. In this way, companies can increase their production without getting new environmental permits.

Most recent investments have been made into recirculating aquaculture systems. However, the production capacity potential of recirculating aquaculture systems has not yet been fully fulfilled and there is an ongoing process of research and development of new aquaculture techniques for Northern environments as well as continued testing for new species (eg. different applications of recirculating aquaculture systems). Also new industrial symbiosis has been developed, where aquaculture production makes use of other industrial production processes and vice versa.

Outlook for 2015 and 2016

The total food fish production was 14 900 tonnes and €56 million in 2015. There was an increase in both, the value and volume of production. These figures include all aquaculture fish production for human consumption in Finland, not only the production of the main activity companies. In addition to food fish, fish culture produced fry totaling 50 million individuals of different ages, both for stocking and further rearing.

Finland has set the national strategy for aquaculture for the period of 2014 to 2020. In the strategy, the objective is to increase production volume from 13 700 tonnes in 2014 to 20 000 tonnes in 2020 (46% increase). Furthermore, Finland wants to increase the production value from €60 million to €100 million in 2020 (67% increase). One of the objectives is to lighten the administrative burden caused by the environmental permit system and related procedures. The permit system will be developed to be straightforward yet not compromise the level of environmental protection provided.

A multiannual innovation and development programme is being promoted to support the growth of sustainable aquaculture, which will be put into practice following the principles of learning and network-based development. A network of technical expertise and innovation in aquaculture is being built, within which the sector can develop to a high international standard, facilitated by multi-stakeholder cooperation. Finland aims to develop strong PPP –models and platforms to research and industry.

The national operational program for aquaculture under the EMFF is also being implemented. Finland aims to increase the aquaculture production sustainably and thus improve the self-sufficiency of Finland on fish products as well as strengthening the technological expertise of Finland in the aquaculture sector. This growth in aquaculture production should be done in such way that the environmental effects relative to the production are minimized. Finland has adopted an aquaculture spatial plan that identifies the most suitable and productive areas for aquaculture production in marine areas. This plan will be integrated into the national marine spatial plan, and will be supported by the permitting system.

Finland is expecting to increase the aquaculture production in the future by developing further the environmentally friendly aquaculture techniques such as recirculating systems, recycling nutrients by using Baltic Sea fish feed for aquaculture, moving some of the aquaculture production offshore to bigger production units and improving national spatial planning.

4.9.7 Data Coverage and Data Quality

Data quality

Economic EU data collection of aquaculture sector in Finland combines information from different data sources. Main sources are a production survey of Natural Resource Institute (Luke), structural business and financial statement statistics of Statistic Finland (SF) and account survey conducted by Natural Resource Institute. Financial statements were available for all firms in Business Register having aquaculture as the main activity.

Primary sources of financial statements data in Statistics Finland are direct inquiries and business taxation material supplemented by Business Register data. Data is based on corporate balance sheets and profit and loss account data. Statistics Finland checks for the validity of the data. Any missing data was estimated within stratum. Account data was surveyed by Natural Resource Institute by stratified survey to detect the detailed cost structure of fish farms. Cost and earnings estimates were done by design-based and model assisted regression and ratio estimation. The cost variables were estimated with ratio estimation from financial statements. A production survey was collected exhaustively from the producers. Any missing information was estimated by stratum.

Data availability

The reference year of economic data collection is the preceding year. Preliminary financial statements data from Statistics Finland are available on the 4th quarter after the reference year. Data on production volume and value is available half a year after the reference year. Therefore information of the economic situation of aquaculture sector is provided earliest one year after the period investigated.

Confidentiality

Natural Resource Institute does not provide or publish any information about the financial statements or key indicators of individual companies. When segmentation is used to split data into smaller groups, each segment include at least five companies. If there are less than five companies in a segment, they are clustered with other segments.

Differences in DCF data compared with other official data sources

Natural Resources Institute Finland provides the data on aquaculture for Eurostat and the DCF and thus the differences in the Figure 4.9.10 are due to different estimation and classification practices of these organizations and different data needs. Eurostat data include all aquaculture production in Finland, including also production of companies that are not main activity producers whereas DCF data includes only those companies that have aquaculture as their main business activity. In addition, Eurostat data include only food fish production and no juvenile or fry production. Both fish produced for human consumption and fry are included in the DCF data.

European whitefish production in cages is reported as fresh water production in the Eurostat data, but it is reported as marine production in the DCF data. There was some shellfish production reported to Eurostat in 2013 and 2014, but no shellfish was reported under DCF as there was not enough economic data available for shellfish farmers. In Figure 4.9.10, the DCF data of production value is based on the turnover of aquaculture companies instead of the sales value of cultured fish and fry. The turnover can include other business activities and is not limited to the pure sales of aquaculture products produced by the company.

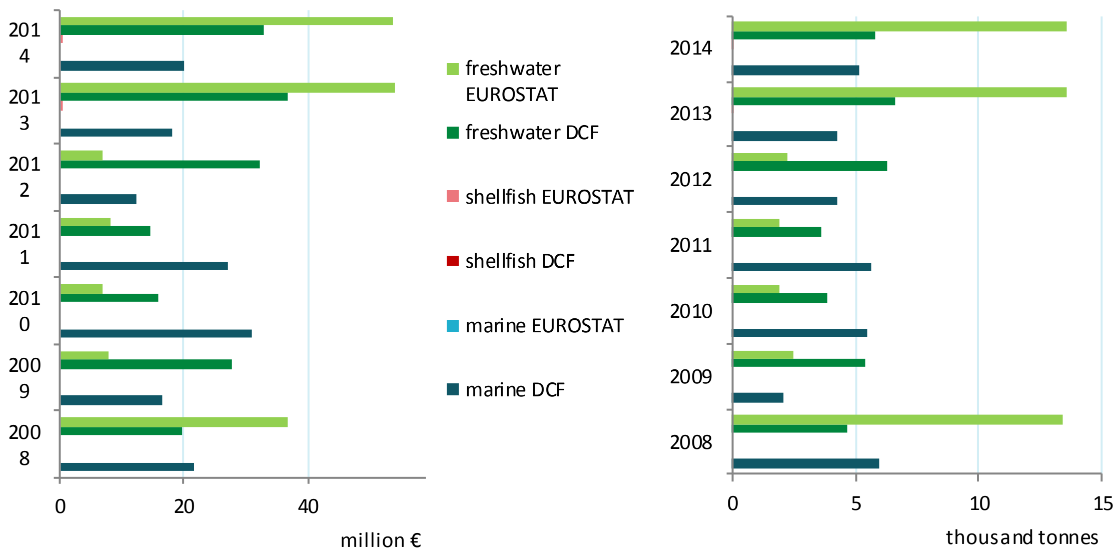


Figure 4.9.10 Comparison of DCF data with EUROSTAT data for Finland: 2008-2014

4.10 France

4.10.1 Summary

Production volume and value

In global, the French aquaculture sector produced 268.7 thousand tonnes and €961.1 million. In comparison with the previous report, it is important to highlight that some segment have been removed because of either an achieved sampling rate low (see point Data quality) or economic parameters from 2008 to 2014 were not available for these seven years. These segments represent around 15% of the total sales volume and value in 2014 and are: Sea bass & Sea bream Hatcheries & nurseries (segment 3.1), Sea bass & Sea bream cages (seg 3.4), Other marine fish on growing (seg 6.2), Mussel rafts (seg 7.1), Mussel Long line (seg 7.2), Other shellfish Long line (seg 10.2).

In this chapter, all published data concern only 7 segments for which all economic data are available: Trout on growing (segment 2.2), Trout combined (seg2.3), Mussel Bottom (seg7.3), Oyster rafts (seg8.1), Oyster Bottom (seg8.3), Oyster Other (seg8.4), Other shellfish rafts (seg10.1). With these 7 segments, French aquaculture sector produced 225.9 thousand tonnes of farmed product in 2014, which corresponded to a decrease by 1% on 2013. This result accentuate the trend of the previous years (-11% compared to the average 2008-2013). The total value of production showed a slight increase by 1% to €833.9 million. In comparison with the average 2008-2013, the total value is stable.

Overall industry structure and employment

The French aquaculture sector is largely dominated by bivalve molluscs farming. Shellfish farming is done nearly along all the French coasts. The most productive regions are: Poitou-Charentes, Bretagne, Basse-Normandie for oysters; Poitou-Charentes is more oriented toward sales at the latest stage for human consumption while Bretagne and Normandie are important for rearing at an intermediate stage, leading to important commercial exchange between regions. For mussels, regions come in this descending order: Bretagne, Méditerranée, Poitou-Charentes, Basse-Normandie. Freshwater fish farms are located in nearly all regions with a higher production in Aquitaine and Bretagne. For marine fish, farming is concentrated in some regions: Nord-Pas-de-Calais, Basse-Normandie, Provence-Alpes-Côte d'Azur and Corse.

The total number of aquaculture farms is 2 953 slightly decreasing compared 2013 (-1%). Compared to the average of 2010-2013, Table 4.7.2 shows a decrease of the number of aquaculture farms decrease of 5%. The 7 segments having a full economic data set over the last three years represent 91-93% of the overall turnover.

Main segments

The French aquaculture sector is largely dominated by bivalve molluscs farming. In weight, shellfish farming ranks first with a production of 191.5 thousand tonnes (85% of national total) and €720.8 million for turnover (82%). The second group is the freshwater fish sector with 34.4 thousand tonnes (15%) and €113.1 million (12%).

Pacific cupped oysters (*Crassostrea gigas*) sales nearly represent 49% of the whole aquaculture production in weight and 65% in value. Oysters are mainly produced in intertidal areas by elevated cultivation systems (bags on trestles – segment 8.3). In the Mediterranean, where oyster farming mostly takes place in lagoons, other techniques are used, mainly the culture on rope hung under tables; these farms are included in the oyster raft segment (segment 8.1). Their production reaches 9.1 thousand tonnes and €27.5 million representing respectively 8% and 5% of all the oyster segments.

Two species of mussels are cultivated in France. Blue mussel (*Mytilus edulis*) and Mediterranean mussel (*Mytilus galloprovincialis*) represent 26% in weight, 13% in value of the whole aquaculture production. Mussel farming in the Channel and Atlantic coasts is almost all based on the blue mussel. The predominant cultivation system relies on fixed wooden poles (so-called "bouchot" technique) used in inter-tidal areas (segment 7.3). In the Mediterranean, mussels are cultivated in raft (segment 7.1), in fact on ropes suspended below large tables. The long line technique (segment 7.2) is being developed on open sea areas (Atlantic and Mediterranean). For some producers on the Atlantic coast, this technique is complementary to the "bouchot" technique. The long lines are used for catching spatfall and for a part of growing mussels. After 2 or 3 month, mussels are fixed on the "bouchot" in order to finish their growth. In this case, these companies are included in the mussel bottom segment (segment 7.3).

In freshwater fish farming, the main production results from the farming of rainbow trout for 98.6% and other salmonids (*brown trout* - *Salmo trutta* - for instance). The segments of trout are still the most important fish production sector in terms of sold volume (34.5 thousand tonnes, 87% of fish farming excluding pond farming) and value (€113.1 million, 68.5% of fish farming). The saltwater fish farming is a small sector in France. The sales volume of sea bass and sea bream is 2.6 thousand tons with a corresponding turnover of €3.9 million, where production volume and value sharing between hatcheries and nurseries, cages and land-based facilities. No economic data are published for the French saltwater fish farming.

It should be also highlighted the production of sturgeon caviar, even there were produced 22 tonnes from only 7 companies, it achieved a value of almost €13.4 million (statistical survey 2013, DPMA). The sturgeon's activity also includes some companies that are rearing to maturity females and sell to caviar producers. Caviar production is a new activity and return on investment, due to a long life-cycle, is a limiting factor in the development of the sector.

Current production trends and main drivers (Trends and triggers)

In shellfish sector, the sales decrease in weight during last year due to production loss with mortalities of oyster juveniles since 2008 and poor growth (2013) and mortalities (since 2014) of mussel.

Since 2014, a high mortality of mussels have been located in production areas located in the West of France (Pertuis Breton and bay of Bourgneuf). The mortalities have reached up to 100% on the long line and 50-80% of the "bouchot" cultivation system. The causes of these mortalities are yet to be established. Three domain of research are currently privileged: pathological, environmental and physiological. Nowadays, a suspicious amount of *Vibrio Splendidus* was detected. For professionals impacted, financial difficulties are important (slump in sales) while cleaning of leaseholds (remove the mussels) causes significant costs. In 2014, the turnover and the total sales reached respectively €4.4 million and 2.4 tonnes either a decreased by 53% and 56% between 2013 and 2014.

Due to the increase of feed costs and the foreign competition, the price, margins and profitability of the trout sector remained low at the beginning of 2010's. The freshwater fish sector renews with growth in 2014. The turnover and sales increased by 7% and 3% between 2012 and 2014. The control costs from the companies and a high demand from French consumers explain a part of this evolution.

Outlook

Production is not expected to increase significantly in the coming years. Mortalities of oyster juveniles still occur and rearing cycle cover three years; shellfish farmers may hopefully maintain their production with a stable price.

Shellfish farmers dread climate change increasing risk of epizootic and the emergence of diseases in the marine environment. This climate change will affect the environmental parameters: temperature change on ocean acidification, on rainfall and therefore the salinity and the concentration and nutrient quality. This will have consequences on future aquaculture output and on the economic results.

For fish sectors, an increase of production needs to improve the feed aspects in term of efficiency and costs, needs to open new production sites.

4.10.2 Production and sales

The total output of the French aquaculture sector in 2014 is 225.9 thousand tonnes and €833.9 million as turnover. The sales volume decreased by 11% in comparison with the average of 2010-2013 but turnover is stable The diminution in weight was observed in all sectors while the sales value move upward for shellfish and downward for fish sectors.

Table 4.10.1 Production and sales for France: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Sales weight (thousand tonnes)			***287.8***	***257.6***	***246.1***	***227.6***	***225.9***	*-1%*	*-11%*
Marine			0.0	0.0	0.0	0.0	0.0		*0%*
Shellfish			247.3	221.5	212.8	193.1	191.5	*-1%*	*-10%*
Freshwater			40.4	36.1	33.3	34.5	34.5	*0%*	*-5%*
Hatcheries & nurseries			0.0	0.0	0.0	0.0	0.0		*0%*
Sales value (million €)			***792.7***	***800.8***	***875.9***	***826.4***	***833.9***	*1%*	*1%*
Marine			0.0	0.0	0.0	0.0	0.0		*0%*
Shellfish			670.2	680.9	770.0	713.3	720.8	*1%*	*1%*
Freshwater			122.5	119.9	105.9	113.1	113.1	*0%*	*-2%*
Hatcheries & nurseries			0.0	0.0	0.0	0.0	0.0		*0%*

Source: EU Member States DCF data submission

4.10.3 Industry structure and employment

From 2010 to 2014, the number of enterprises decreased from 3 171 to 2 953. Employment in the French aquaculture sector reach 16 454 persons for 9 114 full time equivalent jobs (FTE).

The shellfish sector account for 2 665 companies (90% of the national total), mainly small scale and family structures (68%). They employ around 15 300 jobs representing 8 170 full time equivalent jobs (FTE) as seasonal jobs are quite important. During the latest years, the number of companies was decreasing slightly but this sector had 3 750 enterprises in 2002. In addition, if the tasks in the leaseholds are carried out by the majority of men, the work in the establishment (packaging, orders, billing, etc.) is rather feminine. On the period 2010-2014, the reduction of mal FTE is less important than female FTE. To cope with oyster mortalities, the manpower needs related to production activities (spat collection in particular) was more important. In contrast, the reduction in volumes sold resulted in a reduced need of women's work (oyster packing, direct sales).

Table 4.10.2 Structure of the French aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Structure (number)									
Total enterprises			*3,171*	*3,125*	*3,104*	*2,988*	*2,953*	*-1%*	*-5%*
<=5 employees			2,403	2,429	2,402	2,215	2,238	*1%*	*-5%*
6-10 employees			425	387	381	456	417	*-9%*	*1%*
>10 employees			343	309	321	317	298	*-6%*	*-8%*
Employment (number)									
Total employees			18,519	17,311	17,363	17,922	16,454	*-8%*	*-7%*
Male employees			11,938	11,279	11,385	11,648	10,980	*-6%*	*-5%*
Female employees			6,581	6,032	5,978	6,274	5,474	*-13%*	*-12%*
FTE			10,139	9,677	9,646	8,905	9,114	*2%*	*-5%*
Male FTE			7,299	7,020	6,989	6,471	6,656	*3%*	*-4%*
Female FTE			2,841	2,656	2,657	2,434	2,457	*1%*	*-7%*
Indicators									
FTE per enterprise			3.2	3.1	3.1	3.0	3.1	*4%*	*0%*
Average wage (thousand €)			23.2	24.6	23.6	27.2	28.3	*4%*	*15%*
Labour productivity (thousand €)			44.0	39.9	49.3	53.2	51.9	*-2%*	*11%*

Source: EU Member States DCF data submission

The number of freshwater fish farming companies is 298 in 2014, 80% being small scale or family structures; the employment account for 1 170 jobs, corresponding to 946 FTE. In spite of being a pioneer in the early eighties, the French sea-water fish farming has remained a small sector with only 27 companies in 2013, including hatcheries of seabass and seabream. The total employees are 539 corresponding to 502 FTE. The national statistical survey doesn't cover the companies and employment of freshwater fish farming in ponds.

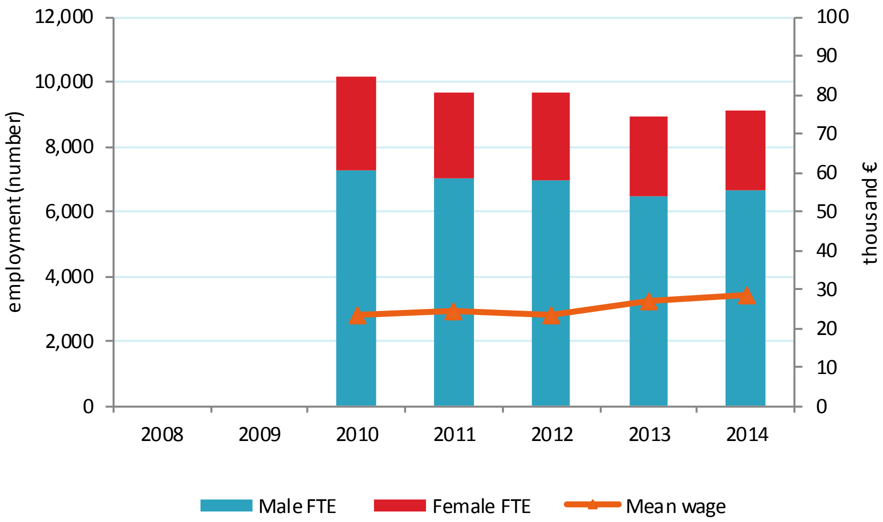


Figure 4.10.1 Employment trends for France: 2008-2014.

Source: EU Member States DCF data submission

Average wage and value of unpaid labour per FTE remain stable in 2014 compared to 2013. In comparison with the average of 2010-2013, the increase of average wage reaches 15% and the labour productivity increased by 11%.

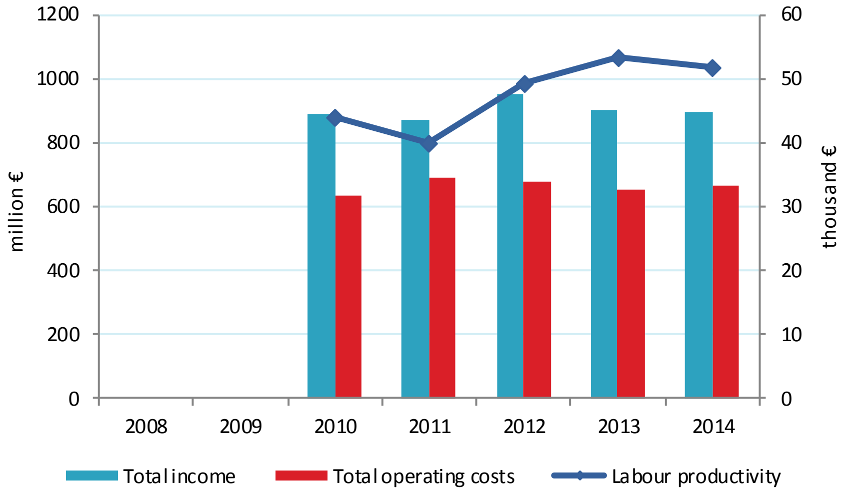


Figure 4.10.2 Income, costs, wages and labour productivity trends for France: 2008-2014.

Source: EU Member States DCF data submission

4.10.4 Economic performance

For the 7 segments where all economic indicators are available, the weight of shellfish farming sector (82% of the total turnover) influences widely the result of national economic performance. So, an average indicator can hide a disparity between different segments

For these 7 segments, turnover and total income increased slightly by 1% from 2013 to 2014, reaching respectively €833.9 million and €896.5 million while the total operating costs was relatively stable. In global, aquaculture sector made a positive net profit and had a positive EBIT in 2014. Nevertheless, the evolution of net profit for freshwater farming sector is highly fluctuating and sometimes negative (see below).

Wages and value of unpaid labour represent 39% of the total operating cost (TOC), 41% for the shellfish sector for which techniques need more manipulation of animals. Livestock costs represent 34% of the TOC: 40% in the shellfish sector, 7% in fish sectors where feed costs represent around 43% of the TOC. In comparison with the average of the period 2010-2013, the livestock cost in 2014 increased by 12%.

Table 4.10.3 Economic performance of the French aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	% of total income	Change 2014-13	Development 2014/(2008-13)
Income (million €)										
Turnover			792.7	800.8	875.9	826.4	833.9	93%	1%	1%
Other income			50.2	36.7	50.5	55.8	46.1	5%	-17%	-5%
Subsidies			45.0	35.1	27.9	17.6	16.5	2%	-6%	-47%
Total income			*887.8*	*872.5*	*954.3*	*899.8*	*896.5*	*100%*	*0%*	*-1%*
Expenditures (million €)										
Wages and salaries			133.1	126.9	126.0	127.0	135.8	15%	7%	6%
Imputed value of unpaid labour			102.2	111.4	101.8	115.3	121.9	14%	6%	13%
Energy costs			22.0	24.2	26.6	26.5	28.5	3%	7%	15%
Repair and maintenance			25.9	24.7	23.9	22.8	23.9	3%	5%	-2%
Raw material: Feed costs			51.3	61.9	56.8	41.8	45.3	5%	8%	-14%
Raw material: Livestock costs			203.0	214.5	215.2	181.8	227.8	25%	25%	12%
Other operational costs			94.6	126.4	128.8	135.5	81.7	9%	-40%	-33%
Total operating costs			*632.1*	*690.1*	*679.0*	*650.7*	*664.9*	*74%*	*2%*	*0%*
Capital Costs (million €)										
Depreciation of capital			84.7	80.4	183.6	174.4	175.6	20%	1%	34%
Financial costs, net			8.5	30.3	32.9	21.5	20.6	2%	-4%	-12%
Extraordinary costs, net			2.2	2.2	2.8	2.4	2.7	0%	13%	13%
Capital Value (million €)										
Total value of assets			1054.6	1066.5	1080.7	1027.2	1079.4	120%	5%	2%
Net Investments			65.5	80.3	65.2	94.7	76.3	9%	-19%	0%
Debt			684.8	664.4	678.9	665.5	644.6	72%	-3%	-4%
Input & Production (thousand tonnes)										
Raw material: Feed			51.1	56.5	52.3	28.4	37.9		34%	-19%
Raw material: Livestock			81.8	88.3	66.1	47.8	45.5		-5%	-36%
Performance Indicators(million €)										
Gross Value Added			446.1	385.6	475.2	473.8	472.8	53%	0%	6%
Operating cash flow			255.7	182.4	275.3	249.1	231.6	26%	-7%	-4%
Earning before interest and tax			171.0	102.0	91.7	74.7	56.0	6%	-25%	-49%
Net profit			162.5	71.6	58.8	53.2	35.5	4%	-33%	-59%
Capital productivity (%)			42.3	36.2	44.0	46.1	43.8		-5%	4%
Return on Investment (%)			16.2	9.6	8.5	7.3	5.2		-29%	-50%
Future Expectation Indicator (%)			-1.8	0.0	-11.0	-7.8	-9.2		-19%	-79%

Source: EU Member States DCF data submission

Despite the considerable uncertainty regarding future production, subject to natural hazards, professional reinvested to renew their outdated equipment. The item "depreciation of capital" increased by 34% in 2014 on average 2010-2013. The variability of output also makes cautious professionals on the bank loans. They reduced their level of debt by 4% in 2014 compared to the average 2010-2013.

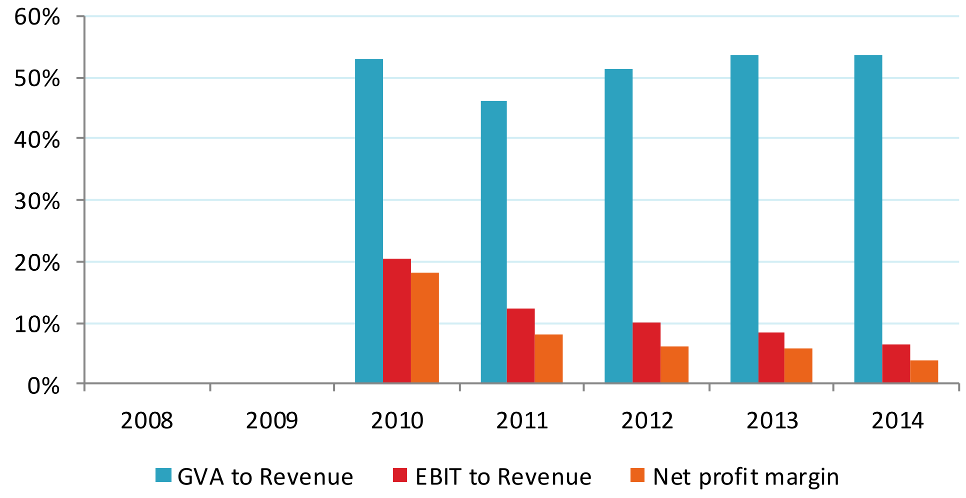


Figure 4.10.3 Economic performance for France: 2008-2014

Source: EU Member States DCF data submission

French aquaculture sector made a positive net profit and had a positive EBIT in 2014 but this indicator is in sharp decline (-59% decrease by 2014 compared 2010-2013). The overall net profit decreased by 59% in 2014 compared to 2010-2013. In global, return on investment remains positive but the trend is down (-50% in 2014 compared to 2010-2013).

4.10.5 Main species produced and economic performance by segment

Main species of French aquaculture sector are pacific cupped oyster, blue and Mediterranean mussel, rainbow trout. The weight of Pacific cupped oyster (46% of the volume, 61% of the value) remains important despite the recorded mortality since 2008.

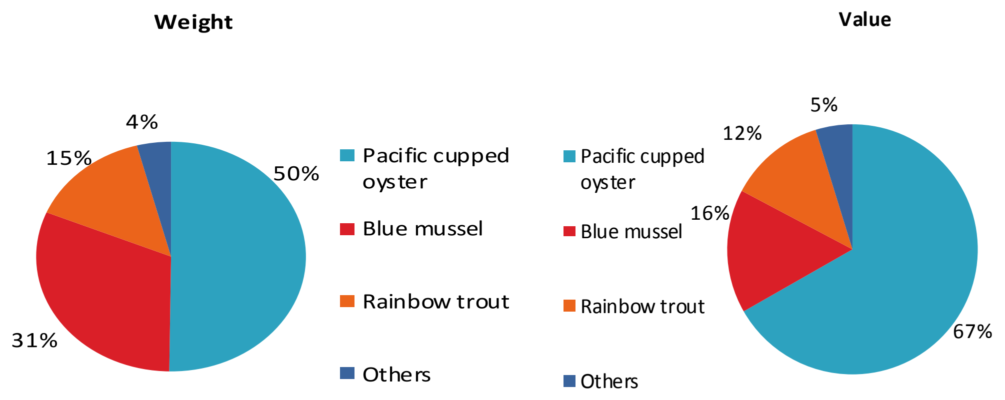


Figure 4.10.4 Main species in terms of weight and value in French production: 2014.

Source: EU Member States DCF data submission

The price is given as a global indicator as volumes and values combine sales of juveniles, young adults sold to other aquaculture farms, adult sold to human consumption. Price for mussels and rainbow trout are quite stable since 2008. After an increasing price from 2008 to 2010, price for sea bass has stabilized around €12.8/kg.

For pacific cupped oyster, after stability for some years before 2011, the price increased by 20% in 2011 and then 24% again in 2012. The increase was 3% per year in 2013 and 2014. Throughout the period, an increase of 70% of the price of oysters is observed. This is an effect of the decreasing production sales due to mortalities of juveniles since 2008. The price of oysters seems to have reached an upper limit for the consumer market.

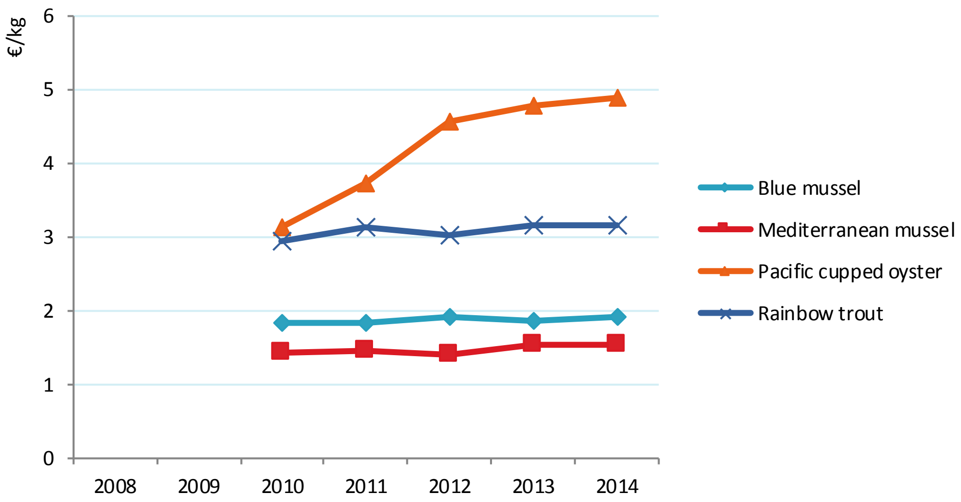


Figure 4.10.5 Average prices for the main species produced in France: 2008-2014.

Source: EU Member States DCF data submission, 2016

The most relevant segments in the French aquaculture are Oyster bottom (segment 1), Mussel bottom (segment 2), Trout on growing (segment 3) and Trout combined (segment 4).

Segment 1: Oyster bottom

Companies in this segment are very heterogeneous (i.e. in terms of size, turnover, etc.), and they have different strategies of production. Some of them focus on one stage of production (short cycle) instead of achieving the whole rearing cycle. The spat is supplied either by wild spat (produced by the farmers themselves thanks to collectors of different kinds in the regions located at the South of Loire, or purchased to these farmers by others), or spat produced in hatcheries, or both. In response of mortalities of spat, hatcheries select and produce more resistant diploid or triploid spats. The production of triploids spat is dominant. If the cost of the seed is higher than the wild seed, the growth of these oysters is faster (shorter production cycle) and rotation of stock is higher. It exists also a last phase of oyster production, the refining ("affinage") of oyster. This additional process, which consists in ending the rearing of oysters by a temporary immersion in marshland ponds (“claires”), provides a significant added-value to the final product. Only the oyster farms of Charente Maritime and Vendée practice this process.

The segment consists of 1 860 enterprises and 5 863 FTE. The sales production volume was 106 794 tonnes with a corresponding turnover of €522 million. The production volume accounts for 44% and the value accounts for 58% of the total French production.

Since 2008, the French oyster industry is facing to mortalities of spat (shellfish less than one year) in pacific cupped oysters: between 60 and 90% mortalities in all breeding sites. The research shows that OsHV1 µvar virus plays an important role in explaining mortality and is clearly associated with bacteria of the genus Vibrio splendidus. To cope with these mortalities, several strategies have been implemented. Some companies which have leasehold to collect spat, have increased the number of spat collectors. The work of collector is labour intensive. So, this strategy has conducted to increase the number of seasonal employment. Due to the necessity to handle the supply of natural spat, the demand for spat collection leaseholds has increased and caused a strongly progression of the transfer price between oyster farmers. In complement or not with natural seed, the purchase of juveniles in the hatcheries offered a solution in terms of diversification of oyster juvenile. The consequence is the augmentation of the value of the livestock.

Considering it takes 3 years to produce an oyster, the impact of these mortalities on the economic performance will be measured in 2012 and following years. Firms have received subsidies in order to purchase the spat. Since 2012, the enterprises have resumed their investments. Investments in spat and materiel explain the progression of the total value assets (figure 4.10.6). Turnover to total income ratio reach 92% and profitability was rated 5% in 2014 (-6 point/2010).

Segment 2: Mussel bottom

The second most important segment is the mussel bottom and consists of 287 firms and 1079 FTE in 2014. Since 2010, the production of mussel is decreasing. This decline was due to unfavourable weather causing a deficit of production and poor quality of mussels (2011, 2012). The deficit comes also from the resurgence of predators (sea-star) in some areas of production (Channel and Atlantic coasts).

In 2014, the sales production volume is 59 897 tons with corresponding turnover of €116 million. This cultivation represents 83% of the value of French mussel turnover and 82% of the weight. Due to the slump in sales, the performance measures indicates decline between 2010 and 2014 in terms of gross value added (-20%), earnings before interest and tax (-61%) and net profit (-68%).

Segment 3: Trout on growing

For the trout segments, beside the population of companies having a commercial status that are reported here, France have around 80 enterprises with a non-commercial status (association, federal fish farms): generally of small size that produce essentially young fish for the restocking of rivers and don't have a real economic activity. There is a wide range of commercial companies from small businesses that produce less than 10 tonnes of fish per year and some big companies whose annual production exceeds 1 000 tonnes. Small producers focus on local niche markets (sell live fish to stock ponds or river or for sports fishing) whereas medium and large companies are able to offer regularly sufficient quantities to supermarket chains. But they must face pressure from supermarkets, wholesalers and processing industries on prices. The latest years, the low price per kilo of trout and its stagnation, the increase of feed cost limit margins and profitability of the activity. Large scale production has the capacity to support on-going technological development and improved productivity.

The third segment, trout on growing, is 24 514 tonnes bringing about a total turnover of €75 million. It represents 71% of the whole trout aquaculture in weight and 66% in value. This segment accounts 201 enterprises for 572 FTE or 60% of the total trout FTE. Since 2010, the economic situation in this segment had developed unfavourably. The turnover (-11%), sales volume (-16%), the total value of assets (-1%) and the total number of FTE (-17%) are decreasing between 2010 and 2014. It was also proportionally the lesser performer in operating cash flow (9% of the income) and net profit (4%). Currently, the equipment and investments are little renewed. The level of depreciation of capital and total asset are the lowest since 2010. With a better income and lesser operating costs in 2013, earnings before interest and tax, net profit became positive 2013.

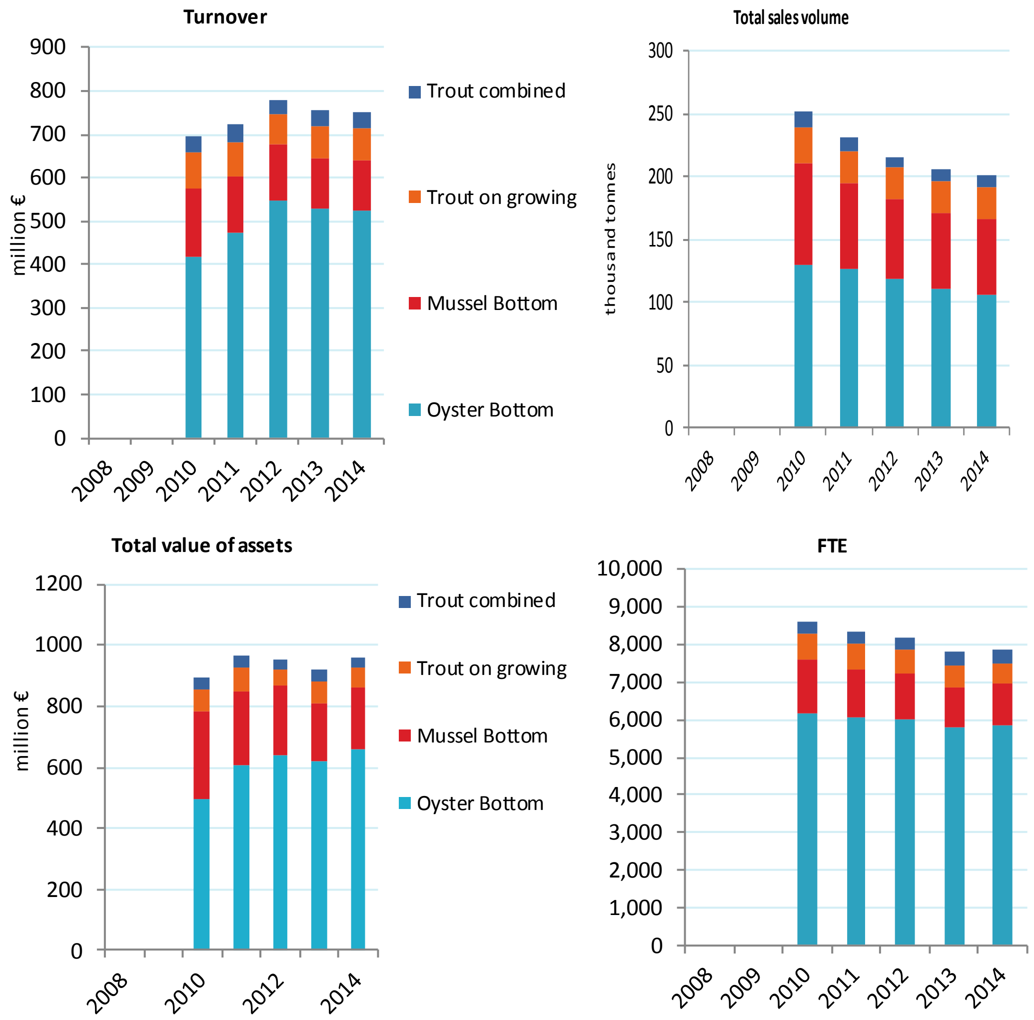


Figure 4.10.6 Structural development French aquaculture sector: 2008-2014.

Source: EU Member States DCF data submission

Segment 4: Trout combined

The trout combined activities complete the global trout production with a total income of €33.7 million and a sale volume of 9 937 tonnes in 2014. The segment consists of 97 firms and 375 FTE. The same decreasing trend between 2010 and 2014 as in the trout on growing segment is observed regarding total sales production (-12%) and total of value of assets (-12%). However, a slightly increase of the turnover is observed (+1%). The enterprises in this segment remain profitable in 2014 with a positive net profit.

Table 4.10.4 Economic performance of main French aquaculture segments: 2008-2014 (in million €).

Variable	2008	2009	2010	2011	2012	2013	2014	% of total income	Change 2014/13	Development 2014/(2008-13)
Trout combined										
Total income			39.7	40.3	37.7	38.8	39.7	100%	2%	1%
Gross Value Added			17.1	16.2	14.2	12.8	14.6	37%	14%	-3%
Operating cash flow			5.1	6.4	6.4	2.4	4.5	11%	89%	-11%
Earning before interest and tax			2.3	3.8	4.7	0.3	1.5	4%	394%	-46%
Net profit			2.2	3.0	1.8	-0.4	1.3	3%	419%	-22%
Total sales volume (thousand tonnes)			11.3	10.9	8.6	9.9	9.9		0%	-2%
Trout on growing										
Total income			85.4	86.4	87.4	92.8	77.8	100%	-16%	-12%
Gross Value Added			20.5	10.2	20.4	29.1	20.7	27%	-29%	3%
Operating cash flow			7.7	-5.8	5.7	3.2	7.1	9%	120%	163%
Earning before interest and tax			4.8	-10.0	2.5	-8.9	4.3	6%	149%	250%
Net profit			4.1	-12.6	1.2	-9.9	3.2	4%	132%	173%
Total sales volume (thousand tonnes)			29.1	25.3	24.8	24.5	24.5		0%	-5%
Mussel Bottom										
Total income			176.8	137.4	135.6	122.5	122.7	100%	0%	-14%
Gross Value Added			138.2	96.1	100.7	93.0	85.2	69%	-8%	-20%
Operating cash flow			89.8	53.2	61.4	59.7	49.6	40%	-17%	-25%
Earning before interest and tax			65.6	31.1	16.6	28.3	13.8	11%	-51%	-61%
Net profit			63.1	24.3	9.1	23.4	9.5	8%	-59%	-68%
Total sales volume (thousand tonnes)			81.5	67.9	64.4	60.7	59.9		-1%	-13%
Oyster Bottom										
Total income			468.0	523.8	589.6	568.0	566.2	100%	0%	5%
Gross Value Added			203.2	227.0	289.2	289.9	301.5	53%	4%	19%
Operating cash flow			100.1	114.0	173.1	158.6	146.2	26%	-8%	7%
Earning before interest and tax			58.9	70.5	68.6	59.1	42.1	7%	-29%	-35%
Net profit			53.7	53.8	51.5	46.9	30.0	5%	-36%	-42%
Total sales volume (thousand tonnes)			129.5	126.9	118.4	110.9	106.8		-4%	-12%

Source: EU Member States DCF data submission

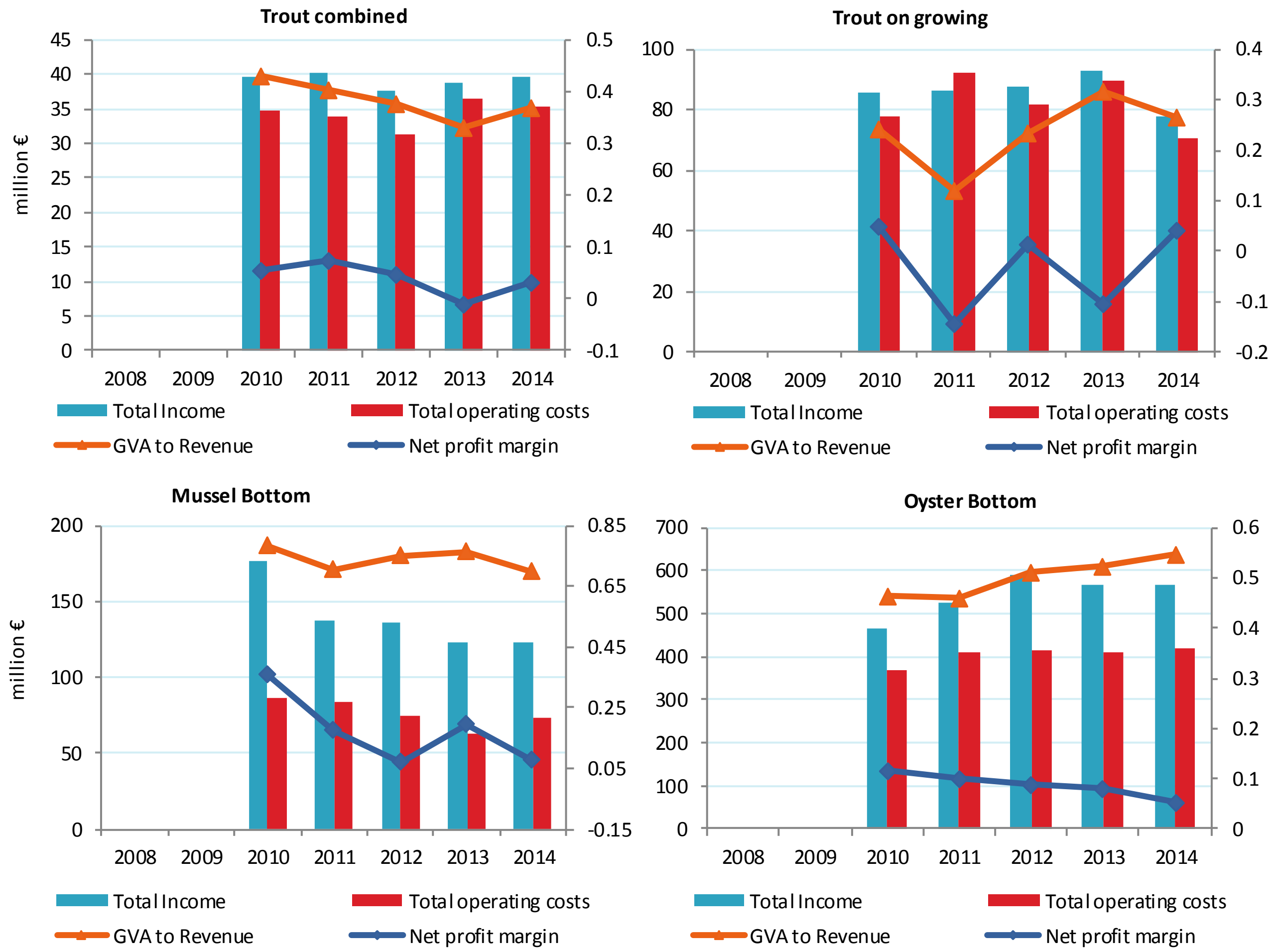


Figure 4.10.7 Economic performance indicators for the main French segments: 2008-2014.

Source: EU Member States DCF data submission

In Figure 4.10.8, the operational cost structures for the four French segments are presented.

Segment 1: Oyster bottom

Livestock is the main cost (36% of the total operating costs and depreciation of capital) as there are exchange of oysters between regions to improve shellfish growth, to supply adults to farmers specialized in "affinage" process. The important demand of spat and the increase in prices spat (natural and hatchery - figure 4.7.9) cause an increase of 19% of the cost of the livestock between 2010 and 2014. Wages and value of unpaid labour is a high cost (32% of the total costs), depreciation of capital was rated to 20% as in 2010. Despite the mortalities, enterprises seem to be more optimistic and invest since 2012. The weight of the depreciation of capital increased from 10 to 20% of the total costs. The amounts of the investments were multiplied by 2.5 between 2010 and 2014.

Segment 2: Mussel bottom

The most important operational cost items are wages and salaries and the imputed value of unpaid labour, which are higher than the operating costs. Investments are important for this activity. The depreciation of capital item attains 33% of the total: operating costs and depreciation of capita. In the case of mussel farming, the spat supply is exclusively on wild source, so the livestock costs are very limited (9%).

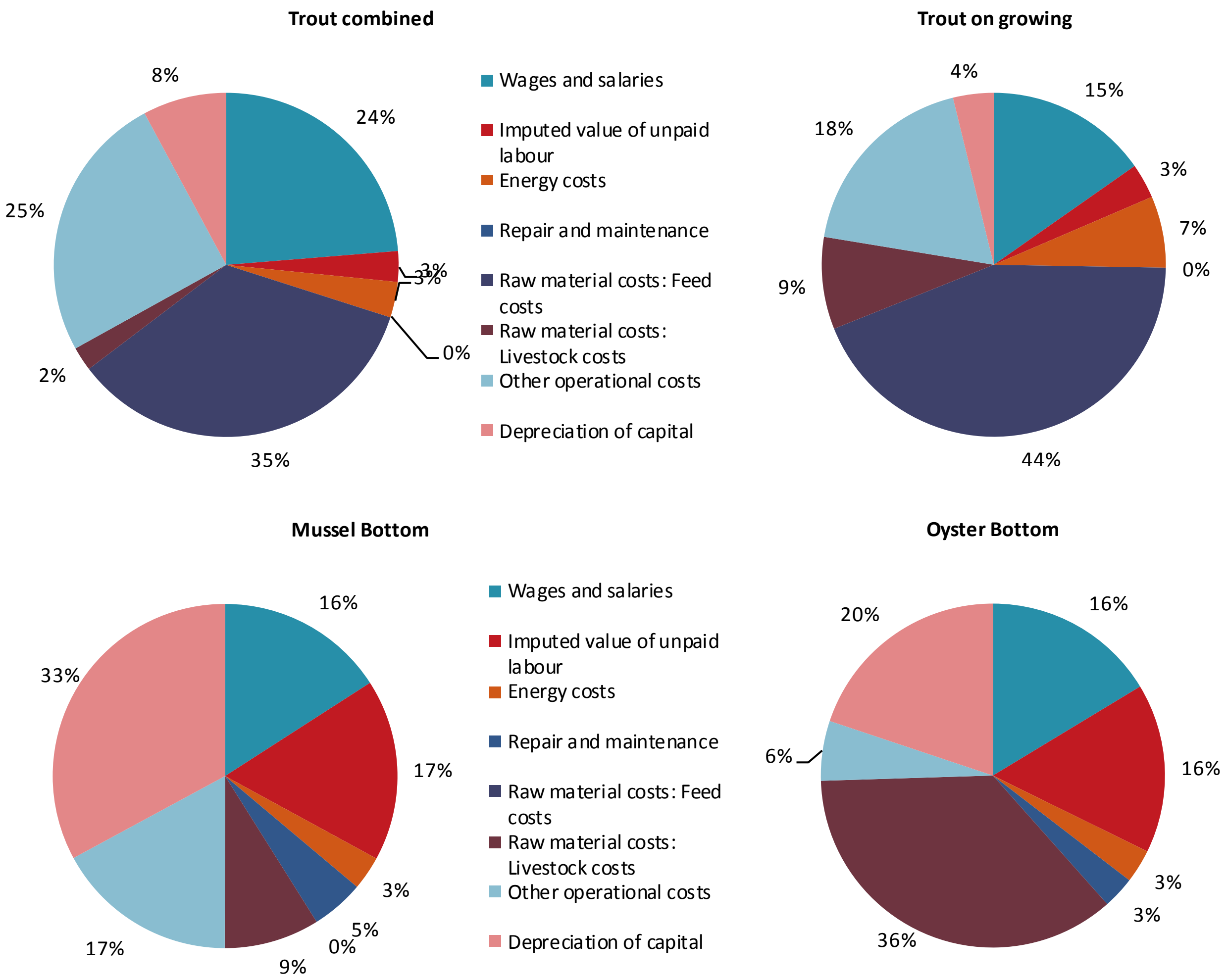


Figure 4.10.8 Cost structure of the main segments in France: 2014.

Source: EU Member States DCF data submission

Segment 3: Trout on growing

The trout on growing segment show the traditional cost composition for freshwater aquaculture industry, where the main cost components are feed which covers 44% of the total operational costs in 2014. Anticipating the augmentation of price, firms had purchased and stocked more feed in 2011 and 2012 (50% of total costs).

Segment 4: Trout combined

As these farmers have to feed their juveniles, also the adults that they are rearing up for their own production, feed costs is also high (35% of the total: operational costs and depreciation of capital in 2014) while livestock costs are low (2%). The second and third operational cost items are the depreciation of capital and wages and salaries.

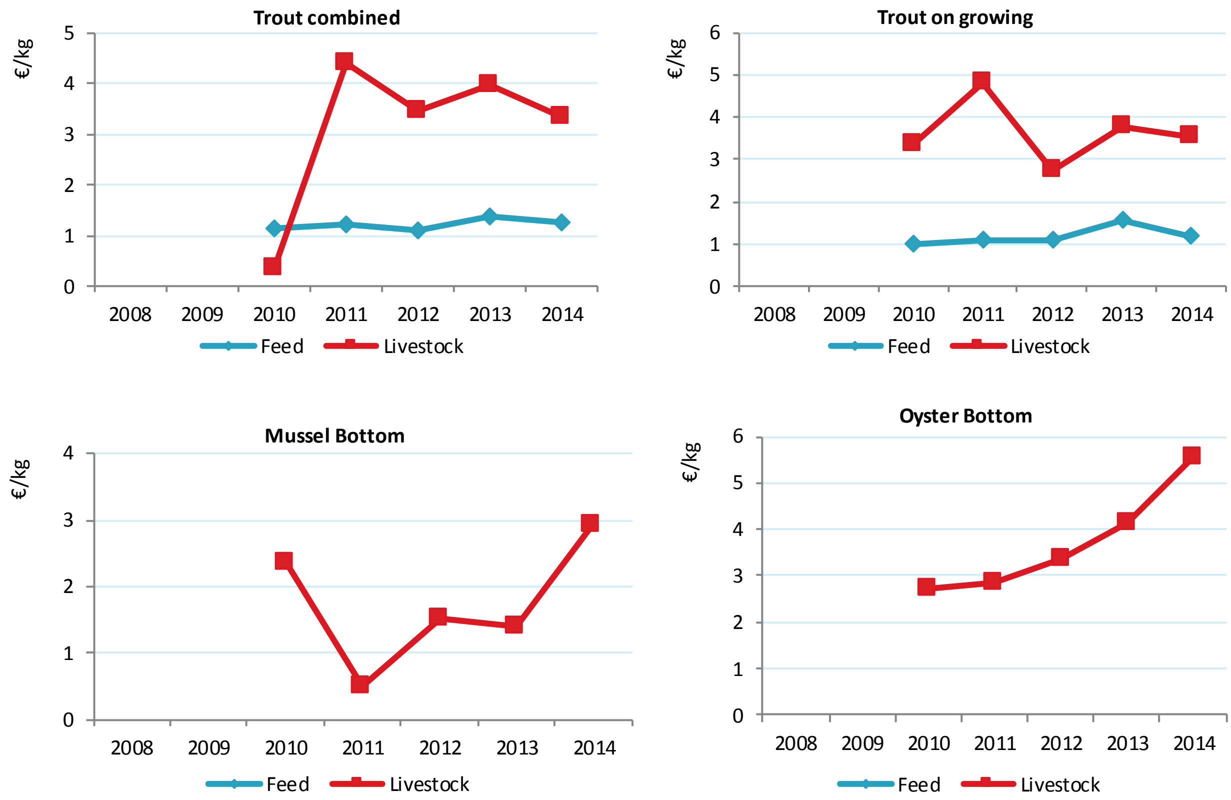


Figure 4.10.9 Feed and livestock prices for the main French segments: 2008-2014.

Source: EU Member States DCF data submission

4.10.6 Trends and triggers

Current production trends and main drivers

In the oyster sector, since 2008, the mortalities of spat has impacted noticeably the production. The main concern of oyster farmers is to maintain profitability. This expected level of requirement leads oyster farmers to keep an adequate level of livestock through the number of spat collectors and their purchase in the hatcheries. The situation is more difficult for professionals with no leasehold, the livestock costs item carry weight. The control of stocks in breeding and in particular for the supply of spat is still a major issue. French State made a commitment in the research for runways of release of crisis. One of these approaches appears to be genetic selection to identify resistant oysters.

Although mussel production are characterized by a decrease since 2010, the production is in regular progress on the whole decade, due to the contributions of the off-shore techniques. The mussel mortalities observed in Pertuis Breton and Bay of Bourgneuf are worrying for concerned mussel producers but also for all mussel farmers who are afraid about a possible propagation. As with any environmental hazard, the prevention methods or the tools for reducing the economic consequence are limited.

The freshwater production has shown a downward trend of production over the years, the number of firms and employment decreased (365 units to 298 from 2007 to 2014). Total production has declined compared to the production of 1995, due to a non-competitive production cost, of volatile global prices and the difficulties with installing or expansion encountered (conflicts of uses, binding regulations, strong competition from other imported fish, etc.). Developing for a sustainable production is done with the respect of constraints related to the Water Framework Directive (WFD), the Water Act at national level, sanitary regulations. French fish farmers hope that these different efforts will be adequate to consolidate the positive economic results observed in 2014 and the demand of the French consumers for quality fish.

In all sectors, rising up the production of aquaculture will benefit from increasing the number of farming sites. This will be made easier by simplifying the administrative procedures for aquaculture authorisation, by a better integration of aquaculture activities in the regional development planning.

Market structure

The reduction of oyster quantities leads modifications on market structure. Price of ongrowing and adult oysters continue to increase in 2013 and 2014 between oyster farmers and on the different markets (sell-through, retail-chains, exportation). In 2014, France exported 11 193 tonnes of oysters and imported 6 295 tons, what released a €75 million credit balance. The exchanges of oysters are marginal compared with the production which allows to answer the domestic demand. The challenge to increase the quantities produced oysters limit development prospects of exports.

French mussel production is not adequate to meet the national demand. The imports of mussels (53 437 tonnes in 2014) mainly, from Chile, Netherlands and Spain exceed widely the exports (2 855 tonnes) revealing a €68.4 million trade deficit. 33% meadows of the imports of mussels concern frozen mussel or in can.

For fifteen years, the marine fish sees its production stagnate or decline, even though more than 80% of fish consumed is imported. A forty companies are involved in marine finfish aquaculture (including hatcheries), on 50 sites along the Atlantic and Mediterranean coasts, but the sector is now very focused on less than a dozen of the companies that realize the three quarters of sales. The freshwater sector is facing to difficulties market and environmental constraints. This results in particular a growing number of requirements related to the evolution of the market demand, economic competitiveness, quality of management of the environment and the social acceptability of production methods. Ensure the necessary development of the French fish also becomes more complex in the context of globalized trade of aquatic products. French products are in competition with foreign domestic productions where natural conditions, social and environmental standards are more advantageous.

Issues of special interest

The oyster mortalities lead to intensify the French research on the development of resistant oysters. This research is conducted by public institutions (including the Ifremer) and by the French private hatcheries.

Since May 2013, "Moules de Bouchot" are a protected name. It's the first French product to obtain the Traditional Speciality Guaranteed (TSG) designation, because they are produced according to a traditional production method. With the introduction of a TSG, mussel farmers wish to boost their revenues. It will also increase the market value of the products of economic operators, by guaranteeing that they are distinguishable from other similar products.

The quality of the water remains crucial for the development of aquaculture.

Outlook for production and trends

In the oyster sector, the situation of mortalities of spat is continuing. Since 2008, the supply of spat and the management of the stock remains a crucial issue. In 2015 and 2016, a high mortality of mussels observed in the West of France (Pertuis Breton, Bay of Bourngeuf) is continuing.

Shellfish farmers dread climate change increasing risk of epizootic and the emergence of diseases in the marine environment. This climate change will affect the environmental parameters: temperature change on ocean acidification, on rainfall and therefore the salinity and the concentration and nutrient quality. This will have consequences on future aquaculture output and on the economic results. Hedging instruments to address environmental risks are not suitable or efficient. A reflexion of France on the establishment of tools will be carried out. These instruments must be compatible with EMFF.

The Operational Programme (OP) "Fisheries and Maritime 2014-2020" for support from the European Maritime and Fisheries Fund (EMFF) in France aims at achieving key national development priorities along with the "Europe 2020" objectives. The OP addresses the general reform of the Common Fisheries Policy (CFP) and the development of the Integrated Maritime Policy (IMP). Funding will aim at promoting more competitive fisheries and aquaculture sectors based on knowledge, innovation and high employment, and promoting a more efficient use of resources through the sustainable development of its fisheries and aquaculture sectors. Funding will also go to projects that improve the livelihood of fishing communities by increased support for Fisheries Local Action Groups (FLAGs), and to supporting French public bodies in enforcing CFP rules and providing sound data for the management of the fisheries and aquaculture sectors. In comparison to the past, the accent is stronger on the preservation of resources and the marine environment, climate change, and shifting towards a low-carbon economy, as well as on the development and competitiveness of businesses and in particular SMEs. The programme covers the whole territory of France, including its outermost regions (Martinique, Mayotte, Guadeloupe, French Guyana and Réunion) and overseas communities (Saint Martin). The total OP budget is €774 353 018, a 76% from the EU contribution and 24% from the national contribution.

The French OP is organised around 6 finding priorities:

- Union Priority 1 (UP1): €150.9 million (25.7% of total EMFF allocation) will aim at a better balance fisheries activities and environmental protection and sustainability. The accent is put on innovation, energy savings and scientific knowledge. The OP also addresses fleet capacity by adjusting fleet capacity to resources, modernisation of the fleet, investments in port infrastructures in line with requirements under the discards ban, and improving traceability of fisheries products and processing.

- Union Priority 2 (UP2): €88.8 million (15.1% of EMFF allocation) will go towards meeting the objectives of the French national strategic plan for aquaculture that aims at boosting competitiveness and sustainability of the French aquaculture sector. Actions will aim to improve communication in the aquaculture sector, improve territorial cohesion of aquaculture in the French territories and boost the development of aquaculture in outermost regions. Support will focus on three national objectives: technological development, innovation and knowledge transfer, competitiveness and viability of aquaculture enterprises and protection and restoration of biodiversity.

- Union Priority 3 (UP3): €122.3 million (20.8% of EMFF allocation) will go towards compliance with CFP rules regarding control and data collection. Funding will go towards improving the collection and management of data, including through the rationalisation of data bases, to improve scientific assessment of stocks and to implementing the action plan for control which will reinforce administrative capacity and the effectiveness of fisheries control and inspection.

- Union Priority 4 (UP4): €22.6 million (3.8% of EMFF allocation) will help ensuring better territorial cohesion of fisheries and aquaculture. Actions will aim at: maintaining and creating new jobs, reinforce the position of fisheries and aquaculture within the development of coastal territories, strengthening the FLAGs network and increasing added value through innovative projects and research.

- Union Priority 5 (UP5): €163.2 million (27.8% of EMFF allocation) will go towards improving the marketing, diversification and valorisation of seafood products. The French OP gives a central role to producer organisations (PO) that currently place almost 50% of the French production on the market, through the implementation of production and marketing plans, the reinforcement of POs across its territory (both mainland and outermost regions). Compensation for additional costs in the six French outermost regions has more than doubled compared to the 2007-2013 period.

- Union Priority 6 (UP6): €5.3 million (0.9% of EMFF allocation) will go towards strengthening the efficiency of maritime surveillance and widening the network of marine protected areas and improving knowledge on the marine environment and interactions with human activities.

- €34.8 million (5.5% of EMFF allocation) are allocated to technical assistance in order to reinforce the implementation system, ensure efficient administration of the EU funding, including support to reducing burden on beneficiaries, improving e-administration and publicity and information measures.

The strategy for UP2 is anchored in a comprehensive national strategic plan for aquaculture. It is concentrated on technological development, innovation and knowledge transfer, competitiveness and viability of aquaculture enterprises, and protection and restoration of biodiversity. By 2023, aquaculture activities are expected:

- To reinforce the place of aquaculture in French territories and develop the employment: shellfish farmers and fish farmers are actors involved in water quality and aquatic ecosystems. Their role of environmental observation should facilitate the integration of aquaculture activities in the territories;

- Develop sustainable aquaculture production activities by supporting farmers in the improvement of environmental performance and the implementation of risk management tools;

- Increase the value of products throughout the value chain: the French market for aquatic products (fisheries and fish farms), highly dependent on imports, has substantial growth opportunities for the different aquaculture sectors, subject to offer consumers guaranteed products to their origins, production conditions and their health and organoleptic qualities;

- Increase and share expertise, knowledge and innovation for development of aquaculture activities. The development of this sector is largely based on research, development and innovation. These different points should be shared with society and consumers. Many aquaculture issues require improved knowledge: shellfish mortality, feed efficiency in fish farming, effluent limitations, closed circuits, new adapted species or descent, supply management spat, etc.

Several national and regional measure of EMFF are proposed to aquaculture enterprises. Concerning the national measures: measure 47 (innovation, €5.7 million for the national contribution (NC) for 2016-2020), measure 51a (mapping census for the best aquaculture sites, €1.9 million NC), measure 56 (animal health, €2.7 million NC), measure 57 (insurances, €500 000 NC). For regional measures in continental regions: 48 (investments in aquaculture enterprises), 50c (networking) 51 b, c, d (increasing the potential of aquaculture sites), 68 (marketing) and 69 (processing) with €2.3 million NC for the programming period.

For 2014 to 2023, the French expected growth objectives are:

- An increase of 8 000 tonnes by 2023 with maintaining of shellfish production and increasing fish farming and seaweed production;

- An increase of €80 million of value by 2023.

Nevertheless, a lot of external factors could influence the level of production such shellfish mortality, price volatility, environmental hazards. So, these increases are the maximum values possible by 2020.

Concerning the effect on FTE, funding will aim at developing attractiveness of jobs in the aquaculture industry, encouraging evolution from part-time employment to full-time employment through diversification of activities, supporting installation of young entrepreneurs and improved access to training. The objectives are to maintain 10 000 FTE and create 500 new FTE.

In term of environment, two objectives are to promote sustainable exploitation of the aquatic environment through support to collective actions aimed at improving water quality and to improve aquaculture techniques to minimize environmental impacts.

4.10.7 Data Coverage and Data Quality

Data quality

In 2010, DPMA with LEMNA, an economy laboratory from Nantes University, have set up a working group with 2 subgroups: shellfish farming, fish farming. Each subgroup has clarified how production data should be used to determine the membership of each enterprise to a particular DCF segment as no precise recommendation was found in the DCF regulation, especially on species level for shellfish. To improve the accuracy of sampling, the subgroup defined the stratification to be applied within each segment. The subgroups had also to characterize more precisely the content of each economic indicator.

For shellfish farming, the subgroup involves two enterprise accounts management centres that transmit economic data, on anonymous basis, from a sample of the accounting records of enterprises that they follow. To determine the membership of an enterprise to a segment and stratum, to give full detailed economic data, these centres collect additional data to the standard accounting records.

The planned sample rate is 15% overall (from 16% to 25%) and could be realised for the main segments. Apart from production and employment, economic data are not transmitted for some segments in 2014: mussel raft and long line, and other shellfish on long line. The low sampling rate (6%), leading to high CV’s explains this result. Enterprises in these segments are located on Mediterranean coast where the enterprise accounts management centres have started to collect the additional data needed for our economic collection in 2012. In addition, many enterprises are individual units and don’t have accounting records. The effort in order to consolidate the sample must be reinforce in the future.

For year 2014, the socioeconomic data of 439 enterprises in the shellfish farms segments was collected (274 in 2010) representing 15.8% of the population. The main segments had an appropriate sampling rate, giving a good precision.

The socioeconomic data of 3 enterprises in the marine fish segments was collected, covering the sea bass and sea bream segments. The achieved sampling rate low for the cage segment (25%) representing a limited population of 15 enterprises with a high variation from small farms to very important ones, giving a poor precision. Due to restructuration for one big size enterprise, the very small population (5 units) of the sea bass – sea bream hatcheries & nurseries segments can't be provided properly since 2012.

The socioeconomic data of 58 enterprises in the trout segments was collected for year 2014, representing 19.5% of the population. As these segments show a high variation from small farms to very important ones, this sampling rate give a medium precision for economic data.

Data availability

Decision to consider shellfish farms in "oysters" or "mussels" segments is based on the turnover ratio of one of these species group to the overall turnover; otherwise the firm is included in "other shellfish". Since 2010, this minimum ratio was fixed to 60% of the total turnover but segmentation was not updated for years 2008 and 2009 to respect this level.

For the period 2010-1014, economic parameters (turnover, subsidies, other income, total income, wages and salaries, imputed value of unpaid labour, energy costs, raw material costs: livestock costs, raw material costs: feed costs, repair and maintenance, other operational costs, depreciation of capital, financial costs net, extraordinary costs net, total value of assets, net investments, debt, raw material volume: livestock, raw material volume: feed) are not available for all segments, but the main ones.

These economic parameters are available for 7 segments corresponding to 15% of the total turnover in 2014. Therefore, even if total data is presented for the whole French aquaculture sector, economic indicators have been calculated only using data for these main indicators where all economic data was available.

Confidentiality

Production data (in weight and value) are assed via an exhaustive survey realised by the statistical service of French fisheries organisation. This survey is registered to the national committee for statistical information and must follow rules for statistical confidentiality: published results aggregated from a minimum of 3 enterprises and one unit doesn't represent more than 85% of the group total.

As part of the DCF data rely on production, segments defined by France try to follow this rule, by example: "Other marine fish" segment is a mix of some enterprises quite different one to another in size and grown species.

But some situation of statistical confidentiality may still occur when data within segment are disaggregated, by example: number of enterprise by employment size.

Differences in DCF data compared with other official data sources

In application of regulation EC 762/2008 of the European Parliament and of the Council, France is reporting every year the production in volume and unit price to Eurostat with a copy to FAO statistics unit. The production concerns mainly the adult animals which are sold for human consumption in general, for river restocking or recreational fishing additionally in the case of fresh water farming. These numbers don't take in account the commercial activity between farmers for livestock exchange at intermediate growth stages, including shellfish spat collected from sea.

Economic data transmitted in the DCF program are reporting in one hand the whole sales (in volume and turnover) from the enterprises: adults products sold for human consumption or river restocking for fresh water fish, animals (adults or juveniles from nurseries or shellfish spat) sold from one farm to another one which will carry on subsequent rearing up. In another hand, economic data include livestock bought (in volume and cost) by enterprises from other farmers.

The ratio livestock costs on sales turnover is 27% in shellfish farming (mainly oyster segments representing 61% of the overall turnover) and 6% in fish farming (mainly trout segments).

This explains the main difference between Eurostat production data and DCF turnover figures.

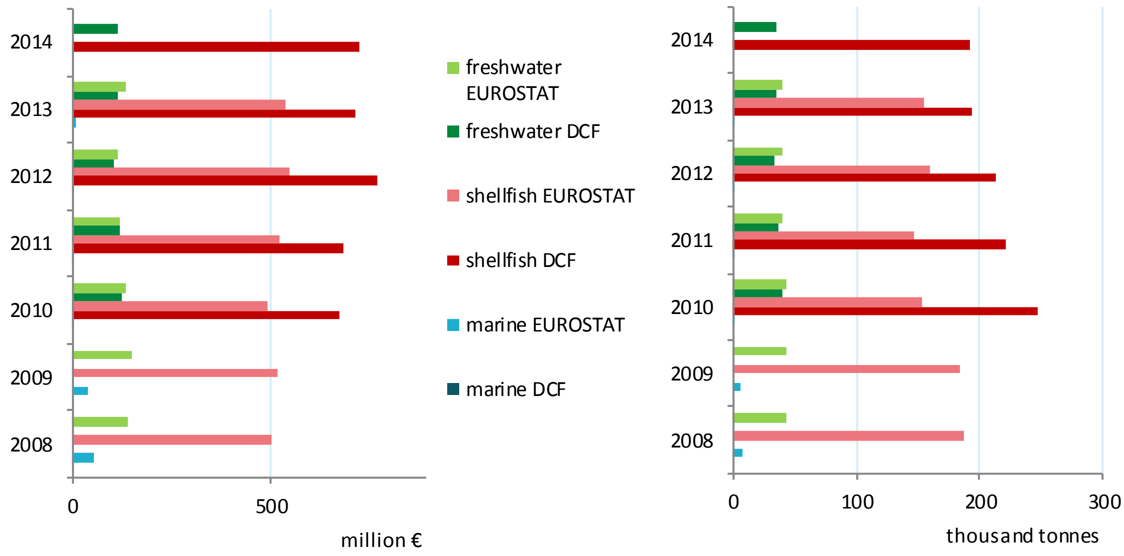


Figure 4.10.10 Comparison of DCF data with EUROSTAT data for France: 2008-2014

4.11 Germany

4.11.1 Summary

Production volume and value

In total, the German aquaculture sector produced around 26 200 tonnes in 2014 and 25 400 tonnes in 2013, which means a huge decrease compared to39 200 tonnes in 2011, but only a slight decrease compared to 26 500 tonnes in 2012. The main reason for this fluctuation is the fluctuation in blue mussel production, which is very much depending on natural conditions. Production of fish from freshwater remains more or less stable at about around 20 000 tonnes. The main species are trout with 10 600 tonnes, carp with around 5 200 tonnes and blue mussel with 5 300 tonnes in 2014. As specific data collection under DCF regulation in Germany is restricted to the mandatory marine sector, only for blue mussels reliable data on the economic situation of the segment is available. For the other segments only data collected under the Eurostat Aquaculture Statistics regulation are available, which means mainly the production volume.

Production value for the blue mussel segment was about €8.7 million in 2013 and €15 Million in 2014, while volume was just increasing from 5 200 tonnes to 6 900 tonnes in 2014. So the increase in terms of value reflects a huge increase in prices paid to the producers. Unfortunately, the production and volume and value figures are maybe not correct, as Eurostat data only show 5.2 tonnes production in 2014 with a value of €10.4 million. This issue, also relevant for 2013, is discussed in the data quality part of this chapter. In the following chapters only the blue mussel segment is analysed, as there are no reliable data except for production volume for the other segments. Wherever reliable data or knowledge on the other segments are present, it is documented in the relevant section of this text.

Overall industry structure and employment

The majority of enterprises are quite small, less than 10% of companies produce more than 5 tonnes per year. This means that profit maximization is not the main aim for the aquaculture production, but a more or less stable production, often not serving as the main income source. Many producers also combine aquaculture with gastronomic activities. Reliant figures on employment are not available, as Germany only reports marine aquaculture data, but some figures have been included in the last EU-Aquaculture report.

The marine sector consists mainly of blue mussel producers, holding licenses from the states Lower Saxony and Schleswig-Holstein. These licenses are given for a restricted time and producers are obliged to form producer organisations, that have to pay license fees of more than 300 000 € per year.

Main segments

The main segment is blue mussels on bottom in the marine sector, trout and carp for the freshwater. Trout stand for more than the half of German fish production in aquaculture facilities, carp for around a quarter.

Current production trends and main drivers (Trends and triggers)

Blue mussel production relies mainly on the natural seed. Seed mussel are collected and transferred to dedicated cultural areas. As the seed fall in the 21st century was almost quite bad, producers started to collect mussel seed by longlines, which actually is on the edge or below of profitability. During the grow-out time of about two years mussels are susceptible to the natural conditions in the German North Sea. One serious storm can easily diminish one third of the mussels stored on the seabed. Increase of extreme weather conditions and further shortage of seed mussel may affect this business seriously.

The freshwater sector mainly suffers from diseases, predators like cormorant, lack of successors and a lack of concentration in order to increase market power and thereby producer prices. Economies of scale do not occur due to the small production unit. Carp is a seasonal and regional fish, with decreasing demand for, also reflected in the low prices for this species.

Outlook

As long as there is no political will to establish new aquaculture facilities with serious measures taken to achieve increased targets for production, the sector will likely not expand. Mussel production will further rely on the seed fall, which is effected by harbour constructions and ocean dumping of sand dredged from river beds like the Elbe in the near of cultivations areas. Long and demanding license procedures, together with the competition of off-shore wind farms and tourism in marine areas and traditional agriculture and other uses of ground onshore, along with the lack of new water rights, are main obstacles for the development of the sector. As the sector is so small in Germany compared to agriculture and industry, one could not expect any major changes in the effort of administrations and political bodies to support the sector. Some states have at least started to create priority areas for aquaculture facilities in their spatial planning. To the view of the expert writing these lines traditional aquaculture is more or less seen as folklore and not as a field for business development.

4.11.2 Production and sales

The main species are trout with 10 600 tonnes, carp with around 5 200 tonnes and blue mussel with 5 300 tonnes in 2014. As specific data collection under DCF regulation in Germany is restricted to the mandatory marine sector, only for blue mussels reliable data on the economic situation of the segment is available.

Production volume in the mussel segment is very much depending on natural conditions, in particular the seed fall. Producers are used to it and do think in longer terms. In good years reserves are created for the years with less income.

Table 4.11.1 Production and sales for Germany: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 13-14	Develop. 2014/(08-13)
Production weight (thousand tonnes)	***43.7***	***40.2***	***40.6***	***36.2***	***25.4***	***25.3***	***27.3***	***8%***	***-22%***
Marine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*
Shellfish	6.8	4.0	4.9	19.2	6.7	5.2	6.9	*32%*	*-10%*
Freshwater	37.0	36.3	35.7	17.0	18.7	20.1	20.4	*2%*	*-26%*
Production value (million €)	***96.3***	***94.0***	***94.0***	***103.0***	***90.9***	***103.9***	***109.8***	***6%***	***13%***
Marine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*
Shellfish	9.7	5.0	4.1	27.8	9.5	8.7	15.0	*72%*	*31%*
Freshwater	86.6	88.9	89.9	75.2	81.4	95.2	94.9	*0%*	*10%*
Hatcheries & nurseries (million units)				***6,284***	***143***	***164***	***205***		
Eggs				2,649	43	36	117		
Juveniles				3,635	100	128	88		

Source: EU Member States DCF data submission and Eurostat, 2016

4.11.3 Main species produced and economic performance by segment

The following tables just reflect the situation in the blue mussel segment, as economic data for the other segments are not reported and also not present to the public in Germany. Also in here the mentioned fluctuation in the economic development of the blue mussel sector is obvious.

Table 4.11.2 Economic performance of the German aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	*% of total income*	Change 2014-13	Development 2014/(2008-13)
Income (million €)										
Turnover	9.7	5.0	4.1	27.8	9.5	8.7	15.0	*100%*	*72%*	*39%*
Other income	0.1	0.0	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*	*-100%*
Subsidies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*	*-100%*
Total income	*9.8*	*5.1*	*4.1*	*27.8*	*9.5*	*8.7*	*15.0*	*100%*	*72%*	*38%*
Expenditures (million €)										
Wages and salaries	3.1	2.9	2.9	3.6	3.2	3.0	3.3	*22%*	*12%*	*6%*
Imputed value of unpaid labour	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*	*0%*
Energy costs	1.2	0.5	0.3	2.2	1.9	0.3	0.4	*3%*	*26%*	*-58%*
Repair and maintenance	0.6	0.3	0.4	0.8	0.7	0.8	1.0	*7%*	*25%*	*68%*
Raw material: Feed costs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*	*0%*
Raw material: Livestock costs	0.0	0.4	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*	*-100%*
Other operational costs	1.4	1.1	0.9	1.8	1.8	2.0	4.2	*28%*	*110%*	*183%*
Total operating costs	*6.3*	*5.3*	*4.4*	*8.3*	*7.5*	*6.1*	*8.9*	*60%*	*47%*	*41%*
Capital Costs (million €)										
Depreciation of capital	1.5	0.4	1.1	2.9	2.9	2.4	2.4	*16%*	*0%*	*28%*
Financial costs, net	0.3	0.2	0.1	0.3	0.3	0.2	0.2	*2%*	*0%*	*9%*
Extraordinary costs, net	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*	*0%*
Capital Value (million €)										
Total value of assets	14.7	14.3	11.8	25.5	24.0	22.5	21.0	*140%*	*-7%*	*12%*
Net Investments	0.5	0.1	0.0	1.5	0.4	0.9	1.8	*12%*	*100%*	*216%*
Debt	4.0	2.9	2.7	5.5	5.0	5.4	4.9	*33%*	*-9%*	*16%*
Input & Production (thousand tonnes)										
Raw material: Feed	0.0	0.0	0.0	0.0	0.0	0.0	0.0		*0%*	*0%*
Raw material: Livestock	0.0	0.6	0.0	0.0	0.0	0.0	0.0		*0%*	*-100%*
Performance Indicators(million €)										
Gross Value Added	6.6	2.7	2.5	23.1	5.2	5.6	9.3	*62%*	*68%*	*23%*
Operating cash flow	3.5	-0.2	-0.3	19.5	1.9	2.6	6.0	*40%*	*132%*	*34%*
Earning before interest and tax	2.0	-0.6	-1.4	16.6	-1.0	0.2	3.6	*24%*	*1699%*	*38%*
Net profit	1.7	-0.8	-1.5	16.3	-1.2	0.0	3.4	*23%*	*8025%*	*40%*
Capital productivity (%)	45.1	18.7	21.5	90.6	21.6	24.7	44.5		*80%*	*20%*
Return on Investment (%)	13.6	-4.1	-11.8	65.1	-4.0	0.9	17.3		*1824%*	*74%*
Future Expectation Indicator (%)	-7.2	-1.9	-9.1	-5.5	-10.4	-6.7	-2.9		*57%*	*58%*

Source: EU Member States DCF data submission

As the number of licenses in the mussel segment are fixed and most costs items are more or less fixed, the development is quite stable. Only if the number of years with low income becomes too many, some companies come into serious problems. If they can´t survive, the license is taken over by one of the other companies normally, as the producer organisations are responsible for the licenses and all companies are member of one of the two.

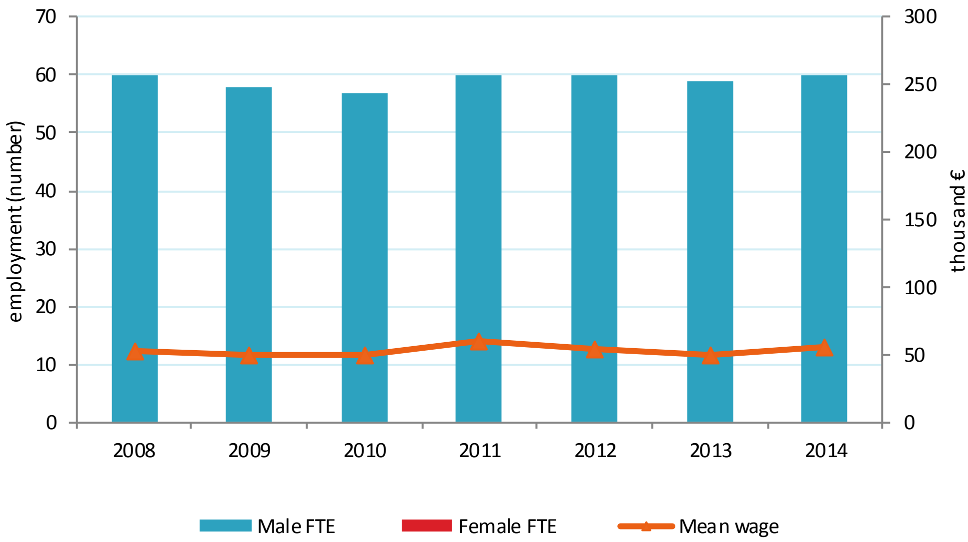


Figure 4.11.1 Employment trends for Germany: 2008-2014.

Source: EU Member States DCF data submission

Table 4.11.2 shows numbers of economic performance, simply reflecting the already mentioned situation. On average the segment is still profitable, and very good years can overcompensate years of lower income. 2014 was a quite good year in terms of income. In general an income of around one million Euro per company and vessel is needed on average.

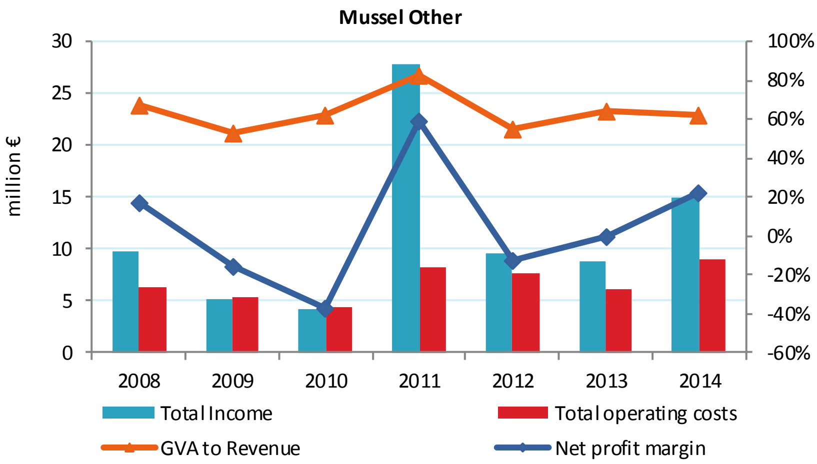


Figure 4.11.2 Economic performance for Germany: 2008-2014

Source: EU Member States DCF data submission

As Figure 4.11.2 shows, the development of the segment almost completely relies on natural conditions, and very good years change with quite bad years in terms of income, which then is reflected in the productivity figures.

The price for blue mussels is very much depending on quality and supply from other countries, as almost all production is sold via the auctions in Yerseke/The Netherlands.

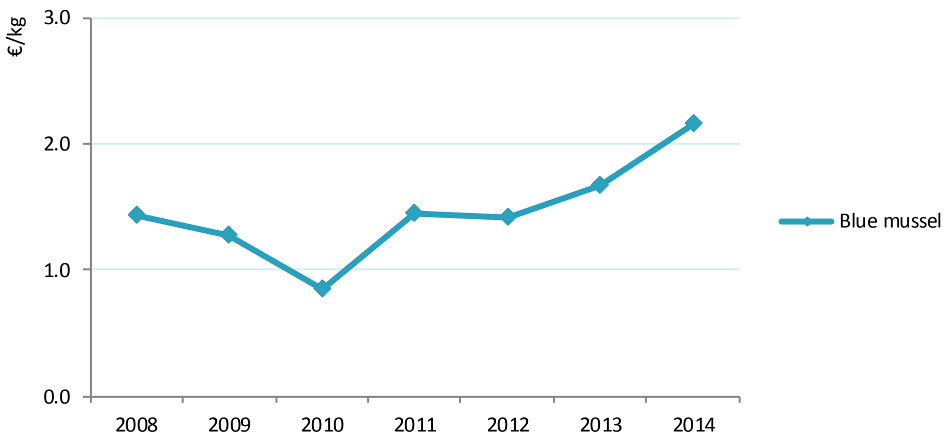


Figure 4.11.3 Average prices for the main species produced in Germany: 2008-2014.

Source: EU Member States DCF data submission

4.11.4 Trends and triggers

Current production trends and main drivers

As mentioned, blue mussel production depends on natural conditions. Freshwater aquaculture is more or less stable, also facing the problem of succession. Some new trends are the use of heat from biogas facilities for aquaculture purposes, mainly in order to get higher subsidies for the biogas production. Furthermore, some currently small enterprises try to start innovative production, e.g. for shrimp aquaculture in order to have fresh shrimps supply with German products, as the prices are quite high.

Outlook for future production trends

Germany stated in its national aquaculture strategy concrete production goals:

- Increase of total production from around 26 500 tonnes to 52 000 tonnes in 2020
- Increase in the freshwater sector by 148%
- Marine fish farming from less than 50 tonnes to 1 000 tonnes in 2020
- Mollusk production increase by 144% until 2020

This goes along with the aim of better marketing of aquaculture products, development of licensing guidelines and training of administrative actors, research in improved production technologies and vaccines for fish diseases, a coordinated research strategy, coordinated spatial planning etc.

Compare this aims with the development of the past, production targets seem to be completely unrealistic. Blue mussel as well as freshwater licenses are still an issue of administrative obstacles. No initiative to ease the license procedure is known to the expert. Only one state has designated areas for aquaculture facilities so far. A coordinated national research strategy exists. But a plan of a national competence center for aquaculture has been denied by federal ministerial representatives. As aquaculture, in particular the fresh water segments, are under the authority of the individual German states, a concentrated action is actually not visible, moreover not expectable.

Currently the aquaculture production is Germany decreases more or less. In order to achieve the production targets in 2020, producers have to begin the licensing process and the construction of the facilities in between the next 2-3 years, as commercial production needs some time to be set up, also most species that are suitable have grow-out periods of a year and more. Currently one must state, that larger new facilities are more likely to get bankrupt than to become a success story (Some recent examples: Caviar production have become bankrupt, marine fish production in the state of Saarland have become bankrupt etc.).

4.11.5 Data Coverage and Data Quality

Differences in DCF data compared with other official data sources

For almost all years data are comparable between the different sources for the blue mussel segment. Data for the freshwater aquaculture are now also comparable between Federal statistical Office and Eurostat and FAO, as the source is the same since several years, even if in the beginning of the aquaculture data collection by the Federal Statistical Office in Germany a lot of critique was present about the figures. To mention are the differences in Eurostat and FAO data for 2013, as actually Eurostat receives the data from the German Federal Statistical Office and transfers these figures to FAO, so they should be the same. Data under DCF are based on landing statistics, while the German Statistical Office collects the data via questionnaire. Why these data are different for 2014 is at the moment unclear but will be evaluated. Maybe different reporting periods for financial statements and landing statistics are the reason. In the next aquaculture report the explanation should be available. Another reason could be the landing and transfer of seed mussels, which are then maybe not reported as production sold, but part of the landing statistic and therefor also of the financial accounts. But in the Eurostat statistic is only asked for production for human consumption. But this is only a guess.

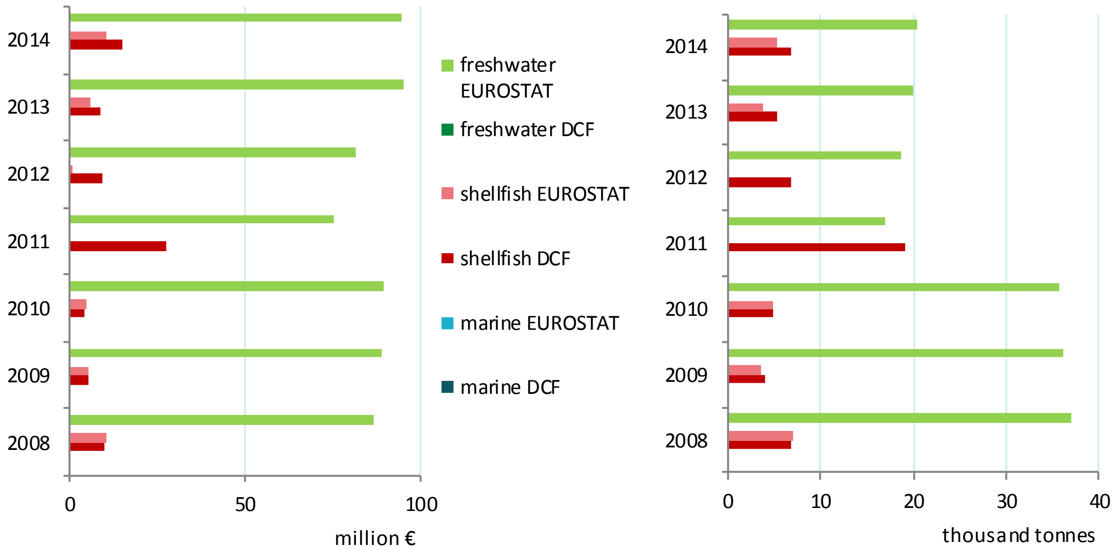


Figure 4.11.4 Comparison of DCF data with EUROSTAT data for Germany: 2008-2014

4.12 Greece

4.12.1 Summary

Production volume and value

According to the data provided by Greece, for 2014, the aquaculture production was 118.1 thousand tonnes corresponding to the value of €613.3 million. No data is provided by Greece for the years 2008 to 2012.

Overall industry structure and employment

Large vertically integrated enterprises, most of which are listed in the Athens stock exchange market dominate the Greek marine finfish aquaculture industry. Freshwater and shellfish aquaculture are mainly comprised of small family enterprises.

Total employment in the Greek aquaculture sector is estimated at 5 129 employees in 2014 or 4 640 in FTE terms. Male employees dominate the sector (83%).

Main segments

In 2014, the dominant specie produced by the Greek aquaculture sector is Gilthead sea bream, accounting for 46% of the Greek aquaculture production volume and 55% of the production value. European sea bass, the second most important species accounted for 30% of the production volume and 40% of the production value. Mediterranean mussel, an important specie in terms of volume (20%) generated only 2% of the total production value, due to the relatively low unit price of mussels. Rainbow trout, meagre, red porgy, sharp snout sea bream and other species contribute 4% to the production volume and 3% to the production value.

Current production trends and main drivers (Trends and triggers)

A rise in the production, mainly for sea bass and sea bream, is expected during 2017 mainly as an effect of the higher prices (and thus profit margins) received by the producers during 2014 and 2015. The restructuring of debt and the bank loans, the changes of the shareholders and the changes of management for the main Greek production companies (during 2015 and 2016) are also expected to facilitate the rise of the production.

Outlook

In the short run, rise of the production and rise of investment is expected for the Greek aquaculture. The Greek banks, as present major shareholders in the aquaculture are expected to transfer the shares to new investors. Further consolidation of the sea bass and sea bream sector is also likely, subject to authorization of the competition authorities. On the long run, more EMFF funds directed toward research and innovation (rather to the renovation of production facilities) are needed for the development of the sector.

Further consolidation of the mussel sector is expected. A considerable rise of the production is not expected if key issues of the mussel aquaculture in Greece are not addressed.

4.12.2 Production and sales

According to the data provided by Greece, for 2014, the aquaculture production was 118.1 thousand tonnes corresponding to the value of €613.3 million.

No data is provided by Greece for the years 2008 to 2012. As data of 2013 are inconsistent and do not account for the population of the enterprises, 2013 figures are not discussed in the remaining of the national chapter.

Table 4.12.1 Production and sales for Greece: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Sales weight (thousand tonnes)						***78.9***	***118.1***		
Marine						76.3	0.0		
Shellfish						0.0	0.0		
Freshwater						0.0	0.0		
Hatcheries & nurseries						0.0	0.0		
Sales value (million €)						***370.9***	***613.3***		
Marine						343.5	404.1		
Shellfish						0.0	8.6		
Freshwater						0.0	6.1		
Hatcheries & nurseries						27.3	29.3		

Source: EU Member States DCF data submission

4.12.3 Industry structure and employment

While large vertically integrated enterprises, most of which are listed in the Athens stock exchange market, dominate the Greek marine finfish aquaculture industry, freshwater and shellfish aquaculture are mainly comprised of small family enterprises. This structure is also evident in the table below despite the fact that the data probably refer to the sample and not to the population of the sector.

Total employment in the Greek aquaculture sector is estimated at 5 129 employees in 2014 or 4 640 in FTE terms. Male employees dominate the sector (83%). Female employees are usually employed in marine hatcheries and packing units and account for 17% of the employment in the sector. FTE per enterprise is estimated at 18.7; nevertheless, as the major segments (marine finfish and mussels) are extremely differentiated in terms of employment, this indicator is mainly useful for disaggregated segments rather than for the sector as a whole.

No data is provided by Greece for the years 2008 to 2012.

Table 4.12.2 Structure of the Greek aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Structure (number)									
Total enterprises						*54*	*248*		
<=5 employees						21	187		
6-10 employees						9	22		
>10 employees						24	39		
Employment (number)									
Total employees						2,901	5,129		
Male employees						2,318	4,280		
Female employees						583	849		
FTE						2,878	4,640		
Male FTE						2,303	3,832		
Female FTE						575	808		
Indicators									
FTE per enterprise						53.3	18.7		
Average wage (thousand €)						19.1	21.4		
Labour productivity (thousand €)						31.2	25.6		

Source: EU Member States DCF data submission

4.12.4 Economic performance

No economic variables are provided by Greece for the years 2008 to 2012. For 2013 data are inconsistent and do not account for the population of the enterprises thus only the performance of the sector in 2014 is discussed hereafter.

The Greek aquaculture sector generated €680.3 million of income in 2014, mainly originated (90%) from turnover, and other income (9%). Subsidies were estimated at €3.3 million in 2014. Operating costs account for 97% of the total income thus the operating costs were marginally covered by the income generated.

The reliance of the marine finfish segment on debt is evident as debt accounts for 170% of the income generated.

As suggested by the net profit indicator, the sector as a whole generated losses during 2014. Depreciation of capital is more than triple of the net investment in the sector suggesting that the enterprises are not able or they are not willing to invest in the sector. Future expectation indicator also confirms this finding.

Further analysis of the cost components and for most of the performance indicators is meaningless as the two main segments in the sector have extremely different characteristics. On one side, there is the mussel semi intensive aquaculture segment with zero inputs (feed) in the production, affected mainly by external factors such as the climate conditions, generating 1%-2% of the income in the sector. On the other side there is the marine intensive finfish aquaculture, a developed industry generating most of the income in the sector, mainly affected by the economic environment in the Greek economy, the international commodity price of fish feed raw material and the demand in southern European countries.

Table 4.12.3 Economic performance of the Greek aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	% of total income	Change 2014-13	Development 2014/(2008-13)
Income (million €)										
Turnover						370.9	613.3	*90%*		
Other income						38.3	63.7	*9%*		
Subsidies						0.0	3.3	*0%*		
Total income						*409.2*	*680.3*			
Expenditures (million €)										
Wages and salaries						54.4	97.5	*14%*		
Imputed value of unpaid labour						0.6	1.9	*0%*		
Energy costs						9.6	16.5	*2%*		
Repair and maintenance						5.2	8.5	*1%*		
Raw material: Feed costs						134.0	230.7	*34%*		
Raw material: Livestock costs						111.7	195.0	*29%*		
Other operational costs						58.8	107.4	*16%*		
Total operating costs						*374.3*	*657.4*	*97%*		
Capital Costs (million €)										
Depreciation of capital						14.0	18.7	*3%*		
Financial costs, net						28.7	45.1	*7%*		
Extraordinary costs, net						3.0	63.8	*9%*		
Capital Value (million €)										
Total value of assets						594.5	1200.3	*176%*		
Net Investments						8.5	6.3	*1%*		
Debt						547.0	1156.3	*170%*		
Input & Production (thousand tonnes)										
Raw material: Feed						244.7	273.1			
Raw material: Livestock						0.0				
Performance Indicators(million €)										
Gross Value Added						89.9	119.0	*17%*		
Operating cash flow						34.9	22.9	*3%*		
Earning before interest and tax						20.9	4.2	*1%*		
Net profit						-7.9	-40.8	*6%*		
Capital productivity (%)						15.1	9.9			
Return on Investment (%)						3.5	0.4			
Future Expectation Indicator (%)						-0.9	-1.0			

Source: EU Member States DCF data submission

4.12.5 Main species produced and economic performance by segment

In 2014, the dominant specie produced by the Greek aquaculture sector is Gilthead sea bream, accounting for 46% of the production volume and 55% of the production value. European sea bass, the second most important specie accounted for 30% of the production volume and 40% production value. Mediterranean mussels, an important species in terms of volume (20%) generated 2% of production value, due to the relatively low unit price of mussels. Rainbow trout, meagre, red porgy, sharp snout sea bream and other species contribute 4% to the production volume and 3% to the production value.

Relatively small quantities of dentex and mullet are produced. Other species like white seabream, stripped seabream and common pandora are either produced in small quantities or on experimental production stage. Shellfish production is mainly comprised of mussels and freshwater production is mainly comprised of rainbow trout.

Figure 4.12.1 Main species in terms of weight and value in Greek production: 2014.

Source: EU Member States DCF data submission

European sea bass was the highest valued specie in 2014 as it received the highest average per unit value (price).

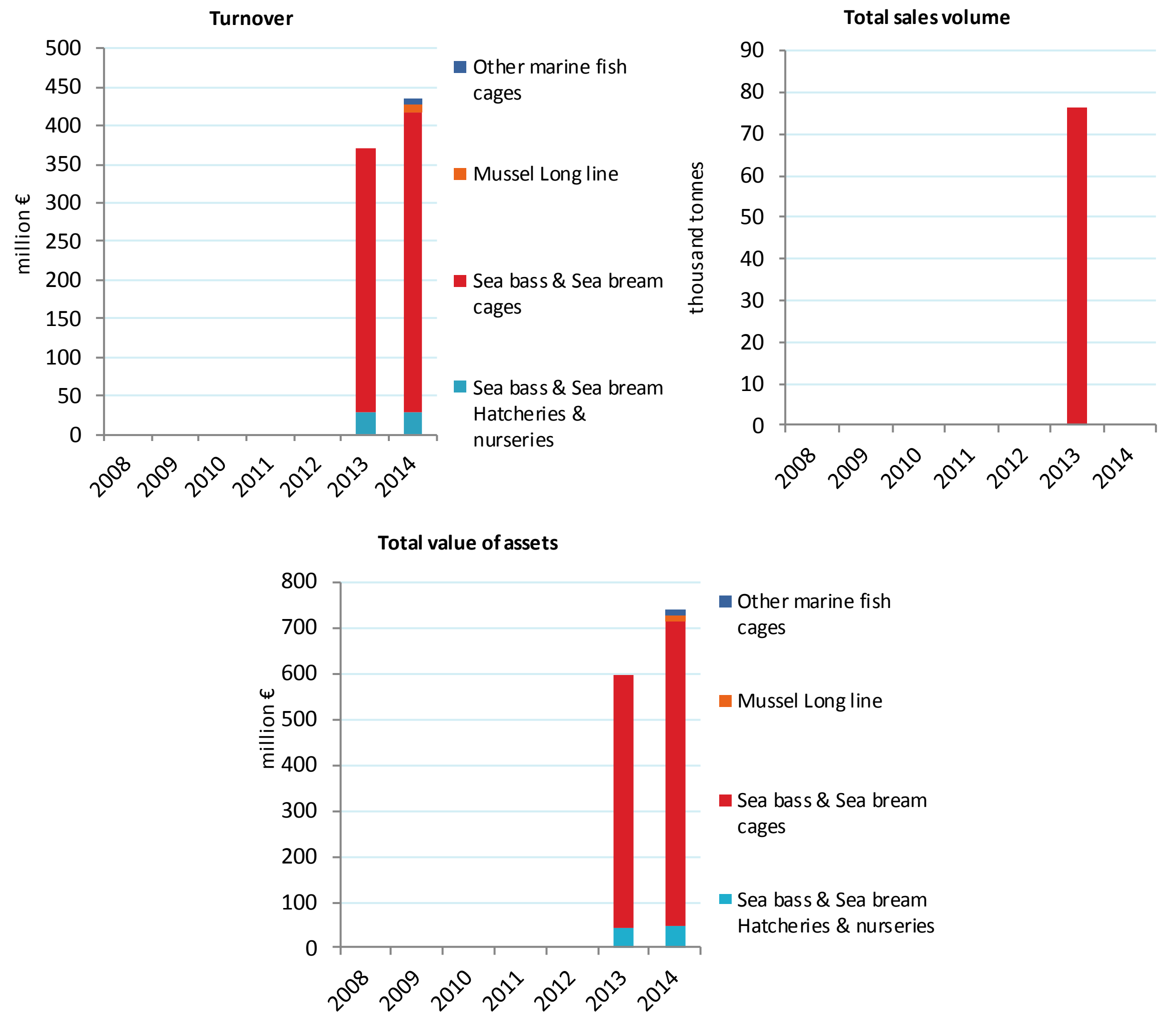


Figure 4.12.2 Structural development Greek aquaculture sector: 2008-2014.

Source: EU Member States DCF data submission

Further analysis at the segment level is not possible because data at segment level seem to have been disaggregated based on fixed percentages and so it produces the exact same performance for each segment, as well as totally unrealistic costs for some segments.

4.12.6 Trends and triggers

Current production trends and main drivers

Greek aquaculture production volume is stabilized since 2009 around 110 000 tonnes. As the vast majority of the production is exported to southern European countries, production volume stabilization is partly attributed to the negative effects of the recent debt crisis on the demand of Southern European consumers. On top, producers were forced to reduce production as an effect of the limited availability and the cost of bank loans in the Greek economy. A rise in the production, mainly for sea bass and sea bream, is expected during 2017 mainly as an effect of the higher prices (and thus profit margins) received by the producers during 2014 and 2015. The restructuring of debt and the bank loans, the changes of the shareholders and the changes of management for the main Greek production companies (during 2015 and 2016) are also expected to facilitate the rise of the production.

Meagre (*Argyrosomus regius*) seems to be a promising species, both from a production and demand point of view. This species is well appreciated by the Greek and Southern European consumers and already present in the retail stores and fishmonger sales points in Greece.

While no significant changes are expected for the mussel production, the concentration of the mussel production companies has begun during 2014 and it is expected to further develop during the next few years.

Freshwater expansion is mainly restricted by the unavailability of suitable space in Greece.

Market structure

Sea bass and sea bream aquaculture in Greece is under consolidation for the last decade, during which, the number of companies decreased by two thirds (2/3) to approximately 60 companies in 2015. The seven larger companies are estimated to produce and trade (directly or through affiliated companies) more than 70% of the Greek production.

During 2015, commercial banks as major creditors, undertook the majority of the ownership of the two largest companies, Nireus S.A. and Selonda S.A. and they proceeded with the acquisition of DIAS S.A. by Selonda S.A.. During 2016, the ownership of Andromeda S.A., the fourth largest aquaculture company in Greece, was acquired by an American fund.

The large aquaculture companies are vertically integrated and combine hatcheries with clusters of cage fish farms packing plants and in some cases, these companies also operate own fish-feed factories and processing plants.

More than 20 000 tonnes of farmed marine fish in Greece are now certified with B2B and B2C standards, mainly Global Gap and to a lesser extend Friends of the Sea standard. Organic certification is rather limited and the market segment for organic fish is expected to remain niche. Supply side product diversification includes the production of various size grades and the production of new farmed species such as meagre.

The vast majority (70-80%) of the Greek marine aquaculture fish production is exported mainly to EU countries. The domestic market is estimated at approximately 25 000 tonnes and the production is distributed to the market mainly through wholesalers, fishmongers and small or large retailers. The products are mainly traded unbranded or under private retail standards in the domestic market. In the EU market, the Greek unbranded products compete mainly with the Turkish farmed marine fish but in general there is a price premium paid for the Greek origin.

Mussel aquaculture (*Mytilus galloprovincialis*), is the most important shellfish aquaculture in Greece. There exist two main on-growing techniques for mussel production, the pole system with small farms in shallow coastal sheltered areas and the long-line system in depths greater than 10 m. Mussel aquaculture produces 15% - 16% of the Greek aquaculture production in terms of volume; nevertheless the value of the mussel aquaculture production is approximately 1%-2% of the value of Greek aquaculture production.

The number of the Greek mussel aquaculture companies is not clear or readily available. According to the Greek veterinary registry, as of March 2016, there exist 166 registered mussel aquaculture facilities (i.e. individual leased sea space). There also exist additional facilities with incomplete licencing not provided by the veterinary registry. Nevertheless, as the lease and the licence may include more than one natural or legal person, there is no direct match between the number of licences and the number of companies. As 210 unique natural or legal persons (to a lesser extend) are identified in veterinary registry we consider that the number of individual mussel aquaculture companies in Greece probably exceeds 200 companies. We expect that the consolidation process of the mussel aquaculture will result to fewer companies in the near future.

Vertical integration for mussel aquaculture can be considered the cases when a company owns purification (when necessary), dispatch and processing facilities. In total, based on the veterinary registry, we estimate that less than 10% of the mussel production companies are vertically integrated.

To date, there exists no labelled fresh mussel product of Greek aquaculture origin. The most common diversification activity is the basic possessing of mussels (de-shelling of mussel bodies). There is no diversification of cultivated mussel species. The main outlets for domestic consumption of fresh whole or de-shelled mussels are the restaurants. For the Northern Greece, near by the main production areas, flea markets and retail stores are also important outlets. Depending on the production volume, 50% to 70% of the Greek mussel production is exported mainly to Italy and France.

Issues of special interest

Greece adopted a special spatial plan for the aquaculture in 2011 (join Ministerial decision No 31722 of 2011) in-line with the constitution. This spatial plan includes provisions for the spatial allocation of aquaculture activities, including a map (not detailed and without coordinates) of current or proposed areas for aquaculture development. It also includes provisions for the establishment of Areas for Integrated Aquaculture Development and guidance for the spatial allocation of these areas or individual aquaculture projects and elements of integrated coastal zone management. On top, the special spatial plan for aquaculture includes guidance for the improvement of various laws in order to facilitate the development of aquaculture and reduce the administrative burden as well as the costs for licensing. Finally the special spatial plan for aquaculture includes a detailed action plan.

A major result of the spatial planning for aquaculture is the introduction of "Standard Environmental Commitments" procedure mainly for small farms and farms in Areas for Integrated Aquaculture Development. The procedure previewed is rather simple where the environmental impact assessment (EIA) is substituted by an application for the adoption of "Standard Environmental Commitments".

A new framework law (No 4282 of 2014) in Greece is aiming to introduce the "one stop shop" approach where the jurisdiction of aquaculture licensing lays under the decentralised governmental authorities who are obliged to implement all the actions needed and obtain all the necessary opinions and approvals from various administrative authorities. The law includes provisions for licensing the aquaculture activity at the sea, infrastructure at the seashore and buildings on the land. The full implementation of the law is expected till the end of 2016.

Since the introduction of the new framework law, lease of sea areas for aquaculture in Greece is allowed only for Greek and EU citizens and legal entities (enterprises) for a renewable period of twenty (20) years with an annual fee. The application for lease and license is addressed to the decentralised governmental authorities. After a period of maximum three months, for the necessary opinions and approvals, a temporary lease for two years is issued. A new application is then needed for environmental impact assessment and veterinary approval in order for the license to be issued within the two years period of the temporary lease.

The introduction of the framework law does not reduced the administrative burden (except in the case of Areas for Integrated Aquaculture Development), but the Greek authorities expect that the development of aquaculture will be facilitated due to the "one stop shop" approach and the provisions for simultaneous approvals and licensing of all the aquaculture activities at the sea, the seashore and on the land. Nevertheless, all the various existing central, regional and local approvals and licenses need to be concluded within the two year period of the temporary concession.

Outlook for 2015 and 2016

The main priorities and various actions, for every priority, are defined in the national strategic plan for aquaculture adopted in 2014. The main priorities of the Greek national strategic plan are: 1) Simplification of the licensing system for the aquaculture, 2) Ensuring sustainable aquaculture development through coordinated spatial planning, 3) Strengthening of competitiveness, 4) Promotion of a level playing field in terms of competition. The, rather ambitious, quantified strategic objective of the national strategic plan is 7% annual increase of aquaculture production in Greece till 2030. Nevertheless, we may not identify any macroeconomic trend suggesting such an increase in the demand for the Greek aquaculture products given the current sales price and production costs.

The Greek operational program for the European Maritime and Fisheries Fund amounting €523 million was accepted by the European Commission by the end of 2015. Approximately €90 million, 17% of the total budget, are previewed mainly for 110 aquaculture projects and 20 innovative projects. The baseline indicators, referring to the year 2013 include production volume of 113 825 tonnes, production value of €435.4 million and 4 115 FTE jobs. Organic production of 1 661 tonnes is also a baseline indicator referring to the year 2014. The quantitative targets set in the Operational programme for the year 2023 include increased production volume by 30 000 tonnes and increased production value by €114.8 million. Two projects are previewed for the protection of the marine environment with regard to the aquaculture. Vocational training is expected to increase the FTE jobs by 30 and contribute to the maintenance of 50 FTE jobs.

The targets of the operational programme may be considered realistic given the current economic situation in Greece. Nevertheless, the contribution of EMFF on the rise of the production is probably overestimated. The rise of the production volume and value is indeed expected, mainly as an effect of the higher prices received by the seabass and seabream producers during 2014 and 2015, the restructuring of debt and the bank loans, the changes of the shareholders and the changes of management for the main Greek production companies.

Thus, in the short run, rise of the production and rise of investment is expected for the Greek aquaculture. The Greek banks, as present major shareholders in the aquaculture are expected to transfer the shares to new investors. Further consolidation of the sea bass and sea bream sector is also likely, subject to authorization of the competition authorities. On the long run, more EMFF funds directed toward research and innovation (rather to the renovation of production facilities) are needed for the development of the sector.

Further consolidation of the mussel sector is expected. Nevertheless a considerable rise of the production is not expected if key issues of the mussel aquaculture in Greece are not addressed. These key issues include the identification of new suitable areas for mussel aquaculture, talking with unlicensed production, the establishment of integrated areas for aquaculture development and the establishment of early warning systems related to climatic factors.

4.12.7 Data Coverage and Data Quality

Data quality

No specific survey for DCF data collection was conducted in Greece for the period of 2008 to 2012; hence the economic variables are not reported. In 2013, due to lack of budget authorization, an early attempt was made to demonstrate a part of the Greek aquaculture industry. The data analysis was limited to the sea bass & sea bream cages segment since it is the main aquaculture activity. Nevertheless, data of 2013 are not comparable to year 2014, as they are taking into account only a part of Greek aquaculture industry (the achieved sample rate was 58%). In 2014, there was a more complete survey for DCF data collection.

Data availability

In 2014, the data collection process included the mailing and completion of a questionnaire by companies in aquaculture sector. On a second stage, there were onsite visits to the companies in order to acquire more detailed information for further segmentation. In cases of SA and LTD enterprises, there was an extra processing of the published financial statements in order to be crosschecked the information that was provided in questionnaires. Additionally, several data acquired from the records of the Hellenic Ministry of Rural Development and Food.

Differences in DCF data compared with other official data sources

Divergences between Greek DCF and EUROSTAT data should mainly be attributed to unreported data due to confidentiality issues, missing data, methods used for the approximation of missing data, aggregation issues and revision issues.

Given the current structure of the sector, the author suggests that all the enterprises in the marine finfish sector to be treated as one segment under DCF. This will reduce the burden to the reporting enterprises and will produce better quality of data. Some variables such as the number of enterprises producing new species, the volume and value of the new species (other than sea bass and sea bream) produced are enough in order to highlight the trend for these species.

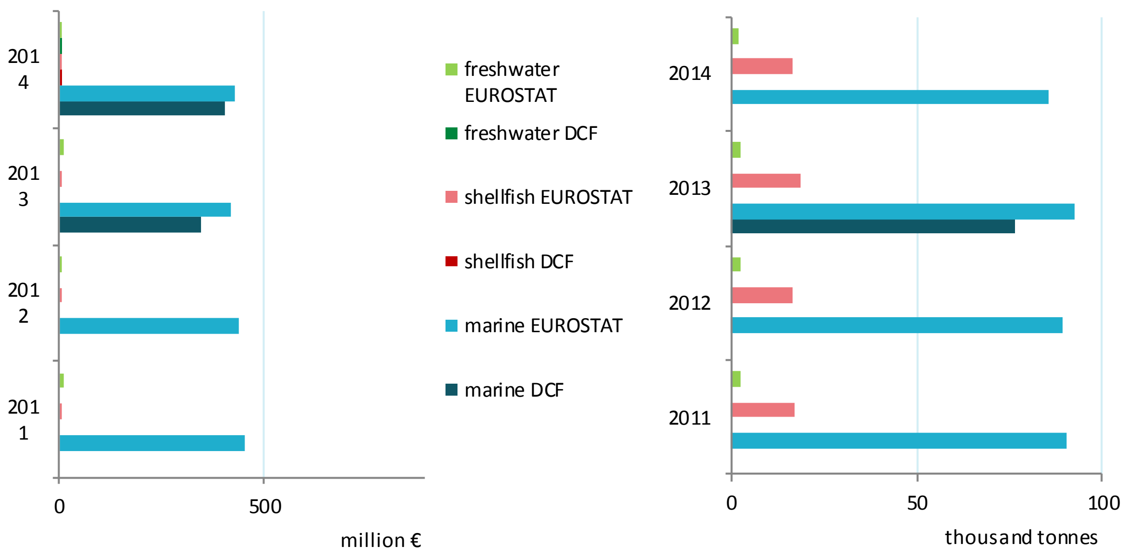


Figure 4.12.3 Comparison of DCF data with EUROSTAT data for Greece: 2008-2014

4.13 Hungary

4.13.1 Summary

Production volume and value

The Hungarian aquaculture sector produced 15.4 thousand tonnes of fish in 2014. This production was valued at about €30.3 million (EUROSTAT, 2016). Hungary produces no marine or shellfish aquaculture.

A growth in sales weight of 7% was observed from 2013 to 2014. This growth raised the total sales from 14.4 thousand tonnes to 15.4 thousand tonnes and from €25.6 million to €30.3 million.

As a consequence of the growth in production weight, the value of sales increased by 19% in 2014, and still remains 6% above the average of the production observed in 2008-2013.

Table 4.13.1 Production and sales for Hungary: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 13-14	Develop. 2014/(08-13)
Production weight (thousand tonnes)	***15.0***	***14.2***	***13.6***	***15.5***	***14.6***	***14.4***	***15.4***	***7%***	***6%***
Marine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*
Shellfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*
Freshwater	15.0	14.2	13.6	15.5	14.6	14.4	15.4	*7%*	*6%*
Production value (million €)	***30.4***	***26.5***	***27.2***	***30.3***	***29.9***	***25.6***	***30.3***	***19%***	***7%***
Marine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*
Shellfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*
Freshwater	30.4	26.5	27.2	30.3	29.9	25.6	30.3	*19%*	*7%*
Hatcheries & nurseries (million units)	***1,124***	***736***	***409***	***288***	***518***	***671***	***225***	***-66%***	***-64%***
Eggs	16	0	0	0	0	0	0	*0%*	*-100%*
Juveniles	1,108	736	409	288	518	671	225	*-66%*	*-64%*

Source: EUROSTAT

Main segments

According to available EUROSTAT data common carp was the main species produced by the Hungarian aquaculture sector, representing 67% in terms of weight and 68% in value of total production in 2014. The second important fish species is North African catfish with 14% of the total weight and 14% of the total value. Silver carp production represents 9% of the total weight but only 4% of the total value. With lower representability there is the production of grass carp with 4% of the total weight and 3% value and Wels catfish with 1% and 2% of the total weight and value, respectively.

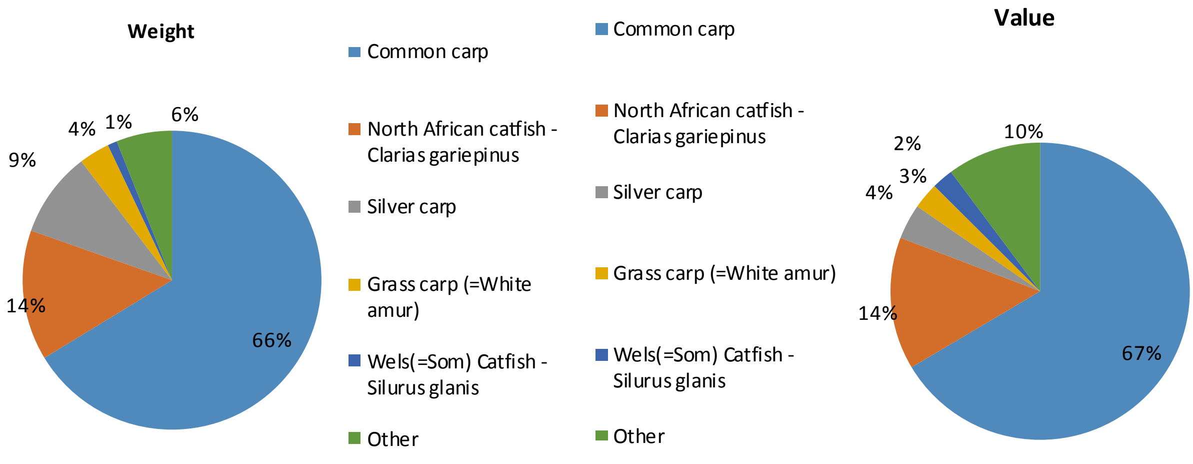


Figure 4.13.1 Main species in terms of weight and value in Hungarian production: 2014.

Source: EUROSTAT

Aquaculture prices have increased from 2013 to 2014. All the main species prices increased in 2014. Only the price for silver carp maintained the same.

The price of common carp in Hungary was 2.0 €/Kg in 2014. The price of North African catfish was 2.0 €/Kg, silver carp 0.8 €/Kg, grass carp 1.7 €/Kg, and for Wels catfish it was 4.5 €/Kg in 2014.

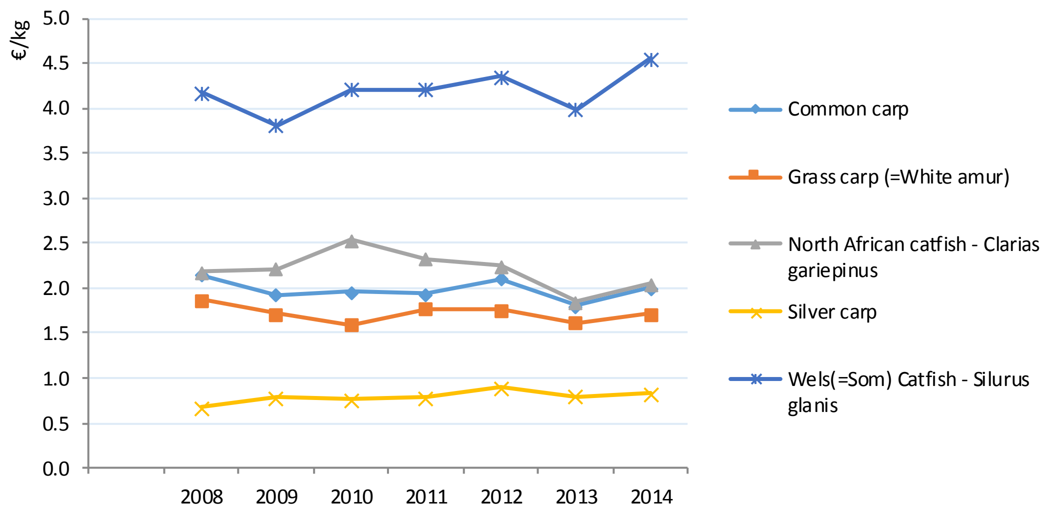


Figure 4.13.2 Average prices for the main species produced in Hungary: 2008-2014.

Source: EUROSTAT

4.13.2 Data Coverage and Data Quality

Hungary is a landlocked country producing only freshwater aquaculture products. The freshwater data collection is not mandatory under the DCF and landlocked countries are therefore not requested to provide economic data for this report.

4.14 Ireland

4.14.1 Summary

Production volume and value

The period 2012 to 2014 has seen a continuation in the decline in production volume output, from 36 000 tonnes to 31 000 tonnes in the Republic of Ireland. Despite continuing increases in unit value for some sectors, over the period, this volume decline has caused an overall decrease in production value for the first time since the upward trend first recorded in 2009. Overall value peaked in 2012, at €131 million, then dropped dramatically to €117 in 2013 and farther decreased to €116 million in 2014. The decline was caused by the continuing difficulties in the mussel sectors; curtailments in harvesting and low unit value in rope mussels, the continuing collapse of bottom mussel production through lack of seed supply but also due to the difficulties in salmon production caused by the effects of Amoebic Gill Disease. Salmon production began to show signs of recovery from ADG in 2014, with 9 400 tonnes produced, up from a nadir of 9 100 tonnes in 2013.

Overall industry structure and employment

The structure and employment makeup of the Irish industry has not changed significantly over the 2012 to 2014 period. An apparent employment increase from a total 2012 figure of 1 713 to 1 831 may reflect a difficulty in estimating the total number of casual workers in the native oyster sector. The sector is almost entirely casual and output fluctuates considerably as this is a fishery that is considered aquaculture by technicality. The more reliable overall FTE figure shows a more realistic slight downward trend in employment in the face of a challenging production environment, over the period.

The number and hierarchy of business entities and the collective number of production units has also remained approximately constant at national level. At segment level however there are adjustments occurring in the Bag-and-Trestle oyster and Bottom mussel sectors. New business entities are gradually coming on stream in oysters, as this sector continues to expand, while BM companies undergo amalgamation and consolidation in the face of difficult production conditions.

Main segments

The main segments of the Irish industry continue to be, in order of both volume and Value; Ongrown Salmon, Bag-and-Trestle oysters (*C. gigas*), Rope mussels and Bottom mussels. Smolt production is worth over €3 million overall but some of this is tied economically to the on-grown salmon segment, due to the production units involved being used to at least partially supply their on-grown parent companies.

The On-grown (Sea cage) salmon segment is generally of a 10-13 000 tonne scale, worth between €55 million and €85 million, employing 125 persons, mainly full time, on sea-sites production, not including specialist teams and 2.5 times that in the value added economic chain. The production units, 12 and their 34 associated sites, are located down the length of the west coast and are operated by 6 companies. Virtually all, between 90 and 95% of all production is to organic certification. The majority of product is sold as whole round or head on gutted and is sold principally to the European market but also farther afield.

Bag and Trestle oyster production is close to 9 000 tonnes and worth €39 million in 2014. Currently made up of 135 production units and rising, employing 728 people. There is an even spread of full time and part time employment and this is rising. Products are sold traditionally as live bulk to buyers, predominantly to France. There is a shift towards direct selling and towards new markets, with the best quality produce finding good prices in the Far East. The units are located throughout the coastline but most concentrated in the Southeast and Northwest.

The bottom mussel sector is undergoing contraction in numbers of businesses and employment level in the face of scarce raw material and subsequent declining production capacity. This sector had diminished to a 2014 production volume of 3206 tonnes worth €4.2 million from 6 484 tonnes worth €6.2 million in 2012 and from 17 000 tonnes worth €17.3 million in 2008. The sector continues to employ 118 persons, mainly full time (FTE 85) and is located on the east and southwest coasts, having disappeared from the north coast, over the period. The product is bulk live and supplies mainly the Dutch and French markets.

The rope mussel sector is a relatively steady performer on the face of it, producing generally between 8 500 and 10 000 tonnes of bulk product, valued between €5.5 million and €6 million. Employment, a large proportion of which is part time, is in gradual decline, 258 persons (FTE 133) in 2014. Turnover, €5.4 million in 2014 and subsequently wages are relatively low in the sector. The two products are fresh live bulk for direct export and that destined for the local processing industry which goes on to mainly export the value added product. Prices per unit production are relatively low compared to mainland European counterparts; up to €750 per tonne fresh market and usually much less for processor destined product. The industry is concentrated in the southwest but is also present on the northwest coast. As with bottom mussels and oysters, efforts are being made by the industry to differentiate their product and get its story told to break free of the status of reserve bulk supply to shortfalls in the Dutch and French markets.

Current production trends and main drivers (Trends and triggers)

Irish aquaculture hit a trough in 2013 in terms of overall production volume and value. Signs of recovery were apparent in 2014 salmon production volume and value, however bottom mussel production hit its lowest level for many years at 3 206 tonnes. Unit value for both sectors also moderately increased, while oyster value increased at a reduced rate to the previous 5 years, due to an adjustment in the French market for smaller sized oysters that caught Irish producers off guard. Oyster volume continued to increase modestly. Rope mussel production increased in 2013 to 9834 tonnes, only to dip again to 8 139 tonnes in 2014, combined unit value in this sector, averaged between the fresh market and processed, was €660. Changes depend on the strength of the preferred fresh market. For 2015, all four sectors have increased output volume and value. The oyster trend continues as before to over 9 000 tonnes, though with a drop in value: €35 million. Salmon showed a strong recovering trend to 13 000 tonnes, worth €90 million and both mussel sector outputs are strongly recovering; back to 6 000 tonnes for bottom and over the 10 000 tonne normal ceiling for rope. There is no significant change in employment level though this is increasing in the oyster sectors; 770 in bag and trestle segment and up to 429 in the native oyster segment (mainly seasonal).

Outlook

The production data for 2015 have been already estimated and show a strong recovery in the salmon and mussel sectors. Overall 2015 production volume and value have increased to 40 177 tonnes, worth €148.7 million, with a slight upturn in employment, to 1 835.

The outlook in general is for modest recovery in overall volume and a greater increase in overall value as value added strategies kick in. Employment is expected to increase in the salmon and oyster sectors, while other sectors such as ongrown trout consolidate their current niches, through value adding and marketing. Smaller producers in such sectors as trout and Other shellfish, are entering into a level of processing to add value and increase their market presence. It is accepted that Irish aquaculture can best compete by focussing on supplying high end or niche markets such as organic salmon and differentiated shellfish products to markets beyond the traditional ones, such as into Asia, rather than increasing volume. The move to differentiated, branded products such as origin green and to direct selling has gained momentum. The traditional un-differentiated bulk sales approach has no future as Irish production volume capacity can never hope to compete in any sector through volume potential alone.

4.14.2 Production and sales

Table 4.14.1 indicates a 5 year cycle, where Irish production overall value has almost dropped to where it was in 2009, while overall volume has dropped below 2009 level. The marine sector declined in volume and value from 2009 despite an increase in unit value. The same happened for the trout sector (freshwater) with a drop in unit value also. Shellfish volume was brought down over this period by the decline in bottom mussel and clam production though overall value increased due to the expansion of the oyster sector, both in terms of volume output and unit value.

Table 4.14.1 Production and sales for Ireland: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Sales weight (thousand tonnes)	***45.0***	***47.4***	***46.7***	***44.8***	***36.2***	***34.7***	***31.7***	*-9%*	*-25%*
Marine	9.2	12.3	15.9	12.5	12.4	9.4	9.7	*3%*	*-19%*
Shellfish	33.9	33.6	29.4	30.8	22.7	24.1	20.9	*-13%*	*-25%*
Freshwater	1.8	1.4	1.2	1.3	0.8	1.0	0.9	*-10%*	*-29%*
Hatcheries & nurseries	0.1	0.1	0.1	0.2	0.2	0.2	0.2	*-5%*	*12%*
Sales value (million €)	***94.3***	***106.6***	***122.5***	***128.5***	***130.3***	***117.7***	***116.3***	*-1%*	*0%*
Marine	47.1	65.4	77.6	74.2	75.7	56.6	58.8	*4%*	*-11%*
Shellfish	39.2	34.6	38.6	47.4	47.3	55.5	52.2	*-6%*	*16%*
Freshwater	6.4	4.8	4.4	4.3	2.8	3.3	3.1	*-5%*	*-27%*
Hatcheries & nurseries	1.5	1.9	2.0	2.6	4.6	2.3	2.2	*-6%*	*-13%*

Source: EU Member States DCF data submission

4.14.3 Industry structure and employment

The structure and employment level of Irish aquaculture has largely remained the same though with some reduction in the overall number of businesses and production units and minor changes in the size profile of these. There has been a decline in the 5 or less employee businesses. This trend is being reversed in the oyster other sector (Bag and Trestle) where small operators are recently licenced and are in start-up phase. In other sectors, amalgamations are occurring and in all sectors sole traders are giving way to limited companies. Some of these amalgamations are being driven by outside investment; Dutch companies accessing bottom mussel sites and French businesses going into partnership with or acquiring Irish oyster operations.

Table 4.14.2 Structure of the Irish aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Structure (number)									
Total enterprises	*304*	*303*	*302*	*292*	*279*	*283*	*277*	*-2%*	*-6%*
<=5 employees	233	232	229	209	191	198	197	*-1%*	*-9%*
6-10 employees	41	41	43	52	62	58	49	*-16%*	*-1%*
>10 employees	30	30	30	31	26	27	31	*15%*	*7%*
Employment (number)									
Total employees	1,972	1,952	1,715	1,748	1,708	1,840	1,821	*-1%*	*0%*
Male employees	1,809	1,807	1,569	1,605	1,571	1,716	1,692	*-1%*	*1%*
Female employees	163	145	146	143	137	124	129	*4%*	*-10%*
FTE	1,287	976	952	958	956	956	941	*-2%*	*-7%*
Male FTE	1,220	908	878	875	887	891	871	*-2%*	*-8%*
Female FTE	67	68	74	84	69	66	70	*5%*	*-2%*
Indicators									
FTE per enterprise	4.2	3.2	3.2	3.3	3.4	3.4	3.4	*1%*	*-1%*
Average wage (thousand €)	19.9	28.1	29.8	26.7	42.2	26.0	31.9	*23%*	*11%*
Labour productivity (thousand €)	21.5	34.0	48.5	55.6	63.4	32.6	52.2	*60%*	*23%*

Source: EU Member States DCF data submission

Employment took a sharp drop in 2009, then recovered somewhat. The fluctuations within the native oyster fisheries confound the trend in overall employment. The FTE is a more reliable indicator and this declined sharply in 2009 but has remained fairly constant since then, with a slight overall decline. The ratio between male and female workers remains largely unchanged. Overall the table indicates an aquaculture sector struggling to maintain position while aiming for modest output increases of high value products to a more diverse market spectrum.

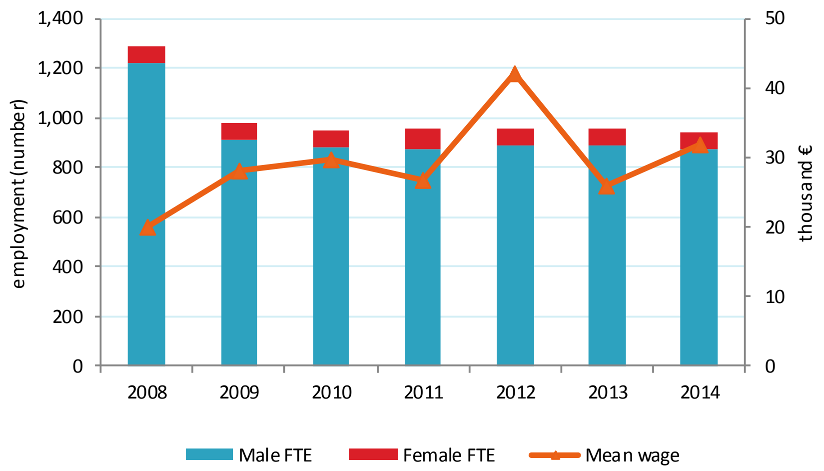


Figure 4.14.1 Employment trends for Ireland: 2008-2014.

Source: EU Member States DCF data submission

While productivity has increased per FTE the mean wage recorded of €42 000 is considered an over-estimation. A figure between €25 000 and €30 000 per FTE is considered as more realistic. Wages for employees has increased over the period though not as dramatically as displayed in the above tables. In the case of smaller operations, this wage increase may come at the loss of any drawings from turnover taken by the owner-directors who, along with family, create the unpaid labour value in some shellfish segments.

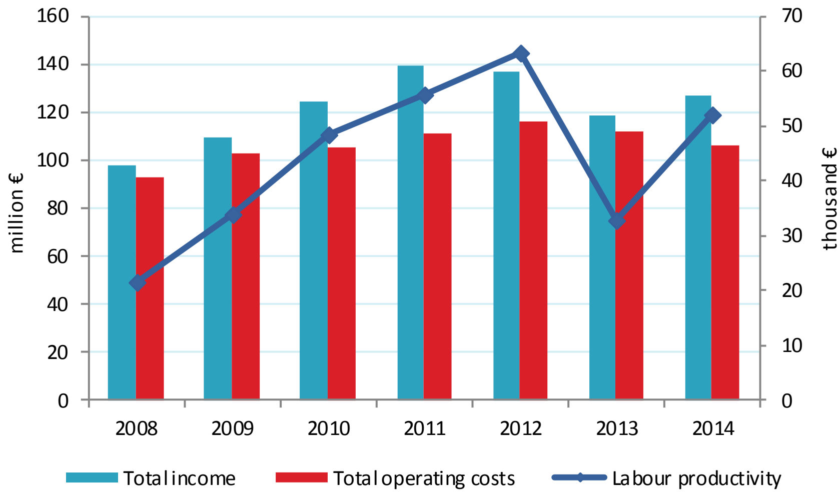


Figure 4.14.2 Income, costs, wages and labour productivity trends for Ireland: 2008-2014.

Source: EU Member States DCF data submission

4.14.4 Economic performance

The performance of Irish aquaculture rose to a peak of production value in 2012, then the steady decline in volume output brought value down to a low of €117 million in 2013. The shellfish sector declined in volume consistently over the period while the finfish (Salmon mainly) sector underwent a cyclical rise to 15 700 tonnes, worth €77.6 million, down to 9 125 tonnes, worth €55.7 million. Overall production value nearly returned to 2009 values though unit value for both shellfish and finfish sectors generally increased. Total operating costs surprisingly has not changed much overall in this period, though cost of sales; wages and salaries and raw material costs did rise as expected. The drop in the costs of energy and repairs and maintenance and overheads may reflect investment in new innovations and production efficiencies, targeted by state funding as well as the reduction of separate costs as business amalgamations occurred in sectors such as trout and mussels.

A number of challenges particular to almost each sector brought on extra ordinary costs. Poor weather conditions leading to poor growth, stress and disease induced mortality have hit the oyster sector hard. Algal blooms, leading to bay closures to harvesting, led to large scale losses of rope mussels as these fall off as the un-harvested lines grow too heavy. The stock falls to the bottom where it is lost to starfish and crabs. The salmon industry production was curtailed by the continuing effects of the parasite ADG, particularly affecting the health of smolts. The lack of seed mussel, crippling the bottom mussel industry, may not be considered an extraordinary cost from the point of view of frequency of occurrence, yet the most recent scarcity in the traditionally reliable Western Irish Sea source have led to business closures in this sector.

Table 4.14.3 Economic performance of the Irish aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	% of total income	Change 2014-13	Development 2014/(2008-13)
Income (million €)										
Turnover	94.3	106.6	122.5	128.5	130.3	117.7	116.3	*92%*	*-1%*	*0%*
Other income	0.9	1.6	0.6	10.3	5.7	0.2	8.5	*7%*	*3524%*	*165%*
Subsidies	2.9	0.8	1.0	0.7	0.5	0.8	1.7	*1%*	*120%*	*53%*
Total income	*98.1*	*109.0*	*124.2*	*139.4*	*136.5*	*118.7*	*126.5*	*100%*	*7%*	*5%*
Expenditures (million €)										
Wages and salaries	23.7	25.1	27.4	23.5	37.9	23.6	28.3	*22%*	*20%*	*5%*
Imputed value of unpaid labour	1.9	2.3	0.9	2.1	2.4	1.3	1.8	*1%*	*33%*	*-2%*
Energy costs	1.9	1.7	3.3	6.1	10.2	11.1	3.8	*3%*	*-66%*	*-34%*
Repair and maintenance	7.9	7.7	5.8	7.3	10.6	11.4	7.0	*6%*	*-38%*	*-17%*
Raw material: Feed costs	17.5	28.7	25.5	27.7	22.3	23.5	24.9	*20%*	*6%*	*3%*
Raw material: Livestock costs	12.6	10.9	7.6	5.4	13.7	14.6	14.7	*12%*	*0%*	*36%*
Other operational costs	27.5	26.0	34.8	39.0	18.6	26.2	25.2	*20%*	*-4%*	*-12%*
Total operating costs	*93.0*	*102.4*	*105.3*	*111.1*	*115.7*	*111.7*	*105.7*	*84%*	*-5%*	*-1%*
Capital Costs (million €)										
Depreciation of capital	4.0	4.5	13.3	5.7	8.1	6.9	5.0	*4%*	*-27%*	*-29%*
Financial costs, net	1.7	1.4	2.4	0.8	2.1	3.0	6.4	*5%*	*110%*	*233%*
Extraordinary costs, net	0.0	0.0	0.0	0.0	0.0	0.4	7.0	*6%*	*1814%*	*10520%*
Capital Value (million €)										
Total value of assets	133.1	168.7	170.9	142.6	189.7	165.1	199.8	*158%*	*21%*	*24%*
Net Investments	6.7	18.5	8.7	3.6	2.3	3.9	20.4	*16%*	*425%*	*180%*
Debt	48.9	65.3	105.6	101.6	125.6	85.3	86.0	*68%*	*1%*	*-3%*
Input & Production (thousand tonnes)										
Raw material: Feed	13.4	16.6	20.5	16.8	16.2	11.0	17.0		*54%*	*8%*
Raw material: Livestock	25.1	25.3	23.9	21.9	15.2	15.6	15.9		*2%*	*-25%*
Performance Indicators(million €)										
Gross Value Added	27.7	33.2	46.2	53.3	60.6	31.2	49.2	*39%*	*58%*	*17%*
Operating cash flow	5.0	6.6	18.9	28.3	20.9	7.1	20.8	*16%*	*195%*	*44%*
Earning before interest and tax	1.0	2.1	5.6	22.7	12.8	0.1	15.8	*12%*	*11311%*	*114%*
Net profit	-0.7	0.7	3.1	21.8	10.7	-2.9	9.4	*7%*	*427%*	*73%*
Capital productivity (%)	20.8	19.7	27.0	37.3	32.0	18.9	24.6		*30%*	*-5%*
Return on Investment (%)	0.8	1.3	3.3	15.9	6.8	0.1	7.9		*9788%*	*70%*
Future Expectation Indicator (%)	2.0	8.3	-2.7	-1.4	-3.0	-1.8	7.7		*520%*	*3331%*

Source: EU Member States DCF data submission

Production expansion is limited by a number of factors; Availability of licenced ground, raw material cost against product value, distance to market (mainly export) and raw materials, potentially diseased input stock, Exposed and harsh environment, in comparison to some mainland competitors. In response to this the industry is moving, with State and EMFF funding, towards turning some of these challenges to advantage. The harsh environment is used to highlight the image of a healthy clean lean product from the wild Atlantic. The licencing issue remains so industry is making do with what they have and focussing on quality per unit output. Funding is geared towards 4 pillars; Competitiveness, sustainability, training and innovation. The indicators may show this shift to a certain extent, as well as evidence of a fitter industry emerging with net investment, GVA, EBIT, ROI and FEI all on an upward trend for the period. Access to funding is still limited to those businesses with full licences. The presence of most businesses within or adjacent to Natura 2000 sites means that licence renewals require a slow appropriate assessment process undergone before licence renewal, which is being carried out on a Bay by Bay basis. This is especially tough on those producers at the end of the queue.

The industry is returning to profitability after a dip in 2013 and this continues in 2015.

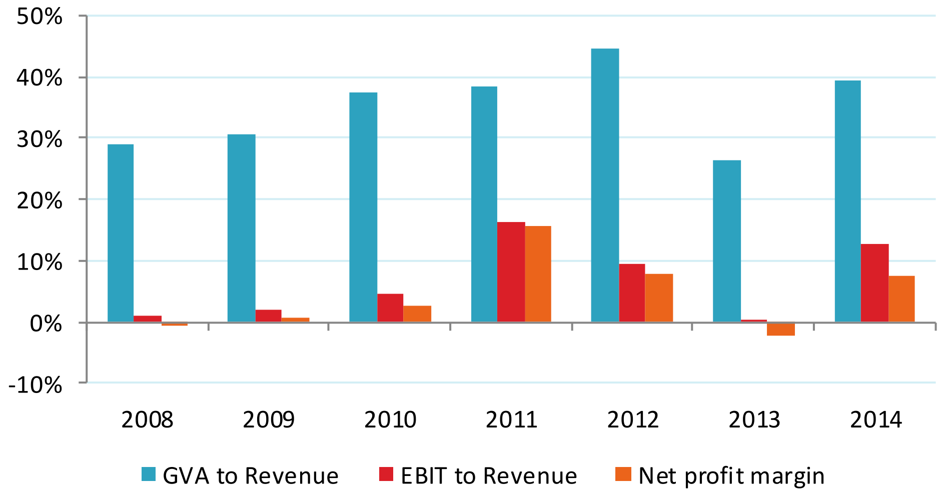


Figure 4.14.3 Economic performance for Ireland: 2008-2014

Source: EU Member States DCF data submission

4.14.5 Main species produced and economic performance by segment

Figure 4.14.5 shows that the combined weight of mussel production is greater than that of Salmon. However in terms of both volume and value, salmon production dominates Irish aquaculture on a segment by segment analysis. Oyster production volume, ignoring annual dips and rises in rope mussel production, is now or close to being on a par with that of rope mussel. Oysters are the most valuable shellfish production segment and there is still potential for farther increases in volume production and unit value. Bottom mussel production is harder to predict but probably will never reach the level of production of the early 2000s of 25 000 tonnes again. Rope mussels generally oscillate between 8 000 and 10 000 tonnes with prolonged bay closures due to red tides limiting production volume and damaging continuity of supply. Mussel unit value for both segments has been comparatively low as this depends on the home supply of mussels in France and Holland, traditional markets for Irish mussels. Certification such as mussel stewardship council and origin Green and Energetic marketing initiatives by more mussel companies seek to differentiate and add value to Irish mussels, while seeking new markets.

Figure 4.14.4 Main species in terms of weight and value in Irish production: 2014.

Source: EU Member States DCF data submission

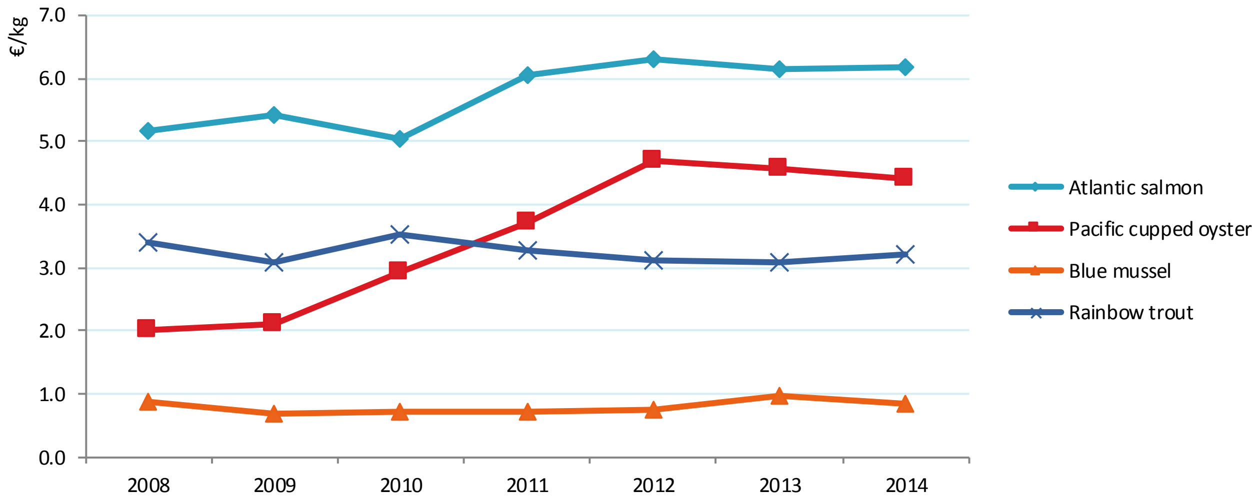


Figure 4.14.5 Average prices for the main species produced in Ireland: 2008-2014.

Source: EU Member States DCF data submission

Salmon unit value remains strong at above €6 per kg. Production is organically certified and supply is unable to match demand. This status is expected to continue as indicated by 2015 data.

Gigas oyster average unit value dipped slightly to €4.3 per kilogram from €4.6. A shift in the main market France to smaller grade left a number of producers with larger grades to sell to an alternative market. The timing was unfortunate as the Italian market, that prefers the larger grades had closed. The average belies the fact that an increasing number of businesses are getting increasingly better unit prices where these have come together to create a brand for niche markets such as the lucrative Asian market. Unit value for these branded oysters are generally from €5 to €6 per kg and sometimes more. Unit value for native flat oyster is generally a little more, at €5 per kg plus.

Mussel unit value is generally low, with bottom mussels, nearly all sold fresh bulk, getting the better price, in or around €1 per kg. Rope mussels sold fresh get in or around €0.7 per kg.

Rope mussels sold for processing get €0.5 per kg or less. Unit value has depended on the home supply or lack of, in the markets of France and Holland. Businesses in both mussel segments are beginning to brand as well as certify their product to add value. Certification quickly moves from distinguishing your product to becoming standard practice. Branding has a longer shelf life in this regard, before the product needs 're-inventing' once more.

Trout on-growing is a small and consolidating segment, with the dominant companies providing primary product for their own processing units. Unit value is holding steady at just over €3 per kg.

Segment 1: Salmon cages

Proportion of the industry: Salmon on-growing at sea is the largest segment of the Irish industry by volume and value in 2014; 30.65% and 50.6% respectively. FTE is 12.1% of total nationally.

Characteristics of the segment: A capital intensive segment with a modest proportion of direct employment, mainly full time, supporting other employment up an extensive economic value added and services chain. Ownership is by multinational and local business. Six companies operate 12 to 13 production units over 34 sites. Presence is socially very important. Businesses tend to work individually and are self-contained.

Status: The economic indicators indicate profitability and growth in 2014 after a production rise and fall over the previous 6 years.

Main production tool: Sea cages and service vessels.

Production location: In exposed deep water bays along the entire west coast.

Input: Smolts ranging in size from 60 to 80 g., purchased or self produced, are inputted in spring to a smolt site and then later to an ongrowing/harvesting site, within the production unit.

Production cycle: ranges from 9 to 18 months, producing various size classes, depending on market need, averaging at 3 to 4 kgs.

Output: The organically certified products are predominantly Whole round or head on gutted, with fillets and other value added products. Harvesting season tends towards all year production with fluctuation in intensity. Market is 20% home and the balance is exported primarily to Europe, also worldwide.

Factors limiting production: Regulation; Slow process (years) involved in obtaining and renewing licences, curtails capacity and access to grant aid. Parasites, such as lice need to be continuously controlled, ADG, jellyfish and algal blooms can have an effect from reduced feeding and condition to mortality. Environment, High energy fluctuating environments curtail production at either extreme of possible weather. High temperatures and low water movement or stormy conditions curtail feeding/ condition and can cause mortality, even without the effects of pathogens that these conditions may bring on.

Segment 2: Oysters other (bag and trestle)

Proportion of industry: In 2014 this oyster segment overtook rope mussels as the largest shellfish segment by volume; 28.1%. It has been the most important shellfish segment for value and employment for several years; 33.8 % and 46.2 % of national total respectively in 2014.

Characteristics: A labour intensive segment, with an even distribution of full time, half time and casual employment. Ownership is mixed with growing French investment and partnerships with local licence holders. The 135 businesses, active in 2014, range from companies employing over 30 people down to sole traders, employing one. The majority are family owned, employing one full time and several part-time. Unpaid labour can be expected to occur within family run units. Businesses work mainly individually but seek state aid when there is access. Some also work collectively to create shared brands and better sales. The segment is socially important in remote areas.

Status: the segment is growing steadily in volume, unit value and employment since 2008 with increases in the value of all economic indicators such as GVA, net profit etc, in 2014.

Main production tool: Bag on trestle, vessel or wheeled transport.

Production location: Intertidal; in shallow bays, within or near estuarine areas, widespread around the coast.

Input: Seed is purchased from hatcheries, primarily French ones, at a size from several grams upwards or half to near full size stock are purchased from other Irish based operations, depending on the production cycle stage focus of the business. Input of the smaller size classes occurs in spring or late autumn.

Production Cycle: The industry has moved towards spreading the production cycle over more than one site, optimising use of a site's particular growth capability. Thus there are producers who produce half grown stock, which are then sold to on-growers and then possibly on to fatteners before being sold to the consumer market. The production cycle therefore can be anything from 2 months to 3 years, depending on the level of specialisation but generally is still from one to three years.

Output: As said above, is a half grown (< 65g) or consumer ready product of several size classes ranging from 65 g to 150 g. Product is sold fresh live. Harvesting is trending from autumn- winter to all year for the larger businesses.

Factors limiting production: Regulation; slow processing (years) of licence applications, new and renewals curtails production expansion and access to state investment. Mortalities; Gigas oysters are very susceptible to disease, possibly due to over breeding and mortalities can be frequent and large scale. Mortalities can be the end result of poor growth conditions, causing stress and vulnerability to disease.

Segment 3: Mussels bottom

Proportion of industry: A collapse occurred in the segment, diminishing its contribution to national output. Volume and value output was 10.14% and 3.6% of total respectively in 2014 and FTE was down to 9%. Employment is mainly full time.

Characteristics of the segment: Though being capital intensive, the sector was also a high rate employer and full time. Ownership is still mainly family owned but investment from Dutch companies has been increasing for some years. The social importance of the segment has diminished. 24 businesses remained active in 2014. Businesses work independently but some have come together to challenge the state over seed fishing access and resource management in general. State aid is sought when accessible.

Status: The segment is shrinking in terms of number of businesses. This is reflected in the negative values of the economic indicators. Output volume increased in 2014.

Main Production Tools: Mussel dredgers.

Location: The east and southwest coast; three bays, collapsed along the north coast. Sites are shallow, sheltered and estuarine, subtidal with some intertidal juvenile shell hardening sites also.

Input: Seed of 20mm, 600 pieces plus per kg is fished in the summer and autumn, during weak tides and relayed on production sites by the company. A small number hire the dredger services of other companies to gather and relay for them.

Production cycle: one to two years depending on the site environment and the size class targeted for sale. Stock movement is within one production unit. Harvesting occurs from late autumn to mid spring of sizes from 80 to 90g, 80 to 110 pieces per kilo and can be for on growing or the consumer market, depending on the size, the market and the meat content. The market is predominantly Holland and France.

Factors limiting Production: Perceived top-down regulation and management; the industry has no control over access to wild seed beds and costs of complying with vessel C.O.C is very high compared to competitors. Supply of seed is almost entirely reliant on the settlement of wild beds, which do not occur every year in sufficient amounts. Weather conditions can lead to poor growth, meat content, stress and mortality or poor prices for poor meat yields.

Segment 4: Mussels long line

Proportion of industry: Up to 2014 this was the largest shellfish segment by volume output and a relatively steady output volume performer, producing between 8 000 and 10 000 tonnes annually, depending on market strength or Bay red tide status governing harvesting permission. Output volume in 2014 was 25.8% of total. Consistently low unit value explains the modest GVA of the sector. Output value in 2014 was 4.6% of total. The segment is a significant though weakening employer. FTE in 2014 was 14.8% of total. Employment is mainly part time or casual.

Characteristics: A labour intensive and socially very important presence in remote areas, offering seasonal employment alternatives to agriculture, tourism and fisheries. Businesses traditionally have been independent in nature, though there is some pooling of resources to minimise the effects of bay closures and improve harvesting continuity of supply and unit value. State aid is applied for if available. The sector is almost entirely locally owned with a degree of unpaid labour among the family run enterprises. The segment is becoming gradually more capital intensive as overall employment numbers and numbers of individual businesses declines. As the age profile of licence holders advances, more and more sites are being leased to better equipped and more committed entities.

Status: The sector has struggled to remain profitable as economically indicated, despite successful investment in technical innovation and efficiencies, as well as in product certification. Output volume was in excess of 10 000 tonnes in 2015 and can be expected to remain within the current output fluctuation pattern, though with less direct employment, less businesses (63 in 2014) and similar to gradually improving output values, if value added projects succeed.

Main production Tool: Suspended ropes, service vessels.

Location: The segment is found mainly in the deep bays of southwest and present in other suitable west coast bays. Sites vary from sheltered to moderately exposed.

Input: Seed is collected from suspended collectors close to the production lines in spring. Costs are usually minimal compared to other segments.

Production Cycle: 1 to three years depending on location, growth conditions and market need. Stock movement is within one site.

Output: Harvesting occurs mainly from late autumn to early spring, or whenever harvesting is permitted in the bay while a market is open. The product is sold fresh and consumer ready to France, Holland, Italy and elsewhere in Europe at sizes of 80 to 90 g, 80 to 100 pieces per kg and is also sold to local processors and a few companies sell half-growns to bottom mussel producers.

Factors limiting production: Bay closures can be lengthy and can occur at the height of harvest season, disrupting supply, reducing sales value and increasing losses of stock from the lines. Adverse weather can lead to poor growth and yields. Regulation; application processes for new or renewed licences is slow (years), curtailing expansion of capacity and preventing access to state aid. Low market unit value has been the case for years for a product hithertofore indistinct from mussels from the purchasing country. Efforts are underway to increase the profile and value of Irish mussels.

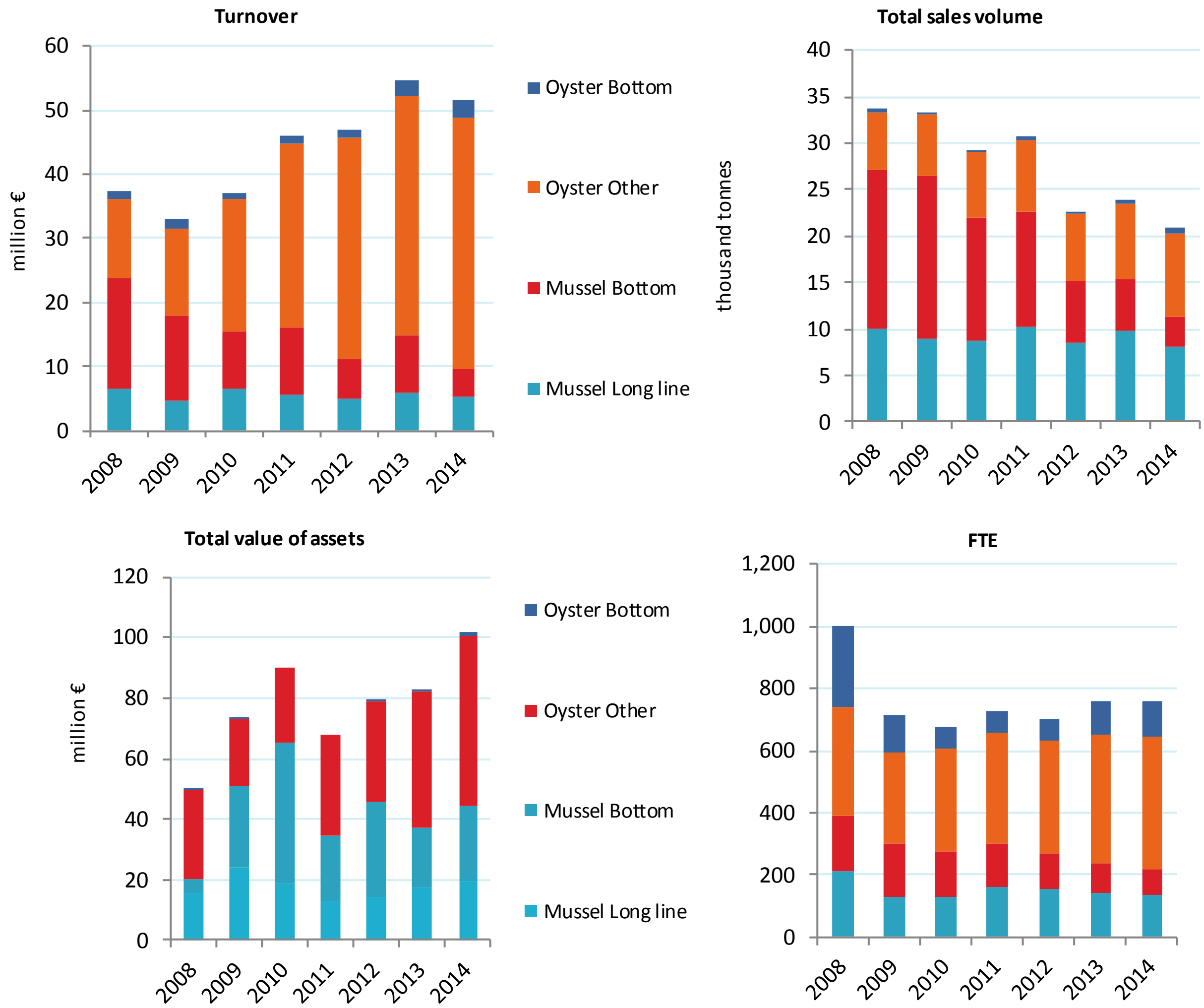


Figure 4.14.6 Structural development Irish aquaculture sector: 2008-2014.

Source: EU Member States DCF data submission

The above bar graphs show the relative share of each segment in Irish aquaculture. The dominance of salmon in both output volume and value is seen. While the turnover proportions are correct, the scales are wrong as salmon production volume in 2014 was 9 368 tonnes of a total 31 000 tonnes produced overall. The significance of oysters as the largest direct employer in Irish aquaculture is seen. Although salmon is capital intensive in comparison, there is a considerable economic chain stemming from site production to the tune of 2.5 to one production FTE. Rope mussels is another important direct employer, labour intensive segment that, along with oysters is socially very important, providing employment, albeit seasonal to areas with marginal agriculture, seasonal tourism and seasonal inshore fishing as alternatives.

Table 4.14.4 Economic performance of main Irish aquaculture segments: 2008-2014 (in million €).

Variable	2008	2009	2010	2011	2012	2013	2014	% of total income	Change 2014/13	Development 2014/(2008-13)
Mussel Long line										
Total income	7.3	5.7	6.6	11.1	5.0	5.8	5.9	100%	1%	-15%
Gross Value Added	3.4	3.9	4.7	2.9	1.6	2.6	1.5	25%	-44%	-54%
Operating cash flow	1.4	1.8	1.7	-3.3	-0.8	0.8	-0.5	8%	-161%	-281%
Earning before interest and tax	1.2	1.4	0.9	-4.5	-1.8	-0.2	-1.8	30%	-859%	-249%
Net profit	1.2	1.3	0.4	-4.6	-2.1	-1.0	-3.0	50%	-188%	-156%
Total sales volume (thousand tonnes)	10.1	9.0	8.8	10.1	8.6	9.8	8.2		-17%	-13%
Mussel Bottom										
Total income	17.3	13.3	9.2	10.8	8.6	9.2	4.2	100%	-54%	-63%
Gross Value Added	2.5	2.8	5.0	4.1	5.9	5.4	1.0	25%	-81%	-76%
Operating cash flow	0.0	0.4	1.4	1.2	2.6	3.8	-1.0	-24%	-127%	-165%
Earning before interest and tax	-1.6	-1.3	-7.8	0.5	0.7	2.1	-2.4	-57%	-215%	-95%
Net profit	-2.7	-1.9	-9.4	0.4	-0.4	2.0	-3.0	-70%	-248%	-50%
Total sales volume (thousand tonnes)	17.0	17.5	13.2	12.5	6.5	5.5	3.2		-42%	-73%
Oyster Bottom										
Total income	1.3	1.5	0.9	1.4	1.2	2.5	2.9	100%	17%	96%
Gross Value Added	1.2	1.4	0.8	1.2	1.0	2.2	2.6	90%	17%	99%
Operating cash flow	0.6	0.7	0.7	-1.1	-0.5	1.0	1.2	41%	17%	402%
Earning before interest and tax	0.5	0.7	0.7	-1.1	-0.5	1.0	1.2	41%	17%	403%
Net profit	0.5	0.7	0.7	-1.1	-0.5	1.0	1.2	40%	17%	407%
Total sales volume (thousand tonnes)	0.4	0.4	0.2	0.3	0.2	0.5	0.6		21%	71%
Oyster Other										
Total income	12.7	14.0	20.9	30.0	36.2	37.7	47.9	100%	27%	90%
Gross Value Added	3.8	5.2	10.9	16.4	26.9	22.1	26.7	56%	20%	87%
Operating cash flow	-5.3	0.1	5.7	9.8	18.9	8.8	10.2	21%	16%	61%
Earning before interest and tax	-6.7	-1.3	4.2	8.2	17.2	7.2	9.4	20%	30%	95%
Net profit	-6.8	-1.4	4.1	7.8	16.6	6.0	6.2	13%	3%	41%
Total sales volume (thousand tonnes)	6.2	6.5	7.1	7.7	7.4	8.2	8.9		9%	24%

Source: EU Member States DCF data submission

The above table emphasises the struggle of the two mussel segments to remain profitable in the face of low value output to production effort and the factors that cannot be controlled; seed mussel supply for bottom and harvest holdups for rope mussels. The negative values for profitability reflect the closure of some bottom and rope entities and their amalgamation into economically fitter enterprises.

The steady growth in volume and value of oysters is seen. Economic contribution has increased with GVA and employment increasing year on year over the period.

Salmon has undergone a cyclical increase and decrease of economical value with production fortunes. The sector is the biggest economical contributor, even in bad production years and there are farther economic contributions along the value added chain and within specialist services and support industries. Recovery of economic contribution is evident in 2014.

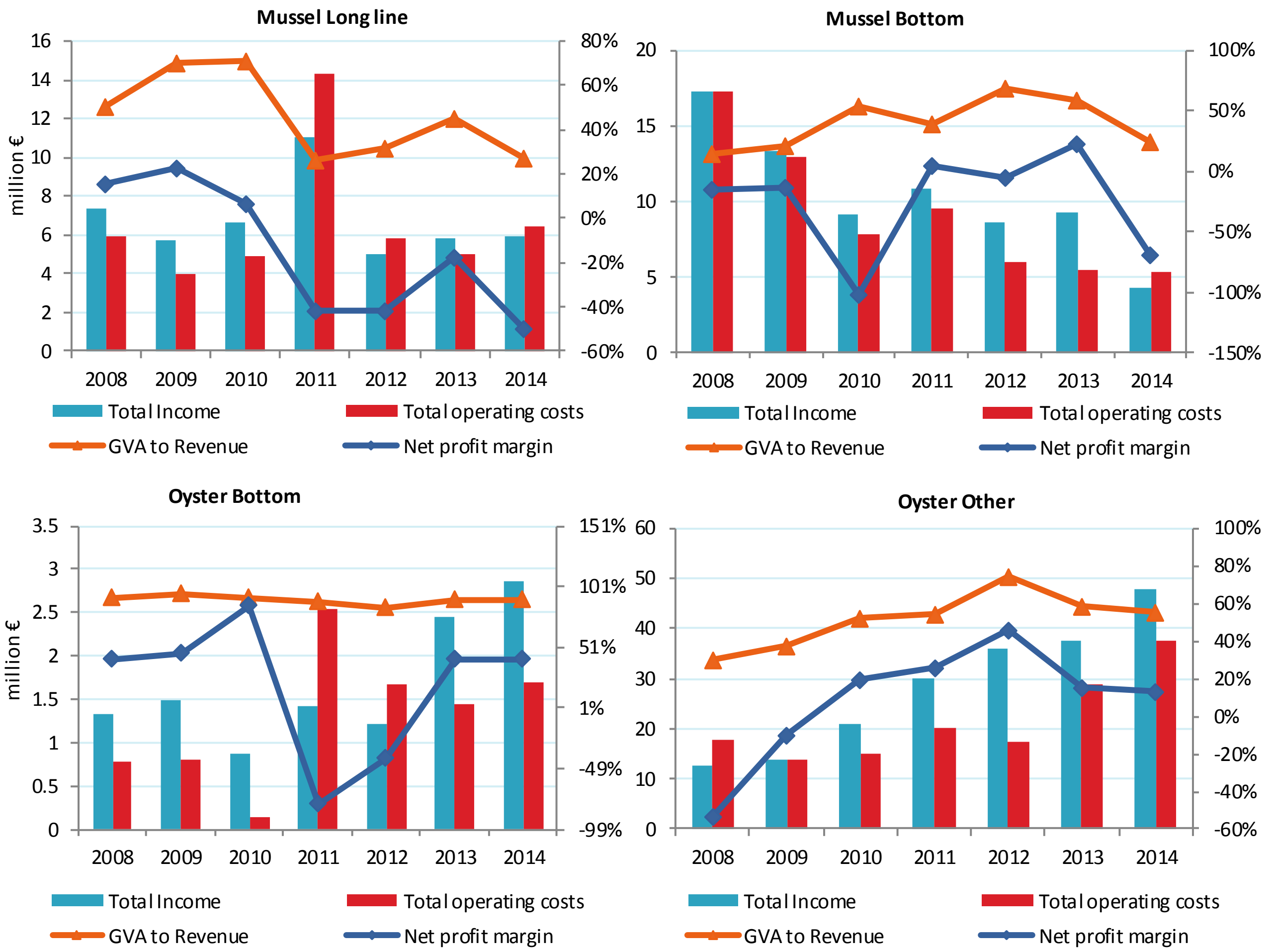


Figure 4.14.7 Economic performance indicators for the main Irish segments: 2008-2014.

Source: EU Member States DCF data submission

The graphs above show the high cost to turnover ratios for all segments, showing the challenge to maintain profitability and economic contribution. This is particularly the case for the low unit value mussel sectors

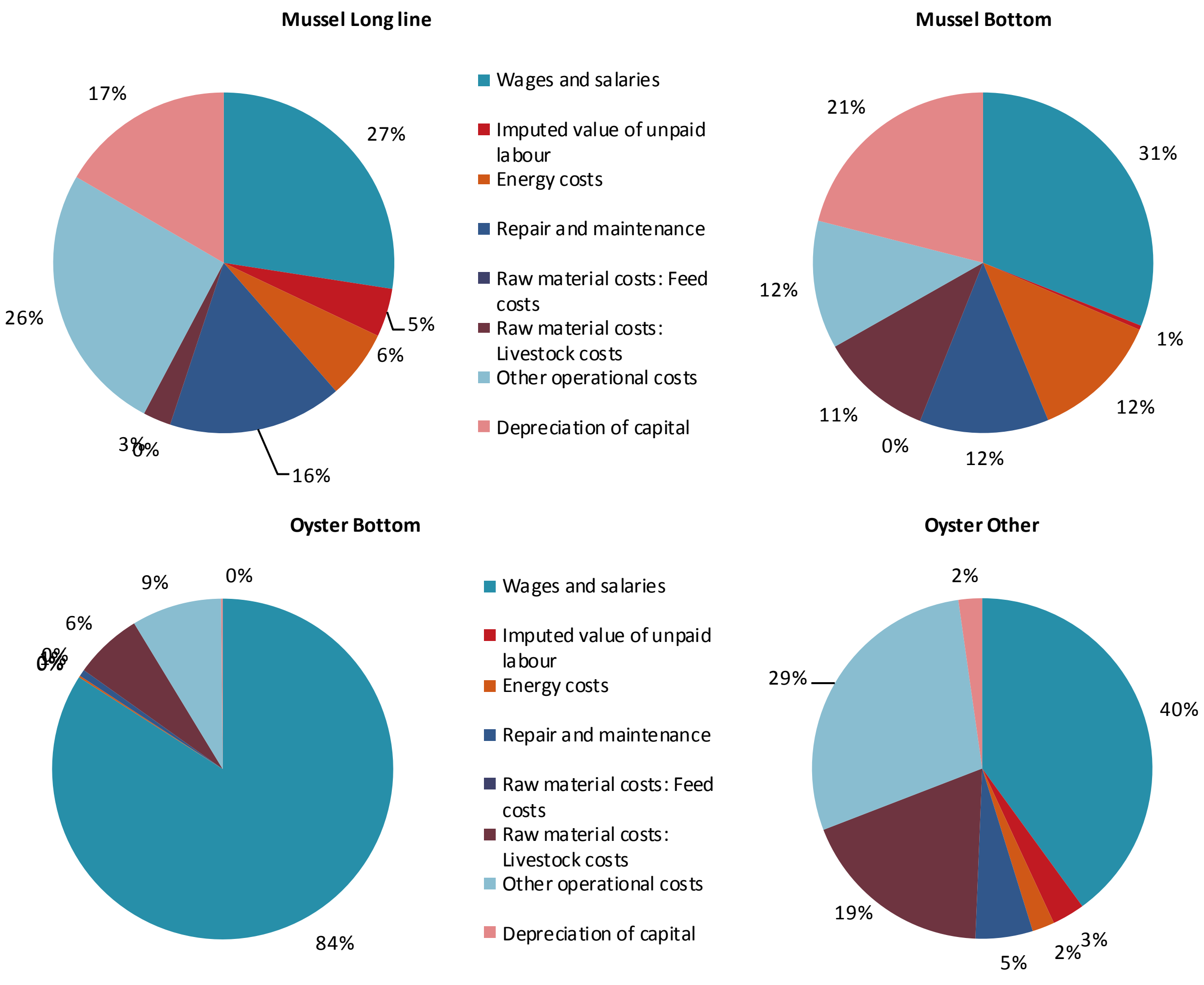


Figure 4.14.8 Cost structure of the main segments in Ireland: 2014.

Source: EU Member States DCF data submission

The figure above illustrates the relative proportions of production costs for each of the 4 main segments. The biggest cost for salmon and the profit margin decider in normal years is feed. As a capital intensive sector, direct employment costs are relatively small compared to the labour intensive rope and oyster segments. Labour is the biggest cost in the oyster sector which spends the least on repair and maintenance and energy costs. Repair and maintenance, raw material input and energy are significant costs of bottom mussel, with raw material supply costs being the crucial profit-loss decider. Depreciation of capital is also significant in this sector, owing to the necessary ownership of large specialised vessels for seed gathering. Wages and salaries are decreasing as a cost for the rope sector as it gradually becomes more capital intensive. Raw material costs are slight for this segment, as supply is usually close by, reliable, subject to good year-bad year settlement fluctuations and is self-collected by the business.

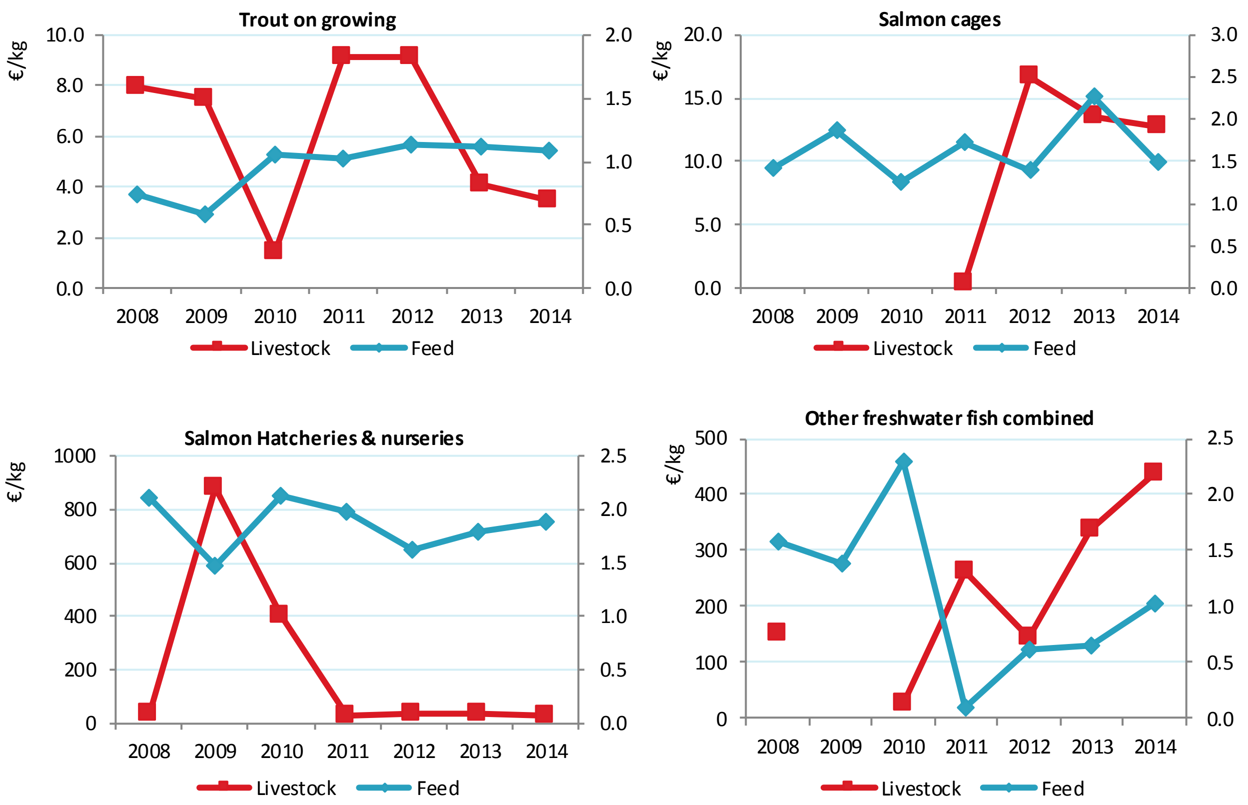


Figure 4.14.9 Feed and livestock prices for the main Irish segments: 2008-2014.

Source: EU Member States DCF data submission

4.14.6 Trends and triggers

Current production trends and main drivers

Production trends generally are for a modest increase in volume and unit value. Salmon and bottom mussels are recovering from lows caused by the effects of ADG in the case of salmon and seed supply in the case of bottom mussels. A moderate quantity of seed was found in the Irish Sea in 2014 that raised production in 2015 to just under 6 000 tonnes. Gigas oyster volume continues to increase, with an increase of average unit value to €3.9 per kilo in 2015. The rope mussel sector increased output in 2015 to 10 318 tonnes, with an average unit value of €0.645. Seed supply to this sector is not the constant worry that it is to bottom mussels, with their continued reliance on the occurrence of wild seed settlement. The main concern for the rope sector is the increasing frequency of red tides and the resultant closures of bays to harvesting. Such closures can continue for months, during which time, large quantities of stock are lost from the lines and markets are lost.

Market structure

Irish aquaculture is still primarily a supplier of bulk live shellfish and round or head-on gutted finfish to a mainly export market on the European mainland and beyond. Distance from market is an ongoing challenge for rapid delivery of a highly perishable product. The traditional purchasing countries of Irish oysters and mussels have large home production of the same shellfish species and large home markets. The Irish supply had the role of supplement supply to these. The main importers of aquaculture Shellfish produce, in order of quantity in 2014 were; France, Spain, Netherlands, Italy, Germany and the UK, with the far East gaining in importance. Principle importers of finfish (salmon) in 2014 were France, Germany, UK, Belgium, Switzerland, North America and others

As previously stated, efforts are being made to diversify markets, differentiate product and add value. All salmon is organically certified while oysters and mussels are being certified in a drive to differentiate Irish shellfish from the rest. A new departure in Ireland is to link stakeholders in the coastal resource for mutual and increasing benefit. The 'Wild Atlantic Way is a brand and a package where holiday makers can follow coastal routes, along which they can visit fish farms and sample their products at source. For fish farms, especially the smaller family run ones, this is an alternative income stream and the chance to paint a positive picture of aquaculture in an enjoyable way for both producer and visitor. The number of subscribing farms and the number of routes are increasing since the ideas inception in 2013 and is a good example of how businesses and state bodies, in this case food, marketing, innovation, tourism and aquaculture agencies can pool resources for the collective good. This tourist package also supplements the branding of Irish seafood products as a highly healthy nutritious product, coming from the exposed, wild and clean Atlantic environment. In this way, the challenge posed by distance from the European centre is being used to advantage as a marketing tool.

Ireland The EMFF, Expectations

Notwithstanding the realistic overall assessment of continuing limited capacity for volume output and new emphasis on high-end markets, value add on, innovation and sustainability, it is interesting to look at the projections for The EMFF period per major segment. The projections have been described as being at the upper or optimistic limit. The segments are:

Rope mussels are projected to reach 14 065 tonnes. Having occurred once before, this represents maximum possible output with current capacity and will require major co-ordination of the rope mussel producers and state agencies to counteract the restrictions to output caused by red tide induced Bay closures to harvest. Open Bays would have to be relied upon to cover for closed bays. The alternative is a significant increase in capacity, which is unlikely. Unit value, thanks to marketing activity, can be realistically expected to increase, while the projected volume output is correctly described as optimistic.

Bottom mussels are projected to reach 29 976 tonnes. Again this figure was the high water mark of previous production in the early 2000s. Unless a significant alternative to the supply of wild seed can be established, any prediction of future overall output for this sector is conjecture and this observer believes the above projection, at current technical ability, to be un-realistic. Unit value, as with Rope mussels, can be expected to improve, with continuing strenuous product differentiation efforts.

The oyster sectors are expected to reach 9 270 tonnes. The bag and trestle Gigas segment alone has reached over 9 000 tonnes production in 2015. Subject to the increased efficiency of licenced ground use and the steadily increasing overall licenced area and to mortality events, output volume of this segment should significantly exceed the above projection. Overall value of this segment should also increase, even with a halt to increasing unit value.

Combined Finfish segments are set to reach 25 082 tonnes, principally via the salmon segment. A medium sized new production unit has recently been licenced to begin operations. Similar sized units are undergoing the application process and there are reasonable grounds for optimism for the increase in salmon production output and the maintenance or increase in unit value as the premium reputation of Irish salmon products holds. Moderate increases in the trout segment output, as production structural changes are completed, plus potential increases in the perch segment output, subject to the success of the peatland project, are also very possible. The above projection for the EMFF period is cautiously optimistic and a realistic target.

Issues of special interest

Partnerships with other stakeholders have been mentioned to broaden aquacultures potential and allow it to tell its story. Unlike in other member states, aquaculture has hithertofore occupied a marginal place in the public consciousness and there was no significant home market for shellfish products. The image of fish-farming had been largely fashioned by those opposed to the industry, especially the lobby opposed to salmon farming.

The application by the state agency responsible for aquaculture development, BIM to obtain a licence for a l5,000 tonne offshore salmon production unit in the west has been withdrawn as new legislation has put a 6,000 tonne limit on salmon unit sizes, thereby disqualifying the application. The unit, would have doubled Irish production when at full capacity, had it been given permission to go ahead. A smaller unit has recently been licenced in the southwest and farther sites are under the application process.

State investment in the industry is following 4 pillars: training, innovation competitiveness and sustainability. Under these headings a number of familiar challenges to the industry are being tackled.

Bottom mussels: A project to provide an alternative seed supply to the industry is underway, following an earlier project more intensively, this seeks to gather seed as done for the rope industry on vertical collector surfaces that can then be transferred to the seabed.

Oysters and other shellfish: Shellfish Hatcheries and stock are being funded to develop and provide a local, disease free seed supply (including triploid stock for gigas) alternative to the shellfish sectors that rely on imported seed or, in the case of scallops, on an infrequent and highly localised natural spatfall. Another initiative is investigating how to pool resources of state agency and business to enable maximum access to approved depuration facilities.

Salmon: A project, at the design phase, is underway to treat lice and other parasites with fresh water, using an on-site de-salination unit and a bulk freshwater transport tarpaulin that can be quickly and cost effectively deployed. Also the use of such fish cleaner species as wrasse and lumpsuckers continues to be developed. There are of course higher tech solutions being developed elsewhere in Europe.

Outlook for 2015 and 2016

The outlook is for continued recovery in the form of steady increases in salmon and oyster volumes, with unit value also increasing in shellfish in general, as the marketing and branding efforts pay off. Salmon unit value should hold at least over this period as demand continues to rise worldwide. Mussel unit value should increase for the same marketing effort reason though output fluctuations are governed by the un-controllable factors of seed supply for bottom mussels currently and the occurrence of red tides for rope mussels. Indeed the output for oysters cannot be guaranteed either as sales are curtailed by both viral and bacterial induced mortalities and the increase in the presence of norovirus in bays which could accumulate in shellfish, leading to harvest and sales stoppages.

The 2015 figures show these expected outlooks as all four major segments reported a strong increase in volume output and moderate unit value increases.

4.14.7 Data Coverage and Data Quality

Data quality

The quality of census data; production and employment variables are generally of good quality. The census survey is a long established in-house survey used to inform BIM development programs and is widely used by other agencies. The producers themselves participate in the order of 80% of the population. These participate at least to some extent because the results are published within a month or so of survey compilation and the results are of interest to them.

Certain financial variables, available on-line are of good quality but as most businesses are small, the accounts available online are abridged, providing data for depreciation, assets, debts and often not much more. As these are got online, the response rate is 100%. The target sample is 33%. Access to full accounts is difficult owing to the clients suspicion of survey motives and their own limited access to accountants.

Up to now the most difficult data to obtain and the least reliable, have been the operational costs variables that tend to be located in full financial accounts. These variables are gathered by direct sample survey and are: wages and salaries, energy costs, repair and maintenance and other operational costs. Often the surveyed are unsure of their own data in the case of these variables. Also the variables net investments and financial costs have proved difficult to obtain. 20% of the population is the target sample but returns can be well under 10%, depending on the segment and the variable.

Data availability

Census data becomes available for dissemination by May of the year n+1, with provisional figures available a month earlier. Operational costs and financial data are gathered by December of year n+1, with provisional dissemination possible by the end of that month.

Confidentiality

A policy document on confidentiality, in line with the protection of information act, is being produced by BIM, the agency charged with gathering and presenting aquaculture data for DCF, Eurostat, FAO and others and when completed, will be made available online. As a rule, when the population of a segment of whichever dataset drops to three business entities, that segment is reviewed to decide if it can continue to be reported as an independent segment, without exposing the data of an individual. If the segment population should drop farther, the segment is amalgamated into the next most compatible segment if possible. The above rule applies to all but the very largest companies who dominate their segments and without the participation of whom, the survey would be seriously compromised.

Differences in DCF data compared with other official data sources

The differences between DCF and Eurostat/FAO are as outlined below. There is broad agreement with a difference in how juvenile salmon are segmented between the two groupings. Differences may occur between the estimates made for DCF, Eurostat, FAO on the one hand and those made by Producer organisations, in particular the representatives of shellfish producers, who may have better access to their clients. It is not known which block of estimates is the more accurate and there are frequent cross references and cooperation between such groups and this agency. The estimates of the latter may err on the conservative side for shellfish and has over estimated for salmon production on at least one occasion.

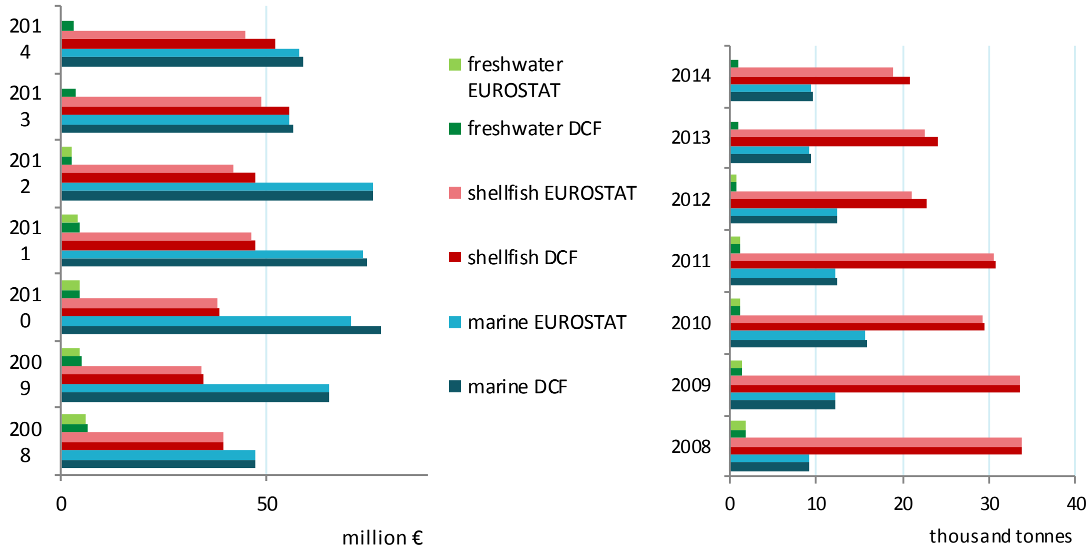


Figure 4.14.10 Comparison of DCF data with EUROSTAT data for Ireland: 2008-2014

The census survey held annually creates a common pool of raw data used for supplying both Eurostat and DCF requirements. The main differences are the time lag between the two data requests and the manner in which the data had been segmented differently for the two different regulations. There is close agreement between the Eurostat and FAO datasets as they are both similarly organized and only several months lie between their upload times.

One area of variation requires clarification; the different ways that smolt production is organized between Eurostat and DCF. At first they were organized in the same manner, then due to a query made by DCF end user, the segmentation in the case of the DCF was changed. In the Eurostat dataset, the total smolt production volume is given. In the DCF dataset, only the data of standalone salmon smolt producing companies populate the segment 1.1; Salmon hatcheries. A DCF end user can obtain an average unit value for smolts using the variables turnover divided by sales volume of segment 1.1. Previously smolt production units that were part of companies whose main business is selling ongrown salmon had been included in DCF segment 1.1. In the Eurostat dataset, they still are and the volume of smolts produced in the auxiliary units does generate some turnover, depending on what proportion of such smolts are sold and what proportion is used to supply in house ongrowing sites. As these smolt units are economically tied to the ongrown segment (seg 1.4 cages) any turnover generated is added to the ongrown turnover. Overall national turnover for both datasets is basically the same, barr time lag adjustments.

4.15 Italy

4.15.1 Summary

Production volume and value

In 2014, Italian aquaculture sector produced 185 thousand tonnes, which corresponded to an increase of 21% respect the previous year. Total value of Italian aquaculture production was more than €566 million, which correspond to an increase of 18% over the same period. From 2008 to 2014, the total volume decreased by 8%, whereas the total value growth of 13% thanks to higher average prices. The driving species in marine sector was the high commercial value sea bass and sea bream. The marine production has signed positive trend in volume (+45%) and value (+51%); for the freshwater sector, the performance of sturgeon production, that meet the required quality caviar, confirmed the Italian leader position in Europe. In general the freshwater segment has been a reduction in value (-2%), compared with an increase of volume (+4%) produced compared to 2013. This recorded average prices for the massive species (trout) lower than previous years. In the period 2009-2014 the freshwater sector shows a greater ability to maintain stable average prices, in fact, to a reduction of -32% volumes during 2008-2014, in terms of production value, the decrease was only -8%.

Overall industry structure and employment

During the last three years the number the enterprise is 587 (the same), according the National census, which is carried out each 3 years. The process and the propensity to aggregation in associations or producer organizations, already begun in previous years, continue to strengthen especially in the mussel and clam segments. The Italian aquaculture sector is dominated by small enterprises with less than 5 employees. 55% of the Italian enterprises had less than 5 employees, 24% of the enterprises had 6-10 employees and the 20% was represented by enterprises had more of 10 employees.

Main segments

The production in Italy can be divided into nine main segments. Main segment referred to volume of production is shellfish (more of 105 thousand tonnes), in which the 31 thousand tonnes is represented from clams (*Tapes philippinarum*) and around 75 thousand tonnes are represented from mussel (*Mytilus galloprovincialis*). The main two species are considered massive production and their *ex farm* prices are low: €0.79/kg for mussel and around €2.8/kg for clam.

Referring to the value of production, the main segment is trout (*Oncorhynchus mykiss*) one, (Seg.2.2 on-growing represents 89% of total value of the two main segments for trout): the turnover in 2014 is around €1.2 billion for the total all trout segments (Seg.2.2 and Seg.2.3) and the average price is around €2.8/kg for Seg.2.2 (on growing) and less than €2.5/kg for Seg.2.3 (combined). Also a trout offer is considered massive production and this is confirmed by the lower prices. The trout segment is the second in terms of volume of production, (around 41 thousand tonnes in 2014). This segment is characterized by fattened juveniles and their sales; in some cases inside of the land based farms are hatcheries, where produce fingerlings for auto-consumption. The production techniques used are primarily ponds, tanks and raceways.

Finally, according the *ex-farm* average price, the main segments are represented from seabass and seabream, in which recorded price from €7.5/kg to more of €11/kg (Seg.3.3). The total performance, into 2014, is higher than the previous year and is 18 thousand tonnes (+25% in volume of production and +43% in value).

Current production trends and main drivers (Trends and triggers)

In 2014 the consumption of fresh fish increased by approximately 1.3% over the previous year (ISMEA, 2015). Among the farmed species, there was an increase of purchases for the salmon, mussel and sea bass. In the same period, however, has decreased the purchase of clam, sea bream and trout. Exports of fish bred in 2014 related mainly sea bass and sea bream, whether fresh or thawed (ISTAT / ISMEA): specifically exports mainly to the German market recorded a +99.2% for sea bream and a +130.2% for sea bass, compared to 2013. In the shellfish segment, the mussels have achieved the best results: the mussel exports increased, compared to 2013, by more than 41% (ISTAT / ISMEA), satisfying the demand mainly from France and Spain.

Outlook

The outlook for the short period should be distinguished according to the three macro-aggregates Italian aquaculture. In the case of aquaculture of marine fish, (both on land and in sea cages), contrary to the last prevision, in which it was estimated a low growth around 1%, the performance was too much positive. According the actual situation, the market will follow the last short-time trend for marine segment, and the forecast for the short period is represented by an increase in production but not more 1-2%per year, according to Italian numbers of enterprises and their carrying capacity. For the segment of freshwater aquaculture, growth is pretty low: according the last short-period trend, the outlook for the next years is of slow growth around 2% per year, for high value quality offers of freshwater goods. The sector, furthermore, push much on the diversification of products offered to consumers. The market supply of freshwater satisfies the external trade, mainly represented from Central Europe market. Finally, the segment of shellfish is expected to have a slight growth between 0.8% and 1% per year, because the producers push for the strength production value. The monitoring activity of the annual growth is related to the "governance" of the sector: in the last 3 years many cooperatives have jointed in Producers Organizations (POs), in which the aim is to guarantee the level of revenue of the producers, also thanks to introduction local quota, for associates, planning to catch the shellfish.

4.15.2 Production and sales

In 2014, total Italian aquaculture production amounted to 185.8 thousand tonnes in volume, and around €557 million in value. Both volume and value are fluctuating over the period 2009-2014, but, considering only the last two reporting periods, the sector shows an increase: 21% in volume and 18% in value. All segment, freshwater, marine and shellfish have been a good productive performance that showed the reaction of the Italian producers to push the national aquaculture farms. The increase of volume sales is a small sign of recovery in consumption of Italian households compared to the aquaculture product. There were increases in fish farm purchases, especially related to the double event: the reduction of wild seafood product and increased confidence in the Italian aquaculture products.

General analysis of production sales shows a margin of significant growth both for the segment marine and the shellfish one. The modest growth, however positive and unexpected, is that the sector of Freshwater. This picture confirms the sector's potential to grow and be better able to meet the growing demand of Italian farming fish market. Consumers are favourably predisposed to direct household purchases of farmed fish, especially if the aquaculture products are able to guarantee the quality and, especially, if they are made in Italy. The double-digit increase for the marine segment (+45% in quantity) and shellfish (+27% in quantity), also shows that companies are increasing production capacity, increasing the tonnage of biomass bred and are also selling the product at commercially size (250-350 g). This does reduce the risk of having produced large size (greater than 500gr) more difficult to sell. Also managing to sell average size of about 300g product, companies can rely on a faster return of capital (shorter periods to monetize through sales).

The value of sales recorded a very positive performance for marine species, for which are registered +58% compared to 2013. For shellfish positive result is showed by +19% of value respect the previous year. A different trend has related to freshwater segment, in which are stressed the decrease its value of around -4%. This reduction shows a contraction of ex farm average price for trout; different trend, in the same segment, was for the sturgeons and their eggs (for caviar). The price of sturgeon continues to maintain high recording signals of openness of the market both nationally and internationally.

Table 4.15.1 Production and sales for Italy: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Sales weight (thousand tonnes)	***222.6***	***217.2***	***270.8***	***157.0***	***191.2***	***153.9***	***185.8***	*21%*	*-8%*
Marine	12.6	14.1	16.2	12.1	11.7	16.5	24.0	*45%*	*73%*
Shellfish	97.9	89.4	173.7	83.7	109.5	83.3	105.7	*27%*	*0%*
Freshwater	112.1	113.7	80.9	61.3	70.0	54.0	56.1	*4%*	*-32%*
Hatcheries & nurseries	0.0	0.0	0.0	0.0	0.0	0.0	0.0		*0%*
Sales value (million €)	***439.5***	***608.4***	***585.3***	***422.9***	***464.9***	***481.3***	***566.9***	*18%*	*13%*
Marine	113.2	125.8	138.5	70.6	79.9	114.6	181.0	*58%*	*69%*
Shellfish	68.7	149.7	182.9	146.3	135.3	122.9	146.7	*19%*	*8%*
Freshwater	257.6	332.9	264.0	206.0	249.6	243.7	239.2	*-2%*	*-8%*
Hatcheries & nurseries	0.0	0.0	0.0	0.0	0.0	0.0	0.0		*0%*

Source: EU Member States DCF data submission

There is no information about nursery/hatcheries performance, although the segment is very important. For marine species, Italy is capable of producing the necessary quantities and abundant production that used to export the fry/juveniles in other countries. The trend in recent years is to export fry/fingerlings especially in extra-EU North-African countries. For the freshwater sector, the situation is different: Italy satisfies only in part the demand of fry, so it imports large quantities from other European countries.

4.15.3 Industry structure and employment

During the last three years the total number of enterprises is constant, equal to 587 legal entities. More variability is recorded for employees and FTE. The Italian aquaculture sector has been affected over the last decade by a metamorphosis in terms of production structure, size of existing enterprises and number of employees by segment of production. The change was most evident from 2007-2008, since which the Italian economy has started to go through a phase of particular difficulty, involving all sectors of production. The transformation phase that has hit the industry tends to renovate the structures and modernize them to encourage concentration phenomena, which can contribute to the formation of more solid, more modern, more efficient and more competitive companies.

Italian aquaculture is characterized, at Mediterranean level, by a high level of specialization, high degree of industrialization and large-scale organization. The total number of legal entities in the aquaculture sector was 694 in 2008, in the beginning of the analysed period, but since then it has decreased to reach 587 in 2014, too (-15%). The Italian aquaculture sector is mainly represented by small size enterprises, dominated by family run businesses with no more than 5 employees (54%).

Table 4.15.2 Structure of the Italian aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Structure (number)									
Total enterprises	*696*	*696*	*692*	*589*	*587*	*587*	*587*	*0%*	*-8%*
<=5 employees	366	366	366	315	325	325	325	*0%*	*-5%*
6-10 employees	175	175	166	139	140	140	140	*0%*	*-10%*
>10 employees	155	155	160	135	122	122	122	*0%*	*-14%*
Employment (number)									
Total employees	4,357	5,884	5,836	5,076	5,159	5,064	5,112	*1%*	*-2%*
Male employees	4,053	5,459	5,299	4,032	4,324	4,405	4,342	*-1%*	*-6%*
Female employees	304	425	537	1,044	835	659	770	*17%*	*21%*
FTE	3,428	3,612	2,839	2,117	1,938	2,212	1,695	*-23%*	*-37%*
Male FTE	3,155	3,324	2,676	1,914	1,777	1,985	1,528	*-23%*	*-38%*
Female FTE	273	288	163	203	161	227	167	*-26%*	*-24%*
Indicators									
FTE per enterprise	4.9	5.2	4.1	3.6	3.3	3.8	2.9	*-23%*	*-30%*
Average wage (thousand €)	34.9	29.6	38.8	30.9	37.0	48.1	81.5	*69%*	*123%*
Labour productivity (thousand €)	31.3	57.8	83.1	73.6	106.2	97.5	136.1	*40%*	*82%*

Source: EU Member States DCF data submission

In 2014 the total number of workers is increase about only 1%, but in terms of total FTE have been recorded a contraction about 23% compared to previous year; this situation is related to more employees in the farms, but they work less, in terms of hours per week and/or for fewer weeks during the referring year. During the 2014, both FTE female than male were decreased, respectively of -26% and -23%. Especially for the shellfish production most of workers are called to work only for limited periods (seasons) while for both freshwater and marine fish farming, full-time and dependent employment is prevailing. Referring to the expenditure for wage and salary, the "cost for employees", has been registered a three times more respect the previous year. The cause, maybe, was related to the fixed part of wage and salary, represented from cost for insurance. There are more employees that are involved for lower hours during the day. More part-time person, seasonal persons, which correspond to high fixed cost related to the "share" of wage and salary fixed, not related to the real time/hours employed in the farms. The reduction of FTE employees has influenced the average number of employees in Italian enterprises, which was of 2.9 FTE per farm (2014). Each FTE produces more than 136 thousand €, very high percentage compared to the previous middle period (during 2008-2014, in total Italian aquaculture, the labour productivity increases more than 82%). Surely the Italian aquaculture can achieve higher levels of productivity. Many strategic choices of the sector will be linked to the strategy which will be implemented the goals of the European Maritime and Fisheries Fund (EMFF). The Italian aquaculture sector has the capacity and potential of the right to grow both in tons produced and thus increase significantly the employees.

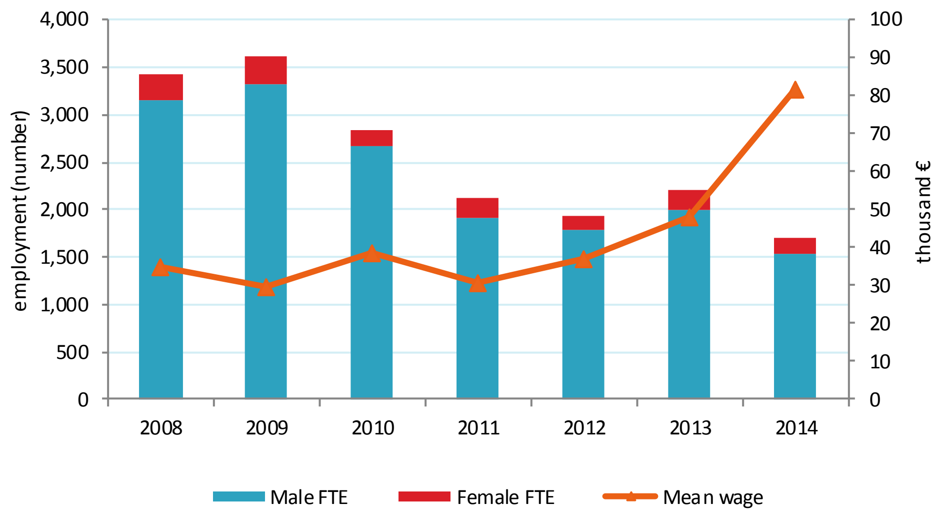


Figure 4.15.1 Employment trends for Italy: 2008-2014.

Source: EU Member States DCF data submission

In 2014 the total income of the Italian aquaculture sector was more than €588 million: 96% of which represented by turnover, 3% by other income and 1% by subsidies.

If looking at the overall period, after an increase in 2009, when the total income of the sector was about €639 million, a declining period has started. In the last 3 years the performance shows a significant upturn of total income: in 2014 an increase of 17% is registered if compared to the 2013, and on the total observed period the performance is positive (around +13%).

Referring to operating cost, in 2014, it amounted to €490 million, representing the 83% of total income. The labour productivity was the particularly high in overall considered period: it was more than €136 thousand per FTE.

The labour productivity in 2014 increased more than 40% rather than the previous year and the FTE per enterprise were 2.9, around 23% less respect the 2013 and -30% related the observed period (2008-2014).

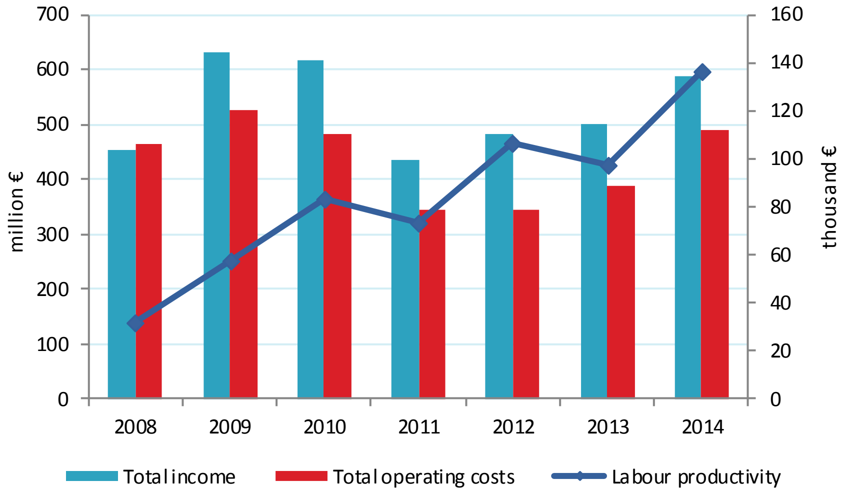


Figure 4.15.2 Income, costs, wages and labour productivity trends for Italy: 2008-2014.

Source: EU Member States DCF data submission

4.15.4 Economic performance

The total turnover, in 2014, registered a +17%, shared between best performance in income (+18%) and significant increase of subsidies (+45% respect 2013). The other income has characterised from reduction, compared to previous year, of 2%.

The total expenditure represents 83% of total income. Analysing the operating costs, the total expenditure is dominated, in order of percentage weight, from wages and salaries (23%), feeds costs (22%) and energy costs (21%).

The cost of juvenile and the fry (livestock costs) is among the lowest in the entire statistical reporting period, in fact in 2014 it weighs only 9% on operating costs, and marks a decrease of -52% compared to 2013, while compared to the period 2008-2014, marks an even greater reduction, which reaches more than -56%. The energy costs have registered a historic growth: only in 2014 it amounted to +134% over the previous year and even more than +168% compared to the data collection period (2008-2014). Increased three-digit cost energy is directly related to the product volumes in 2014: the aggregates that have grown more, in terms of sales, are the marine and shellfish. In either case, the use of support/service vessels for offshore installations (cages and long-line for mussels, as well as bottom-up in the clams) was affected by increases of fuel cost, during the same period. Reducing costs for livestock could be read as the presence of biomass still in pre-fattening stage, in fact in 2014 the reduction of livestock costs, there was an increase, compared to 2013, the in feed costs. It means, in fact, that the farms of fish are in the process of reduction of sowing and biomass finishing. They are, in practical terms, in the final fattening phase of farmed species. As it knows, average production cycles are riding two fiscal years, as they have an average life of 18-20 months.

Table 4.15.3 Economic performance of the Italian aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	% of total income	Change 2014-13	Development 2014/(2008-13)
Income (million €)										
Turnover	439.5	608.4	585.3	422.9	464.9	481.3	566.9	*96%*	*18%*	*13%*
Other income	10.7	18.3	21.6	10.2	14.5	16.3	16.0	*3%*	*-2%*	*5%*
Subsidies	2.7	3.0	9.7	2.6	2.7	4.2	6.0	*1%*	*45%*	*45%*
Total income	*452.9*	*629.7*	*616.6*	*435.8*	*482.1*	*501.7*	*588.9*	*100%*	*17%*	*13%*
Expenditures (million €)										
Wages and salaries	108.9	103.5	109.4	64.7	71.4	105.9	135.6	*23%*	*28%*	*44%*
Imputed value of unpaid labour	10.6	3.4	0.7	0.8	0.4	0.5	2.5	*0%*	*363%*	*-9%*
Energy costs	35.7	77.4	24.0	38.9	51.2	54.0	126.3	*21%*	*134%*	*169%*
Repair and maintenance	16.4	32.7	8.7	15.4	25.3	23.6	35.5	*6%*	*50%*	*75%*
Raw material: Feed costs	163.1	166.0	146.4	66.6	72.8	81.2	128.8	*22%*	*59%*	*11%*
Raw material: Livestock costs	95.2	102.4	135.1	145.4	107.5	107.1	51.4	*9%*	*-52%*	*-56%*
Other operational costs	32.3	39.3	56.9	10.9	16.8	15.9	10.2	*2%*	*-36%*	*-64%*
Total operating costs	*462.3*	*524.7*	*481.2*	*342.8*	*345.3*	*388.3*	*490.3*	*83%*	*26%*	*16%*
Capital Costs (million €)										
Depreciation of capital	19.8	32.0	35.5	19.5	22.0	20.4	24.5	*4%*	*20%*	*-2%*
Financial costs, net	36.5	13.0	16.7	6.7	6.8	8.2	11.7	*2%*	*42%*	*-20%*
Extraordinary costs, net	14.4	7.8	7.9	4.0	5.8	3.0	4.8	*1%*	*59%*	*-34%*
Capital Value (million €)										
Total value of assets	409.9	1409.0	1319.1	700.8	721.7	726.2	885.9	*150%*	*22%*	*1%*
Net Investments	39.6	298.0	398.3	239.2	223.8	235.0	256.2	*44%*	*9%*	*7%*
Debt	573.7	644.4	757.4	412.7	441.9	484.5	545.5	*93%*	*13%*	*-1%*
Input & Production (thousand tonnes)										
Raw material: Feed	170.6	161.1	117.7	98.2	79.3	60.4	104.2		*72%*	*-9%*
Raw material: Livestock	176.6	45.8	54.0	32.6	30.6	24.1	33.2		*38%*	*-45%*
Performance Indicators(million €)										
Gross Value Added	107.4	208.9	235.8	155.8	205.7	215.8	230.7	*39%*	*7%*	*23%*
Operating cash flow	-9.4	105.0	135.4	93.0	136.7	113.4	98.6	*17%*	*-13%*	*3%*
Earning before interest and tax	-29.2	73.0	99.9	73.5	114.8	93.0	74.2	*13%*	*-20%*	*5%*
Net profit	-65.8	60.0	83.2	66.9	108.0	84.8	62.5	*11%*	*-26%*	*11%*
Capital productivity (%)	26.2	14.8	17.9	22.2	28.5	29.7	26.0		*-12%*	*12%*
Return on Investment (%)	-7.1	5.2	7.6	10.5	15.9	12.8	8.4		*-35%*	*12%*
Future Expectation Indicator (%)	4.8	18.9	27.5	31.4	28.0	29.6	26.2		*-12%*	*12%*

Source: EU Member States DCF data submission

Compared to the cost of capital is detected, from 2008-2014, a general trend of decrease in both depreciation and financial costs, a factor which implies a reduction of investment in durable goods and, therefore, the resulting drop in bank credit demand. This trend is confirmed of general decrease (-1%) of debts during 2008-2014. The Capital cost has signed a 7% incidence of total income. The GVA marks a good increase (7% more than 2013) and represents, in 2014, more than €230 million. In 2014, EBIT was €74 million, but fell by 20% over the previous year. ROI is unsatisfactory compared to 2013, in fact in the year observed is

-35%. ROI is2014 was 8.4% and is positioned in the average values of the last survey three years. ROI from 2008-2014 grew by 12%. This is an indicator of an industry of capital intensive type, highly specialized both employed and of sophisticated technologies used. The high capacity for knowledge of aquaculture techniques, had a positive impact on productivity capacity (+26% in 2014) of the Italian aquaculture sector. The level of capital productivity from 2008-2014 continued to grow to record, on the period, an increase of 12%. Considered the FEI, after three years of growth, from 2013 began to reduce, and, in 2014 is about 26%.

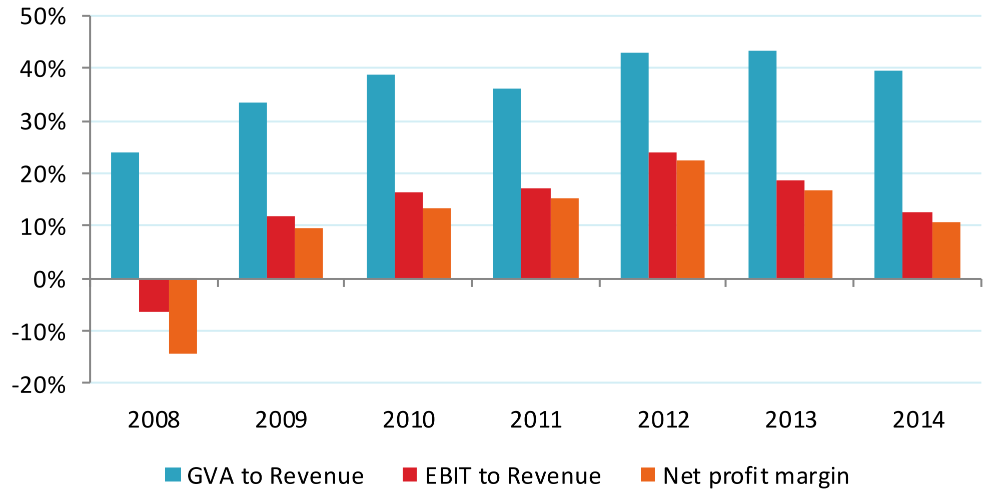


Figure 4.15.3 Economic performance for Italy: 2008-2014

Source: EU Member States DCF data submission

The sector continues to show the ability to generate a good GVA compared to revenue (+40% in 2014). In addition, EBIT to revenue follows a very consistent trend with respect to the percentage of the entire observation period (2008-2014). The incidence of taxes can also be read in relation to the net profit margin that tends to contract.

4.15.5 Main species produced and economic performance by segment

The main species in volume farmed are for shellfish the Mediterranean mussels and Venus clams, while for the freshwater macro-aggregate the trout was the first cultured fish; finally for the sector of euryhaline species the most farmed species was the sea bass.

On the hand of value, the most important species is the trout and the mussel is one of the last species. The sector of the freshwater is traditionally a driving force for the value product.

Important aspect is that in the segment falls trout rearing of salmon destined exclusively to the production of caviar. Aquaculture Italian is the largest in the world in the production of caviar from farmed sturgeon, exported to more than 90%, but it is also among the world's varieties of farmed species and for the stock of sturgeons in the herd. According to the production performance of the last two years, can be seen increases in the volume and value of sea bass and sea bream production, mainly those from the cages. Significant are the segments of the mussels and clams, because they represent respectively bivalve with the lowest price ex farm (mussels) and bivalve positioning Italy as the first producer in Europe (clam).

Very important, especially in terms of volumes sold on the foreign market, it is the segment of trout. This segment continues to respond to a slight increase in terms of production performance, but gives obvious signs of maturity, and has reached the carrying capacity that ensure its sustainability also environmental as well as economic and social.

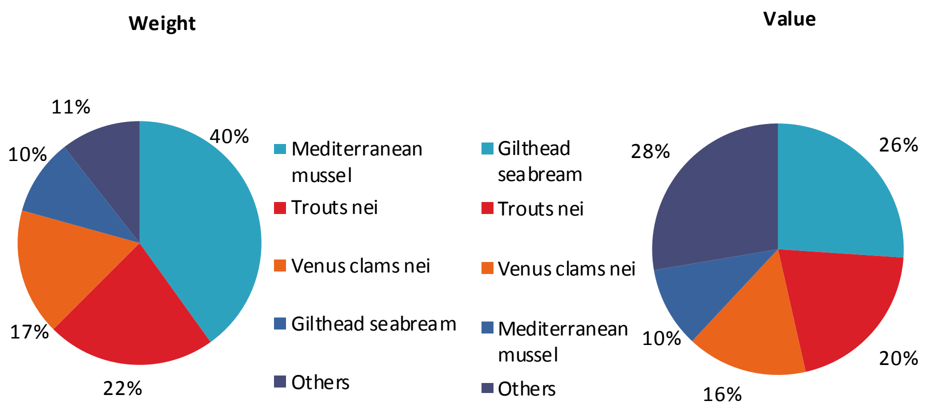


Figure 4.15.4 Main species in terms of weight and value in Italian production: 2014.

Source: EU Member States DCF data submission

As regards marine species, the most performed was, in 2014, the Mediterranean sea bass and seabream (the two species are bred together and, in the whole observed period, the average price of seabass is always slightly higher than seabream) , mainly appreciated by consumers. In the Italian market the price of sea bass is strongly influenced by cultured area: the highest price is for sea bass of lagoon (as Orbetello lagoon, where the price maybe around €10/kg). It is very recent trend to willingness to pay more for euryhaline species that are certified or that came from organic production. No more information and data are available about Italian production of organic aquaculture volume offers. The species with lower price is represented by Mediterranean mussel. The average price, (€0.78/kg), on a regional and national level, showed a significant difference in relation to the production area. The companies in Sardinia and Liguria sprouting higher prices, while Apulia producers offered more cheaply mussels. These differences can be attributed to a different quality of product, as well as in social situations and different organizational.

The trend of other freshwater species has been influenced mainly by the sturgeon produced for niche market of caviar. Initial high quality product from sturgeon pushes the average price, but during the last three years the situation is stabilised.

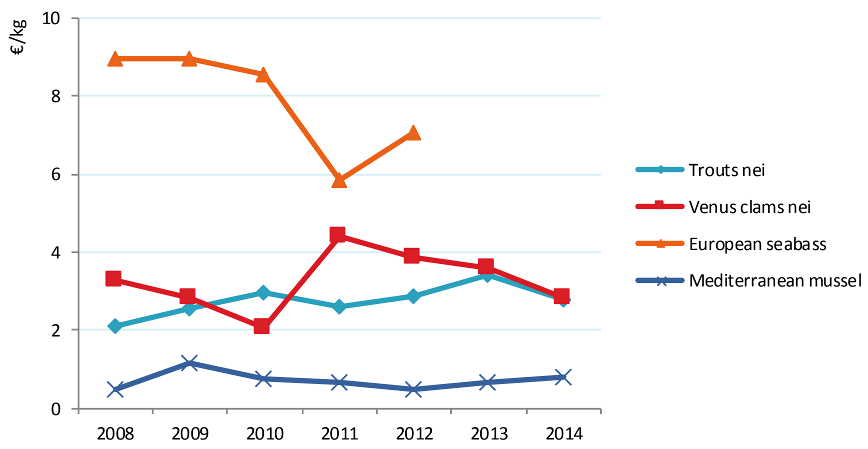


Figure 4.15.5 Average prices for the main species produced in Italy: 2008-2014.

Source: EU Member States DCF data submission

Although the data are collected in Italy for nine different segments, in this chapter four segments have been considered, significant both from the point of view of high input of capital (sea bream & sea bass cages and on growing), from the point of view of number of employees (clams and mussels) and their high degree of specialization (sea bream sea bass cages and on growing technique). Based on the above reasons, the performance of the following product segments is analysed:

- Segment 1: Clam bottom;
- Segment 2: Mussel long line;
- Segment 3: Sea bass & sea bream cages
- Segment 4: Sea bass & sea bream on growing.

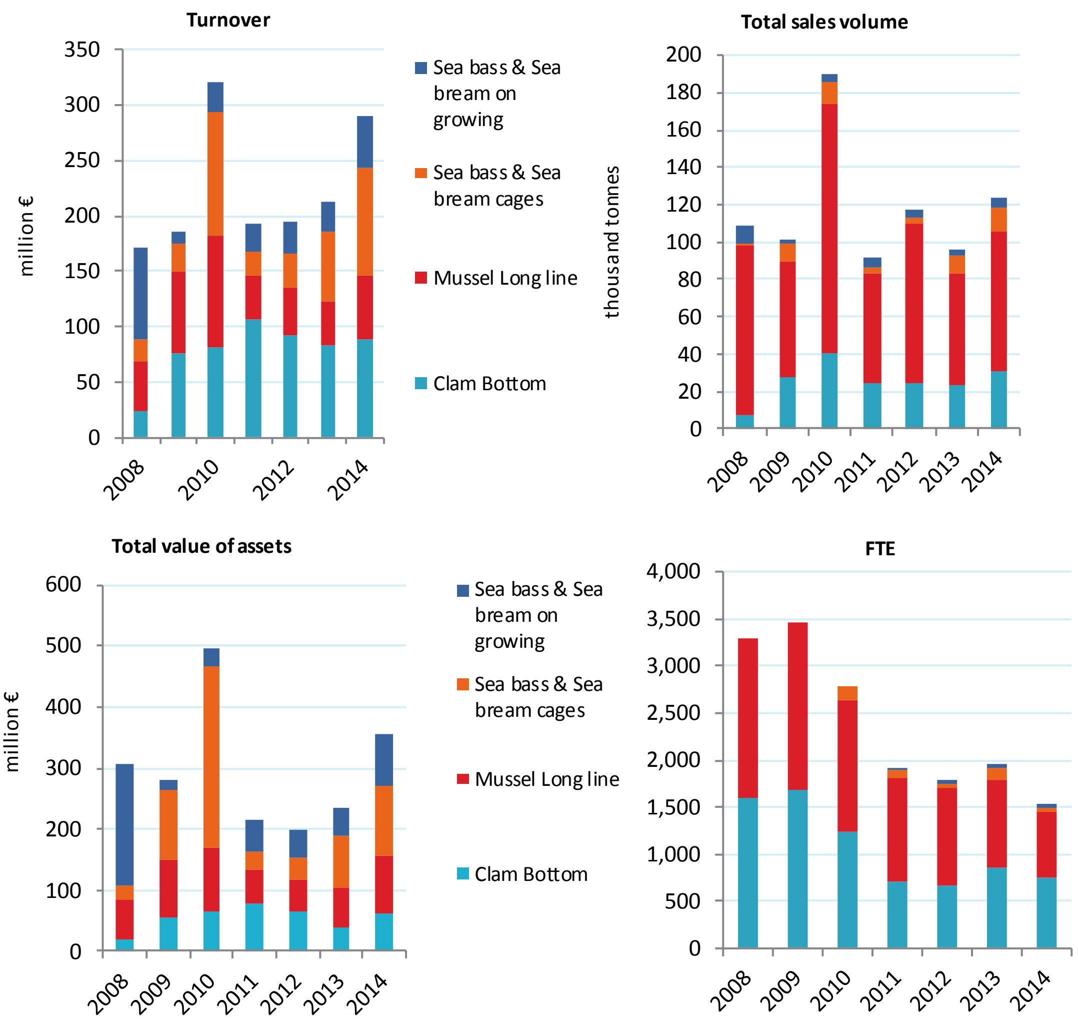


Figure 4.15.6 Structural development Italian aquaculture sector: 2008-2014.

Source: EU Member States DCF data submission

The economic performance of the four Italian segments is shown in the next table. There is the need to describe the economic performance of the segments that can be enhanced and strengthened also by future management policies at national and regional level. Another reason, last but not least, is that the four segments can, if they reach a new point of economic and financial stability, ensure the resumption of high quality products and satisfy, in part, the domestic demand for seafood product.

Table 4.15.4 Economic performance of main Italian aquaculture segments: 2008-2014 (in million €).

Variable	2008	2009	2010	2011	2012	2013	2014	% of total income	Change 2014/13	Development 2014/(2008-13)
Mussel Long line										
Total income	47.8	77.9	106.1	41.4	44.6	41.6	61.1	100%	47%	2%
Gross Value Added	-3.9	26.7	21.5	18.8	21.1	21.7	11.0	18%	-49%	-38%
Operating cash flow	-30.1	-3.4	-10.6	9.2	13.4	7.4	-8.7	14%	-218%	679%
Earning before interest and tax	-36.4	-7.5	-14.7	7.0	10.3	4.4	-13.5	22%	-407%	269%
Net profit	-37.4	-8.1	-15.7	6.5	9.7	3.4	-14.6	24%	-522%	239%
Total sales volume (thousand tonnes)	90.5	62.3	133.8	59.6	85.5	60.3	74.5		24%	-9%
Clam Bottom										
Total income	25.4	79.1	90.5	107.7	98.2	88.8	99.1	100%	12%	21%
Gross Value Added	4.0	48.5	80.2	18.2	16.6	25.2	86.9	88%	245%	171%
Operating cash flow	-2.6	38.6	73.4	5.1	3.3	-6.6	34.3	35%	620%	85%
Earning before interest and tax	-4.2	37.4	71.4	1.5	1.8	-8.3	31.7	32%	481%	91%
Net profit	-4.6	36.2	70.5	0.6	1.3	-9.0	30.9	31%	444%	95%
Total sales volume (thousand tonnes)	7.4	27.1	40.0	24.1	24.0	23.1	31.2		35%	29%
Sea bass & Sea bream cages										
Total income	21.0	27.8	116.0	22.3	31.2	65.6	98.5	100%	50%	108%
Gross Value Added	9.2	0.2	23.5	8.8	14.9	21.9	18.2	18%	-17%	39%
Operating cash flow	7.3	-8.5	9.8	6.6	12.8	15.9	10.1	10%	-36%	38%
Earning before interest and tax	6.1	-13.4	-0.4	5.4	11.6	13.4	7.1	7%	-47%	87%
Net profit	5.7	-14.0	-6.5	5.2	11.2	12.7	6.7	7%	-47%	180%
Total sales volume (thousand tonnes)	1.7	9.9	12.2	2.7	3.8	9.1	12.8		40%	94%
Sea bass & Sea bream on growing										
Total income	87.3	11.4	27.0	26.1	29.9	26.7	46.9	100%	75%	35%
Gross Value Added	19.9	0.6	10.6	23.8	22.3	19.9	13.5	29%	-32%	-16%
Operating cash flow	3.6	-1.4	5.7	16.4	16.0	12.5	4.4	9%	-65%	-51%
Earning before interest and tax	-1.6	-2.8	5.1	15.1	14.0	11.0	2.6	6%	-76%	-61%
Net profit	-4.3	-2.9	4.9	14.9	13.8	10.8	2.2	5%	-80%	-65%
Total sales volume (thousand tonnes)	9.5	1.5	3.8	5.1	4.2	3.7	5.6		49%	20%

Source: EU Member States DCF data submission

As regards the shellfish, it will be analyzed because represent a strong implication with the coastal communities. The mussels and clams sectors are characterized by a complex structure in which still live old traditions and modern capital intensive farming techniques. The process of transformation to modern farming practices (no more local and traditional / artisanal) occurred with the introduction, in the second half of the 80's, a new technique: the long line offshore. The use of new technologies for breeding mussels has allowed using new spaces. The traditional areas of production, mainly located in coastal areas closely or lagoon (such as the Venetian lagoon, the Gulf of Trieste, the Gulf of Taranto), there are adding many new offshore companies, no longer constrained by environmental and sanitation issues. This has meant that the shellfish industry today represents the main voice production of the Italian aquaculture, although the production is based almost exclusively on mussels (*Mytilus galloprovincialis*) and clams (*Tapes philippinarum*), limited quantities of clams (*Tapes decussatus*) and oysters (*Crassostrea giga* and *Ostrea edulis*). On the hand of market, the fragmentation of supply, added to the lack of producer organizations (POs), represent a strong weakness for shellfish industry. Another factor of the inefficiency in the sector is represented to the lack of commercial capacity of the producers: the shellfish farm is responsible almost exclusively of the production aspects, but the marketing and the sales implication are owned almost entirely by intermediaries and wholesalers, so the benefits for the producers are marginal. Finally, the decrease excessive stability of producer prices according to the progressive increase in production costs, also due to the transposition of European directives.

The Mussel sector represents the most important in terms of volume (74.5 thousand tonnes), but all the others variables describe a not profitable segment for future investments, mainly caused to lower ex farm price and objective possibility to introduce best practice that will maybe can influence a willingness to pay of the consumers.

Figure 4.15.7 Economic performance indicators for the main Italian segments: 2008-2014.

Source: EU Member States DCF data submission

The first Italian segment in terms of total income, is represented from clam bottom-up technology (€99 million), followed from seabass and seabream farmed in cages with around €98 million and SBSB on-growing technology in which the total income is around €47 million.

The mussel is the 4th in terms of total income (€61 million).The segment while producing significant volumes of product, mussel, is the one with a worse economic performance: a GVA of about €11 million, has recorded a net margin and a negative EBIT, respectively -€14.5 million and -€13.5 million. The mussel segment is the one unable to generate cash, indeed operating cash flow is significantly negative (-€8.7 million). The sector suffers from the inability of the operators to increase the ex-farm price, is the absence of a centralized supply distribution channel. Surely the greatest weakness is the lack of aggregation of supply: the producers are not involved in the purification/depuration and relaying stages of mussels, which compromises the ability to control the price. There may also be appropriate for major innovations in management by POs.

The best performance, related to GVA comes from Clam segment, (€86.9 million) and the others three segments are, respectively SBSB in cages (€18.2 million), SBSB on-growing (€13.5 million) and mussel (€11 million). The segment of clam produce cash from its activities, and the operating cash flow represents a 35% of total income, with increasing, in 2014, of higher percentage rather than previous year, +620%.

Segment 1: Clam bottom

With a harvest of 30-40 000 tons per year, Italy is the leading European producer and the second in the world for the production of clams, almost exclusively of the Philippine species, introduced in 1983. In 2014, the Italian sales volume was 31 thousand tonnes, equal to €87 million of turnover and average ex farm price of €2.8/kg.

The success of the national livestock *T. philippinarum* is mainly due to two factors: the presence of areas and high trophic levels (Adriatic coastal lagoons) and the high volume of juvenile wild. The cultivation of the Philippine clam farming system is low-tech and in almost thirty years has seen few innovations to improve yields. Only the collection phase of the product has undergone significant changes with the evolution of new tools. The Italian production of *T. philippinarum* is concentrated in the stretch of coast between Grado and the southern part of the Po Delta. In Italy the annual needs of Philippine clam seeds is estimated to be at least ten billion units, more than 95% or which are taken in areas that have the calling for the establishment and development of juveniles of this species (nursery areas). The techniques of reproduction of Philippine clam have been consolidated for the past few decades. Since, however, the availability of wild juveniles may be a limiting factor in recent years the belief that the nursery areas is of great strategic importance for the future of the national clam is consolidating. This approach has led, as in the case of Emilia-Romagna, to the geo-referenced mapping and management of the nursery areas of clam according to the objective of protecting and increasing production of juveniles.

Analysing the items of operating costs in clam segment, more than 79% is absorbed from wage and salary. Never before 2014 was recorded the same high wages and salary costs. The number of employees was 2 377, which correspond to 740 FTE. The employed are seasonal so receive salary only for the period in which they work on the clams farm; in the other words, in the some phases some employees are the suppliers of raw materials and then are occupied into clams farms. There are no particular crises in the clam segment that can justify unclear contraction in employees and the increase of labour costs. Considering the percentage of cost for livestock lower (3%), maybe possible that the wages and salaries include a cost that fisherman receives for selling of seeds to the clam-farm (auto-consumption and auto-production of seeds).

Related to GVA, clam segment showed a positive performance and the percentage of GVA to revenue is 88% in 2014, recorded an increase more than 60% compared to the previous year (2013).

Segment 2: Mussel long line

Mussel farming has a high dynamism. The market still has room for expansion, especially for oysters, for which depend almost exclusively from abroad, but also for the mussels, especially if there is a tendency towards presentations more practical for the consumer and that allow greater penetration also in the market interior and northern Italian regions. For the offshore mussel farming systems have achieved high quality standards, giving more stability to the system, limiting the damage caused by the storms, and the related costs, and allowing you to invest in technological improvements. In Italy, mussel is an important production, which puts the country in a leading position in Europe with a production of about 75 thousand tones. Domestic production is not always able to meet the demand, also in relation to the seasonality of the supply that characterizes the national product. Production companies, based on the modest market value of the mussels and the expansion of farming into new areas, must meet the objective of maximizing production efficiency, focusing on the areas in which they deem the conditions most suitable from the point of view of the productivity parameters. The development of the sector is also heavily dependent on the improvement of farming methods, in a perspective of sustainable exploitation of the resource and to reduce costs of production. Compared to the year 2013, the segment shows an increase in the volume of more than 24%. The total income was increased of around 46%. This growth, not corresponded to better performance of GVA: it was -49% respect the 2013. The negative performance has supported by high costs of production. The first item is represented to energy cost, which represents more than 40% of operating costs. This value has been characterized to higher increase compared with previous period of statistic observation. Considering that the average price in 2014 was around €0.79/kg, the energy cost per kilo was around €0.39/kg. The costs of production are higher rather than *ex farm* price.

Segment 3: Sea bass & sea bream cages and Segment 4: Sea bass & sea bream on growing

The economic analysis for the segments of sea bass and sea bream will be treated together in the same paragraph. The choice is because the major differences are generated by different technology applied. In general, although the incidence of each operating cost is different in the two segments, in general they are very aligned in relation to the macro-economic performance. The financial crisis has affected numerous sea bass and sea bream farms that were not prepared for the challenges of this period of strong economic and financial instability. These challenges, in fact, require total dedication, high technical capacity and appropriate financial capabilities. In Italy, today, companies that have a size suitable for the challenges are few. These companies manage, however, to ensure: productions of quality, both as regards the fry and the products fattened and the ability to withstand the increasing competition with other Mediterranean productions, especially North African. The two segments of sea bass and sea bream (on growing and in cages), were chosen because in Italy it is a bit much to enhance the production of marine species with high commercial value. Furthermore, these two segments are also those in which there is a high employment level, in terms of FTE: most of people work permanently compared to other segments in which the employed are more seasonal. Finally, they are important because they are the most representative enterprises of capital intensive high-technology and high labour specialization. For sea bass and sea bream similar considerations can be from the point of view of development strategies and management and investment optimization. However, if we analyze the performance on the side of production costs, there is a big difference in the costs structure between the two segments.

The most important differences between the two segment for Seabass and Seabream are related to feed costs and energy costs: for the segment SBSB in cages, the most % of operating costs is represented from energy cost (30%), while for the segment SBSB on growing the high % is related to feed cost (more than 34% of the total operating cost).

The SBSB on cages normally used some bots for support the cages in terms of normal activities of production (distribution of feeds, change of nets, monitoring of the cages, etc.), for all those activities are direct increasing of fuel costs of the vessels.

In terms of cost of personnel, the difference is important: for the segment SBSB cages the total cost for wages and salaries (10% of total operating costs) is the half of the SBSB on-growing (20%).

Related to fingerlings and repair/maintenance costs, for the two segment of SBSB are more or less equivalent.

For twice SBSB segment, the GVA to revenue and net profit have registered a contraction in the 2014, compared to the previous year (2013). In 2014, in the segment SBSB on cages, the GVA to Revenue was 19%, while in the segment SBSB on-growing was 29%; in terms of net profit, for SBSB cages it was 7% and for SBSB on-growing was 5%.

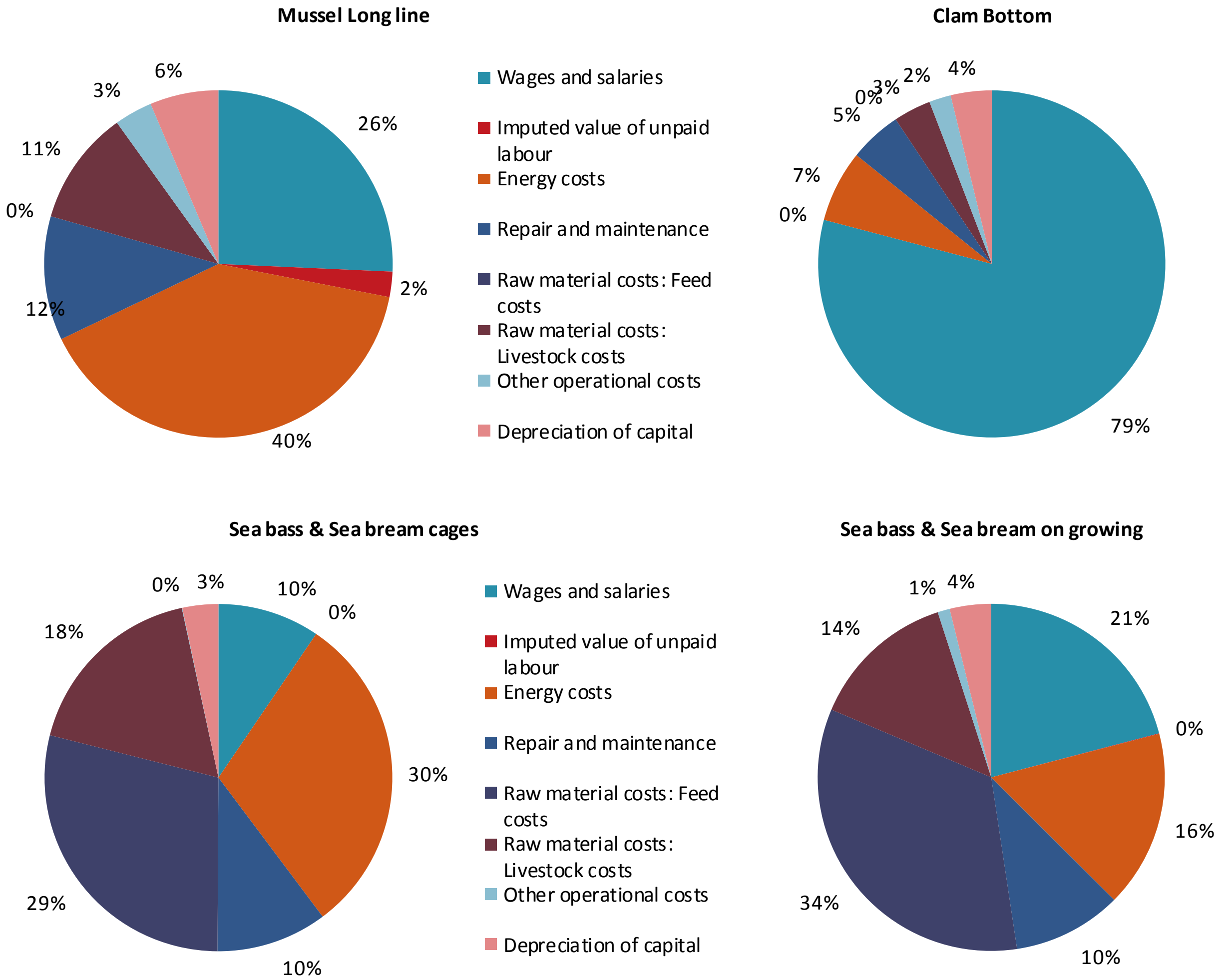


Figure 4.15.8 Cost structure of the main segments in Italy: 2014.

Source: EU Member States DCF data submission

The costs of the fry/livestock and feed are highly variable from one type to other farms. They depend mainly on the cultured species and technology.

For marine cultured species, costs for feeds depend of the technologies in which are used: in off-shore cages, the risk is represented from a greater dispersion of the product, compared to what, for the same biomass bred, is used in the life cycle of inland farms. Moreover, the costs for fingerlings depend from the size of "seeding". Normally for fingerlings used in the cages, the average size is greater than those placed on the inland tanks, for so their cost is higher.

In the case of mussels and clams, the cost item related to feed is completely absent. The values related, however, to the seed (livestock) are quite high. In the case of clams these values represent a share of the integration of the income of fishermen employed on plant. For the clams, Furthermore, the cost of the seed suffers fluctuations because strongly dependent on the availability of wild seed in the sea. In Italy it is increasingly important to identify the nursery areas to have an availability of wild seed clam.

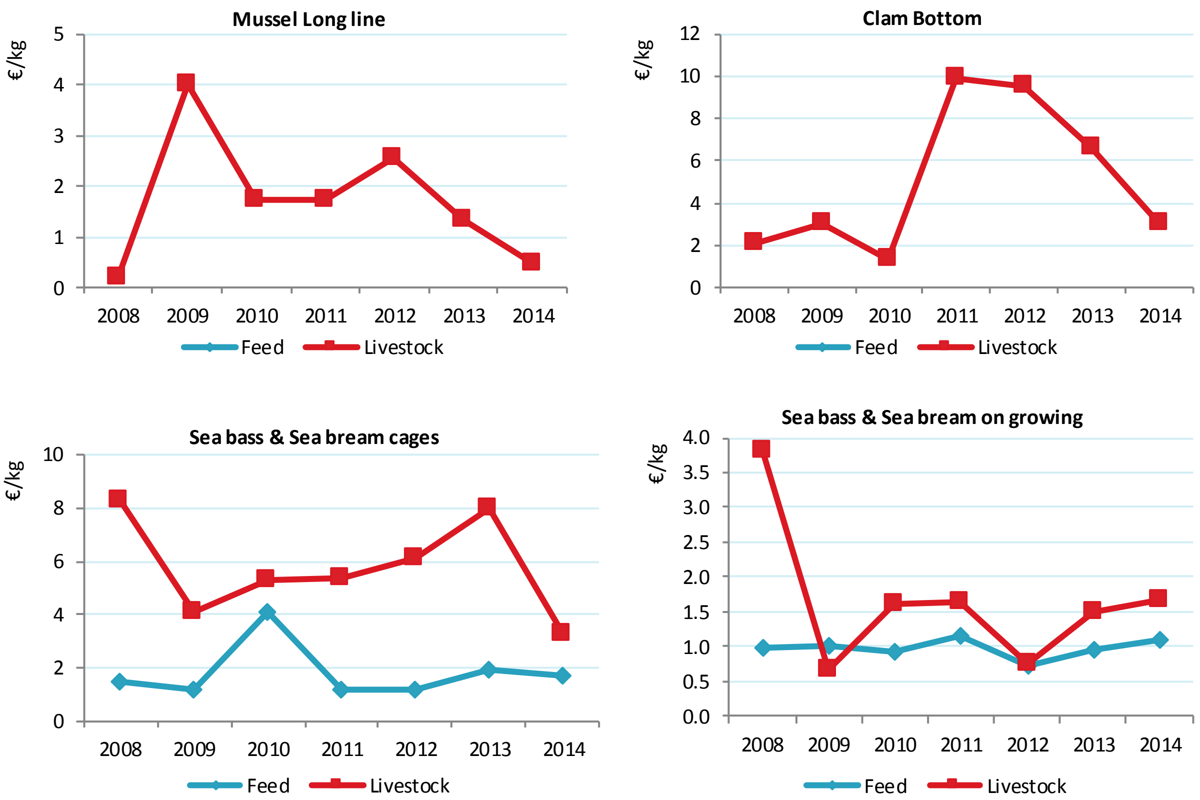


Figure 4.15.9 Feed and livestock prices for the main Italian segments: 2008-2014.

Source: EU Member States DCF data submission

4.15.6 Trends and triggers

Current production trends and main drivers

During the last three years the entire aquaculture sector is continuing to adjust crisis, which manifests in different ways. The most obvious is the lowest number of fixed and full-time employees, replaced by seasonal workers employed for a minimum number of hours per week. In many companies recur to employing low-resource, so use it only in case of need for consultants and experts are paid as consultants.

The scarce presence of more skilled personnel affects both the operating costs, such as an increase in feed costs in the on-growing segment, and strong increases in energy costs in SBSB segment cages.

For certain segments, such as mussels, environmental factors influence very much the production performance, especially when storms cause loss of product.

A longstanding problem for the bivalve in general, and for the more significantly clams, it is the difficulty of finding wild seed. In the strategic program for aquaculture it is stressed that this issue significantly affects the productivity of the sector. In national strategic plan for Italian aquaculture, it hopes for better management of nursery areas and their increase.

Among the possible future activities of transversal improvement in support of the entire aquaculture, it is the opportunity of a refinement of the interview and interaction activities between research and the productive sectors. The centre of more efficient interaction will be the Ministry (MIPAAF). For certain segments, such as the mussels, it is hoped a better control of rising energy costs. Currently, energy costs pearl mussels are very high because both the distance of production areas from the coast and from the use of ships which are used both to manage the rows of mussels, both for the collection of mussels. Basically they use more powerful boats because they are also "delivery centres." For mussels it is focusing a lot to shorten the steps between producer and consumer, helping to boost its vertical integration of the production and distribution process. In the last two years there are new productions and aquatic species are increasing volumes of farmed algae. In Southern Italy there are productions of spirulina (*Arthrospira platensis* or Spirulina platensis): small productions that are totally absorbed by the food industry specialized in sports. Some quantities are also required by the pharmaceutical industry, although the Italian bid cost is not competitive compared to spirulina imported from the USA and China.

A recent report of the European Federation of Aquaculture (FEAP) Producers showed the lowest production of juveniles of sea bass and sea bream in 2013 in Turkey, a trend that is expected to continue. Together with similar contractions in a number of other producing countries, it is expected that the net result shows an overall drop in production, especially for bream, at least for the next two years. Whereas a significant increase in prices accompanied the zero growth of production in 2014, suggesting that demand is growing, this could lead to a positive turn assembles more consistent profitability for the industry as a whole.

Market structure

In 2013 and 2014, aquaculture in Italy continues to be an important support to meet the growing demand for fish by consumers. A survey made through the retail distribution channel (COOP) showed that the aquaculture product is a guarantee, because it is more available and more easily available. Also it allows to efficiently handling the possibility of programming of the request, according to the different periods of the year. Refers to the quality, retailers recognizes a high level of quality of Italian production and also the ability to directly control the quality standards. Important, then, is the possibility of having low variability of price. Finally it is important the ability to track the product and the identification of the origin (Italy).

In 2014 the balance of the fish trade balance was negative, (4.9%, source ISMEA-ISTAT, 2014) because imports of the product, especially at end of year (October to December) continued to grow. The increase responds to the growing consumption of fish both fresh and processed. Consumer prices of fish products were the almost stationary.

After the implementation of the embargo on food products from Western countries, which entered into force in August 2014, the segment of seabass and seabream in the Russian market has been influenced by changes in the geography of the exporting countries and their logistics, while the variety and range of products have remained the same. Shipments of sea bass and sea bream from Italy, France and Greece have been replaced by Turkey and North African countries. The main trend has been to a further strengthening of Turkey as the main supplier country of sea bass and sea bream in the Russian market. The Russian ban is an opportunity for Turkey, because bass and sea bream are the second category present on Russian shelves after the salmon, and the Russian Federation is facing a shortage of the latter.

Italy supplies fish product mainly on the EU28 market, compared to purchases on Extra-EU markets. From January to October 2014, exports increased for the volume of mussels, sardines, anchovies, sea bream and sea bass, from the corresponding period of 2013. Exports increased mainly because France has increased the import of mussels, while for the oily fish (sardines and anchovies) there is an appreciable demand from the Spanish market, to which is added for the first time a significant increase in demand by Albania anchovies. As for the euryhaline species, the Italian product was prompted in particular by the German and Croatian markets. Related to the processed products, canned tuna is the main product exported, an increase of 20.4% in volumes sent across the border than in January-October 2013 (in particular the period, to Germany and Greece). It also noted the increase more than twice as many of caviar supplies as a result of the exploit on the Latvian market.

It looks good even the trend of exports of fresh or chilled fillets of trout (+ 27.2% on the same period of 2013) due to increased requests from Poland (+ 40.1%), Switzerland (+18.7 %), Germany (+ 199.3%) and the Netherlands (+ 790.1%).

Analysing the same period, imports have increased further, mainly with respect to the supply of fresh and chilled salmon (up 23.9% the product from Sweden) and live lobsters (US and Canada the main source markets). Increased, in addition, imports of seabass from Turkey (+ 36.5%) and Croatia (+ 18.6%). Including processed products, in parallel to the increase in exports, it grew compared to 2013 the import volume in tuna canned (+ 17.4%), especially from Spain. It is registered still growing imports of frozen shrimp (especially Ecuador) and smoked salmon (with large increases of product coming from Sweden and Germany). Finally they have increased volumes of frozen octopus imported especially from Indonesia and Vietnam.

By analysing the consumption of Italian households, in 2014 there was the growth of domestic consumption of fish products, an increase in volume of 2.1% compared to 2013. In 2014, it consolidated the growth of purchases of fresh products (+ 1.7% in volume compared to 2013, + 1.5% in value) and strengthens the consumption of processed products (collectively, + 3.1% in volume and + 2.3% in value).

Among fresh products, the most consumed species are sardines and octopus and mussels, anchovies and salmon. During the 2014, it has registered the decreases, -6.7%, in demand for clams.

With regard to processed fish products, they grew the consumption of preserves and semi-including those based on mackerel and tuna. It was increased the consumption of frozen and dried, salted and smoked, the latter driven in particular by the cod.

Issues of special interest

Italian aquaculture sector is a perfect picture where the equilibrium is represented from tradition and high technologies, joint with very optimal climate, favourable environmental and geographical conditions. On the side of the vertical integration, more of 90% of aquaculture processed products came from vertical integration of processing industry, which represents an opportunity for the development for the sectors in the future. On the opposite side, as a "macro" weakness, it is important to recall a not adequate logistic infrastructure and not efficient, but punctual and not coordinated at Regional level, investments for the old facilities (mainly for inland aquaculture, because more of tanks have been builder in the 60s). More of the past inefficiency in production for aquaculture are related to the lack of national strategic plant and no strong and bidirectional interaction between Central Ministry and Regions. The National Strategic Plan represents a result of strong activity of bottom up participation of different level of stakeholder involved during around 2 years of consultation and validation of the general short, middle and long terms objectives. The leitmotif of the Italian Aquaculture Plan is the Blue Growth. The plan wants to create a political framework, regulatory and appropriate administrative to make the most modern and sustainable aquaculture, integrated coastal and rural areas to create economies and territorial cohesion. It will strengthen the image of the industry in order to better guide the choices of consumers. The main objectives considered into the Plan are the follows:

- Support and consolidate the Italian role of aquaculture in the European and international context;
- Give legal and administrative certainty to the sector to strengthen the competitiveness of enterprises, encourage investment and internationalization;
- Develop a single framework environment, based on knowledge, to organize and manage aquaculture activities, maintain healthy and productive aquatic environments and protect sensitive habitats;
- Consolidate, upgrade and diversify production systems, through technological innovation and research, to boost growth, competitiveness and sustainability of aquaculture activities;
- Improvement of aquaculture products market organization;
- Improve communication and information to the public on the economic, social and environmental impact of aquaculture activities and enhance the value of aquaculture products;
- Invest and strengthen qualified human resources and management skills of aquaculture enterprises, favouring generational replacement and youth employment.

Outlook for future production trends

Related to marine aquaculture sector, Italian strategic Plan highlighted the need to identify new areas for the marine aquaculture farms, and also the need to create a mapping with all the plants that already exist in Natura 2000 areas. In the NSP there are indications to push the marine aquaculture, which range from improving governance (the adoption of a general law devoted exclusively for aquaculture), to species diversification and technical innovation. Some indicators have been indicated in the NSP for aquaculture, i.e., organic production in the 2013 was around 250 tons, until 2025 will be auspicated other +500 tons. For marine fish production it will be estimated an increase to 576 000 tons in the 2030 and more than 1 000 new employees. The per capita consumption of aquaculture product will increase, in the 2013 it was around 4.2 kg per capita, in the 2025 around 6 kg/per capita. As regards allocated zone in the aquaculture, the ambition will be to obtain 20 there was any AZA.

Related to shellfish sector, to maintain the environmental quality of areas intended for the production and collection of shellfish and also to guarantee the conditions of competitiveness of enterprises of molluscs. In particular: the identification of new areas for the development of shellfish farming; through the development of AZA, the creation of a national network of microbiological monitoring

The indicators have quantified objectives: increase of 31.2% of the volumes of shellfish (from 88 000 tons in 2013 to over 122 000 tons in 2025). Increase of 26.3% of the value (from €172 million in 2013 to €237 million in 2025).

The ambition is related also to improve new species: the increase of the shellfish species, going from 4 to 7 species farmed species in 2025. Currently there are only three (3) species of shells that exceed 1 000 tons per year, in 2025 the goal is to reach 4 species.

4.15.7 Data Coverage and Data Quality

Data quality

The methodology of the system "Probability Sample Survey", was used to draw the sample from the universe of aquaculture companies, for technical and production segment, according to a random selection.

- The segments are 9 according to the following criteria: technology / species
- Data samples in accordance with Appendix X must be expanded;

Structural data in Volume (tones) and Value (Euro) per segment (and here It must necessarily occur with the consistency of the data collected and sent to Eurostat according to Reg.762/2008).

From analyses and verifications carried out on the data contained into the report, the consistency between Eurostat data and data DCF is not respected.

Related to estimation, the optimum sample number per stratum is defined according to Bethel's procedure (1989). Then, for each collected variable, to obtain the estimates of the totals per stratum, the Horvitz-Thompson formula is used, derived for the particular case of the simple random sampling without replacement. According to this particular estimator, the variance and the CV are calculated to evaluate the precision level.

As regards the imputation of non-responses, there is a process of localization of errors. The control procedure of the survey can be considered as interactive graphic micro-editing of the univariate type. The term interaction refers to the fact that, in the procedure of localization of errors, there are not only automatic phases but also phases which require human intervention to investigate the situation and to evaluate the effective presence of the error (therefore the human intervention regards the localization phase and not that of imputation). The control is mainly of the univariate type because the variables are controlled individually and only in rare cases are suspected relationships existing among them controlled, using suitable synthesis indexes. During the various phases wide use is made of graphic tools to visibly evaluate situations marked as errors. Finally the word micro-editing is used because the data is gathered in suitable domains of study within which the sampling units can be considered very homogenous. For each of these sets of data, suitable control functions are first calculated, and then, for each of them, certain rules of incompatibility are verified. In the case of activation of conditions of error, which is in the case where the observed value does not belong to the region of acceptance, those control functions are then observed individually for all the sampling units forming the single domain. Thus the sample unit, or units, responsible for the activation of conditions of error is localized for the entire domain of study and then the imputation of the erroneous data follow.

The MS has not provided guidance on the methodology to ensure the quality of the expanded data.

Data availability

Data for the aquaculture sector is published once a year on both an aggregated farm and enterprise level for each segment. The aquaculture statistics are published on Italian Economic Observatory, approximately 18 months after the end of the reference year.

Confidentiality

There are no confidentiality problems because the nine segments include more than 20 companies. For some segments there is a high variability, therefore it was necessary to increase the number of the sample analysed.

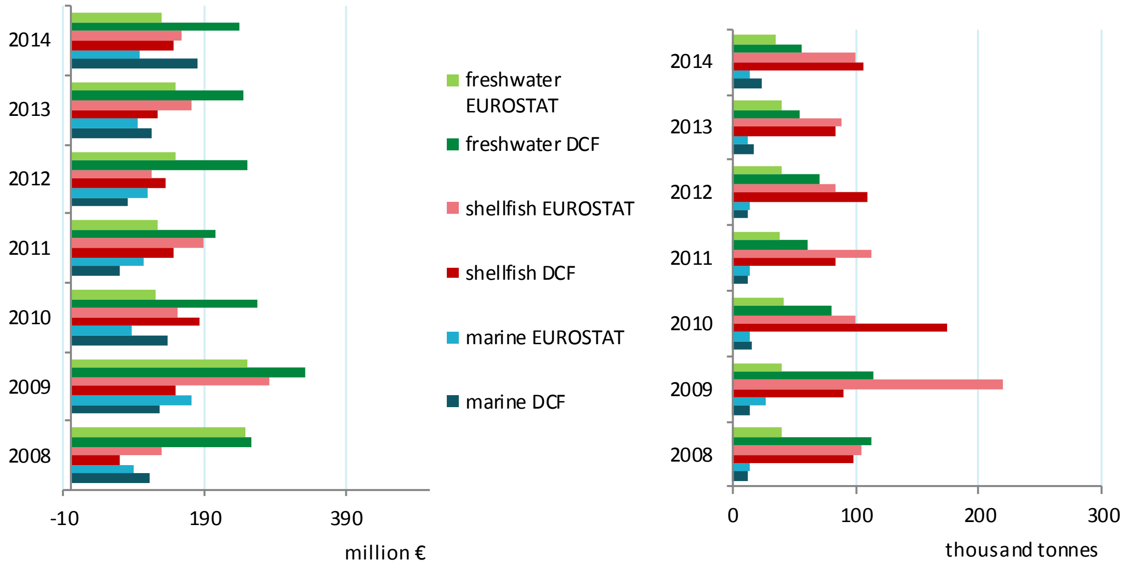


Figure 4.15.10 Comparison of DCF data with EUROSTAT data for Italy: 2008-2014

4.16 Latvia

4.16.1 Summary

Production volume and value

Latvia is a country producing only freshwater aquaculture products. The Latvian aquaculture sector produced 680 tonnes in 2014. This production was valued about €1.8 million. The freshwater data collection is not mandatory under the DCF, and country is therefore not requested to provide economic data for this report. However economic data collection for some variables has been started from 2014. The first data for costs and detailed income data will be received for 2015.

Overall industry structure and employment

Latvia is rich of the water resource and has a good location of inland waters and a stable, ecologically pure environment, which facilitates the development of aquaculture. For Latvian countryside aquaculture is important business activity and in the employment provision field. The 61 active aquaculture enterprises employed 259 persons in 2014. The aquaculture sector plays noticeable role in the Latvian regions development.

The main activities of the Latvian aquaculture enterprises are follows:

- Artificial breeding of young fish for restocking in coastal seawater and inland freshwater.
- Fish cultivation in freshwater open land ponds and land based farms in special tanks and growing up for market sale.
- Short term fish cultivation in freshwater ponds for commercial angling.
- Fish cultivation in household ponds for self-consumption or hobby angling.

The aquaculture enterprises mainly concentrated in the regions of Kurzeme and Vidzeme. A considerable number of agricultural holdings have commenced their business in aquaculture in addition to their other business activity.

Main segments

Total number of ponds registered for aquaculture and its area were 719 ponds and 5 207 ha (decreased by 3% from 2013) respectively in 2014. There were 1 238 pools with the volume of 18 019 m3 (increased by 5% from 2013) and 28 recirculation systems with the volume of 5 133 m3 (increased by 24 % from 2013) used for aquaculture production in 2014.

Current production trends and main drivers (Trends and triggers)

The development of producing aquaculture is largely hindered by the high production costs of the breeding and the problems with the sales of finished products. The main item offered at the market – trade size carps during relatively short summer can usually be grown only in the long three-summer cycle with very high production costs. Common carp was the main species produced by the Latvian aquaculture sector; representing 80% in weight and 62% in value of the total production in 2014. The production volume and value has significantly increased between 2010 and 2014 - by 17% and 34%, respectively. But Latvian aquaculture production represents a very small share in the total EU freshwater aquaculture production.

Outlook

In 2015, the number of registered aquaculture enterprises was 153; however, only 87 of them were economically active. The number of the economically active aquaculture companies increased by 26 companies between 2014 and 2015. The specific weight of the total number of persons employed in aquaculture has increased from 259 in 2014 to 376 in 2015. Total number of ponds used for aquaculture in 2015 and its area were 781 ponds and 4 947 ha; 1 282 pools with the volume of 17 289 m3 and 28 recirculation systems with the volume of 6 923 m3. The production volume and value were 863 tonnes and €3.5 million, respectively. The production volume and value have significantly increased between 2014 and 2015 - by 21% and 48%, respectively. Total sales increased by 183 tonnes.

4.16.2 Production and sales

During the period from 2004 to 2007 the aquaculture of Latvia developed in a generally positive direction: the production capacity and productivity increased, but starting from 2008 the level of production output has declined as a result of the economic crisis. The economic situation started to improve from 2010. However, the subsidies also have a sharp increase around 30% between 2010 and 2014.

The Latvian aquaculture sector produced 680 tonnes in 2014. This production was valued about €1.8 million. The average price decreased significantly by 28% between 2013 and 2014 and was €2.69. Latvia produces no marine aquaculture (see Table 4.16.1).

The main production mass in 2014 was provided by the open land ponds 82%, which are suitable under the local conditions mainly for the purpose of cyprinid fish farming, 11% of the aquaculture production was obtained from the natural flow water basin, whereas 7% - in the recirculation systems.

The increase in sales weight of more than 6% was displayed from 2013 to 2014 in freshwater aquaculture bringing the total sales up by 36 tonnes. This is 132 tonnes higher that of 2010.

The value of sales has also increased over the past year and has shown a sharper growth of 34% and bringing the total sales up by €630 thousand.

Table 4.16.1 Production and sales for Latvia: 2008-2014.

Variable	2010	2011	2012	2013	2014	Change 13-14	Develop. 2014/(10-13)
Production weight (thousand tonnes)	***0.548***	***0.548***	***0.575***	***0.644***	***0.680***	***6%***	***17%***
Marine	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*
Shellfish	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*
Freshwater	0.5	0.5	0.6	0.6	0.7	*6%*	*17%*
Production value (million €)	***1.20***	***1.25***	***1.40***	***1.62***	***1.83***	***13%***	***34%***
Marine	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*
Shellfish	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*
Freshwater	1.19	1.25	1.40	1.62	1.83	*13%*	*34%*

Source: EUROSTAT

4.16.3 Industry structure and employment

Due to the aquaculture sector in Latvia has a small number of enterprises (61 active enterprises in 2014) can be observed important changes in total value and volume.

During the previous decade between 2010 and 2014 the aquaculture production of Latvia reached its peak in 2014 – 680 tonnes in total or around €1.5 million in average per year in monetary terms (2010 - 2014). It is significant that the most radical increase in 2014 was in the commercially most valuable items: carps, trout and sturgeon breeding and sales - an average quantity by 83%, 33%, and 20%, respectively compared to 2010. Half of the aquaculture production for carps is imported from Lithuania as well as trout and sturgeon have a significant share at imported volume.

The number of the economically active aquaculture companies increased by 21 companies during the time period from 2010 to 2014. Production amount of aquaculture products are not restricted with quota or other restrictions, thus, in comparison to fishing, the initiation of business in this sector is simpler. In 2014, the number of registered aquaculture enterprises was around than 150; however, only 61 of them were economically active and farmed market size fish for sale or produced young fish for restocking and on growing. About 90% of enterprises classified as small enterprises where the number of employment is less than 10 people. As the number of the aquaculture companies increased, the number of the employees of the aquaculture companies increased as well – by 13% during the period 2010-2014. The specific weight of the total number of persons employed in aquaculture has increased from 231 in 2010 to 259 in 2014. The aquaculture mostly employs men and women aged 20-55. However, work productivity in aquaculture is comparatively low. The average salary was around €500 per month what is 34% less than average salary in the country in 2014. At the enterprises in the main cases the Latvian inhabitants are employed. The political and economic instability resulted in having relatively little impact on changes of employment level in the aquaculture sector compared to other sectors.

4.16.4 Main species produced

Common carp was the main species produced by the Latvian aquaculture sector; representing 80% in weight and 62% in value of total production in 2014 (see Figure 4.16.1). Other important fish species are sturgeons with 23% of the total value and 8% of the total weight, trout with 11% and 6% of the total value and weight respectively (EUROSTAT 2014).

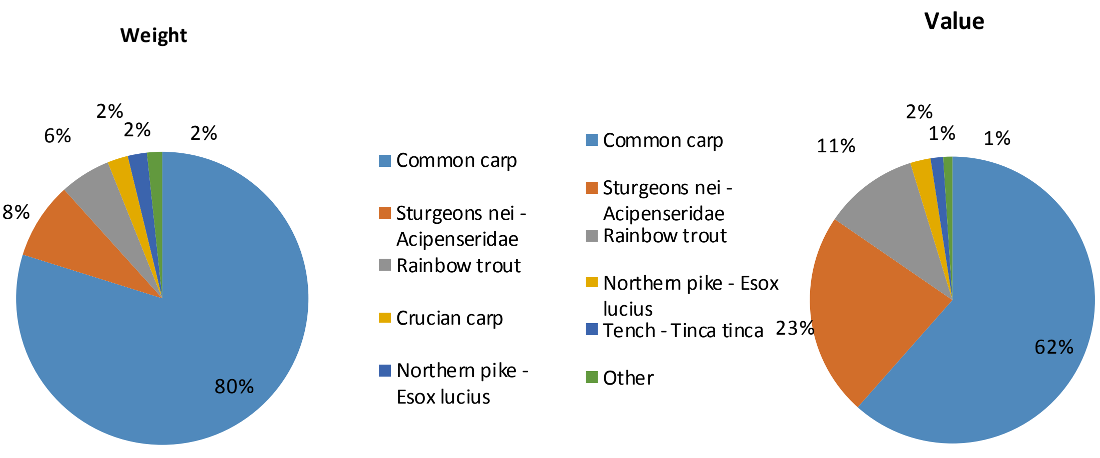


Figure 4.16.1 Main species in terms of weight and value in Latvian production: 2014.

Source: EUROSTAT

The average first-sale price for aquaculture products in Latvia was €3.4 per Kg during the 2010-2014 period, and for common carp was €2.0 per Kg (see Figure 4.16.2). The high share of the common carp (representing 62% of the first-sale revenues) in the Latvian aquaculture leads average aquaculture prices down, compared to the other species that are more expensive. The average price for trout and sturgeons was €5.0 per Kg and €6.3 per Kg respectively between 2010 and 2014.

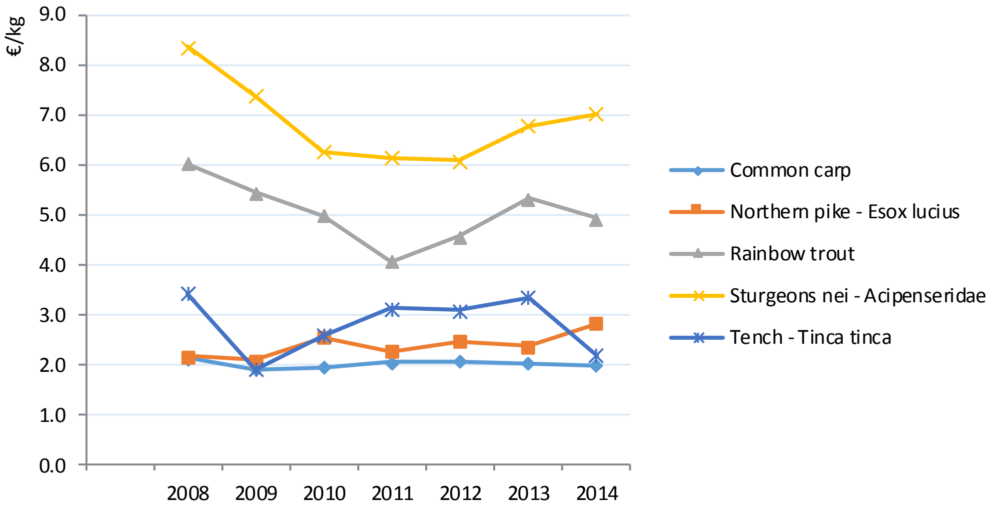


Figure 4.16.2 Average prices for the main species produced in Latvia: 2010-2014.

4.16.5 Trends and triggers

Current production trends and main drivers

The investments in the modernisation of aquaculture companies and introduction of new technological solutions increased significantly. The number of the recirculation systems increased by 18 between 2010 and 2014. The investments increased significantly and were around €3.0 million in average between 2010 and 2014. The total number of aquaculture companies focused to the market, raise the quality and safety of the produced production, as well as facilitate the extension of assortment of the produced production. Investments in the protection measures compensated losses caused by the wild predators, thus the production produced by the company will remain competitive in the market.

The Institute of Food Safety, Animal Health and Environment "BIOR" is responsible for the implementation of the National Fish resources restocking program. In BIOR there are 5 State-owned Fish Hatcheries – Tome, Dole, Karli, Brasla, Pelci designated for breeding of salmon and sea trout smolts, pike, pike- perch, river lamprey larvae and juveniles. The program is established in order to ensure the fish fry compensatory releases to lower the damage to fish resources caused by Hydropower Stations as well as to restore damages and losses facilitated by different human activities in public water bodies. Every year they restock up to 20 million fish larvae, juveniles and smolts in public waters, however, it is not sufficient; therefore, the private hatcheries should be involved as well. In 2014 State hatcheries released about 12 million fish larvae, juveniles and smolts.

One of the opportunities for private hatcheries is the specialization in fish resources restocking for public water bodies. Year by year the input of private hatcheries in restocking program is growing and varies from 10% to 25%.

The 43% of Latvian aquaculture enterprises are situated at Natura 2000 areas. These enterprises produce aquaculture production with applying environmental safety methods where recirculation systems are used. The enterprises received special licence from the State Environmental Service, which obligate to follow the environmental safety standards and should comply with Directive 2006/118/EU on the protection of groundwater against pollution and deterioration.

Market structure

At the moment in Latvia further industrial processing of fish caught in aquaculture slowly developing. The insignificant amount of realised aquaculture production provides evidence that only a part from the companies produces goods for market. The biggest part of the production is sold fresh to the customers. There is no aquaculture production trade system, which would comprise and efficiently organize the realisation of products from small private producers. More than half of the companies registered as aquaculture enterprise does not produced an aquaculture production for market. Thus it is difficult to provide constant and fixed amount and quality of the production supply.

Outlook for future production and trends 2015 - 2016

The Aquaculture, in comparison to other fisheries sectors, has good development opportunities.

Due to decrease of fish resources in the sea, aquaculture shall be developed as an alternative source of fish resource. Latvia has good location of inland waters (lakes, rivers) and a stable, ecologically pure environment. Amount of aquaculture production is not restricted by quota or other restrictions, thus, in comparison to fishery this sector offers more convenient initiation of business. But in comparison to neighbouring countries, Latvia does not have so good climatic conditions for production of aquaculture products in the open land ponds (too warm conditions for the fish of cold waters and too cold - for the fish of warm waters). In future it may negatively affect the compatibility of the industry in terms of production costs in international level.

In order to improve the aquaculture development and for the organization of the studies the Aquaculture, Research and Education Centre have been opened in 2015. The aim of the studies is to share the experience in aquaculture as well as to promote the aquaculture enterprises modernisation.

There are two main directions for fish farming in Latvia which will be developed:

- fish farming for consumption;
- fish breeding for fish restocking and reproduction in natural streams and lakes (fish recourses reproduction).

In addition to the National Fish resources restocking program and the Latvian Fisheries Fund also supports fish and crayfish restocking in public waters. In Gauja, Venta, Daugava rivers and in the small rivers it was restocked about 17 million of fish larvae, juveniles and smolts in 2015. For the fish cultivation in Latvian freshwater open land ponds annually are restocked about 12-26 million of fish larvae, juveniles and smolts.

In 2015, the number of registered aquaculture enterprises was 153; only 87 of them were economically active. The number of the economically active aquaculture companies increased by 26 companies between 2014 and 2015. The specific weight of the total number of persons employed in aquaculture has increased from 259 in 2014 to 376 in 2015. Total number of ponds used for aquaculture in 2015 and its area were 781 ponds and 4 947 ha; 1 282 pools with the volume of 17 289 m3 and 28 recirculation systems with the volume of 6 923 m3. The production volume and value were 863 tonnes and €3.5 million, respectively. The production volume and value have significantly increased between 2014 and 2015 - by 21% and 48%, respectively. The total sales went up by 183 tonnes.

4.16.6 Data Coverage and Data Quality

Latvia only produces freshwater aquaculture and since freshwater aquaculture is not compulsory under the DCF, it did not submit aquaculture data under the DCF regulation. Therefore, EUROSTAT data was used in this analysis.

The Central Statistical Bureau of Latvia (CSB) carries out general reporting on aquaculture sector by collection some basic data as production by species in tonnes and value, total area of fish ponds, volume of rearing tanks and number of employment. The questionnaire form "1-Aquaculture" was revised in 2014 and detailed information about income and costs, as well as investments and annual depreciation were included in the form. The first data will be possible to receive for 2015. The CSB gathers also structural business statistic data extracting the information from official account reports received from enterprises (according to the EUROSTAT definition under NACE Code 05.02: "Fish Farming"). According to the small number of aquaculture enterprises and to protect the collected data confidentiality these data are clustered for two segments by number of person employed more than 10 and less than 10 people. The quantity and value for production annually is provided to the EUROSTAT in accordance with Regulation (EC) No 762/2008 of the European Parliament and of the Council of 9 July 2008 on the submission by Member States of statistics on aquaculture and repealing Council Regulation (EC) No 788/96.

4.17 Lithuania

4.17.1 Summary

Production volume and value

Lithuanian aquaculture sector in 2014 produced 3.84 thousand tonnes (FAO, 2014) of total freshwater fish production from which 3.4 thousand tonnes were destined for consumption (Eurostat, 2014) corresponding to €8.96 million and €7.4 million, respectively. Compared to 2013, total volume and value of total production decreased by 8.7% and 5.8% respectively, whereas compared to 2008 it improved by 27.8% and 34.9%, respectively (FAO data).

Overall industry structure and employment

Lithuanian aquaculture sector population in 2014 consisted from 44 enterprises and aquaculture farms. Pond aquaculture units cover the highest share of total production, as 18 enterprises produced around 97% of total national production volume and covered 80% of total employment. In 2014 pond aquaculture units employed 391 persons. All of them are integrated into national producer organisation (PO). Another important part of industry includes newly developed aquaculture units using RAS (recirculating aquaculture systems). RAS aquaculture units have a tendency of constantly increasing capacity and production volume. In 2014 RAS aquaculture units employed 94 persons. Aquaculture enterprises, producing African catfish in RAS are integrated into other producer organisation of Alternative aquaculture. In 2014, national aquaculture sector employed 485 people from whom 366 were males and 119 females. Total number of employees increased by 12.5% compared to 2013.

Main segments

Common carp combined is the main segment in the Lithuanian aquaculture sector in terms of volume and value of production, representing the 86% in weight and 76% in value of total production in 2014. Carps are mostly produced in polyculture with other cyprinids and other freshwater species. In 2014, 3.3 thousand tonnes of carps were sold from which 2.9 thousand tonnes was destined for consumption. Compared to 2013, total carp production decreased by 11.9%

Trout on growing could be defined as second most important segment, contributing to 2.8% of total volume and 4.9% of total value. The majority of production is provided from RAS aquaculture units, and smaller part from tanks and raceways. In 2014 aquaculture units produced 109.5 tonnes of trout production and compared to 2013 decreased by 4.9%.

Other freshwater species combined represents the rest part of production from aquaculture sector. This segment includes important sub-segment of African catfish, produced in RAS and mainly for the processing industry, as well as other higher value species as sturgeons, pike-perch and European catfish, produced in ponds and tanks or raceways. In 2014, 34% of total population were growing African catfish with volume of 45.7 tonnes. African catfish is produced mainly by small enterprises with an average of 4 employees per unit.

Current production trends and main drivers (Trends and triggers)

From 2008 to 2014 total aquaculture production increased by 27.8%. The main drivers affecting aquaculture growth were increasing trends of fish consumption at national level, while export volumes did not show an increasing tendency. Increased investments had the significant impact on sector, by rising aquaculture production capacity through construction of new RAS farms, modernisation of existing pond infrastructure, as well as contributed to competitiveness, especially in period of economic crisis.

Outlook

Total sales for aquaculture production (for consumption and juveniles) in 2015 is foreseen to increase by 15.7%, whereas value of production by 18.6%. In 2015 carp production is estimated to increase by 11%, with 6% increase in exports and 5% in local market. Increase in the local market is related to higher demand for processing aquaculture production, as new processing units were developed. Trout production in 2015 is foreseen to increase by 150%, with a decline of price at 10%. For 2015, sturgeon production is estimated to improve by 24%. The price of sturgeon is declining with an increase on production volume. Production of African catfish in 2015 will increase approximately by 190% due to the better exploitation of current RAS capacity rather than from newly developed systems.

Production and sales

In 2014, Lithuanian aquaculture sector produced 3.84 thousand tonnes (FAO, 2014) of freshwater fish from which 3.4 thousand tonnes (Eurostat, 2014) were destined for consumption corresponding to €8.96 million and €7.4 million, respectively. Total production volume and value has a tendency to increase from 2008, however with the high fluctuation depending on year. Compared to 2013, volume and value of total production declined by 8.7% and 5.8% respectively, whereas in comparison to 2008 it increased by 27.8% and 34.9% respectively (FAO data).

The major part of production was generated from pond aquaculture represented by such species as common carp, bighead carp, white amur, and other freshwater species produced in pond polyculture. Total production of common carp in 2014 was 3.3 thousand tonnes and to 2013 it decreased by 11.6%, whereas 17.1% of growth was observed compared to 2008. Production value of common carp declined by 10.5% compared to 2013, but increased by 16% compared to 2008. According to preliminary data, production of common carp will increase approximately by 11% in 2015.

Table 4.17.1 Production and sales for Lithuania: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 13-14	Develop. 2014/(08-13)
Production weight (thousand tonnes)	***3.0***	***3.4***	***3.1***	***2.9***	***3.3***	***3.9***	***3.4***	***-14%***	***3%***
Marine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*
Shellfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*
Freshwater	3.0	3.4	3.1	2.9	3.3	3.9	3.4	*-14%*	*3%*
Production value (million €)	***6.6***	***6.7***	***5.8***	***6.4***	***6.9***	***8.5***	***7.4***	***-13%***	***9%***
Marine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*
Shellfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*
Freshwater	6.6	6.7	5.8	6.4	6.9	8.5	7.4	*-13%*	*9%*
Hatcheries & nurseries (million units)	***2,321***	***2,197***	***1,483***	***1,327***	***1,373***	***238***	***253***	***6%***	***-83%***
Eggs	0	0	0	144	0	0	0	*0%*	*-100%*
Juveniles	2,321	2,197	1,483	1,183	1,373	238	253	*6%*	*-83%*

Source: EUROSTAT

Rainbow trout is considered to be as second most important stock for aquaculture producers with annual production of 109.4 thousand tonnes in 2014 corresponding to €440.1 thousands. Compared to 2013, rainbow trout production slightly decreased by 5.4%, but compared to 2008 it increased by 36.9%. Although in 2008 the rainbow trout production was obtained from pond and tanks or raceways aquaculture, in 2014 the major part came from RAS. Further development of rainbow trout in RAS is foreseen for 2015 and onwards. According to preliminary data, production of rainbow trout will be increased by 150% in 2015, mostly from newly developed RAS systems.

In contrast to rainbow trout RAS systems owned by larger companies, smaller RAS units focus on African catfish production. Number of African catfish producers has increased from 3 units in 2012 to 15 in 2014. Total production in 2014 was 45.7 tonnes corresponding to €157 thousand and compared to 2013 volume increased by 30.5%. According to preliminary data, production of African catfish will increase approximately by 190% in 2015 due to the better exploitation of current RAS capacity rather than from newly developed systems.

Main species produced

The common carp was the main species produced by the Lithuanian aquaculture sector, representing the 86% of total volume and 76% of total value. This percentage constantly decrease during last years, for example in 2012, carp production covered 91% of total volume and 86% of total value. Carps are mostly produced in polyculture with other cyprinids and variety of freshwater species as Northern pike or European catfish. The average first-sale price for common carp sold for consumption was €1.97/Kg whereas including juveniles it was €2.1/Kg. During long term period, carp prices remained relatively stable during long term period and compared to 2013, average price increased by 1.5%, whereas compared to 2008 it declined by 1%.

Around 67% of total carp production was sold in the internal market, mainly for direct consumption. Average price for carp in 2014 for local market was actually the same as export price. The main export market for carp in 2014 was Poland and Latvia with corresponding quantities 696 tonnes and 361 tonnes respectively.

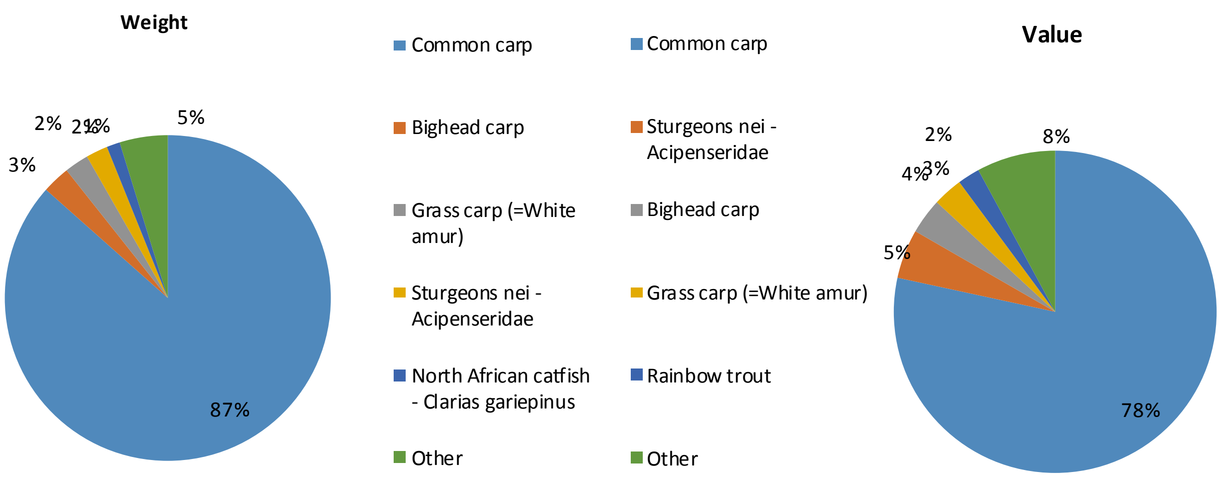


Figure 4.17.1 Main species in terms of weight and value in Lithuanian production: 2014.

Source: EUROSTAT

In 2015 carp production is estimated to increase by 11%, with 6% increase in exports and 5% in local market. Increase in the local market is related to higher demand for processing aquaculture production, as new processing units were developed.

Trout was second most important species, contributing to 2.8% of total volume and 4.9% of total value. The majority of production is provided from RAS aquaculture units, with smaller part from tanks and raceways as well as ponds. In 2014 aquaculture units produced 109.5 tonnes and compared to 2013 it decreased by 4.9%. In 2014 rainbow trout prices were €4.0/Kg and compared to 2013 increased by 25.6%. The significant increase in prices was partly associated with supply of pan size trout from RAS which had a higher price in market. Around 95% of production was sold in the internal market. The main export market for rainbow trout in 2014 was Estonia. Trout production in 2015 is foreseen to increase by 150%, with a decline of price at 10%.

Production of African catfish in 2014 was 45.7 tonnes and increased by 30.5% compared to 2013. Average prices for African catfish in 2014 was €3.43/Kg for fresh production and compared to 2013 it decreased by 2.64%. For 2015 significant growth of African catfish production is foreseen, approximately 190%, mainly due to the better exploitation of current RAS capacity rather than from newly developed systems. Increasing trend of sturgeon production was observed from 2008 with slight fluctuations depending on year. In 2014, aquaculture farms produced 72.8 tonnes of sturgeons, compared to 2013 production declined by 37%, but compared to 2008 it increased 4 times. For 2015, sturgeon production is estimated to improve by 24%. The price of sturgeon is declining, related to an increase on production volume. In 2014, the average price was €5.11/Kg, about 11% lower than in 2013. Further decrease by 2% is estimated for 2015.

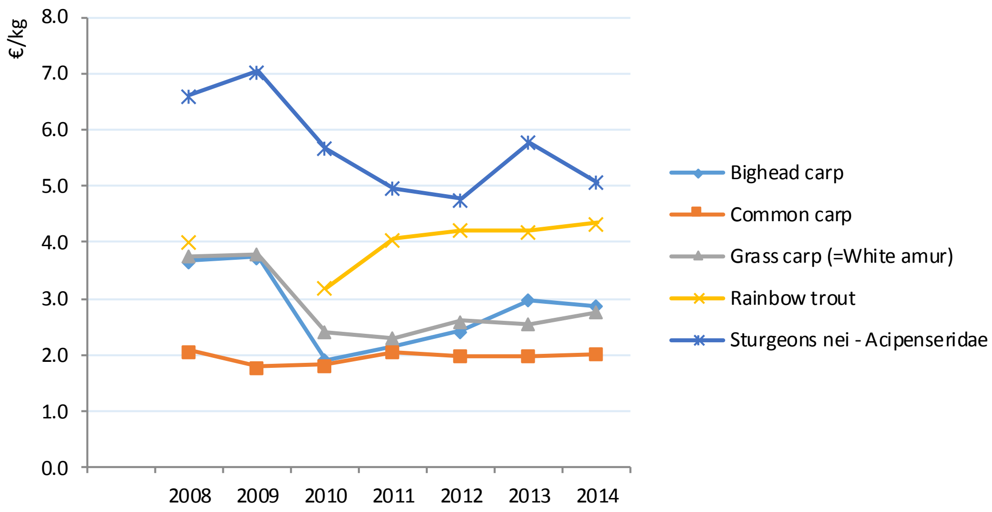


Figure 4.17.2 Average prices for the main species produced in Lithuania: 2008-2014.

Source: EUROSTAT

Overall industry structure and employment

Lithuanian aquaculture sector population in 2014 consisted from 44 enterprises and aquaculture farms. From the total population, 18 pond aquaculture producers sold around 97% of total national production. All of them are integrated into national producer organisation (PO). Members of this PO produce mainly carps and other polyculture freshwater species, as well as rainbow trout and sturgeons in tanks and raceways. In general, carp production in Lithuania could be considered as extensive, one third of total production is certified as organically produced. Aquaculture enterprises, producing African catfish in RAS are integrated into producer organisation of alternative aquaculture.

In 2014 Lithuanian aquaculture sector structure consisted from 9.0 thousand of ha from which 3.2 thousand ha were for regular production and 5.8 thousand ha were certified for organic production. Capacity of RAS in 2014 it increased to 2.9 thousand m3 from 1.2 thousand m3 in 2013. According to preliminary results, RAS capacity in 2015 will increase to 6.2 thousand m3 and 8.4 thousand m3 in 2016.

In 2014, aquaculture sector employed 485 people from whom 366 were males and 119 females. Total number of employees increased by 12.5% compared to 2013. In general, employment in aquaculture sector constantly increasing from 2010 and is expected that in 2015 it will remain at stable level or will have a slight decrease due to transfer of labour from aquaculture to diversified fish processing activities. It is expected that aquaculture units which partly diversified its activities to processing of aquaculture production firstly will try to rearrange already employed labour within enterprise activities.

Trends and triggers

Current production trends and main drivers

Long term Lithuanian aquaculture production trends give positive outlook for future developments and expectations. From 2008 to 2014 total aquaculture production increased by 27.8% (FAO). The triggers affecting aquaculture growth is increasing trends of fish consumption at national level, while export volumes do not have an increasing tendency.

Increasing investments during EFF period and projected investments from EMFF is considered as one of the main drivers where higher demand for processing purpose after diversification of activities is increasing volume and value of production during recent years. Increase investments boosted aquaculture production capacity through construction of new RAS farms, modernisation of existing pond infrastructure, as well as contributed to competitiveness, especially in period of economic crisis. Rapidly increasing RAS aquaculture sub-sector will contribute to the growth and production volume and especially value, as RAS units target mostly higher value species. RAS capacity according to preliminary data will reach 8.4 thousand m3, compared to the 2.9 thousand m3 in 2014. Modernization of pond infrastructure increased efficiency of pond, basin and channels, reduced costs of production. For instance, increased volume and value of carps, rainbow trout, sturgeons and other local species during 2009-2013 was obtained from the almost same pond area.

Market structure

Around 70% of Lithuanian aquaculture production is sold in internal market. The rest part is exported, mainly to Poland – 62.2% of export sales and 31% to Latvia. No production was exported to Russia, so trade ban did not directly influenced aquaculture market. The majority part of production is sold as fresh, mainly in supermarkets and directly from farms. From 2015 and onwards, increased demand for processing is foreseen. According to primary data, in 2015 about 12% of production for supply in local market is used for processing industry. The total aquaculture production in terms of destination, is divided to market for consumption and further growing purposes, when ex-farm production is sold at the size of juveniles. Around 13% of total production was sold as juveniles for further growing in 2014.

Outlook

With regard to further development of aquaculture sector, Lithuanian aquaculture strategy for the 2014-2020 period focused on enhancement of the competitiveness and viability of aquaculture enterprises, in particular SMEs, improvement of safety and working conditions as well as the protection and restoration of aquatic biodiversity and ecosystems related to aquaculture. In addition the improvement and supply of scientific knowledge as well as the improvement of the collection and management of data were taken into account. Following the Second Union priority (II UP) "Fostering environmentally sustainable, resource-efficient, innovative, competitive and knowledge-based aquaculture" the indicator concerning projects, supporting economically beneficial investments into aquaculture sector was selected as most important and around 51% of all budget from II UP was dedicated to it. With economically beneficial investments in aquaculture farms will be contributed to the economic growth and job creation. Support will be provided to the setting up of new perspective aquaculture enterprises (in particular of small and medium-sized enterprises and modernisation of existing enterprises. Seeking stronger competitiveness and economic results of the aquaculture business, the innovation and entrepreneurship will be promoted. Another prospective method for increasing income of aquaculture enterprises is to add value to own products by carrying out the primary processing and direct marketing, as well as introducing new types of products with good market perspectives as well as diversifying production. In the strategic plan, sales of aquaculture products in 2017 is foreseen 10% higher compared to 2013, corresponding to 4.6 thousand tonnes, for the year 2022, around 52% higher, corresponding to 6.4 thousand tonnes. Considering the fact that in 2007-2013 the increase of 90% was expected, current targets are likely achievable. Production value for years 2017 and 2022 is foreseen to increase by 19% and 98% respectively. Employment in terms of persons employed is estimated to be improved by 4% in 2017 and 22% in 2022.

4.17.2 Data Coverage and Data Quality

Lithuania only produces freshwater aquaculture and since freshwater aquaculture is not compulsory under the DCF, it did not submit aquaculture data under the DCF regulation. Therefore FAO and EUROSTAT data was used in this analysis. Aquaculture production (sales) from Eurostat data covers only that part which is destined to consumption, whereas FAO data covers total production (sales) including juveniles which represents an important part of Lithuanian aquaculture sector. In the report total production was mostly covered by FAO data with better coverage of production data and when values regarding production for consumption were analysed, Eurostat data was used. Data for 2015 is taken from published information by State enterprise Agricultural Information and Rural Business Center (data is included to Official Statistics Programme of Lithuania).

4.18 Malta

4.18.1 Summary

Production volume and value

The Maltese aquaculture industry is exclusively based on marine fish. In 2014, 8 600 ton of marine fish were produced by the Maltese aquaculture sector. A decrease of 5% was observed from the previous year. This was also reflected in the value, where sales value from aquaculture practices in Malta amounted to over €97 million in 2014 corresponding to a decrease of 8% from the previous year.

Overall industry structure and employment

Six aquaculture enterprises operated in 2014. Only one enterprise had less than 5 employees, where each of the remaining enterprises employed more than 10 persons. This structure was relative stable over the past seven years. The number of employees decreased from the previous year (2013) by 13%, whereas fulltime equivalents decreased by 14%. Male employees were accounting for 96% of total employment. The average wage returned to similar values as in earlier year and recuperated from the declining values obtained in the two previous years.

Main segments

The aquaculture industry in Malta is marine-based. The greatest portion of production and value is mainly attributed to the capture based aquaculture for Atlantic bluefin tuna. Following this, other important segments include the culture of European seabass and Gilthead seabream.

On a regional scale, Malta attributes for a very low proportion in hatcheries and nurseries, and low volumes of seabass and seabream and other species except for bluefin tuna. Bluefin tuna fattening attributes for a significant share in the Mediterranean.

4.18.2 Production and sales

The Maltese aquaculture industry is exclusively based on marine fish. In 2014, 8 600 ton of marine fish were produced by the Maltese aquaculture sector. A decrease of 5% was observed from the previous year. This was also reflected in the value, where sales value from aquaculture practices in Malta amounted to over €97 million in 2014 corresponding to a decrease of 8% from the previous year.

Table 4.18.1 Production and sales for Malta: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Sales weight (thousand tonnes)	***6.7***	***6.3***	***5.4***	***3.8***	***7.0***	***9.1***	***8.6***	*-5%*	*35%*
Marine	6.7	6.3	5.4	3.8	7.0	9.1	8.6	*-5%*	*35%*
Shellfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Freshwater	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Hatcheries & nurseries	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Sales value (million €)	***93.6***	***47.9***	***54.3***	***50.5***	***83.2***	***105.9***	***97.3***	*-8%*	*34%*
Marine	93.6	47.9	54.3	50.5	83.2	105.9	97.3	*-8%*	*34%*
Shellfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Freshwater	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Hatcheries & nurseries	0.0	0.0	0.0	0.0	0.0	0.0	0.0		

Source: EU Member States DCF data submission

4.18.3 Industry structure and employment

Six aquaculture enterprises operated in 2014. Only one enterprise had less than 5 employees, where each of the remaining enterprises employed more than 10 persons. This structure was relative stable over the past seven years. The number of employees decreased from the previous year (2013) by 13%, whereas fulltime equivalents decreased by 14%. Male employees were accounting for 96% of total employment. The average wage returned to similar values as in earlier year and recuperated from the declining values obtained in the two previous years.

Table 4.18.2 Structure of the Maltese aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Structure (number)									
Total enterprises	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*0%*	*0%*
<=5 employees	0	0	0	0	0	0	1		
6-10 employees	1	1	0	0	0	1	0	*-100%*	*-100%*
>10 employees	5	5	6	6	6	5	5	*0%*	*-9%*
Employment (number)									
Total employees	221	173	227	189	167	205	179	*-13%*	*-9%*
Male employees	210	167	205	177	155	188	171	*-9%*	*-7%*
Female employees	11	6	22	12	12	17	8	*-53%*	*-40%*
FTE	169	145	161	165	153	178	153	*-14%*	*-6%*
Male FTE	160	141	152	158	148	167	148	*-11%*	*-4%*
Female FTE	9	4	9	7	4	11	5	*-55%*	*-32%*
Indicators									
FTE per enterprise	28.2	24.2	26.8	27.5	25.4	29.6	25.4	*-14%*	*-6%*
Average wage (thousand €)	24.0	25.2	20.4	18.1	23.1	19.2	23.1	*21%*	*7%*
Labour productivity (thousand €)	117.4	-137.6	95.5	84.0	-9.5	89.7	89.1	*-1%*	*123%*

Source: EU Member States DCF data submission

The total number of persons employed in the Maltese aquaculture sector was 179, corresponding to 153 FTEs. The graph below shows an overall stable trend, with slight fluctuations in the number of employees, for both males and females. In general, the average wage shows only smaller fluctuations, which in most cases mirror the number of employees, i.e. for the years in which the number of employees increase, the average wage decrease, while when the number of employees decreased, the average wage increase.

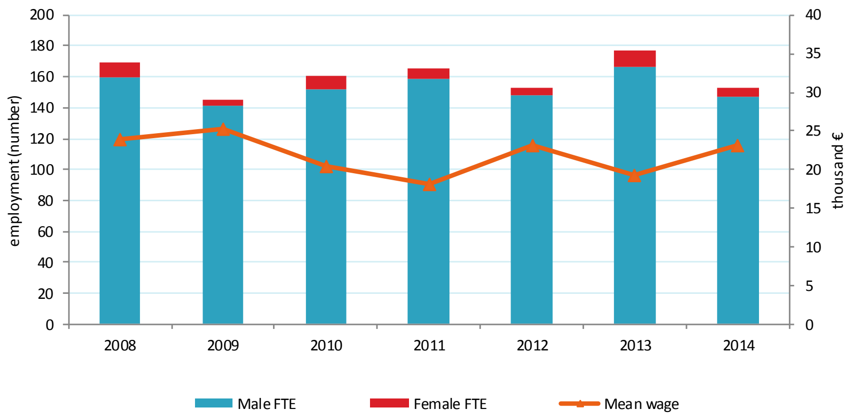


Figure 4.18.1 Employment trends for Malta: 2008-2014.

Source: EU Member States DCF data submission

The total income is exclusively from the turnover from the sale of fish from the farms. The greatest proportion of costs was due to the raw material required; feed (27%) and livestock (45%). Other operational costs, wages and salaries, energy costs and repair and maintenance followed in decreasing order. The fluctuations in the labor productivity are mainly caused by the fluctuation in the GVA, which was negative in 2009 and 2012. In the years 2010, 2011 and 2013 and 2014, the labor productivity is rather constant.

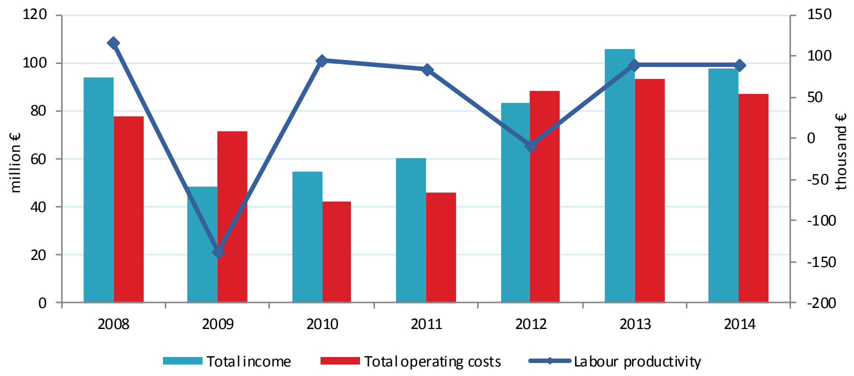


Figure 4.18.2 Income, costs, wages and labour productivity trends for Malta: 2008-2014.

Source: EU Member States DCF data submission

4.18.4 Economic performance

In 2014, total income decreased by 8% when compared to 2013 whereas total operating costs decreased by 7%. Significant variations in expenditure, capital costs and capital value were observed when compared to previous years. These variations from year to year is probably caused by the fact that the population is very small (only 6 enterprises in total) and thus any larger change in any of the enterprises would result in a significant variation in data.

Table 4.18.3 Economic performance of the Structure of the Maltese aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	% of total income	Change 2014-13	Development 2014/(2008-13)
Income (million €)										
Turnover	93.6	47.9	54.3	50.5	83.2	105.9	97.3	100%	-8%	34%
Other income	0.0	0.2	0.2	6.4	0.0	0.0	0.0	0%	0%	-100%
Subsidies	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0%	0%	-100%
Total income	*93.7*	*48.2*	*54.5*	*56.9*	*83.2*	*105.9*	*97.3*	100%	-8%	32%
Expenditures (million €)										
Wages and salaries	4.1	3.7	3.3	3.0	3.4	3.4	3.5	4%	4%	2%
Imputed value of unpaid labour	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0%	0%	-100%
Energy costs	2.8	1.5	0.9	1.3	3.2	1.4	1.9	2%	29%	0%
Repair and maintenance	4.5	4.1	0.9	3.1	2.5	1.7	1.9	2%	10%	-34%
Raw material: Feed costs	17.5	22.4	13.0	17.3	27.4	28.5	23.5	24%	-17%	12%
Raw material: Livestock costs	30.9	24.4	13.1	11.1	40.7	44.3	39.3	40%	-11%	43%
Other operational costs	18.0	15.7	11.2	10.3	10.9	14.0	17.2	18%	23%	29%
Total operating costs	*77.8*	*71.7*	*42.4*	*46.0*	*88.1*	*93.4*	*87.3*	90%	-7%	25%
Capital Costs (million €)										
Depreciation of capital	8.8	11.1	6.3	1.9	1.5	1.5	1.4	1%	-4%	-72%
Financial costs, net	1.1	7.2	1.1	0.5	-1.4	0.3	0.0	0%	-100%	-100%
Extraordinary costs, net	3.3	5.3	0.2	0.3	0.0	0.0	0.0	0%	0%	-100%
Capital Value (million €)										
Total value of assets	18.7	17.5	13.7	10.7	9.5	29.9	29.0	30%	-3%	74%
Net Investments	4.1	0.9	1.5	0.4	1.1	3.7	1.0	1%	-74%	-50%
Debt	5.3	37.3	29.3	35.7	33.3	44.4	76.1	78%	71%	147%
Input & Production (thousand tonnes)										
Raw material: Feed	24.8	36.6	18.0	11.1	7.9	36.2	28.7		-21%	28%
Raw material: Livestock	3.0	4.6	1.4	0.8	2.7	3.8	3.7		-3%	36%
Performance Indicators(million €)										
Gross Value Added	19.8	-20.0	15.4	13.9	-1.4	15.9	13.6	14%	-15%	87%
Operating cash flow	15.9	-23.5	12.1	10.9	-5.0	12.5	10.1	10%	-20%	164%
Earning before interest and tax	7.1	-34.6	5.7	9.0	-6.4	11.0	8.6	9%	-22%	732%
Net profit	5.9	-41.8	4.6	8.5	-5.0	10.7	8.6	9%	-19%	405%
Capital productivity (%)	105.9	-113.9	112.0	129.0	-15.2	53.3	46.8		-12%	4%
Return on Investment (%)	37.8	-197.4	41.9	83.5	-67.9	37.0	29.7		-20%	374%
Future Expectation Indicator (%)	-25.0	-58.2	-35.6	-13.7	-4.4	7.4	-1.6		-121%	93%

Source: EU Member States DCF data submission

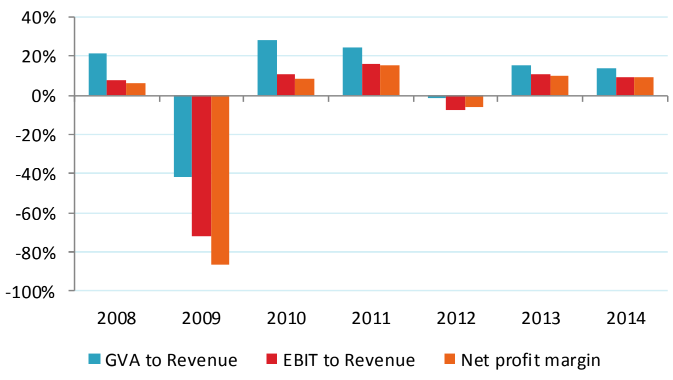


Figure 4.18.3 Economic performance for Malta: 2008-2014

Source: EU Member States DCF data submission

The contribution to the national economy, measured as GVA, was positive in 2014 as was the net profit. In general, the contribution from the aquaculture sector has been positive five out of the seven years covered by the DCF data. In contrast, the future expectation indicator has only been positive in one out of seven years (2013) and the indicator is also negative in 2014. However, the indicator is only slightly negative with a value of 1.6 in 2014.

4.18.5 Main species produced and economic performance by segment

The largest segment in the Maltese aquaculture sector is the 'other marine fish cages', which mainly consist of Atlantic Bluefin tuna aquaculture. The tuna is captured in the wild and fattened in the off-shore cages. A very minor amount of other marine fish species is also included. The second most important segment is the marine production of sea bass and seabream in cages.

On a regional scale, Malta attributes for a very low proportion in hatcheries and nurseries, and low volumes of seabass and seabream and other species except for bluefin tuna. Bluefin tuna fattening attributes for a significant share in the Mediterranean.

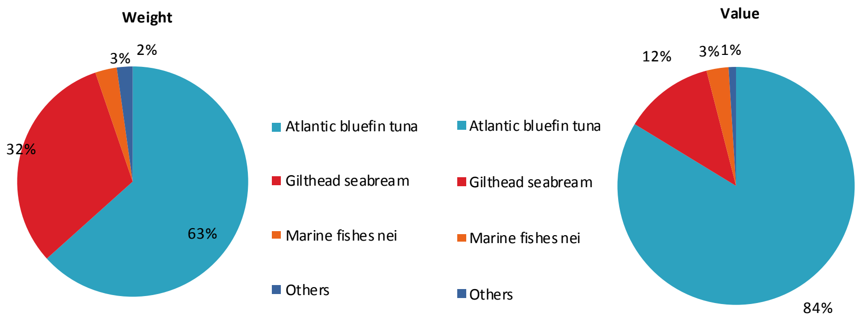


Figure 4.18.4 Main species in terms of weight and value in Structure of the Maltese production: 2014.

Source: EU Member States DCF data submission

The top aquaculture species in Malta by first-sale weight were: Atlantic bluefin tuna (63%) followed by Gilthead seabream (32%). The other species (European seabass and other marine fish) accounted for 5% in weight. In terms of value, bluefin tuna sales dominated, attributing 84% of the value when compared with other species. This is mainly due to the fact that bluefin tuna are receiving very high prices especially in the Japanese market, which is the main market for Malta of this species. The second most important species was Gilt-head seabream with 11% of the value. Other species contribute only 4% to the total value.

The lowest average price per kilogram remained that for the Gilthead seabream and remained relatively constant over the past seven years. The price for European seabass fluctuate a bit more through the years, however the price have decreased since2011 and the gap between European seabass and Gilthead seabream seems to be closing. Atlantic Bluefin tuna received the highest prices. Since 2011, the average price has decreased significantly, however in 2013 and 2014 the price has leveled out at a level of 15 euro per kilo.

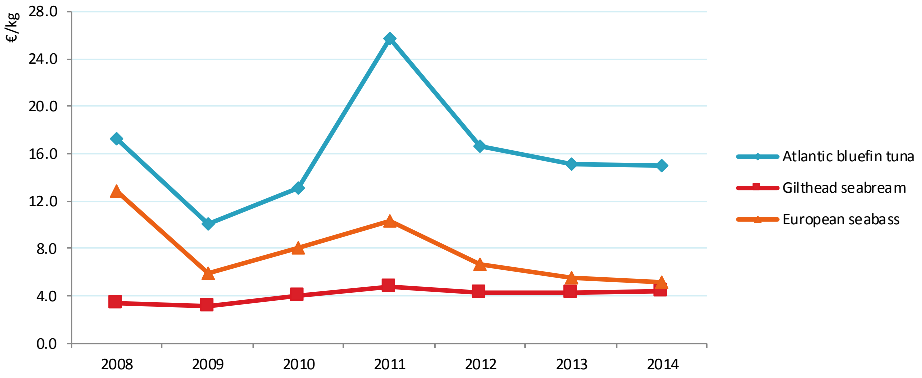


Figure 4.18.5 Average prices for the main species produced in Malta: 2008-2014.

Source: EU Member States DCF data submission

In Malta, the aquaculture sector is divided into two main segments, these being:

• Sea bass and sea bream cages

• Other marine fish cages

However, due to the limited number of enterprises (six in total) and only one enterprise in other marine fish cages aquaculture it is not possible to present data on these segments, due to confidentiality reasons.

4.18.6 Trends and triggers

The expert advice in this section about current production trends and main drivers, market structure, issues of special interest, and outlook for 2015, cannot be provided due to the absence of an expert from Maltese at the experts meeting.

4.18.7 Data Coverage and Data Quality

The expert advice in this section about data quality, data availability, confidentiality and differences in DCF data compared with other official data sources, cannot be provided due to the absence of an expert from Maltese at the experts meeting.

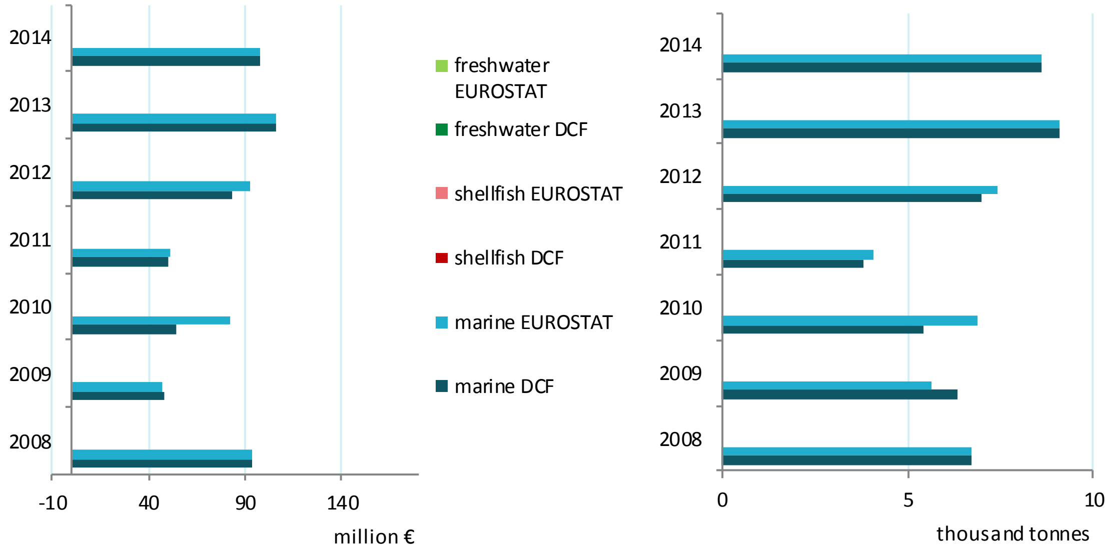


Figure 4.18.6 Comparison of DCF data with EUROSTAT data for Malta: 2008-2014

4.19 Netherlands

4.19.1 Summary

Production volume and value

The Dutch aquaculture sector produced a total of 65.8 thousand tonnes in 2014, which corresponded to an increase of 82% from 2013 to 2014. The total production value was around €94 million for both 2013 and 2014. Compared to the average for the years 2008-2013, the total volume increased by 31%, whereas the total value decreased by 2%.

Overall industry structure and employment

In 2014, the total population of aquaculture farms was 110, distributed over mussel production (54 companies), oyster production (20 companies) and freshwater aquaculture (36 companies). The Dutch aquaculture sector is dominated by small enterprises with less than 5 employees.

Main segments

The production in the Netherlands can be divided into three main segments. The largest segment is the production of blue mussels on bottom cultures. The second most important segment is the production of oysters. Third is land-based production of freshwater fish, mostly eel and catfish.

Current production trends and main drivers (Trends and triggers)

2014 showed a significant increase in mussel production, caused by a good supply of mussel seed in the years before. A growing amount of mussel seed comes from so called mussel seed collectors.

Oyster production is relatively good at the moment, but will drop coming years due to increasing problems with larvae and spat mortality due to the presence of Herpes virus and the Japanese oyster drill in the Dutch waters.

The production size of freshwater aquaculture has decreased over the years, as has the number of active companies. In 2014, total sales value dropped by 12% as a result of decreased European eel production.

Outlook

Based on the currently available data, is it expected that the mussel sector will show a good performance in the coming years as supply of mussel seed was relatively high in the last years. It is expected that production of oysters will fall by over 80% in 2016/2017 due to herpes disease and the Japanese oyster drill if nothing will happen. With regards to freshwater aquaculture, a stabilisation in number of companies and production is expected.

4.19.2 Production and sales

Dutch aquaculture is dominated by the shellfish sector, largest in sales weight and in sales value. Within this sector, blue mussels are the most important species. The freshwater sector is much smaller in weight and value.

Table 4.19.1 Production and sales for Netherlands: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Sales weight (thousand tonnes)	***38.3***	***58.3***	***74.6***	***47.1***	***47.6***	***36.3***	***65.8***	▲ *82%*	▲ *31%*
Marine									
Shellfish	38.3	48.0	60.4	36.8	37.6	29.7	60.1	▲ *102%*	▲ *35%*
Freshwater		10.4	14.2	10.3	10.0	6.5	5.7	▼ *-12%*	▼ *-44%*
Hatcheries & nurseries									
Sales value (million €)	***107.3***	***92.1***	***109.5***	***82.2***	***91.2***	***60.6***	***69.7***	▲ *15%*	▼ *-23%*
Marine									
Shellfish	70.6	61.5	76.5	52.8	66.0	60.6	69.7	▲ *15%*	▲ *7%*
Freshwater	36.8	30.6	33.0	29.4	25.2	33.5	24.3	▼ *-28%*	▼ *-23%*
Hatcheries & nurseries									

Source: EU Member States DCF data submission

In 2014, total sales weight increased considerably by 82% from 36.3 thousand tonnes to 65.8 thousand tonnes. Total sales value kept stable, around €94 million. The overall increase in value is largely the results of increasing shellfish production (+102%).

Culture of shellfish is by far the largest activity. We differentiate between mussels (*Mytilus edulis*) and oysters (*Ostrea edulis* and *Crassostrea gigas*). The production of mussels has increased between 2013 and 2014 by 112%, and total sales value increased by 11%. The increase in sales weight can be explained by the enormous mussel seed productions in the years before (it will cost 2-3 years to grow seed to commercial sized mussels). The mussel sector is by far larger than the oyster sector (€56.8 million compared to €3.3 million total sales volume in 2014). Oyster production started to decrease from 2013 onwards due to high mortality rates of Japanese oyster (*Crassostrea gigas*) larvae and spat caused by herpes disease and the exotic Japanese oyster drill (*Ocenebra inornata*). Production of shellfish takes place in the coastal areas with a concentration in the South-Western province Zeeland and the Wadden Sea.

Freshwater aquaculture is the second main segment albeit significantly smaller. Total sales value of this sector decreased in 2014 (-28%) even as sales weight (-12%), mainly due to a decrease in high valued European eel (-550 tonnes). Activities are dispersed throughout the country, with some concentration around traditional fishing communities. Freshwater aquaculture is dominated by production of European eel and North African catfish. Catfish has low value but is produced in relatively high volumes. Eel production in tons was almost as big as catfish (including claresse) production in 2014, but due to higher fish prices, total value was over 4 times as high.

4.19.3 Industry structure and employment

Structure and employment trends are discussed, differentiating between the shellfish and freshwater fish sectors.

Table 4.19.2 Structure of the Dutch aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Structure (number)									
Total enterprises	*130*	*125*	*119*	*113*	*111*	*112*	*110*	*-2%*	*-7%*
<=5 employees	124	118	112	106	104	104	102	*-2%*	*-8%*
6-10 employees	6	7	7	7	7	8	8	*0%*	*14%*
>10 employees	0	0	0	0	0	0	0		*0%*
Employment (number)									
Total employees									
Male employees									
Female employees									
FTE	218	391	369	357	363	216	212	*-2%*	*-33%*
Male FTE	218	391	369	357	363	216	212	*-2%*	*-33%*
Female FTE	0	0	0	0	0	0	0		*0%*
Indicators									
FTE per enterprise	2.7	3.1	3.1	3.2	3.3	2.9	2.9	*0%*	*-5%*
Average wage (thousand €)	42.1	23.8	26.5	33.3	26.3	43.2	50.2	*16%*	*54%*
Labour productivity (thousand €)	318.7	114.7	164.5	111.1	132.3	166.4	192.2	*16%*	*14%*

Source: EU Member States DCF data submission

The total FTE in the Dutch aquaculture sector (excluding the freshwater aquaculture) is estimated at 212 FTE. From 2013 to 2014, the number of employees has gone down by 2%. This decline is in line with observed trends. Note that the estimated number of FTE for 2008, 2013 and 2014 excludes the freshwater sector. In 2012, the number of FTE in the freshwater sector amounted 150. The aquaculture sector is dominated by men. The average FTE per enterprise has kept stable at 2.9 FTE per enterprise (based on shellfish aquaculture). In the mussel sector the number of FTE increased slightly (compared to 2008) due to the use of mussel seed collectors in this sector. Labour productivity increased by 18%. This increase reflects the good performance of the mussel sector in 2014.

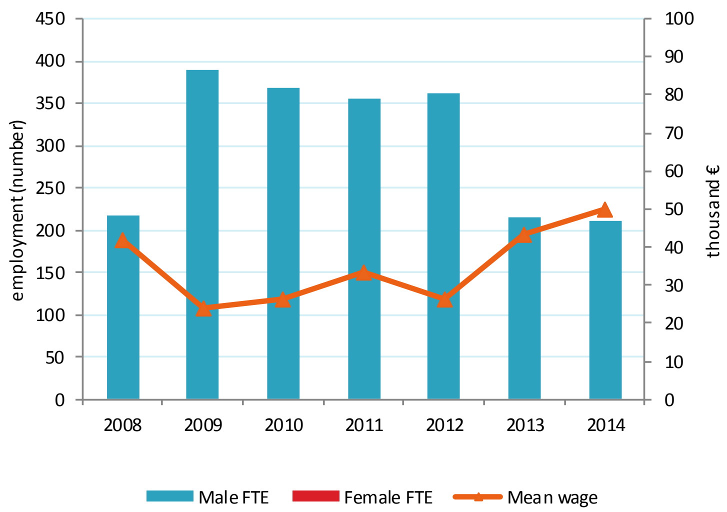


Figure 4.19.1 Employment trends for Netherlands: 2008-2014.

Source: EU Member States DCF data submission

The number of enterprises and FTEs (for the shellfish aquaculture) has decreased from 2008 to 2014, but the average number of FTE per enterprise has been rather constant over the period. The decrease in number of enterprises is largely the result of the exit of the smaller mussel companies and landbased (catfish) farms. Over the last years, we have witnessed a slow but steady decline in the number of companies due to economic problems or retirement.

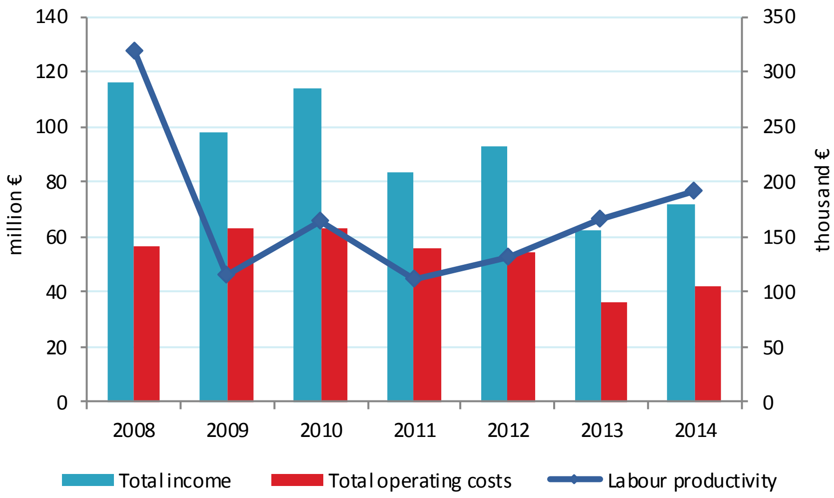


Figure 4.19.2 Income, costs, wages and labour productivity trends for Netherlands: 2008-2014.

Source: EU Member States DCF data submission

4.19.4 Economic performance

From 2013 to 2014, total income increased by 15%. Note that the income for 2013 and 2014 excludes the freshwater sector. The total income is dominated by the turnover from the sale of shellfish from the farms, which contributes 97% of total income, leaving only 3% to other sources of income.

Table 4.19.3 Economic performance of the Structure of the Dutch aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	% of total income	Change 2014-13	Development 2014/(2008-13)
Income (million €)										
Turnover	107.3	92.1	109.5	82.2	91.2	60.6	69.7	97%	15%	-23%
Other income	9.2	6.1	4.2	1.1	1.9	2.1	2.4	3%	15%	-41%
Subsidies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0%	0%	0%
Total income	*116.6*	*98.3*	*113.8*	*83.3*	*93.1*	*62.7*	*72.2*	100%	15%	-24%
Expenditures (million €)										
Wages and salaries	9.1	9.3	9.8	11.9	9.5	9.3	10.6	15%	14%	8%
Imputed value of unpaid labour	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0%	0%	-100%
Energy costs	8.8	8.5	7.6	7.8	6.5	4.6	5.2	7%	14%	-29%
Repair and maintenance	5.4	5.0	7.9	6.8	5.3	4.5	5.2	7%	15%	-11%
Raw material: Feed costs	14.2	12.4	9.8	7.5	6.9	0.0	0.0	0%	0%	-100%
Raw material: Livestock costs	8.9	17.1	14.7	10.7	15.3	10.7	12.9	18%	20%	0%
Other operational costs	9.9	10.5	13.0	10.8	11.2	7.1	8.1	11%	15%	-22%
Total operating costs	*56.4*	*62.8*	*62.8*	*55.6*	*54.7*	*36.2*	*42.1*	58%	16%	-23%
Capital Costs (million €)										
Depreciation of capital	6.8	9.3	7.7	4.2	4.0	2.3	2.1	3%	-10%	-64%
Financial costs, net	6.3	6.6	4.9	5.6	5.5	3.4	3.3	5%	-4%	-39%
Extraordinary costs, net	0.5	2.6	0.6	0.2	0.1	0.2	0.2	0%	20%	-68%
Capital Value (million €)										
Total value of assets	103.2	102.7	19.4	25.5	24.2	34.3	33.2	46%	-3%	-36%
Net Investments	14.7	11.2	7.8	2.6	3.5	17.0	18.9	26%	11%	100%
Debt	120.5	107.2	94.6	104.8	103.0	88.6	85.4	118%	-4%	-17%
Input & Production (thousand tonnes)										
Raw material: Feed	0.0	11.1	9.9	10.2	9.4	0.0	0.0		0%	-100%
Raw material: Livestock	12.5	35.0	29.4	10.1	56.2	34.3	37.5		9%	27%
Performance Indicators(million €)										
Gross Value Added	69.3	44.8	60.7	39.6	48.0	35.9	40.8	56%	14%	-18%
Operating cash flow	60.2	35.5	50.9	27.7	38.4	26.6	30.1	42%	13%	-25%
Earning before interest and tax	53.4	26.2	43.2	23.6	34.4	24.3	28.0	39%	16%	-18%
Net profit	47.1	19.5	38.4	17.9	28.9	20.9	24.8	34%	19%	-14%
Capital productivity (%)	67.2	43.6	313.6	155.1	198.0	104.7	122.7		17%	-17%
Return on Investment (%)	51.7	25.5	223.3	92.3	142.1	70.8	84.4		19%	-16%
Future Expectation Indicator (%)	7.7	1.9	0.7	-6.1	-2.2	43.0	50.8		18%	580%

Source: EU Member States DCF data submission

For economic performance, 2013 and 2014 data is excluding the freshwater sector. The expenditures in 2014 are dominated by cost of livestock (18%), wages and salaries (15%), other operational costs (11%), repair and maintenance costs (7%) and energy cost (7%). Cost of livestock for the mussel sector shows a steep increase during years. In the mussel sector more and more mussel seed needs to be collected from so called mussel seed collectors instead of seed fisheries. The costs of producing mussel seed from collectors are much higher than getting it from seed fisheries; expenditures in 2008 were roughly €4.0 million whereas in

2014 they reached over €12.5 million. Energy costs have increased as well, from €4.6 million in 2013 to €5.2 million in 2014. This increase in energy costs could be related to the increased sales volume in the mussel sector in 2014.

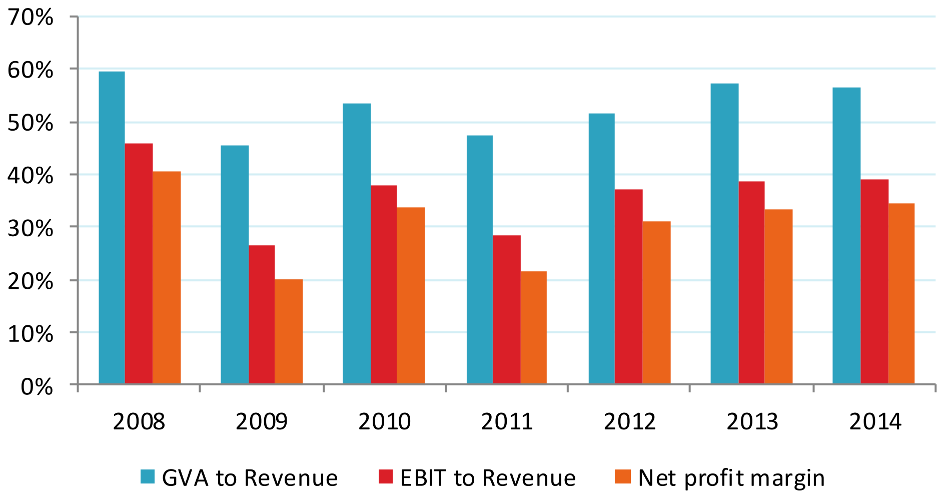


Figure 4.19.3 Economic performance for Netherlands: 2008-2014

Source: EU Member States DCF data submission

The gross value added for the shellfish sector as a whole increased by 14% even as the EBIT (16%) and net profit (19%). The total value of assets decreased by 3% between 2013 and 2014. The total level of debts decreased by 4%.

4.19.5 Main species produced and economic performance by segment

Aquaculture production in the Netherlands can be divided into three main segments:

- Segment 1: blue mussel on bottom cultures
- Segment 2: oysters on bottom cultures
- Segment 3: freshwater fish, mainly European eel and North African catfish.

Figure 4.19.4 Main species in terms of weight and value in Structure of the Dutch production: 2014.

Source: EU Member States DCF data submission

Segment 1: mussels on bottom cultures

Traditionally, the largest sector in Dutch aquaculture is mussels culture, consisting of 54 active companies. The data shows that total sales volume in 2014 was considerably higher than in 2013, increasing from 26.8 thousand tonnes to 56.8 thousand tonnes (+112%). Sales value increased by 15%, €54.4 million in 2013 and €62.6 million. Sales volumes are influenced by the collection of mussel seed in the 2-3 years before production. Low amount of seed was collected in 2011 (around 10 million kg) causing relatively low sales volumes in 2013, where high amount of seed was collected in 2012 (around 56 million kg) causing relatively high sales volumes in 2014. In the Netherlands the mussel sector remains by far the largest aquaculture sector. Profit margin lays around 32% in 2014.

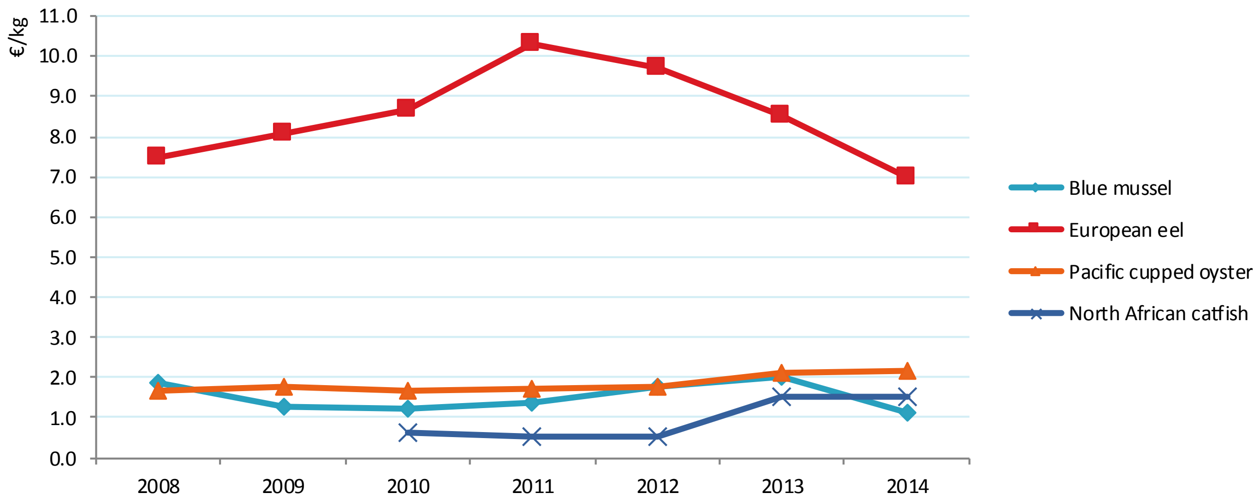


Figure 4.19.5 Average prices for the main species produced in Netherlands: 2008-2014.

Source: EU Member States DCF data submission

Segment 2: Oysters on bottom culture

The oyster industry is different from the mussel industry. The scale of production is lower, companies are smaller and the majority of the entrepreneurs combine the culture of oysters with other activities. The capital invested in the vessels is much lower (average age around 70 years) than for the mussel sector, resulting in a higher return on investment and capital productivity, but labour productivity is much lower than in the mussel sector. Total sales volume in 2014 was 3.3 thousand tons, an increase of 11% compared with 2013. Revenues are based on flat values and amounted €7.1 million in 2014 (€6.2 million in 2013).

Segment 3: Freshwater aquaculture on land

The third sector of aquaculture in the Netherlands consists of freshwater aquaculture. European eel and North African catfish are the two most important species. For a variety of reasons the number of companies and the production of both species declined steeply over the last decade. In 2014, this decline has continued, however less spectacular. Other species which are grown by a small number of companies are trout, turbot, tilapia, carp, yellowtail and pikeperch. Fresh water aquaculture is a relatively small sector in the Netherlands. In 2014, turnover dropped by 28%, mainly due to a decrease in eel sales volume by 550 tonnes.

Figure 4.19.6 Structural development Structure of the Dutch aquaculture sector: 2008-2014.

Source: EU Member States DCF data submission

In Table 4.19.1, the economic performance of the Dutch shellfish segments is shown. From the table it can be seen that the gross value added is positive for the shown segments, and overall production, income and profit shows a significant increase compared to 2013.

Table 4.19.4 Economic performance of main Structure of the Dutch aquaculture segments: 2008-2014 (in million €).

Variable	2008	2009	2010	2011	2012	2013	2014	*% of total income*	Change 2014/13	Development 2014/(2008-13)
Mussel Bottom										
Total income	*73.5*	*60.7*	*73.7*	*46.6*	*60.3*	*56.4*	*65.0*	*100%*	▲ *15%*	▲ *5%*
Gross Value Added	*56.0*	*38.4*	*45.4*	*22.0*	*32.5*	*30.9*	*35.4*	*55%*	▲ *15%*	▼ *-6%*
Operating cash flow	*48.7*	*30.4*	*36.8*	*12.1*	*24.8*	*22.8*	*26.1*	*40%*	▲ *15%*	▼ *-11%*
Earning before interest and tax	*45.7*	*24.7*	*30.7*	*9.0*	*21.7*	*21.0*	*24.3*	*37%*	▲ *16%*	▼ *-4%*
Net profit	*42.2*	*21.2*	*26.8*	*4.5*	*17.3*	*17.6*	*21.1*	*32%*	▲ *20%*	▬ *-2%*
Total sales volume (thousand tonnes)	*36.2*	*45.7*	*56.2*	*32.6*	*33.4*	*26.8*	*56.8*		▲ *112%*	▲ *48%*
Oyster Bottom										
Total income		*4.0*	*7.1*	*7.3*	*7.6*	*6.3*	*7.2*	*100%*	▲ *14%*	▲ *12%*
Gross Value Added		*2.8*	*5.6*	*5.9*	*6.3*	*5.0*	*5.3*	*74%*	▲ *7%*	▲ *4%*
Operating cash flow		*2.3*	*4.7*	*4.3*	*4.7*	*3.8*	*4.0*	*56%*	▲ *6%*	▬ *1%*
Earning before interest and tax		*2.1*	*4.6*	*4.0*	*4.5*	*3.3*	*3.7*	*51%*	▲ *12%*	▬ *0%*
Net profit		*2.1*	*4.6*	*3.9*	*4.5*	*3.3*	*3.7*	*51%*	▲ *12%*	▬ *1%*
Total sales volume (thousand tonnes)		*2.3*	*4.2*	*4.2*	*4.2*	*3.0*	*3.3*		▲ *11%*	▼ *-9%*

Source: EU Member States DCF data submission

In Figure 4.19.7, the economic indicators for the shellfish segments are presented. The mussel sector shows good performance in 2014, whereas the oyster sector did better. However, performance in the oyster sector will go down in coming years, due to oyster predation (Japanese oyster drill) and diseases (Herpes).

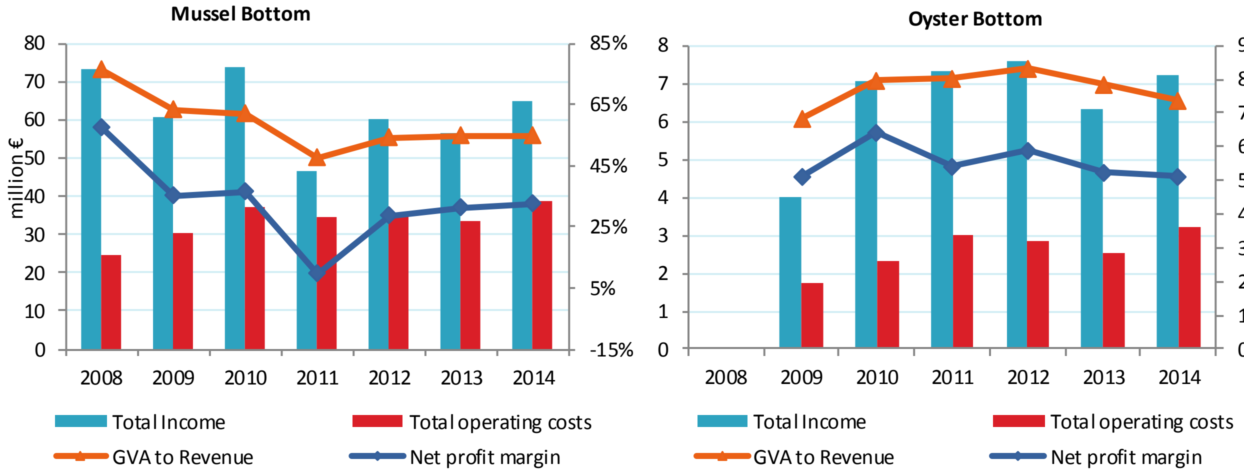


Figure 4.19.7 Economic performance indicators for the main Structure of the Dutch segments: 2008-2014.

Source: EU Member States DCF data submission

In Figure 4.19.8 the operational cost structures for the two Dutch shellfish segments are presented. No operational costs for 2014 are available for freshwater aquaculture.

Segment 1: mussels on bottom cultures

Most important costs items include livestock costs (31%) wages and salaries (23%), other operational costs (18%), repair and maintenance (12%) and energy costs (12%). Within other operational costs, rental costs for the area where the mussels are farmed are important. Costs of livestock increase due to the use of more expensive mussel seed from mussel seed collectors. In an agreement with the Dutch Ministry and environmental NGOs the mussel sector started a transition from wild seed fisheries to sustainable alternatives (mussel seed collectors) in 2020.

Segment 2: Oysters on bottom culture

Most important costs items for the oyster sector are wages and salaries (37%), other operation costs (22%), repair and maintenance (13%) and livestock costs (10%). The variable "other operational costs" also includes the costs of lease of the growing area (approx. 8%).

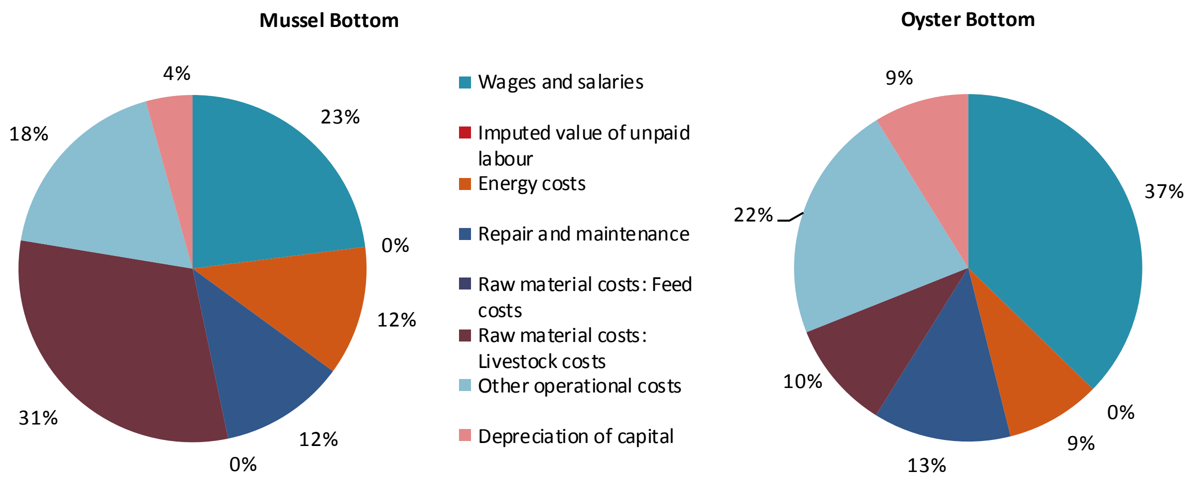


Figure 4.19.8 Cost structure of the main segments in Netherlands: 2014.

Source: EU Member States DCF data submission

Figure 4.19.9 shows the average price per kg mussel seed. There is an increasing trend in mussel price due to the use of mussel seed collectors. In 2011 the average price per kg was extremely high. In that year no seed was gathered from mussel seed fisheries.

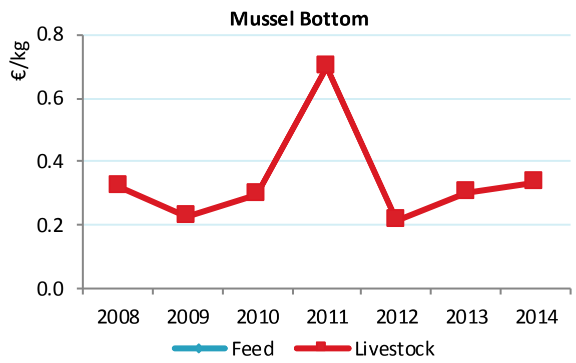


Figure 4.19.9 Feed and livestock prices for the main Structure of the Dutch segments: 2008-2014.

Source: EU Member States DCF data submission

4.19.6 Trends and triggers

Current production trends and main drivers

The increased economic performance of the aquaculture sector in 2014 is largely explained by high production levels of blue mussels. Production is highly dependent on mussel seed availability. In 2013 and 2014 seed production was relatively high, 34 million kg and 37 million kg, respectively. These high volumes will help the sector to have relatively high production levels in coming years. The mussel sector is in transition towards the use of mussel seed collection technologies, rather than bottom trawling. Seed from mussel seed collectors are more expensive and will have an effect on the economic performance. However, by using mussel seed collectors, the sector is more independent from natural seed fall.

The oyster sector has increasing problems with larvae and seed mortality due to the presence of Herpes virus and the Japanese oyster drill in the Dutch waters. Production of oysters are good at the moment, but will drop coming years.

The last years, the freshwater aquaculture has continued to decrease as companies stop production or have been acquired by other companies. This trend continued in 2014. Based on anecdotal evidence, there are signs that the remaining companies succeed in business model innovation to increase revenues. Direct sales to consumers of processed products, even online, can increase revenues.

Market structure

The market structure of the mussel sector changes. For mussel production, the number of companies producing decrease. Smaller family companies are overtaken by (most of the time) vertically integrated (family) companies. The market structure of the oyster sector has not witnessed major changes in the last years. For oyster production, the number of companies producing and trading remains stable. The mussel and oyster sector continues to have close contact with research institutes and (local) politics.

The freshwater aquaculture sector shows some signs of change. Apart from the decreasing number of companies, there are signs that direct sales and local sales become more important. The sector is not well organised and lacks structural contact with research institutes.

Issues of special interest

Around 5.1% of the total budget of the new Dutch operational program is allocated for aquaculture. The objective for aquaculture is to increase the value of aquaculture production via niche and high-value products. Beside this, the Netherlands will increase environmental and economic sustainability, by creating better cooperation, knowledge sharing and increased technical innovation.

Recently, interest for aquaculture in combination with offshore wind energy has increased. This might be a solution to spatial conflicts in the heavily used North Sea, and it might come with some synergy reducing operating costs.

In the last years, academic and business interest in production of seaweeds has grown. The first commercial seaweed farms are established in 2013 and might prove to be an impulse for the aquaculture sector in the Netherlands. However, economic and ecologic values need to be proven.

Producer organisation 'PO Mossel' set up a knowledge/innovation agenda for coming years to improve production efficiency in terms of volume per unit area on current mussel beds. At the moment production efficiency is relatively low and could be improved.

The Dutch oyster association started with experiments for off bottom oyster farming to decrease the oysters mortality from the Japanese oyster drill and herpes virus.

Outlook for 2015 and 2016

The combination of mussel seed collection by bottom trawling and other technologies will improve the seed supply in future. In 2014 17.5 million kg seed was collected via mussel seed collectors, 23% more than 2013. In 2015, collection increased to 19.6 million kg. The available mussel seed in the years 2013 and 2014 are the basis for mussel production in 2015 and 2016. Sales volumes will reach over 50 thousand tonnes in these years.

The presence of a toxicant called tetrodotoxin (TTX) in mussels at the beginning of the mussel season in 2016 will have an impact on the profitability of the sector in that year. Consumers are reluctant to consume mussels which affect the average mussel price. Besides the presence of TTX, the profitability of the mussel sector will be affected by the increased supply of mussels from surrounding MS. It is expected that smaller family businesses, which are not vertically integrated, will face problems coming years.

It is expected that production of oysters will fall by over 80% in 2016/2017 if nothing will happen. This will have an enormous negative impact on the economic performance of this sector. Projects are started in 2016 to grow oysters off bottom to prevent mortality from the Japanese oyster drill.

With regards to freshwater aquaculture, a stabilisation in number of companies is expected. Experiments notwithstanding, there are no signs that the sector will undergo major structural changes in the coming years. It is likely that the remaining producers will focus on direct sales to consumers and restaurants, rather than compete on the wholesale market with imported whitefish. Some companies started their aquaculture business using EFF funds, however most of these companies were not successful and stopped producing.

4.19.7 Data Coverage and Data Quality

Data quality

The account statistic for 2014 is based on a sample of 18 aquaculture companies (shellfish), which covers 24% of the total population of 74 farms. These 18 companies provide detailed information to LEI Wageningen UR, that is used for extrapolation to the entire sector. Additional aggregate information on sales volume and value of mussels and oysters is available from Statistics Netherlands, the Dutch oyster association and the mussel producer organisation 'PO mossel'.

Information on the number of freshwater companies, sales volumes and values is retrieved from the Dutch aquaculture association NEVEVI and own databases of LEI Wageningen UR. Additional aggregate information on sales volume of eel is available from Statistics Netherlands.

Data quality differs considerably for the three sectors. Information on the mussel sector comes from 12 companies (22% of in total 54 companies). A total of 6 oyster companies provide detailed information to LEI Wageningen UR (30% of in total 20 companies). Concerning freshwater aquaculture, no companies provided detailed information (0% of in total 36 companies).

Data availability

Data of landbased aquaculture is not collected as planned. Land based aquaculture in the Netherlands is a relatively small (36 farms in 2014), reluctant, fragmented, highly competitive and dynamic. Only information on the number of freshwater companies, production volume and value level could be obtained for this segment. This information was gathered from a desk study and information from the Dutch aquaculture association NEVEVI. Data of the mussel and oyster sector is collected in accordance with the Dutch National Plan. After collecting the information and having it checked by accountants, the companies voluntarily submit data to LEI Wageningen UR. As some companies work with financial years running from July to July, submission of this information can take place late. Once all information is collected, it is processed by LEI Wageningen UR.

Confidentiality

Obviously, the fact that such a low number of companies deliver information is a problem for confidentiality. When collecting data, LEI Wageningen UR explicitly mentions that the information will be treated confidentially. General guidelines that segments should include more than 10 enterprises would be hard to put into practice, given the low number of companies in the oyster segments.

Differences in DCF data compared with other official data sources

When comparing the Dutch data for DCF with the value and production registered by EUROSTAT, the following remarks can be made.

The EUROSTAT data mentioned production of marine finfish (ca. 3.5 million kg in 2014). Most likely, this concerns the produce of marine (flat)fish under experimental conditions, and not commercial production.

Apart from this difference, the DCF and EUROSTAT are generally in line with each other. Differences between DCF and Eurostat could be explained by the extrapolation that affects total production levels.

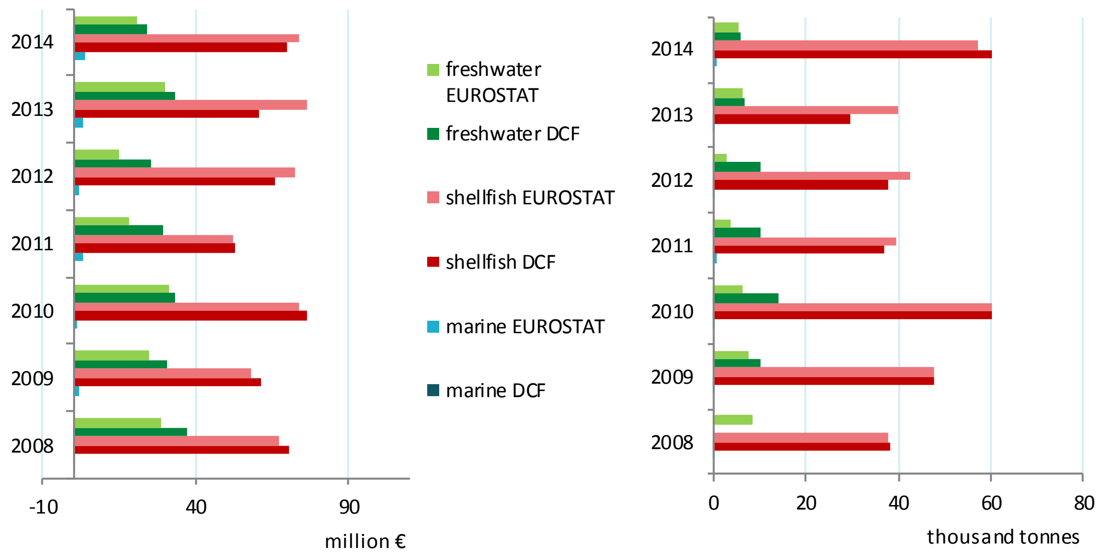


Figure 4.19.10 Comparison of DCF data with EUROSTAT data for Netherlands: 2008-2014

4.20 Poland

4.20.1 Summary

Production volume and value

The total volume of Polish aquaculture production of fish was 36.3 thousand tonnes in 2014 and it increased by 16% compared to 2013. The total value of production was €89.3 million in 2014 and there was also an annual increase of 17% recorded. From the average production between 2009 and 2013, the total volume increased by 12%, whereas the total value increased by 14%.

Overall industry structure and employment

In 2014 there were 1242 aquaculture land-based farms and their number increased by 47% compared to 2013 and the average of 2009-2013. The sector was dominated by small enterprises with less than 5 employees (70% of total).

Main segments

The biggest segment is the production of common carp. In 2014 common carp represented 52% of the total volume of production and 43% of the whole total value of aquaculture production.

The next segment of the production is harvesting of rainbow trout, which contributed 37% of the total volume and 42% of the total value of aquaculture production.

Many farms produced in polyculture more than one freshwater species, mainly African and European catfishes, grass carp, silver carp, bighead carp, crucian carp, pike, tench and sturgeon.

There are few fish farms in Poland producing sturgeon, tilapia, and barramundi using recirculation system.

The only segment covered by DCF data collection consists of fish farms that breed and rear Atlantic salmon fry and that cooperate with the Panel for Restocking appointed by the Minister of Agriculture and Rural Development for stocking Polish Marine Areas.

Current production trends and main drivers (Trends and triggers)

Carp is produced for the domestic market. Demand is seasonal and stagnating. Most carp is sold in December before Christmas Eve in the form of live fish and fresh whole fish. Export opportunities are just about 1.5 thousand tonnes per year.

The main factor which stimulates the production of rainbow trout, in addition to domestic demand, is export which in 2015 stood at 6.5 thousand tonnes (48% of total production in 2014). About 64% of the export of trout goes to the German market, mainly smoked (88%).

Outlook

In Poland freshwater aquaculture production in volume is dependent on the prevailing meteorological conditions. In the case of, carp too low autumn temperature shortens the feeding period and growth of fish. However, in the case of trout, too high temperature continuing in the period from June to August limits feeding and weight gain of fish. The main limiting factors in achieving maximum potential yields are outbreaks of viral diseases and also pressure of piscivorous animals (cormorants, otters).

In 2014 Multiannual national plan for the development of sustainable aquaculture in Poland for 2014-2020 was developed. According to the Plan, freshwater fish farming should maintain current extensive production level (carp) and over 100% growth of intensive production volume in (trout) by 2020. Moreover, it is planned to initiate marine fish and mollusc farming by 2020.

It is expected that in 2020 aquaculture production of all species will increase to 61 thousand tonnes because of reducing piscivorous animals pressure, improve fish farms epizootic conditions, and promotion of consumption of carp as slow food and a traditional Christmas dish.

4.20.2 Production and sales

Total volume of Polish aquaculture production of fish was 36.3 thousand tonnes in 2014 and increased by 16% compared to the previous year data. The total value of production amounted to €89.3 million and there was also an increase of 17%. Compared to the average from 2009 to 2013, the total volume increased by 12%, whereas the total value increased by 14%.

Total production includes not only fish for the food market but also production of stocking material. In 2014 the sector produced and sold 11.6 thousand tonnes of seed and stocking materials of many species for sale, among them Atlantic salmon fry for stocking Polish Marine Areas.

The only segment covered by DCF data collection consists of fish farms that breed and rear Atlantic salmon fry and that cooperate with the Panel for Restocking appointed by the Minister of Agriculture and Rural Development for stocking Polish Marine Areas.

Total volume of hatcheries & nurseries production was 1.2 thousand tonnes in 2014 and increased by 2% compared to the previous year data. The total value of production amounted to €3.7 million and there was also an increase of 18%. Compared to the average from 2009 to 2013, the total volume increased by 9%, whereas the total value increased by 13%.

Table 4.20.1 Production and sales for Poland: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Sales weight (thousand tonnes)		***36.5***	***30.8***	***29.1***	***34.4***	***31.3***	***36.3***	*16%*	*12%*
Marine		0.0	0.0	0.0	0.0	0.0	0.0		
Shellfish		0.0	0.0	0.0	0.0	0.0	0.0		
Freshwater		35.5	29.6	28.2	33.2	30.1	35.1	*17%*	*12%*
Hatcheries & nurseries		1.1	1.2	0.9	1.2	1.2	1.2	*2%*	*9%*
Sales value (million €)		***76.6***	***67.8***	***61.7***	***108.9***	***76.1***	***89.3***	*17%*	*14%*
Marine		0.0	0.0	0.0	0.0	0.0	0.0		
Shellfish		0.0	0.0	0.0	0.0	0.0	0.0		
Freshwater		73.7	64.5	58.8	105.3	72.5	85.7	*18%*	*14%*
Hatcheries & nurseries		2.9	3.3	2.9	3.7	3.5	3.7	*6%*	*13%*

Source: EU Member States DCF data submission

4.20.3 Industry structure and employment

In 2014, there were 1 242 aquaculture land-based farms (mainly carp farms) and it was upgrowth by 47% compared to 2013. The sector is dominated by small enterprises with less than 5 employees. 70% of the Polish farms had less than 5 employees, 18% had 6-10 employees and 12% more than 10 employees. That means that the aquaculture farms were managed mainly by micro and small family enterprises or small and medium companies. The total number of persons employed in the Polish aquaculture sector was 7 664 and it increased by 43% compared to 2013.

Table 4.20.2 Structure of the Polish aquaculture sector: 2008-2014

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Structure (number)									
Total enterprises					*840*	*846*	*1,242*	*47%*	*47%*
<=5 employees					500	518	872	*68%*	*71%*
6-10 employees					216	196	225	*15%*	*9%*
>10 employees					124	132	145	*10%*	*13%*
Employment (number)									
Total employees					5,583	5,430	7,764	*43%*	*41%*
Male employees									
Female employees									
FTE									
Male FTE									
Female FTE									
Indicators									
FTE per enterprise									
Average wage (thousand €)					11.4	11.5	11.8	*2%*	*3%*
Labour productivity (thousand €)		19.0	26.7	16.5	26.5	18.5	21.3	*15%*	*-1%*

Source: EU Member States DCF data submission

4.20.4 Economic performance

Within the framework of DCF Poland did not collect economic data for freshwater species in accordance with the provisions of Chapter IV, Part A, point of 2.2. Commission decision of 6 November 2008 (2008/949/WE). For this reason the economic performance includes only information on fish farms that breed and rear Atlantic salmon fry and cooperate with the Panel for Restocking appointed by the Minister of Agriculture and Rural Development to stocking Polish Marine Areas and is presented in Salmon Hatcheries and nurseries segment.

4.20.5 Main species produced and economic performance by segment

Total volume of aquaculture production of fish was 36.3 thousand tonnes in 2014 and increased by 16% compared to the previous year data. The total value of production amounted to €89.3 million and there was also an increase of 18%. The total volume increased by 12%, whereas the total value increased by 14% compared to average 2009-2013.

The biggest sector is the production of carp. In 2014 common carp stood for 51% of the total volume of production and for 42% of the whole total value of aquaculture production. The volume of production of common carp increased to 18.4 thousand tonnes (about 9%) and to the value of €37 million (about 5%). Carp farms are widespread all over the country but the largest facilities are located in central and southern Poland where climatic conditions are warmer and thus more advantageous. Carp production is carried out in earth ponds. Total earth ponds useable area of production for carp is about 60 thousand ha, which stands for about 79% of total area of earth ponds registered by the Central Office of Cartography and Geodesy.

The next sector is harvesting of rainbow trout, which contributed 33% of the total volume of production and 42% of the total value of aquaculture production. Production of rainbow trout increased to 13.4 thousand tonnes (about 31%). On the other hand, the total value of the production was €37.7 million, which corresponds to an increase of 34%. Trout production is carried out in concrete ponds that are supplied with water from rivers or other running sources with partial recirculation of water. Trout farms are located in the north on the Baltic Sea coast and in southern Poland in the Carpathian foothills in rich terrain with clear, cool waters.

In terms of volume and value another important species was chars nei (respectively 3% and 4%). Production of other freshwater species amounted to 3.3 thousand tonnes and the value of production was €10.8 million. The other freshwater species constituted 12% of turnover in aquaculture and have 9% share in volume of production.

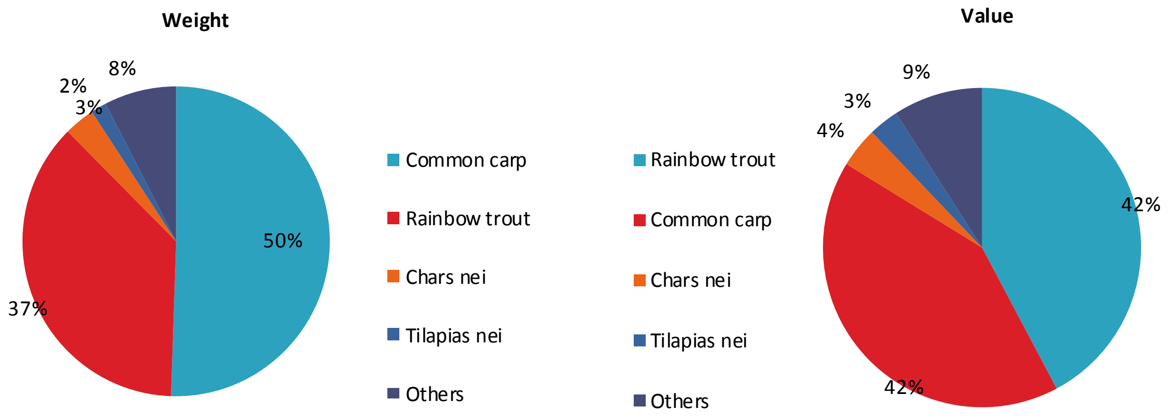


Figure 4.20.1 Main species in terms of weight and value in Structure of the Polish production: 2014.

Source: EU Member States DCF data submission

In 2014, average prices for rainbow trout increased by 2% to €2.8/kg, for common carp decreased by 4% to €2.02/kg and for other freshwater fish down by 21% to €1.17/kg. From 2008 to 2014, rainbow trout prices increased by 42%, for common carp increased by 5% and for other freshwater fish decreased by 52%. Throughout the period 2008-2014 rainbow trout average prices were higher than the prices of common carp: in 2008-2011 by 2% and from 2012 from 14% to 39%.

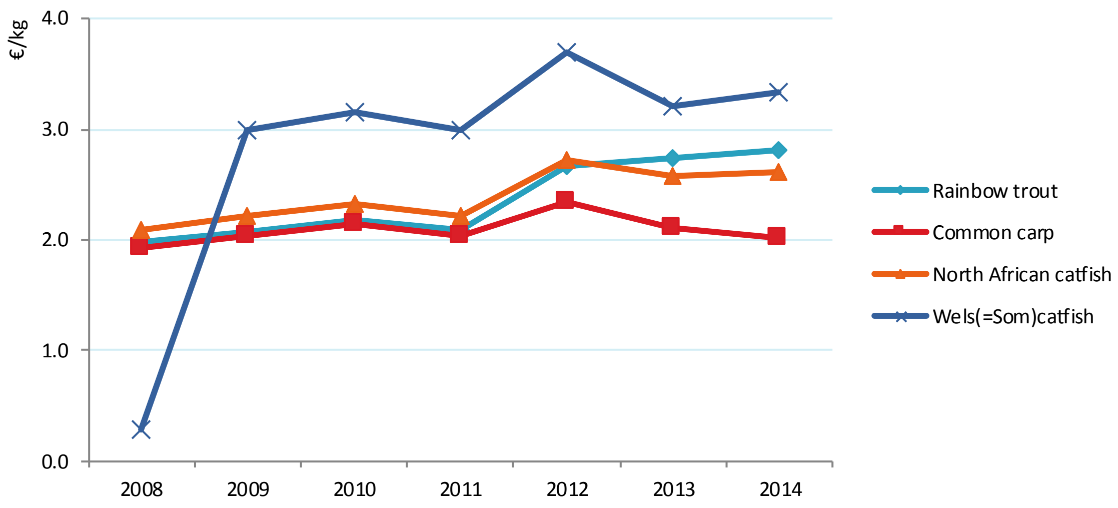


Figure 4.20.2 Average prices for the main species produced in Poland: 2008-2014.

Source: EU Member States DCF data submission

The economic performance includes only information on fish farms that breed and rear Atlantic salmon fry and cooperate with the Panel for Restocking appointed by the Minister of Agriculture and Rural Development to stocking Polish Marine Areas. (Collecting economic data for freshwater species is not mandatory, in accordance with the provisions of Chapter IV, Part A, point of 2.2. Commission decision of 6 November 2008 (2008/949/WE)). In 2014, there were four such farms.

The total income from analysed farms amounted to €3.8 million and increased by 5% compared to the previous year. Total production from analysed fish farms was 1210 tonnes of fish and stocking materials and increased by 2% compared to the previous year. Ratio analysis shows that the condition of these farms was better compared to the previous year. The contribution to the national economy, measured by GVA indicator, was €1.1 million and increased by 13%. Operating cash flow increased to €0.6 million (by 29%) and also earnings before taxes and interest (EBIT) increased to €0.3 million (by 63%). Net profit also increased to €0.3 million (by 73%).

Table 4.20.3 Economic performance of main Structure of the Polish aquaculture segments: 2008-2014 (in million €).

Variable	2008	2009	2010	2011	2012	2013	2014	% of total income	Change 2014/13	Development 2014/(2008-13)
Salmon Hatcheries & nurseries										
Total income		3.0	3.7	3.2	3.8	3.6	3.8	100%	5%	10%
Gross Value Added		1.0	1.3	0.7	1.4	1.0	1.1	30%	13%	4%
Operating cash flow		0.5	1.1	0.4	0.8	0.5	0.6	15%	29%	-11%
Earning before interest and tax		0.3	0.8	0.1	0.6	0.2	0.3	9%	63%	-21%
Net profit		0.3	0.8	0.1	0.6	0.2	0.3	8%	73%	-18%
Total sales volume (thousand tonnes)		1.1	1.2	0.9	1.2	1.2	1.2		2%	9%

Source: EU Member States DCF data submission

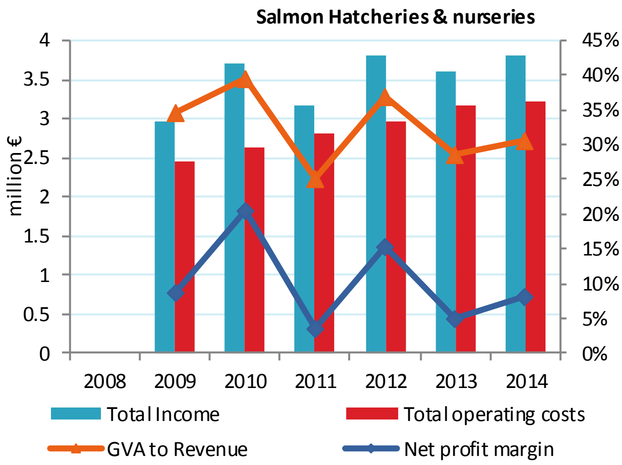


Figure 4.20.3 Economic performance indicators for the main Structure of the Polish segments: 2008-2014.

Source: EU Member States DCF data submission

Segment 1: Salmon nurseries & hatcheries

The operating costs structure has not changed in comparison to the previous year. More than half of the cost of operating costs (52%) had the purchase of feed. Other costs were labour costs (wages and salaries and imputed value of unpaid labour) (17%) and purchase of livestock (10%). Share of other elements of the cost was lower and ranged from 7% to 1%, respectively for depreciation of capital and energy costs, repair and maintenance, energy costs, other operational costs and imputed value of unpaid labour.

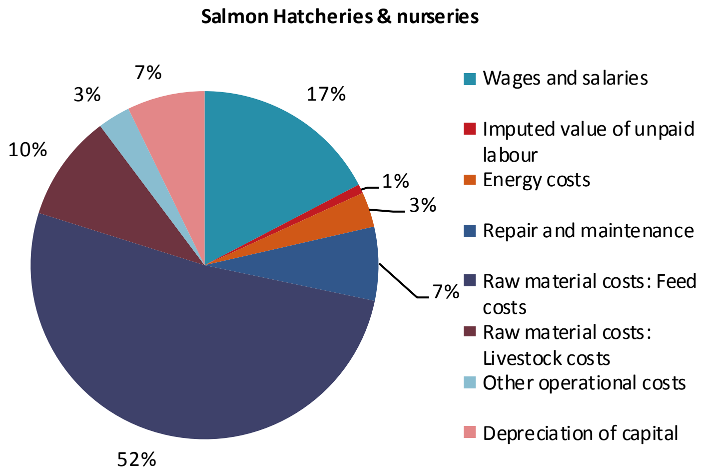


Figure 4.20.4 Cost structure of the main segments in Poland: 2014.

Source: EU Member States DCF data submission

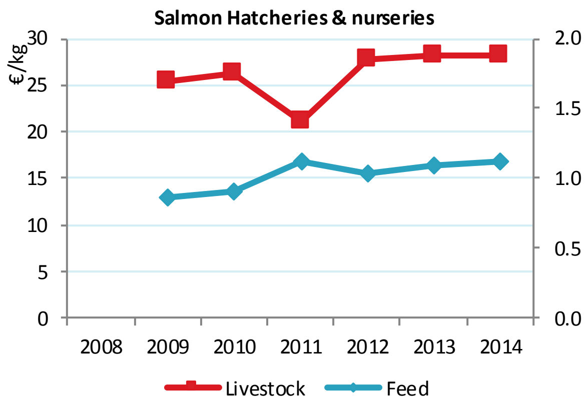


Figure 4.20.5 Feed and livestock prices for the main Structure of the Polish segments: 2008-2014.

Source: EU Member States DCF data submission

4.20.6 Trends and triggers

Current production trends and main drivers

In Poland freshwater aquaculture production in volume is dependent on the prevailing meteorological conditions. In the case of carp, too low autumn temperature shortens the feeding period and growth of fish. However, in the case of trout, too high temperature continuing in the period from June to August limits feeding and weight gain of fish. The main limiting factor in achieving maximum potential yields is outbreaks of viral diseases and also pressure of piscivorous animals (cormorants, otters) which are protected.

Restocking of the Polish Marine Areas is carried out under the Fisheries Act of 19 February 2004 (Journal of Laws of 2004, No. 62, pos. 574) by the Minister of Agriculture and Rural Development and is funded annually by the state budget. The statutory guarantee for the restocking creates good prospects for fishing farms which produce Atlantic salmon juveniles for the purpose of restocking Polish Marine Areas.

The investments in aquaculture were supported by the European Fisheries Fund by grants under the Operational Programme "Sustainable Development of the Fisheries Sector and Coastal Fishing Areas 2007-2013". Under priority axis 2 "Aquaculture, inland fishing, processing and marketing of fishery and aquaculture products" the limit of funds for support investments in aquaculture was almost €126.2 million, of which 75% was from EU. The majority of operations implemented under measure 2.1 "Support investments in aquaculture" consisted of development and modernisation of the aquaculture production facilities, investment in aquaculture diversification towards prospective or new species and in the development of sustainable aquaculture. Within measure 2.2 "Aqua-environmental measures" there were two kinds of actions to be carried out: 1. supporting the use of traditional or environmentally friendly practices and techniques in breeding and farming fish; 2. protecting fish genetic resources. Fish farms located in Nature 2000 areas would get financial assistance under the action 2.2.

Under the Operational Programme "Fisheries and the Sea" 2014-2020 almost €269 million was planned to support aquaculture (priority axis 2 "Environmentally sustainable, resource-efficient, innovative, competitive knowledge-based aquaculture") of which 75% is support from the EMFF. The funds for aquaculture from 2014 to 2020 are more than twice as big as allocation in the previous programming period.

In recent years fish farmers more often process their products by themselves and offer fresh fillets or smoked fish to increase sales.

Market structure

Carp are produced for the domestic market. Export opportunities are just about hundred tonnes per year. Most carp are sold in December before Christmas Eve in the form of live fish and fresh whole fish. The increase in carp production resulted in 2014 in an increase in the import of carp to almost 4.9 thousand tonnes, representing a growth of 21% compared to the previous year. The largest number of carp comes to Poland from the Czech Republic (43%) and Sweden and Germany (both for 15%). There was an increase in export of carp and carp products in 2014 to 1.8 thousand tonnes, up by 7% compared to 2013. Poland exports carp mainly to the Netherlands (31%) and Germany (19%).

The main factor which stimulates the production of rainbow trout, in addition to the domestic demand, is export, which in 2014 stands at 6.6 thousand tonnes (18% of total production in 2014). About 67% of the export of trout, mainly smoked (92%), goes to the German market. Trout import increased in 2014 reaching almost 13.8 thousand tonnes, which accounted for growth by 18% compared to the previous year. The largest number of trout comes to Poland from Norway, Turkey and Denmark (respectively 32%, 25% and 14%).

In 2014 in domestic market the availability and marketing of fresh aquaculture products improved and developed as a result of permanent offer of sale of MAP packaged fresh fish (including trout and tilapia) in discount stores and supermarkets.

Poland also imported 12.8 thousand tonnes of other freshwater fish. Among them the most accounted for pangasius (68%) imported mainly from Vietnam and tilapia (32%) from China.

Issues of special interest

In recent years, the production of new species is developed and the new techniques of production have been introduced. There are few land based farms producing sturgeon, barramundi, North African catfish - Clarias gariepinus and Wels Catfish - Silurus glanis. In 2012 the largest and most modern fish farm in Poland in a closed circuit water system was opened in the village of Bońki near Płońsk. The target production is expected to reach 1.3 thousand tonnes, mainly including new thermophilic species, such as tilapia. The project was financed with the participation of the European Fisheries Fund (EFF).

There was a new trend in Polish aquaculture: the implementation of certification for product safety and organic production. So far only the barramundi farming near Olsztyn has implemented GLOBAL GAP.

Some Polish extensive fish ponds, due to the biological diversity of habitat and animal species of special importance for Poland, were included in the Natura 2000 areas. In this case, many farms are turned into multifunctional fish farms ponds, which also offer services in recreation, maintaining biodiversity and improving water management.

In recent years new techniques of production has been introduced as for example farming of Atlantic salmon from egg to harvest size in recirculating aquaculture systems using geothermal saline waters. Jurassic Salmon Sp. z o.o. situated in Janowo, West Pomerania was established in May 2013 and started production in June 2015. Within the framework of the operational programme "Sustainable Development of the Fisheries Sector and Coastal Fishing Areas 2007-2013", project was co-financed from public funds at the amount of €5.7 million, including €4.2 million from the UE.

There are new trends in breeding sturgeon (Siberian sturgeon, Russian sturgeon, sterlet albinos, bester) for caviar production. Two farms Eko-kawior and Gospodarstwo Rybackie Goslawice received funding from operational programme "Sustainable Development of the Fisheries Sector and Coastal Fishing Areas 2007-2013", €1.8 million, €1.4 million, respectively.

In 2014, there was a development of a 'Code of Good Fishery Practice in Fish Farming' which was introduced in March 2015.

No maritime spatial plan (MSP) has been officially adopted in Poland yet (up to now MSP procedure was tested only in EU projects e.g. pilot project plan for the Middle Bank, Gulf of Gdansk and pilot plan of Pomeranian Bay). Moreover, inventory of the current state "Study of conditions and directions of spatial development for Polish marine areas" is being prepared.

Outlook for future production trends

Production

According to Multiannual national plan for the development of sustainable aquaculture (MNPAqua), production volume should increase by 53% to 61 thousand tonnes in 2020. Freshwater fish farming should maintain extensive production volume (carp) and over 100% growth of intensive production volume (trout) by 2020. Moreover, it is assumed to maintain the current area of production for extensive aquaculture (60 thousand ha of usable area) as a 'productive surface'. It is planned to initiate marine fish and mollusc farming by 2020.

Operational Programme "Fisheries and the Sea" 2014-2020 is a financial instrument contributing to the implementation of MNPAqua. The expected increase in production is lower than in MNPAqua and is 51.6 tonnes by 2023 (including growth to 6.0 thousand tonnes from recirculation systems). Under the OP almost €269 million (EU + national) was planned to support aquaculture (priority axis 2 "Environmentally sustainable, resource-efficient, innovative, competitive knowledge-based aquaculture"). The funds for aquaculture from 2014 to 2020 are more than twice as big as allocation in the previous programming period.

The main objective of EMFF is to promote aquaculture (conventional methods and recirculation systems) and the farming of salmonids and other species (eel, pikeperch, sturgeon, catfish and turbot) with significant market potential, and to increase the share of species other than carp in aquaculture overall. There is considerable emphasis on aquaculture providing environmental services.

Effect on competitiveness

According to Multiannual national plan for the development of sustainable aquaculture (2014-2020) Poland will enhance aquaculture competiveness by:

- increasing government-led promotion of fish products through the Fish Promotion Fund,
- increasing the profitability of extensive production farms by an average of 10% through financial support for income diversification,
- development of the domestic market, increasing the supply level and doubling deliveries to processing sector (thanks to action taken by FPF),
- financial support to encourage a bond between science and producers.

Effect on environment

In the field of environmental protection is an important need to support pro-environmental values of aquaculture facilities. Compensation has a positive impact on the environment in the carp ponds. For example, OP plans that there will be a 5% reduction of energy consumption in aquaculture facilities, including moving towards renewable energy. Also, 795 aquaculture farms will receive aqua-environmental payments.

Multiannual national plan for the development of sustainable aquaculture (MNPAqua) and Operational Programme "Fisheries and the Sea" 2014-2020 are presenting different aquaculture production growth forecasting. It is assumed that less production in a longer period is more realistic.

4.20.7 Data Coverage and Data Quality

Data quality

Poland is not obliged to collect the freshwater aquaculture economic data in accordance with the provisions of Chapter IV, Part A, point of 2.2. Commission decision of 6 November 2008 (2008/949/WE).

DCF data includes only fish farms that breed and rear Atlantic salmon juveniles and cooperate with the Panel for Restocking appointed by the Minister of Agriculture and Rural Development (MARD) to restocking Polish marine areas and the maintenance and conservation of diadromous fishes in the surface inland waters.

Data availability

In 2014, there were four such farms. A questionnaire was used to collecting all data. Completion and return of a questionnaire was voluntary. In 2014 only one completed questionnaire returned.

The total volume and value production and employment data was based on the data from questionnaire RRW-22 "Statement of the surface of ponds and the amount of fish produced in fish ponds and other devices used for breeding or rearing".

Confidentiality

Due to confidentiality reasons, there were estimations made for segment salmon hatcheries & nurseries.

Differences in DCF data compared with other official data sources

From 2008 there are no significant differences between DCF and EUROSTAT total production data.

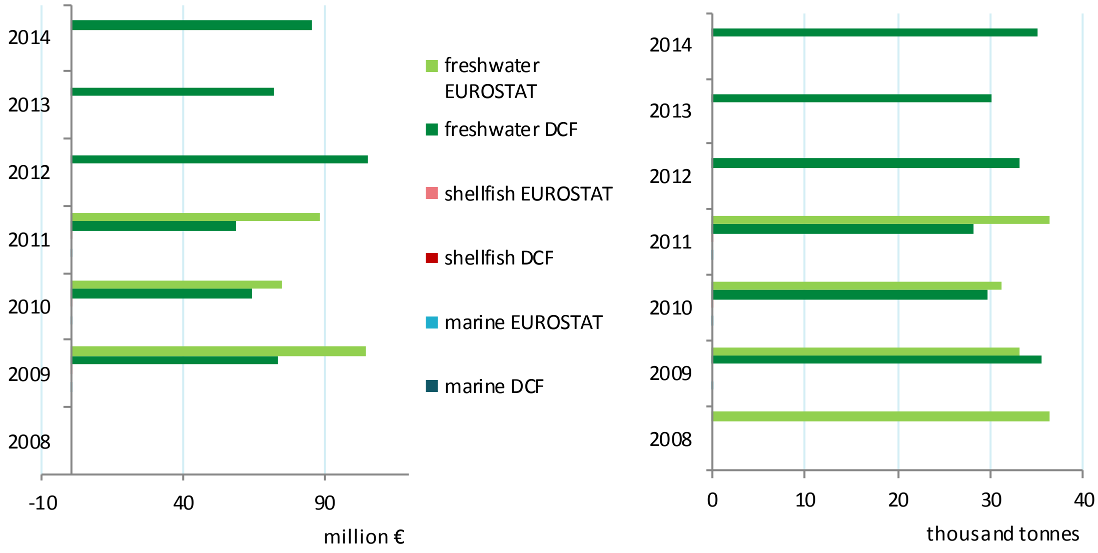


Figure 4.20.6 Comparison of DCF data with EUROSTAT data for Poland: 2008-2014

4.21 Portugal

4.21.1 Summary

In total, the Portuguese aquaculture sector produced and sold around of 8.8 thousand tonnes in 2014, which corresponded to an increase of 24% from 2013 to 2014. The total value of the production was €49.5 million, which corresponded to a slightly decrease of 2% over the same period. From 2008 to 2014, the total sales volume increased by 17%, whereas that in total value increased by 5%.

Analysing the evolution of sales between 2008 and 2014, the highest value in production and sales (by weight and value) was in 2012. In that year, turbot sales represented 43% of the totals with a volume of 4.4 tonnes and €20.3 million.

Overall industry structure and employment

In 2014, the Portuguese Aquaculture sector was comprised by 1 428 farms that employed 2 357 workers, of which 479 were women and 1 878 were men, in a proportion of 1:4. The sector is dominated by small enterprises with less than 5 employees. 98% of the Portuguese enterprises had less than 5 employees, in 2014.

Main segments

The production in brackish and marine waters remained the most important, accounting for about 93% of total production. The production of fish in brackish and marine waters, in turn, represented 47.7% of total production, and from those, 91.0% corresponded just to production of sea bass and turbot. The increase in the production of marine fish is explained essentially by the increase of 52.5% in the production of turbot in the previous year, due to the resumption of business activity of the infrastructure dedicated to the production of this species. In contrast to the increase in production of turbot, the production of sea bream, sea bass and sole has decreased.

The Portuguese production can be distributed into four main segments. The most important (in terms of production weight) is based on production of other marine fish on growing namely, turbot and sole. The production techniques used are tanks and recirculation systems.

The second most important segment is the marine production of clam bottom culture, which is produced in bottom (small areas of land in intertidal zone, usually with less than 1 hectare).

The third segment is the production of sea bass and sea bream on growing in ponds and cages.

The fourth segment is the oyster bottom culture in intertidal zones, normally using bags and tables.

Current production trends and main drivers (Trends and triggers)

Portugal is not self-sufficient in aquaculture produce and supplies of turbot, sole, sea bass, sea bream, oysters and mussels. All these species are mainly farmed, nevertheless, the volume of production is not enough, and so, there is a dependence of imports to market supplies. In the case of sea bass and sea bream, the primary production, is mostly to internal market, however it seems the oysters and mussels harvested in the system based on bottom culture and longlines, are mostly exported to France and other countries of EU. Turbot and sole are also exported to other EU countries.

The foreign market for organic mussels continues to be the principal destination of sales.

Employment in the turbot sector remains steady. The oyster sector continues to grow in production volume, value and employment.

Outlook

An increase in production is expected due to new production farms for mussels and oysters and also due the contribution of the production of a new farm for sole as well as with the expectation of increasing in turbot production.

However, the expansion problems continue. Availability of limited licenses and long delays in administrative management of applications, as well as the inexistence of Portuguese hatcheries, access to back credit and mortality and growth restriction due disease or parasites are some of the issues that more influence the difficulties in expansion.

The outlook for the increase of overall value is good. Looking forward for direct selling of shellfish products into new, high end markets occurring for oysters, and at the same time, rope mussel producers are beginning to benefit from new markets in EU.

4.21.2 Production and sales

Production has been steadily increasing over the years, namely in the marine and brackish water, with the contribution of finfish production (turbot) and shellfish production. By other hand, freshwater production has been decreasing, due to low acceptance of this kind of product in the national market and to competitiveness difficulties with other countries in external markets. Sales have been increasing over the years, but not in value. This is because of the sale prices of shellfish (mussels and clams) that are lower than the finfishes. Nevertheless, between 2009 and 2014, is to highlight the increase of 39% in weight and 26% in value in the marine sector.

Table 4.21.1 Production and sales for Portugal: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Sales weight (thousand tonnes)	***6.9***	***6.2***	***6.5***	***7.9***	***10.4***	***7.1***	***8.8***	*24%*	*17%*
Marine	3.0	2.4	2.5	3.8	5.7	2.5	4.6	*87%*	*39%*
Shellfish	3.2	3.3	3.3	3.5	4.1	4.0	3.8	*-5%*	*4%*
Freshwater	0.7	0.5	0.7	0.5	0.7	0.7	0.5	*-36%*	*-28%*
Hatcheries & nurseries	0.0	0.0	0.0	0.0	0.0	0.0	0.0		*0%*
Sales value (million €)	***41.0***	***36.5***	***41.7***	***55.1***	***57.5***	***50.4***	***49.5***	*-2%*	*5%*
Marine	16.8	12.5	16.1	24.0	33.8	21.0	26.2	*24%*	*26%*
Shellfish	22.5	22.9	24.1	28.9	21.9	27.6	21.3	*-23%*	*-12%*
Freshwater	1.7	1.2	1.6	2.1	1.7	1.8	2.0	*9%*	*20%*
Hatcheries & nurseries	0.0	0.0	0.0	0.0	0.0	0.0	0.0		*0%*

Source: EU Member States DCF data submission

4.21.3 Industry structure and employment

At the end of 2014, there were 1 428 licensed establishments in aquaculture to freshwaters, brackish and marine waters. This represents less 28 units in relation to 2013. In terms of total area, it is practically the same area than before, with average size of 3.1 hectares per aquaculture establishment[1].

As regards the type of production facilities, the structure remained the same, about 88.3 % for the production of bivalve molluscs in intertidal zones. Tanks and earth ponds for fish production accounted for 9.2% and floating structures (mainly for the production of bivalve molluscs) accounted 2.1 % of all licensed establishments[1].

Table 4.21.2 Structure of the Portuguese aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Structure (number)									
Total enterprises	*1,463*	*1,454*	*1,459*	*1,447*	*1,438*	*1,456*	*1,428*	*-2%*	*-2%*
<=5 employees	1,446	1,443	1,443	1,433	1,423	1,433	1,405	*-2%*	*-2%*
6-10 employees	11	7	9	9	9	13	14	*8%*	*45%*
>10 employees	6	4	7	5	6	10	9	*-10%*	*42%*
Employment (number)									
Total employees	2,347	2,306	2,320	2,300	2,431	2,452	2,357	*-4%*	*0%*
Male employees		2,024	1,889	1,824	1,947	1,951	1,878	*-4%*	*-3%*
Female employees		282	430	476	484	501	479	*-4%*	*10%*
FTE		1,227	1,228	1,733	1,735	817	799	*-2%*	*-41%*
Male FTE		1,085	1,004	1,378	1,477	689	648	*-6%*	*-42%*
Female FTE		142	224	356	257	128	151	*18%*	*-32%*
Indicators									
FTE per enterprise		0.8	0.8	1.2	1.2	0.6	0.6	*0%*	*-40%*
Average wage (thousand €)		7.5	7.2	7.2	8.4	15.6	12.9	*-17%*	*40%*
Labour productivity (thousand €)		13.3	10.0	22.6	18.1	13.0	30.3	*132%*	*97%*

Source: EU Member States DCF data submission

Distribution by gender shows a dominance of the male work force, representing 80% of total job. The representation of female workers has been increasing constantly until 2013. From 2013 to 2014 there was a decrease of 4% in the number of female's workers, but the evolution since 2009 shows an increase of 10%. In 2014, the total number of people employed in the Portuguese aquaculture sector was 2 357, corresponding to 799 FTEs.

The biggest change that is observed is in the enterprise's performance. This can be showed by the fall of FTEs between 2012 and 2014, when compared with total employees. The accommodation of economic and financial restrictions as well as more efficient processes induced a change of paradigm in employment. The partial time contracts are now, more common in big enterprises than in years before.

[1] Estatísticas da Pesca 2015. DGRM.

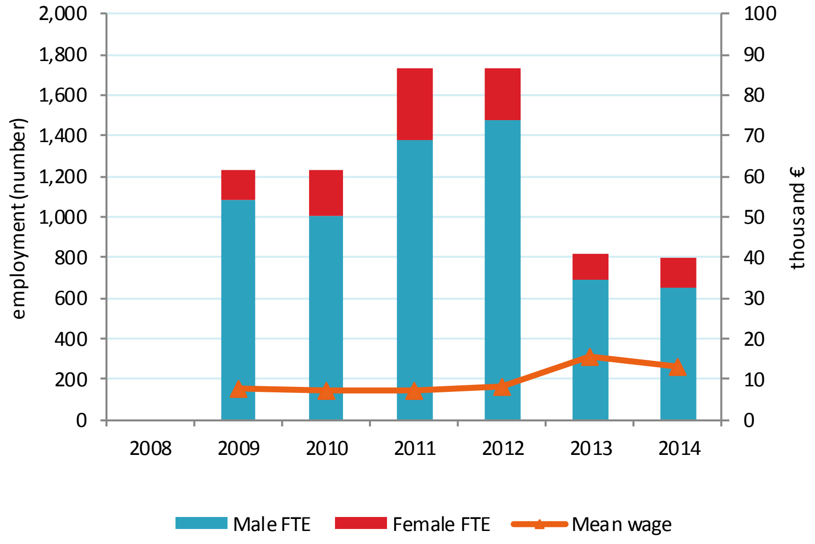


Figure 4.21.1 Employment trends for Portugal: 2008-2014.

Source: EU Member States DCF data submission

From 2013 to 2014, the number of employees decreased in 4%. Average FTE per enterprise has stayed the same from 2013 to 2014 but, as seen before, 40% of decrease is observed since 2009. The same evolution is observed for the indicators Average wage and Labour productivity, in which no change was register in the recent years. Yet, since 2009 was registered an increase of 8% and 9% in each, fixing in €12.9 thousands the average wage and in €30.3 thousands the labour productivity for 2014.

Total Income is composed by the sum of Turnover, Other Income and Subsidies. The high variation in Total Income is due the fluctuations observed in Other Income, namely in 2012 it was registered an unexpected value of €42 million mostly related to just one enterprise. However, the enterprises have managed to change the decreasing tendency of labour productivity from 2013 to 2014. The labour productivity is measured as gross value added per full time employee.

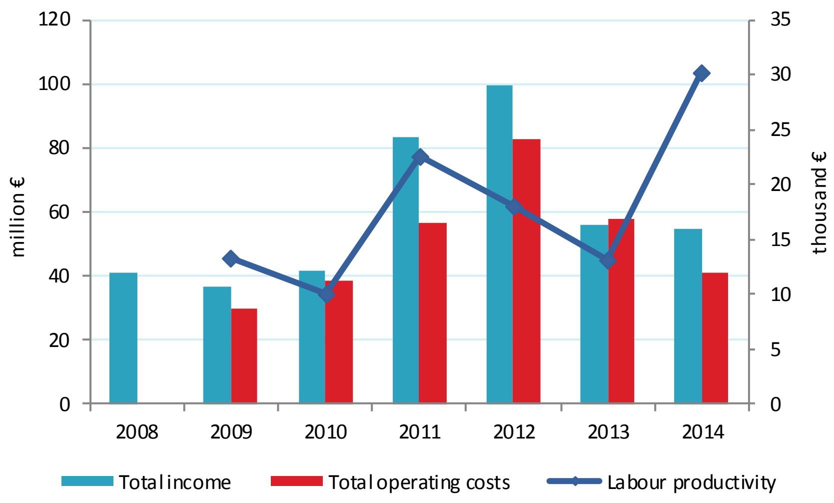


Figure 4.21.2 Income, costs, wages and labour productivity trends for Portugal: 2008-2014.

Source: EU Member States DCF data submission

4.21.4 Economic performance

From 2013 to 2014, total income decreased by 2% and the operational cost also decreased by 41%. The total income is dominated by the turnover from the sale of fish from the farms, which contributes 91% of total income.

Table 4.21.3 Economic performance of the Structure of the Portuguese aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	*% of total income*	Change 2014-13	Development 2014/(2008-13)
Income (million €)										
Turnover	41.0	36.5	41.7	55.1	57.5	50.4	49.5	*91%*	*-2%*	*5%*
Other income	0.0	0.0	0.0	28.2	42.3	5.4	5.0	*9%*	*-7%*	*-60%*
Subsidies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*	*0%*
Total income	*41.0*	*36.5*	*41.7*	*83.3*	*99.7*	*55.8*	*54.5*	*100%*	*-2%*	*-9%*
Expenditures (million €)										
Wages and salaries		7.0	7.1	9.5	8.6	11.7	9.3	*17%*	*-21%*	*5%*
Imputed value of unpaid labour		2.2	1.8	2.9	5.9	1.1	1.0	*2%*	*-3%*	*-63%*
Energy costs	2.0	3.4	2.2	3.6	5.8	5.0	4.6	*8%*	*-8%*	*25%*
Repair and maintenance		3.1	5.4	1.2	2.0	3.2	1.8	*3%*	*-43%*	*-40%*
Raw material: Feed costs	6.5	6.6	7.1	10.6	11.5	10.0	10.7	*20%*	*6%*	*22%*
Raw material: Livestock costs	0.0	6.0	12.2	14.7	19.4	25.0	11.3	*21%*	*-55%*	*-12%*
Other operational costs	12.2	1.0	2.6	14.1	29.5	1.9	2.0	*4%*	*3%*	*-80%*
Total operating costs	*20.7*	*29.5*	*38.3*	*56.6*	*82.9*	*57.9*	*40.6*	*74%*	*-30%*	*-15%*
Capital Costs (million €)										
Depreciation of capital		0.4	5.1	10.0	23.8	30.6	30.4	*56%*	*-1%*	*117%*
Financial costs, net		0.1	0.2	5.4	20.2	27.7	17.9	*33%*	*-36%*	*66%*
Extraordinary costs, net		0.7	0.1	0.0	0.0	0.0	0.0	*0%*	*0%*	*-100%*
Capital Value (million €)										
Total value of assets		188.3	223.8	246.2	262.6	268.9	265.5	*487%*	*-1%*	*12%*
Net Investments		172.1	179.1	3.2	15.8	22.8	29.6	*54%*	*30%*	*-62%*
Debt		79.9	121.0	7.0	14.9	16.6	6.4	*12%*	*-61%*	*-87%*
Input & Production (thousand tonnes)										
Raw material: Feed	8.2	7.6	7.3	3.9	8.1	6.3	6.2		*-3%*	*-11%*
Raw material: Livestock	0.1	0.2	0.5	0.7	0.1	0.1	0.2		*59%*	*-20%*
Performance Indicators(million €)										
Gross Value Added		16.3	12.3	39.1	31.4	10.7	24.2	*44%*	*127%*	*10%*
Operating cash flow		7.1	3.4	26.7	16.9	-2.1	13.9	*26%*	*776%*	*34%*
Earning before interest and tax		6.6	-1.6	16.7	-7.0	-32.7	-16.5	*30%*	*50%*	*-358%*
Net profit		6.5	-1.8	11.3	-27.2	-60.4	-34.3	*63%*	*43%*	*-140%*
Capital productivity (%)		8.6	5.5	15.9	12.0	4.0	9.1		*130%*	*-1%*
Return on Investment (%)		3.5	-0.7	6.8	-2.7	-12.2	-6.2		*49%*	*-493%*
Future Expectation Indicator (%)		91.2	77.8	-2.8	-3.1	-2.9	-0.3		*90%*	*-101%*

Source: EU Member States DCF data submission

The expenditures are dominated by raw material (feed costs and livestock costs) with 20% and 21% respectively and cost of wages and salaries (17%), of total income in 2014.

From 2013 to 2014 all the expenditures has increase with the exception of Wages and Salaries. Concerning other expenditures related with labour, cost imputed value of unpaid labour has been decreasing over the period 2009-2014. The total expenditures are 74% of the total income.

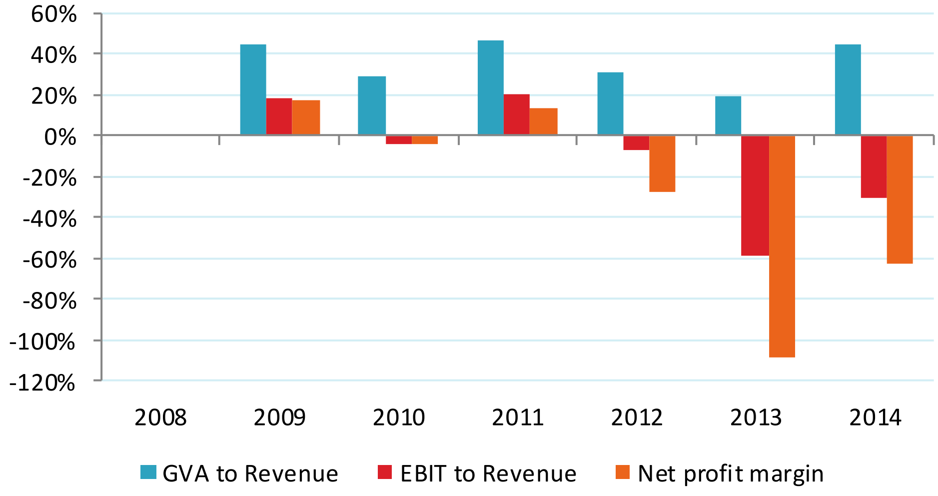


Figure 4.21.3 Economic performance for Portugal: 2008-2014

Source: EU Member States DCF data submission

The gross value added for the whole sector as increased 44% from 2013 to 2014. Both EBIT and net profit are negative since 2012. Those values are due the appearing of a big enterprise in 2009. The activity of this enterprise changed the overall cost structure of the sector. Despite this unbalance, appears that the sector had an improvement in the last year, with 50% and 43% of increase in EBIT and net profit. The total value of assets and debts decreased 1% and 61%, respectively. The net investment increased 30%, since 2013 to 2014.

The most significant cost for this paradigm shift has been the depreciation of capital. The feed and livestock costs as well as wages and salaries are the others variables more relevant.

4.21.5 Main species produced and economic performance by segment

The production in Portugal is dominated by four main segments. The most important (in terms of production weight) is based in the production of other marine fish on growing (turbot and sole). The production techniques used are tanks and recirculation systems.

The second most important segment is the marine production of clam, which is produced in bottom, in small areas of land in intertidal zone, usually with less than 1 hectare.

The third segment is sea bass and sea bream on growing in ponds and cages.

The fourth segment is the oyster bottom culture in intertidal zones, usually using bags and tables.

In Portugal, the aquaculture production based in land for other marine fish, as turbot and sole, is mainly located in the central region of Portugal. Bottom clam culture is now mainly confined to estuaries and lagoons zones due to a lack of wild seeds supply. Bottom oyster culture, also appears in estuaries and lagoons zones. Mussel in long line appears in south region located in open sea. The marine productions of sea bass and sea bream in earth ponds and cages are located both near the coast and in open sea in Portuguese continental coast and in Madeira.

Exports represent 33% of total sales production. Exports of aquaculture products consist mainly in turbot sales (91%) and in mussel sales (6.3%)[2].

The main species produced in Portugal is turbot, which represents 30% of the total volume and 27% of total value of production. The second most important species in weight is grooved carpet shell, which represents 26% of the volume and 41% of the value total production. Sea bream and sea bass represent together 21% of total production weight and 24% of total value. At least, is important to mention that the oysters production (*Crassostrea angulata, Crassostrea gigas and Ostrea edulis*) has appear with higher relevance in 2014 with 9% in weight and 7% in value.

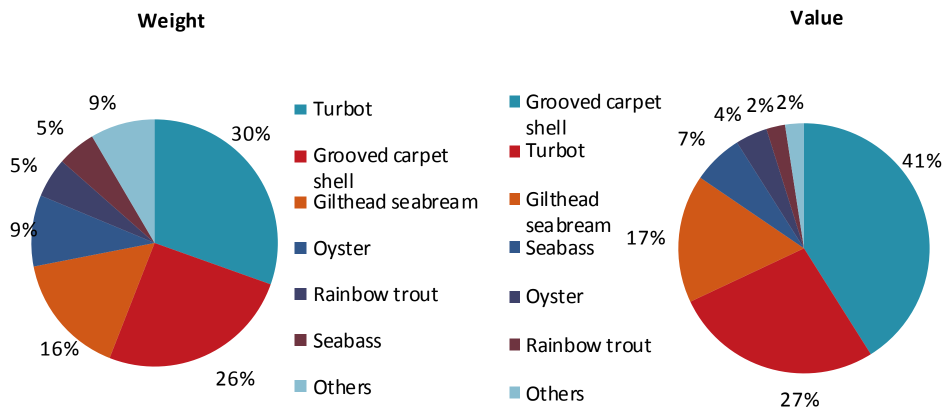


Figure 4.21.4 Main species in terms of weight and value in Structure of the Portuguese production: 2014.

Source: EU Member States DCF data submission

The average price of turbot has been decreasing since 2010 essentially due to the increase in the production over the last years, as well as the sale of fishes with smaller size. The sea bass and sea bream prices have slightly increased in the last year. For the rainbow trout the prices has decreased since 2012. Concerning the average prices for oysters group since 2009 that the average price have been increasing, and recently a slightly break is observed.

The average price of clam presents variations, due to greater or lesser suffering of this product in the market. This type of extensive production depends on the availability of seeds on the natural environment as well as the environmental conditions. The emergence of diseases and parasites also influence the extensive productions.

[2] Estatísticas da Pesca, 2015. DGRM.

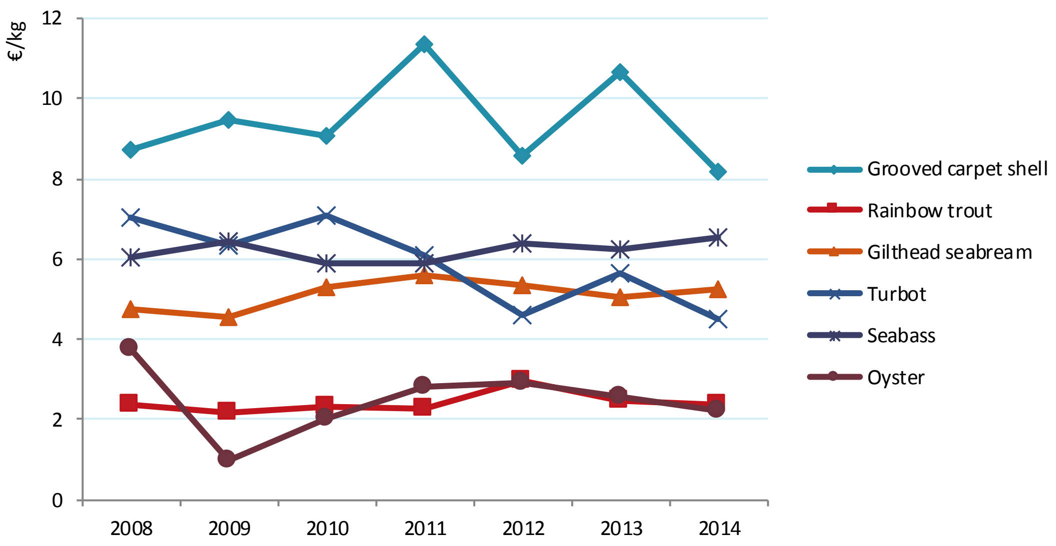


Figure 4.21.5 Average prices for the main species produced in Portugal: 2008-2014.

Source: EU Member States DCF data submission

The most relevant segments in the Portuguese aquaculture are evaluated below.

Segment 1: Other marine fish on growing

The most important segment is other marine fish on growing. The techniques used recirculation systems on tanks. The product from theses farms is mainly turbot and sole. The segment consists of 10 production farms. The production volume was 2 736 tonnes with a corresponding value of €12.6 million. The production volume accounts for 31% and the value accounts for 28% of the total Portuguese production.

Segment 2: Clam bottom

The second most important segment is the clam bottom farms producing Grooved Carpet Shell. In 2014, there were 1 269 farms. The production volume was 2 135 tonnes with a value of €17.1 million. The segment covers 24% of the volume and 38% of the value of total Portuguese production.

Segment 3: Sea bass and Sea bream on growing

The main species produced in this segment are Sea bass and Sea bream in ponds and cages, merge the segments 3.2 and 3.4. In 2014, there were 46 farms in this segment. The production techniques are semi-intensive and intensive in open systems. The production volume was 1 870 tonnes with a corresponding value of €13.5 million. The segment covers 21% of the volume and 24% of the value of total Portuguese production.

Segment 4: Oyster bottom

In 2014, the segment has 58 farms, and the production was 883 tonnes with a corresponding value of €2.7 million. The segment has increased in last year's, and actually covers 10% of the volume and 6% of the value of total Portuguese production.

From Figure 4.21.6 it can be seen that, from 2013 to 2014, the turnover from the Portuguese aquaculture sector has been increasing, along with the sales volume. The total value of assets and the total number of FTE has decreased.

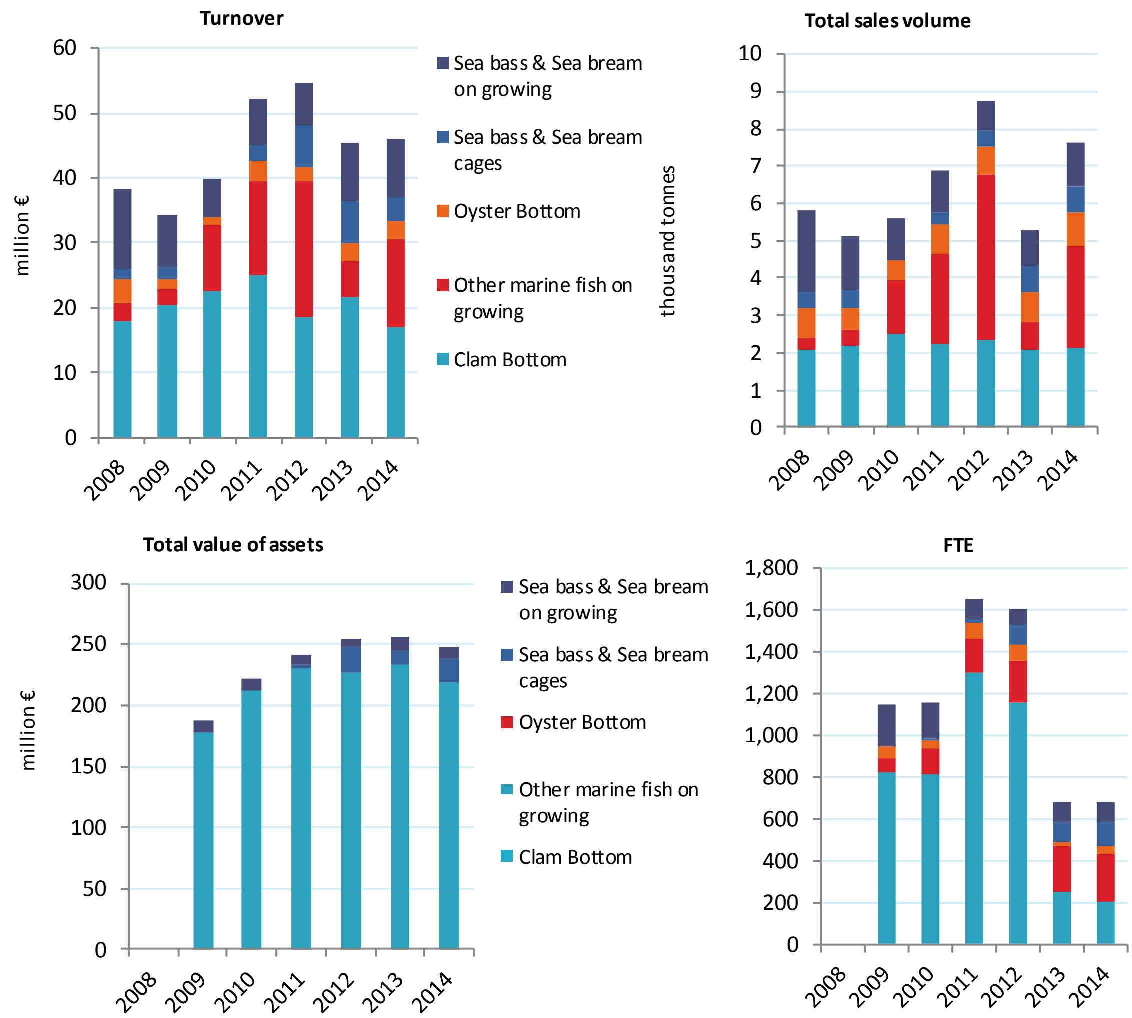


Figure 4.21.6 Structural development Structure of the Portuguese aquaculture sector: 2008-2014.

Source: EU Member States DCF data submission

In Table 4.21.4 and Figure 4.21.7, the economic performance of the four Portuguese segments is shown. From the table it can be seen that in 2014 the gross value added is positive for the four segments. But net profit and EBIT are negative for other marine fish on growing, from 2008 to 2014 and to Sea bass and Sea bream on growing for 2014.

Table 4.21.4 Economic performance of main Structure of the Portuguese aquaculture segments: 2008-2014 (in million €).

Variable	2008	2009	2010	2011	2012	2013	2014	% of total income	Change 2014/13	Development 2014/(2008-13)
Clam Bottom										
Total income	18.1	20.4	22.7	25.0	18.6	21.8	17.1	100%	-21%	-19%
Gross Value Added		19.3	22.0	24.2	17.8	21.0	16.4	96%	-22%	-21%
Operating cash flow		15.3	18.4	17.0	10.9	18.3	14.4	84%	-22%	-10%
Earning before interest and tax		15.3	18.4	17.0	10.9	18.3	14.4	84%	-22%	-10%
Net profit		15.3	18.4	17.0	10.9	18.3	14.4	84%	-22%	-10%
Total sales volume (thousand tonnes)	2.1	2.2	2.5	2.2	2.4	2.1	2.1		3%	-5%
Other marine fish on growing										
Total income	2.8	2.6	10.0	42.4	62.9	10.0	17.5	100%	75%	-20%
Gross Value Added		-5.3	-10.2	6.2	15.2	-8.5	3.9	23%	146%	842%
Operating cash flow		-6.7	-12.3	3.6	11.7	-12.8	0.4	3%	103%	113%
Earning before interest and tax		-6.7	-16.7	-4.3	1.2	-23.5	-10.8	-62%	54%	-8%
Net profit		-6.7	-16.8	-9.3	-5.6	-32.3	-17.7	-101%	45%	-25%
Total sales volume (thousand tonnes)	0.3	0.4	1.4	2.4	4.4	0.8	2.7		256%	68%
Oyster Bottom										
Total income	3.5	1.6	1.2	3.2	2.2	2.8	2.7	100%	-1%	15%
Gross Value Added		1.1	0.9	3.0	2.0	2.6	2.5	91%	-5%	29%
Operating cash flow		0.8	0.5	2.6	1.6	2.4	2.1	78%	-11%	35%
Earning before interest and tax		0.8	0.4	2.6	1.6	2.4	2.1	78%	-11%	37%
Net profit		0.8	0.4	2.6	1.6	2.4	2.1	78%	-11%	37%
Total sales volume (thousand tonnes)	0.8	0.6	0.6	0.8	0.8	0.8	0.9		13%	25%
Sea bass & Sea bream cages and Sea bass & Sea bream on growing										
Total income	14.0	9.9	6.1	9.8	13.1	16.1	13.5	100%	-16%	18%
Gross Value Added	0.0	0.7	-0.6	4.2	-3.2	-5.5	1.1	8%	120%	249%
Operating cash flow	0.0	-2.0	-2.7	2.8	-5.7	-8.5	-1.8	-14%	78%	32%
Earning before interest and tax	0.0	-2.2	-2.3	1.7	-15.1	-22.8	-15.1	-112%	34%	-123%
Net profit	0.0	-2.3	-2.4	1.4	-25.4	-37.3	-23.3	-172%	38%	-112%
Total sales volume (thousand tonnes)	2.6	1.9	1.1	1.4	1.3	1.7	1.9		11%	11%

Source: EU Member States DCF data submission

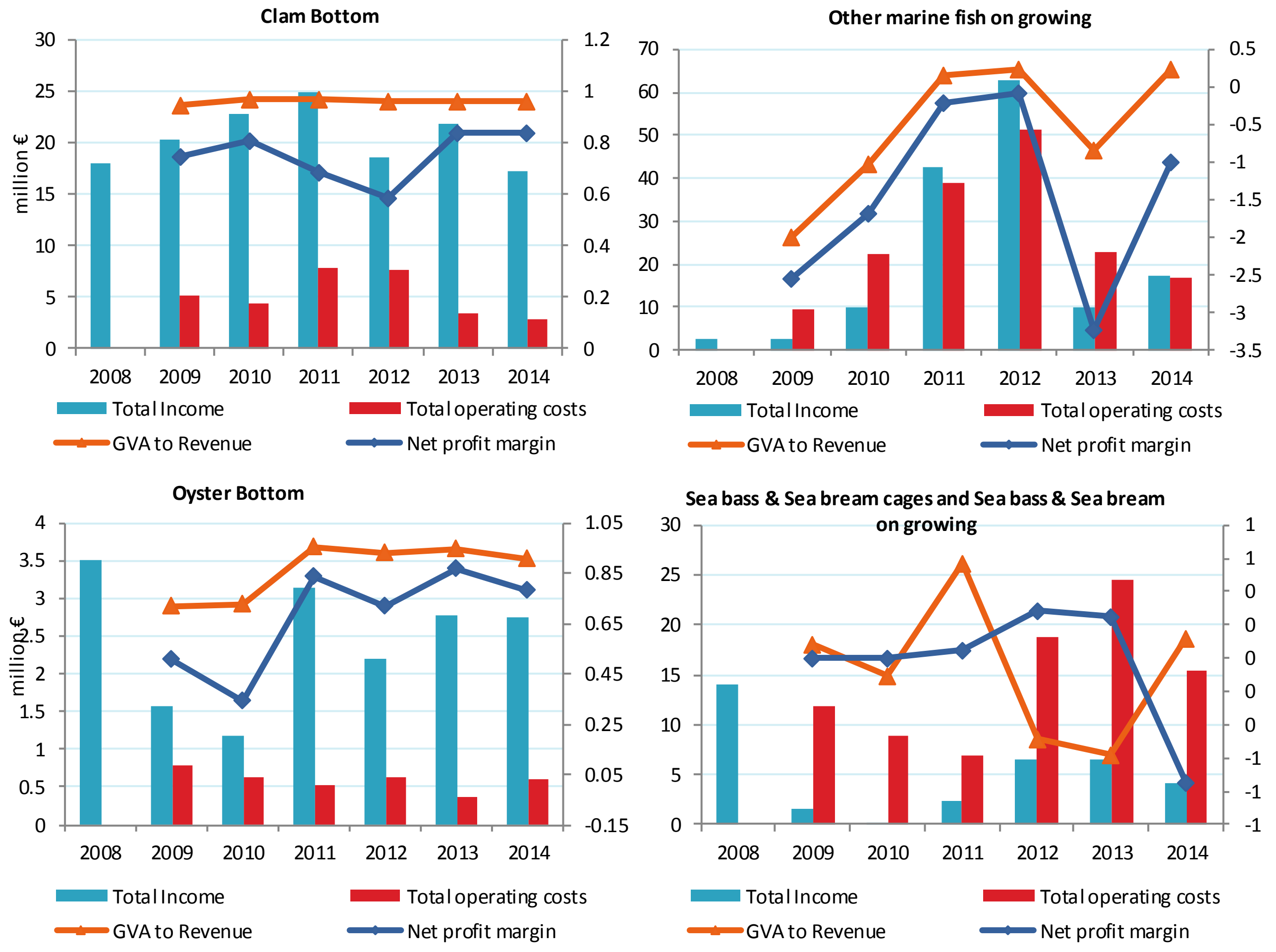


Figure 4.21.7 Economic performance indicators for the main Structure of the Portuguese segments: 2008-2014.

Source: EU Member States DCF data submission

In Figure 4.21.8, the cost structures for the four Portuguese segments are presented.

Segment 1: Other marine fish on growing

Production in this segment is intensive (mainly turbot and sole). This segment, with only 10 enterprises, is the most relevant, having a turnover of about €13.5 million.

In this segment, one big enterprise with a greater investment unbalanced the costs structure, and the depreciation of capital has become the most significant cost.

Segment 2: Clam bottom culture

With 1 269 enterprises and a turnover of about €17.1 million, this is the second most relevant segment in Portuguese aquaculture. Enterprises are mostly small familiar units managed by the owner and their relatives. Bottom culture has a very low level of investments and operational costs are mostly wages and salaries.

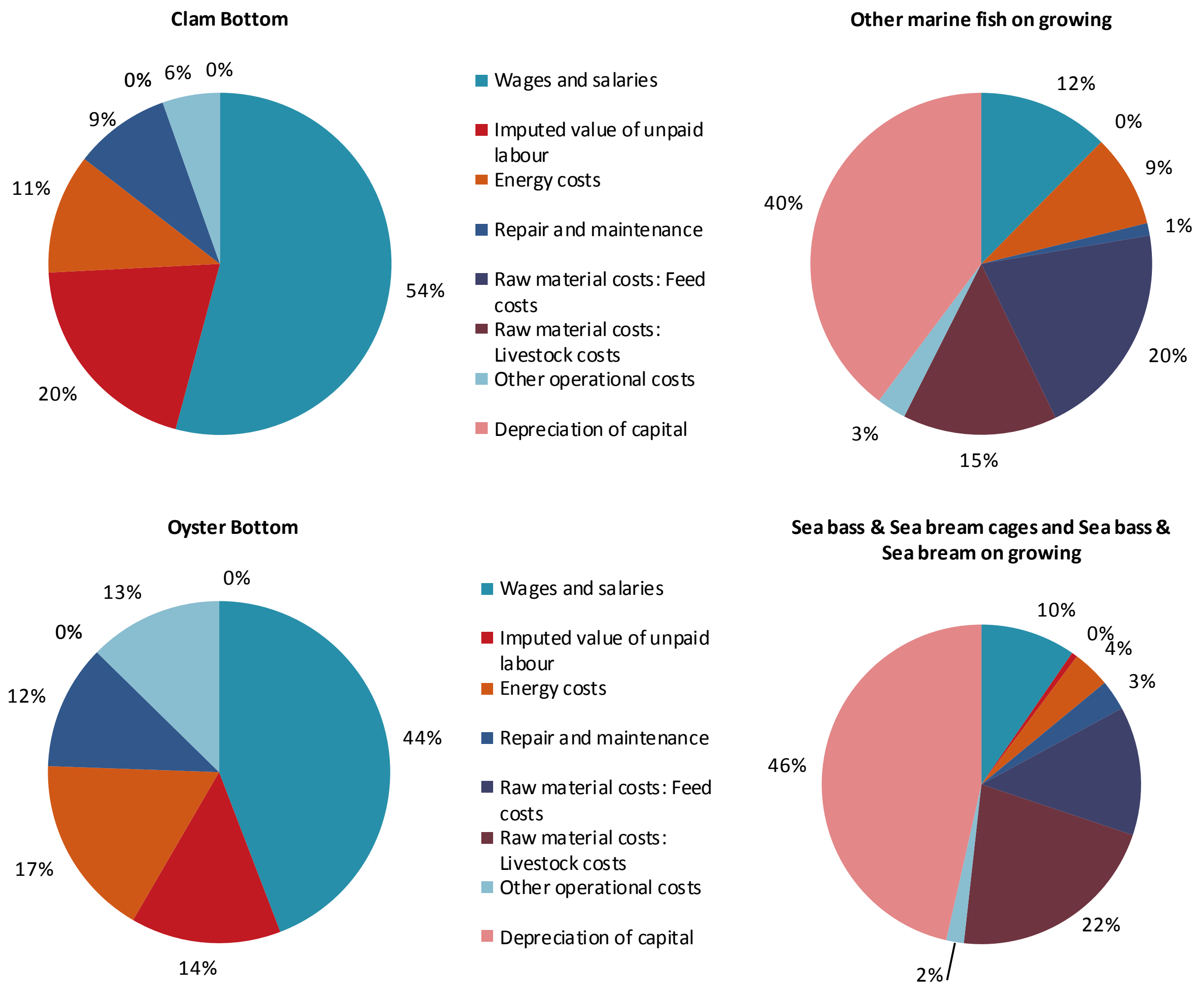


Figure 4.21.8 Cost structure of the main segments in Portugal: 2014.

Source: EU Member States DCF data submission

Segment 3: Sea-bass and Sea-bream on growing

Composed by 46 enterprises, this segment has a turnover of about €13.6 million. It is mostly characterized by traditional production using earth ponds with high maintenance costs and low production densities. The welfare of fish and the environment are taken in high regard and the final product is of high quality. Also included in this segment are 6 cages, characterised by high densities of fish and high livestock and feed costs. In 2014, the depreciation of capital and livestock costs have been higher than the maintenance ones.

Segment 4: Oyster bottom

Composed by 58 enterprises mostly in the centre of the country, this segment has sales value of around €2.7 million. The enterprises are mostly small familiar units run by the owner and its relatives. Bottom culture has a very low level of investments and operational costs are mostly wages and salaries. This segment includes mixed type establishments (extensive and semi-intensive system). In this segment, in some years, it may be occasionally happened some feed costs related to the fish production. The tendency is to this establishments turn in bivalve's monocultures.

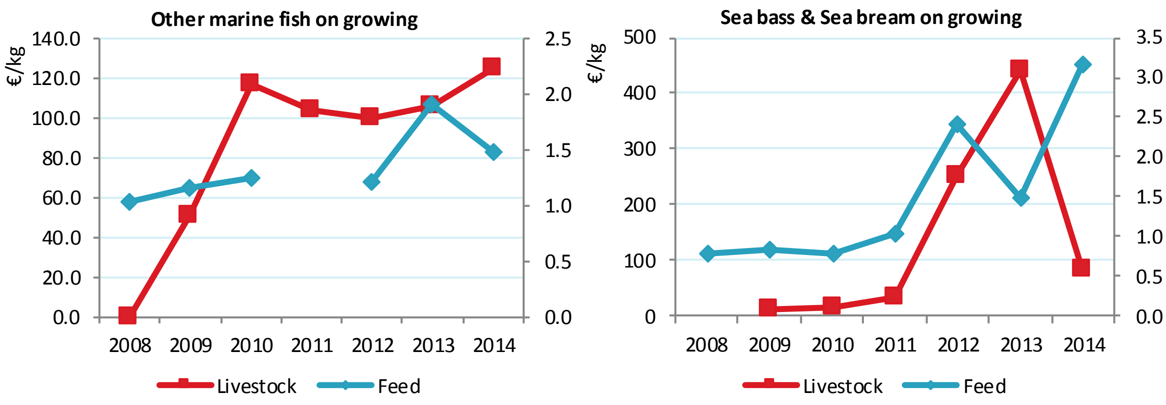


Figure 4.21.9 Feed and livestock prices for the main Structure of the Portuguese segments: 2008-2014.

Source: EU Member States DCF data submission

4.21.6 Trends and triggers

Current production trends and main drivers

The increase in production in 2014 was mainly because of finfish, especially turbot, sea bream and sea bass. Production is expected to grow in the next few years because new projects are under development. These new enterprises will produce mussels, oysters and sole.

Portuguese aquaculture is largely confined to open sea, estuaries zones and lagoons. Almost 90% of aquaculture facilities are located in public domain areas, based on 10-year private concessions, renewable for successive identical periods. Since 2015, it´s possible to aquacultures to upgrade the concession till 50 years. The enterprises are characterized by a great deal of extensive farming, largely family-based, that don't have an organized system of accountability.

The subsectors in the Portuguese aquaculture are related with the following production systems:

Extensive: The extensive production develops in areas between tides, called intertidal zones, with the cultivation of bivalve molluscs such as clams and oysters. These production units are included in segments 8.3 and 9.3. Most of the units are in the Algarve and Centre regions.

Semi-intensive: Included in segment 6.2, the earth ponds are the main production system for sea-bass and sea-bream in Portugal. Different farms uses various levels of stocking densities and pond sizes, but in general these are semi-intensive systems covering large areas with ponds ranging from one to several hectares and production levels from 0.5 to 6 Kg/m3 (mostly around 2 kg/m3) at the end of the production cycle. Although sea-bass and sea-bream are traditionally the target species produced in such ponds, there is commonly natural stocking from wild larvae of other fish species, including Senegalese sole. Previous attempts at on growing sole in ponds in a polyculture regime with sea-bass and sea-bream shows promising growth rates. Species in polyculture regime from different trophic levels have also been considered an efficient and environmentally sound strategy to minimize the impacts of aquaculture systems, because an important fraction of dissolved nutrients and organic matter is recycled within the pond. The difficulties faced by this type of aquaculture are largely related to its high production costs (mainly high labour costs and high land costs) that compromise its economic sustainability due to the low productivity of these systems. There is currently a trend of reconverting the culture practiced in the earth pounds from a fish culture to a mollusc culture, with the consequent decrease in the volume of sea-bass and sea-bream produced.

Intensive: Corresponding to segments 3.2 and 3.4, the intensive production in Portugal refers to the cultivation of turbot and sole. Since 2012 some new developments happened with the production of sole in recirculation systems and in intensive regime as well as the installation of a hatchery of sole. Production costs are high, but the selling price per kg compensates.

Investments in aquaculture are based on spatial planning, seeking not only to minimize possible conflicts with other users with an appetite for the same locations, but also compatible with other uses of the same space, in particular those involved in the conservation of ecosystems, with a view to the sustainable development of aquaculture practices. They will privilege environmental standards in the implementation of the physical structures, but, mainly, in the use of aquaculture production methods compatible with the protection and improvement of the environment. Investments to introduce improvements in management practices of production and marketing including through the intensification of new information and communication technologies are also encouraged. Structural modernisation is also being promoted within the current fisheries management plan. These objectives are consistent with those established by the EU in the Common Fisheries Policy, and particularly the 2002 Strategy for the Sustainable Development of European Aquaculture, which promotes environmental, economic and social sustainability. The intervention of the Fund was very important however the fact of not being able to compete for large enterprises has limited investment, innovation and use of new technologies as well as the presentation of new products for new markets. Reality denotes that SME's have not been able to match the expectations of the Commission nor the demands and market needs in terms of diversification of products and certification of production.

Production of sole with a new hatchery and on growing unit, currently producing sole and using and developing new techniques and diets.

There are some new pilot projects developing new techniques and new feed diets.

Production is expected to increase due to new production units, namely new offshore units for mussels, a new production unit for sole and the increase in production of turbot. The preview production of mussels, main introduces in the future a new segment.

National production is expected to grow in 2015-2020 due to the new production farms and the possible of investments supported by the EMFF.

Market structure

The Portuguese aquaculture is mostly based on bottom culture units, about 1300 establishments, with strictly family labour. With the definition of new aquaculture sites in open sea areas it is expected the emergence of new enterprises with logistical support or even aiming a restructuration in the national sector.

With the emergence in 2009 of a big company, the overall cost structure become greatly altered and irregular. The impact of this situation is still making impossible to have a correct cost structure.

Considerable investment was made in 2013 (open sea) that will have expected positive impacts in the next 5 years productions.

The need to differentiate Portuguese products represented a way to the certification of the national production. In this moment we have two farms of mussel with certification, namely for organic aquaculture production and Marine Stewardship Council (MSC).

The objective of national fisheries policy in regard to aquaculture is to increase and diversified production, in the sustainable mode, to improve the sector's competitiveness.

The processing and marketing of fishery products must respond to changing consumer trends and profiles, seeking to expand and diversify its business, adjusting it to market developments, betting on internationalization and joint control of marketing channels in order to enhance the ability to generate added value. To strengthen this capacity is essential to a strong focus on quality and innovation of processes and products, as well as in the introduction of improvements in the management and organization of enterprises.

Most aquaculture products are for national consumption; however the export sales are growing from 2012 to 2014 of 6% to 33% in the total of sales. Overall sales figures, when compared to the significant investments in aquaculture in the period 2007-2013, seem rather modest. Nevertheless, some investments (notably in a mussels and oysters farms which is about to begin operations) will bring returns in the longer term.

Issues of special interest

Many projects were conducted in order to improve new species, methods and technologies which contribute to the increase of the production and to the reduction of environmental impacts of semi-intensive and intensive aquaculture. The proportion of nutrients utilized for fish growth can be maximized, for example by selecting very digestible ingredients that facilitate nutrient assimilation and promote the improvement of FCRs (Feed Conversion Ratios), and at the same time reducing the amount of waste and nutrient output from fish farms (Black 2001, World Bank 2006). Eco-friendly feeds, in which fishmeal protein is replaced by vegetable protein sources, may also contribute to the reduction of aquaculture's ecological footprint by reducing the pressure on natural fisheries resources).

In intensive aquaculture we improved to use recirculation systems (RAS), and in semi-intensive and extensive system we are going to develop the use of multi-trophic system.

The target for the national aquaculture presents a strong growth in the next years, especially concerning the exploitation of new open sea areas and, with the support of European Fund for Fisheries and Maritime Affairs (EMFF), to achieve until 2023, an increase in productive capability of about 25 000 tons.

The significant increase are based in the identification and availability in the Atlantic coast in Mainland of new areas of aquaculture production in open sea, the rehabilitation of aquaculture areas of production in areas of estuaries, reaches and other wetlands and the betting in systems for intensive production and of multi-trophic system.

Outlook for future production trends

- National strategy on aquaculture

The Strategic Plan for the Portuguese Aquaculture is provided by reference with two strategic guidelines as follows:

National Strategy for Sea 2013-2020 (ENM 2013-2020);
Sustainable Development Strategy for European Aquaculture, matter of communication of the European Commission of the European Parliament and of the European Council

- The National Strategy for Sea 2013-2020 assumes the ocean as a vector of development established, among others, in the exploitation of marine resources aiming, among other objectives, to reinforce the economic potential of sea, to increase the contribution for the Gross Domestic Product and reinforce the national scientific and technological capacity.

The action plan to run this Strategy adopts as an objective under the aquaculture "the phenomenon of this activity in line with the consumption growth", in particular for the balance and alignment of production with the needs of consumption.

- To fill in the deficit in capture fisheries is one of the greatest goals of the European Union in order to reinforce the autonomy in terms of food supply, creating, at the same time, wealth and jobs creation.

- Portugal has natural conditions which, though with some limitations, are adequate to the development of this activity and leads the technology of production in species subject to occupy specific markets. Therefore, the development of the national aquaculture sector, as a way to satisfy an ever growing demand of capture fisheries and the creation of national wealth is a priority.

- Under this context, and considering the National Strategy for the Sea 2013-2020, as well as the strategic guidelines of the European Commission, the development of aquaculture in Portugal has the following guiding principles:

The sustainable exploitation of resources using adequate practices to the preservation of the environment;
The using of natural resources, in particular open sea spaces, coastal areas, estuaries, reaches and rivers with conditions to aquaculture, favouring the reusing of inactive areas;
The institutional involvement, in particular at the level of administrative structures, existing resources under the investigation and development, as well the incentives to private investment;
The reinforcement of consumer's confidence settled in food quality and food safety of the aquaculture products;
The maintenance and development of jobs and quality of life.

- The strategic approach to adopt intends to find solutions which allow overcoming the main constraints conditioning the national aquaculture sector in the period 2014-2020, and supporting the development of an intelligent and ecological aquaculture, competitive one capable of competing at a worldwide level and providing to consumers safe products and of high nutritional value.

- National strategic goal for 2014-2020 is to increase and diversify the offer of products from national aquaculture, based on principles of sustainability, food quality and food safety, to satisfy the needs of consumption and contributing for local development and for employment increase.

1. Main results to achieve

- The target for the national aquaculture presents a strong growth in the next years, especially concerning the exploitation of new open sea areas and, with the support of European Fund for Fisheries and Maritime Affairs (EMFF), to achieve until 2023, an increase in productive capability of about 25 000 tonnes.

- The significant increase are based in the identification and availability in the Atlantic coast in Mainland of new areas of aquaculture production in open sea, the rehabilitation of aquaculture areas of production in areas of estuaries, reaches and other wetlands and the betting in systems for intensive production and of multi-trophic system.

2. Main bases of strategic intervention

The interventions to reach the strategic goal for the aquaculture sector in Portugal are grouped in three axes, each one of which with specific goals and corresponding actions and/or projects to implement:

Simplify the administrative proceedings in order to reduce the deadlines and administrative steps needed for the licensing processing;

Facilitate the access to the space and water with the aim to identify spaces with water resources with higher potential for aquaculture and having lesser environment impact;

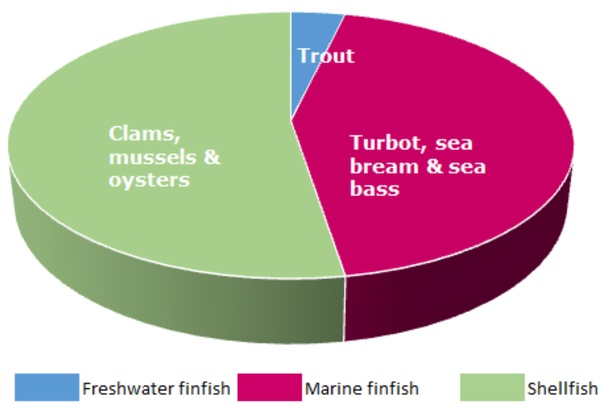
Reinforce the competitiveness of the aquaculture and promote equal conditions for the EU operators, with the aim to increase, diversify and value the national aquaculture production.

The actions foreseen in the National Strategic Plan are financed by EMFF funds registered in Priority 2 of the Operational Program 2014-2020, financial resources and areas of intervention identified in the following table:

- According to the Strategic Plan for the Portuguese Aquaculture (2014-2020), despite the relative abundance of water resources in Portugal, especially in marine or brackish water, industry growth rates are limited by the technical conditions and / or natural use existing resources, the spaces available for production and the availability of financing. This growth is also affected by the estimated increase in costs, particularly energy and feed. However, technological development will, in the coming years, enable, on the one hand, the use of spaces and water resources untapped or underexplored.

The summary of Portugal's multiannual national plan for the development of sustainable aquaculture (published in DGMARE page) shows the current situation:

Total volume (2013): 9 611 tonnes	*Portugal's contribution to EU aquaculture: 0.7% volume & 1.2% value*
Total value (2013): €53.8 million	



Main species	*Volume (t)*	*% of main species*
Trout	*772*	*8.0*
Turbot	*2 353*	*24.36*
Sea bream	*1 201*	*12.4*
Sea bass	*455*	*4.7*
Clams	*2 372*	*24.5*
Mussels	*1 547*	*16.0*
Oysters	*995*	*10.3*

Source of data: Eurostat

National Growth Objectives (2014-2020)

↑ Production volume from 10 317 tonnes to 35 000 tonnes in 2020 (239% increase in production capacity)

3. Response to the strategic guidelines

Simplify administrative procedures:

- Set up a website (http://eaquicultura.pt/) containing information related to application submission, analysis and follow up of the permitting and licensing procedures.

Simplification of legislation.

- Preparation of clearer administrative procedures for key areas identified as problematic by industry.

Coordinated spatial planning:

- Improving the legal and regulatory framework for aquaculture in Portugal.
- Development of existing instruments for territorial management.
- Identification and creation of new aquaculture production areas.

Enhance competitiveness:

- Increase in and diversification of production and supply of new products, including the installation of new units and / or modernization of existing ones.
- Investment in production methods to ensure high food safety standards.
- Research on offshore aquaculture, identifying coastal areas, species and suitable production systems;

Level playing field:

- Support for the creation, organisation and functioning of the Producer Organizations;
- Promoting partnerships between the sector, industry and distribution and marketing chains;
- Monitoring and improvement of statistical information.

4. Best practices

The Plan identifies a number of examples of best practice covering different species, production systems and scales, including:

Preservation of fresh water endemic species, which are threatened with extinction due to the variation of the flow of small rivers and streams of the south of Portugal.

Evaluate potential impacts on the production of clams due to environmental changes in Ria Formosa (Algarve).

- The Operational program of EMFF

The promotion of a competitive aquaculture, economically viable, socially and environmentally sustainable, will be supported by the Operational Programmer 2014-2020, with this Strategic Plan, ex-ante conditionality.

The vast majority of actions set out in this Strategic Plan will be financed through the EMFF funds in Priority 2 of the Operational Programmer 2014-2020.

The following table refers to the use of the EMFF funds provided for in Priority 2 to support the actions developed under the Strategic Plan.

EMFF USING THE OP 2014-2020

Intervention areas	Interveners	Resources of the EMFF
Planning Space and Access to Water	Public entities	€4 million
Productive investments	Aquaculture companies	€36.5 million
Research & Development	Sector Scientific and Technological	€7.5 million
Sustainability Activity	Public entities and Aquaculture Companies	€9 million
Training and Dissemination of Knowledge	Scientific entities, Training, Business and Sector Associations	€2 million

The EMFF contribution for the period 2014-2020, for sustainable aquaculture is €59 000 thousands, represents 15% of the total EMFF for Portugal.

The Strategic Plan for the Portuguese Aquaculture 2014-2020 (PEAP) and Operation Program (OP) PO MAR 2020 contain both a SWOT analysis, verifying that all points strong, weaknesses, opportunities and threats of the PEAP analysis is in SWOT OP. Consequently, the results of SWOT analysis within the PEAP are answered in the OP project, verifying that all the measures provided for in PO corresponding item in the main actions envisaged in the Strategic Plan for Portuguese aquaculture (PEAP).

The identification of the most suitable areas for the installation of aquaculture establishments and the development of the activity in line with the preservation of the environment may be supported by measures aimed at increasing the potential of sites aquaculture.

The needs identified in the SWOT analysis are in correspondence with intervention axes defined in PEAP, in particular with regard to the order spaces dedicated to aquaculture and public investment effort (especially in innovation) and private, in order to increase the domestic supply of aquaculture products quality. It should be noted that the simplification of the regulatory framework of aquaculture activity, although not subject to co-financing by the EMFF, it is an action of the Strategic Plan crucial to its success in the field of aquaculture.

In addition to the actions of the PEAP funded under Priority 2 of the OP 2014-2020 other actions relevant to the aquaculture sector may also be support object of this program through other priorities, particularly in terms of spreading the benefits of fish consumption and promoting the quality of aquaculture products, support for the establishment or operation of producer organizations and improve the tools for collecting statistical data.

As an expert do you consider these goals are reachable/realistic?

We have technical skills and natural conditions that allow us to make the investments and use the funds to forward the productive capacity express in PEAP.

However, we are recovering from a financial crisis, and we hope that it will not be repeated, because it was reflected in a decrease in the investment in aquaculture.

4.21.7 Data Coverage and Data Quality

Data quality

The account statistics for 2014 is based on a census on the 1 428 aquaculture farms. The operation is carried out annually between January and April.

The Portuguese Directorate General for Natural Resources, Security and Maritime Services (DGRM) has registered the total population of farms and enterprises engaged in aquaculture production in Portugal. It is mandatory for all aquaculture producers in Portugal to report the production in volume and value each year at the farm level. The operation of data collection was expanded in order to fulfil the needs of DCF and socio-economic data is now collected. The same operation fulfils the administrative needs for information, EUROSTAT and DCF. The data is collected at farm level.

While production data is mandatory, economic data is provided voluntarily. Answer rates vary accordingly to the type of unit, with bottom units having an answer rate of 46% and other units having an answer rate of 69%. The low rate of responses is a tendency in the last 3 years and the administration is enforcing the response with some administrative measures that include sanctions if production is not delivered one year and may include the removal of the license in case of non-response for 2 years.

Due to the low response rates, variables are estimated for the whole population and quality indicators calculated.

Data for the aquaculture sector is published once a year aggregated by type of unit and species. The aquaculture statistics are published on an annual publication, "Estatísticas da Pesca", in collaboration between DGRM and the Portuguese National Statistics Institute (INE) approximately 18 months after the end of the reference year.

Confidentiality

Confidentiality rules are applied when the number of units in a segment in less than 3. In this case units are aggregated, when possible, to a similar segment, under statistical evidence that both populations are homogeneous. When aggregation is not possible, data provided doesn't include the confidential values and may not include other values if it's possible to achieve the same information by subtracting totals to the known segments.

Differences in DCF data compared with other official data sources

Portuguese data collection uses the same base to provide information to Eurostat, FAO and DCF. Differences on the data result from the disaggregation requested by the data calls and the time of the year where data is provided. When data changes (new data is received or resubmission of data by some enterprises), new sets are compiled and disseminated to the different end users, accordingly to data revision policies. Other than this, differences between sources should not happen.

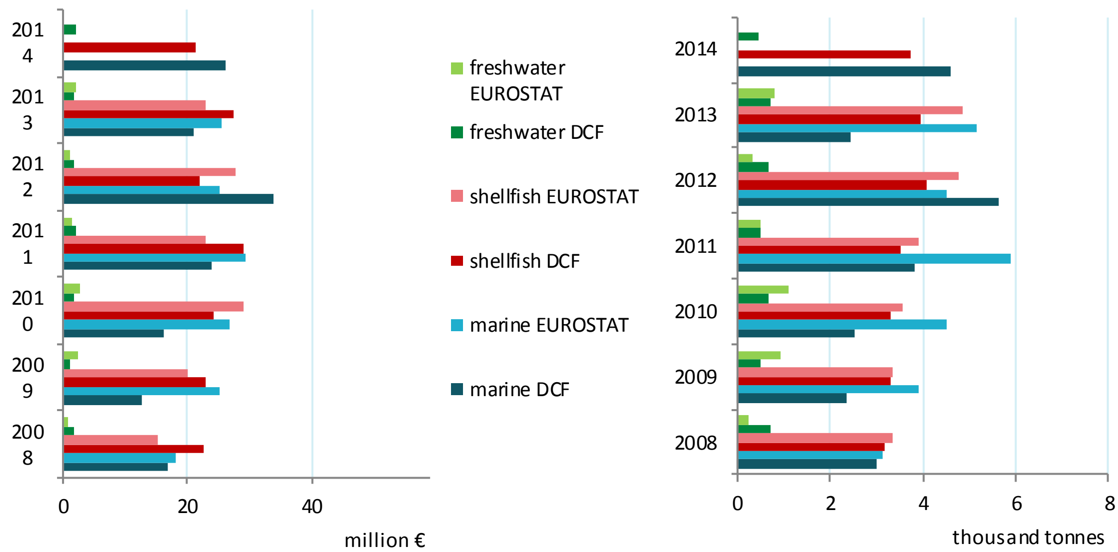


Figure 4.21.10 Comparison of DCF data with EUROSTAT data for Portugal: 2008-2014

4.22 Romania

4.22.1 Summary

Production volume and value

The Romania aquaculture sector produced 10 579 tonnes in 2014 which corresponded to an increase of 4% from 2013 to 2014. The total value of production was €19.1 million, corresponding with a decrease of 5% comparing with 2013. In 2014 compared with the period 2009-2013, the total volume increased by 9%, and the total value reduced by 4%. It should be mentioned that Romania started to collect data for fresh water aquaculture in 2009, due to the fact the marine aquaculture was missing – only one pilot farm for mussels at that time existed; this segment is still under development, the quantities produced are not at all significant in total production, comparing with the first one.

Overall industry structure and employment

In 2014, the total enterprises were 430. The Romania aquaculture sector is dominated by small enterprises with less than five employees. In recent years the proportion of small enterprises has increased, accounting for 71% of the Romania aquaculture industry in 2014.

Main segments

The production in Romania can be divided into four main segments. The largest segments are the land based farm for carp production. The first one is carp combined production, which consists of a combination of hatcheries, nurseries and on growing farms. The production in the land based farms is typically using the extensive technologies. The second most important segment is the carp on growing production, using the same technologies as for the first segment. The third segment is trout combined consisting of land based recirculation systems farms and tanks. The fourth one is trout on growing using the same techniques.

Current production trends and main drivers (Trends and triggers)

The expert advice in this section cannot be provided due to the absence of an expert from Romania at the experts meeting.

Outlook

The expert advice in this section cannot be provided due to the absence of an expert from Romania at the experts meeting.

4.22.2 Production and sales

After a period of volatility in the production during the period of economic crisis between 2009 and 2011, with a drastic decline of total volume from 12 863 tonnes in 2010 to 8 353 tonnes in 2011, in 2012 the aquaculture industry production has increase to 10 005 tonnes and has begun a stable trend that has continued during the period 2012-2014. The 10 579 tonnes obtained in 2014 represents an increase of 4% and 9% compared to 2013 and the period 2009-2013, respectively.

The total value of production had a similar evolution with a decline from €31.2 million in 2010 to €16.4 million in 2011, followed by an increase up to €18.1 million in 2012. This significant increase continued during 2013, but differently from the evolution of the quantities produced, the value of the production decreased a 5% in 2014 compared to 2013 and a 4% respect to the average value obtained between 2009 and 2013. The results of 2014 suggest a decline in the value of the production per kilogram of seafood produced compared with previous years.

Table 4.22.1 Production and sales for Romania: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Sales weight (thousand tonnes)		***7.3***	***12.9***	***8.4***	***10.0***	***10.1***	***10.6***	*4%*	*9%*
Marine			0.0	0.0	0.0	0.1	0.0	*-71%*	*-40%*
Shellfish		0.0	0.0	0.0	0.0	0.0	0.0	*28%*	*85%*
Freshwater		7.3	12.7	8.3	9.9	10.0	10.4	*4%*	*8%*
Hatcheries & nurseries			0.1		0.1	0.1	0.1	*36%*	*30%*
Sales value (million €)		***13.9***	***31.2***	***16.4***	***18.1***	***20.2***	***19.1***	*-5%*	*-4%*
Marine			0.0	0.1	0.1	0.2	0.1	*-59%*	*-19%*
Shellfish		0.1	0.0	0.0	0.0	0.0	0.0	*2%*	*11%*
Freshwater		13.8	30.9	16.2	18.0	19.7	18.7	*-5%*	*-5%*
Hatcheries & nurseries			0.3		0.1	0.2	0.3	*41%*	*52%*

Source: EU Member States DCF data submission

The percentage of freshwater species is more than 99% and few percentages of eggs and juveniles. In this context, the conclusion is the Romania aquaculture is not diversified.

4.22.3 Industry structure and employment

The analysis of the evolution and the structure of the aquaculture industry by enterprises, as presented in Table 4.22.2, reinforces the conclusions reached in the previous section regarding the production achieved and its value. The industry structure suffers significant changes between 2009 and 2011 both in terms of the number of enterprises and labour force.

In 2012 the total number of enterprises increased a 34.8% until 430, and it has remained stable during 2013 and 2014. Therefore, the evolution of the number of enterprises followed the same trend than the evolution of the production. Furthermore the number of companies in 2014 increased an 11% compared with the period 2009-2013. Considering the size of the enterprises of the industry, the 71.2% of them have five or less employees. The most significant aspect is that the increase of 10% in the number of enterprises of less than five employees in 2014 compared to 2013 is not a circumstantial situation. Instead, the number of enterprises with more than 10 employees has decreased a 24% in 2014 compared with the period 2009-2013, the number of enterprises with six to 10 employees decreased a 16%, and the number of enterprises with less than five employees increased a 32%. The conclusion that can be obtained from these data is that the Romanian aquaculture industry follows a trend in which the number of companies remains stable, but there has been a change in the structure thereof, with an increasing number of small enterprises and a reduction of the biggest producers. This evolution has significant implications in the employment.

Table 4.22.2 Structure of the Romanian aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Structure (number)									
Total enterprises		*315*	*444*	*319*	*430*	*427*	*430*	*1%*	*11%*
<=5 employees		170	227	212	281	280	308	*10%*	*32%*
6-10 employees		79	101	58	66	97	67	*-31%*	*-16%*
>10 employees		66	116	49	83	50	55	*10%*	*-24%*
Employment (number)									
Total employees		2,669	3,933	2,669	2,968	2,351	2,542	*8%*	*-13%*
Male employees		2,135	3,330	2,135	2,549	1,966	2,170	*10%*	*-10%*
Female employees		534	603	534	419	385	372	*-3%*	*-25%*
FTE		2,542	3,932	2,542	2,523	1,691	2,001	*18%*	*-24%*
Male FTE		2,065	3,330	2,065	2,210	1,465	1,722	*18%*	*-23%*
Female FTE		477	603	477	313	226	279	*23%*	*-33%*
Indicators									
FTE per enterprise		8.1	8.9	8.0	5.9	4.0	4.7	*17%*	*-33%*
Average wage (thousand €)		3.3	2.8	2.6	2.3	4.7	4.3	*-8%*	*37%*
Labour productivity (thousand €)		9.9	3.3	4.9	5.7	16.9	21.6	*28%*	*165%*

Source: EU Member States DCF data submission

The total number of persons employed in the Romania aquaculture sector in 2014 was 2 542, corresponding to 2 001 FTE. From 2013 to 2014, the number of employees increased an 8% with an increase of the 10% in the male employment, and with a reduction of the 3% in the female employment. This increase in the last year has been probably motivated by the significant increase in the total income experimented by the industry in 2013 and 2014, and that is analysed in the economic performance section. However, in the long term, and as a consequence of the increase in the number of small companies, the labour force has suffered a reduction of the 13% in 2014 compared with the period 2009-2013. This evolution has been particularly significant in the female employment which suffered a reduction of the 25% for the same period. In terms of FTE the reduction has been even stronger, what contribute to the argument of a reduction in the labour force of the industry.

This context of increase in the production, reduction of its value, and an increasing proportion of small companies, is reinforced by the labour indicators. As a consequence of the reduction in the size of the enterprises, the number of FTE per enterprise decrease a 33% in 2014 compared to the period 2009-2013. The stability in the production during the last years, despite the growing number of small businesses, has been achieved through the increase in the labour productivity per employee, which was really significant when comparing the €21.6 thousand in 2014 with the €8.1 thousand average during the period 2009-2013. The average wage has also remained stable since 2012. This evolution suggests that despite the reduction in the size of enterprises, the qualification of workers has not declined, what has helped to maintain the labour productivity.

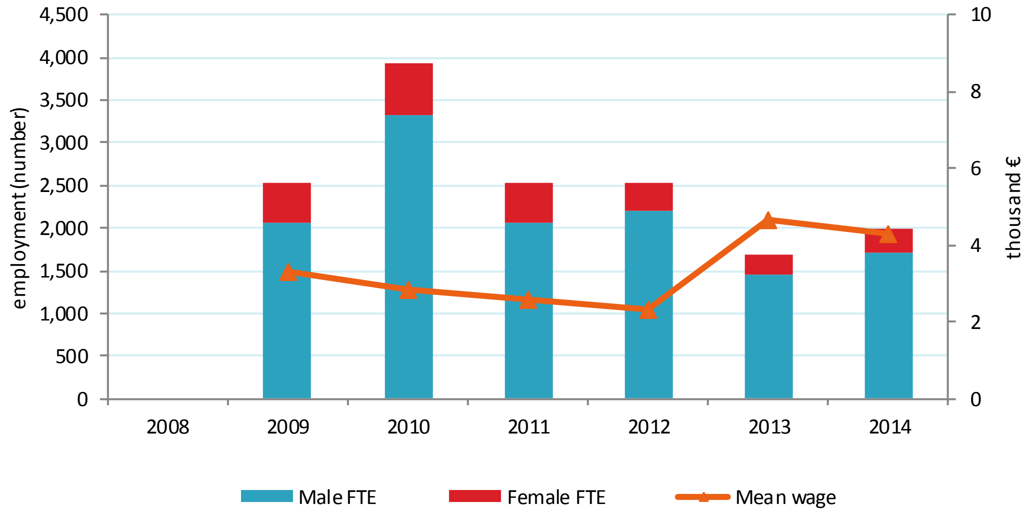


Figure 4.22.1 Employment trends for Romania: 2008-2014.

Source: EU Member States DCF data submission

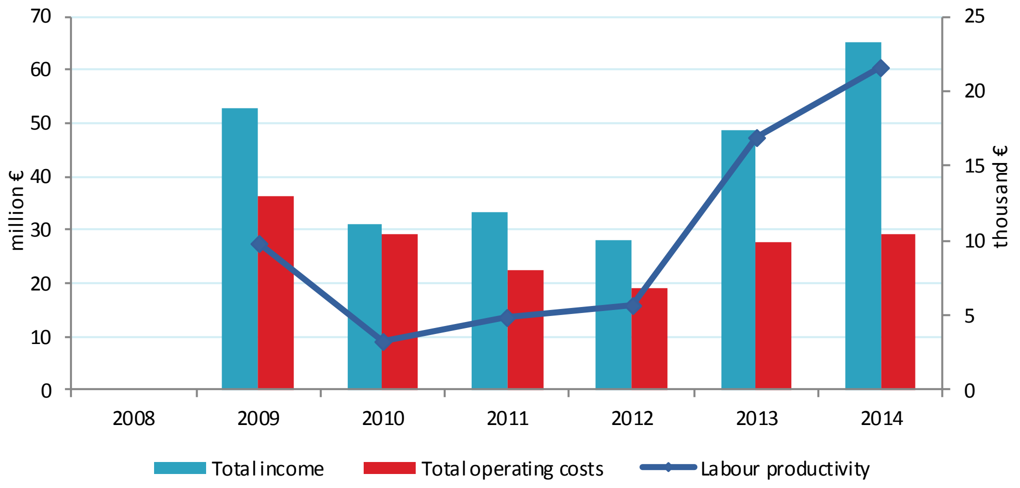


Figure 4.22.2 Income, costs, wages and labour productivity trends for Romania: 2008-2014.

Source: EU Member States DCF data submission

4.22.4 Economic performance

From 2009 the total income followed a negative trend from €52.7 million to €28 million in 2012. During this period the total income was dominated by the turnover from the sales of fish from the farms. Then the total income increased to €48.7 million and €65.1 million in 2013 and 2014 respectively. This strong increase of 68% of the total income in 2014 compared to the period 2009-2013 was possible mainly by an increase in the other income. While in 2012 the other incomes represented the 33% of the total income, this proportion increased to the 58% and 68% in 2013 and 2014 respectively. According to this data, the improvement in the income of the aquaculture industry for 2013 and 2014 may have been achieved thanks to the increase in other activities such as processing and marketing, which would be an indicator of increased integration of producers along the chain value.

Table 4.22.3 Economic performance of the Structure of the Romanian aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	% of total income	Change 2014-13	Development 2014/(2008-13)
Income (million €)										
Turnover		13.9	31.2	16.4	18.1	20.2	19.1	*29%*	*-5%*	*-4%*
Other income		38.8	0.0	11.9	9.3	28.2	44.4	*68%*	*58%*	*152%*
Subsidies		0.0	0.0	5.1	0.6	0.3	1.5	*2%*	*419%*	*26%*
Total income	*0.0*	*52.7*	*31.2*	*33.4*	*28.0*	*48.7*	*65.1*	*100%*	*34%*	*101%*
Expenditures (million €)										
Wages and salaries		7.5	10.8	6.4	5.7	7.6	8.4	*13%*	*11%*	*11%*
Imputed value of unpaid labour		1.0	0.3	0.2	0.2	0.3	0.2	*0%*	*-33%*	*-47%*
Energy costs		3.2	1.7	1.3	0.9	1.9	1.7	*3%*	*-8%*	*-4%*
Repair and maintenance		5.6	1.1	0.8	0.7	2.2	0.8	*1%*	*-61%*	*-60%*
Raw material: Feed costs		4.7	7.4	7.3	5.8	6.9	9.5	*15%*	*38%*	*48%*
Raw material: Livestock costs		4.6	5.4	5.2	4.9	4.4	4.5	*7%*	*2%*	*-7%*
Other operational costs		9.5	2.5	1.4	0.8	4.5	3.9	*6%*	*-14%*	*4%*
Total operating costs	*0.0*	*36.1*	*29.3*	*22.5*	*19.0*	*27.8*	*29.1*	*45%*	*5%*	*30%*
Capital Costs (million €)										
Depreciation of capital		2.8	3.8	3.3	2.7	5.6	5.2	*8%*	*-6%*	*44%*
Financial costs, net		0.4	0.8	0.1	0.2	0.3	0.2	*0%*	*-25%*	*-37%*
Extraordinary costs, net		1.3	2.1	0.0	0.2	0.2	0.2	*0%*	*-17%*	*-76%*
Capital Value (million €)										
Total value of assets		175.8	381.4	74.1	65.9	141.0	189.1	*291%*	*34%*	*13%*
Net Investments		15.9	19.7	3.5	9.9	52.5	5.5	*8%*	*-90%*	*-73%*
Debt		49.5	58.9	11.7	12.1	62.9	42.4	*65%*	*-32%*	*9%*
Input & Production (thousand tonnes)										
Raw material: Feed		11.0	27.8	6.9	12.6	12.3	19.5		*58%*	*38%*
Raw material: Livestock		3.4	5.0	3.1	3.6	2.2	2.1		*-6%*	*-40%*
Performance Indicators(million €)										
Gross Value Added		25.1	13.0	12.4	14.3	28.5	43.1	*66%*	*51%*	*131%*
Operating cash flow		16.6	1.9	10.9	9.1	20.9	36.0	*55%*	*72%*	*203%*
Earning before interest and tax		13.8	-1.9	7.6	6.4	15.3	30.8	*47%*	*101%*	*273%*
Net profit		13.3	-2.7	7.5	6.2	15.0	30.5	*47%*	*103%*	*288%*
Capital productivity (%)		14.3	3.4	16.7	21.7	20.2	22.8		*13%*	*49%*
Return on Investment (%)		7.8	-0.5	10.3	9.7	10.9	16.3		*50%*	*113%*
Future Expectation Indicator (%)		7.4	4.2	0.4	11.0	33.3	0.2		*-100%*	*-99%*

Source: EU Member States DCF data submission

The structure of the expenditures shows an increase of 5% in 2014 compared to 2013. The expenditure structure is typical from fish farming activities in which feed cost is the main component with the 33% of the total operating cost followed by the wages (29%) and the live stocks (16%). The low importance of the energy cost and the repair and maintenance cost is explained by the general use of extensive technologies. The reduction of expenditures in 2014 took place in most of the cost components, except wages, livestock cost and feed. This last cost increase was particularly relevant, not only by the total amount of the rise, but also because of the importance of this cost for the performance of the activity.

Regarding the capital value, together with the increase of the activity and the improvement of the incomes during 2013 and 2014, the total value of the assets also increased from €65.9 million in 2012, to €141 million in 2013 and €189.1 in 2014. The net investment have been positive during all the period considered. In was particularly significant the net investment developed in 2013, which helps to explain the increase in the depreciation of capital from €2.7 million in 2012, to €5.6 and €5.2 in 2013 and 2014 respectively. Also together with the investments in capital, the debt of the enterprises significantly increased from €12.1 million in 2012 to €62.9 million in 2013 and then was reduced to €42.4 million in 2014.

The gross value added for the sector as a whole increased by 51% and both EBIT and net profit was positive in 2014 and the double than in 2013. This positive evolution of the performance indicators had its origin not in an increase in the turnover, but in the significant increase in the other income.

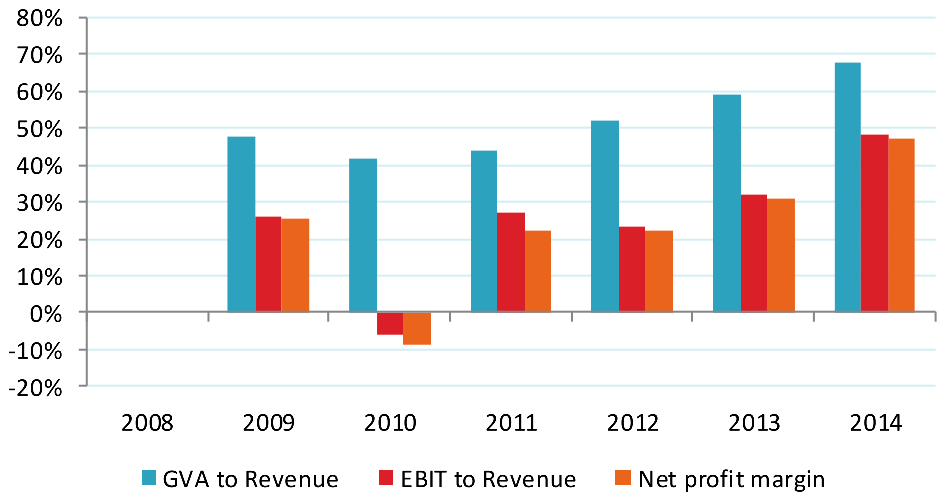


Figure 4.22.3 Economic performance for Romania: 2008-2014

Source: EU Member States DCF data submission

4.22.5 Main species produced and economic performance by segment

The aquaculture production in Romania is divided into four main segments. The largest segment is the land based production of combined carp, consisting in a combination of hatcheries, nurseries and on growing farms. The production in the land based farms is typically using the extensive technologies. The production techniques are used in primarily ponds, tanks and lakes. The second most important segment is the carp on growing production, using the same technologies as for the first segment. Also the production is based on similar techniques such as primarily ponds, tanks and lakes. The third segment is trout combined and eggs trout consisting of land based recirculation systems farms and tanks. The fourth one is trout on growing using the same techniques.

The land based fresh water aquaculture production is spread in the majority counties around the country on camp and hills. The trout production is located in counties near mountains were the farms are concentrated.

The main species produced in Romania are cyprinids and trout species in 2014, as it was also in the previous years. On the first place there are the cyprinids species family (common carp, silver carp, bighead carp) comprising 75% of the total volume produced. The second species is trout sharing 9%, followed by crucian carp with 11% of the total quantities produced. In terms of value, carps accounted for the 71% of the production turnover in 2014. Here, the importance of the common carp is even higher for the industry that in terms of production since nearly to the half of the total turnover is generated by this species. Also the rainbow trout is more important in terms of value. The value generated by the rainbow trout in 2014 achieved the 20% of the total turnover.

Figure 4.22.4 Main species in terms of weight and value in Structure of the Romanian production: 2014.

Source: EU Member States DCF data submission

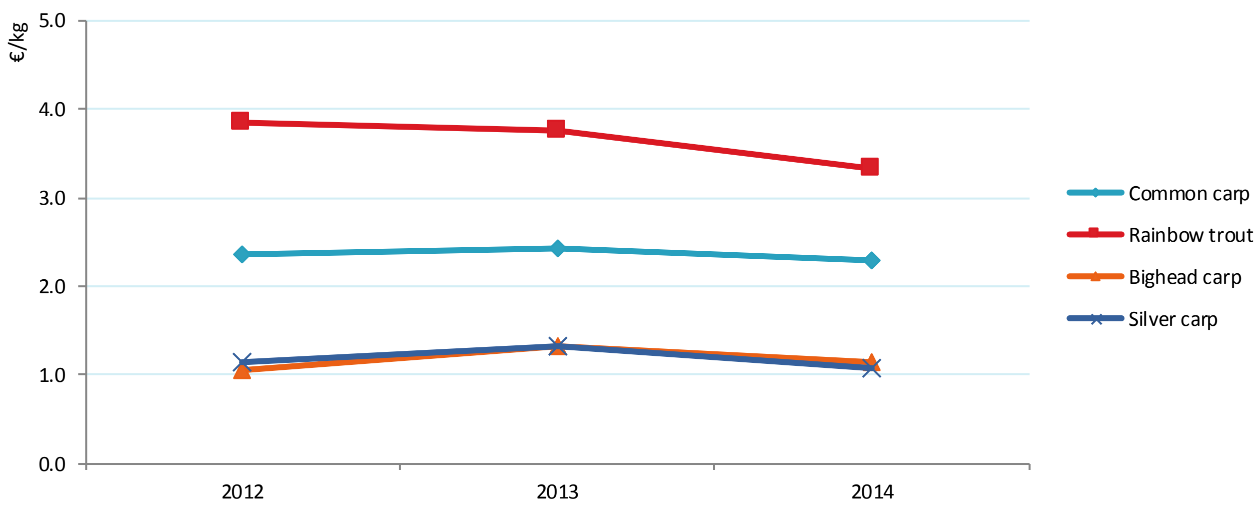


Figure 4.22.5 Average prices for the main species produced in Romania: 2008-2014.

Source: EU Member States DCF data submission

The Romania aquaculture sector is dominated by carp and trout species, both segments combined and on growing. The most relevant segments in the aquaculture are analysed below.

Segment 1: Trout combined

The trout combined is the less important segment in terms of quantities produced and employment compared with carps production. However, it represents a significant part of the industry in terms of value sue to its higher value at markets. The segment employed the equivalent to 220 FTE which represent the 11% of the total industry. The total value of asset achieved €9.9 million which is only the 5% of the total value of assets in the industry. This production structure produced a total volume in 2014 of 0.9 thousand tonnes that generated a turnover of €2.88 million. Trout combined produced only the 8.5% of the total quantities obtained by the industry. However, due to the higher market value of this species compared with carps, it achieved the 15% of the total turnover in 2014.

Segment 2: Carp on growing

This segment is focused in fating the individuals. The segment employed the equivalent to 609 FTE which represent the 30% of the total industry. The total value of asset achieved €20 million which is the 10% of the total value of assets in the industry. This production structure produced a total volume of 2.7 thousand tonnes in 2014 that generated a turnover of €3.89 million. Carp on growing produced the 25% of the total quantities produced in the industry, but only achieve the 20.3% of the total turnover in 2014.

Segment 3: Carp combined

The carp combined is the most important segment in the Romania aquaculture industry; land based fresh water farms, combining the production of hatcheries and nurseries with grow out farms. The segment employed the equivalent to 1 020 FTE which represent the 51% of the total industry. The total value of assets achieved €134.79 million, which is the 71.28% of the total value of assets in the industry. This production structure produced a total volume in 2014 of 6.5 thousand tonnes that generated a turnover of €10.89 million. This production represented the 61.5% of the quantities produced, but only the 56.9% of the value directly generated with the turnover generated.

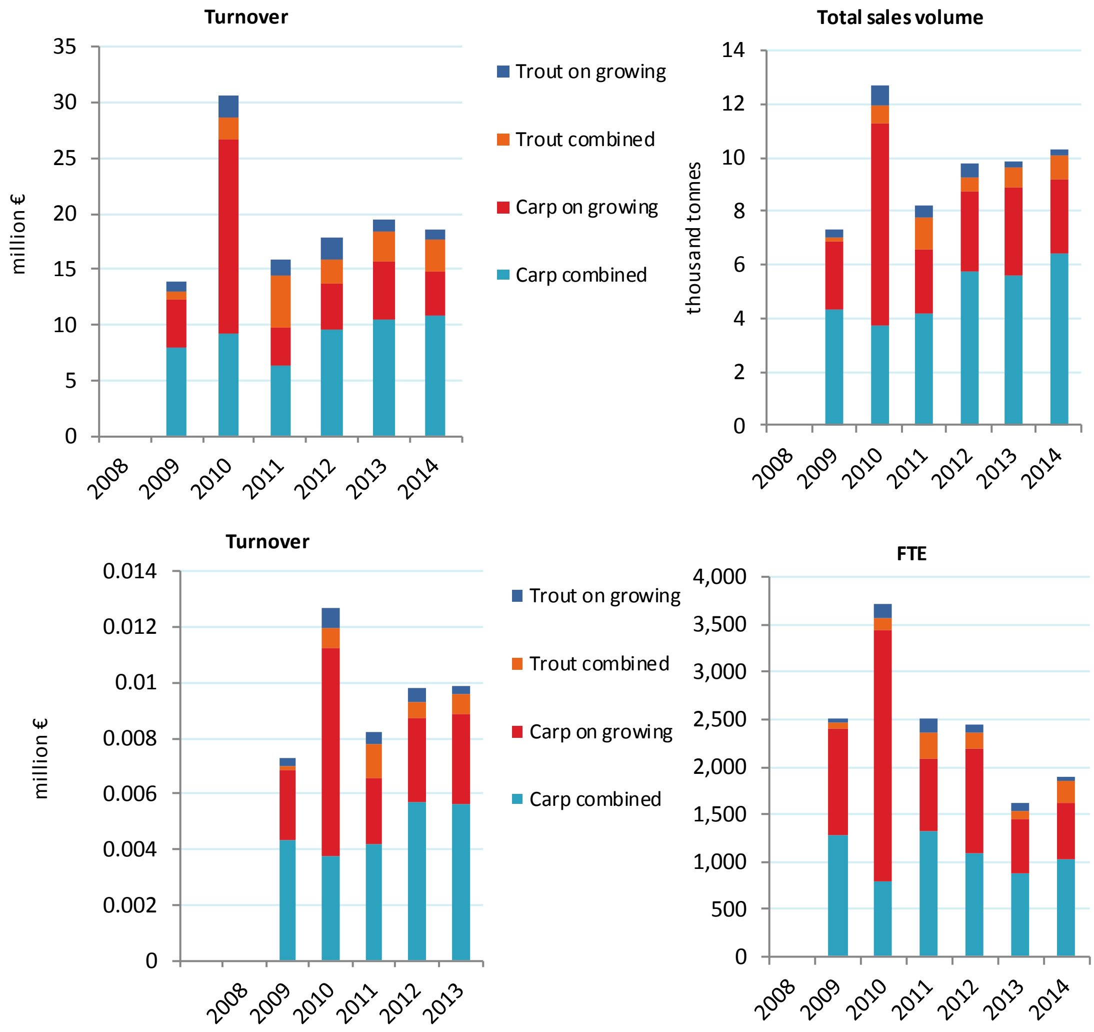


Figure 4.22.6 Structural development Structure of the Romanian aquaculture sector: 2008-2014.

Source: EU Member States DCF data submission

Segment 4: Trout on growing

The fourth segment is the trout on growing. The segment employed the equivalent to 50 FTE which represent only the 2.5% of the total industry. The total value of assets was €4.65 million which is the 2.4% of the total value of assets in the industry. In absolute terms of employment and assets, this segment is the smallest. But if the amount of assets per FTE is considered, trout on growing is the second segment behind carp combined but before trout combined and carp on growing. These data suggest that the trout on growing segment is more intensive in the use of technology. This production structure produced a total volume in 2014 of 0.3 thousand tonnes that generated a turnover of €0.87 million. These production represented the 2.84% of the quantities produced, but achieved the 4.5% of the value generated.

Table 4.22.4 Economic performance of main Structure of the Romanian aquaculture segments: 2008-2014 (in million €).

Variable	2008	2009	2010	2011	2012	2013	2014	% of total income	Change 2014/13	Development 2014/(2008-13)
Trout combined										
Total income		1.4	1.9	6.0	2.8	3.9	7.0	100%	77%	117%
Gross Value Added		0.8	0.9	3.2	1.3	1.6	3.9	56%	152%	155%
Operating cash flow		0.5	0.5	1.9	0.6	0.8	2.8	40%	247%	226%
Earning before interest and tax		0.4	-0.6	1.6	0.5	0.5	2.1	31%	364%	371%
Net profit		0.4	-0.7	1.5	0.5	0.4	2.1	30%	376%	388%
Total sales volume (thousand tonnes)		0.2	0.7	1.2	0.6	0.7	0.9		16%	26%
Carp on growing										
Total income		34.3	17.5	9.5	9.1	14.7	18.0	100%	22%	6%
Gross Value Added		21.7	9.0	0.7	5.9	8.3	14.5	80%	74%	58%
Operating cash flow		18.7	2.1	-1.8	3.9	5.6	12.3	68%	119%	116%
Earning before interest and tax		17.5	0.2	-3.3	3.1	3.5	11.5	64%	231%	176%
Net profit		17.3	-0.1	-3.4	3.0	3.5	11.5	64%	232%	184%
Total sales volume (thousand tonnes)		2.5	7.5	2.4	3.0	3.2	2.7		-15%	-26%
Carp combined										
Total income		14.7	9.3	15.4	13.7	23.1	34.1	100%	48%	124%
Gross Value Added		1.3	3.1	7.2	5.9	15.6	22.0	64%	41%	233%
Operating cash flow		-3.6	0.5	10.0	3.9	13.0	18.8	55%	44%	295%
Earning before interest and tax		-5.2	0.0	8.8	2.3	11.3	16.7	49%	47%	382%
Net profit		-5.3	-0.4	8.8	2.1	11.0	16.5	48%	49%	409%
Total sales volume (thousand tonnes)		4.3	3.8	4.2	5.7	5.6	6.5		15%	37%
Trout on growing										
Total income		1.5	1.9	1.8	2.1	1.8	2.5	100%	39%	42%
Gross Value Added		0.6	0.4	0.7	1.0	0.6	1.2	47%	101%	76%
Operating cash flow		0.5	-0.2	0.4	0.6	0.1	0.9	37%	573%	250%
Earning before interest and tax		0.4	-0.4	0.3	0.4	0.0	0.7	29%	2082%	460%
Net profit		0.4	-0.5	0.3	0.4	0.0	0.7	29%	1764%	563%
Total sales volume (thousand tonnes)		0.3	0.7	0.4	0.5	0.3	0.3		-6%	-40%

Source: EU Member States DCF data submission

The Figure 4.22.6 helps to understand the importance of each segment and the evolution in recent years. The combined carp is the most important segment both in terms of production structure (total value of assets and FTE) and production results (turnover and total sales volume). It is also possible to see that the trout combined segment is not much relevant when considering the production structure, but it becomes more relevant in terms of turnover.

As a general comment, all segments obtained positive performance indicators in 2014. In 2012, the combined segments suffered a strong reduction in the performance indicators, while the on growing segments experimented a positive evolution from negative results to positive indicators (See Table 4.22.4). During 2013 and 2014 there has been a positive trend in the performance indicators in all the segments. In the big picture of the Romania industry, this positive evolution in the performance indicators of the segments was not caused by a positive evolution in the turnover, but it took place due to a significant increase in the other incomes.

The most significant increase in the total income in 2014 took place in the combined segments. However, the on growing segments obtained a better evolution in the performance indicators, as the GVA to revenue and the net profit margin. The explanation to this context is in the evolution of the total operating cost, which increased with the total income in the combined segments, but suffered a reduction in the on growing segments. In this last case, the increase in the total income and the reduction of the operating cost, helped to improve these two performance indicators. The possible explanation to this situation can be in the nature of these other income. However, with the available data is not possible to know the economic activities that generated these incomes.

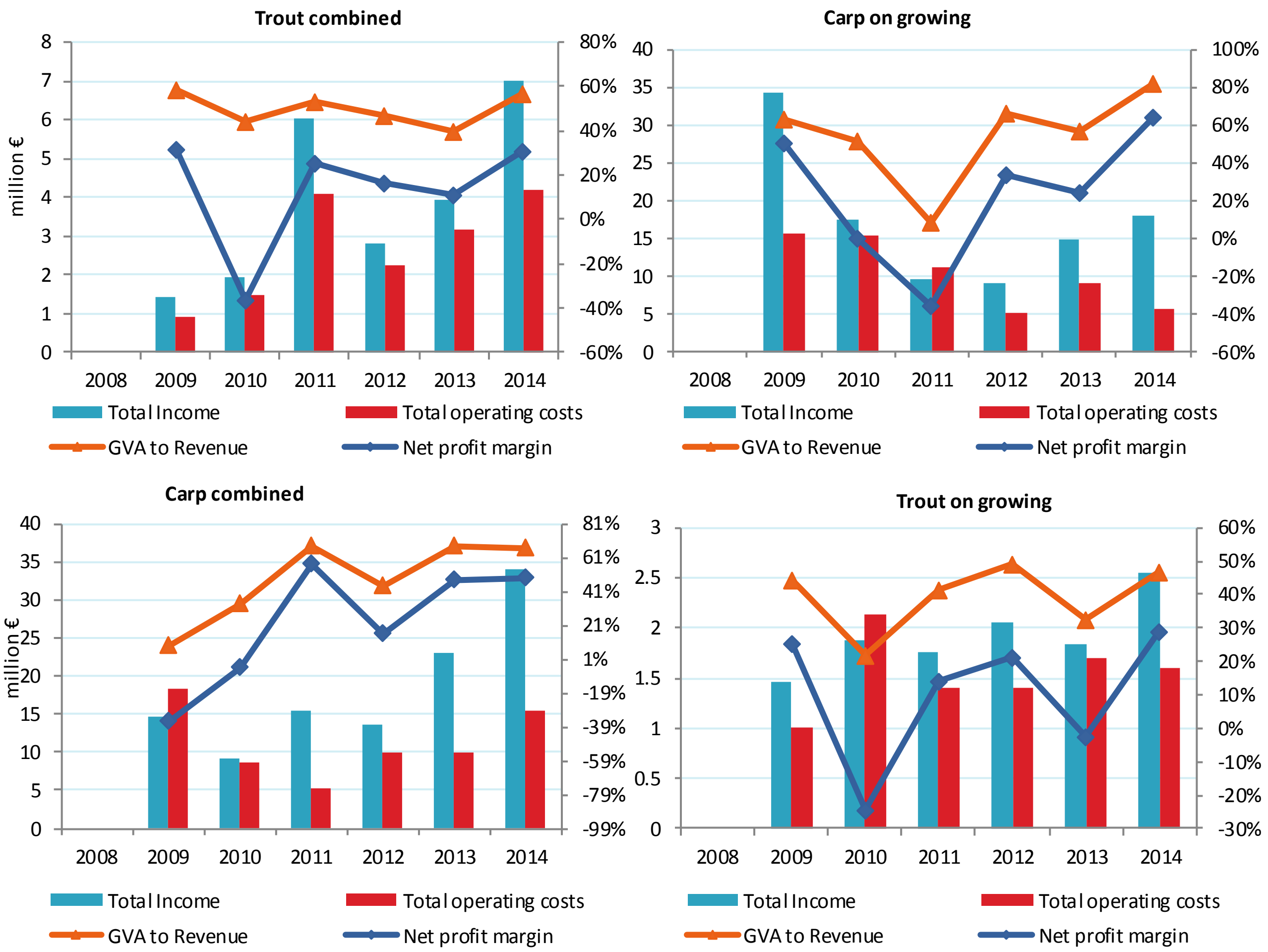


Figure 4.22.7 Economic performance indicators for the main Structure of the Romanian segments: 2008-2014.

Source: EU Member States DCF data submission

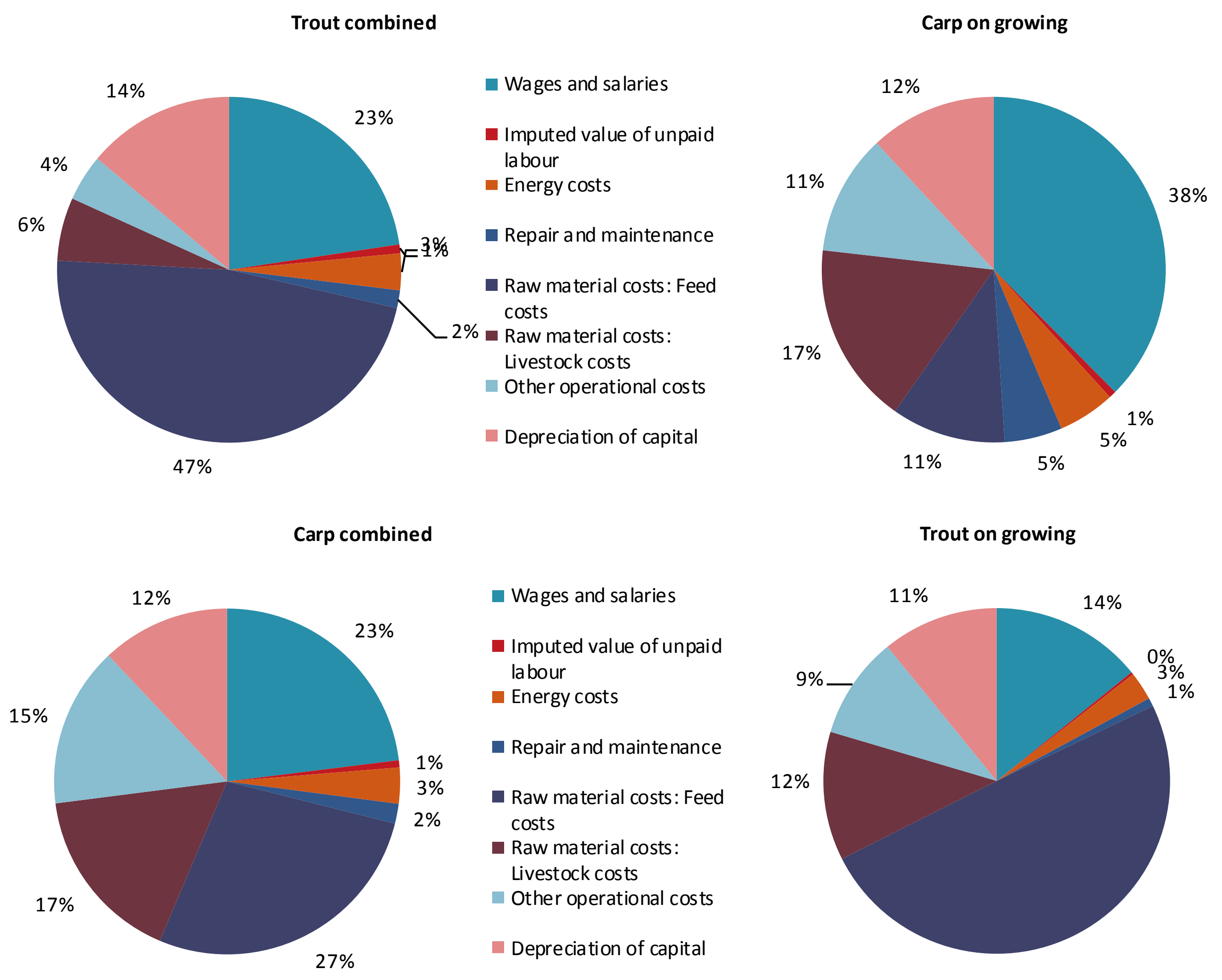


Figure 4.22.8 Cost structure of the main segments in Romania: 2014.

Source: EU Member States DCF data submission

In Figure 4.22.8 the operational cost structures for the Romania main segments in 2014 is presented. The vast majority of the aquaculture farms are located in open spaces and due to the extensive technologies the costs for energy, repair and maintenance, imputed value for unpaid labour were minimum 4% and maximum 11% in total costs structure, and depreciation of capital was between 11%-14% and other operational costs 4% to 11%. Meantime, the wages and salaries costs represent between 14% and 38% of the total costs. For the other elements of the costs structure the situation is as follow:

Segment 1: Trout combined: the feed costs are 47% and livestock costs 6% in total costs.

Segment 2: Carp on growing: In this case, the main production cost is the labour cost considering the wages and salaries, which achieved a 38% of the total operating cost, the highest of the four segments. Livestock and feed costs represented the 28% in 2014.

Segment 3: Carp combined: the traditional costs elements for land based fish farm are the raw material costs, both livestock and feed ones, covering 44% of total costs.

Segment 4: The feed cost is 50% and raw materials represented the 12% of the total cost.

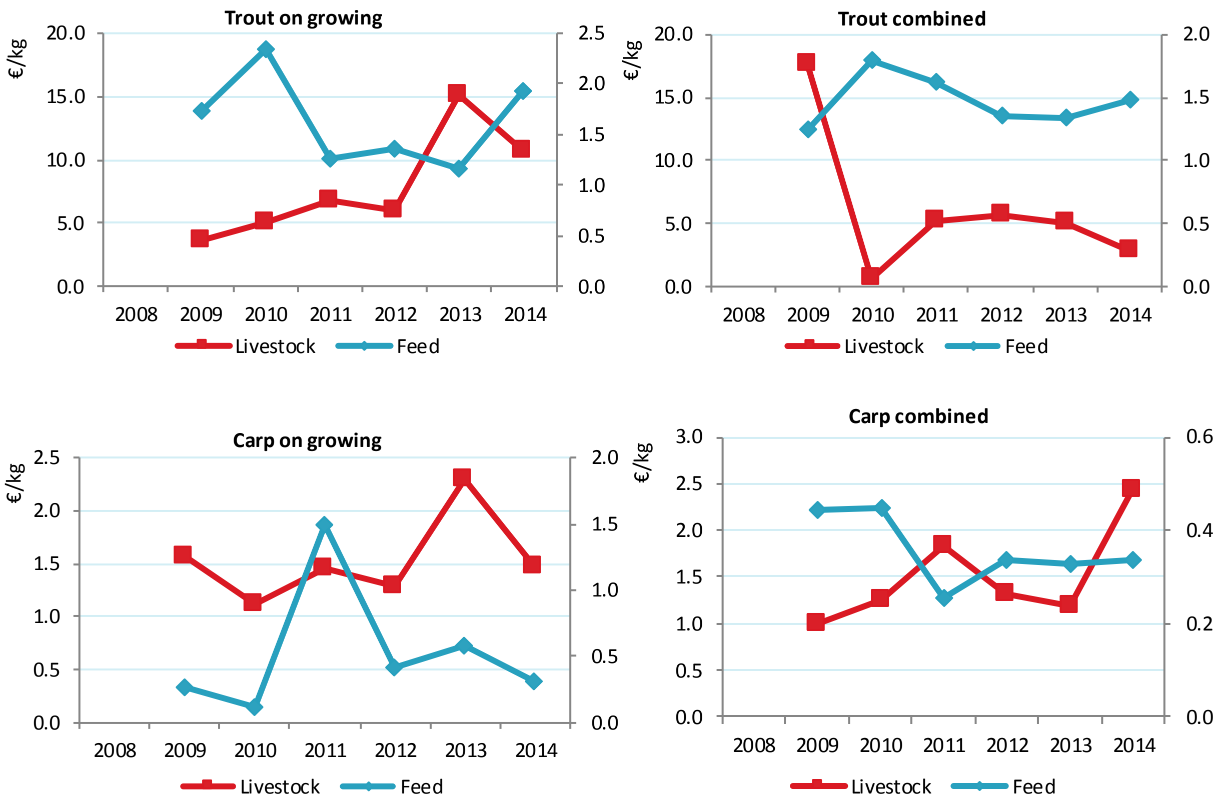


Figure 4.22.9 Feed and livestock prices for the main Structure of the Romanian segments: 2008-2014.

Source: EU Member States DCF data submission

Due to the importance of the raw materials in the operating cost structure, it is relevant to analyse the evolution of their prices in recent years. In the last three years considered, the price of feed has remained relative stable in all the segments. After several years in which the feed price followed a positive trend, the change in the trend in 2011 and the stability thereof have contributed to the improvement in the economic results. Livestock prices have been more volatile. In 2014 livestock prices suffered a reduction in all the segments except in the carp combined.

4.22.6 Trends and triggers

The expert advice in this section about current production trends and main drivers, market structure, issues of special interest, and outlook for 2015, cannot be provided due to the absence of an expert from Romania at the experts meeting.

4.22.7 Data Coverage and Data Quality

The expert advice in this section about data quality, data availability, confidentiality and differences in DCF data compared with other official data sources, cannot be provided due to the absence of an expert from Romania at the experts meeting.

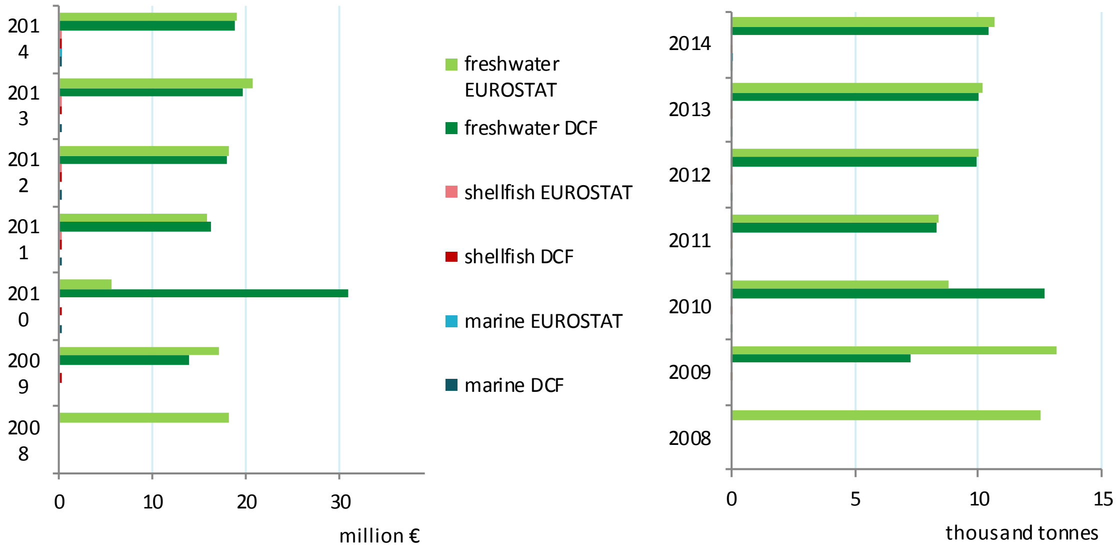


Figure 4.22.10 Comparison of DCF data with EUROSTAT data for Romania: 2008-2014

4.23 Slovakia

4.23.1 Summary

Production volume and value

The Slovakian aquaculture production consisted of 1 214 tonnes in 2014, solely from freshwater species and reached the highest level since 2008. Annual increase from 2013 to 2014 amounted 12%. The recovery of production since the lows in 2010 was partially related with improved economic situation. High correlation was observed with the GDP per capita (Eurostat data), when it decreased in 2008-2010 years and from 2010 to 2014 recovered to the highest number.

The same trend for value of production was observed in 2008-2014 year period, when value significantly dropped by 40.7% from 2008 to 2010 and significantly recovered to the highest value in 2014, reaching €3.24 million. Despite the lowest production volume and value in 2010, at that time the average production price was highest within five year long period. Turnover from low production volume was increased by rising prices and contrary, in 2014 increased production supply negatively affected prices with the 7% annual decline.

Whilst no marine or shellfish aquaculture is produced due to the landlocked nature of Slovakia there were production of fish eggs and juveniles. In 2014, they amounted to €256 million, a 49% decrease regarding the period 2008-2014.

Table 4.23.1 Production and sales for Slovakia: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 13-14	Develop. 2014/(08-13)
Production weight (thousand tonnes)	***1.1***	***0.8***	***0.6***	***0.9***	***1.3***	***1.1***	***1.2***	***12%***	***27%***
Marine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*
Shellfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*
Freshwater	1.1	0.8	0.6	0.9	1.3	1.1	1.2	*12%*	*27%*
Production value (million €)	***2.7***	***1.8***	***1.6***	***2.4***	***3.2***	***3.2***	***3.2***	***2%***	***30%***
Marine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*
Shellfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0%*	*0%*
Freshwater	2.7	1.8	1.6	2.4	3.2	3.2	3.2	*2%*	*30%*
Hatcheries & nurseries (million units)	***674***	***612***	***456***	***113***	***746***	***429***	***256***	***-40%***	***-49%***
Eggs	434	500	418	91	446	272			
Juveniles	240	112	38	22	300	157	256	*63%*	*77%*

Source: EUROSTAT

Main segments

Rainbow trout was the main species produced by the Slovakian aquaculture sector, representing 72% in total volume and 76% of total value of sector production. Second biggest segment is common carp with the 20% of the weight and 16% of the production value. Other segments could be considered of minor importance and consists of species as sea trout, grass carp and Northern pike.

Figure 4.23.1 Main species in terms of weight and value in Slovakian production: 2014.

Source: EUROSTAT

Rainbow trout average first-sale prices in Slovakia were €2.8 per Kg in 2014, while common carp and grass carp prices were €2.2/Kg and €2.5/Kg, respectively. Prices for main target species, rainbow trout and grass carp had a different trend in 2014. Rainbow trout average price decreased by 10% between 2013 and 2014. Common carp, which is the only other markedly sizeable segment, had, on the other hand, relatively stable prices in 2008-2014 period (€2.2/kg).

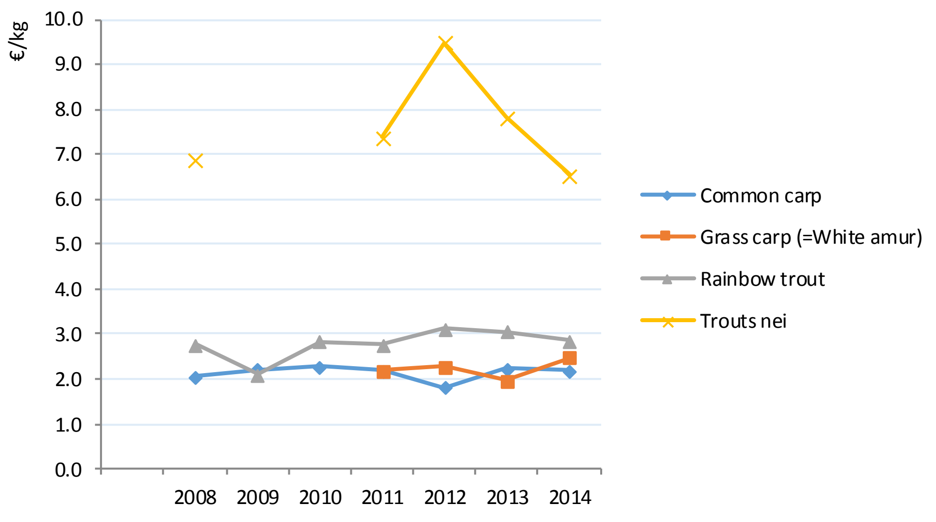


Figure 4.23.2 Average prices for the main species produced in Slovakia: 2008-2014.

Source: EUROSTAT

Trend and trigger /Outlook

Increased volumes and stabile prices of common carp in Slovakia demonstrate high importance and perspective outlook for near future in country aquaculture sector. As an example in 2014, when supply was increased with a same price, compare to 2013. Supply for Common carp could be considered as demand driven. Quite different price performance was observed in Rainbow trout segment, when significantly increased quantities of production pushed prices down what could be considered as supply driven.

4.23.2 Data Coverage and Data Quality

Slovakia is a landlocked country and only produces freshwater aquaculture. Because freshwater data is not compulsory under the DCF, landlocked countries were not requested to collect data under the DCF regulation. Because of the lack of DCF data for Slovakia, FAO and EUROSTAT data were used in this analysis.

4.24 Slovenia

4.24.1 Summary

Production volume and value

Aquaculture in Slovenia comprises freshwater aquaculture (cold-water fish farming of salmonids and warm-water fish farming of cyprinids) and mariculture (fish and shellfish farming). The major species contributing most of the production value in freshwater fish farming are rainbow trout (*Oncorhynchus mykiss*) and common carp (*Cyprinus carpio*), whilst in mariculture it is Mediterranean mussel (*Mytilus galloprovincialis*) and European seabass (*Dicentrarchus labrax*).

For the DCF, Slovenia collects data on marine aquaculture, not for the freshwater segments. Hence, in this chapter all data refers to marine (fish and shellfish) aquaculture.

In 2013 the turnover of the marine aquaculture was €616 751, in 2014 this turnover increased by 37% and amounted €846 395. The total sales volume also increased by 35% from 2013 to 2014 and it was slightly more than 382 tonnes in 2013 and a bit less of 517 tonnes in 2014.

The main segments in the Slovenian marine aquaculture sector are Sea bass & Sea bream cages (seg3.4) and Mussel rafts (seg7.1).

Overall industry structure and employment

In 2014 Slovenia had six companies with five or less employees and one company with six to ten employees. The status in employment reflects the situation in the aquaculture sector whereby the majority of small family farms operates with self-employed persons, mostly one employee and some unpaid assistance from family workers. Total employment in 2014 was estimated at 20 jobs, corresponding to almost 19 FTEs. The level of employment decreased between 2008 and 2014, with total employed decreasing by 38% while the numbers of FTEs decrease by 32% over the period. With respect to the gender of those in employment, men are predominated in aquaculture sector. In 2014 only 4 women (20%) were involved. Average salary per FTE employees in 2008 was €21 513. In 2014 average salary per FTE employees decrease for approximately 33% regarding 2008 and amounted €14 463.

Main segments

They are two main segments in the Slovenian marine aquaculture sector; Sea bass & Sea bream cages (seg3.4) and Mussel rafts (seg7.1). The most important species are Mediterranean mussel and European seabass.

In terms of sales volume mariculture shellfish farming are more important than fish farming. The major and the only cultured shellfish species, Mediterranean mussel, accounts for 86% of total sales volume in 2014. The production of European seabass is more important than the production of gilthead seabream. It contributes around 13 to total mariculture production in 2014.

Current production trends and main drivers (Trends and triggers)

Regarding techniques and species all Slovenian marine segments are very homogeneous. Marine fish farming practice is normally intensive and takes place in floating platforms where the cages are submerged into the sea. They produced mostly European seabass. Shellfish farming practice is extensive and takes place in lines of floating buoys linked together, where longlines with mussels are suspended. The major and the only cultured shellfish species is Mediterranean mussel.

Outlook

Future development of Slovenian mariculture is strongly conditioned by the small size of the Slovenian Sea. In 2007, three larger areas were designated for marine aquaculture in Slovenian territorial waters that were subsequently separated into 22 plots, for which concessions were granted for the use of marine water in 2009. It is expected that these plots will not be able to expand, due to the use of Slovenian territorial waters for other purposes. All Slovenian maritime fish and shellfish farms are currently operating at about 50% of their capacity. In the future we can expect increasing production to maximum capacity and then stagnation of Slovenian marine aquaculture.

On the other hand, because of the good quality and quantity of inland water, Slovenia has a good chance to increase freshwater aquaculture, particularly salmonid rearing such as rainbow trout, Huchen (*Hucho hucho*) and brown trout. Today there are in Slovenia about 60 trout farms, with a total production of only about 635 tonnes per year.

4.24.2 Production and sales

In 2014 were six companies in Slovenia dealing with shellfish farming, primarily with mussel farming (Mediterranean mussel). The shellfish are farmed using hanging ropes that are attached to rafts.

In the same year were only one company that was engaged in breeding of fish. A main space for breeding is sea bass. Main farming techniques is breeding in cages.

Table 4.24.1 Production and sales for Slovenia: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Sales weight (thousand tonnes)	***1.3***	***1.3***	***0.8***	***1.3***	***1.1***	***1.1***	***1.3***	*19%*	*13%*
Marine	0.1	0.1	0.1	0.1	0.1	0.0	0.1	*37%*	*20%*
Shellfish	0.2	0.3	0.1	0.4	0.3	0.3	0.5	*35%*	*44%*
Freshwater	1.0	0.9	0.7	0.8	0.7	0.7	0.8	*11%*	*-3%*
Hatcheries & nurseries									
Sales value (million €)	***3.1***	***3.1***	***2.2***	***2.8***	***2.8***	***2.9***	***3.3***	*14%*	*18%*
Marine	0.4	0.5	0.3	0.3	0.4	0.2	0.4	*70%*	*19%*
Shellfish	0.1	0.2	0.0	0.2	0.4	0.4	0.4	*16%*	*73%*
Freshwater	2.6	2.4	1.9	2.3	2.0	2.3	2.5	*8%*	*11%*
Hatcheries & nurseries									

Source: EU Member States DCF data submission

In 2013 the marine aquaculture turnover was €616 751, in 2014 the same turnover increased by 37% and amounted €846 395. The total sales volume also increase by 35% from 2013 to 2014 and it was 382 tonnes in 2013 and 517 tonnes in 2014.

The main segments in the Slovenian marine aquaculture sector are Sea bass & Sea bream cages (seg3.4) and Mussel rafts (seg7.1).

4.24.3 Industry structure and employment

Aquaculture in Slovenia comprises freshwater aquaculture (cold-water fish farming of salmonids and warm-water fish farming of cyprinids) and mariculture (fish and shellfish farming). Warm-water and cold-water fish farming has been practiced since the end of nineteenth century, while mariculture has a shorter history: it started at the end of the twentieth century. The major species contributing most of the production value in freshwater fish farming are rainbow trout (*Oncorhynchus mykiss*) and common carp (*Cyprinus carpio*), whilst in mariculture it is Mediterranean mussel (*Mytilus galloprovincialis*) and European seabass (*Dicentrarchus labrax*).

Mariculture practice is traditional. Fish farming takes place in cages submerged into the sea, while mussel farming takes place in a standard manner in lines of floating buoys linked together, with longline nets hung from them. In 2007, three larger areas were designated for marine aquaculture in Slovenian territorial waters that were subsequently separated into 22 plots, for which concessions were granted for the use of marine water in 2009. It is expected that these plots will not be able to expand, due to the use of Slovenian territorial waters for other purposes. Currently, all the concessions for using marine water for the breeding of marine organisms have been granted, two of them for breeding marine fish and 20 for breeding shellfish. The total area for breeding fish at sea (excluding shellfish farming) in 2014 was 5 663 m2 (two plots). The area of the 20 plots at sea that are used for shellfish farming was 45.1 ha.

Due to natural circumstances, the development of marine fish farming in Slovenia is limited. Mariculture takes place in the Bay of Strunjan, the Bay of Debeli rtič (shell-fish farming) and in the Bay of Piran (fish and shell-fish farming).

Mariculture shellfish farming is more important than fish farming regarding the total volume of sales. The major and the only cultured shellfish species, Mediterranean mussel, accounts for 86% of total mariculture production in 2014. The production of European seabass is more important than the production of gilthead seabream. It contributes around 13% to total mariculture production in 2014.

Since the early eighties (1982) the production of the Mediterranean mussel (*Mytilus galloprovincialis*) has been increasing and in 1988 it reached a maximum of 703 tonnes. After that year a significant decline was due to the fact that exports to Italy ceased. In 1995 the production of mussels reached a minimum of 12 tonnes. In recent years, there are increases in production, particularly due to the resolution of the status of shellfish production facilities through the granting of concessions for the use of marine water: first in 2001 and then in 2003, when production reached 135 tonnes, the highest since 1992. There was also a peak in production in 2011, with 446 tonnes of Mediterranean mussels produced. Current production covers mainly the needs of the domestic market. In recent years, especially in 2010, considerable difficulties occurred in the production of shellfish due to the frequent closures of sales because of the occurrence of biotoxins, which prevents shellfish farms to be used to their full production capacity. Damage on shellfish farms caused by wild fish, especially by sea bream, also presents major problems in the last few years.

From 1991 onwards intensification was carried out especially with farming European seabass and seabream in the Bay of Piran. A first result of seabass production in 1992 was 5.7 tonnes. In subsequent years annual variations in production (growth and decline) were noted. In 2001 production reached its maximum with 59 tonnes, and very similar amounts were noted in 2003. Here, there was a peak in production in 2014, with 66 tonnes of seabass.

The first results of seabream production in 1992 were 4 tonnes. In the following years there was a growth in production, with some variations, until 1997 when production reached a maximum of 61 tonnes. After that year production declined and reached a minimum of 6 tonnes in 2001. In 2003, production was 16 tonnes. From 2010 to 2014, there was no production of seabream.

Slovenia is a net importer of fish and fish products. In 2014 imports were approximately four times larger than exports. There is a continuous import of fresh farmed species: seabream, seabass and salmon. The majority of the imported fish products come mainly from the European Union and are frozen, dried or processed.

Table 4.24.2 Structure of the Slovenian aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Structure (number)									
Total enterprises	*11*	*11*	*13*	*11*	*11*	*8*	*7*	*-13%*	*-35%*
<=5 employees	10	10	11	9	8	5	6	*20%*	*-32%*
6-10 employees	1	0	1	1	1	3	1	*-67%*	*-14%*
>10 employees	0	1	1	1	2	0	0		*-100%*
Employment (number)									
Total employees	29	35	31	32	34	32	20	*-38%*	*-38%*
Male employees	27	33	26	26	28	24	16	*-33%*	*-41%*
Female employees	2	2	5	6	6	8	4	*-50%*	*-17%*
FTE	26	32	28	28	28	27	19	*-29%*	*-32%*
Male FTE	24	30	23	23	22	19	15	*-21%*	*-35%*
Female FTE	2	2	5	4	6	7	4	*-51%*	*-18%*
Indicators									
FTE per enterprise	2.4	2.9	2.1	2.5	2.5	3.3	2.7	*-19%*	*3%*
Average wage (thousand €)	21.5	19.7	19.7	24.4	28.4	19.3	14.5	*-25%*	*-35%*
Labour productivity (thousand €)	85.8	66.1	86.0	179.6	104.3	86.3	35.6	*-59%*	*-65%*

Source: EU Member States DCF data submission

In 2014 Slovenia had six companies with five or less employees and one company with six to ten employees. The status in employment reflects the situation in the aquaculture sector whereby the majority of small family farms operates with self-employed people, mostly one employee and some unpaid assistance from family workers. Total employment in 2014 was estimated at 20 jobs, corresponding to 19 FTEs. The level of employment decreased between 2008 and 2014, with total employed decreasing by 38% while the numbers of FTEs decrease by 32% over the period. With respect to the gender of those in employment, men are predominated in aquaculture sector. In 2014 only 4 women (20%) were involved. Average salary per FTE employees in 2008 was €21 513. In 2014 average salary per FTE employees decrease for approximately 35% regarding 2008 and amounted €14 463.

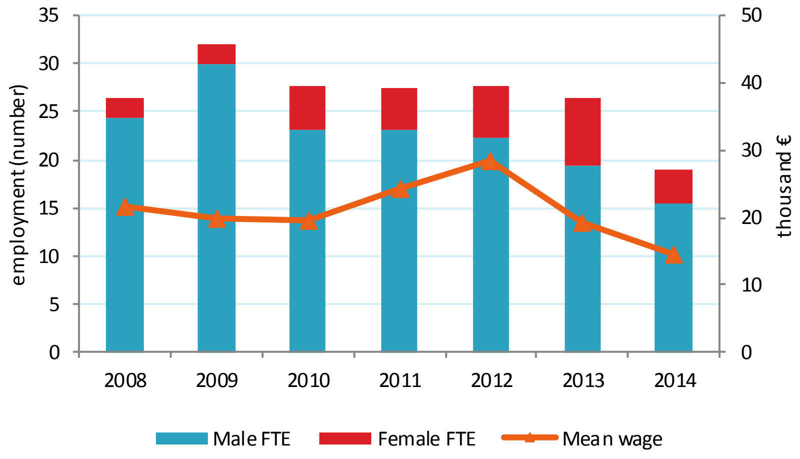


Figure 4.24.1 Employment trends for Slovenia: 2008-2014.

Source: EU Member States DCF data submission

The number of enterprises decreased from 2008 to 2014, but the average number of FTE per enterprise has been rather constant over the period. At the same time, also the labour productivity has been decreasing for 65%. In the period 2012-2014 Slovenian aquaculture sector underwent major structural changes. Some of the larger companies that are dealing with different types of activities, separated aquaculture from other activities formed new smaller companies which are exclusively engaged in aquaculture. Consequently, the share of other income in total income has decreased in the period 2012-2014 for almost 80%. This had impact on lower labour productivity in the period mentioned. The structural changes made in Slovenian aquaculture sector had negative impact also in employment trends and average wage in period 2012-2014.

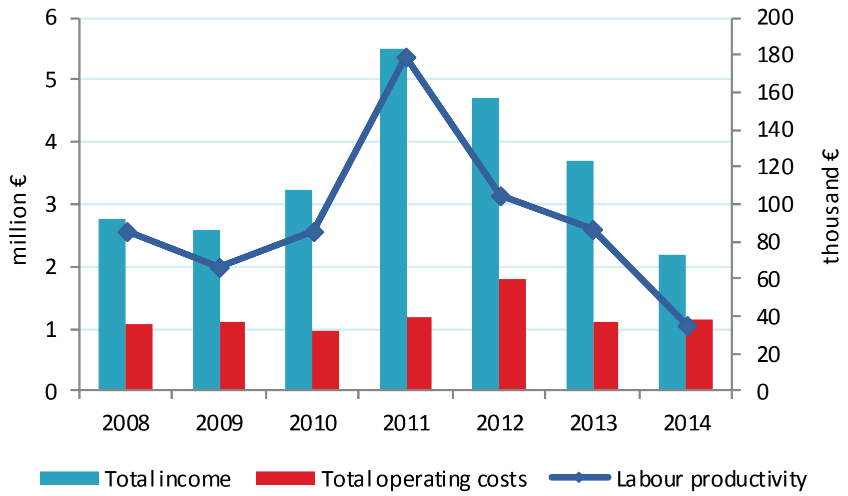


Figure 4.24.2 Income, costs, wages and labour productivity trends for Slovenia: 2008-2014.

Source: EU Member States DCF data submission

The total amount of income generated by the Slovenian aquaculture sector in 2014 was €2.2 million. This consisted of €0.8 million in turnover, €0.7 million in subsidies and €0.7 million in other income (Figure 4.24.2 and Table 4.24.3). The total income of the Slovenian aquaculture sector decreased by 40% between 2013 and 2014, while turnover increased by 37% in the same period. The reason for decreasing value of total income is in other income which decreases for almost 70% in the period mentioned.

All the firms in Slovenian aquaculture sector are registered to practice aquaculture and aquaculture should be their main source of income, however large part of the income still gain from carrying out other activities, such as scuba diving, underwater work, marketing, etc.

4.24.4 Economic performance

Table 4.24.3 Economic performance of the Structure of the Slovenian aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	% of total income	Change 2014-13	Development 2014/(2008-13)
Income (million €)										
Turnover	0.5	0.7	0.3	0.5	0.7	0.6	0.8	39%	37%	49%
Other income	2.2	1.9	2.5	4.9	3.2	2.3	0.7	31%	-70%	-76%
Subsidies	0.0	0.0	0.4	0.1	0.8	0.8	0.7	30%	-16%	84%
Total income	*2.8*	*2.6*	*3.2*	*5.5*	*4.7*	*3.7*	*2.2*	100%	-40%	-42%
Expenditures (million €)										
Wages and salaries	0.6	0.6	0.4	0.6	0.5	0.5	0.3	12%	-47%	-50%
Imputed value of unpaid labour	0.0	0.0	0.1	0.1	0.2	0.0	0.0	0%	0%	-100%
Energy costs	0.1	0.1	0.1	0.1	0.2	0.1	0.1	5%	56%	29%
Repair and maintenance	0.1	0.1	0.0	0.0	0.0	0.0	0.0	2%	41%	-9%
Raw material: Feed costs	0.2	0.2	0.1	0.2	0.3	0.3	0.1	5%	-65%	-54%
Raw material: Livestock costs	0.1	0.1	0.1	0.1	0.3	0.1	0.1	5%	-24%	-24%
Other operational costs	0.0	0.0	0.1	0.0	0.2	0.1	0.5	22%	615%	512%
Total operating costs	*1.1*	*1.1*	*1.0*	*1.2*	*1.8*	*1.1*	*1.1*	52%	1%	-6%
Capital Costs (million €)										
Depreciation of capital	0.1	0.1	0.2	0.3	0.5	0.7	0.9	40%	22%	161%
Financial costs, net	0.1	0.1	0.2	0.2	0.1	0.1	0.1	4%	-27%	-37%
Extraordinary costs, net	0.1	0.1	0.0	0.1	0.1	0.0	0.0	1%	43%	-66%
Capital Value (million €)										
Total value of assets	3.2	3.1	4.6	6.9	10.2	8.2	8.7	397%	6%	44%
Net Investments	0.1	0.0	0.3	1.5	1.9	3.1	1.0	47%	-67%	-11%
Debt	2.5	2.5	3.6	5.4	6.2	3.7	3.7	171%	2%	-6%
Input & Production (thousand tonnes)										
Raw material: Feed	0.2	0.2	0.1	0.2	0.3	0.3	0.1		-50%	-35%
Raw material: Livestock	0.0	0.0	0.0	0.0	0.1	0.1	0.1		69%	269%
Performance Indicators(million €)										
Gross Value Added	2.3	2.1	2.4	4.9	2.9	2.3	0.7	31%	-71%	-76%
Operating cash flow	1.7	1.5	2.3	4.3	2.9	2.6	1.1	48%	-59%	-58%
Earning before interest and tax	1.6	1.4	2.1	4.0	2.4	1.8	0.2	8%	-90%	-92%
Net profit	1.5	1.3	1.9	3.8	2.3	1.7	0.1	5%	-94%	-95%
Capital productivity (%)	71.2	69.3	51.3	71.3	28.2	27.9	7.7		-72%	-85%
Return on Investment (%)	49.9	45.1	45.2	57.8	23.4	22.4	2.1		-91%	-95%
Future Expectation Indicator (%)	-1.4	-2.4	3.1	16.4	13.6	28.6	1.6		-94%	-83%

Source: EU Member States DCF data submission

Total operating costs by the Slovenian aquaculture sector in 2014 was €1.1 million. The largest expenditure items were Other operational costs (€0.5 million) and Wages and salaries (€0.3 million) (Table 4.24.3). The total operating costs remains relatively stable from 2008-2014, with exceptional in 2012 when was a peak with €1.8 million.

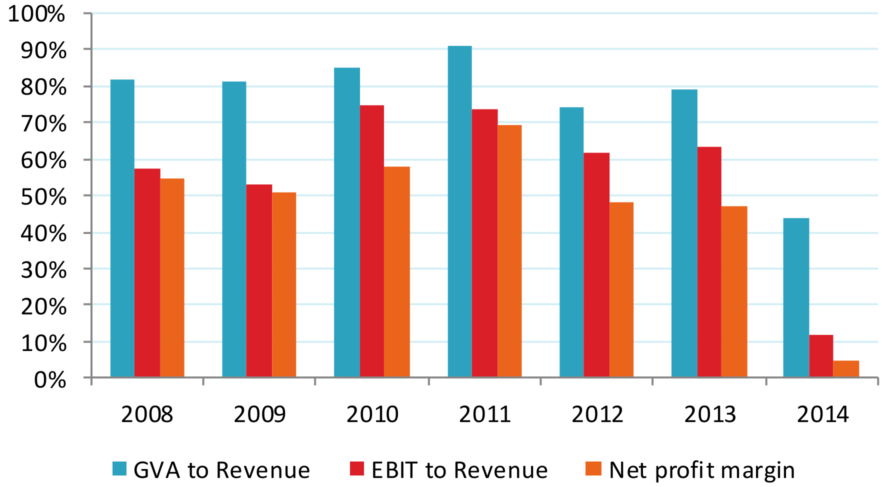


Figure 4.24.3 Economic performance for Slovenia: 2008-2014

Source: EU Member States DCF data submission

In terms of economic indicators, the amount of GVA, OCF, EBIT and Net profit generated by the Slovenian aquaculture sector in 2014 was €0.7 million, €1.1 million, €0.2 million and €0.1 million respectively, see Table 4.24.3. Values of all economic indicators are decreased from 2013, namely due decreased value of other income in 2014.

4.24.5 Main species produced and economic performance by segment

The most relevant segments in the Slovenian marine aquaculture are:

- Segment 1: Sea bass & Sea bream cages (seg3.4);
- Segment 2: Mussel rafts (seg7.1).

They are two main segments in the Slovenian marine aquaculture sector; Sea bass & Sea bream cages (seg3.4) and Mussel rafts (seg7.1). The most important species are Mediterranean mussel and European seabass.

In terms of sales volume mariculture shellfish farming are more important than fish farming. The major and the only cultured shellfish species, Mediterranean mussel, accounts for 86% of total sales volume in 2014. The production of European seabass is more important than the production of gilthead seabream. It contributes around 13% to total mariculture production in 2014.

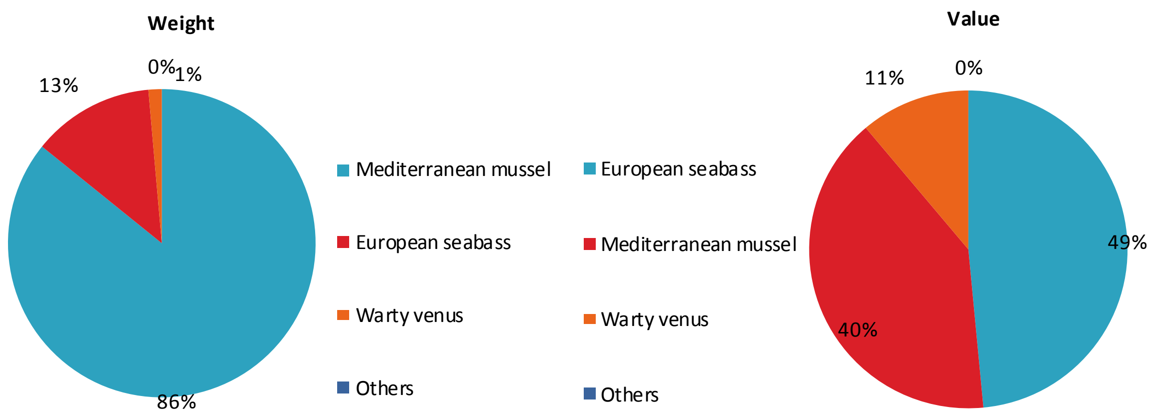


Figure 4.24.4 Main species in terms of weight and value in Structure of the Slovenian production: 2014.

Source: EU Member States DCF data submission

In terms of sales volume, sales volume of the Mussel rafts segment represents 86% of the total sales volume of Slovenian aquaculture sector in 2014. Turnover from this sector represent 49% of the total turnover in the same year. In the Mussel rafts sector were 18 FTE employees in 2014, which represent 66% of all FTE employees in Slovenian aquaculture sector in the same year.

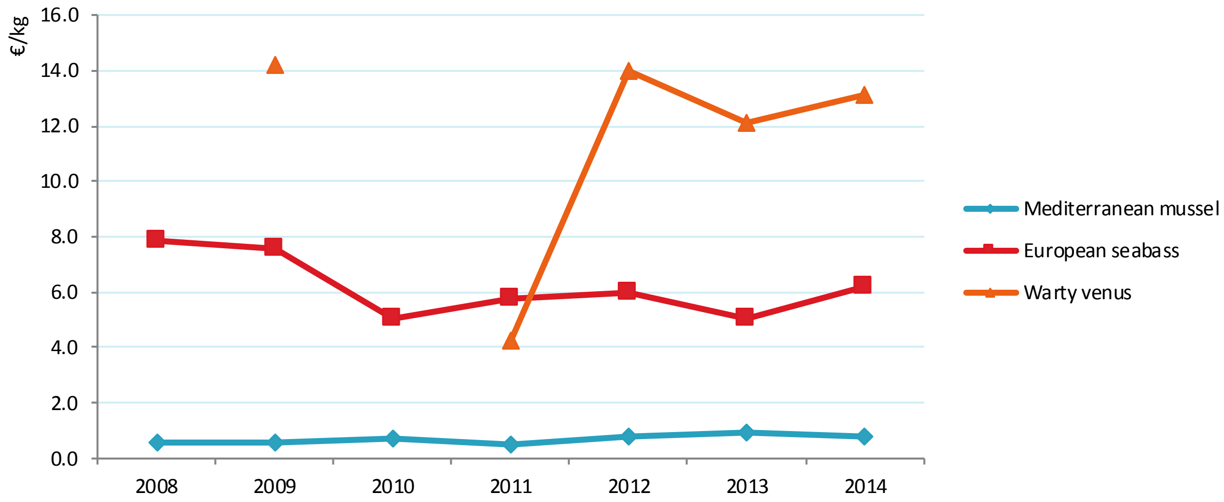


Figure 4.24.5 Average prices for the main species produced in Slovenia: 2008-2014.

Source: EU Member States DCF data submission

The highest average price on the market achieves Warty venus with amount of €13.10/kg. The average price of European seabass was €7.81/kg in 2008. In 2014 average price decrease by 20% regarding 2008 and amounted €6.20/kg. The main reason for decreased price of seabass is increased imports of seabass, mainly from Greece and Croatia, where the first-sales price is lower than in Slovenia. The average price of Mediterranean mussel was €0.77/kg in 2014 and increase by 45% over the period 2008-2014.

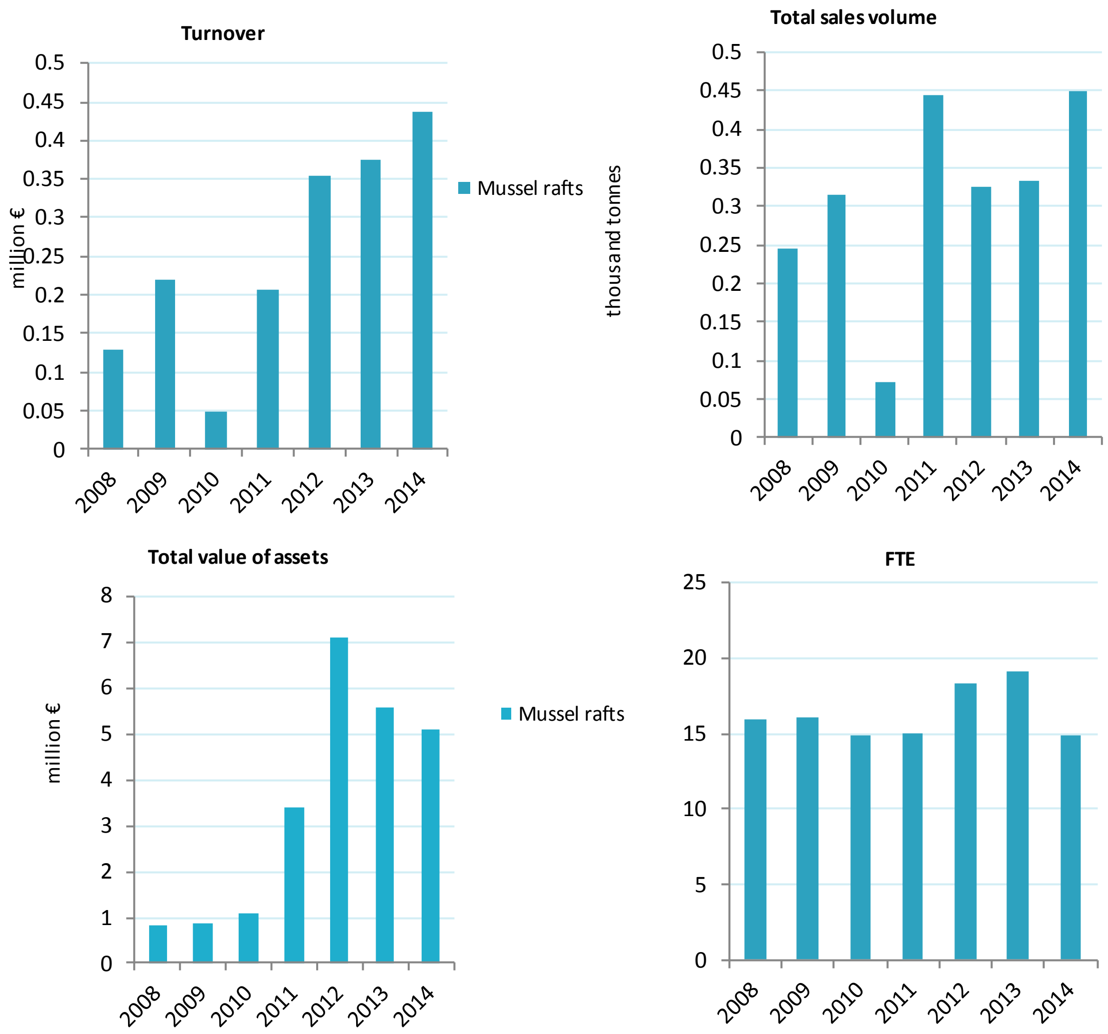


Figure 4.24.6 Structural development Structure of the Slovenian aquaculture sector: 2008-2014.

Source: EU Member States DCF data submission

In Table 4.24.4, because of the confidentiality issues, only the economic performance of the Mussel rafts segments is shown. From the table it can be seen that the gross value added and net profit are positive in the period from 2008 to 2014.

Table 4.24.4 Economic performance of main Structure of the Slovenian aquaculture segments: 2008-2014 (in million €).

Variable	2008	2009	2010	2011	2012	2013	2014	% of total income	Change 2014/13	Development 2014/(2008-13)
Mussel rafts										
Total income	1.2	1.4	1.6	3.7	4.2	3.4	1.5	100%	-54%	-40%
Gross Value Added	1.1	1.3	1.4	3.5	3.1	2.5	0.6	39%	-76%	-72%
Operating cash flow	0.8	1.0	1.3	3.2	3.4	2.8	1.0	68%	-63%	-50%
Earning before interest and tax	0.8	0.9	1.3	3.1	2.9	2.3	0.3	18%	-88%	-85%
Net profit	0.7	0.9	1.2	3.1	2.8	2.2	0.2	16%	-89%	-87%
Total sales volume (thousand tonnes)	0.2	0.3	0.1	0.4	0.3	0.3	0.5		35%	55%

Source: EU Member States DCF data submission

In terms of sales volume, sales volume of the Mussel rafts segment represents 86% of the total sales volume of Slovenian aquaculture sector in 2014. Turnover from this sector represent 49% of the total turnover in the same year. In terms of other economic indicators, the amount of GVA, OCF, EBIT and Net profit generated by the Slovenian Mussel rafts sector in 2014 was €0.6 million, €1.0 million, €0.3 million and €0.2 million respectively, see Table 4.24.4 Despite increased productions and first sales prices of Mediterranean mussel as the most important species in this segment the values of all economic indicators in Mussel rafts sector are decreased substantially from 2008. Main reason for decreasing of economic indicators is decreased in other income due major structural changes in the sector. In terms of sales volume and value, Mediterranean mussel represents 98% and 78% of the total sales volume and value of the Mussel rafts segment.

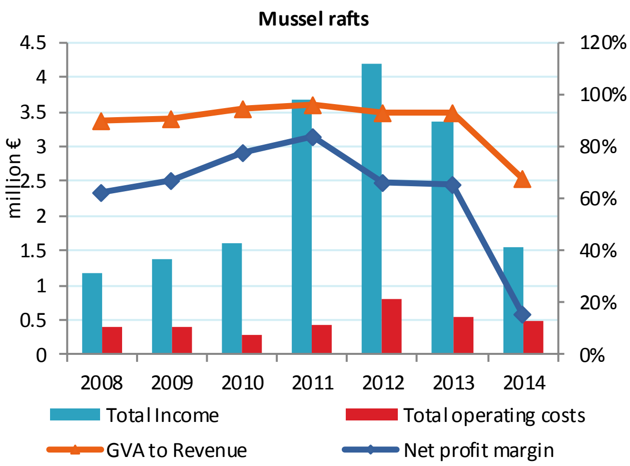


Figure 4.24.7 Economic performance indicators for the main Structure of the Slovenian segments: 2008-2014.

Source: EU Member States DCF data submission

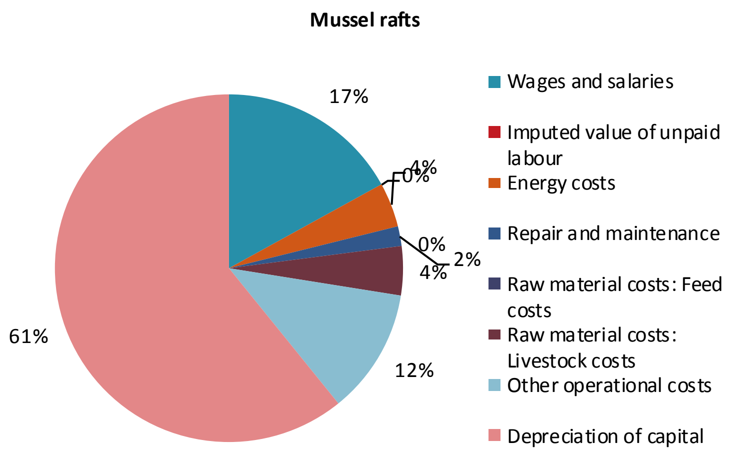


Figure 4.24.8 Cost structure of the main segments in Slovenia: 2014.

Source: EU Member States DCF data submission

The largest cost item of Mussel rafts sector in 2014 were the Depreciation of the capital, accounted for 61% of the total operational costs. Wages and salaries made up 17% of all operational costs. In 2014 Depreciation of the capital increases by 22% regarding 2013 and by 690% regarding 2008. Slovenian Mussel rafts sector has over the past few years, with the help of EU Funds, invested significantly in the new equipment and production facilities. So this new investments are the main reason for increased value of Depreciation of capital.

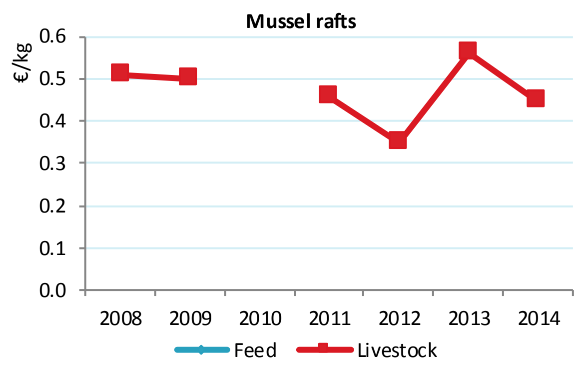


Figure 4.24.9 Feed and livestock prices for the main Structure of the Slovenian segments: 2008-2014.

Source: EU Member States DCF data submission

4.24.6 Trends and triggers

Current production trends and main drivers

Market structure

Slovenian market for marine products is fragmented and disorganized. A large number of producers and dealers are unorganized and acting individually. For all these reasons they achieve a lower first sales price and higher operating costs and are therefore non-competitive with foreign suppliers. Slovenia is a net importer of fish and fish products. In 2014, imports were approximately four times larger than exports. There is a continuous import of fresh farmed species: seabream, seabass and salmon. The majority of the imported fish products come mainly from the European Union and are frozen, dried or processed.

Issues of special interest

The Ministry of Agriculture, Forestry and Food (MAFF) is responsible for fisheries and aquaculture in Slovenia. Fisheries comprise capture fisheries, aquaculture of fish and other water animals and trade in fisheries products. Inland fisheries, fish farming and fish health are managed by three main Acts: the Freshwater Fishery Act, the Livestock-breeding Act (ZŽiv) and the Veterinary Service Act (Zvet) and their regulations, ordinance, etc. Marine fisheries, fish and mussel farming are regulated by Marine Fisheries Act (ZMR-2). In fisheries and aquaculture it is necessary to take into consideration the Environment Protection Act (ZVO), the Nature Conservation Act (ZON), and the Water Act (ZV).

The main leading government agency in fisheries and aquaculture is the Directorate of Forestry, Hunting and Fisheries within the Ministry of Agriculture Forestry and Food. The main task of the Directorate is to provide overall administrative control of aquaculture and fisheries, to ensure an adequate legislative framework for aquaculture and fisheries, and to carry out related legislative tasks. The Directorate is directly involved in controlling the operation of fish farms, licensing procedure of alien species or hybrids and is also responsible for the maintenance of fish stocks in natural waters. The concessions for the use of water, which are the prerequisite for setting up a fish farm in Slovenia, are, however, granted by the Ministry of Environment and Spatial Planning. The Directorate manages that part of the state budget which is designed for fisheries and aquaculture. The funds are used for a variety of purposes, including the financing of the setting up and the management of fisheries information systems; financing of performing public service in fisheries by the Fisheries research institute of Slovenia; for the protection of natural resources Development in the Republic of Slovenia 2007-2013; as well as for the collection of data in and monitoring in fisheries. Ecological, biological research and the breeding of some indigenous species (Danube salmon, grayling, nase) are conducted in the Fisheries Research Institute of Slovenia. The Marine Biology Station of the National Institute for Biology deals with interdisciplinary research of the sea.

There has been a dynamic change in the fish production sector due to economic changes in the period from the independence of Slovenia to its accession to the European Union and after the accession. In the future it would be reasonable to support research projects such as: analysis of potential possibilities in fish farming development in Slovenia with regards to spatial and hydrological circumstances and research into the possibility of economic farming of new species. It would also be reasonable to continue with investment in the modernization of older fish farms, especially the improvement of hygienic conditions and the construction of new fish farms which comply with EU legislation technologically and ecologically. It would also be necessary to adopt all outstanding fisheries legislation and encourage the establishment of aquaculture producer organisations with a view to the development of fish farming in terms of small and medium sized family fish husbandry. These measures would facilitate the more competitive position of Slovenian fish farming. Natural circumstances and conservation requirements in Slovenia do not allow the development of large industrial farms. The establishment of producer organisations would make it easier to obtain knowledge, new technology and reduce market costs.

Typical Slovenian maritime enterprise is small family fish/shell farm with self-employed persons, mostly one employee and some unpaid assistance from family workers. Regarding techniques and species all Slovenian marine segments are very homogeneous. Marine fish farming practice is normally intensive and takes place in floating platforms where the cages are submerged into the sea. They produced mostly European seabass. Shellfish farming practice is extensive and takes place in lines of floating buoys linked together, where longlines with mussels are suspended. The major and the only cultured shellfish species is Mediterranean mussel.

Outlook for future production trends

In the Slovenian Operational Programme for 2014-2020 the emphasis is primarily on freshwater aquaculture. The main objectives in marine aquaculture are to increase the production of shellfish to 1000 tonnes and production of marine fish to 120 tonnes. Future development of Slovenian marine aquaculture is strongly conditioned by the small size of the Slovenian Sea. In 2007, three larger areas were designated for marine aquaculture in Slovenian territorial waters that were subsequently separated into 22 plots, for which concessions were granted for the use of marine water in 2009. It is expected that these plots will not be able to expand, due to the use of Slovenian territorial waters for other purposes. All Slovenian maritime fish and shellfish farms are currently operating at about 50% of their capacity. In the future we can expect increasing production to maximum capacity and then stagnation of Slovenian marine aquaculture. The production volume of marine fish and shellfish in 2014 was 66 tonnes and 450 tonnes respectively, so it can be assumed that the objectives of Slovenian OP are realistically achievable.

On the other hand, because of the good quality and quantity of inland water, Slovenia has a good chance to increase freshwater aquaculture, particularly salmonid rearing such as rainbow trout, Huchen (*Hucho hucho*) and brown trout. Today is in Slovenia about 60 trout farms, with a total production of only about 635 tonnes per year.

Fish farming is a sector that promises growth, in particular through an intelligent approach to quality and value adding that is integrated with environmental protection. Main aim of Slovenian OP are Technological development, innovation and knowledge transfer, competitiveness and viability of aquaculture small and medium-sized enterprises (SMEs) including improvement of safety or working conditions, protecting and restoring aquatic biodiversity, enhancing aquaculture-related ecosystems, promoting resource-efficient aquaculture, providing professional training and lifelong learning.

Key objective of Slovenian OP for fresh water aquaculture;

- Increase volume, value and net profit of aquaculture production; in cold water volume to a 1 000 tonnes per year, warm water volume 300 tonnes per year, increased GVA per employee to a €25 000 per year, total value of production to a €1.8 million per year and net profit to a €180 000;
- Increase organic aquaculture and recirculation systems; five fish farms with capacity more than 10 tonnes per year, total production of 500 tonnes per year;
- Support environmental services;
- Create and maintain employment; increase number of total employees to 180.

Slovenia collecting the economic and social data just for the marine aquaculture so in the future will not be able fully assess whether the objectives have been achieved or not.

4.24.7 Data Coverage and Data Quality

Data were collected only for the marine fish species.

Regards to the data base "The central register of aquaculture and commercial ponds" from MAFF, in 2014, there were six operators in Slovenia dealing with shellfish farming and one subject that was engaged in breeding of fish. The data for the operators mentioned were collected from multiple sources (The Agency of the Republic of Slovenia for Public Legal Records and Related Services (AJPES), questionnaire, MAFF)), allowing for cross checking. The accounting data, which are collected by the AJPES public agency, are already checked and verified. The data were collected for all seven subjects.

In June 2015 the questionnaires for 2014 were sent to all operators and all of them also returned the questionnaire. Therefore, the response was 100 %.

Economic data on the aquaculture sector were collected from accounting records – AJPES and through questionnaires. The national program for collection of economic data for the aquaculture sector combines information from three main resources:

1. Questionnaire information returned from the aquaculture sector on a voluntary basis,

2. Data base: 'The central register of aquaculture and commercial ponds' from MAFF,

3. The annual accounts of business enterprises.

The data collected from all sources are combined in such a way that a complete set of accounting items is compared for each business enterprise.

In cases where a questionnaire, as the only source, was used the response rate was 100%. In cases where the data from annual accounts of business enterprises was used the response rate was also 100 %, because we have economic reports for all investigated companies.

The economic variables were collected on the basis of Council Regulation (EC) No 199/2008 and the Appendix X to the Commission Decision (EC) 949/2008. Slovenia has uploaded the complete set of requested data to the JRC server before the deadline.

While due to confidentiality issues because of the low number of marine fish farms, we are only presenting Mussel rafts segment (seg7.1) in the chapter 4.7.5: ''Main species produced and economic performance by segment''.

In case of Slovenian data, there are differences between Eurostat and DCF data. The difference is because the Eurostat data also contain data from freshwater aquaculture and also because of better coverage of DCF data.

List of acronyms and abbreviations;

AJPES - The Agency of the Republic of Slovenia for Public Legal Records and Related Services.

MAFF - The Ministry of Agriculture, Forestry and Food of the Republic of Slovenia.

VARS - Veterinary Administration of the Republic of Slovenia.

Differences in DCF data compared with other official data sources

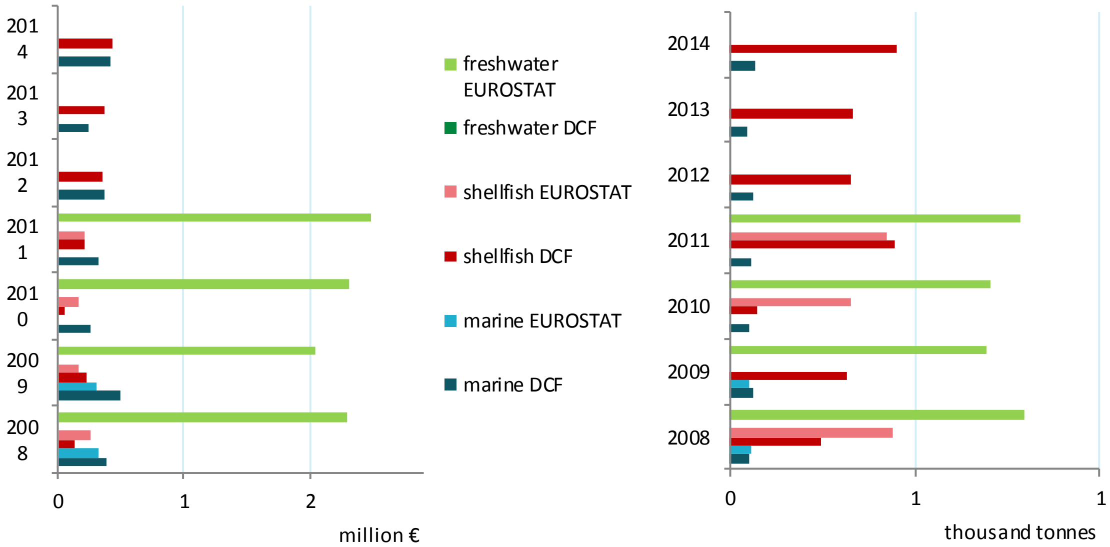


Figure 4.24.10 Comparison of DCF data with EUROSTAT data for Slovenia: 2008-2014

4.25 Spain

4.25.1 Summary

The Spanish aquaculture sector produced 285 160 tonnes of fish, fry and molluscs in 2014. Due to natural conditions, one of the main features of the Spanish aquaculture is diversity, with marine products, fish, mollusc, algae and freshwater species. The volume of production increased by 25% from the previous year, showing a recovery after two years of production decreases. In fact, 2014 was the best year for aquaculture production in volume and in value since 2008. This production generated €545 million and the sector had a total income of €589 million, representing an 18% increase over the years from 2008.

Beside the important production for human consumption, there are also juveniles and eggs (fishes and molluscs) which are produced in hatcheries and nurseries mostly to be grown in other establishments, but also to restock rivers or coastal zones.

Overall industry structure and employment

Aquaculture in Spain has a significant role in the economic and social development in certain areas. This sector keep a level of employment which result is important at a local level in the areas where it develops. Spanish aquaculture structure is based in small units, with a number of 3 035 in 2 014, which an average of less of two establishments operate by each unit, of which most are rafts for mussels and cultivated parks for clams.

The number of employees in Spanish aquaculture is 19 914, what represents an increase comparing with the previous year. Nearly half of the FTE corresponds with self-employed workers and female employees only represent 26%.

Main segments

Segment 1: Trout combined

Trout represents the freshwater aquaculture production in Spain, since the rainbow trout facilities produce nearly the only freshwater production. Trout production activities are spread around all the regions and involve all the cultivation stages, hatcheries, nurseries and fattening facilities. Regarding the data for 2014, trout segment economic indicators has improved compared with 2012. As in the other fish productions considered, the main operational cost is feed.

Segment 2: Mussel rafts

The mussel production in Spain represented the 77% of the total Spanish aquaculture production in terms of quantities and the 20% of the value in 2014. Because it is a species that depends on natural conditions, its annual production can reflect strong fluctuations. However, in 2014 the production was the highest in the considered period. This is the most important segment in terms of employment, in which most of the workers are self-employed and the small familiar units are the basement of the activity. The mussel industry was the most profitable of the four segments analysed during 2014.

Segment 3: Other marine fish in cages

This segment is mainly represented by the Atlantic Bluefin tuna fattened in cages, which with a production of 3 088 tonnes, employs 217 people with higher qualification than in other subsectors and a higher stability during the year. The economic indicators registered a positive evolution.

Segment 4: Bass & bream cages

Sea bass and sea bream are the main species in the Spanish aquaculture in terms of value. These species are cultivated in the Mediterranean coast of Spain and in the Canary Islands in warm waters. The number of companies has been suffering a reduction process since 2008, but the average size of the companies has grown. Also the number of people working in this segment has been reduced. This segment of the industry has experienced a great improvement in its economic performance indicator since 2012.

Current production trends and main drivers (Trends and triggers)

The recent evolution of the Spanish aquaculture sector shows a positive tendency both in terms of production and value. After a negative evolution during the economic crisis, the economic performance indicators have shown a recovery even in those segments that suffered negative economic results.

In terms of sector structure, in recent years the number of enterprise remains stable but has been a change in the composition, with a reduction in the number of small enterprises and an increase in the number of big ones. This explains the reduction in the level of employment compared to 2011. Even this, the number of FTE increased in 2014.

This evolution can be explained in general terms by several reason; the increase in some segment prices, the increase of the efficiency production, and the investments in renovation and improvements of the assets.

Outlook

The drive in Spanish aquaculture is based in CFP, in EMFF and in the strategic guidelines publishes by Commission in April 2013, and which have the target to boost the Member States to define their own national targets through their strategic plans. The Spanish government plans to provide subsides of €274 541 290 (EMFF contribution + MS contribution) to boost a sustainable aquaculture.

The guidelines go towards four priority areas: simplification of administrative procedures and reducing the period of authorization of new fish farms, the coordinated spatial planning to overcome the negative effects of the lack of space, strengthening the competitiveness of EU aquaculture and the promotion of fair competition.

4.25.2 Production and sales

In Spain, the production of aquatic products from fisheries increased in 2014, after the trend of decline in previous years.

The reached production in aquaculture sector in 2014 was 288 244 tonnes, which means an increase of 24% from the last year. Anyway, the data of production for human consumption from EUROSTAT shows a production of 253 153 tonnes in 2008; so in this period of time this figure has increases a 13%.

The production in 2014 corresponds mainly to marine aquaculture (fish and shellfish), and only 5.7% is freshwater aquaculture. Besides, the marine aquaculture is represented by shellfish and just 16% of the total production is marine fish. By far the largest activity in Spanish aquaculture in terms of production is culture of mussel (*Mytilus galloprovincialis*), which represents 76% of the total weight. In 2014 mussel production increased a 34% after 2013, which was a very bad year, with a great effect of red tides.

In terms of value, in 2014, 60% of sales value is due to marine aquaculture, 26% comes from shellfish and just 9.2% comes from freshwater aquaculture.

Among the fish, the most important species in 2014 are seabream and seabass as the main marine species and the rainbow trout in freshwater; the three of them represent the 78% in the total fish weight production. But there are other species cultivated in Spain less representative in terms of weight but important in terms of value and in terms of diversification in the aquaculture outlook: turbot, with a production of 7 766 Tonnes in 2014, Atlantic Bluefin tuna, with high value, Senegalese sole, blackspot seabream, and meagre. Freshwater aquaculture goes on keeping constant in a lower level than 10 years ago; in 2014 its production was reduced another 5% and this now represents 13% of decline since 2010.

Freshwater aquaculture produces sturgeon, which must be mentioned as a drive in freshwater diversification.

Table 4.25.1 Production and sales for Spain: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Sales weight (thousand tonnes)	***260.6***	***274.2***	***259.7***	***276.9***	***271.3***	***231.7***	***288.2***	*24%*	*10%*
Marine	46.2	46.8	43.1	44.9	44.0	46.7	47.8	*2%*	*6%*
Shellfish	187.6	203.4	193.9	213.4	207.7	165.8	222.6	*34%*	*12%*
Freshwater	25.7	20.6	20.4	14.3	18.9	17.8	16.4	*-8%*	*-16%*
Hatcheries & nurseries	1.2	0.3	0.4	2.8	0.0	0.2	0.1	*-55%*	*-91%*
Sales value (million €)	***462.6***	***440.0***	***469.6***	***504.3***	***482.3***	***492.7***	***545.7***	*11%*	*15%*
Marine	253.5	234.2	271.7	281.6	314.6	275.7	330.8	*20%*	*22%*
Shellfish	124.1	116.4	111.2	110.8	90.4	106.4	142.7	*34%*	*25%*
Freshwater	73.4	52.7	45.9	24.0	56.5	88.3	50.1	*-43%*	*-12%*
Hatcheries & nurseries	11.5	36.7	40.8	88.0	20.8	22.3	22.0	*-1%*	*-40%*

Source: EU Member States DCF data submission

Among the shellfish, apart from the commented importance of mussel, there are other species cultivated as oysters, or clams. There are also smaller productions or even experimental of octopus and queen scallop among others; there is an establishment cultivating abalone and there will be production in 2016.

The turnover for that total volume of production is €545.7 million in 2014, growing 11% compared to 2013, and reaching the highest value of the data set, since 2008. In the last year the groups have experienced different trends: shellfish production grew a 34% and, so its turnover showed a big improve comparing with 2013. Marine fish production increased slightly but the turnover grew 20%, reaching the highest value from the beginning of the series. However, freshwater aquaculture goes on with its decline, consolidating a negative trend since the first year of the series.

4.25.3 Industry structure and employment

In 2014 the number of enterprises is 3 035, which remains stable compared with the previous years. These companies operate a number of 5 307 aquaculture establishments, most of them are rafts for mussels and culture parks for bivalves; 186 of these establishments operate in freshwater aquaculture and 4 933 in marine and brackish aquaculture, showing the different relevance of the two subsectors.

The small firms, with less than five employees and resulting most of them small familiar units, dominate the Spanish aquaculture sector, with the 77% of all of them. This number increases along the period, but it remains stable in the last two years. The family nature of farms has special importance in mussel aquaculture, where there are few companies and lot of self-employed people, each one of them own two or three rafts as an average. This activity has an important contribution to the employment in these areas, where many people are involved in these tasks. The parks of bivalves work in the same way; self-employed people which work a small number of units and in some periods helped by members of the family.

In the considered years the number of companies with more than 10 employees has increases, and now this group constitutes 15% in the total structure.

Table 4.25.2 Structure of the Spanish aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Structure (number)									
Total enterprises	*3,101*	*3,105*	*3,066*	*3,059*	*3,032*	*3,023*	*3,035*	*0%*	*-1%*
<=5 employees	2,028	1,976	2,127	1,914	2,269	2,398	2,340	*-2%*	*10%*
6-10 employees	714	767	516	370	506	220	234	*6%*	*-55%*
>10 employees	359	362	423	775	257	405	461	*14%*	*7%*
Employment (number)									
Total employees	26,322	28,882	27,907	27,180	19,891	18,805	19,914	*6%*	*-20%*
Male employees	18,344	20,692	19,852	19,800	13,669	13,914	14,227	*2%*	*-20%*
Female employees	7,978	8,190	8,055	7,380	6,222	4,891	5,687	*16%*	*-20%*
FTE	6,612	6,176	6,377	6,639	5,740	5,716	5,946	*4%*	*-4%*
Male FTE	5,124	4,852	4,995	4,969	4,400	4,559	4,860	*7%*	*1%*
Female FTE	1,488	1,324	1,381	1,665	1,341	1,157	1,089	*-6%*	*-22%*
Indicators									
FTE per enterprise	2.1	2.0	2.1	2.2	1.9	1.9	2.0	*4%*	*-3%*
Average wage (thousand €)	25.0	17.8	20.9	20.5	22.5	20.8	22.6	*9%*	*6%*
Labour productivity (thousand €)	15.2	15.4	28.2	26.8	19.7	24.2	32.9	*36%*	*52%*

Source: EU Member States DCF data submission

The number of employees in Spanish aquaculture is 19 914 in 2014, having suffered an increase comparing with 2013. The variation in FTE figures shows a rise in this parameter of 4%, recovering from the previous two years, when there was a fall in the level of employment.

As said before, in Spanish aquaculture 37% of the total FTE is self-employed people, over all in the subsector of mussel and clams farming. It is this segment where the fall in the number of people working is more accentuated, as it corresponds with the production drop.

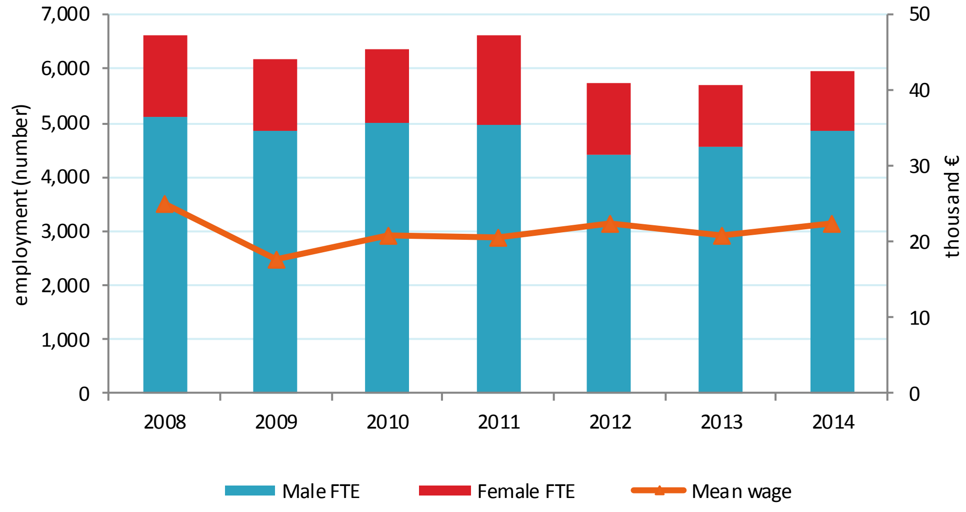


Figure 4.25.1 Employment trends for Spain: 2008-2014.

Source: EU Member States DCF data submission

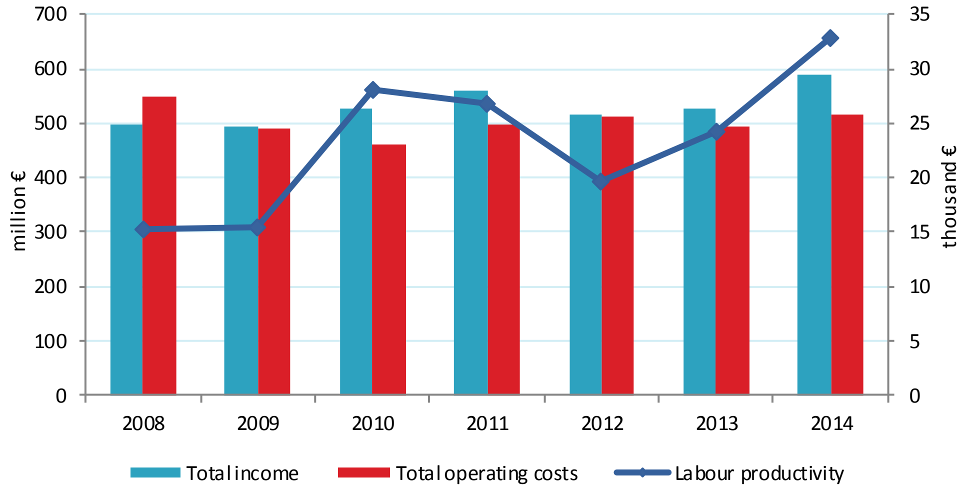


Figure 4.25.2 Income, costs, wages and labour productivity trends for Spain: 2008-2014.

Source: EU Member States DCF data submission

The relation between number of employees and FTE is close to three in 2014, and it suggests a high rotation and an instability of people working in the establishments. The 71% of the employees are male and also the 81% of FTE. In 2014 female contribution in aquaculture has raised in number of employees, but it has decreased into a light way (6% comparing with 2013) in terms of FTE. Average FTE per firm in 2014 has recovered in a very slight way. The enterprises have managed to increase labour productivity. It has risen a 24% in 2014, mainly due to a higher GVA.

In the different segments the structure is different, being the mollusc farming where there are more self-employed people, more seasonal work and also more unpaid labour. The fish farms, which are larger companies, are more constant in the number of employees and they are more qualified, with higher average wages.

4.25.4 Economic performance

Spanish aquaculture experienced a trend of growth in sales value during 2010 and 2011 after the collapse suffered in 2009. In 2012, the results of the activity of the sector suffered another significant decline. At that time, industry and public institutions that support it, feared that the new reduction in the value of the activity was a new change in trend, and could be the beginning of a new negative evolution of the activity. However, the improvement of the results during 2013 and 2014, confirmed that 2012 was a single result, and that the trend in the medium term for the Spanish industry is positive. The turnover of the Spanish aquaculture industry has increased an 11% in 2014 respect to 2013. The positive evolution is even higher if we compare the turnover obtained 2014 with the period 2008-2013. Almost the 93% of the Spanish aquaculture income comes from sales turnover, which remained stable compared with 2013. However it is necessary to highlight that the absolute value of other incomes increased a 57% in 2014 compared to 2013, and reached the same level that achieved during the period 2009-2011. This suggests that during 2014 the aquaculture production industry has increased again their operations in other activities different from aquaculture production as fish processing or fish trade, among others.

Since it is true that other income has not a significant importance in the total income, its increase can be a sing of some initiatives of diversification of the economic activities. The structural changes that have taken place in the seafood value chain in Spain have motivated some initiatives of vertical integration in which enterprise not only produce the fish, but also processed and/or market it. Part of this initiatives had been facilitated by the direct subsidies, through specific lines promoting processing and marketing of seafood products in the context of EFF. In 2014, direct subsidies account only for a 2% of total income. Since 2011 the amount of subsides has followed a negative trend. The €13.6 million subsidies obtained by the industry in 2014 was a 20% less compared with the period 2008-2013. The explanation for this is not a reduction in availability of European funds. During 2013 and 2014, the reduction in the subsidies was due to a reduction in the in the number of applications.

Operational costs show particular structures across species, but at the aggregated level, four factors represents the 75% of the total operational expenditures in 2014; wages and salaries, feed cost, livestock cost and other operational cost. Labour cost represents the 16% of the operational cost in 2014 and has increased an 11% respect 2013, but it remains stable comparing with the average cost during the period 2008-2013. When it is considered the imputed value of the unpaid labour, the labour cost increase until represent the 23% of the operational cost. In 2014 the level of employment in the sector increased compared with 2013 as it is shown in Table 4.25.2. But the increase in the labour cost was proportionally higher than the increase in the level of employment. This can be understood as a continuity in the change started in 2012 in the characteristic of the labour force in the Spanish aquaculture industry. At that time there were a reduction in the number of employees, but an increase in the total labour cost (considering also the unpaid labour). That means that in a context of employment reduction, the qualification of the workforce increased. In 2014 there were an increase in the employment and in workers qualification. The increase in the average wages, together with the increase in labour productivity suggest an increase in the technological level of the industry and in the professionalization and qualification of the sector labour force. This change in the labour force structure is motivated by the changes in the industry structure, where more and more, extensively and semi-intensively aquaculture activities are substituted by intensive productions that requires less employment but more qualified and less seasonal. All the above ends in more skilled workers under better employment conditions. Livestock cost represented in 2014 the 10% of the operational cost in the aquaculture industry. This cost remained stable compared to 2013, but suffered the strongest cost decline compared with the period 2008-2013. However, the positive percentage increase in livestock quantities supplied to the industry (111%) compared with its value reduction (-1%) indicates a significant decrease in the average price of the livestock purchased during 2014 respect to 2013. The main cost in the Spanish aquaculture industry is the feed, which represents the 27% of total expenditures. The quantity of feed supplied to fish remain stable in 2014 compared to 2013 and increased an 18% compared with the period 2008-2013. The value of the feed purchased during 2014 was a 3% lower than in 2013, and a 26% higher than the average during 2008-2013 respectively. The comparison between the evolution of the feed quantity consumed and its value shows a reduction in the average feed price in 2014 respect 2013, but this average price is still higher compared with the average price during the period 2008-2013. This reduction of the 3% in the average feed price in 2014 broke the positive trend in feed prices between 2011 and 2013, when the average feed price increased a 21%.

Capital costs include depreciations, financial costs and extraordinary costs. Depreciation of capital goods has increased a 29% in 2014 compared with 2013. This may indicate that aquaculture firms have renewed and also augmented their fixed equipment's with the improved returns obtained during 2013 and 2014. Net financial costs are still negative but have been reduced a 4%, continuing the negative tendency started in 2012. The financial cost in 2014 are a 33% lower than the average cost during the period 2008 to 2013, in which the financial cost increased due to the economic and financial difficulties imposed by the negative economic context. It is difficult to draw a single cause, but one of the drives of this situation can be the economic recovery of the enterprise that has helped companies to reduce their level of debt. Finally, extraordinary costs represents in 2014 less than 6% of the financial cost. The available data do not allow to provide a properly explanation of their origin. However, the particular nature of these cost, associate with circumstances that are not related with the normal activity of the company, helps to explain the absence of a clear trend during the period analysed.

The decrease of 13% in the total value of assets can have its origin in two main issues. On the one hand, the evolution of the fix assets can indicate investments in more intensive equipment's driven by the increase of bigger companies and the reduction of lower technological assets. This is consistent also with the increase in depreciation of capital during 2014 and the establishment of new enterprises in the industry, particularly those with more than 10 employees. Furthermore, these new fixed assets can be destined to the diversification of the economic activities of the industry, what is coherent with the increase in other incomes. However, the evolution of net investment that has decreased a 60% in the last year does not allow to confirm what the previous indicators suggest about the evolution of capital investments. One of the possible reasons is that most of these new investments in fixed assets took place in the second half of 2013, and their complete year depreciation was not accounted until 2014. On the other hand, the reduction of the total assets in a context of investment in fixed assets can had its origin in the variation of the livestock value. In 2014 took place a 24% increase in the sales weight which suggest an increase in the livestock that were marketed, and as a consequence, a reduction in the livestock value. Furthermore, the livestock cost suffered a significant reduction in 2013 and 2014 compared with 2011 and 2012 what do not contributed to the reposition of the livestock value and as a consequence facilitated the reduction of the total value of assets in 2014. The reduction of the livestock cost in 2013 did not have a negative effect on the total value assets due to a reduction in the livestock marketed that year and also due to the strong net investment in fixed assets. Unfortunately, with the available data it cannot be confirmed which part of the decrease in the total value of assets was mitigated by an increase in the total asset and which part of the reduction was generated by livestock value reduction.

Table 4.25.3 Economic performance of the Structure of the Spanish aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	% of total income	Change 2014-13	Development 2014/(2008-13)
Income (million €)										
Turnover	462.6	440.0	469.6	504.3	482.3	492.7	545.7	93%	11%	15%
Other income	21.7	36.4	36.3	36.2	15.1	19.3	30.2	5%	57%	10%
Subsidies	11.4	16.3	20.5	20.7	19.7	13.3	13.6	2%	3%	-20%
Total income	*495.8*	*492.8*	*526.4*	*561.2*	*517.1*	*525.2*	*589.5*	100%	12%	13%
Expenditures (million €)										
Wages and salaries	97.4	87.3	94.1	99.3	94.4	83.6	92.8	16%	11%	0%
Imputed value of unpaid labour	67.9	22.9	38.9	37.0	34.8	35.0	41.3	7%	18%	5%
Energy costs	13.3	23.2	22.6	27.1	24.4	18.8	21.6	4%	15%	0%
Repair and maintenance	13.6	16.1	15.6	13.9	12.9	12.3	13.2	2%	7%	-6%
Raw material: Feed costs	96.8	117.4	110.5	123.2	143.7	162.4	158.2	27%	-3%	26%
Raw material: Livestock costs	152.9	115.4	65.1	82.3	83.9	57.7	57.3	10%	-1%	-38%
Other operational costs	106.9	109.4	112.5	116.0	119.7	122.4	130.0	22%	6%	14%
Total operating costs	*548.9*	*491.7*	*459.2*	*498.9*	*513.8*	*492.2*	*514.4*	87%	5%	3%
Capital Costs (million €)										
Depreciation of capital	12.7	43.0	40.9	40.4	34.1	24.7	31.9	5%	29%	-2%
Financial costs, net	-23.7	-18.4	-16.8	-17.1	-16.6	-12.2	-11.7	2%	4%	33%
Extraordinary costs, net	15.4	-2.3	4.8	2.3	0.7	-0.4	2.6	0%	772%	-23%
Capital Value (million €)										
Total value of assets	958.5	724.7	854.6	736.7	907.0	916.8	798.5	135%	-13%	-6%
Net Investments	42.4	26.3	11.7	27.7	16.7	56.7	22.5	4%	-60%	-26%
Debt	469.8	441.4	476.6	358.5	429.3	432.2	333.5	57%	-23%	-23%
Input & Production (thousand tonnes)										
Raw material: Feed	154.2	127.3	122.3	166.1	174.9	180.7	181.6		0%	18%
Raw material: Livestock	16.9	14.7	15.0	26.0	24.3	21.1	44.5		111%	126%
Performance Indicators(million €)										
Gross Value Added	100.8	94.9	179.7	178.0	112.8	138.4	195.6	33%	41%	46%
Operating cash flow	-53.1	1.1	67.1	62.3	3.3	33.0	75.1	13%	127%	296%
Earning before interest and tax	-65.7	-41.9	26.2	21.9	-30.8	8.3	43.2	7%	422%	417%
Net profit	-42.0	-23.5	43.0	39.0	-14.2	20.5	54.9	9%	168%	1351%
Capital productivity (%)	10.5	13.1	21.0	24.2	12.4	15.1	24.5		62%	53%
Return on Investment (%)	-6.9	-5.8	3.1	3.0	-3.4	0.9	5.4		502%	458%
Future Expectation Indicator (%)	3.1	-2.3	-3.4	-1.7	-1.9	3.5	-1.2		-134%	-155%

Source: EU Member States DCF data submission

After a negative evolution in all the performance indicators in 2012, Spanish aquaculture again has started a positive trend in which all the indicators improved in 2013 and 2014. The improvement has been particularly strong in 2014. The contribution of the sector to the economy was €195.6 million in 2014, which represented the 33% of the total income, and an increase of the 41% respect to 2013.

The most relevant indicator for analysing the performance of a company or industry are EBIT and net profit. It can be seen in Table 4.25.3 that EBIT represented in 2014 the 7% of the total income and between 2013 and 2014 increased a 422%. This significant evolution was possible due to a higher proportional increase in the total income (11%) than in the total operating cost (5%). As mentioned above, the improvement in the results was not caused by an increase in the average price of the seafood produced, since the average turnover per kilogram produced decreased an 11%. Instead, the efficiency of the production processes improved, making possible a reduction of the average operating cost per kilogram of 16%. This can be interpreted like a sing of a change in the Spanish industry, which in recent times has been strongly affected by price volatility and difficulties to obtain profitability improvements through reduction in production cost.

When considering a relative measurement as is the Return on Investment ratio, it is confirmed an increase from a rate of 0.9% in 2013 to 5.4% in 2014. That means than in average during 2014 the economic performance of the assets of the Spanish companies have been positive, or in other words, for each €100 of investment made in the companies, were obtained €5.4. Considering this, and regardless of how the activity was funded and what was the financial cost, the activities developed by the Spanish aquaculture industry were profitable.

The comments about the performance indicators can be summarized in a positive trend and evolution in the middle term, which has intensified in the last two years. The good economic results provide financial stability to the sector companies and reduce financial risk. This time, the increase in the total income comes not only from an increase in prices, but also by an improvement in the use of the operational inputs and the development of more efficiency production processes. At the same time, the results generated a positive outlook, and it is expected than after a period of economic crisis, demand contractions and price volatility, the industry can now research and make new investments to improve production processes, fixed assets and diversify the activities. Thus the industry would increase the efficiency, competitiveness and sustainability of the economic activities.

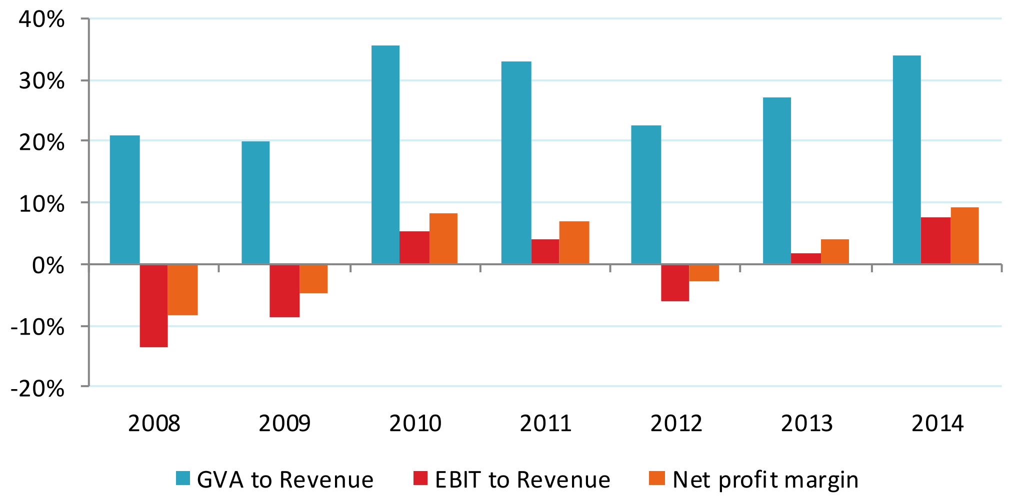


Figure 4.25.3 Economic performance for Spain: 2008-2014

Source: EU Member States DCF data submission

4.25.5 Main species produced and economic performance by segment

By far Mediterranean mussel goes on been the main harvested species in Spain, with a production in 2014 of 220 449 tonnes, which represent the 77% of total production. It is mainly produced in Galicia in rafts, but it is also cultivated in Cataluña, and in a smaller proportion in Baleares and Valencia in rafts, and in Andalucía in longlines. Also it is important to mention that its value is just the 20% of the total. This is a species which production depends on the environmental conditions, suffering big fluctuations into different years.

When talking about marine fish, seabream is the main harvested species in Spain, with 18 148.37 tonnes in 2014, with a total value of €100 952 thousand. Seabass is the second marine fish cultivated in Spain, with 17 292 tonnes in 2014. However, seabass gets first position in the fish marine segment in terms of value, with a total value of €114 359 thousand, which represents the 21% of the total national value. Both of these species are concentrated in Mediterranean coast, but are also are produced in the Canary Islands and in the Atlantic coast of Andalucía. The third important species in turbot produced in the North Atlantic coast and with a total production in 2014 of 7 933 tonnes with a value of near €64 million. The Atlantic Bluefin tuna, with only nearly 3 088 tonnes, gets a turnover of nearly €56 million.

Figure 4.25.4 Main species in terms of weight and value in Structure of the Spanish production: 2014.

Source: EU Member States DCF data submission

The rainbow trout is the main freshwater species in Spain. Its production is distribute inland around mostly all the regions of the country. Total production achieved 15 468 tonnes in 2014 with a value of €56 172 thousand.

In the group of molluscs in Spain there is also a traditional ways of aquaculture, like the clams cultivated in the intertidal areas. Their production is dominated by *Ruditapes philippinarum*. These are a kind of aquaculture with a high social value in the areas which it is concentrated.

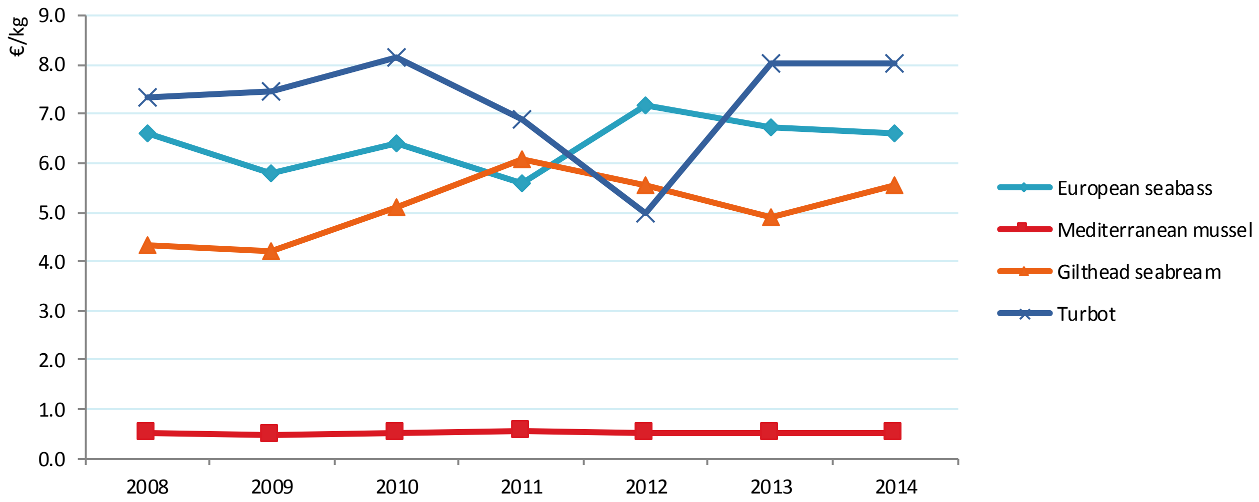


Figure 4.25.5 Average prices for the main species produced in Spain: 2008-2014.

Source: EU Member States DCF data submission

The analyse of evolution of the average prices for the main species in Spanish aquaculture indicates that in 2014 the market remained stable compared to 2013, which is significantly different from the volatility experimented in the previous years. At the same time, it helps to reinforce the argument that indicates that the improvement in the GVA to Revenue has been caused most by an improvement in the production efficiency instead of a rise in market prices.

The most relevant segments in the Spanish aquaculture are analysed below.

Segment 1: Trout combined

This segment represents the freshwater aquaculture in Spain, with the rainbow trout (*Oncorhynchus mykiss)* as nearly the only cultivated species. There are establishments dedicated to this species in nearly all the Spanish regions: hatcheries, nurseries and farms to grow fries. Rainbow trout is cultivated in inland establishments, situated in the bank of rivers and which take advantage of the natural river flow.

The big differences in the figures of this segment along the years must be interpreted as a change of some companies into different segments, depending on the culture phases and the culture species. Even in 2013 there are some companies which cultivate sturgeon and trout; they have been included in this segment because the value of trout production is higher than the sturgeon value for these specific companies. This situation causes a bias for 2013 in the segment. This is the reason it is better to compare the data of 2014 with 2012, instead of 2013, for this segment.

The number of FTE in this sector represents the 8% in Spanish aquaculture. There are 73 companies dedicated to this activity, mainly small companies with less than 5 employees. Due to these establishments are situated in zones with a high level of unemployment, these companies are elements of rural development.

Rainbow trout production is suffering a steady decline since 2008, with less companies and establishments dedicated to this activity. Regarding the data for 2014, the segment of trout combined obtained the lowest GVA of the four segments considered in this analysis. As in other fish productions, the main operational cost is feed, that in 2014 achieved the 45% of the total cost production, much higher than in first year of the series. There has been an exchange in the percentages between livestock and feed cost along the years.

Compared with other fish segments the proportion of the cost is similar to the segment of sea bass and sea bream cages: feed and livestock are the most important in the cost structure. In this segment wages and salaries supposes the 20% of the costs.

The other indicators show a positive performance in the production of trout in Spain in 2014, since both, EBIT and net profits have changes their signs respectively. Comparing 2014 and 2012, total income decreases 18%, but total costs fall 45%.

The average wage in the segment has suffered a drop, so as the number of FTE remains stable, the cost in wages and salaries decreases. At the same time, the total employees have increased slightly, and this fact suggests a bigger temporality.

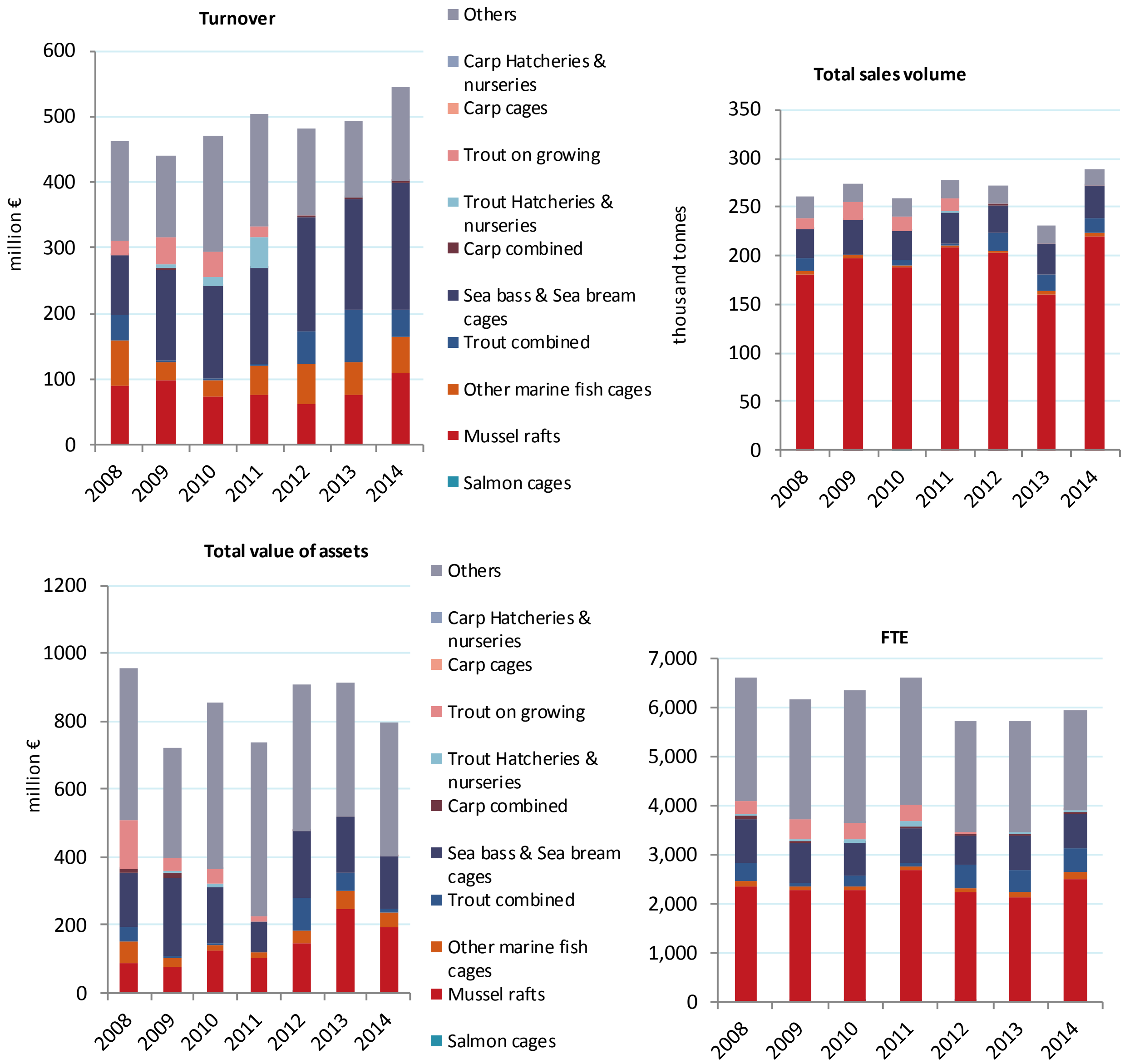


Figure 4.25.6 Structural development Structure of the Spanish aquaculture sector: 2008-2014.

Source: EU Member States DCF data submission

Segment 2: Mussel rafts

The mussel industry in Spain, most of it concentrated in Galicia, represented the 77% of the total Spanish aquaculture production in terms of quantities and the 20% of the value in 2014, considering that the average price of this product is significantly lower than the main fish produced in Spain. Being a species which depends on natural conditions, its annual production reflects high fluctuations; in 2013 suffered a decrease of 20% respect to 2012 until 161 thousand tonnes, the lowest production in all the period analysed. However, the total sales volume increased to 220 thousand tonnes, which was 37% higher production than in 2014 compared to 2013. This total production was the higher in the period considered. The evolution during 2013 and 2014 illustrates how dependent is this production to the environmental conditions in the Galician estuaries, where red tides can close the production areas for long periods.

This is the biggest segment in terms of employment, with 2 493 FTE in 2014, which was a 17% higher than in 2013. Traditionally it is a sector where there are a lot of people working a part of the year; most of them are self-employed workers; so the small familiar units are the base of this segment.

In this context, and as in 2013, the mussel industry was the most profitable of the four segments analysed during 2014. The mussel industry GVA was positive in all the years analysed and the EBIT and net profit have been positive since 2009. Although all the economic indicators have a positive value it is necessary to highlight the break in the negative evolution of the indicators between 2011 and 2013 and the positive evolution in all of them in 2014. The increase 40% in the total income has its origin in the increase in the quantities marketed during the year, and in a lesser manner, to an improvement of the 5% in ex-farm prices between 2013 and 2014 according to the turnover and the sales volume reported. The economic indicator EBIT and the net profit also experimented a significant increase between 2013 and 2014.

The operational cost structure of this extensive aquaculture activity really differs from the observed in the other segment analysed. Different from fish farming where feed is the main cost and labour cost is under the 25% of the total cost, in the case of the mussel industry there is no feed cost, but as a low investment capital activity, labour cost is the most relevant operational cost. While the GVA, which does not consider the labour cost, is the 74% of the total income, the EBIT, in which the labour cost is considered, falls to the 31% of the total income in 2014. The relevance of labour cost is confirmed in the Figure 4.25.8 in which can be observed that the wages and salaries represented the 20% of the operational cost, but what is more relevant, the imputed value of unpaid labour was the 46% of the total operational cost.

Segment 3: Other marine fish cages

In this segment it is included the Atlantic Bluefin tuna fattened in cages, with a production of 3 088 tonnes, in Cataluña, Murcia and Andalucía.

This segment employs 217 people equivalent to 139 FTE with higher qualification than in other subsectors and a higher employment stability during the year. The total value of the assets was more than €47.5 million in 2014.

This segment production obtained a total turnover of nearly €55.9 million and a total income of €57.9 million in 2014. The total income increased a 15% compared to 2013 and a 25% compared with the average in the period 2008-2013. All the other performance indicators also obtained a positive result and suffered a positive evolution compared both with 2013 and with the average results obtained during the period 2008-2013. The increase in the GVA and in the EBIT was proportionally higher than in the total income. With the increase in the sales volume, the income increased a 15% while the total operating cost only increased a 7%. This helps to explain the improvement in these two performance indicator.

In the case of the cost structure, traditionally this segment implements the common fish farming structure in which the main cost are feed and livestock. However, in the available data, while feed cost represent the 24% of the total operational cost in 2014, livestock cost only represent the 1%. This last data does not represent the common level for this type of activity (in 2012 the livestock cost achieved the 18% of the total operational cost), since tuna farming is a base capture-based aquaculture activity, and this implies that it needs to buy individuals harvested at the sea. With the available data, it is not possible to provide an explanation to this evolution in the livestock cost.

Table 4.25.4 Economic performance of main Structure of the Spanish aquaculture segments: 2008-2014 (in million €).

Segment 4: Sea bass and sea bream cages

Variable	2008	2009	2010	2011	2012	2013	2014	% of total income	Change 2014/13	Development 2014/(2008-13)
Trout combined										
Total income	38.7	2.5	3.2	2.2	50.6	84.3	42.9	100%	-49%	42%
Gross Value Added	12.6	0.9	0.9	0.9	7.2	25.4	12.8	30%	-50%	61%
Operating cash flow	2.9	0.5	0.3	0.5	-3.5	11.1	4.6	11%	-58%	134%
Earning before interest and tax	2.6	0.3	0.1	0.5	-6.9	7.6	3.4	8%	-55%	381%
Net profit	3.3	0.4	0.2	0.5	-6.6	8.0	3.7	9%	-54%	289%
Total sales volume (thousand tonnes)	12.9	1.3	5.1	0.5	17.7	17.2	15.6		-10%	71%
Mussel rafts										
Total income	94.0	106.4	83.2	81.6	64.6	78.6	110.1	100%	40%	30%
Gross Value Added	32.4	67.2	52.3	57.8	45.4	54.7	81.0	74%	48%	57%
Operating cash flow	-36.1	45.8	27.9	28.5	18.6	17.0	36.2	33%	113%	114%
Earning before interest and tax	-37.1	40.5	21.2	24.2	16.9	14.7	34.4	31%	133%	157%
Net profit	-34.2	43.3	23.7	23.8	16.7	15.3	34.7	32%	126%	135%
Total sales volume (thousand tonnes)	180.6	197.8	188.4	208.0	202.1	160.6	219.6		37%	16%
Other marine fish cages										
Total income	68.6	29.2	25.3	45.5	59.5	50.5	57.9	100%	15%	25%
Gross Value Added	28.3	11.0	7.0	22.2	14.4	16.6	20.5	35%	24%	24%
Operating cash flow	23.5	8.5	3.9	17.4	7.8	9.7	14.3	25%	48%	21%
Earning before interest and tax	22.1	7.7	2.9	16.3	6.3	8.3	12.7	22%	53%	20%
Net profit	24.2	7.9	3.7	18.4	10.2	10.2	15.1	26%	48%	21%
Total sales volume (thousand tonnes)	3.8	2.4	1.8	2.9	3.0	2.9	3.1		6%	10%
Sea bass & Sea bream cages										
Total income	105.4	157.6	159.1	165.8	188.9	178.6	221.7	100%	24%	39%
Gross Value Added	-13.2	5.5	23.2	15.2	12.2	-0.9	30.5	14%	3554%	335%
Operating cash flow	-32.0	-17.1	3.6	-1.2	-3.6	-16.0	7.9	4%	149%	171%
Earning before interest and tax	-35.5	-30.7	-7.6	-11.1	-14.2	-24.6	-1.0	0%	96%	95%
Net profit	-29.6	-24.0	-1.5	-5.8	-8.4	-20.3	2.9	1%	114%	120%
Total sales volume (thousand tonnes)	29.7	34.1	29.8	32.2	29.4	31.4	33.0		5%	6%

Source: EU Member States DCF data submission

Gilthead seabream (*Sparus aurata*) is the most cultivated fish in Spain, with near 17 000 tonnes in 2014, although with a 13% less than in 2013. This is another drop after the slight upturn in 2012. The maximum Spanish production was in 2008, with more than 23 000 tonnes. Sea bass production (*Dicentrarchus labrax*) in 2014 has increased an 11%. The production of juveniles in 2014 goes on the same tendency than the trend of fish on growing for both species. The species produced in this segment reached a value of 221.6 million Euro in 2014, which results the 37% of total Spanish income in that year, and 35% comparing the turnovers. This amount of money was got with a production of 32 965 tonnes, nearly an increase of 5%, comparing with the previous year.

These species are cultivated in warm waters, in the Mediterranean Sea. Along the Mediterranean Spanish coast (Andalucía, Murcia and Canary Islands for sea bass and Valencia for sea bream) there are hatcheries which cultivate the fingerlings, which later will be grown in cages in the sea. In spite of these establishments, there are not enough juveniles for the companies which grow these species in cages; so they must be imported from other countries.

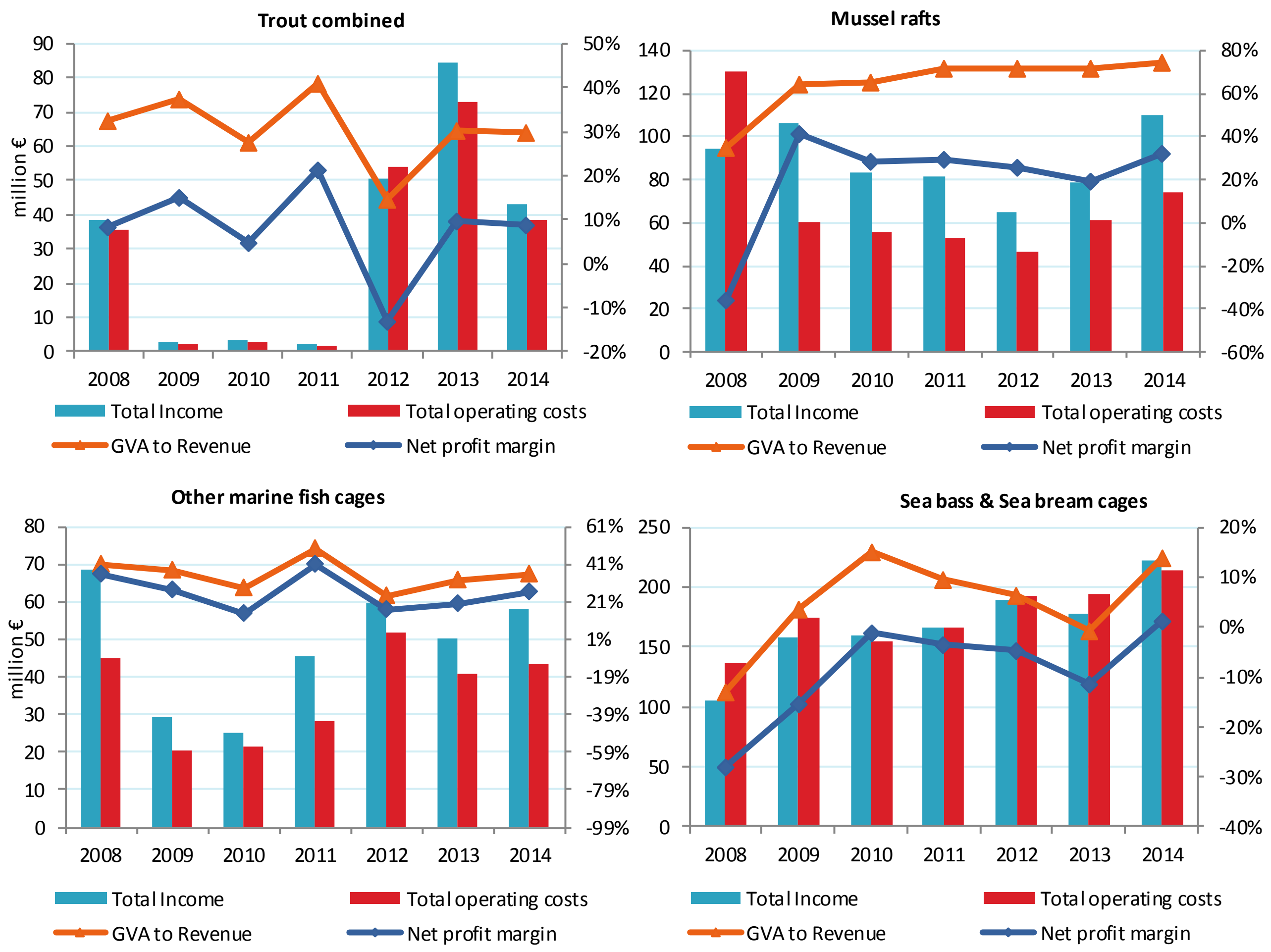


Figure 4.25.7 Economic performance indicators for the main Structure of the Spanish segments: 2008-2014.

Source: EU Member States DCF data submission

The number of companies has gone on the reduction process since 2008, from 59 firms to 31 last year, but the average size of the companies has grown. The number of employees in this segment suffered a decline in 2012, but it recovered in 2013 and it increased again in 2014. The relation between employees and FTE in this segment has a better proportion comparing with other segments and with the total and it suggests more stability in the employment. Costs on wages and salaries decreased in the series, except in the last year when these expenses increased more than the number of jobs.

Although a part from some production developed in brackish waters in southern Spain, the majority of the domestic sea bass and sea bream production is grown in cages. This segment generated the 37% of the total income of the industry in 2014, what makes sea bream and sea bass the most important species in terms of value.

After several years with some indicators which showed bad economic results, the economic performance began to recover in 2013 and this recovery has gone on in 2014.The total income decreased a 5% between 2012 and 2013; however there have been an upward movement last year, rising a 24% from €178.5 million to €221.6 million. This increase is due to two factors; an increase in production of sea bass and an increase in the price of gilthead seabream than compensate the slight decrease occurred in 2014. These companies are looking for new ways of activity, as the important rise in other incomes in this segment suggest. This fact can be related with the rise in net Investments which occurred in 2013.

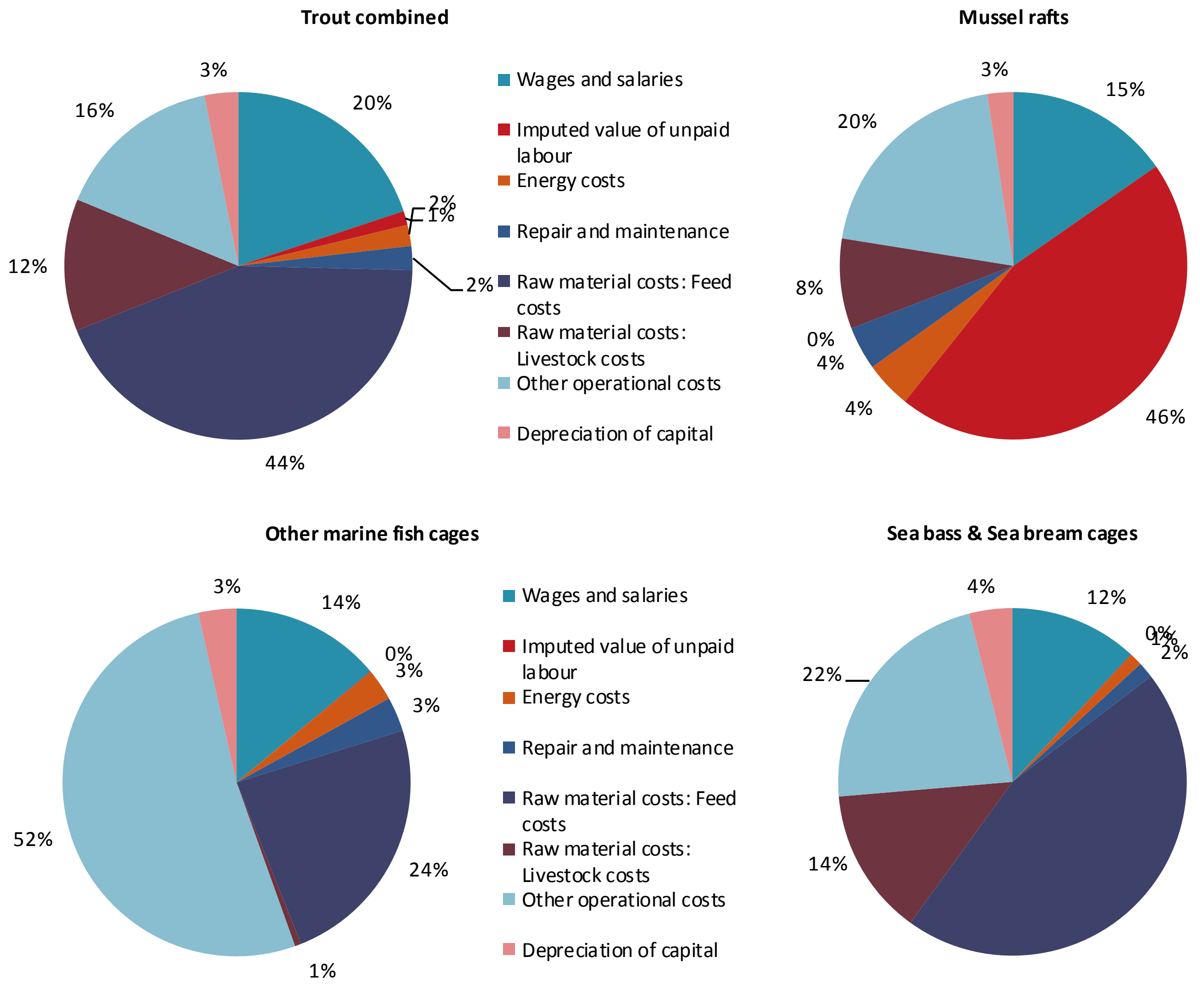


Figure 4.25.8 Cost structure of the main segments in Spain: 2014.

Source: EU Member States DCF data submission

In the structure of operating expenses is the feed which remains a highest percentage, although its price, which was increasing in recent years, seems to have been contained in the last year. The feed cost in the sea bass and sea bream segment in Spain decreased from the 48% of the total operating cost in 2013 to the 47% of the total in 2014. The decrease in feed prices and its relevance in the cost structure of these companies affected to the performance results and the change in the trend of the economic indicators. Apart from "Other operational costs" are the costs in livestock which also constitute a significant amount. The total income in this segment has increased 24% and the operational costs just 10% in 2014.

As a results of the increase in total income and a relative cost containment the indicators of Gross Added Value (GVA) and GVA to revenues change their signs from negative to positive.

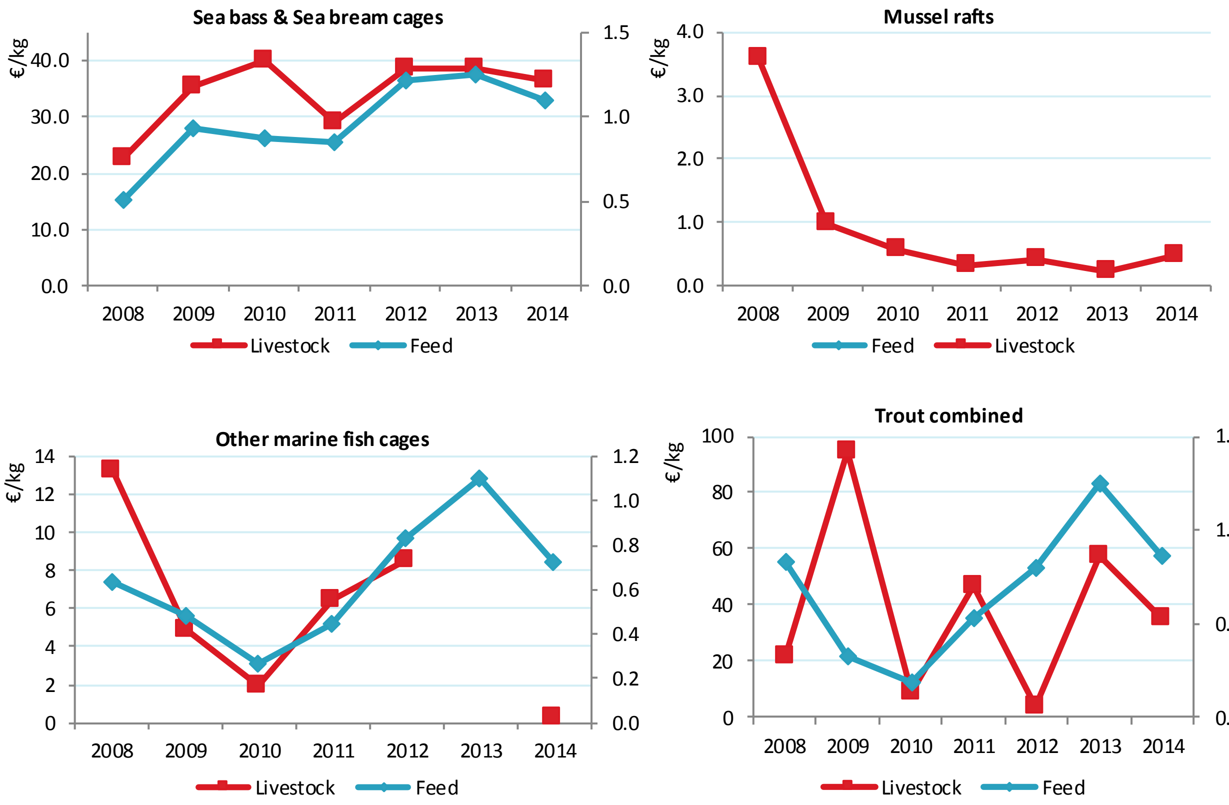


Figure 4.25.9 Feed and livestock prices for the main Structure of the Spanish segments: 2008-2014.

Source: EU Member States DCF data submission

4.25.6 Trends and triggers

Current production trends and main drivers

The recent evolution of the Spanish aquaculture sector shows a positive tendency both in terms of production and value. After a negative evolution during the economic crisis, the economic performance indicators have experimented a recovery even in those segments that suffered negative economic results.

In terms of sector structure, in recent years the number of enterprise has remained stable but has been a change in the composition, with a reduction in the number of small enterprises and an increase in the number of big ones. This explains the reduction in the level of employment compared to 2011. Even this, the number of FTE increased in 2014.

This evolution can be explained in general terms by several reason; the increase in some segment prices, the increase of the efficiency production, and the investments in renovation and improvements of the assets.

In the case of mussel production, after a strong decrease of the production in 2013 due to the red tide, the industry has achieved the highest level of production in all the period analysed. The evolution of the industry is expected to be positive but it is necessary to consider that this activity suffer a strong volatility due to environmental issues. Traditionally, mussels in Spain have been marketed fresh or canned. In recent years there have been some initiatives in order to produce new product presentations which more added value through its transformation.

The evolution of trout in the Spanish sector has continued the negative trend of the recent years. Price market still are low and it is not expected and increase in next years. In this context some farmers has started to find production alternatives more profitable like the rainbow trout eggs marketed as trout caviar. More recently, an increasing activity is the commercialisation of embryonated eggs, which has found a new market in South America.

The seabream and seabass economic performance indicator have improved significantly compared with the previous years. During 2015 and 2016 the seabream and seabass industries have increased the purchases of livestock. According to this, it the medium term the production is expected to increase.

The Bluefin tuna is a really profitable activity due to the high prices that the tuna obtain at markets. Its production is a capture-base aquaculture, and is restricted by the availability of individual at the sea. Recently, the IEO (Instituto Español de Oceanografía) in collaboration with aquaculture enterprises, has closed the biological cycle of the Bluefin tuna. Now, it is necessary to wait to the knowledge transfer to the producers. After this, it is expected new investments and a significant increase in the production.

Market structure

Spain is the largest market for seafood in the EU and one of the biggest in the world. In recent years there have been significant changes in the structure of the market along the value chain. The traditional structure of aquaculture value chain that is, farms, wholesaler and retailer, has been changed by new agents and more direct channels. Vertical integration in which farmers process the product and/or trade with it, the purchasing of big retailers directly to the farms, direct marketing from farmers to consumers through internet, and direct delivering from farms to consumers, are some examples of the new tendency's in the supply structure of the Spanish market.

Spanish farmers face competition not only from other aquaculture producers from inside and outside the EU, but also from popular wild species like hake and cod fish with a strong tradition of consumption in Spain. These wild species sometimes are competitors for aquaculture products also in terms of price, like in recent years when their supply increased and the prices fall until reach levels even cheaper than the main farmed white fish species like bass and bream.

There is still a strong tradition of consumption of fresh seafood products in Spain. The consumption of fresh whole fish still remains a significant part of the sales. However, the changes in lifestyles in recent years have increased the demand for more processed products. Identification and differentiation of farmed products in the marketplace has improved along the previous years, but there are still issues of confusion and mislabelling that become even more important for the marketing of processing products.

That is the case of the processing of seabream and seabass marketed as white fish fillets. Nowadays there are multiple white fish fillets offered fresh and frozen which are competitors or substitutes of these two species, since most of the consumers do not appreciate differences in the time of purchase apart from the price. This context is a competitive disadvantage for these species since due to the small size of the seabream and seabass compared with other species filleted, the processing results in wastes off production nearly to the 60% and has a relevant labour cost due to the manual boneless process. Due to this situation, there are initiatives to inform the consumers and differentiate the product in terms of quality.

In a different way, more processed products have found a segment of consumers that are willing to pay more for pre-cooked or ready to eat products. That is the case of some Galician companies that are producing ready to eat mussels in different sauces. These productions previously were mostly exported but in recent years have experimented an increase in the demand in the Spanish market.

Efforts in product differentiation undertaken by producers have had different results depending of the species and the level of processing. However in general these effort still don't reach the marketplace in sufficient amount to have a positive effect of product appraisal and price. Under these conditions price appears as the main competitive tool, and the volumes of supply as the main drivers for price. These conditions put domestic farmers, especially in the finfish segment, vulnerable to the pressure of species with lower market prices.

Diversification of the economic activities through vertical integration along the value chain (processing and trading) has been the solution adopted by several producers to leave price competition in the ex-farm step of the value chain, and obtain part of the value created in further steps. This is expect to be a tendency in next years.

Issues of special interest

The top production in Spain remains in the same species cultivated during the last years. Particularly in recent years the industry has focused in those species which has the technology, the management knowledge and its market in order to consolidate productions and growth perspectives. The high level of diversification initiated twelve years ago was reduced in the years of the economic crisis. At that time, Spanish enterprises focused in the production of the species that were at the industrial and commercial scale phase, avoiding allocate scarce liquidity resources to activities which at that time still did not provide incomes. However, during 2013 and 2014, diversification of species became again an issue of interest for the industry, starting again the allocation of resources for research. This activity is still not reflected in the data of these report since in general, the initiatives have not yet achieved the industrial and commercial stages. So it is expected that the results of this renovated interest in diversification to produce high value product and to access to new market segments, will have result in the next years. It is necessary to highlight that the high diversity of environments in Spain for the aquaculture increases the possibilities for diversification.

The existence of high qualified groups of research in Spain in several fields (new species, feed factor conversion, diseases) and important consolidated fishery sector, which can transfer technology and skilled workers to aquaculture, must be an advantage to boost firms.

Due to the increasing competition in some productions, generated by the increase in the supply of some wild species and the imports of products arrived from the EU and outside the EU with lower prices, there is a growing interest in the industry for the differentiation of the product and the production of high added value products. Spanish producers are also starting to see the diversification of economic activities as a solution to avoid the competition in prices. Diversification allows them to processing their product and obtain the value added in this process. This processing is taken place in caning, but the most successful experiences have taken place in those producers that decided to produce pre-cooked and ready to eat product. In this case is usual that the activity is developed in collaboration with other enterprises that have the knowhow. The economic diversification is reduced to several experiences but cannot be treated as a general tendency. It is expected that the success in many of the initiatives, encourage other producers to follow the same way.

Setting up new business will be stimulated with a simplification of administrative procedures, which at present are so complicated than discourage the new investment and with a correct spatial management for the different uses.

Outlook for future production trends

The drive in Spanish aquaculture is based in CFP, in EMFF and in the strategic guidelines publishes by Commission in April 2013, and which have the target to boost the Member States to define their own national targets through their strategic plans. The Spanish government plans to provide subsides by €274 541 290 (EMFF contribution + MS contribution) to boost a sustainable aquaculture. The distribution of this financial support to the industry is as follows:

1. Support and consolidation of the technological development, innovation and knowledge transfer: €60 435 196.
2. Promoting the competitiveness and viability of aquaculture enterprises: €141 282 020
3. Protection and restoration of aquatic biodiversity and ecosystems empowerment, and promoting an efficient aquaculture: €47 354 982.
4. Promotion of an aquaculture that protect environment, promotion the animal health and welfare, and public health: €20 339 056.
5. Development of training, new skills, and lifelong learning: €5 130 003.

The Spanish multi-year strategic plan for Spanish aquaculture 2014- 2020 highlight important areas for future development and growth of production and technological advancement processes:

1. To simplify administrative procedures and the normative frame for the activity. Spain must try the homogenization of the strategies in its 17 autonomous communities, which at present have different competencies and normative in the activity regulation. Here it must be mentioned the attention to the potentiality in off-shore aquaculture since the administrative point of view and the conflicts solution in the interaction with other marine users. However it is essential to facilitate the investment and stablish the same competitive context and it is improving in this way.

2. Increase production, stressing the integrated coastal zone management and the identification of adequate areas for the aquaculture development. It must be highlighted the importance of the strategic plans in aquaculture in order to encourage the investment in new sites with technologies that allow a better use of the space and a better access to the water.

   Location for sites for the freshwater aquaculture development presents now less problems than in past years due to the cessation of activity of a large number of establishments, over all in the last five years. Moreover, the use of Recirculating Aquaculture Systems (RAS) allows to cut off water consumption, and this controlled atmospheres have stimulated the location of new facilities in unconventional areas for certain aquaculture productions.

   An example of development in this guideline is a facility sited in Valladolid dedicated to the cultivation of whiteleg shrimp that is far from the sea. The site location decision was based on economic (cheaper land) and logistic (good communications, proximity to major wholesalers and consumer markets) factors and on incentives to innovative investments. At present, due to the success of this facility, another similar project is in its beginning steps.

3. Strengthening competitiveness through R & D and training of professionals, ensure technology transfer to the industry and advance in animal welfare, prevention and eradication of diseases.

   In Spain there are very good research aquaculture groups, although their researches must be transferred to industry and productive sector. In recent years, these institutions and their researchers have made a great effort to maintain even increase the research production, despite the cuts in the financial support due to budget constraints. In order to ensure the technology transfer to the industry it is necessary a coordinated strategy. On the one hand, increase the support to the research centres and universities that have accumulated and are generating a really valuable knowledge for the development of the industry. On the other hand implement actions to reinforce the links between the industry and these research institutions. These links should be not only stablished for transferring the knowledge, but also since the starting point of the research process. These will help to identify the real needs and demands of the industry and will help to facilitate the access of the researchers to de industry activities.

4. Improving the profitability and sustainability of the sector through the diversification of species and improved performance in feed.

   Diversification can satisfy the demand of seafood products that are not always available from fisheries. It also decreases the risk of investing in monocultures and the reliance on market evolution. In that sense it is a tool for profitability.

   The recent improvements in the economic results are expect to facilitate a new increase in the industry activity in terms of species diversification.

   There is interest in the industry for species diversification as an alternative to other mature markets which do not allow significant grows.

   The aquaculture sector in Spain reduced but not stopped the diversification species processes during the crisis. If enterprise did this effort during the financial crisis, it is expect that in next years, there will be new initiatives.
   According to the data, in Spain sole, blackspot sea bream and meagre are the species most exploited in terms of diversification. This diversification is not only associated with new species, but also with new products, directed to different market niches; for example sturgeon caviar or trout caviar.

   Most of these species share the problems that create bottlenecks in food, especially in the larval stage, and feed conversion factors. Thus efforts should be directed to the search for substitutes for fish meal and oil, more efficient alternative formulations and ingredients, such as fish waste silage and vegetal meals, which reduce some of the costs of the inputs.

5. Ensure the supply to markets and improve the image of aquaculture products.

   To do this there are developing marketing plans to consider the needs and perspectives of market development and promotional campaigns of aquaculture products. In the past, promotional actions not always achieved the expect effects in the level of consumption of aquaculture products but they had a positive impact in the consumer knowledge about these products and in their image. The development of new marketing plans will help to improve the image of aquaculture products, and also will have a positive impact in the consumption.

4.25.7 Data Coverage and Data Quality

Data quality

Spain has two surveys directed to the aquaculture sector. In 1999 the Activity Survey started, in order to get information about the activity of the aquaculture establishments, especially the species production with the different techniques and the employment of the sector; the economic information is collected with the economic survey since 2008.

Both surveys are programmed and developed at the same time, once a year, using the same population to research and with a common field work. The unit used as a population is the establishment for aquaculture. Each survey has its own questionnaire, getting information for different variables, except the value for the production (collected in both questionnaires). In this case, individual answers are checked and if there are inconsistencies, they are researched and the found mistakes are corrected. So the consistency between both surveys is guaranteed.

Data are collected with combined methods; in a part of the population it is used a census and in another part a stratified sampling. The sampling is used in the population of mussel in rafts in Galicia. The segmentation used in Economic Survey uses a typology of aquaculture establishments which is coherent with the established groups in Commission Decision 2010/93/UE.

If an enterprise produces more than one species, it has been allocated to the segment of the species with a higher turnover. When a company owns more than one establishment, it can uses different techniques. In Spain each establishment is the data collection unit, so because of the data are sent aggregated in enterprises, when there are different techniques, the company is allocated where its turnover is highest again. This can cause a company can changes among different segments in different years.

Data availability

Data for the aquaculture sector is published once a year in Fisheries Statistics in Ministry of Agriculture, Food and Environment`s website at the end of the next year. Data can be consulted in this website in three different ways:

- Using a query builder, so that each user generates its own results.
- With predefined tables of establishments, production, employment and food supply.
- Downloading the data base. In this case, queries are performed with Microsoft EXCEL program, by means of pivot tables previously generated by the system; in this case the user can perform a large number of queries.

Confidentiality

Public statistics law forces to protect data`s confidentiality supplied by informants. This law dedicates its chapter III to the statistical confidentiality, saying in any case, statistics cannot disclose personal data. This confidentiality protection forces even not to publish much disaggregated information to avoid identification of the informant. This has been respected in all moment, so the different segments provided in Spain have more than one enterprise.

Differences in DCF data compared with other official data sources

The Spanish data for DCF is in line with both value and production registered in FAO and EUROSTAT, because they come from the same sources.

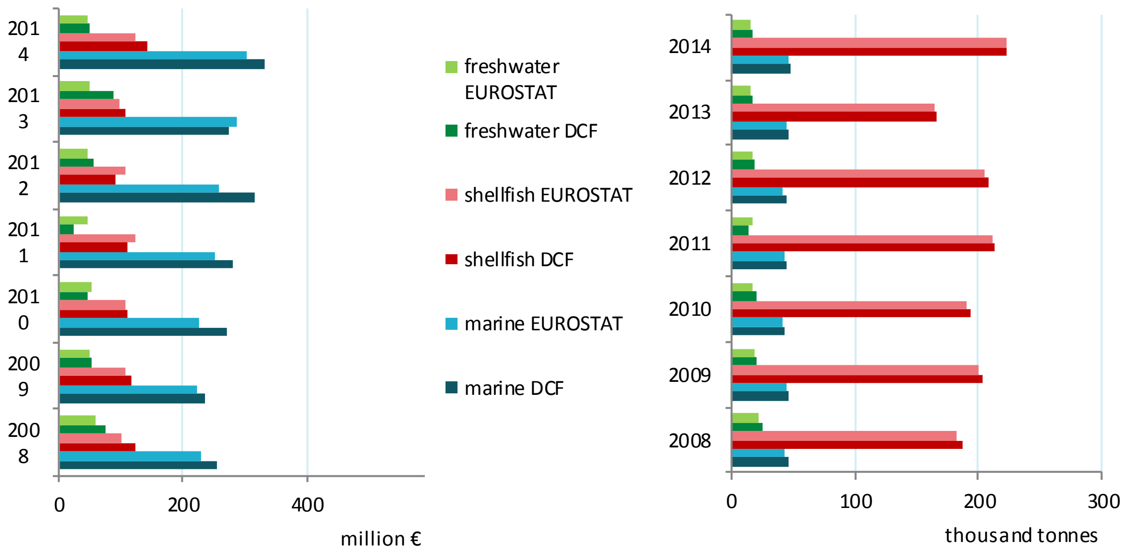


Figure 4.25.10 Comparison of DCF data with EUROSTAT data for Spain: 2008-2014

4.26 Sweden

4.26.1 Summary

Production volume and value

Over the years 1998 to 2014 production levels have increased from 8 200 tonnes in 2008 to 14 000 tonnes in 2014 and the value of total production have increased from €14.5 million in 2008 to €56.9 million in 2014. The change in production levels between 2013 and 2014 is a decreased to 2%, however this corresponds to a total increase in value of 13%.

Overall industry structure and employment

In 2014, the total population of aquaculture farms was around 500, which was distributed on 142 enterprises. The Swedish aquaculture sector is dominated by small enterprises, and in 2014 90% of the Swedish enterprises had less than 5 employees.

Main segments

The production in Sweden is divided into four main segments:

- Segment 1: Freshwater fish in cages, Rainbow trout and Arctic char.
- Segment 2: Freshwater fish on growing, Rainbow trout, Arctic char on growing and Rainbow trout combined.
- Segment 3: Trout in cages and on growing Salmon.
- Segment 4: Shellfish, farming techniques long line (mussels) and shellfish farming techniques other (oysters, crayfish), almost entirely consisting marine species.

The most commonly grown fish in Sweden is Rainbow trout (*Oncorhynchus mykiss*) grown in cages for consumption. Species grown in cages are common both in freshwater and in marine waters, although species grown in freshwater are dominating. The average size of a cage is 1 380 m^3. Other production methods, such as ponds and raceways are used mainly for producing fish for stocking.

Current production trends and main drivers (Trends and triggers)

The Swedish aquaculture sector has over time experienced an increase in the volume of production. The growth of Swedish aquaculture has been strong in the 2000s, averaging 7.7% annually between 2000 and 2012. However, the growth in sector stalled in 2012, and production 2014 decreased by 5.3 %. Exports of fresh, chilled or frozen fish are mainly to other European countries, especially Finland and the Baltic countries. There is also a continuous high demand for fish for stocking related to recreational fishing.

Outlook

The significantly higher net import than net export still implies a positive development for the Swedish aquaculture farmer. The aquaculture industry sees a positive future and there are several large applications for expanded and/or new permits for fish production. The difficulties facing the Swedish aquaculture sector are mainly related to regulations, initial investment costs and difficulties of implementing new growing techniques at a commercial scale. However, to some extent counter the difficulties and to stimulate progress, Sweden implemented start up support for new aquafarmers in programme period of EMFF 2014-2020.

4.26.2 Production and sales

The production of Swedish aquaculture in 2014 was 14 000 tonnes of fish and shellfish, dominated by Rainbow trout which represented 73% of the total production. The production of Arctic char amounted to 1 720 tonnes, and production of cultivated Blue mussels was 1 770 tonnes. Production volumes for 2014 indicate decrease of 2% compared to 2013. The value of aquaculture production was €56.9 million Euros in 2014, also indicating an increase of 13% compared to 2013 (Table 4.26.1).

Table 4.26.1 Production and sales for Sweden: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Sales weight (thousand tonnes)	***8.9***	***10.4***	***11.7***	***14.5***	***14.8***	***14.4***	***14.0***	*-2%*	*13%*
Marine			0.0	0.0	0.0	0.0	0.0		*0%*
Shellfish		2.1	1.4	1.5	1.3	1.7	1.8	*4%*	*9%*
Freshwater	6.3	8.2	10.3	13.0	13.5	12.7	12.3	*-3%*	*15%*
Hatcheries & nurseries			0.0	0.0	0.0	0.0	0.0		*0%*
Sales value (million €)	***34.5***	***29.4***	***41.2***	***47.5***	***49.8***	***50.3***	***56.9***	*13%*	*35%*
Marine			0.0	0.0	0.0	0.0	0.0		*0%*
Shellfish		1.1	0.8	1.0	1.0	1.3	1.3	*-1%*	*18%*
Freshwater	27.2	28.3	40.4	46.5	48.7	49.0	55.6	*13%*	*39%*
Hatcheries & nurseries			0.0	0.0	0.0	0.0	0.0		*0%*

Source: EU Member States DCF data submission

4.26.3 Industry structure and employment

Sweden has favourable natural prerequisites for aquaculture with a large number of freshwater areas and a long coastline. Firms are located in 100 out of Sweden's 290 municipalities and a majority of these are sited in rural areas. Over the last decade, production levels have been steadily increasing while the number of firms has decreased (Table 4.26.2).

Table 4.26.2 Structure of the Swedish aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Structure (number)									
Total enterprises	*155*	*192*	*175*	*153*	*147*	*144*	*142*	*-1%*	*-12%*
<=5 employees	142	182	162	139	135	130	128	*-2%*	*-14%*
6-10 employees	9	7	10	10	9	9	8	*-11%*	*-11%*
>10 employees	4	3	3	4	3	5	6	*20%*	*64%*
Employment (number)									
Total employees	379	424	399	392	370	420	411	*-2%*	*3%*
Male employees	321	367	356	343	317	354	345	*-3%*	*1%*
Female employees	58	57	43	49	53	66	66	*0%*	*21%*
FTE	223	222	230	263	263	304	278	*-9%*	*11%*
Male FTE	199	201	209	235	232	266	249	*-6%*	*11%*
Female FTE	24	22	21	28	31	38	29	*-23%*	*9%*
Indicators									
FTE per enterprise	1.4	1.2	1.3	1.7	1.8	2.1	2.0	*-7%*	*23%*
Average wage (thousand €)	29.0	24.4	28.6	32.1	33.4	32.9	44.5	*35%*	*48%*
Labour productivity (thousand €)	48.9	39.2	52.1	58.1	45.6	61.9	65.5	*6%*	*29%*

Source: EU Member States DCF data submission

In 2014 the Swedish aquaculture sector employed 411 persons, corresponding to 278 FTEs. During the last year, the number of employees decreased by 2%. However, during the full reported period, the number of employees shows a 3% increase. The sector is characteristically dominated of male employees (both in numbers and FTEs), with only 16 percent female FTEs in 2014. The data show a trend of increasing total employment in terms of number of employees as well as FTE has increased.

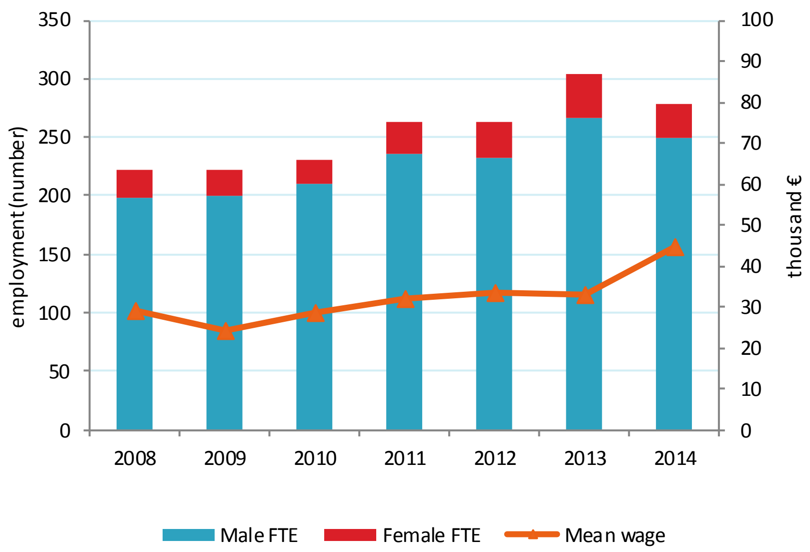


Figure 4.26.1 Employment trends for Sweden: 2008-2014.

Source: EU Member States DCF data submission

The average FTE per enterprise for the whole period has increased by 23% while the average wage remained stable over the period. The labour productivity has been increasing after a drop in 2012 (Figure 4.26.1).

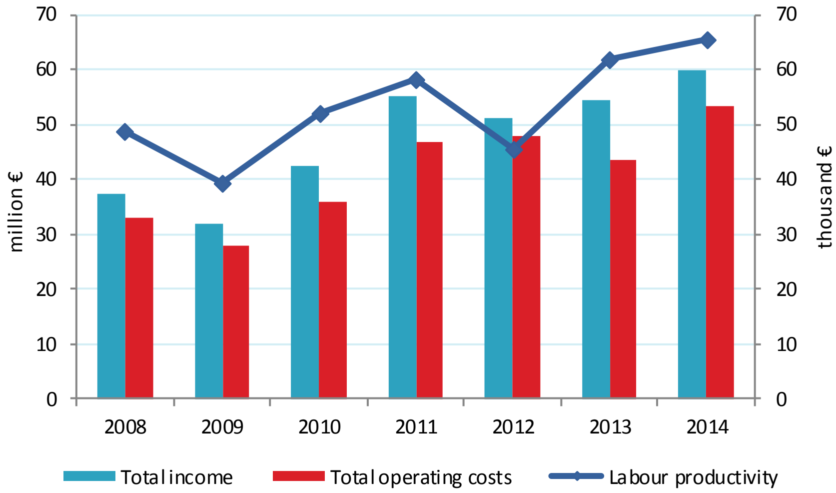


Figure 4.26.2 Income, costs, wages and labour productivity trends for Sweden: 2008-2014.

Source: EU Member States DCF data submission

4.26.4 Economic performance

Turnover is the main source of income for firms in the Swedish aquaculture sector. In 2014, the share of total income was 95% and has remained at a similar level over the covered time period. The cost structure shows that the main operational expenditures for aquaculture firms are the cost of labour (wages and salaries) and raw material (feed and livestock). Both energy cost and imputed value of unpaid labour makes out a small share of total income, of about 3% each (Table 4.26.3).

Table 4.26.3 Economic performance of the Structure of the Swedish aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	% of total income	Change 2014-13	Development 2014/(2008-13)
Income (million €)										
Turnover	34.5	29.4	41.2	47.5	49.8	50.3	56.9	*95%*	*13%*	*35%*
Other income	2.9	1.6	0.2	6.1	1.4	2.1	2.1	*4%*	*2%*	*-12%*
Subsidies	2.5	0.8	0.8	1.4	4.3	2.0	0.7	*1%*	*-66%*	*-66%*
Total income	*39.9*	*31.8*	*42.3*	*55.0*	*55.5*	*54.4*	*59.7*	*100%*	*10%*	*28%*
Expenditures (million €)										
Wages and salaries	6.2	5.2	6.4	8.2	8.5	8.8	10.9	*18%*	*24%*	*51%*
Imputed value of unpaid labour	0.3	0.2	0.2	0.2	0.3	1.2	1.5	*3%*	*27%*	*272%*
Energy costs	1.6	1.3	1.3	1.4	1.3	1.5	1.9	*3%*	*27%*	*37%*
Repair and maintenance	1.4	1.2	1.6	2.0	2.1	1.0	1.2	*2%*	*27%*	*-20%*
Raw material: Feed costs	14.4	12.2	17.0	22.6	23.1	23.2	25.8	*43%*	*11%*	*37%*
Raw material: Livestock costs	4.1	3.4	4.3	5.4	5.7	4.1	4.7	*8%*	*15%*	*5%*
Other operational costs	5.1	4.3	5.3	6.9	7.1	3.8	7.3	*12%*	*89%*	*34%*
Total operating costs	*32.9*	*27.7*	*36.0*	*46.7*	*48.0*	*43.6*	*53.2*	*89%*	*22%*	*36%*
Capital Costs (million €)										
Depreciation of capital	1.8	1.8	1.8	2.2	2.6	2.3	2.8	*5%*	*25%*	*36%*
Financial costs, net	0.7	0.6	0.4	0.8	-0.8	0.8	1.0	*2%*	*26%*	*144%*
Extraordinary costs, net	0.1	0.1	0.1	0.1	0.1	0.1	0.1	*0%*	*-27%*	*-21%*
Capital Value (million €)										
Total value of assets	46.5	34.9	48.6	61.5	63.3	64.8	65.6	*110%*	*1%*	*23%*
Net Investments	4.1	5.0	4.9	2.9	1.0	1.3	0.7	*1%*	*-48%*	*-79%*
Debt	18.3	17.2	22.5	44.9	41.1	44.3	46.8	*78%*	*6%*	*49%*
Input & Production (thousand tonnes)										
Raw material: Feed	14.2	17.6	16.5	15.4	21.5	20.0	19.7		*-2%*	*12%*
Raw material: Livestock	0.9	1.0	1.0	1.7	1.3	1.3	0.9		*-31%*	*-27%*
Performance Indicators(million €)										
Gross Value Added	10.9	8.7	12.0	15.3	12.0	18.8	18.2	*31%*	*-3%*	*41%*
Operating cash flow	7.0	4.1	6.2	8.2	7.5	10.8	6.5	*11%*	*-40%*	*-11%*
Earning before interest and tax	5.2	2.3	4.4	6.0	4.9	8.5	3.7	*6%*	*-57%*	*-29%*
Net profit	4.5	1.7	4.0	5.3	5.7	7.7	2.7	*4%*	*-66%*	*-45%*
Capital productivity (%)	23.5	25.0	24.7	24.8	19.0	29.0	27.8		*-4%*	*14%*
Return on Investment (%)	11.1	6.6	9.1	9.8	7.8	13.2	5.6		*-57%*	*-41%*
Future Expectation Indicator (%)	5.0	9.2	6.3	1.1	-2.6	-1.5	-3.3		*-120%*	*-214%*

Source: EU Member States DCF data submission

The total expenditures have increased together with the production from 2008 and in 2014 make up for 89% of the total income (Table 4.26.3). The expenditures were dominated by cost of feed (43%), cost of livestock (8%) and cost of wages and salaries (21%, including imputed value of unpaid labour) in 2014. Especially labour costs and feed costs have increased significantly during the period. Development of total income is incorrect due to inaccurate reporting of subsidies in 2012. This deficiency only affects the total income for 2012, and does not affect the development of the time series in a major way.

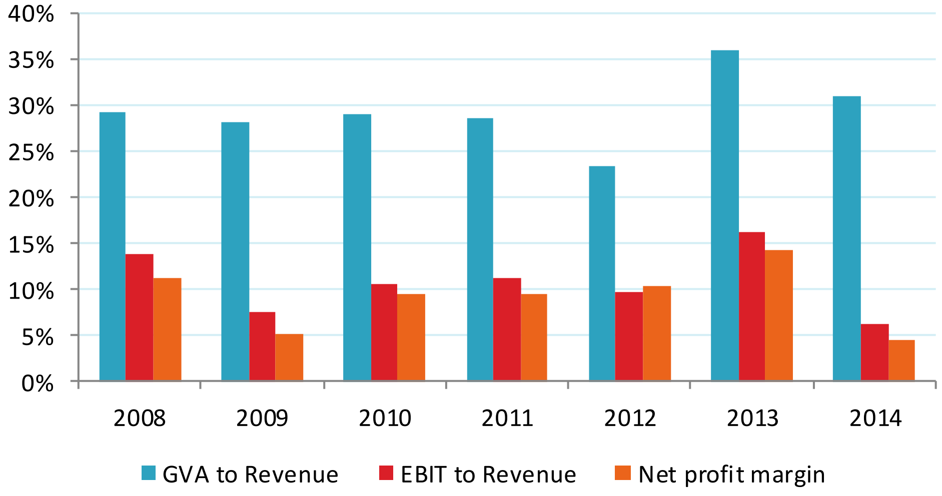


Figure 4.26.3 Economic performance for Sweden: 2008-2014

Source: EU Member States DCF data submission

The gross value added for the sector as a whole has increased significantly from 2008. However, the profitability dropped significantly in 2014 regardless an increase in income. This was due to the increase in operating costs. Operating cash flow decreased by 40% and EBIT dropped 57%. Also the net profit decreased significantly but the sector remained profitable in 2014 and capital profitability (27.8%) and ROI (5.6%) remained reasonably good. The total value of assets and debts increased by 1 percent and decreased by 6 percent respectively. The net investments continue to show a declining trend.

4.26.5 Main species produced and economic performance by segment

The production in Sweden can be divided into four main segments. The largest segment in Swedish aquaculture, in terms of both value and volume of production, is freshwater fish grown in cages (Rainbow trout and Arctic char). The second most important segment is freshwater fish on growing (Rainbow trout, Arctic char on growing and Rainbow trout combined). The third segment consists of Trout in cages and on growing Salmon. The forth most important segment is producing shellfish, almost entirely marine species of mussels and oysters. Farming techniques for shellfish are long line (for mussels) and shellfish farming techniques other (for oysters and crayfish) (Figure 4.7.4).

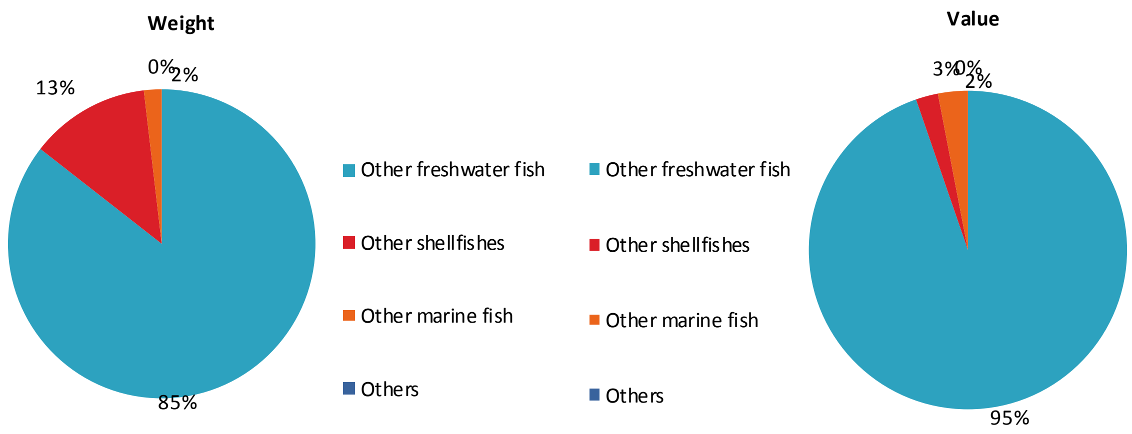


Figure 4.26.4 Main species in terms of weight and value in Structure of the Swedish production: 2014.

Source: EU Member States DCF data submission

Aquaculture farms in freshwater have a huge dominance in Sweden – both in production and value (Figure 4.26.4). Other methods for aquaculture in Sweden are ponds and pools. Rarer are recirculating systems with only eight units running in 2014. Rainbow trout is the most important species in Sweden and is produced in most geographical regions. Fresh water cages are the main farming technique, with 84% of the Rainbow trout farmed in fresh water cages.

In 2014, Swedish aquaculture yielded 11 152 metric tonnes of fish (in fresh weight) of which 9 454 tonnes were produced for human consumption. The dominating species was Rainbow trout, with 85% of the total fish production for consumption. The segment shows a decrease in production with 3%. The production of Arctic char amounted to 1 393 tonnes for consumption, which is a 9% decrease from 2013. Furthermore, there were 1 770 tonnes of cultivated blue mussels. The total value of aquaculture production for consumption amounted to €40.6 million, a decrease with €0.7 million compared to 2013. This decrease is somehow false since it is an effect due to currency conversion, in SEK the total value actually increased 3.5%, from 357.4 million SEK in 2013 to 369.8 million SEK in 2014.

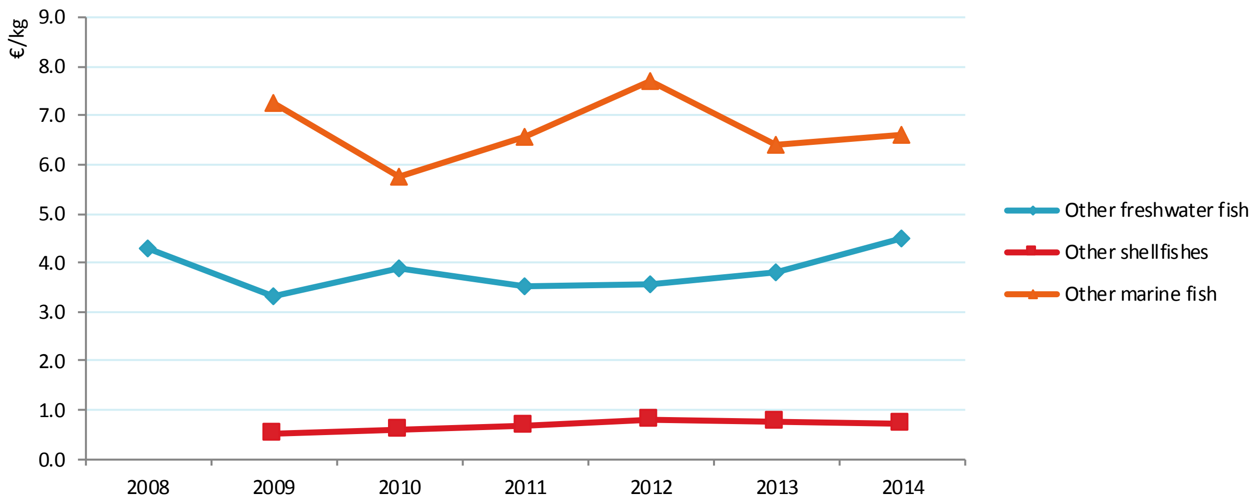


Figure 4.26.5 Average prices for the main species produced in Sweden: 2008-2014.

Source: EU Member States DCF data submission

Large-sized Trout produced in cages in marine waters follow the price of salmon, which has been increasing over the period of 2008 to 2012. The price has then decreased back to same levels as in 2011. Prices of other shellfishes have been fairly constant during the last years. However, the prices of other freshwater fish have been increasing during 2013 and 2014. (Figure 4.7.5).

The most relevant segments in the Swedish aquaculture are analysed below.

Segment 1: Freshwater fish in cages, Rainbow trout and Arctic char.

The value and volume of production of segment 1 has between 2008-2012 grown constantly and the figures indicated that the segment was experiencing progress in the economic indicators. However, the positive trend seen between 2008 – 2012 was change to a negative trend in 2013. The sector now show decline in progress. In 2014, the segment produced 73% (10 280 tonnes) of total aquaculture production in Sweden and its turnover accounted for 76% of total turnover which are significant decreases from 2012. Total sales volume in segment has decreased with 15.4% during 2011-2014 from 12.2 to 10.3 thousand tonnes and gross value added decreased from €11.9 to €9.4 million. However, turnover still shows a positive trend with an increase of 12.5%, from €38.4 million in 2012 to €43.2 million in 2014.

Segment 2: Freshwater fish on growing, Rainbow trout, Arctic char on growing and Rainbow trout combined.

The second largest segment in terms of production value is freshwater species on growing. The main species grown in this segment are Arctic char and Rainbow trout. In 2014, the segment produced 5% of total production and its turnover accounted for 18% of total turnover. During 2008-2014 total sales volume has increased from 0.5 thousand tonnes to 1.7 thousand tonnes, indicating that the volume of production has remained fairly stable in this segment at the same time gross value added increased from €3.1 million in 2012 to €7.1 million in 2014. All economic indicators show positive trends which point out this segment as the most promising segment in 2014.

Segment 3: Trout in cages and on growing Salmon.

The third largest segment in terms of production value is trout on growing. The available data shows no significant changes in terms of volume of production or the values of the economic indicators for this segment. Production volume and gross value added has remained fairly constant over the studied time period with volumes around 0.2 thousand tonnes and gross value added around €0.7 million.

Segment 4: Shellfish, farming techniques long line (mussels) and shellfish farming techniques other (oysters, crayfish), almost entirely marine species.

The smallest segment consists of firms growing mussels/oysters and firms growing freshwater crayfish. This segment only represents a small share of Sweden's total aquaculture production in terms of value of production. Production volumes in this segment mainly consist of volumes of mussels and oysters (around 99%). Although the firms in this segment are very heterogeneous in terms of their structure and average production volumes (crayfish compared to mussels/oysters) they are merged into one segment due to confidentiality reasons. During 2010-2011, performance indicators showed an increase in income, productivity, profitability and also a small increase of production for this segment. The available data for 2011 and 2012 show a different development with increases in several of the economic indicators (operating cash flows, EBIT, net profit) but a decrease in total sales volume and total income.

Figure 4.7.6 shows that the FTE and total value of assets in the Swedish aquaculture sector has remained stable, and the sales volume and the turnover have decreased slightly. Turnover have increased substantial 2014.

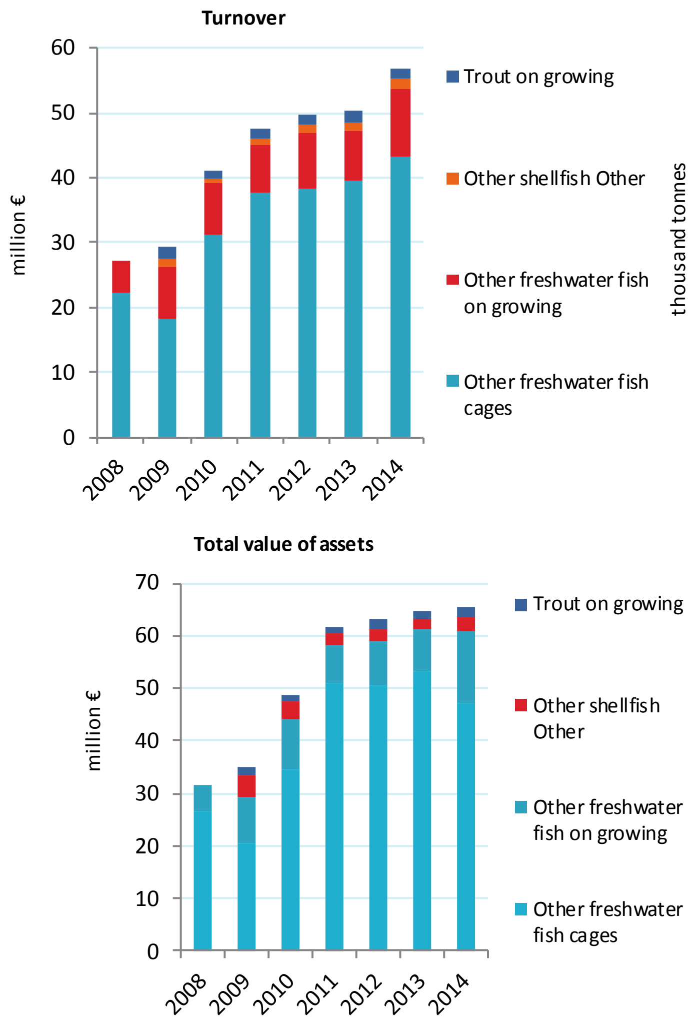


Figure 4.26.6 Structural development Structure of the Swedish aquaculture sector: 2008-2014.

Source: EU Member States DCF data submission

The economic performance of the four Swedish segments is shown in Table 4.26.4. This table depict a positive gross value development for all the four segments 2008 - 2014, though the change between 2013 and 2014 is negative (-9%) for segment 1 and (-21%) for segment 2.

Table 4.26.4 Economic performance of main Structure of the Swedish aquaculture segments: 2008-2014 (in million €).

Variable	2008	2009	2010	2011	2012	2013	2014	% of total income	Change 2014/13	Development 2014/(2008-13)
Trout on growing										
Total income		2.2	1.6	1.5	1.8					
Gross Value Added		0.7	0.5	0.4	0.4	1.0	0.9		-9%	49%
Operating cash flow		0.3	0.3	0.2	0.5	0.3	0.3		-6%	-22%
Earning before interest and tax		0.3	0.2	0.2	0.4	0.2	0.2		-18%	-39%
Net profit		0.3	0.2	0.2	0.5	0.2	0.1		-31%	-54%
Total sales volume (thousand tonnes)		0.3	0.2	0.2	0.2	0.3	0.3		-6%	9%
Other freshwater fish cages										
Total income	23.1	19.4	31.1	44.0	39.2					
Gross Value Added	5.8	4.6	8.4	11.8	7.8	11.9	9.4		-21%	12%
Operating cash flow	2.3	1.6	3.8	5.8	3.7	4.9	0.9		-81%	-74%
Earning before interest and tax	1.4	1.0	2.5	4.2	1.7	3.2	-1.0		-132%	-144%
Net profit	1.1	0.6	2.2	3.7	2.4	2.5	-1.6		-163%	-176%
Total sales volume (thousand tonnes)	5.8	6.6	9.4	12.2	12.6	11.7	10.3		-12%	6%
Other freshwater fish on growing										
Total income	4.7	8.3	8.5	7.6	9.1					
Gross Value Added	1.4	2.9	2.7	2.6	3.1	5.2	7.1		38%	141%
Operating cash flow	0.5	1.5	1.9	1.3	1.6	3.1	4.2		34%	153%
Earning before interest and tax	0.2	0.9	1.5	0.8	1.3	2.7	3.6		33%	193%
Net profit	0.0	0.8	1.4	0.6	1.3	2.6	3.2		20%	179%
Total sales volume (thousand tonnes)	0.5	1.4	0.7	0.7	0.7	0.7	1.7		154%	120%
Other shellfish Other										
Total income		1.9	1.1	1.9	1.1					
Gross Value Added		0.6	0.4	0.5	0.7	0.8	0.8		2%	39%
Operating cash flow		0.7	0.3	1.0	1.6	0.6	0.5		-19%	-44%
Earning before interest and tax		0.1	0.2	0.8	1.5	0.5	0.3		-41%	-54%
Net profit		0.0	0.2	0.8	1.5	0.5	0.3		-45%	-57%
Total sales volume (thousand tonnes)		2.1	1.4	1.5	1.3	1.7	1.8		4%	11%

Source: EU Member States DCF data submission

There are large variations in terms of production levels and the value of various economic indicators across these four segments. Rainbow trout and Arctic char grown in cages is the largest segment in terms of both volume and value of production. The segment stands for around 80% of total aquaculture production in Sweden and its turnover accounts for around 75% of total turnover. In Table 4.26.4 and Figure 4.26.7, the economic indicators of the four main segments are presented, EBIT is negative in all segments except for segment 3 which show a positive development both during the period 2008-2014 with 193 % increase, and between 2013-2014 with a 33 % increase. In segment 2, other freshwater fish cages, there has been a negative trend for all indicators except total sales volume. In EBIT there is a drastic reduction (-132%) 2013-2014.

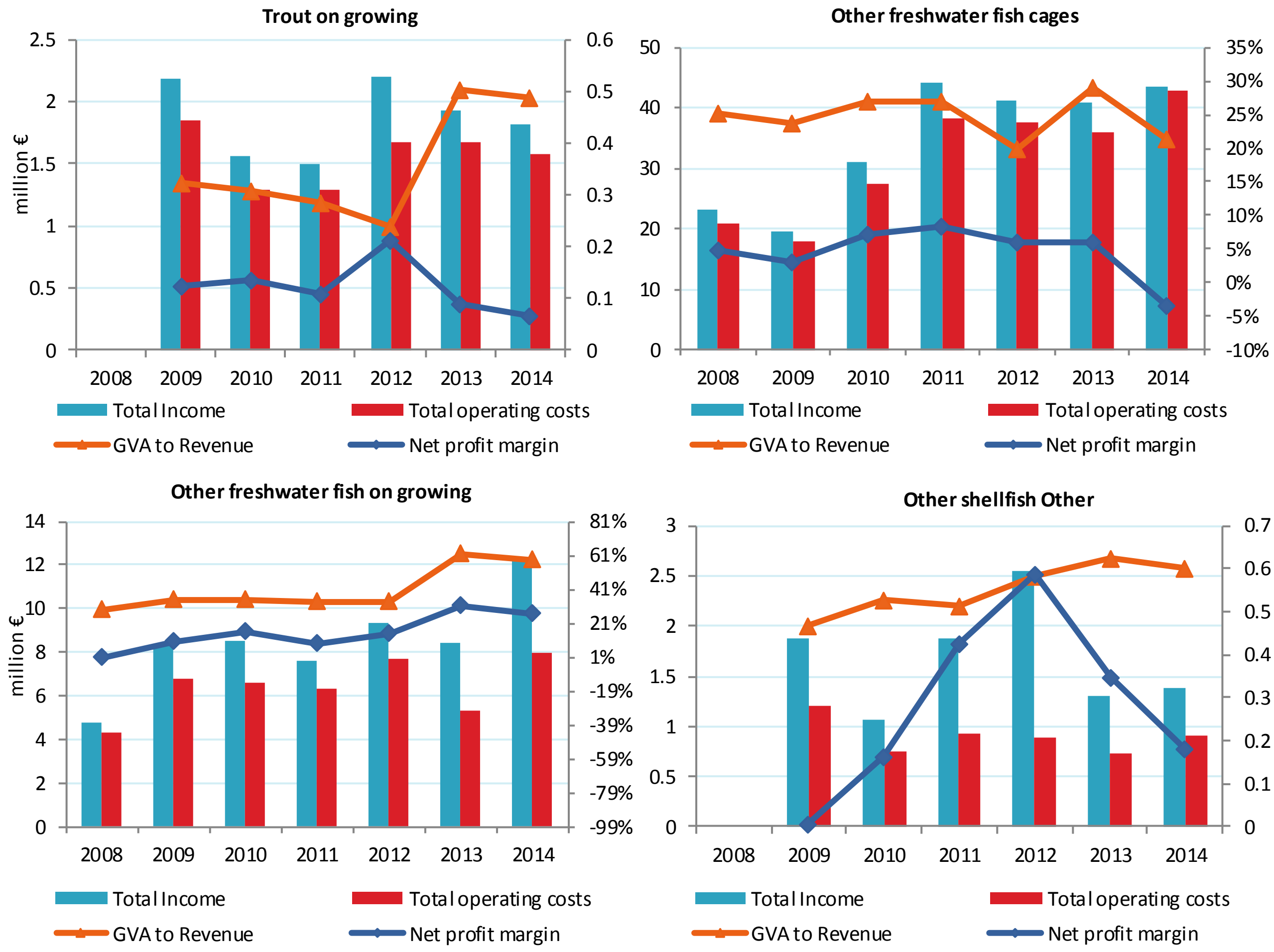


Figure 4.26.7 Economic performance indicators for the main Structure of the Swedish segments: 2008-2014.

Source: EU Member States DCF data submission

In the last reporting of data for 2013 and 2014 there are a trend of decreasing GVA to revenue and net profit margins in all sectors. During the period 2008 – 2012, Segment 1 shows an decreasing total operating cost. However, the total operating costs stabilized 2011-2012 but total income decreased, with falling GVA and reduced net profit margins as a result. Total income is decreasing for segment 2, trout on growing, and 4, other shellfish other, compared to 2012. This decreasing trend is influenced by incorrectly reported subsidies in 2012 and will be adjusted in future reporting. Nevertheless, segment 4 also shows a periodic variation of income, to some extent corresponding to total sales volume (Figure 4.26.7).

The operational cost structures for the four Swedish segments are presented in Figure 4.26.8.

Segment 1: Freshwater fish in cages, Rainbow trout and Arctic char.

Raw material and livestock costs are traditionally the main cost component with 30% of total operating costs in segment 1. The costs for wages are 25% of total operating costs. The energy costs are of minor importance, 7% of total operational costs are due to energy costs.

Segment 2: Freshwater fish on growing, Rainbow trout, Arctic char on growing and Rainbow trout combined.

In segment 2, other freshwater fish on growing, the cost components feed and livestock are also the most important of total operational costs, covering 61%. Naturally are the costs for feed larger in on growing farms than in segment 1 and the costs are 52%, compared to 19%

for segment 1. Energy cost, repair and maintenance and imputed value of unpaid labour in segment 2 are of minor importance with only a total cost of 4%. Wages and salaries are slightly lower, 18%, than for the other three segments.

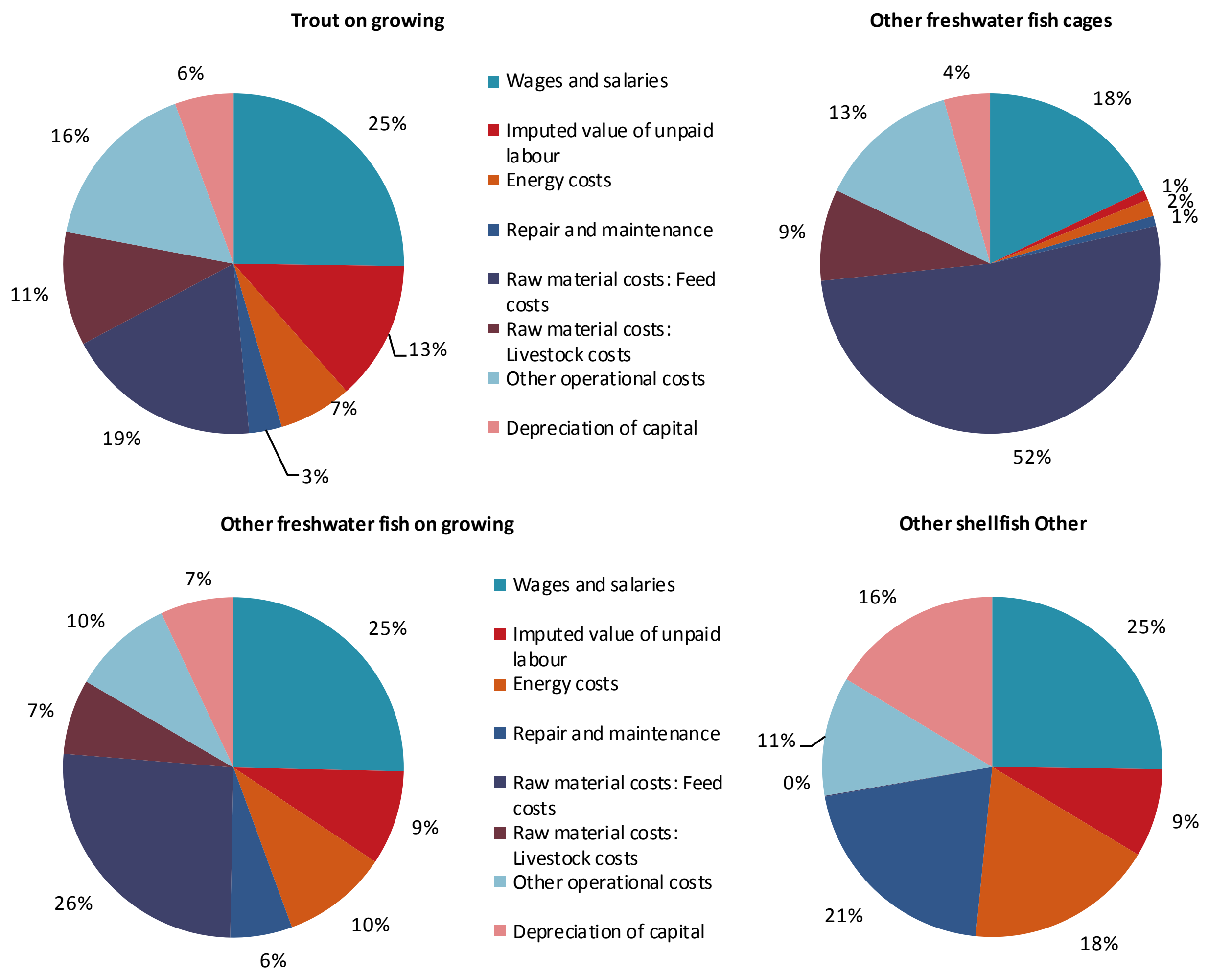


Figure 4.26.8 Cost structure of the main segments in Sweden: 2014.

Source: EU Member States DCF data submission

Segment 3: Trout in cages and on growing Salmon.

In the segment Trout in cages and on growing Salmon, the main cost components are also feed and livestock, which covers 33% of the total operational costs. Wages and salaries are in line with the other segments.

Segment 4: Shellfish, farming techniques long line (mussels) and shellfish farming techniques other (oysters, crayfish), almost entirely marine species.

The segment shellfish, farming techniques long line (mussels) and shellfish farming techniques other (oysters, crayfish), has a totally different cost structure because the production costs do not include the cost of feed and livestock. The most important cost items are repair and maintenance of the production system (lines and boats) and the labour costs for repair, maintenance and harvesting. The cost for wages and salaries are nevertheless in line with the other segments. The segment also has had a larger operational cost in depreciation of capital compared to the other three segments due to natural conditions in the segment.

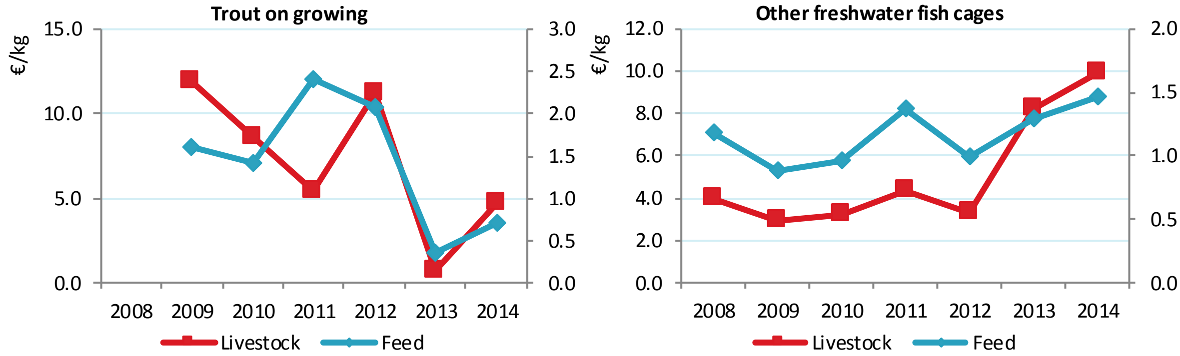


Figure 4.26.9 Feed and livestock prices for the main Structure of the Swedish segments: 2008-2014.

Source: EU Member States DCF data submission

4.26.6 Trends and triggers

Market structure, current production trends and main drivers

The Swedish aquaculture sector is experiencing an increase in volume of production. Over the last decades production levels have increased from 5 500 tonnes (1998) to 14 800 tonnes (2012). One explanation for the observed growth in productions is likely related to structural changes in the aquaculture sector, where firms merge into larger units to exploit economies of scale. Data since 1998 show that the number of firms is decreasing, at the same time average production volumes have been steadily increasing.

However, explanations are also found in the high market demand for Rainbow trout and Arctic char, which are the main species in aquaculture production in Sweden. The Swedish aquaculture sector almost entirely consists of freshwater fish grown in cages, on growing or combined.

The growth of Swedish aquaculture has been strong in the 2000s, averaging 7.7% annually between 2000 and 2012. The increase is due to the startup of what today are the largest food fish producers and a number of firms who already have relatively high production. Virtually all of the increase relates to food fish production in northern Sweden. This growth stalled in 2013 and there is a decrease in production in 2014.

Issues of special interest

There have also been incentives at the national level to increase the knowledge about the needs for sustainable aquaculture production and ways to promote it. According to regulations of the European Maritime and Fisheries Fund 2014-2020 (EMFF), member states are obliged to develop a national aquaculture strategy in order to increase the state of knowledge about aquaculture and address future needs in order to achieve sustainable production and more efficient policies. The Swedish Board of Agriculture, managing authority of the EMFF, developed a national strategy document (Svenskt vattenbruk - en grön näring på blå åkrar, in Swedish) with the objective to identify how the Swedish aquaculture sector can grow in the direction of economic and environmental sustainability to 2020, with the main challenge of combining economic, ecologic and social cohesion. Among other things, the strategy identified the importance of cooperation among different actors in the industry and the need of spatial planning and development of new production techniques. The national strategy for Swedish aquaculture constitutes the main foundation for constructing a national action plan for sustainable development of Swedish aquaculture.

Outlook for 2015 and 2016

Sweden's net imports of fish, crustaceans and molluscs were significantly higher than the production in 2012. Swedish aquaculture could gain a larger share of the domestic market, where demand for cultivated fish products is high. However, the decrease in production 2014 contra predicts a higher market share for Swedish aquaculture in the near future.

The aquaculture sector still has quite a positive future and there are several large (1000 tonnes) applications for expanded and/or new permits for fish production which are pending at various county boards in northern Sweden. There are also some planned major investments in mussel farming on the west coast of Sweden.

Another factor that is expected to have a positive impact on future production levels is the increased focus on aquaculture policy schemes in the new European Maritime and Fisheries Fund (EMFF). A clear aim of the reformed fund is to develop European aquaculture to achieve sustainable growth in production volumes, improved competitiveness and profitability. Even though it is still unclear what kinds of financial support the national operational programmes will include in different MS, there will most likely be a larger focus on increasing aquaculture productions volumes. The Swedish operational programme will give priority to measures increasing profitability, new sustainable production techniques that reduce the environmental impact and support measures for preventing damage caused by wild predators. However, it is too early in programme period to evaluate or estimate if the efforts made will make a positive impact in the aquaculture sector.

Turning to the difficulties facing the Swedish aquaculture sector, these are mainly related to regulations and difficulties of implementing new production techniques at a commercial scale. There is an ambition to increase marine aquaculture production using sustainable production techniques, however, most of this work is still on project levels and has not reached commercial scales. The production of marine shellfish products is currently small in relation to freshwater production, although Sweden has significant production of organic mussels (KRAV, ASC).

Even though aquaculture in Sweden has a strong potential for further development of sustainable production techniques the organic aquaculture sector still has some obstacles and problems to overcome in order to expand production volumes and scaling up commercial levels (mostly concerning fish production). There are also examples of new species or new cultivation techniques that are under development (i.e. fish species like tilapia, zander and cod) and ongoing research on developments in the feed market (i.e. new production techniques, fodder development, reducing nitrogen emissions and phosphorus emissions, however, not yet at a commercial level.

Some of the main issues affecting the economic performance of the sector and the development of new growing techniques are related to difficulties in the implementation of new techniques and stringent regulations (e.g. development of organic and certified aquaculture), which have often pointed out as significant obstacles of growth in production volumes.

An analysis of the impact of administrative burdens and governance has been made, and it has been pointed out as high, but little has been done to address the matter. The development of spatial planning has, in large, not been put in place in Sweden. The European Maritime and Fisheries Fund and various schemes designed to meet future demand is expected to play a significant role in the development of the Swedish aquaculture sector.

4.26.7 Data Coverage and Data Quality

Since 2011, the Swedish Board of Agriculture is responsible for compiling and reporting statistics on the aquaculture sector for the reported period together with the Swedish Agency for Marine Water Management. The Swedish Board of Agriculture in cooperation with Statistics Sweden conducted two questionnaires and a tax declaration survey for each year. Data is collected from both income tax declarations, administrative records and two questionnaires (Q1 and Q2), sent to all aquaculture farmers (Q1) and all aquaculture firms that have aquaculture as their main activity (Q2). In order to identify the segments, companies using more than one farming technique or growing more than one species, all production, incomes and costs were transferred to the main technique and main species based on turnover.

The questionnaire (Q1) is sent out to all aquaculture farm units and farm units are clustered into enterprises. For each enterprise, the value of sales from Q1 is compared to income as reported in the income tax declarations. Enterprises that have aquaculture as their main activity more than 50% (income from tax declarations/sales value from Q1) are considered to have their primary activity in aquaculture. These enterprises represent the population for questionnaire Q2 (the cost allocation key survey), derived from income tax declarations combined with Q2, for all aquaculture activity in Sweden. By comparing the value of sales from Q1, which covers all aquaculture activity in Sweden, with income in tax declarations for the enterprises with aquaculture as their primary activity we obtain a figure, used to scale-up relevant variables. Using this method, variables can be assumed representative of all aquaculture activity in Sweden and comprise the same allocation between variables as for enterprises with aquaculture as their primary activity.

The primarily objective of the second questionnaire (Q2) is to create a cost allocation key for costs that are not specified in income tax declarations. For the years 2008-2012, the sample for the second questionnaire (Q2) was a non-probability sample based on a priori information that came from questionnaire Q1 and income tax declarations, as described above.

As a result, it could not be planned before the income tax declarations and the results of the first questionnaire (Q1, covering every farming unit) were compiled. Based on the results of the census data, Statistics Sweden selected a representative number of enterprises from each segment (clustered sample) for the second questionnaire (Q2). In order to ensure representativeness in terms of corporate size, structure and farming technique, Statistics Sweden decided on the appropriate sampling method and sample size for Q2. The survey (Q2) was undertaken in 2008 and the cost allocation key was reused for 2009-2012. The population represents all active aquaculture enterprises in 2008 that have aquaculture as their primary activity and the sample for the questionnaire (Q2) represents 46 of these enterprises. The survey had a response rate of 65%. In 2015 a new cost allocation key was made for the reporting of 2013 and 2014 in the same manner as earlier allocation key, with a response rate of 60%. The change of allocation key might have a small impact on aquaculture enterprises costs but are also an updated key which ought to provide a better estimate of aquaculture current situation.

During report evaluation a noticeable error was discovered. Reporting on subsidies 2012 was incorrect and has an impact in reporting of aquaculture enterprises total income. This error will be handled in next reporting. MA will also improve methodology in the matter, recalculating the variable for the total period of reporting.

Data availability

Data for the aquaculture sector is published once a year, in August the same year as the census.

Confidentiality

The 4 segments that are surveyed in Sweden are presented in 4.26.5. To avoid problems with confidentiality, segments should in general include more than 10 enterprises. Due to confidentiality problems, several segments are aggregated. Secrecy on values for segments implies that 1.2. 2.3 and 2.4 are aggregated into 2.2. 5.3 are aggregated into 5.2. and 7.1 is aggregated into 10.4.

Differences in DCF data compared with other official data sources

Since data on aquaculture production is reported from the Swedish official statistics to Eurostat, there should be minor deviations in the production volumes as reported by Eurostat. Furthermore, since FAO, EUROSTAT data and DCF report data on production based on first sales the definition should not be an issue. However, as shown in Figure 4.26.10, Swedish DCF is not identical to Eurostat and FAO data. These disparities are likely a result of differences in the reference population. Disparities may also arise due to updates in the data mainly due to changes in the number of active enterprises.

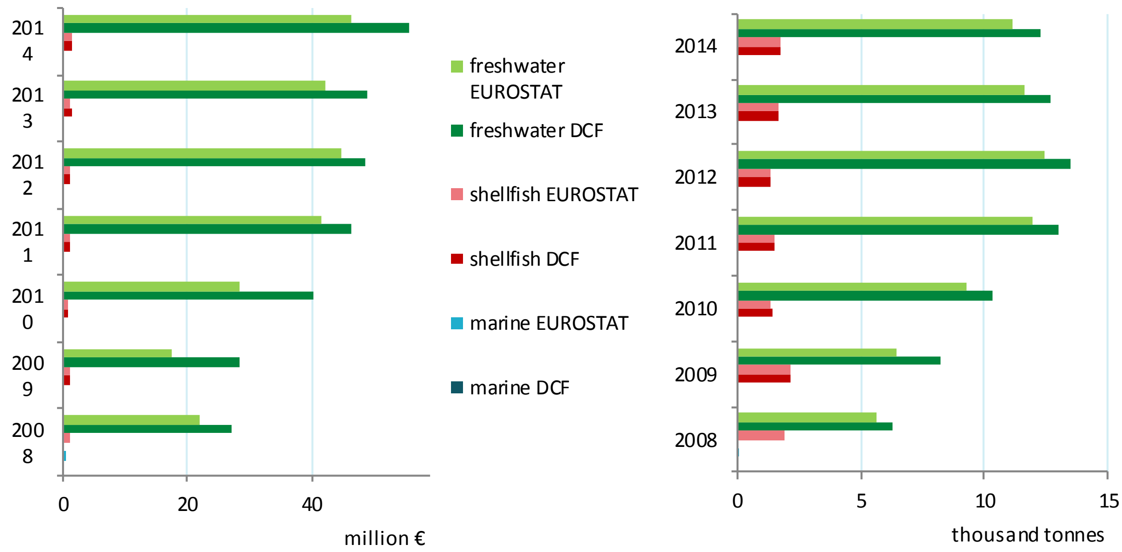


Figure 4.26.10 Comparison of DCF data with EUROSTAT data for Sweden: 2008-2014

4.27 United Kingdom

4.27.1 Summary

Production volume and value

In 2013, the total reported UK aquaculture sales weight was 203 300 tonnes with an estimated value of €897 million. In 2014, sales weight and value increased to 214 700 tonnes and €993 million respectively. Salmon continues to dominate UK aquaculture production by both sales weight (84%) and value (90%). Since 2008, there has been a greater increase in estimated value (41%) than sales weight (8%).

Overall industry structure and employment

The UK aquaculture industry is very diverse reporting production from 9 segments, across seawater and freshwater. A wide variety of finfish and shellfish species are produced for direct consumption, restocking fisheries, and the ornamental (pet) trade. In 2014, UK aquaculture employed 3 310 people; the majority (51%) were employed within the salmon segment, with the trout (18%) and mussel (12%) segments being the other major employers. Nevertheless, other segments still provided employment for >600 people. In 2014, around 550 authorised aquaculture enterprises operated in the UK – the majority (84%) were small (≤5 employees), and only 6% employed >10 people. Five large (multinational) salmon companies are responsible the bulk of UK aquaculture production.

Main segments

Recorded UK aquaculture production tonnage and imputed value was largely attributable to three main segments: Atlantic salmon, mussels and rainbow trout.

- Salmon dominated production tonnage (84%) and value (90%). The salmon segment combined hatcheries and nurseries for the freshwater stages with seawater net-pen production for ongrowing to harvest.
- Mussel was the second most important segment by tonnage (9%), but due to a lower unit value, was third by value (4% of total). In the UK, mussels were grown on the sea-bed and suspended systems.
- Although the volume of trout produced (6% of total) was lower than that of mussels, the trout sector had a slightly higher value (5% of total). Rainbow trout (harvested from both freshwater and marine systems) dominated the segment, but production of brown/sea trout and Arctic char continued. Trout were grown for table consumption and restocking angling waters.

Current production trends and main drivers (Trends and triggers)

Salmon: Production tonnage increased in 2014, continuing the long term trend from 2008. However, a drop of 4% has been reported for 2015, attributed to fish being harvested early due to disease (sea-lice) and plankton (jellyfish, harmful algal blooms) issues. There is strong interest within the industry in the use of cleaner fish (wrasse and lumpfish) as part of integrated sea-lice control; due to the high ratio of cleaner fish: salmon now recognised as necessary, cleaner fish are likely to become an important segment of UK aquaculture in the coming years. Salmon production for 2016 has been predicted to increase from 2015 but not exceed that in 2014.

Mussels: Mussel production fell again, continuing the trend of a 47% fall in production tonnage since 2008. However, production is expected to increase in the coming years with new off-shore long-line sites starting to harvest.

Trout: UK trout production has been stable for the last 4 years; decreased production from freshwater sites is being offset by increased production from seawater. This production is expected to remain stable.

Sea-bass and sea-bream: Production of sea-bass in a large recirculation aquaculture system (RAS) ceased in 2015 due to an inability to compete with cheaper sea bass imports from Turkey and Greece.

Outlook

A dip in UK aquaculture production volume and value is expected for 2015 due to a decreased salmon harvest. However, this decrease is likely to be temporary and 2016 production is expected to be similar to that in 2014.

4.27.2 Production and sales

Time series (2008-2014) of reported production and estimated value for UK aquaculture are summarised in Table 4.27.1, divided into:

- Marine (finfish): salmon + sea-bass + other marine finfish (i.e. halibut);
- Shellfish: mussels + oysters (Pacific cupped oyster, European flat oyster) + clams (Japanese carpet shell, northern quahog) + other shellfish (queen scallop, great Atlantic scallop);
- Freshwater: trout (all irrespective of production in freshwater or seawater: rainbow trout, sea/brown trout, Arctic char) + carp (common carp, Crucian carp) + other freshwater fish (Nile tilapia, barbel, roach, tench, freshwater bream, orfe, perch, pike, chub, rudd);
- Hatcheries & nurseries: these are not reported separately for the UK because, due to vertical integration, enterprises involved in this category typically also engage in ongrowing and are classed as "combined"; additionally, hatchery and nursery production is excluded from DCF submissions due to difficulties in assigning a value to the multitude of sizes of early life stage fish sold. (N.B.: numbers produced are submitted to Eurostat under the separate EC Reg 762/2008).

Table 4.27.1 Production and sales for United Kingdom: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Sales weight (thousand tonnes)	***185.0***	***196.5***	***201.4***	***199.0***	***203.7***	***203.3***	***214.7***	*6%*	*8%*
Marine	130.8	145.2	155.2	158.9	162.8	163.8	179.7	*10%*	*18%*
Shellfish	40.7	35.6	31.5	27.1	27.4	26.3	21.6	*-18%*	*-28%*
Freshwater	13.5	15.8	14.6	13.0	13.5	13.1	13.4	*2%*	*-4%*
Hatcheries & nurseries									
Sales value (million €)	***666.4***	***559.9***	***603.4***	***758.7***	***724.6***	***896.7***	***992.6***	*11%*	*41%*
Marine	558.2	467.3	519.2	681.7	643.2	801.4	895.9	*12%*	*46%*
Shellfish	55.6	47.4	38.7	40.9	40.9	56.6	44.1	*-22%*	*-5%*
Freshwater	52.6	45.2	45.5	36.0	40.5	38.6	52.6	*36%*	*22%*
Hatcheries & nurseries									

Source: EU Member States DCF data submission

Total sales weight and value show clear increasing trends over the time period, attributed to increasing marine production which is almost entirely composed of the salmon segment. The performance of the dominant salmon segment masks the fall in production of shellfish and the static production of "freshwater" species) which is mainly trout (including seawater on-grown trout).

4.27.3 Industry structure and employment

Summary data on employment is presented in Table 4.27.2 and Figure 4.27.1.

Table 4.27.2 Structure of the UK aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	Change 2014/13	Developm. 2014/ (08-13)
Structure (number)									
Total enterprises	*531*	*442*	*428*	*575*	*596*	*548*	*551*	*1%*	*6%*
<=5 employees	431	322	321	498	528	464	464	*0%*	*9%*
6-10 employees	55	70	63	43	45	52	52	*0%*	*-5%*
>10 employees	45	50	44	34	23	32	35	*9%*	*-8%*
Employment (number)									
Total employees	3,050	3,050	3,050	3,064	3,071	3,098	3,310	*7%*	*8%*
Male employees	2,650	2,650	2,650	2,654	2,629	2,771	2,908	*5%*	*9%*
Female employees	400	400	400	410	442	327	402	*23%*	*1%*
FTE	2,660	2,660	2,660	2,671	2,566	2,686	2,761	*3%*	*4%*
Male FTE	2,310	2,310	2,310	2,316	2,233	2,459	2,498	*2%*	*8%*
Female FTE	350	350	350	354	333	228	263	*15%*	*-20%*
Indicators									
FTE per enterprise	5.0	6.0	6.2	4.7	4.3	4.9	5.0	*2%*	*-3%*
Average wage (thousand €)	25.6	21.8	27.4	23.3	34.1	35.1	35.2	*0%*	*26%*
Labour productivity (thousand €)	81.3	85.7	51.6	84.1	62.4	107.1	123.5	*15%*	*57%*

Source: EU Member States DCF data submission

- Enterprises: The situation can be considered static over the period 2008-2014; variation between years is likely to be caused by differences in classification and collation. The different administrations within the UK use different definitions to classify "Aquaculture Production Businesses" under aquatic animal health regulations, and attribution to DCF segments is somewhat open to interpretation.
- Employment: Data for 2008-2010 are extrapolated from 2011. The more reliable data from 2011-2014 show a slight increase which is probably real. Mechanisms for collection of gender data are still being developed by some UK administrations, so this data should be viewed sceptically.
- Indicators: Data should be disregarded for 2008-2011. For subsequent data:
- FTE per enterprise is consistent reflecting a continuing balanced between a few large multi-national salmon companies and the majority of small enterprises.
- The average wage is consistent – around €35 thousand.
- Labour productivity shows an increase over the period 2012-2014 which is likely to be represent more efficient production in the dominant salmon segment

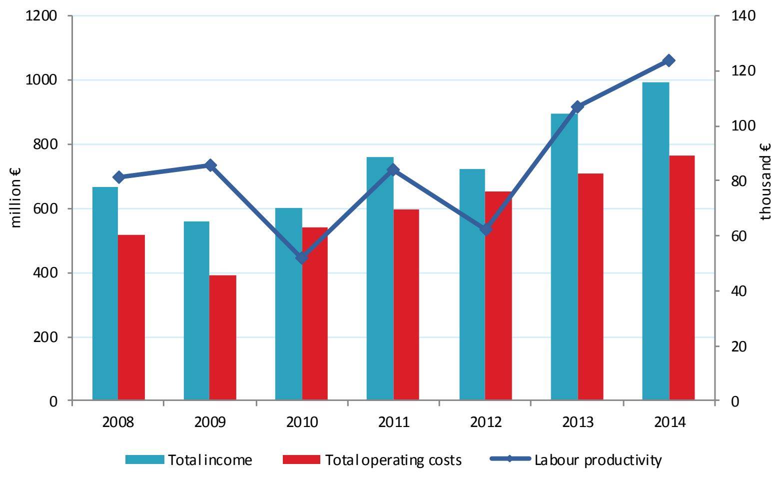


Figure 4.27.1 Income, costs, wages and labour productivity trends for United Kingdom: 2008-2014.

Source: EU Member States DCF data submission

4.27.4 Economic performance

Economic data on UK aquaculture is summarised in Table 4.27.3. Turnover data is considered valid for the period 2008-2014, and has increased by 41% over that period, although it must be recognised that at least part of this increase will be due to change in the GBP: € exchange rate. Due to the initial lack (2008-2010), and then development (2011-2012), of the survey methodology used to gather the remaining data, only which for 2013 and 2014 merit consideration.

Table 4.27.3 Economic performance of the Structure of the aquaculture sector: 2008-2014.

Variable	2008	2009	2010	2011	2012	2013	2014	% of total income	Change 2014-13	Development 2014/(2008-13)
Income (million €)										
Turnover	666.4	559.9	603.4	758.7	724.6	896.7	992.6	99%	11%	41%
Other income					1.7	5.8	14.4	1%	150%	285%
Subsidies				1.0	0.1	0.4	0.4	0%	5%	-20%
Total income	*666.4*	*559.9*	*603.4*	*759.7*	*726.4*	*902.9*	*1007.4*	100%	12%	43%
Expenditures (million €)										
Wages and salaries	68.0	58.0	73.0	62.1	87.0	93.4	96.8	10%	4%	31%
Imputed value of unpaid labour				0.1	0.5	0.8	0.5	0%	-35%	8%
Energy costs				19.1	7.1	19.0	16.0	2%	-16%	6%
Repair and maintenance				17.3	30.5	26.9	32.4	3%	20%	30%
Raw material: Feed costs				311.0	266.8	296.2	298.5	30%	1%	2%
Raw material: Livestock costs				73.7	12.7	38.2	31.9	3%	-17%	-23%
Other operational costs	450.0	332.0	466.0	113.0	249.1	234.6	287.2	29%	22%	-7%
Total operating costs	*518.0*	*390.0*	*539.0*	*596.3*	*653.8*	*709.1*	*763.2*	76%	8%	34%
Capital Costs (million €)										
Depreciation of capital				47.0	32.0	43.2	44.1	4%	2%	8%
Financial costs, net				58.0	5.8	8.8	9.0	1%	2%	-63%
Extraordinary costs, net				0.3	0.4	1.8	1.6	0%	-14%	87%
Capital Value (million €)										
Total value of assets	286.0	182.0	255.0	550.0	612.5	644.9	598.7	59%	-7%	42%
Net Investments				35.0	107.9	63.1	77.6	8%	23%	13%
Debt				167.0	93.0	221.5	258.8	26%	17%	61%
Input & Production (thousand tonnes)										
Raw material: Feed				260.0	266.7	217.0	234.9		8%	-5%
Raw material: Livestock					16.8	2.5	6.3		148%	-35%
Performance Indicators(million €)										
Gross Value Added	216.4	227.9	137.4	224.6	160.0	287.6	341.0	34%	19%	63%
Operating cash flow	148.4	169.9	64.4	163.4	72.7	193.8	244.2	24%	26%	80%
Earning before interest and tax				116.4	40.7	150.5	200.1	20%	33%	95%
Net profit				58.4	34.9	141.7	191.1	19%	35%	144%
Capital productivity (%)	75.7	125.2	53.9	40.8	26.1	44.6	57.0		28%	-7%
Return on Investment (%)				21.2	6.6	23.3	33.4		43%	96%
Future Expectation Indicator (%)				-2.2	12.4	3.1	5.6		81%	26%

Source: EU Member States DCF data submission

Points worthy of note from the above table (2013 and 2014 data) are:

- Due to the dominance of the salmon segment, the national combined data reflects this single segment;
- Income from turnover (=sales) contributed virtually all of total income; other income and subsidies are negligible.

- Total operating costs were 76% of total income; the major expenditures are feed, other operational costs and wages & salaries, comprising 30%, 29% and 10% of total income respectively.
- The performance indicators indicate that UK aquaculture is a profitable industry.

4.27.5 Main species produced and economic performance by segment

The UK's aquaculture industry ranks as one of the largest in the EU and is also one of the most diverse, covering nine segments: Salmon (47 enterprises), Trout (164 enterprises), Sea-bass and Sea-bream (1 enterprise), Carp (80 enterprises), Other freshwater fish (23 enterprises), Other marine fish (11 enterprises), Mussels (116 enterprises), Oysters (87 enterprises), Other shellfish (22 enterprises). Clams are also harvested by Oyster enterprises. These sectors produced finfish and shellfish for the table (i.e. human consumption), release into angling waters, release for conservation purposes, and for the ornamental (pet) trade. Nevertheless, recorded UK aquaculture production tonnage and estimated value in 2014 continued to be attributable largely to only 3 segments: Atlantic salmon, mussels and trout (Figure 4.27.4). The other UK aquaculture sectors were minor in comparison, together contributing 1-2% to total tonnage and value. Although production tonnages and value are negligible in comparison to the major segments, these other segments encompassed 224 enterprises, provided employment for 632 staff and their production was valued at €12.3 million. Production of carp, other freshwater (coarse) fish and salmonids for restocking also help to support the UK's angling industry which is considered to be of economic, social and environmental importance.

Figure 4.27.2 Main species in terms of weight and value in Structure of the production: 2014.

Source: EU Member States DCF data submission

Estimated prices over time for the four most important species in the UK are illustrated in Figure 4.27.5. Part of the variation in time will be due to fluctuations in the GBP:€ exchange rate. This figure demonstrates the low unit price of mussels relative to other shellfish (oyster) and finfish. Prominent changes over time (e.g. for Pacific oyster) are attributed to differences in estimation method rather than representing real changes in market price. More consistent methods of price estimation have been adopted recently.

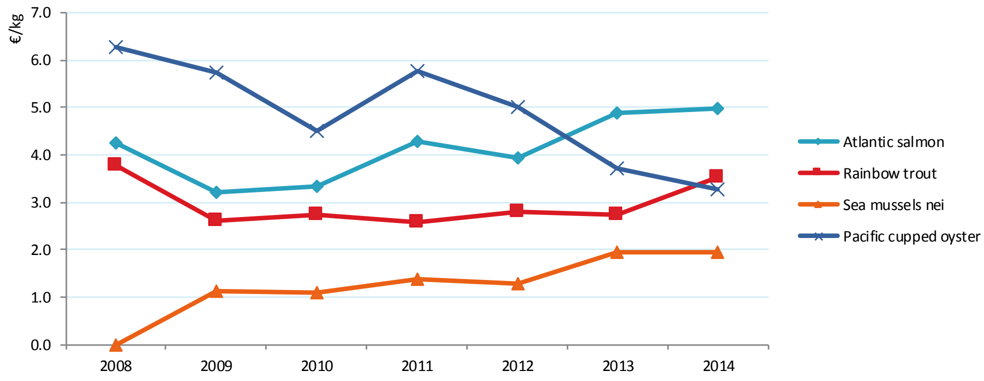


Figure 4.27.3 Average prices for the main species produced in United Kingdom: 2008-2014.

Source: EU Member States DCF data submission. Please note 0 €/kg value for mussels in 2008 is due to classification as Blue mussels (MUS) with an estimated 1.256 €/kg.

Segment 1: Salmon combined

All UK production salmon production was attributed to the combined segment (rather than separated into hatcheries and nurseries, ongrowing, and cages) because enterprises are often vertically integrated, operating across categories within the production cycle and to ensure consistency between years. This sector therefore represents freshwater tanks (hatcheries and nurseries including recirculation aquaculture systems), freshwater net-pens (nurseries), seawater tanks (broodstock/harvest) and seawater net-pens (for ongrowing to harvest).

Salmon dominated UK aquaculture production tonnage in 2014 (179 397 tonnes; 84% of total) and value (€893.6 million; 90% of total). The bulk of salmon production is located in Scotland. A number of non-commercial sites are also included in the data, where fish are produced for release in ecological enhancement schemes.

Segment 2: Mussel other

Mussel aquaculture in the UK uses a variety of systems (on bottom, long lines, rafts). Due to difficulties in separating production systems (companies may operate different systems and seed may be moved between system types) and to ensure consistency between years, all production within the mussel segment was categorised as "mussel other".

Mussel other was the second most important segment by tonnage (20 023 tonnes; 9% of total) but, due to a relatively low unit value, was third by value (€38.6 million; 4% of total).

Segment 3: Trout combined

All UK trout production was attributed to the combined category (rather than separated into hatcheries and nurseries, ongrowing, and cages) because enterprises often operate across categories.

Although the volume of trout produced (13 034 tonnes; 6% of total) was lower than that of mussels, the trout sector had a higher imputed value (€47.9 million; 5% of total). Rainbow trout (harvested from both freshwater and marine systems) dominated the segment, but production of brown/sea trout and Arctic char continued. Trout were grown for table consumption and restocking angling waters. Although production of trout from freshwater systems dominated production, large trout produced in seawater net-pens contributed 15% of the production volume.

The relative size (turnover, production tonnage, asset value, FTE) of the UK aquaculture sectors are graphically illustrated in Figure 4.27.6 and highlight the dominance of salmon and its role in determining inter-annual variation in aquaculture totals.

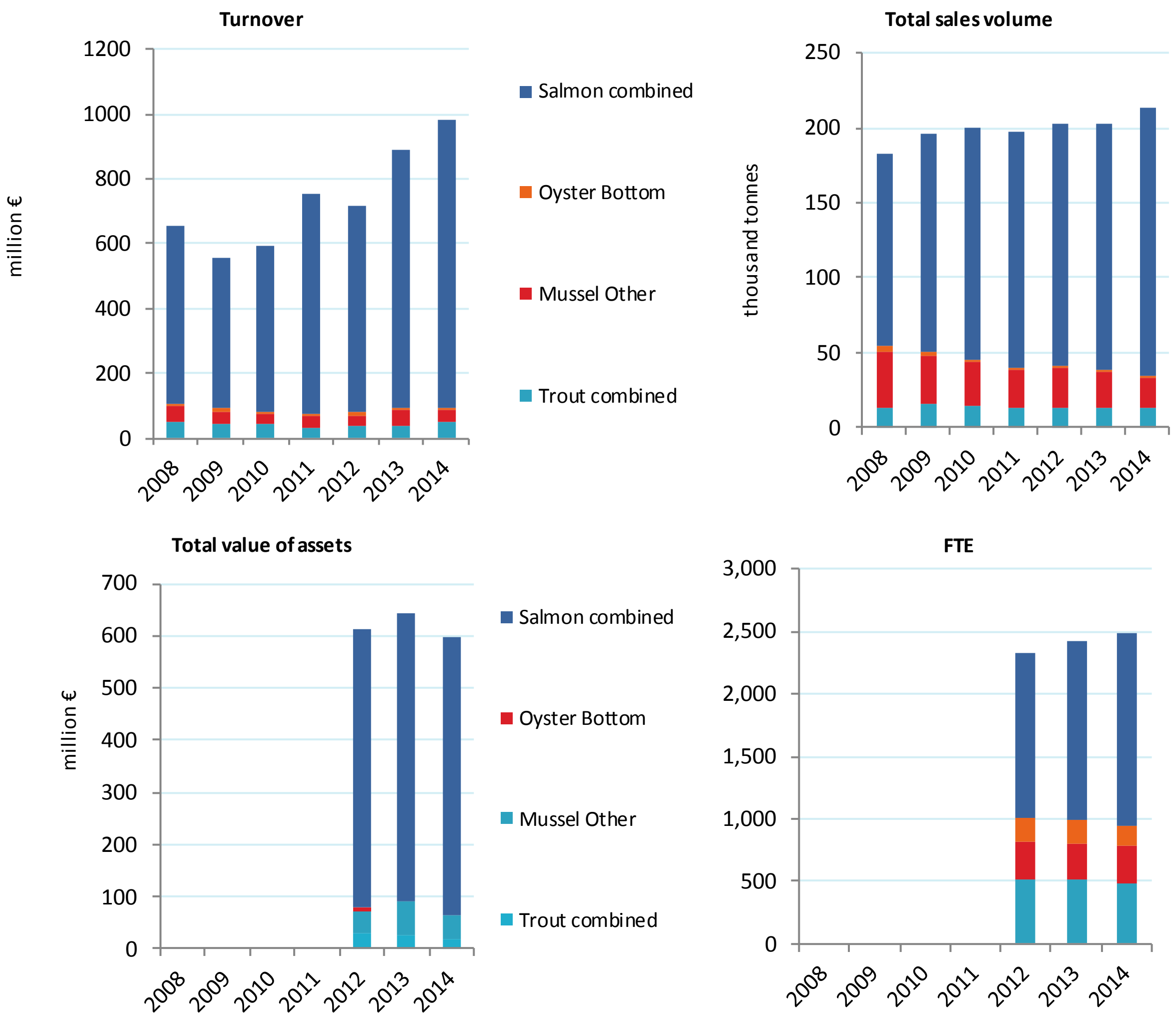


Figure 4.27.4 Structural development Structure of the aquaculture sector: 2008-2014.

Source: EU Member States DCF data submission

The economic performance of the three main sectors is summarised in Table 4.27.4. These data indicate that:

- the salmon and mussel segments in the UK are profitable;
- the UK trout segment is struggling, operating around a break-even level. This interpretation agrees with feedback from UK trout farmers.

Table 4.27.4 Economic performance of main Structure of the aquaculture segments: 2008-2014 (in million €).

Variable	2008	2009	2010	2011	2012	2013	2014	% of total income	Change 2014/13	Development 2014/(2008-13)
Trout combined										
Total income	52.5	42.6	40.8	33.1	37.2	35.4	50.3	100%	42%	25%
Gross Value Added					1.8	9.4	10.2	20%	9%	83%
Operating cash flow					-7.1	2.6	1.9	4%	-24%	-213%
Earning before interest and tax					-8.6	-3.1	0.8	2%	126%	-47%
Net profit					-9.4	-4.1	0.1	0%	103%	-39%
Total sales volume (thousand tonnes)	13.5	15.5	14.2	12.7	13.2	12.8	13.0		2%	-5%
Mussel Other										
Total income	47.0	35.8	32.8	35.8	34.3	53.5	40.1	100%	-25%	1%
Gross Value Added					24.3	26.8	19.8	49%	-26%	-23%
Operating cash flow					18.1	14.7	13.6	34%	-7%	-17%
Earning before interest and tax					14.2	9.4	9.7	24%	4%	-17%
Net profit					10.1	9.0	9.5	24%	6%	-1%
Total sales volume (thousand tonnes)	37.5	31.9	30.2	26.2	26.0	25.0	20.0		-20%	-32%
Salmon combined										
Total income	549.7	464.6	515.7	678.6	642.7	803.8	904.7	100%	13%	49%
Gross Value Added					124.1	241.2	298.7	33%	24%	64%
Operating cash flow					54.5	166.4	216.3	24%	30%	96%
Earning before interest and tax					28.4	134.2	177.2	20%	32%	118%
Net profit					27.7	126.8	169.2	19%	33%	119%
Total sales volume (thousand tonnes)	128.7	144.7	154.6	158.3	162.5	163.5	179.4		10%	18%

Source: EU Member States DCF data submission

In relation to operating costs (Figure 4.27.6):

- Salmon: the main costs were for feed (39% of total), other operational costs (36%) and labour (11%).
- Trout: the main costs were feed (35% of total), other operational costs (36%), labour (16%) and livestock costs (16%). The greater contribution of livestock costs for trout than salmon reflects less vertical integration.
- Mussels: the main costs differed from finfish being other operational costs (51%), labour (20%), and depreciation of capital (13%).

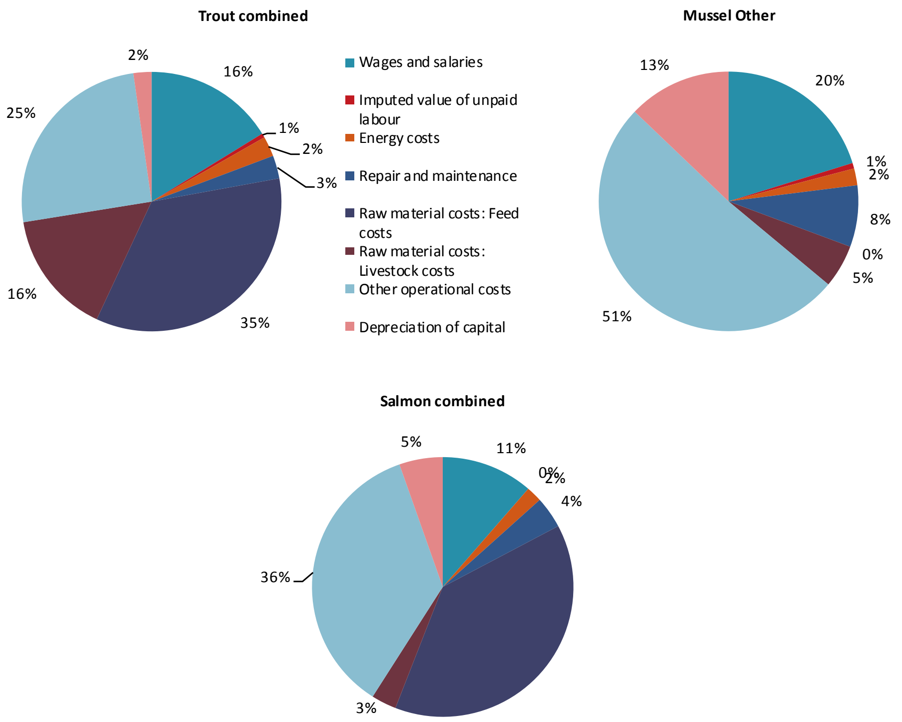


Figure 4.27.5 Cost structure of the main segments in United Kingdom: 2014.

Source: EU Member States DCF data submission

4.27.6 Trends and triggers

Current production trends and main drivers

UK aquaculture production is dominated by salmon production which is focussed in Scotland due to the suitable climate and sheltered sea lochs for on-growing. UK salmon production has increased for the sixth successive year and reached its highest ever level in 2014, 5% above the previous peak in 2003; this is likely to be attributable to a combination of industry, policy and market factors:

- Continuing consolidation to fewer larger companies operating more efficiently in fewer (but larger) sites enabling increasing productivity per employee.
- Support from the Scottish Government which recognises the segment as helping to sustain economic growth in the rural and coastal communities and support (up- and down-stream) jobs across Scotland.
- Improved survival, size at age and yield per smolt.
- A mature market: In 2014 salmon became the UK's most valuable food export with the US, EU, Canada, China and the Far East being important markets. Farmed salmon is also well accepted by domestic consumers being the most popular fresh fish with UK consumers. Salmon is classed as an oily fish and is therefore recommended as part of a healthy diet by public health authorities.
- Certification: The bulk of UK salmon production is certified under various standards that address environmental impacts, product quality, traceability and fish welfare. The industry also operates to the Code of Good Practice for Scottish Finfish Aquaculture.
- Representation: The salmon industry is represented by active trade associations, e.g. Scottish Salmon Producers' Organisation.

Salmon farming continues to mature and further technological improvements (e.g. recirculation aquaculture systems for smolt production, multi-valent vaccines) enable more efficient production in larger systems, improved survival and growth. The multinational nature of salmon farming facilitates the transfer of developments between countries.

Cleaner fish are likely to become an important segment of UK aquaculture in the coming years. Eurostat made it clear that (from 2014 data onwards) only aquaculture products for direct human consumption should be reported. Therefore, to capture and track the future development of cleaner fish aquaculture, it is important that these are included in DCMAP, ideally in a specific segment rather than "other marine fish".

Challenges for the salmon industry remain:

- **Environmental pressures**. Concerns continue to be expressed that salmon farming may have negative impacts on wild salmonid stocks, in particular escapees reducing fitness through genetic introgression, and transmission of sea-lice from farmed stocks compromising the survival of wild smolts. Publication of data on escapes and lice counts is being introduced to aid transparency, and schemes have been introduced to reduce escapes (through containment standards) and potential pathogen interactions (through siting and area management agreements for disease).
- **Disease pressures**: New diseases continue to emerge, for example Amoebic Gill Disease (AGD), and existing pathogen problems can escalate e.g. due to resistance to chemotherapeutants developing in sea- lice. Disease compromises production (growth and survival) and controls add additional costs (e.g. freshwater bathing for AGD). There is significant investment, from both the industry and research bodies, in the production of cleaner fish (wrasse species and lumpfish) as biological control agents for sea-lice. It is recognised that co-culture of two species adds problems (e.g. disease issues; meeting differing welfare requirements) to the previous mono-culture practice. There is also interest in novel physical methods for sea-lice removal.
- **Plankton issues**: Harmful algal blooms and jellyfish swarms have been cited as explanations for a reduced Scottish salmon harvest in 2015. It is difficult to determine whether such events are becoming more frequent and the potential role of climate change. Research is ongoing to use remote monitoring to provide advance warnings to enable interventions to protect stocks.
- **Smolt supply**: Salmon on-growing is dependent upon a sufficient supply of good quality smolt. The industry is currently making significant investment in large centralised recirculation aquaculture systems (RAS) for smolt production reducing dependence on freshwater availability and the vagaries of climate.
- **Seawater site availability**: The availability of additional near-shore sheltered sites is perceived to be limiting expansion of net-pen capacity. The industry is gradually moving to more exposed offshore sites using larger and more robust systems. An additional strategy being investigated is growing of larger size smolt, so the time in seawater net-pens is reduced, thereby enabling more frequent harvests. This strategy requires a greater freshwater capacity, which is in part being met via the introduction of RAS.

UK production of mussels has declined for the sixth successive year. This decline cannot readily be explained given the apparent profitability of the mussel segment. The trend is expected to be reversed in the coming years as new large long-line sites start harvesting. Ongoing challenges for the mussel industry include spat supply, sanitary and phytosanitary controls, and classification of waters.

UK production of trout remains static. The decline in freshwater production is explained by the marginal profitability. Trout are produced for both the table market and restocking angling waters, the latter production commanding higher unit prices. There is anecdotal evidence that demand for restocking trout is declining due to decreasing interest in trout angling. Table trout have to compete with salmon, and it is unlikely that the production will increase, although seawater net-pen trout is considered to have some promise.

Market structure

UK aquaculture businesses generally operate independently, although some shellfish producers may form co-operatives.

The three main segments each have separated trade bodies (producer organisations) which represent their interests on political, regulatory, media and technical issues.

• the Scottish Salmon Producers Organisation (SSPO) encompasses 80% of the tonnage of Scottish salmon production. Membership comprises fish farming companies involved in the freshwater and marine stages of salmon production.

• The British Trout Association represents 80% of UK trout production, and members include trout farmers and feed suppliers.

• The Shellfish Association of Great Britain whose members include shellfish farmers, fishermen, fishermen's Associations, processors, commercial traders and retail companies.

There are also a number of smaller regional/sector trade bodies in the UK (e.g. Association of Scottish Shellfish Growers, Welsh Aquaculture Producers' Association, British Marine Finfish Association, Scottish Shellfish Marketing Group, Shetland Aquaculture).

A number of production standards operate in UK aquaculture (e.g. the Code of Good Practice for Scottish FinFish Aquaculture, Label Rouge, RSPCA Freedom Food, Quality Trout UK). In addition, most retailers have Codes of Practice and/or standards. Interest in organic aquaculture remains limited within the UK – there were no organic trout farms and the only 1% of salmon production was certified as organic, with a clear trend for decreasing organic production (both number of sites and production)

Seafish (i.e. the Sea Fish Industry Authority) is a United Kingdom non-departmental public body "*supporting the seafood industry for a sustainable, profitable future*" funded by a levies on the seafood industry. In recent years Seafish, recognising that aquaculture products (both domestic and imported) play an important role in seafood supply, have taken a more active role in providing information on, and promoting the development of UK aquaculture.

Issues of special interest

Issues of relevance to UK aquaculture include:

- The Aquaculture & Fisheries (Scotland) Act commenced in September 2013 which provides a robust regulatory framework to balance growing the aquaculture sector with protecting the marine environment.
- Scotland's Aquaculture Database and website (http://aquaculture.scotland.gov.uk/) was established in 2014 to make regulatory data collected by SEPA, Marine Scotland, Food Standards Agency Scotland (FSAS) and The Crown Estate publically available.
- Marine ingredients in fish feeds: Marine ingredients (fish meal and fish oil) are major constituents of UK farmed salmon and trout diets. The issues around use of marine ingredients (sustainability, availability, cost) are well known and substitution with by-products from fish processing, land animal protein sources (LAPs), and vegetable meals and oils often discussed. Despite legislatory changes facilitating substitution of fishmeal with LAPs, certification standards in the UK have been cited as barriers to substitution, due to the perception that finfish should be fed natural fish diets.
- Triploidy is well established within the trout segment as it confers sterility and prevents maturation and consequent deterioration in feed conversion and flesh quality. It was not adopted by the salmon segment due to concerns with fish quality but, if applied, could eliminate concerns of introgression as escapees could not interbreed with wild stocks. Research evidence is accumulating suggesting that commercial farming of triploid salmon may be viable.

- An exemplar large marine RAS facility, producing sea-bass since the start of the DCF, ceased production in 2015. Over the course of its operation, it received significant inputs of public (national and EU) funding and had endured several critical periods due to questionable economic sustainability. It is understood that the option of using the facility to produce higher value cleaner fish for the salmon segment is being explored.
- UK salmon exports value fell by 20% in 2015 due to reduced demand from the key markets of the US, Canada and the Far East. The Russian boycott of EU exports, is thought to have contributed by producing a surplus of salmon on world markets.

Outlook for future production trends

The UK's "Multiannual national plan for the development of sustainable aquaculture" (http://ec.europa.eu/fisheries/cfp/aquaculture/multiannual-national-plans/index_en.htm) aims to:

- Increase production value to €958 million in 2020
- Increase production volume to 254 000 tonnes in 2020, via increases in both fish and mollusc farming

In 2014, UK aquaculture was valued at €992, already 4% above the 2020 target. However, the targets for increases in production volumes are likely to be more challenging. Production volume data in Table 4.27.1 is presented graphically with extrapolated trend lines added (N.B: all trend lines significant at $p<0.05$). Recognising that past trends are not good indicators of future performance especially given the length of extrapolation period, these data nevertheless indicate that if current trends continue, the production volume target will not be reached due to a shortfall in shellfish production.

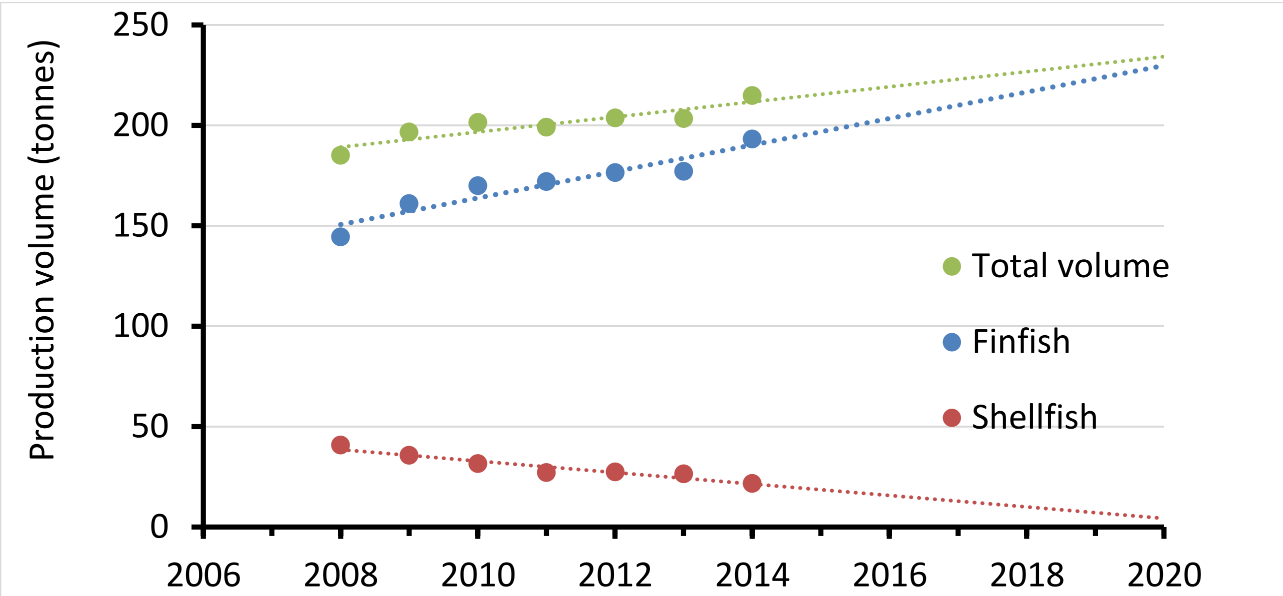


Figure 4.27.6 Aquaculture projections for the United Kingdom up to 2020.

The UK's national strategy aims to aid the aquaculture industry through measures to: simplify administrative procedures; enhance competitiveness; ensure coordinated spatial planning; provide a level playing field; encourage best practices. Such measures may stem the decline in shellfish production, and with support within the Scottish and Welsh administrations, shellfish (and finfish) production could be increased.

The aquaculture aim of the operational program of EMFF (http://ec.europa.eu/fisheries/cfp/emff/doc/op-uk_en.pdf) is *"Fostering environmentally sustainable, resource efficient, innovative, competitive and knowledge based aquaculture"*. The UK aims to provide funding to projects to increase aquaculture production value, volume, profit, reduce environmental impacts and provide employment via:

- Article 47 Innovation in Aquaculture: Developing technical, scientific or organisational knowledge in aquaculture farms
- Article 48 Productive investments in aquaculture
- Article 49 Management, relief and advisory services for aquaculture farms
- Article 50 Promotion of human capital and networking
- Article 51 Increasing the potential of aquaculture sites
- Article 54 Aquaculture providing environmental services

There have been 3 projects approved under EMFF since opening in January with a £2.67 million total project value and £462 thousand EMFF grant funding. However, the impact of EMFF funding on UK aquaculture is unclear due to the forthcoming withdrawal of the UK from the EU ("Brexit"). The UK Government has confirmed that EMFF projects with funding agreements in place before 23/11/2016 will be funded; no longer term commitments have yet been given.

A significant portion of UK aquaculture production is exported (salmon, mussel) rather than being consumed domestically. It is unclear how potential changes in trade agreements (for both imports and exports) following Brexit will affect the domestic and export markets for UK aquaculture products. This may have a larger influence on the industry in the medium term than EMFF funding.

4.27.7 Data Coverage and Data Quality

Data quality

Under aquatic animal health regulations, all aquaculture production businesses (APBs) are required to be authorised by the regional competent authorities for fish and shellfish health. There are three separate bodies covering England and Wales, Scotland, and Northern Ireland, which have a full overview of farm sites and businesses. All APBs are included in annual censuses which collect information on species, production volumes, systems and employment with coverage approaching 100%. Census data were provided direct from the administrations and summed to provide UK totals. Production volumes (tonnes) were therefore fully recorded and can be considered precise.

Typical farm gate prices (GBP/tonne) were based on estimates by experts and producer organisations. Turnover was imputed from volume x estimated farm gate price. All GBP values were converted to € values using annual conversion factors. Turnovers are therefore estimates and can be considered good.

Statistics on employment were partially recorded within the censuses:

- Data on numbers of enterprises (wrt number of employees) can be considered fully recorded and precise.

- Numbers of full-time and part-time employees in Scotland and Northern Ireland, and additional data on numbers of male and female employees and full-time equivalent of part-time employees in England and Wales. The total number of employees was fully recorded and can be considered exact.

- Numbers of male and female employees were only recorded for England and Wales, and shellfish businesses in Scotland. The proportion for England and Wales was used to estimate the gender split in Scotland and Northern Ireland. The numbers of male and female employees were therefore estimates which can be considered good.

- Direct data on total FTE was only collected for England and Wales. For Scotland and Northern Ireland, an FTE of 0.45 was assumed for all part-time staff. Total FTE are therefore estimates which can be considered good.

- Census data on male and female staff were only collected for England and Wales, but not attributed to full or part-time staff: where enterprises employed female staff these were preferentially attributed to part-time staff if present (an assumption based upon expert opinion), to enable calculation of male and female FTEs for each enterprise. The proportions of male and female FTE in the segment FTEs for England and Wales were applied to the segment FTEs for Scotland and Northern Ireland. Male FTE and female FTE are therefore estimates which can be considered good.

All other economic/input data for 2013 and 2014 were collected by a targeted questionnaire survey (salmon – all enterprises; trout & mussel – main producers) with a response rate approaching 50%. Although responses were only received from 8% of UK aquaculture enterprises, these represented >50% of UK production volume and value, i.e. an overall scaling factor of <2. Data quality can therefore be considered fair.

Data availability

Data for the aquaculture sector is published annually in an aggregated form. Scottish aquaculture statistics are available from

http://www.gov.scot/Topics/marine/Publications/FRS-Reports/FRS-Surveys,

and the collated UK statistics from

https://www.gov.uk/government/uploads/.../Aquaculture_Statistics_UK_2012.pdf.

Confidentiality

Reporting of a single segment within each species grouping ensures that each segment represents >5 enterprises. The exception is the single sea-bass enterprise which received significant grant funding and is considered a unique pilot recirculation farm.

Differences in DCF data compared with other official data sources

The volume and value data submitted to DCF should correspond exactly with that submitted to FAO and EUROSTAT as it derives from the same census. However, small differences occur because:

- FAO data may include estimates. FAO request data before it is available (being collected and collated under EC regulations for submission in Yr+2). Data for the previous year is therefore necessarily provided as interim estimates and revised data submitted subsequently when available. FAO data may not reflect the updated submissions.
- Data is combined differently, e.g. within Eurostat rainbow trout and brown/sea trout production is allotted to freshwater and seawater production, but under DCF all trout is reported under freshwater.
- For 2014 data, Eurostat specifically requested that only fish produced for human consumption should be included; DCF data includes all reported aquaculture, i.e. the additional production for angling, the pet trade and cleaner fish (i.e. functional species).

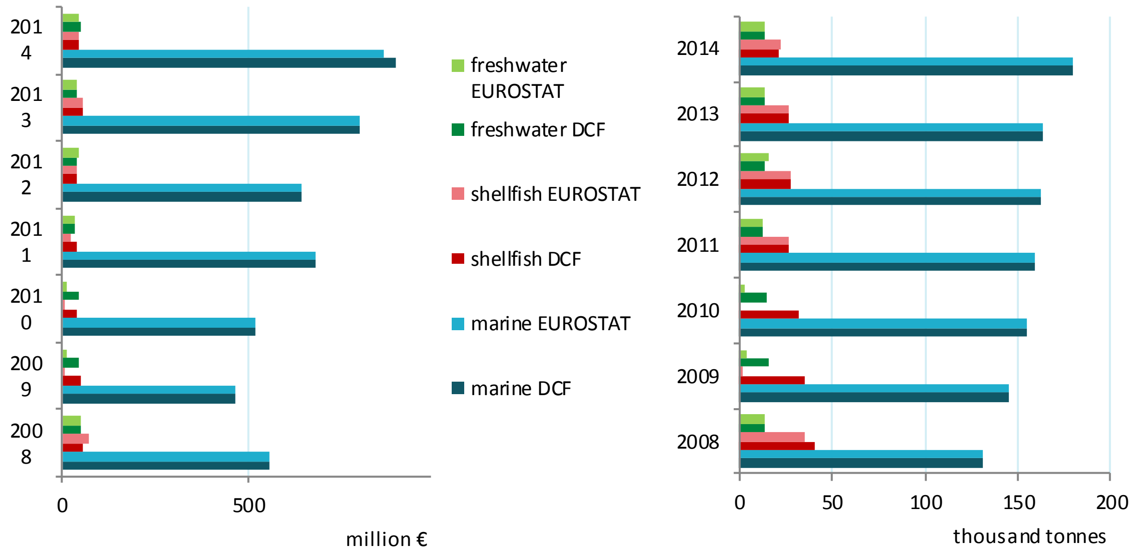


Figure 4.27.7 Comparison of DCF data with EUROSTAT data for United Kingdom: 2008-2014

5. SPECIAL CHAPTER

5.1 The question of subsidies in an economic theoretical perspective

Subsidies[1] from a general perspective

Standard economic theory holds that subsidies are always destructive of the social rent from economic activity because they absorb taxes from the successful and redistribute them to the unsuccessful. This is shifting the capital factor of production from the efficient to the inefficient and diverting scarce resources into the second best alternative. However, this idea relies heavily on the assumptions of perfectly competitive markets (perfect knowledge, many small suppliers and purchasers, homogeneous products, *inter alia*).

Few, if any, of these hold entirely in practice, though the theory still provides valuable insights if it is not taken too literally as markets are known not to operate perfectly. For example, with the exception of salmon production, firms in aquaculture have relatively small market shares and so are relatively numerous. This means that they have little control over the price they are able to charge for their product if they are going to remain competitive. It makes them more vulnerable to cost or exchange rate shocks than they would be if they were a monopoly or in an oligopolistic market structure. There are nevertheless benefits for the consumer in that prices are kept lower and the industry does not extract super-normal profits. It leaves aquaculture firms weak when facing the retail sector where the few purchasers can drive down aquaculturists' profits to near zero.

The Impact of Externalities

Even in classical thinking there were those who have questioned whether subsidies are always destructive. Pigou (1920) developed the idea that they could provide net benefits to society if they produced positive externalities when markets fail to do so without intervention. These could apply in such diverse areas as training or flu vaccine. In aquaculture they relate to such things as organic production and other social and environmental benefits, as well as potential benefits of higher seafood consumption.[2] It does not follow therefore that the success of public policy is to be measured only in terms of increased output. Social and environmental considerations including the viability of communities and pollution matter too.

This view of correcting for "market failure" has been endorsed as a fundamental principle of the Common Fisheries Policy. We may consider the success of subsidies in terms of the three pillars of the CFP (social, economic and environmental); value-added, the co-

[1] In this chapter the term "subsidy" and "public support" are used interchangeably. Economists use the term subsidy for public support, whereas the term public support is used in the official communication from the European Commission.

[2] Sufficient seafood consumption can have a positive effect on public health, particularly with respect to cardiac diseases (Mozaffarian and Rimm, 2006), and seafood consumption is below recommended levels in many European countries.

hesion of vulnerable communities and environmental externalities. These three pillars are not necessarily mutually exclusive or in conflict. Reduction of negative environmental externalities may improve demand and output, and improved output may increase employment, incomes and public health, thereby strengthening social cohesion.

Generally, it is accepted that frictions within the economic system prevent perfect markets from emerging. It is these imperfections that allow subsidisation to produce beneficial, if less than perfect, effects. As regards the diversion of resources, the underlying assumption of the full employment of both capital and labour resources does not hold either, especially in peripheral economic areas such as those inhabited by fishing and aquaculture. More serious criticisms of subsidies are that the institutions establishing them are seldom if ever able to be precisely targeted, leading to waste. Investment decisions will be influenced by the availability of subsidies, and the main insight from the general theory that subsidies lead to misallocation of labour and capital may still be true. Whether the subsidies, in total, give rise to positive benefits or is a drain on society's resources is then an empirical question.

Substitution and Compensation Effects

The misallocation effect of a subsidy is due to the fact that it changes the consumers' product demand as well as firms' demand for factors of production. Slutsky (1915) identified substitution effects which suggest that the subsidised factor would be partly substituted for the unsubsidised as the subsidy makes it cheaper to provide the subsidised product. Hicks (1939) amended this, identifying a secondary, compensating, effect. Nevertheless Hicks compensation effect is only partial leaving a net effect in the direction of the original substitution. This has important implications for attempts to encourage employment in regional and especially peripheral areas such as those where fishing and aquaculture may be important local employers. If capital is subsidised Slutsky and Hicks imply that labour will be relatively expensive (compared to capital) and therefore capital will displace labour. This of course would appear to frustrate one of the major intentions of regional policy.

On the other hand, as it reduces the total private cost of production (costs without accounting for the subsidy), the subsidy may also be the factor that maintains the competitiveness of the firm, and thereby maintains any employment in this industry. The subsidy can accordingly also support. A major objective of regional policy is to expand production, dragging increases in employment with it. This is so even if the improvement in employment is not proportionate to the expansion of output because there are multiplier effects which serve to add further expansion to an economy. Encouraging a shift away from the use of labour towards capital intensive production may seem to defeat the primary objective of regional policy but the history of mankind is of technological development replacing the use of labour. This has then created increases in output demanding more labour to service it.

Expenditure Switching

A remaining benefit for the EU is that subsidisation of domestic producers encourages the displacement of imports by EU production and offers the possibility of increasing exports. These may potentially improve the Balance of Payments Current Accounts of the EU and the respective Member State (MS), though the extent of this is constrained by WTO rules.

Social Cohesion

Social cohesion has been considered by the OECD (2011) and is extensively discussed. It is helped although not guaranteed by strong local economies. Social problems may be reduced. By offering good employment opportunities to the young they may have the chance to remain where they grew up rather than being drawn into the prosperous core economies. Again, there are benefits for the sick, elderly and infirm in having a family around them. All these reduce the total burden on the State.

Sustainable Development and the Environment

In the Communication from the Commission to the European Parliament and the Council of 8 April 2009 - Building a sustainable future for aquaculture - A new impetus for the Strategy for the Sustainable Development of European Aquaculture, COM(2009) 162 final, the Commission set out challenges facing aquaculture, identified causes of stagnation and barriers to development, and sought to give a new impetus to the sustainable development of aquaculture in the European Union. As of 2013, the Commission intended to boost the aquaculture sector through the Common Fisheries Policy reform, and in 2013 published Strategic Guidelines presenting common priorities and general objectives at EU level.

Four priority areas were identified in consultation with all relevant stakeholders:

Reducing administrative burdens, improving access to space and water, increasing competitiveness, exploiting competitive advantages due to high quality, health and environmental standards.

On the basis of the guidelines, the Commission and EU countries are collaborating to help increase the sector's production and competitiveness. EU countries have been asked to set up multiannual plans to promote aquaculture. The Commission is helping with the identification of bottlenecks but also facilitates cooperation, coordination and exchange of best practices between EU countries

Improvement of the environment extends beyond preventing negative externalities from production. In Sweden, experiments have shown that mussel farming can be used for water purification (Lindahl *et al*., 2005) to reduce eutrophication, thereby adding value by producing public amenities that are positive externalities. The spent product may then be used as fertiliser.

Adverse Effects of Subsidy

A serious side effect of subsidisation can be the loss of unsubsidised otherwise viable businesses either in the locality or elsewhere. If "elsewhere" is in another administrative zone there is a danger of competitive subsidisation developing. Unintended side effects must be taken into consideration in any assessment of the success of a policy of subsidisation. The value of environmental institutions can be measured both by the benefits received and the production foregone.

The European Approach over the years

As of the year 2000 the EU and Member States have transferred significant total public support to the aquaculture sector. In this report only funds that are, or have been, co-managed by DGMARE with member states, such as the Financial Instrument for Fisheries Guidance (FIFG), the European Fisheries Fund (EFF), and now the European Maritime and Fisheries Fund (EMFF) are considered and hence the figures will be conservative. Additional funds might have been transferred to the aquaculture sector through the European Regional Development Fund (ERDF), the European Agricultural Fund for Rural Development (EAFRD) or *ad hoc* state aid support provided directly by MS but these are not taken into account.

The EU funds are co-managed by DGMARE together with the MS over a seven year programmed period. The MS not only determine the priorities of the type of projects that can be funded (from a predetermined list) but also provide national funding for these projects. In this report both the EU as well as the national support are taken into account of the actually paid (not committed) amounts. In most cases the total public support is only a percentage of the project with the rest of the project being financed by the entrepreneurs themselves.

Over the years the Commission to the Council and European Parliament have focused their objective of public support to the aquaculture sector to enable member states to promote all three pillars of "Sustainable growth": social, economic and environmental.

The EU support to aquaculture first became more apparent as of the programming period 2000-2006 (FIFG)[3]. In that period the EU together with MS supported the aquaculture sector with €567 million. This support to the sector (with a slightly modified focus) continued with the European Fisheries Fund[4] (EFF: programming period 2007 to 2013) which was launched to underpin the economic, environmental and social objectives of the CFP. In this programming period, a total budget of €598 million of public support has been paid for measures for productive investments in aquaculture, aqua-environmental measures and public health measures as well as animal health measures.

As of 2014, for the programming period (2014-2020) of the European Maritime Fisheries Fund (EMFF)[5] MS plan to support aquaculture with a total of €1 725 million (EU and national co-financing). This support may focus on any of an extensive ranges of areas which are defined in the MS multiannual plans as their priorities and objectives; innovation, productive investments, management, relief and advisory programmes series for aquaculture firms, promotion of human capital and networking, increasing the potential of aquaculture sites, encouraging new aquaculture farmers practicing sustainable aquaculture, conversion to eco-management and audit schemes and organic aquaculture, aquaculture providing environmental services, public health measures, animal health and welfare measures as well as aquaculture stock insurance. See Annex 2 for data per MS for the FIFG, EFF and EMFF.

For the current programming period the Commission was felt that even if wild stocks of fish recover to the target Maximum Sustainable Yield levels, the rapidly expanding demand for fish and other sea foods would also have to be met from aquaculture production. For this reason EU felt it needed to put in place appropriate measures to ensure that the aquaculture industry could take a lead role in the production of aquatic food, technology and innovation, and in setting standards and certification processes at European and international level.

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[3] http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52003PC0658&from=ga

[4] http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=URISERV:l66004&from=EN

[5] http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32014R0508&from=EN

In order to increase competitiveness in the sector, support for research and technological development, promotion of spatial planning in coastal zones, and for marketing would continue. To guarantee the sustainable development of aquaculture, environment-friendly production methods would continue to be promoted, while ensuring that access to a high-quality environment particularly in terms of water quality was available. Animal welfare and health had to be ensured and a high level of consumer protection must continue in order to enhance the image of European aquaculture. Public authorities were exhorted to improve governance, especially in terms of reducing administrative charges, consulting stakeholders and informing the public and financial support was to be available for a range of measures.

5.2 Empirical analysis of EFF support

In this report the EWG working group has tried to assess the impact of the public funding from EFF programme, based on empirical evidence from the economic data available under the DCF from 2008 to 2014.

The total public funding invested into the EU aquaculture during the EFF was close to €0.6 billion. See Figure 5.1 for an overview of total public funding per MS. Clearly Poland, Spain and Romania spent the largest total amount on their aquaculture sector during the whole programming period. In order to see if this funding was spent in countries with large aquaculture sectors the EFF funding was compared with the total value of production. This not only gives a clearer indication of the magnitude of the funding going into the aquaculture sector of the MS but also enables a relative comparison between MS.

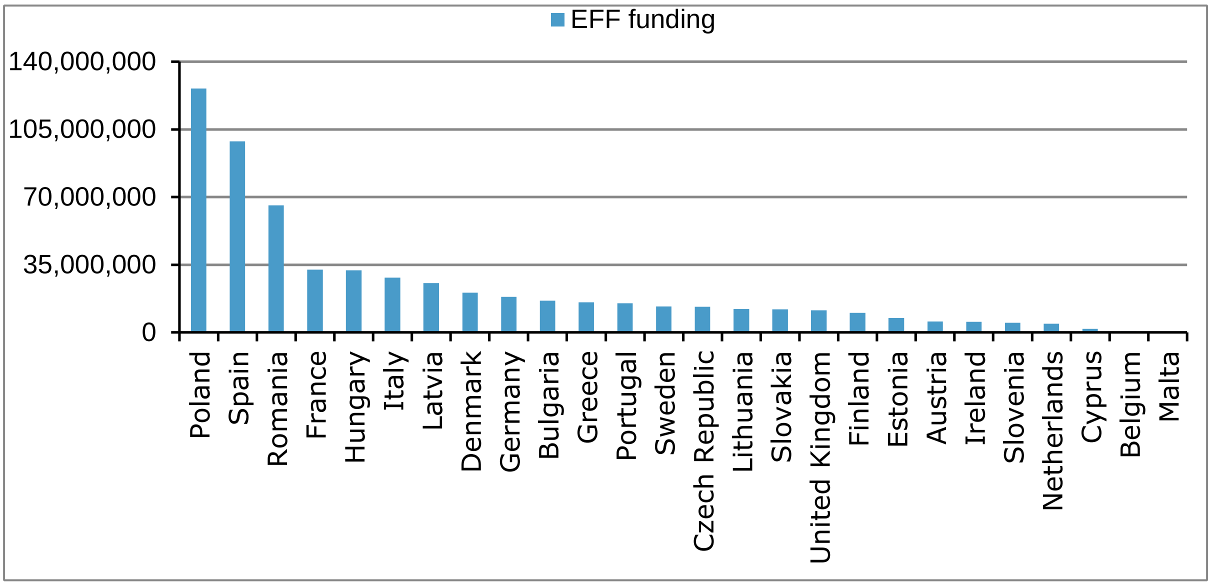

Figure 5.1: Total EFF spending in € per member state on aquaculture (See Annex 2).

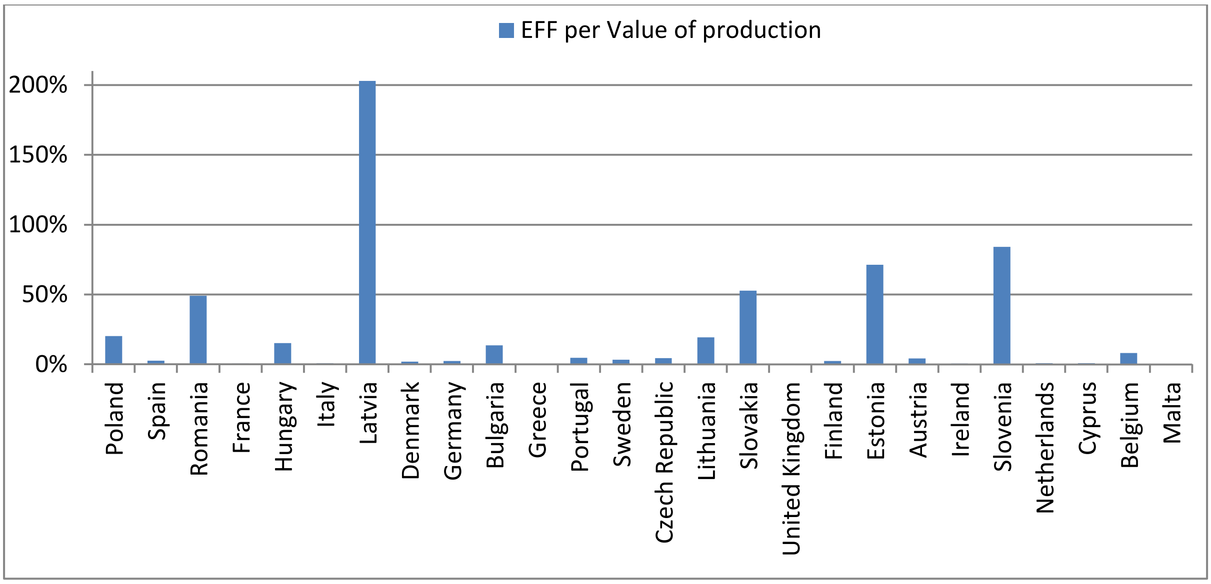

Figure 5.2: The annual average EFF spending per MS compared with the total value of production of the sector (in 2014). (See Annex 2 for the data per MS).

The economic analyses below on subsidies try to evaluate where any changes are visible in the economic data available due to the input of public support. By comparing the spending per MS to the total value of production member states can be compared in relative terms. It is shown that the MS with substantially higher support levels are those with relatively limited production using rather extensive production systems, where the primary objective of the investment seems to be to get the industry started and introduce more intensive production systems.

For the in depth economic analysis of EU public support to the aquaculture sector this chapter will focus on the programming period of the EFF as economic data through the DCF is available as of 2008 up until 2014. For "public support to aquaculture", the ("article 40") data that MS provide DGMARE with on the EFF total public support spend is used instead of the DCF "subsidies"[6] data, as the DCF excludes public support on investment in their "subsidies data" (the EFF support can be found under "other income" in the DCF data). The mean annual spent is the total amount over the period divided by seven as this is the number of years the EFF programme operated. Implicitly, this approach assumes that the actual amount spent was the same in every year, which might not have been the case but enables the building of an economic indicator.

For the economic indicator we will focus on the EFF spent per year over the total value and volume of production as data as well as FTE that are available through the EUROSTAT. We will compute the measures for 2008, the first year the data are available for and 2014. A challenge with respect to computing EU wide measures is that production data are missing for several countries in 2008. When comparing 2008 and 2014, this will therefore be based on data for those countries that reported data for 2008. These make up about 2/3 of total EU production. We will not compute indicators for net profits and GVA, as there is a large subset of countries where these are negative, making relative comparisons infeasible. We will compute average production per enterprise as a measure of space use. If no new licenses (space) have been made available to the sector this is a

[6] https://datacollection.jrc.ec.europa.eu/web/dcf/dc-aqua/var

good indicator of how efficient the existing space is used or has developed over the years.

For environmental issues for coming years MS will collect data on the use of medicines and mortality. Additional data such as phosphorus and nitrogen in DCF maps, investment in water purification systems etc. will be needed to address other aspects of environmental impact. As of now, the available data do not make it possible to conduct an analysis of environmental impact. This is also true with respect to food safety.

Volume

Table 5.1 Production volume[7]

Country	Growth in Volume 2008 to 2014	Mean Annual EFF (total public) Support	
		€/kg in 2008	€/kg in 2014
Austria			
Belgium			
Bulgaria	50.60%	0.526	0.349
Croatia			
Cyprus	28.40%	0.07	0.054
Czech Republic			
Denmark	5.30%	0.066	0.063
Estonia	9.20%	3.213	2.943
Finland	4.70%	0.129	0.124
France			0.021
Germany	2.40%	0.391	0.382
Greece			0.019
Hungary			
Ireland	-29.70%	0.018	0.025
Italy	-16.50%	0.018	0.022
Latvia			
Lithuania			
Malta	28.00%	0.009	0.007
Netherlands	57.10%	0.017	0.011
Poland			0.496
Portugal	28.20%	0.313	0.244
Romania			0.888
Slovakia			
Slovenia	75.30%	2.414	1.377
Spain	10.60%	0.054	0.049
Sweden	57.90%	0.216	0.137
United Kingdom	16.10%	0.009	0.008
Total	5.30%	0.101	0.066

Increasing aquaculture production in the EU was an objective of the EU funding a comparison. EU aquaculture production, based on our sample countries, did increase by 5.3% from 2008 to 2014. Production increased in all reporting countries, but Ireland and

7 Empty fields are due to missing DCF data.

Italy. In the longer run, an increase in production should lead to a more economically sustainable sector, which should require less support to maintain the needed level of research and development to secure a competitive and innovative development. As such, the need for subsidising the sector should decrease over time if the initial goals are achieved.

In total, the subsidy level has been reduced in that it was €0.101 in 2008 and it is down to €0.066 in 2014, corresponding to a decrease of 35% per kilo produced. Ireland and Italy are also the only countries where the subsidy level has increased on a per kilo basis, suggesting that the subsidy does not respond strongly to the production level. Based on the data available, the average support decreased more over time than the increase in production volume. This could be interpreted as if the sector has become less dependent on economic support, which from an economic sustainability point of view is positive.

The subsidy level varies substantially. In 2014, it was lowest in Malta closely followed by the UK at less than a Eurocent per kilo. For most countries the support per kilo is only a few Eurocents per kilo. There are also several countries apparently with very strong support. Estonian aquaculture is clearly the most supported at €2.94/kg. Slovenian fish farms also receive support of over €1/kg. However, the output of all three summed amounts to less than 1% of EU production by volume and in general the higher the subsidy, the lower the contribution to EU aquacultural output.

Value

Table 5.2 Production value[8]

Country	Growth in Value 2008 to 2014	Mean Annual Public Support	
		€subsidy/€sales in	€subsidy/€sales in 2014
Austria			
Belgium			
Bulgaria	70.40%	0.224	0.132
Croatia			0
Cyprus	-8.40%	0.008	0.008
Czech Republic			
Denmark	27.20%	0.022	0.017
Estonia	5.40%	0.623	0.591
Finland	20.20%	0.028	0.024
France			0.005
Germany	53.00%	0.27	0.176
Greece			0.003
Hungary			
Ireland	31.20%	0.008	0.006
Italy	29.50%	0.009	0.007
Latvia			
Lithuania			
Malta	4.00%	0.001	0.001
Netherlands	-38.10%	0.006	0.009
Poland			0.202
Portugal	41.40%	0.053	0.037
Romania			0.148
Slovakia			
Slovenia	-44.40%	0.258	0.464
Spain	18.90%	0.029	0.025
Sweden	58.00%	0.051	0.033
United Kingdom	51.10%	0.002	0.002
Total	29.00%	0.038	0.018

[8] Empty fields are due to missing DCF data.

The value has increased by 30% during the period. As the growth is higher than that of the quantity, the average unit value of the EU aquaculture production also increased. Again there are substantial differences between the countries. Three countries show negative growth in value; Cyprus, the Netherlands and Slovenia. The relative support follows much the same pattern as for quantities, with producers in Estonia and Slovenia receiving most per kilo and Malta and the UK the least.

It is interesting to note that the apparently disturbing fall in Italian production by volume has been more than compensated for by a substantial increase in value.

Employment (Full-Time Equivalent)

Table 5.3 Full-Time Equivalents[9]

Country	Employment Growth 2008 to 2014	Mean Annual Public Support	
		€/FTE in 2008	€/FTE in 2014
Austria			
Belgium			
Bulgaria	-38.80%	2 127	3 475
Croatia			0
Cyprus	36.40%	1 080	792
Czech Republic			
Denmark	-3.70%	8 391	8 715
Estonia	100.00%	71 336	35 668
Finland	9.70%	4 832	4 407
France			508
Germany[10]	0.00%	43 973	43 973
Greece			479
Hungary			
Ireland	-26.90%	615	841
Italy	-50.60%	1 181	2 388
Latvia			
Lithuania			
Malta	-9.80%	342	379
Netherlands	-2.50%	3 005	3 082
Poland			
Portugal			2 694
Romania			4 697
Slovakia			
Slovenia	-28.30%	27 009	37 655
Spain	-10.10%	2 135	2 374
Sweden	24.70%	8 628	6 918
United Kingdom	3.80%	612	590
Total	-17.50%	5 122	2 721

[9] Empty fields are due to missing DCF data.
[10] Germany only reported FTE included in the marine production.

An objective for most industrial policies is to support local employment. It is at time difficult to measure the employment in an industry, as work hours differs and not all jobs are full time. To make the numbers comparable, we will therefore use data were employment is converted into so-called Full Time Equivalents (FTE).

Growth in full time labour equivalents has also been on average negative at -17.5%. In 8 of the 14 countries for which we have data, employment growth is negative. The reduction is strongest in Italy, which also had the largest reduction in quantity produced. This development reduced the community impact of aquaculture in that fewer people are employed in the industry. However, given that production is increasing it is also an indication of increased labour productivity and therefore improved competitiveness.

Estonia, Germany and Slovenia are the countries with the highest support per FTE. Greece and France show the lowest support per FTE, but again there is a strong inverse relationship between support and industry size. Hence, while contributing to employment, the support does not seem to help creating jobs in places where the industry is successful in terms of a higher production level.

Improving the use of space

One of the nine actions set out in the European Commission's strategy for the sustainable development of aquaculture is set out in COM(2002) 511 final is improved use of space. This is primarily a drive for increased intensity as one wants more aquaculture production with allocating more space to the industry.

In Table 5.4 we show the average production per enterprise for those countries where the data is available for 2008 and 2014, and for the EU average, we also show the average for 2014 when only the countries for which data was available in 2008. On average, average production per enterprise has increased by 40% from 207 tonnes to 290 tonnes. In most countries where data are available for both years, the average size of a company has increased, but there is a large variation in enterprise size. When the countries for which data is available only for 2014 are included, the average enterprise size declines substantially. This is mostly due to the relatively small average enterprise size in France.

The patterns are relatively similar when looking at value and FTE in that there are large variations, and there is a substantial increase in average enterprise size for those countries where data is available in 2008. Hence, production intensity has increased and the use of space has accordingly improved.

Table 5.4. Average production per enterprise

Countries	Volume in tonnes		Value in €		FTE	
	2008	2014	2008	2014	2008	2014
Bulgaria	16	19	38,384	48,461	4.1	1.9
Cyprus	318	306	2,901,603	2,017,589	20.6	21
Denmark	272	403	802,645	1,389,531	2.2	2.9
Estonia	42	40	173,513	170,803	1.9	3.3
Finland	62	69	277,663	351,308	1.7	1.9
France		77		282,393		3.1
Germany	675	692	969,530	1,497,750	6	6
Greece		476		2,472,803		18.7

Ireland	148	114	310,103	419,851	4.2	3.4
Italy	320	317	631,420	965,806	4.9	2.9
Malta	1121	1434	15,598,307	16,223,579	28.2	25.4
Netherlands	294	546	825,617	633,937	1.7	1.9
Poland		29		71,919		
Portugal	5	6	28,020	34,688		0.6
Romania		25		44,505		4.7
Slovenia	27	74	47,206	120,914	2.4	2.7
Spain	84	95	149,179	179,796	2.1	2
Sweden	57	99	222,303	400,893	1.4	2
United Kingdom	348	390	1,254,942	1,801,459	5	5
EU 2008 countries	**207**	**290.5**	**502,254**	**952,498**	**4.3**	**6.2**
EU		**203**		**688,520**		**5**

5.3. Public support in aquaculture: Conclusions

1. This group cannot evaluate the economic and social results of public funding for the whole aquaculture sector for all MS as data is missing for fresh water aquaculture. When MS chose to provide public support for any aspects of the freshwater sector, DCF data collection fully covering that sector should be a precondition by including it in the national work plan. In addition MS planning to provide public funding to freshwater aquaculture should also be involved in EU coordination groups (such as PGECON) to discuss methodologies and economic variables/plan surveys. There are also important data missing in other categories. This makes analysis of changes between years difficult.

2. Quantity produced in the EU has been relatively stable for some time but with some annual variation. The 5.3% growth in production volume can be interpreted as a positive trend, but it can also be just a part of the year-on-year variation with 2008 as a somewhat weak base. It is anyway clear that EU production has a weak development with respect to production growth compared to the countries that are leading the blue revolution[11] and makes aquaculture one of the world's fastest growing food production technologies. The support level in the sector is relatively low and less than €0.1 per kilo in most MS. The MS with substantially higher support levels are those with relatively limited production, where the primary objective of the investment seems to be to get the industry started.

3. A 29% growth in production value between 2008 and 2014 looks better, and can be interpreted as an indication that the industry has increased the unit value and quality of its product. However, EU production is often a relatively small part of the total market, and production value will be strongly influenced by price changes on the global market so this growth might not develop in the same direction in the future. Some species like salmon with large price increases have obviously contributed to the increase in production value. Also for production value, the support level is relatively low in most MS.

4. The employment as measured by FTE´s has declined by 17.5%. In EU, 90% of the enterprises are micro-enterprises, employing less than 10 employees. The decline in

[11] China is the world's leading aquaculture producer followed by Indonesia, India, Vietnam and several other developing countries in East Asia. For developed countries Norway and Chile are the leaders of marine aquaculture of salmon.

employment is negative from a social perspective as aquaculture has become less important in supporting activity in coastal communities. In a larger perspective this development is not necessarily bad given that production has not increased much, as it is a sign that labour productivity is increasing. This is a necessary development if the EU industry is to remain competitive. In some countries the support level per FTE is significant. In three countries it is higher than the average salary in the EU. Average support was €2 721 per FTE in 2014. While this is a reduction from 2008, it is a non-trivial support to maintain employment.

5. The intensity of production has increased substantially, as average production per enterprise for those countries where data is available increased from 207 tons in 2008 to 290 tons in 2014. Seen in the light of very few new licenses have been made available to the sector it seems likely that the action of improving the use of space (the exploitation/more intensive use of the exiting licenses) appears relatively successful.

6. It has not been possible to measure a clear social, economic or environmental result of public funding to the aquaculture sector. While there is anecdotal evidence of some success stories, they are limited in scale. The overall picture is a sector with sluggish growth compared to the competitors in the rest of the world. Few examples of sectors with critical mass can be observed in European aquaculture within or across the MS. Individual entrepreneurs and local employment in some coastal communities have possibly benefitted. However, there is, based on the available indicators little evidence that the supports have led to clear changes. In the period investigated, production volume is stable, value is slightly up and employment is slightly down. Hence, impact on coastal communities as well as providing healthy sustainable food for European consumers is limited.

7. For years the majority of the experts have pointed out that administrative issues are far more important to solve than the technical ones (EWG 14-10). Public funding to individual entrepreneurs can have little effect on this. Environmental regulations, difficulties in the licensing process due to multilevel governance and competition for space both on land and in the coastal zones continue to be the most important areas to be addressed to increase growth in the EU aquaculture sector. It still seems that providing better framework conditions for the aquaculture industry is by far the most important issue to solve to lay the foundation for future growth in the European aquaculture sector than providing public funding to individual entrepreneurs.

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5.5. National overview

Each national expert present at the EWG 16-12 meeting, including some experts by correspondence, were asked to answer the following questions in relation to the special topic on "The public support and growth of the national aquaculture sectors":

In relation to the public support spending (EFF), if available, spend on improving the performance in the aquaculture sector, could you please try to answer the following questions

1. What were the original goals in terms of production volume, value, employment, environmental impact, etc., if available, in the National Program 2007-2013 and have these goals been achieved?

2. In the light of these goals set in the National Program 2007-2013 could you please try to answer the following questions:

    - What have we learnt?
    - Growth/decline main drivers and trends
    - Diversification of aquaculture species (species and products)
    - Technical development - Sustainable development
    - If possible also aspects of spatial planning
    - Certification (ASC, Organic etc.)

In the following each countries experts reply is added:

Bulgaria

The main aims regarding the aquaculture, setted out in the Bulgarian Operational programme for the period 2007 – 2013 were to increase and diversify the production of aquaculture with new species with good market prospect, to enhance the quality and the support for the traditional aquaculture concerning social and environmental aspects and to apply the good production practices system for the monitoring of quality and the sanitary and hygiene requirements.

The subsidies from the EFF until 2016 that have been provided to Bulgarian aquaculture farmers amounted around €20 million. From this subsidy, €13 million are provided for the construction of 35 new farms. For the modernization of 24 farms has been given €7 million.

Technical development - Sustainable development

During the operational programme (2007-2013) the construction of 10 new enterprises for production of Mediterranean mussel and the modernization and expansion of five existing enterprises were subsidised therefore it is expected that the production of mussels and employed people in the mussels farms will continue to grow.

Species and product diversification

The construction of a farm for microalgae was funded, this is very new production sector for Bulgaria and the main aim is to replace the current import of microalgae with Bulgarian production.

Another innovative project for Bulgaria is building a recirculating system for eel. The planned production capacity of the farm is expected to be reached in the fifth year after the launching of the production process.

A project that has gained popularity is the cultivation of coho salmon. This is the first farm in Bulgaria for salmon and the expected capacity is 200 tonnes per year. If there are no obstacles the first production from the farm will be available in early 2017.

The main targets that were stated in the Bulgarian Multiannual National Strategic Plan for the promotion of sustainable aquaculture are:

- Improving the competitiveness of the aquaculture sub-sector and supporting development;
- Establishing indicators for environmental, economic and social sustainability;
- Promotion of economic activity in the subsector;
- Diversify and improve the quality of life in coastal and rural areas;
- Equality and security operators in the aquaculture in relation to access to waters and space;
- Administrative simplification regarding the licenses.

Denmark

The Danish objective of the EFF in terms of production volume was 105 000 tonnes, divided on 60 000 tonnes of trout produced in freshwater, 40 000 tonnes of trout produced in sea cages, 5 000 tonnes of European Eel produced in recirculation systems. This corresponds to an increase of 2 times for the freshwater production, 5 times for the sea cage production and 3 times for the eel production compared to the volumes produced in 2007.

Comparing the initial targets of production volume to the achieved volume the fresh water production reached 29 000 tonnes, the sea cage production 14 000 tonnes, and the eel production 1 600 tonnes. Comparing the initial goals with production reached in 2014 the program has not been successful in promoting production growth in the aquaculture sector in Denmark.

In Denmark, approximately 75% of the EFF funds have been spend on the 2 first actions in the EFF program "Action 1: Increase in production capacity due to construction of new farms" and "Action 2: Variation in production due to the extension or modernisation of existing farms". "Action 6: Animal health measures" covers 15% leaving 10% for Action 3 and 4. There have not been allocated any funds to Action 5.

What have we learned?

The most important reasons for the lack of growth experienced over this period are considered to be the discharges of nitrogen and phosphorus to the environment. The aquaculture sector competes with the highly intensive agriculture sector of the rights to discharge these pollutants into the water environment. There have not been set aside a special limit or amount for these discharges from aquaculture. This has prevented the sector from using any reduction achieved in these pollutants, reduction per kilo of produced fish, to increase the overall volume. Investment in new recirculating farms has reduced the environmental impact from the land based aquaculture sector, however, these gains has not been reinvested in producing more fish but have benefited the environment by lowering the emission to the environment.

Furthermore, the lack of new licenses being issued, multilevel governance and environmental concerns of the above mentioned externalities are the most important reasons why the production target set in 2007 have not been reached.

The lesson that could be learned from this is that setting production goal without assuring that the framework conditions for the sector are aligned with these goals (environment, licenses and bureaucracy) will not necessarily led to a positive result, even though a lot of effort and funding are spend to reach these goals.

Technical development - Sustainable development

One of the main focusses in Denmark has been to increase production without increasing the environmental impacts from the farms. This has been achieved by supporting investments in new recirculating farms and rebuilding of traditional farms into more production and environmental efficient farms. This has been a success. The production in these farms has increased from 6 400 tonnes in 2007 to 13 200 tonnes in 2014, reducing the environmental impact of nitrogen 35%, phosphorus 60% and organic materials 90% per kilo of fish produced (Nielsen, 2011). However, at the same time the production in traditional farms has been reduced from 26 200 tonnes in 2007 to 17 200 in 2014, resulting in a decrease in the overall total trout production of 7%.

In 2012, a new regulation of the land based freshwater farms was introduced. The recirculated farms could apply to changing the current feed quota system to a system based on output of nitrogen and phosphorus instead. This would allow the farms to produce more when reducing the environmental impact. However, the bureaucratic process of getting this new management implemented and the farms approved to change from the current management system have been very long and time consuming and the effect of this incentive based regulation has not been reflected in the production volumes between 2012 and 2014.

Species and product diversification

In terms of species diversification, the support of one farm producing Pike Perch has been a success. The farm produces around 100-150 tonnes of Pike Perch for consumption and for on growing. The fingerlings are sold to other producers all over Europe.

Certification (ASC, Organic etc.)

In Denmark there has also been a growing interest for reorganising traditional freshwater farms into organic freshwater farms producing trout. From 2007 until 2014 there has been a growth in production from virtually nothing in 2007 to 640 tonnes in 2014, reorganising 9 freshwater trout farms to organic production. These farms are doing better in economic terms because they are selling their products at a higher price per kilo and even though the cost for producing organic is also higher the net gain has been larger for these farms than for the traditional trout farms.

Sources:

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Statistics Denmark, Account Statistics for Aquaculture from 2007 to 2014.

Estonia

According to the Estonian Operational Programme of the European Fisheries Fund 2007-2013, the goal in the aquaculture sector was to increase production from a baseline level of 700 tonnes in 2007 to target level of 2 500 tonnes in 2015. The goal should be reached by building of new farms. To help achieve this, around €13 million were allocated from EFF for the establishment and modernisation of fish farms.

According to the data of Statistics Estonia the sales volumes of aquaculture products in 2007 and 2014 were 488 and 865 tonnes, respectively. The sales volume has increased by almost two times over the time period. Based on estimates of the Estonian Ministry of Rural Affaires, the project capacity for aquaculture enterprises established by the support of EFF increased to 1 600 tonnes, by the first half of 2014. Growth in capacity was also expected in 2015. This suggests that the goal of the programme is generally achieved. Increase in sales indicates that the investments will pay off. Due to the nature of aquaculture it will take some years to utilise the newly build capacity and reach the maximum production.

Finland

EFF Objectives for the Finnish aquaculture sector were:

- To increase the volume from 14.3 million kg in 2007 to 23 million kg in 2014
- To increase the production value from €44 million in 2007 to €85 million in 2014
- To improve the profitability in the 2007-2014 period
- To employ 650 persons in 2014
- Decrease nutrient loading per fish produced by 4%

What have we learned?

The objective for production growth was not met and the main reason is that the environmental permit system is limiting the production. The total value of aquaculture production (including also non main activity producers) of both food fish and fry was €80 million in 2014 and the growth objective was not reached.

The value of production depends on the global salmon market situation (fish prices) and on the production volume. As the fish prices have not increased in the period and the production volume has not increased due to tight environmental permit policy, the objective for the value of production was not met and the profitability of the sector has weakened. However, the environmental goal of diminishing the nutrient load per kilo of fish produced was reached and the Finnish aquaculture has become more eco-efficient.

Technical development - Sustainable development

Aquaculture sector in Finland has been able to develop new, more environmentally friendly aquaculture technology during the EFF programme period. Finland has been able to decrease the nutrient load per fish produced and the Finnish aquaculture has become more eco-efficient. Nowadays the nutrient load of aquaculture production per tonnes of fish produced is only one third of what it was in the 1980s. The nitrogen loading (kg per tonnes of fish) decreased by 14% and the phosphorus loading decreased by around 30% from 2006 to 2014. This reduction has been possible thanks to fish feed development, developing new culturing techniques and selective breeding of fish.

Number of recirculating systems units have increasing in the recent years. The recirculating systems have a great potential as the nutrient load can be easily managed while it is possible to maintain optimal culturing conditions all year round. However, high production costs as well as risks related to introducing new technologies impose challenges for this technology. There were 9 recirculating systems units in operation in 2014 in Finland producing 300 tonnes of fish with a value of €2 million.

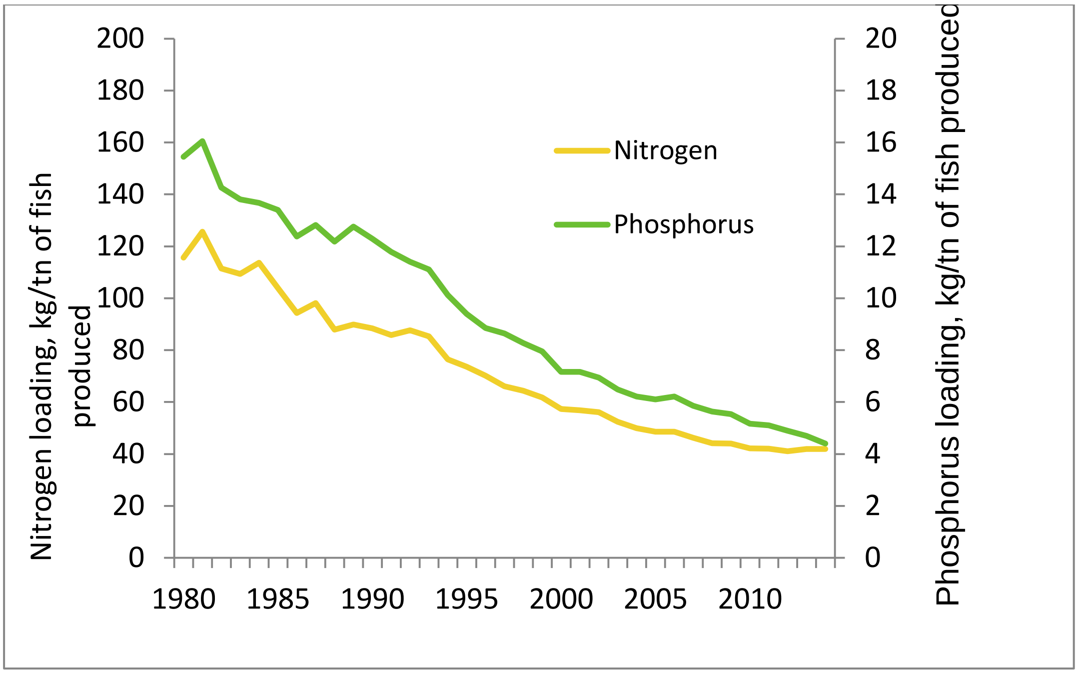

Figure 3. Evolution of nitrogen and phosphorus loading in Finland in kilograms per tonne of fish produced from 1980 to 2014.
Source: VAHTI/Ministry of Environment

France

According to estimates in the Operational Programme for France, oyster production should increase from 115 000 tonnes at the beginning of the period in 2007 to 121 000 tonnes in 2010 and to 127 000 tonnes at the end of the program. Nevertheless, production objectives for 2013 were not achieved. This result is due to the high mortalities of oyster in France since 2008.

Certification (ASC, Organic etc.)

Since May 2013, "Moules de Bouchot" are a protected name. It's the first French product to obtain the Traditional Speciality Guaranteed (TSG) designation, because they are produced according to a traditional production method. With the introduction of a TSG, mussel farmers wish to boost their revenues. It will also increase the market value of the products of economic operators, by guaranteeing that they are distinguishable from other similar products.

Greece

The quantitative targets set in the EFF Operational programme in 2007 included 210 new or renovated production facilities, increased production volume by 11 500 tonnes and increased employment by 496 permanent positions. In the last revision of the operational programme during 2014 the quantitative targets are revised to include 130 new or renovated production facilities, increased production volume of 11 500 tonnes and increased employment by 150 permanent positions.

What have we learned?

The application of the Greek EFF Operational programme has significantly contributed to the renovation of existing production facilities and, to a lesser extent, to the increment of the production potential. The quantitative targets set in 2007 were not met, thus they were amended in 2014. In the case of the production volume increment, the target has not change. Based on the production volume for 2014 reported by Eurostat, the target of increased production volume is also not met.

The implementation of the EFF Operational programme in Greece, in the case of aquaculture, has been vastly affected by administrative obstacles and by the southern European debt crisis.

The lack of spatial planning and the conflicts arising at the coastal zone has raised concerns at the European Commission regarding the distribution of funds for aquaculture and the implementation was delayed until 2012, after the adaptation of the national spatial plan. Nevertheless, pending (since 2007) applications for funding of aquaculture projects facilitated the distribution of funds after 2012.

The newly introduced condition in the EFF regulation regarding the non-eligibility of funding for large enterprises has vastly diminished the potential beneficiaries of the Operational programme. As large companies own production facilities all over the country, they were able to access some EFF funding for the facilities located at the Greek islands.

The Greek debt crisis, the country risk and the need for re-capitalisation of the Greek banks have negatively affected the availability of private funding for aquaculture. Restructuring and refinancing of the debt for the major producer companies has also raised obstacles for new investment. Producers were forced to liquidate assets, decrease the production and limit new investment to the absolutely minimum in order to meet the cash flow needs. The expectations of diminishing demand in the southern European countries, due to the debt crisis, have also contributed to the stagnation of investment during the Operational programme implementation period.

The implementation of the financial engineering instruments for aquaculture was restricted by the limited availability of private funding and the re-capitalisation process of the Greek banks.

Species and product diversification

The funding of projects for algae production and especially a new production facility for Spirulina may be considered a success of the Greek the EFF Operational programme.

Ireland

EFF funding for Ireland was expected to expand aquaculture output to a total of 35.3 thousand tonnes of finfish and 70.8 thousand tonnes of shellfish; 106 000 tonnes total. The results for output volume and value and employment fell far short of expectations for several reasons:

No significant change in site capacity-licenced sites, principally affecting the salmon and oyster segments, Environmental conditions; climactic conditions exacerbating the effects of pathogenic and parasitic organisms affecting food safety or product health-product volume (mortalities), affecting all segments, Seed supply, principally affecting the bottom mussel segment and to a lesser extent, the oyster and other bivalve segments.

Cyclical production trends were observed for salmon and rope mussels over the EFF period. Production remained above critical levels; above a minimum 9 000 tonnes for salmon and above 8 000 tonnes for rope mussel, but below a maximum 15 000 tonnes for salmon (30 000 tonnes anticipated) and 10 000 tonnes (16 400 tonnes anticipated) for rope mussel. The raw materials of these segments; Salmon smolts and seed mussel supply are relatively certain, despite fluctuations in available quantity and costs. These segments were more or less back where they started in output, in 2008, by 2014. The main oyster segment; Bag-on-trestle, has shown a steady growth in all indicators such as volume, value, employment, GVA, productivity, etc., despite vulnerability to pathogens and fluctuating availability of seed quantity, quality and unit costs. It is the only segment that has achieved targets for the 2007 to 2013 period; just under 9 000 tonnes in 2014. It is the bottom mussel segment, which has no control of its seed supply that has not only failed to achieve projected targets (44 000 tonnes) but had crashed as a major constituent segment in 2013.

Targets for "Other Finfish" (2 470 tonnes) and 'Other shellfish (1 400 tonnes) also fell far short by 2014. The clam segment (Manilla Clam) reached a production level of 330 tonnes in 2007 then declined steadily to extinction of production due to the spread of brown ring disease. Scallop production never rose above 60 tonnes, over the period, due to scarcity of seed supply. Abalone and urchin production and the minor finfish segments such as perch and Arctic Char, remain largely unchanged, despite state investment.

What did improve over the period were: Overall product unit value (due mainly to the salmon and oyster segments, less so for mussels), labour and capital productivity and GVA overall. At segment level, The Gigas oyster segment was significantly successful and exceeded its EFF targets.

What have we learned?

It is understood that Ireland cannot compete in scale of volume output to her main competitors in salmon and mussel production. Although, the licencing process lead- time requirement is improving, capacity will not dramatically change in the face of increasing competition for coastal space or inland water access. Challenging climactic conditions, mortality events and distance to market will continue to keep costs high but some of these challenges can also be turned to advantage, such as in marketing strategy. Producer and state agency business plans now have current capacity more in mind. The industry now realise that they can compete by adding value to a quality product from a considered pristine environment, using recognised and certified organic and other high quality certified standards.

Certification (ASC, Organic etc.)

The Irish shellfish and minor finfish products were being successfully distinguished from their competitors as recognised high quality foodstuffs from a pristine environment as marketing and branding efforts began to pay off. This has been the case for salmon for some time as Ireland is the world leading organic producer of salmon products. Hatchery production trends of both shellfish (oysters) and finfish (salmon notwithstanding temporary ADG setbacks) is up and an increasing number of producers operate by recognised eco-sustainable methods, approved by ECOPACT. The long established CLAMS network ensures a ground-up approach to sustainable aquaculture development, in consultation with other local stakeholders and with improving spatial planning strategy.

Technical development - Sustainable development

Investments in future will focus on the species and culture most suited to the relatively harsh environment available to aquaculture in the R.O.I. and where distance to market is not prohibitively costly and market window and scale are more suitable to Irish capacity. The focus will be more on quality, rather than quantity.

Investment therefore focuses for the EMFF period on Competitiveness; technology transfer, Innovation; value adding, sustainability through recognised certified production practices, Training and investment in established and new staff and new enterprises. Red tape; Licencing; the development of a one stop process, integrating the processes of all agencies involved and putting this new streamlined process online. Also a support mechanism for producers affected by frequent red tide events to protect continuity of product supply is to be developed.

Species and product diversification

While some segments merely survived (Abalone, urchins, Perch) or died (Clams) over the period of the EFF, there are some that have emerged as having a significant future. The Perch sector up to now has remained well below 100 tonnes of production though having gained a niche market, is set to expand on ex-peat producing land owned by the peat extraction agency Bord Na Mona, in partnership with the aquaculture development agency BIM. The seaweed sector, also below 100 tonnes production, is expected to expand significantly over the period, due to market potential.

Possibly the most uplifting project to emerge towards the end of the EFF period is the development of the Tourism package/Brand known as 'The Wild Atlantic Way'. Different stakeholders of the Tourist, hospitality and Fisheries sectors and their attendant state agencies have pooled resources for the mutual benefit of all to create a growing tourist experience for a growing market. In essence the tourist is offered a growing number and variety of routes along the Irish Coast, using a variety of transport methods, along which they can visit participating enterprises, sample their products and receive a tour or other experience that the enterprise can offer in an enjoyable exchange for all parties. While the idea may have been partially inspired by such interactive practices among French oyster businesses, the concept has been expanded upon and is rapidly evolving along the potential Irish trails for far more participants than just oyster farms. Barriers and mis-conceptions are broken down on many levels as this is a close and very human engagement between tourist and host, between one and another stakeholder and between different state agencies. This multi-venture project has already done more to improve the image of Irish aquaculture in a relatively short time than any previous initiative.

Italy

From 2000 to present three different financial instruments supporting the development of fish and aquaculture they will have succeeded.

The evolution of the funds has also affected the percentage that, gradually, will be devoted to aquaculture.

For Italy, it started with a total allocation FIGF (2000-2006) of more than €346 million (national share) and some €352 million (EU share), and just over 12% of the Italian share and 9% of the EU quota was allocated to aquaculture. During the period from the EFF (2007-2013) there has been a significant decline in funding for aquaculture.

In Italy the total 2007-2013 allocation for aquaculture was €9.7 million, which represented only 5% of the total allocation; also the EU share for Italian aquaculture was €18.5 million, or about 7% of the total.

The low budget, compared to the previous program (FIFG), combined with a period of economic recession and the sharp reduction in the number of companies, has led to a very poor performance in terms of Italian aquaculture development goals.

The EFF 2007-2013 period, unfortunately, has suffered the effects of strong financial difficulties. Existing aquaculture farms, especially more dependent on borrowed capital (banks) have sharply reduced or even stopped their aquaculture activities.

Aquaculture fish-farms remained active and productive, have come across and stated numerous difficulties to access to bank credit as well as difficulties in obtaining bank guarantees required for access to EFF funds.

According to the latest report of the Italian Council of Ministers, the fisheries sector is supported by the EFF EU funding, which registers a state, at the end of 2015, of 94% in terms of commitment, on a budget of €769.7 million (it refers to total EFF)[12].

Expectations and the new image taken from aquaculture in the last programming (EMFF 2014-2020) provide a budget more than €220 million (between EU and national share) which represents over 25% of national and 21% share of the EU. Really a record both in absolute and percentage terms for Italian aquaculture.

The aquaculture to support Actions planned by the EFF did not produce all of the operations.

The Shares 4 and 6, in fact, have recorded no investment and, therefore, no operation.

Action 2 has recorded more than 63% of the operations and Action 1 about 21% of the operations.

The Action 2 is related to the age of the existing enterprises Italian aquaculture. Companies that have weathered the economic crisis of 2009-2011 are also the oldest and therefore those most involved in the restructuring process, the introduction of new technology and the willingness to invest in new production lines. The more established companies also have had an interest also to propose investment plans for vertical integration. Many fish farms (both marine and Freshwater) have developed a processing line of the aquaculture product.

[12] http://documenti.camera.it/leg17/dossier/Pdf/AG0382.pdf, report 2016

Even the mussels and clams companies have benefited from funding especially for new installations. New licenses were granted for public lands farthest from the coast and therefore were funded also factory ships, to collect and pack the products on board after harvest. The farthest distance of the coast mussel farms, is also confirmed by the increase, over the past three years, the recorded energy costs.

In the shellfish industry, investments were also made to build and modernize purification and dispatch centres of mussels. These transactions were in part supported by Action 6 which recorded a 6% of total operations with aquaculture's EFF funds.

In Sicily and in some other Italian regions, in addition, between 2010 and 2011, some farms have been unable to benefit from the EFF, as a result of new legislation on the cost of state concessions, companies were considered not eligible, why not they had regularized payments to regional authorities.

Unfortunately the controversy has adversely damaged fish-farms that could receive support from the EFF. In some cases, some companies had already started investments because they were waiting for the EFF payments, but the payments were never made - The companies had not paid the state fees and therefore could not have EFF funds.

The new law had associated concessions for aquaculture to the same tariff applied to tourist activities that use public lands. This association in many cases, given the extent of the area granted to the company's aquaculture, clocked the highest state property lease payment of annual turnover reported by the company.

Certain Actions are registered in the clam sector, as in the regions of Emilia Romagna and Veneto were made up of management plans in the Emilia Romagna resource the nursery areas have been realized.

Surely aquaculture has continued to suffer from the absence of the target plan of use of marine and coastal areas. This has exacerbated the conflicts between different economic activities that develop along the Italian coast.

In some cases, however, the plans of aquaculture zoning, implied paralysis for new installations, since they were provided for distances from too high coast. The distance represented a high risk for the investment, as could occur natural disasters, given the weather and wave characteristics of the Italian seas. Analysing the ex-post results of the EFF, they are detected little interest for both EMAS and other environmental certifications. Past experiences (also made in collaboration with UNIPROM or the Fish-farmers Associations), have shown that farmers do not invest in certifications and environmental registration (such as EMAS scheme), because the market does not recognize a premium price. According to the stakeholders they are much more important ad hoc or affiliate to the brand of certified supply chains of modern retail brands.

A great Italian aquaculture weakness is demarcated by underinvestment in new hatcheries, only 1% of the total operations carried out.

This weakness has been the subject of discussion in the works for the definition of the new strategic plan for the Italian aquaculture.

The EMFF will hope significant operations and high investments for the creation of new hatcheries and especially for the production of new species both fish and shellfish.

Latvia

In accordance with the criteria and support amount the planned actions were performed, which were included in the Latvian Operational Programme for 2008 to 2013 and national legislation. One of them was facilitation of competitive and technological modern aquaculture enterprises. The implementation of the task was related with the necessity to modernise the technological production process of the existing aquaculture companies. The increased number of aquaculture companies focused on market and range extension of aquaculture products offered in the market.

The following actions have been implemented:

1. Modernisation of companies, in order to improve the implementation of work conditions, hygiene requirements, health of aquaculture animals and products, as well as impact reduction of the enterprise's activities to environment.

2. Introduction of new breeding technologies, in order to facilitate the breeding of different fish (crayfish) demanded in the market.

3. Provision of protective measures against the harm done by wild predators to open land ponds.

4. Increase of the aquaculture production volume, GVA and market share.

What have we learned?

The first data for the aquaculture sector was obtained for 2010 and the analysis has then been performed for 2010 to 2015. Each aquaculture enterprise with a turnover less than €200 million and with total number of employee lower than 750 was entitled to EFF funding. The investments increased significantly during the period were the Operational Program was implementation and were around €3.0 million in average between 2010 and 2014. The number of active aquaculture companies increased by 47 enterprises corresponding to an increase of 54% between 2010 and 2015. The total number of persons employed in aquaculture has increased from 177 in 2010 to 376 in 2015. Total number of ponds used for aquaculture in 2015 and its area were 781 ponds and 4 947 ha; 1 282 pools with the volume of 17 289 m3 and 28 recirculation systems with the volume of 6 923 m3. The production volume and value were 863 tonnes and €3.5 million respectively -. The production volume and value has increase by 19% and 66% between 2010 and 2015, respectively. The total sales are increased by 314 tonnes. However, the further industrial processing of fish harvested in aquaculture is only slowly developing. The largest part of the production is sold fresh to the consumers. An aquaculture trade system, which could efficiently organize and distribute aquaculture products from small private producers, had not been developed. The demand for aquaculture products in Latvia is higher than domestic supply and around 54% of the aquaculture products were imported from Lithuania, in 2014.

The production volume and value between 2010 – 2

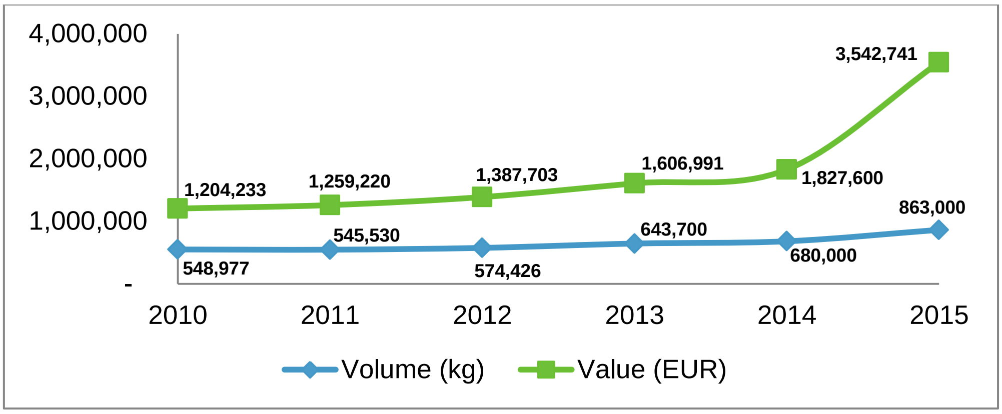

Figure 4: Production and sales for Latvia: 2010-2015.
Source: CSB.

Lithuania

According to 2 Priority axes, Aquaculture, inland fishing, processing and marketing of fishery and aquaculture products, the aim was to develop sustainable aquaculture and fish processing sectors, mainly through productive investments, but also using aqua-environmental and animal health measures.

The objectives were to achieve higher competitiveness, to ensure the quality of production, to promote diversification of production with higher value species and better market prospects. Processing industry, it was intended to strengthen competitiveness of industry, to foster more efficient marketing and increase assortment and quality of production.

Significant consideration was given for implementation of environmental measures with regard to use of aquaculture production methods helping to protect and improve the environment, particularly protect the bird habitats within the production area. Action, concerning aqua-environmental measures, took the largest part, around 59% (€7.09 million including national contribution) of total aid for aquaculture. As a result, 19 from 23 pond aquaculture enterprises in Lithuania implemented nature management and water birds protection measures and fish farming enterprises implementing nature protection measures could run profitable and successful business.

With regard to objectives regarding modernization of farms and construction of new production units, with aim to increase production capacity and improve competitiveness, Actions 1 and 2 were chosen. Investments from Action 1, "Increase in production capacity due to construction of new farms" and Action 2 "Variation in production due to the extension or modernisation of existing farms" amounted 10% (€1.16 million including national contribution) and 28% (€3.35 million including national contribution) from total aid for aquaculture respectively.

What have we learned?

The increase of production volume by 90% in programing period was foreseen after uptake of investments. The foreseen objectives and targets were achieved and total aquaculture production, in 2013 was 4 210 tonnes, with 10% exceeding target. Although in 2014 aquaculture sales moderately declined, the achieved value was still higher than foreseen targets.

Concerning uptake of EFF funds, Action 1 was not sufficiently managed, as only 38% of fund was committed from total aid granted to that operation. Regarding Action 2, 62% of funds were used, whereas Aqua-environmental measures achieved 98% of available aid.

Malta

What have we learned?

In Malta - 6 aquaculture farms operating from 9 sites; 4 produce only capture based species (CBS) or tuna, 1 farm produces closed cycle species (CCS), 1 farm produces both CBS + CCSs. This industry contribute postively towards the European Union trade deficit for fisheries products and is a valuable provider of fish for the local retail and food service sectors.

Growth/decline main drivers and trends

Aquaculture is growing faster than any other food production, supplying 50% of aquatic food consumption. In fact, in Malta, in 2014, the gross output of the aquaculture industry increased by €3.2 million over 2013 while the gross value added of the aquaculture industry has increased by 111.5%. Since 2011, the aquaculture sector in Malta has shown an improvement in the gross output and gross value added of the sector.

However, there is still a need for investment for species diversification on the market. This market diversification may include processing of the product or tapping into new markets eg. Bluefin Tuna in China. This diversification will help avoid stagnantion in the market.

Technical Development- Sustainable Development

With the ever increasing demand for fish protein worldwide, the aquaculture sector is playing an important role in meeting these demands as well as alleviating the strain off of wild fisheries. Sustainable development is definitely a target aquaculture should seek. Below are some examples of ways in which this sector can be more sustainable and to ensure that the practice is carried out in both an environmentally and socially responsible way;

- Reduce reliance on baitfish by using dry feed based on vegetable protein.
- Training and education for farmers is needed in order to highlight the issues of sustainability and management.
- Water conservation and management within land based farm facilities, using re-circulting systems that are equipped with adequate filtration systems in order to reduce as practically possible the amount of water used together with minimizing waste and nutrients expelled, as well as excluding disease spread and the risk of accidentally introducing non-native species into the wild.
- Intensive aquaculture research can help save Blue fin tuna: egg collection in farms utilised for research to close the cycle for this species: more money is needed in investing for more quality research.
- Research and new innovations needed in improving aquaculture techniques and technologies eg. Creating better nets and cages.
- Creating a standard for equipment and materials for all farms to use.

- Tracing point of origins of fish & tracking will allow fishing quotas to be stricter and more enforced as well as identifying to consumers the sustainability of the source.

- Low impact production systems.

- Improved feeds for less pollution.

- Incentives for farm owners to be more sustainable (stocking density, pollution, research, egg collecting, farm area, breeding projects), e.g. Low-interest loans.

- Controlled breeding, eliminating the need for catching wild fish, completely replacing them with captive grown fish.

- Diversifying species kept and grown in farms/aquaculture.

- Farm 'low-trophic' species to reduce the amount of fish feed as well as the reduction of pollution.

- Improved Environmental Impact Assessment- surveys should be done throughout the whole farm process rather than just at the beginning, to evaluate the damage left on the site and how it can be avoided eg. Site rotations, filtration systems or integrating GIS systems to map the sea bed.

- Promote an Integrated Coastal Zone Management (ICZM) approach in support of a developing mariculture industry.

- Promote Mediterranean products in poorly and unexploited markets.

Farm owners are in prime position to greatly contribute to sustainable development by implementing some of these ideas. Each farm should be given a project which contributes to the regeneration of struggling stocks (eg. Bluefin Tuna) and the research produced should be published for general knowledge.

Species and product diversification

- Marinisation of *Oreochromic niloticus* (Tilapia) – Low trophic species, demand less wild fish feed, cheaper to keep.

- Molluscs – E.g. Oysters, Mussels, Clams, Scallops

- *Argyrosomus regius* (Meagre) – 2006 Project to trial spawning and hatching meagre eggs. 60 000 juveniles were successfully reared to a market size.

- *Sparus aurata* (Sea bream) - Reared from captive eggs, demand and production has increased dramatically.

- *Dicentrarchus labrax* (Sea Bass) - Reared frin captive eggs, demand and production has increased dramatically.

- Echinoderms - e.g. Sea urchins and Sea cucumbers, both of which are in growing demand.

- *Diplodus sargus* (White Sea Bream) – Trials carried out, slow growth rate still remains an issue.

- *Seriola dumerili* (Amberjack) – egg collecting and rearing started in 2006, still successfully collecting eggs.

- *Epinephelus aeneus* (Groupers) – Are being reared and trialling for spawning

- Aquatic Plants

- *Mugil Cephalus* (Grey Mullet)

- *Polyprion americanus* (Wreckfish)

- *Dentex dentex* (Common Dentex)

- Corals – Coral propagation projects. Can be grown in indoor aquariums and fragged onto frames which are returned back into the sea

- Ornamental fish.

Diversification of species is important due to the positives each project brings. Trials of breeding/spawning and growing different species of marine/FW life means that popular fast growing and hardier species can be replaced with slower growing, less hardier species which can turn to be more economically viable due to better product quality and increased economic value. Species that supply a better reproductive potential in captivity can be replaced with ones that don't, ensuring that food security will be less of an issue.

Spatial Planning

Currently, the negative impact of the fish farms is trumping the sustainability aspects of them, mainly due to the frozen fish related slime which is being washed onto public beaches. Spatial planning is needed in order to ensure that ecological, environmental, social and economic aspects all coincide in the same environment without negatively affecting each other. Careful planning and balanced development is needed in order to create social acceptance of these farms;

- GIS mapping needs to be used in order to carefully space out farms from beaches and maritime routes. This will give a better understanding of overall positions and distances.

- Satellite mapping- This will show overall temporal changes. This means that before and after representations of the environmental impact can be seen.

- Continuous sea bed surveying, making sure that biodiversity is not negatively affected.

- Continuous water quality surveys.

Certification

Certification on fish products is extremely important, especially for consumers who thrive to buy sustainable products. Aquacultured products can be labelled as such to highlight the whole aquaculture process, including everything from the originating farm and country of the product, processing plant used and the type of food it was fed. For fish caught in the wild for farming purposes, traceability and certification is important to highlight the tackling issue of illegal fishing.

For Malta, the development of a National certification scheme needs to be prioritised in order to show this information on locally sourced fish. This type of certification scheme for farmed fish will be a first in Malta, creating a baseline for future schemes to be developed. This scheme should aim to show that the product is:

- Environmentally and socially sustainable

As well as creating a standard for:

- Food safety
- Animal welfare
- Traceability

Netherlands

The Netherlands spent around 3% of their EFF funding on aquaculture. The main focus for the Netherlands was innovation. Funding helped crossing the valley of death and motivated entrepreneurs to start new innovative aquaculture project. The Dutch aquaculture sector can be divided into three main segments. The largest segment is the production of blue mussels, followed by the production of oysters and land-based production of freshwater fish. The last segment, land-based production of freshwater fish, is relatively young (around 20 years) and had/has opportunities for innovation. A dozen of innovation projects have been set up, however only a few have been a success. This doesn't mean funding in the projects was waste of money. New (or existing) enterprises used the gathered information from the different innovation projects to improve or setup their own farms.

Technical Development - Sustainable Development – Species divercification

Replacement of mussel-seed fisheries with sustainable mussel-seed collectors in the water column

In an agreement with the Dutch Ministry and environmental NGOs the mussel sector started a transition from wild seed fisheries to sustainable alternatives (mussel seed collectors) in 2020. Seed from mussel seed collectors are more expensive and will have an effect on the economic performance. However, by using mussel seed collectors, the sector is more independent from natural seed fall.

Turbot aquaculture

In the South of the Netherlands an entrepreneur succeeded to start up a turbot farm. This farm is now one of the most innovative aquaculture farms in Europe. More information about the farm could be found on www.seafarm.nl.

Various land based aquaculture farms unsuccessful

Not all EFF projects were successful. Various entrepreneurs started a farm with help of money from EFF, but couldn't maintain their innovative farms. However, gathered information from these projects are now used in other enterprises (farming sole and Yellowtail).

Poland

In the programming period 2007-2013 the allocation for Poland under the European Fisheries Fund (EFF) amounted to €695 million, i.e. about 165% more than for the period of 2004-2006. €126.2 million (18% of total) was allocated to aquaculture, including €94.6 million of the EU contribution (75%).

Production objectives for 2013 were not achieved. Volume of production increased only by 5% and turnover increased by 23% compared to the baseline.

Result indicators	Baseline (2006)	Objective 2013	Results 2014
Production in aquaculture	34 600 tonnes	+50% (51 900 tonnes)	+5% (36 346 tonnes)
Turnover	€72.7 million	+35% (€98.1 million)	+23% (€89.3 million)

However, other objectives were achieved, like:

- development and modernization of the aquaculture sector and adjusted it to market prospects and expectations in a sustainable way;
- rehabilitation of fishing ponds and maintenance of exploited pond surface;
- diversification towards other species;
- introduction of modern technologies.

Species and product diversification

In 2012 the largest and most modern fish farm in Poland in a closed circuit water system was opened. The target production is expected to reach 1.3 thousand tonnes, including mainly new thermophilic species, such as tilapia.

Two farms "Eko-kawior" and "Gospodarstwo Rybackie Goslawice" breed sturgeon (Siberian sturgeon, Russian sturgeon, sterlet albinos, bester) for caviar production.

Technical development - Sustainable development

Since 2015 company "Jurassic Salmon" has been farming Atlantic salmon from egg to harvest size in recirculating aquaculture systems using geothermal saline waters.

If possible also aspects of spatial planning

No maritime spatial plan (MSP) has been officially adopted in Poland yet (up to now MSP procedure was tested only in EU projects e.g. pilot project plan for the Middle Bank, Gulf of Gdansk and pilot plan of Pomeranian Bay). Moreover, inventory of the current state

"Study of conditions and directions of spatial development for Polish marine areas" is being prepared.

Certification (ASC, Organic etc.)

Two Polish farms have achieved ASC certification for RAS system: "Global Fish" - ASC Tilapia Standard and "Jurassic Salmon" - ASC Atlantic Salmon Standard.

Company "Global Fish" implemented also GLOBAL GAP in 2012.

The "Code of Good Fishery Practice in Fish Farming" was introduced in March 2015.

Portugal

The main objective of the aquaculture sector in the 2017-2013 periods was to foster an increase in production in quantity and quality. Based on this objective, the strategy developed was focused on encouraging the entry in the market of new units, the diversification of production of other more competitive species, and an increase employment in this subsector.

For this purpose, it was established quantified targets for Portuguese aquaculture to be achieved by the end of the programming period were as follows:

- Aquaculture representation in the national production sector (+ 5%);
- Diversification of the main species (+2);
- Number of jobs in the subsector aquaculture (+ 200);

Portugal approved 73 projects in a total of €31.2 million of public funding (EFF+NC) under the European Fisheries Fund (EFF), for the measure (Axis 2) Aquaculture. This was done to support very different and important set of actions for the sustainable development of this sector, corresponding concerning to constructions of new farms in open sea and extension or modernization of existing farms, also sustenance fostering the development of innovation projects, based in RAS (recirculation systems) and food/nutrition. The maximum rates of public support for the whole country were 60%, except for the Lisbon region, 40%, and peripheral regions it was 75%. The financial crisis of 2007/2008, which also influenced the following years, has not favored investment in aquaculture, whose return is lengthy.

Growth/decline - main drivers and trends

The objectives have been achieved, but the goals have fallen short of the initially planned, however the installation of farms in the open sea was an important alternative production method/supplement available to the sector. It's not a solution for all conflicts or difficulties that comes across the traditional production, but is a way to promote the quality of the product, given the characteristics and methodology of the production system, and a possibility to access different market niches.

What have we learned?

The volume of aquaculture stagnated at Union level, with a slight decrease over the period 2007-2013, but in Portugal, European Fund Fisheries (EFF) increased the productivity, and there has been a tiny rise in volume in production, since 2012. However, this must be seen in the light of the effects of the financial crisis on investments and modernization during the funding period. It is still early to drawing conclusions, since many of these projects have just installed and not yet started producing or did not reach the planned production.

The diversification has not been as successful as was initially thought, due to the impact of the financial crisis on new investments. Still, Portugal developed projects in open sea, with the support of EFF, specifically to produce mussel in long-lines.

Regarding the number of jobs/employees the starting point was estimated, because we don't collect that data. Since 2008 we began to collect such information, and the actual number of employees was much lower than initially estimated.

Aquaculture is an economic sector whose potential should be valued both in economic and social terms and could make a positive contribution to the creation or maintenance of jobs at local or regional level or in direct operation, or in the value chain, contributing for the use of local resources.

In Portugal due to the financial crisis and the difficult access to bank credit, we found that most of the investment was for the modernization of small and medium enterprises. We not witnessed large investments that could guarantee an increase in aquaculture production volume and thus increase the representativeness of the sector.

Another major problem was that large companies cannot apply for funding under the EFF.

In aquaculture projects funded by the EFF, in Portugal, there are no projects that can be highlighted as a case of failure. What is emphasized is that the financial crisis and the difficult access to bank credit, made the most of the investments were for the modernization of small and medium aquaculture units. We witnessed no major investments, which could ensure an increase in the volume of aquaculture production and thus increase the representativeness of this subsector.

Certification (ASC, Organic etc.)

A project that should be highlighted is a project in the open sea for mussel production, that promote competitiveness and long-term sustainability for the sector, focusing on innovation and product quality.

The Portuguese Government granted for 30 years, an offshore concession of 395 ha, one mile of Lagos on the Algarve coast, for mussel production, oyster and scallop that when they are laboring in full, will have a production capacity of up to 9 000 tonnes. The mission of the enterprise is to provide consumers a natural product of choice, safe and nutritionally unparalleled, respecting the principles of sustainable exploitation of the oceans. This project was support of EFF using an environmentally sustainable method of production. In Portugal, it was the first Organic Aquaculture Production Mode certification awarded by SGS, the world's leading body on certification, for the mussel organic production. The production and labeling of these products in EU markets follow a rigorous certification process, however given a differentiae positioning in the market, organic products currently represent windows of opportunity for the development of business in this area.

Slovenia

In the Slovenian Operational Programme for 2007-2013 the emphasis was primarily on freshwater aquaculture. Slovenia, collecting the economic and social data just for the marine aquaculture so it cannot be fully assess whether the objectives for fresh water aquaculture have been achieved or not.

The main objectives, according OP 2007-2013, in marine aquaculture are;

- Promoting investments in aquaculture; the goal is to increase volume of production for 70% regarding production volume from year 2006

- Facilitating marketing and promotional campaigns with a goal to increase of average fish consumption per capita per year

Slovenian marine aquaculture sector has over the past few years, especially from 2010, with the help of EU Funds, invested significantly (3.5 million from EFF) in the new equipment and production facilities. So this new investments are the main reason for that Slovenia has achieved the objectives score in OP. Slovenian marine aquaculture sector produced 192 tonnes of fish and shellfish in 2006, in 2014 the total production increases by 170% regarding 2006 and amounted 517 tonnes. Available data (period 2008-2014) also suggest increased value of other economic variables i.e. Turnover (+49%), Total value of assets (+170%) and Depreciation of capital (+800%).

Spatial planning

Slovenian Mussel rafts sector has over the past few years underwent major changes. New investments and spatial planning are the main reason for increased production and improved economic situation of the sector.

Since the early eighties (1982) the production of the Mediterranean mussel (*Mytilus galloprovincialis*) has been increasing and in 1988 it reached a maximum of 703 tonnes. After that year a significant decline was due to the fact that exports to Italy ceased. In 1995 the production of mussels reached a minimum of 12 tonnes. In recent years, there are increases in production, particularly due to the resolution of the status of shellfish production facilities through the granting of concessions for the use of marine water and significant investments into the sector.

In 2007, three larger areas were designated for marine aquaculture in Slovenian territorial waters that were subsequently separated into 22 plots, for which concessions were granted for the use of marine water in 2009. It is expected that these plots will not be able to expand, due to the use of Slovenian territorial waters for other purposes. Currently, all the concessions for using marine water for the breeding of marine organisms have been granted, two of them for breeding marine fish and 20 for breeding shellfish. The total area for breeding fish at sea (excluding shellfish farming) in 2014 was 5 663 m2 (two plots). The area of the 20 plots at sea that are used for shellfish farming was 45.1 ha.

Technical development - Sustainable development

In the last few years, especially from 2010 onward, around €2.5 million from EFF and around €4 million of private funds have been invested into sector. The funds were used for the modernization of production facilities and for the purchase of new, modern equipment, i.e. new vessels with all the necessary equipment for cleaning and processing mussels on board, a new distribution center etc. All the aforesaid contributed to transformation from poorly equipped and poorly organized into modernly equipped and well organized Mussel rafts sector.

Spain

The drivers in Spanish aquaculture were based on CFP, using the European Fisheries Fund (EFF) as its financial instrument under the 2007-2013 programming period.

For a proper development of the sector, prior to the beginning of programming period Spain considered it was essential to ensure availability of supplies, stabilize markets ensuring consumer reasonable prices, all this in a consistent way with the strategy for sustainable development.

European Fisheries Fund (EFF) was divided into 5 priority axes and the axis 2 was the specific one for aquaculture, inland fishing, processing and marketing of fishery products and aquaculture. There was a contribution of EFF of €263.4 million for Spain in axis 2; adding the national contribution resulted in 391.91 million, the 25% of the EFF for this MS. Analysing the operations, which received funds in Spain, the projects for aquaculture companies were funded mainly through axis 2 but also through other axes.

After analysing the sector and identifying threats and opportunities, in the operative programme for Spanish fisheries sector, targets were set for 2015. Production level was set at 80 000 tonnes, without considering the mussel production. The FTE for aquaculture had a target of 6 587 in 2015.

What have we learned?

In 2014, total production, without considering mussel was 67 796 tonnes and the FTE was 5 946; so neither of the objectives have been reached. These objectives were set before the economic crisis, which limited access to financial resources and prevented many projects from being realised and limited many companies to take new financial risks.

The crisis has also led to a contraction in consumption, an increase in the consumption of low priced products, as well as a stronger competition of products from outside the EU.

One of the possible causes the industry did not achieve the goals for the programme is the high proportion of subsidies allocated in the renovation of assets, which has not had a direct effect in the efficiency.

Technical development - Sustainable development

In this period a total of 1 376 operations, which includes actions related to aquaculture have received funding. In the analysis for species and types of farming, 84% of financed operations have been addressed to marine species (1 150 operations). In total, eligible cost for marine aquaculture were €233 million.

A big part of these operations in marine aquaculture were invested in mussel projects. The mussel producers have obtained funds for building new rafts, which replace the old ones, improving vessels, and their equipment's. In this subsector, EFF contributed to renew structures and auxiliary vessel, improving the work conditions, but it does not appear to have a relation with their production capacity and efficiency. Annual production goes on related with the red ties incidences and the average prices have not improved during the last years.

In marine aquaculture, seabass and seabream producers have received subsidies through 39 operations, for new cages or increase the capacity of the existing ones, and for their establishment inland. The second species in number of funded operations is bluefin tuna. The aquaculture sector has received support for commercialization through the EFF, which has funded different campaigns, fairs, exhibitions for aquaculture products.

In a general sense it is not possible to know if the specific operations contributed to the increase of production, because the data appeared in the applications were an estimation of the production they were trying to reach and, in any case, the producers have to provide the real data after carrying out their investments.

In freshwater, rainbow trout appears in 46 operations, and this is 72% of the EFF investments for this inland aquaculture. Through action 4: Aqua-environmental measures, it has been included some operations for auxiliary machines, like salmon scales, water management infrastructure (filtration system or pumps) and certification EMAS, which have had a contribution to sustainable development.

In freshwater aquaculture it does not seem than the funds have affected the volume of production, but it is possible they have contributed to diversify their products (producing rainbow trout eggs for human consumption), and improving their commercialization, looking for new markets out of European Union, and to reduce environmental impacts.

Species and product diversification

An abalone farm, which received EFF subsidies, is prepared to market this high value product and can be considered as a success example of diversification in aquaculture.

United Kingdom

The "*United Kingdom Operational Programme for the European fisheries fund (2007-2013)*" states that the main aquaculture objectives under Axis 2 (Aquaculture, processing and marketing) were to: "*support the growth and diversification of aquaculture... thereby improving profitability and competitiveness; promote improvements in production standards, environmental and welfare performance; contribute to lifelong learning in the aquaculture ... sectors*". No result indicators were cited (e.g. for volume, structure, profitability, standards, environmental impact, welfare) except for turnover of the UK aquaculture sector. By comparison to subsequent DCF data, the 2015 target was reached/exceeded in 2014.

Indicator	**2006 Baseline**	**2010 Control level**	**2015 Target**
OP target turnover	£507m /€720.4m	£550m / €781.5m	£600m / €852.5m
DCF turnover data submitted by UK		£517m / €603.3m	£800m / €992.6m (2014)

What have we learned?

Although EFF funding may have contributed to the increased turnover, it may also be unrelated. A large part of the increased turnover is due to increased salmon production; the large Norwegian-owned multinationals that represent the bulk of UK salmon production were not eligible for EFF funding, which focused on assistance to smaller-scale operations[13]. This illustrates a key problem in assessing effectiveness of EFF funding – it cannot be known how the industry would have evolved in its absence.

In the UK, the EFF is overseen by the Marine Management Organisation but administered by separate regional authorities in England, Wales, Scotland and Northern Ireland. This devolution made accessing information on EFF funded aquaculture projects difficult at short notice – only a high level "*Review of the European Fisheries Fund in the UK 2011*"[14] and collated data for England were available. Example projects provided in the review were:

- Northern Ireland – Salmon: £151 000 awarded to fund new net-pens allowing increased production, reduced costs and creation of 2 additional jobs.
- Wales - Mussel: £130 000 to develop a new mussel farm within a disused dock. The project uses sustainable and environmentally friendly rope-growing methods (no dredging for seed) and is aimed at increasing exports to Europe.
- Scotland – Trout: £80 000 for oxygenation equipment to reduce input costs, improve survival and welfare and increase product quality and price.
- England- Other freshwater fish: Waste water handling equipment for a new tropical recirculation aquaculture system growing tilapia.

[13] Cappell, R., T. Huntington, F. Nimmo & R. Wailes (2011). 'Interim Evaluation of the European Fisheries Fund (EFF) UK Operational Programme (2007-2013). Produced by Poseidon Aquatic Resource Management Ltd.

[14] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/481348/Review_of_the_European_Fisheries_Fund_in_the_UK_2011.pdf

The 22 aquaculture projects funded in England (3 processing projects had been misclassified under aquaculture) had a total value of £2.0M (£0.41M EFF, £0.35M MMO contributions) and were split as below.

	N projects	% of allocated public funding
BY EFF ACTION		
1. Increase in production capacity due to construction of new farms	9	59%
2. Variation in production due to the extension or modernisation of existing farms	8	18%
3. Increase in number of hatchery produced fry	2	18%
4. Aqua-environmental measures	3	5%
BY SPECIES SEGMENT		
Trout	5	7%
Other freshwater fish	5	54%
Mussel	4	6%
Oyster	7	28%
Other shellfish	1	5%

Species and product diversification

EFF and supporting national funding was therefore spread across the different actions and species segments. Of note is that the 53% of funding in England was directed at 3 projects to produce tropical species in new heated recirculation aquaculture systems. A recent review[15] has highlighted that such systems have received much public funding in the UK but have a poor track record of economic sustainability due to competition from cheaper imports (e.g. the large Welsh sea-bass farm that received >£5m in Welsh Government and European funding[16 17]). The review suggested that public funding should be directed to segments already established in the UK - with a track record of successful production and a proven market.

Apparent lack of EFF grant funding in DCF data

A key point to note is that EFF funding is not well captured in the UK DCF data because:

- Economic data is extrapolated from a sample of salmon, trout and mussel enterprises. Only EFF grants reported by the surveyed companies within these segments would be captured in the UK DCF economic data.

- There is confusion over where EFF grants should be reported (by both surveyed enterprises and Member States). EFF grants are typically for capital investment, and the guidance on DCF variables (https://datacollection.jrc.ec.europa.eu/web/dcf/dc-aqua/var) specifically excludes "investment subsidies" from the Subsidies variable, while there is a separate Net Investments variable.

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[15] Hambrey, J. and Evans, S. 2016 SR694 Aquaculture in England, Wales and Northern Ireland: An Analysis of the Economic Contribution and Value of the Major Sub-Sectors and the Most Important Farmed Species. Seafish.
[16] http://www.dailypost.co.uk/business/business-news/anglesey-fish-farm-needs-high-10012391
[17] http://www.dailypost.co.uk/business/business-news/anglesey-fish-farm-back-difficulty-9768591

6 GLOSSARY

6.1 Parameters requested

Turnover:

"Turnover" comprises the totals invoiced by the observation unit during the reference period, and this corresponds to market sales of goods or services supplied to third parties.

Turnover includes all duties and taxes on the goods or services invoiced by the unit with the exception of the VAT invoiced by the unit vis-à-vis its customer and other similar deductible taxes directly linked to turnover.

It also includes all other charges (transport, packaging, etc.) passed on to the customer, even if these charges are listed separately in the invoice. Reduction in prices, rebates and discounts as well as the value of returned packing must be deducted. Income classified as other operating income, financial income and extraordinary income in company accounts is excluded from turnover. Operating subsidies received from public authorities or the institutions of the European Union are also excluded (Structural Business Statistics (SBS) Code 12 11 0, Commission Regulation (EC) No 2700/98).

Subsidies:

"Subsidies" are the financial assistance received from public authorities or the institutions of the European Union which are excluded from turnover.

It includes direct payments, e.g. compensation for stopping trading, refunds of fuel duties or similar lump sum compensation payments; excludes social benefit payments and indirect subsidies, e.g. reduced duty on inputs such as fuel or investment subsidies.

Other income:

"Other income" refers to other operating income included in company accounts which are excluded from turnover; income coming from other activities than aquaculture, e.g. the licensing of ponds for recreational fishery purposes.

Wages and salaries:

"Wages and salaries" is equivalent to "Personnel costs" on the Structural Business Statistics.

"Personnel costs" are defined as the total remuneration, in cash or in kind, payable by an employer to an employee (regular and temporary employees as well as home workers) in return for work done by the latter during the reference period. Personnel costs also include taxes and employees' social security contributions retained by the unit as well as the employer's compulsory and voluntary social contributions.

Personnel costs are made up of:

- wages and salaries
- employers' social security costs

All remuneration paid during the reference period is included, regardless of whether it is paid on the basis of working time, output or piecework, and whether it is paid regularly or not. Included are all gratuities, workplace and performance bonuses, ex gratia payments, thirteenth month pay (and similar fixed bonuses), payments made to employees in consideration of dismissal, lodging, transport, cost of living and family allowances, commissions, attendance fees, overtime, night work etc. as well as taxes, social security contributions and other amounts owed by the employees and retained at source by the employers. Also included are the social security costs for the employer. These include employer's social security contributions to schemes for retirement pensions, sickness, maternity, disability, unemployment, occupational accidents and diseases, family allowances as well as other schemes. These costs are included regardless of whether they are statutory, collectively agreed, contractual or voluntary in nature. Payments for agency workers are not included in personnel costs. (Structural Business Statistics (SBS) Code 13 31 0, Commission Regulation (EC) No 2700/98).

Wages and salaries: Wages and salaries are defined as "the total remuneration, in cash or in kind, payable to all persons counted on the payroll (including homeworkers), in return for work done during the accounting period." regardless of whether it is paid on the basis of working time, output or piecework and whether it is paid regularly or not. Wages and salaries include the values of any social contributions, income taxes, etc. payable by the employee even if they are actually withheld by the employer and paid directly to social insurance schemes, tax authorities, etc. on behalf of the employee. Wages and salaries do not include social contributions payable by the employer. Wages and salaries include: all gratuities, bonuses, ex gratia payments, "thirteenth month payments", severance payments, lodging, transport, cost-of-living, and family allowances, tips, commission, attendance fees, etc. received by employees, as well as taxes, social security contributions and other amounts payable by employees and withheld at source by the employer. Wages and salaries which the employer continues to pay in the event of illness, occupational accident, maternity leave or short-time working may be recorded here or under social security costs, depending upon the unit's accounting practices. Payments for agency workers are not included in wages and salaries. (Structural Business Statistics (SBS) Code 13 32 0, Commission Regulation (EC) No 2700/98).

Social security costs: Employers' social security costs correspond to an amount equal to the value of the social contributions incurred by employers in order to secure for their employees the entitlement to social benefits. Social security costs for the employer include the employer's social security contributions to schemes for retirement pensions, sickness, maternity, disability, unemployment, occupational accidents and diseases, family allowances as well as other schemes. Included are the costs for all employees including homeworkers and apprentices. Charges are included for all schemes, regardless of whether they are statutory, collectively agreed, contractual or voluntary in nature. Wages and salaries which the employer continues to pay in the event of illness, occupational accident, maternity leave or short-time working may be recorded here or under wages and salaries, dependent upon the unit's accounting practices. (Structural Business Statistics (SBS) Code 13 33 0, Commission Regulation (EC) No 2700/98).

Imputed value of unpaid labour:

Unpaid workers normally refers to persons who live with the proprietor of the unit and work regularly for the unit, but do not have a contract of service and do not receive a fixed sum for the work they perform. This is limited to persons who are not included on the payroll of another unit as their principal occupation.

Thus, imputed value of unpaid labour estimates the value of the salaries that these unpaid workers would have received if their work was remunerated.

The chosen methodology to estimate this imputed value of unpaid labour should be explained by the Member State in their national programme.

Energy costs:

"Energy costs" corresponds to the "Purchases of energy products (in value)" on the Structural Business Statistics.

Purchases of all energy products during the reference period should be included in this variable only if they are purchased to be used as fuel. Energy products purchased as a raw material or for resale without transformation should be excluded. This figure should be given in value only. (Structural Business Statistics (SBS) Code 20 11 0, Commission Regulation (EC) No 2700/98).

Livestock costs:

Livestock costs should correspond to the variable livestock volume.

In the Structural Business Statistics it is included inside 13 11 0 "Total purchases of goods and services".

Feed costs:

Feed costs include the purchasing costs of the feed during the reference period. The feed costs should correspond to feed volume.

In the Structural Business Statistics it is included inside 13 11 0 "Total purchases of goods and services".

Repair and maintenance:

Under repair and maintenance there should be included the costs incurred to bring an asset back to its earlier condition or to keep the asset operating at its present condition (as opposed to improving the asset).

On the Structural Business Statistics is included inside 13 11 0 "Total purchases of goods and services".

Other operational costs:

Other operating costs should comprise outsourcing costs, property or equipment rental charges, the cost of raw materials and supplies that cannot be held in the inventory and have not been already specified (i.e. water, small items of equipment, administrative supplies, etc.), insurance premiums, studies and research costs, external personnel charges, fees payable to intermediaries and professional expenses, advertising costs, transportation charges, travel expenses, the costs of meetings and receptions, postal charges, bank charges (but not interest on bank loans) and other items of expenditure.

On the Structural Business Statistics is included inside 13 11 0 "Total purchases of goods and services".

Depreciation of capital:

Depreciation refers to the decline in value of the assets. In accounting, it is used as the allocation of the cost of tangible assets to periods in which the assets are used, in order to reflect this decline in their value.

The chosen methodology to allocate these costs over periods should be explained in the national programme. ESA (6) 6.02 to 6.05 European System of Accounts 1995 (Regulation (EC) No 2223/96, Regulation (EC) No 1267/2003, Eurostat ESA 1995 manual).

Financial costs, net:

"Financial costs, net" should be calculated as costs, coming from financial activity of the enterprise, minus the financial income.

Extraordinary costs, net:

"Extraordinary costs, net" is the difference between "Extraordinary charges" and "Extraordinary income".

"Extraordinary income" and "Extraordinary charges" are the income and costs that arise otherwise than in the course of the company's ordinary activities (Article 29 of the Fourth Council Directive 78/660/EEC of 25 July 1978).

Total value of assets:

This parameter corresponds to the Balance sheet total of the Structural Business Statistics and the Capital value in the European System of Accounts.

Balance sheet total consists of the sum of items 1 to 16 of the asset side of the balance sheet or of the sum of items 1 to 14 of the liability side of the balance sheet. (Structural Business Statistics (SBS) Code 43 30 0, Commission Regulation (EC) No 2700/98).

Capital value is the total accumulated value of all net investments in the enterprise at the end of the year. ESA 7.09 to 7.24 European System of Accounts 1995 (Regulation (EC) No 2223/96, Regulation (EC) No 1267/2003, Eurostat ESA 1995 manual).

Net Investments:

"Net investments" refers to the difference between Purchase (Gross investment in tangible goods) and Sale (Sales of tangible investment goods) of assets during the year.

Gross investment in tangible goods is the Investment during the reference period in all tangible goods. Included are new and existing tangible capital goods, whether bought from third parties or produced for own use (i.e. Capitalised production of tangible capital goods), having a useful life of more than one year including non-produced tangible goods such as land. The threshold for the useful life of a good that can be capitalised may be increased according to company accounting practices where these practices require a greater expected useful life than the one year threshold indicated above.

All investments are valued prior to (i.e. gross of) value adjustments, and before the deduction of income from disposals. Purchased goods are valued at purchase price, i.e. transport and installation charges, fees, taxes and other costs of ownership transfer are included.

Own produced tangible goods are valued at production cost. Goods acquired through restructurations (such as mergers, take-overs, break-ups, split-off) are excluded. Purchases of small tools which are not capitalised are included under current expenditure. Also included are all additions, alterations, improvements and renovations which prolong the service life or increase the productive capacity of capital goods. Current maintenance costs are excluded as is the value and current expenditure on capital goods used under rental and lease contracts. Investment in intangible and financial assets are excluded. Concerning the recording of investments where the invoicing, delivery, payment and first use of the good may take place in different reference periods, the following method is proposed as an objective:

i) Investments are recorded when the ownership is transferred to the unit that intends to use them. Capitalised production is recorded when produced. Concerning the recording of investments made in identifiable stages, each part-investment should be recorded in the reference period in which they are made.

In practice this may not be possible and company accounting conventions may mean that the following approximations to this method need to be used:

> i) investments are recorded in the reference period in which they are delivered,
>
> ii) investments are recorded in the reference period in which they enter into the production process,

iii) investments are recorded in the reference period in which they are invoiced,

iv) investments are recorded in the reference period in which they are paid for.

Gross investment in tangible goods is based on Gross investment in land (15 12 0) + Gross investment in existing buildings and structures (15 13 0) + Gross investment in construction and alteration of buildings (15 14 0) + Gross investment in machinery and equipment (15 15 0). (Structural Business Statistics (SBS) Code 15 11 0, Commission Regulation (EC) No 2700/98).

Sales of tangible goods includes the value of existing tangible capital goods, sold to third parties. Sales of tangible capital goods are valued at the price actually received (excluding VAT), and not at book value, after deducting any costs of ownership transfer incurred by the seller. Value adjustments and disposals other than by sale are excluded. (Structural Business Statistics (SBS) Code 15 21 0. Commission Regulation (EC) No 2700/98).

Debt:

Financial assets created when creditors lend funds to debtors, either directly or through brokers, which are either evidenced by non-negotiable documents or not evidenced by documents.

Short-term loans: loans whose original maturity is normally one year or less, and in exceptional cases two years at the maximum, and loans repayable on demand.

Long-term loans: loans whose original maturity is normally more than one year, and in exceptional cases more than two years at the minimum.

"Debts" account for provisions and long- and short-term debt (STECF meeting SGECA 06-01).

Livestock (volume):

Volume of livestock purchased during the reference period. The livestock volume should correspond to the livestock cost.

Fish feed (volume):

Volume of feed purchased during the reference period. The feed volume should correspond to feed cost.

Volume of sales:

The volume of sales should correspond to the variable on turnover value. In case of hatcheries and nurseries conversion factors from numbers to tonnes should be stated in the national programmes.

Number of persons employed (Total employment):

This indicator refers to the number of people employed (including full-time and part-time employees) (SGECA-09-03). It corresponds to the Number of people employed of the Structural Business Statistics.

The number of persons employed is defined as the total number of persons who work in the observation unit (inclusive of working proprietors, partners working regularly in the unit and unpaid family workers), as well as persons who work outside the unit who belong to it and are paid by it (e.g. sales representatives, delivery personnel, repair and maintenance teams). It includes persons absent for a short period (e.g. sick leave, paid leave or special leave), and also persons on strike, but not those absent for an indefinite period. It also includes part-time workers who are regarded as such under the laws of the country concerned and who are on the pay-roll, as well as seasonal workers, apprentices and home workers on the pay-roll. The number of persons employed excludes manpower supplied to the unit by other enterprises, persons carrying out repair and maintenance work in the enquiry unit on behalf of other enterprises, as well as those on compulsory military service. Unpaid family workers refer to persons who live with the proprietor of the unit and work regularly for the unit, but do not have a contract of service and do not receive a fixed sum for the work they perform. This is limited to those persons who are not included on the payroll of another unit as their principal occupation. (Structural Business Statistics (SBS) Code 16 11 0, Commission Regulation (EC) No 2700/98).

The number of employees should be reported by gender.

FTE National:

"FTE national" is the number of employees converted in full time equivalents (calculation methodologies vary between countries).

It corresponds to the "Number of employees in full time equivalent units" of the Structural Business Statistics.

The number of employees converted into full time equivalents (FTE). Figures for the number of persons working less than the standard working time of a full-year full-time worker, should be converted into full time equivalents, with regard to the working time of a full-time full-year employee in the unit. Included in this category are people working less than a standard working day, less than the standard number of working days in the week, or less than the standard number of weeks/months in the year. The conversion should be carried out on the basis of the number of hours, days, weeks or months worked. (Structural Business Statistics (SBS) Code 16 14 0, Commission Regulation (EC) No 2700/98).

Reporting the number of FTE national by gender is optional.

Number of enterprises:

The “Number of enterprises” parameter corresponds to a count of the number of enterprises active during at least a part of the reference period (SGECA-09-03).

A count of the number of enterprises registered to the population concerned in the business register corrected for errors, in particular frame errors. Dormant units are excluded. This statistic should include all units active during at least part of the reference period. (Structural Business Statistics (SBS) Code 11 11 0, Commission Regulation (EC) No 2700/98).

Both definitions are similar. However, there are often some divergences with Eurostat data. This is mostly due to the use of the Veterinary list (which is necessary to trade with food products) to update the business register and so companies that are dormant or focusing on other products have been excluded.

Moreover, under the DCF regulation, the number of companies should be disaggregated by the number of persons employed (in ≤5; 6-10 and >10 FTE) (Structural Business Statistics (SBS) Code 16 14 0, Commission Regulation (EC) No 2700/98).

6.2 Indicators calculated

Average wage:

The average salary or mean wage estimates the salary an employee working full time is receiving on this sector. It includes the salaries themselves, the social security costs and imputed value of unpaid labour.

Mean wage = (Wages and salaries + Imputed value of unpaid labour) / FTE

Gross Value Added (GVA):

Gross Value Added measures the contribution of the sector to the economy.

The Gross Value Added indicator calculated in this report is similar, but does not fully correspond to the Value added at factor cost of the Structural Business Statistics.

Value added at factor cost as defined in the Structural Business Statistics is the gross income from operating activities after adjusting for operating subsidies and indirect taxes. It can be calculated from turnover, plus capitalised production, plus other operating income, plus or minus the changes in stocks, minus the purchases of goods and services, minus other taxes on products which are linked to turnover but not deductible, minus the duties and taxes linked to production. Alternatively it can be calculated from gross operating surplus by adding personnel costs. Income and expenditure classified as financial or extra-ordinary in company accounts is excluded from value added. Value added at factor costs is calculated "gross" as value adjustments (such as depreciation) are not subtracted. (Structural Business Statistics (SBS) Code 12 15 0, Commission Regulation (EC) No 2700/98).

Thus, Gross Value Added is calculated on this report as:

GVA = Turnover + Other Income – Energy costs – Livestock costs – Feed costs - Repair and maintenance - Other Operational costs.

GVA to Revenues:

Gross value added to revenue ratio - indicates the share of revenue that contributes to the economy through factors of production (returns to labour and returns to capital). Indicator is calculated as the ratio between gross value added and revenue (the sum of Turnover and Other Income). Expressed as a percentage.

$$GVA\ to\ Revenue = \frac{GVA}{Turnover + Other\ Income} 100\%$$

Earnings Before Interest and Tax (EBIT):

"Earnings before interest and taxes (EBIT)" or "Operating profit" is a measure of a firm's profitability that excludes interest and income tax expenses.

EBIT = Turnover + Other Income + Subsidies – Energy costs – Wages and salaries - Imputed value of unpaid labour - Livestock costs – Feed costs – Repair and maintenance – Other Operational costs – Depreciation of capital

Net profit:

"Net profit" is a measure of a firm's profitability that includes the results of financial activity of the enterprise.

Net profit = EBIT – Financial_costs_net

Net profit margin:

Net profit margin is a measure of the economic performance of a sector or enterprise expressed in relative terms. It is a difference between total income and all incurred costs (operating, capital and financial). Expressed in a percentages.

$$Net\ profit\ margin = \frac{Net\ profit}{Total\ Income} 100\%$$

Return on Investment (ROI):

Return on investment is a performance measure to evaluate the profitability (efficiency) of an investment.

During the SGECA-10-04 meeting it was decided that it was more appropriate to calculate the Return on Investment using the "Earnings Before Interest and Tax (EBIT)", rather than the Net profit.

$$ROI = \frac{EBIT}{Total\_Value\_of\_Assets} * 100\%$$

Running Cost to Turnover Ratio (in %):

This indicator shows how much of the turnover (income) is consumed by production costs.

Running cost to turnover ratio = (Energy costs + Wages and salaries + Livestock costs + Feed costs + Repair and maintenance + Other Operational costs) x 100 / Turnover

Earnings Before Interest and Tax (EBIT) to Revenue ratio:

"Earnings before interest and taxes (EBIT) to revenue ratio" measures the margin of the companies profit. Expressed in a percentages.

$$EBIT\ to\ Revenue = \frac{EBIT}{Turnover + Other\ Income} * 100\%$$

Labour productivity (by FTE or Employee):

Labour productivity is calculated as the average output per worker or per time unit. It can be calculated as Gross Value Added (GVA) divided by Full Time Equivalents (FTE). This indicator describes the value added to the economy from the activity, in this case the value added to the economy by one FTE.

$$Labour\_productivity = \frac{GVA}{FTE}$$

When a MS cannot report the level of employment in FTEs, the number of employees is used as a second best alternative. However, this alternative compromises the comparison and should be clearly stated in the report.

Capital productivity:

Capital productivity is calculated as the average output per unit of capital. It can be calculated as Gross Value Added (GVA) divided by Capital value (total value of assets) in percentage. The indicator describes the value added to the economy by one unit of capital.

$$Capital\ productivity = \frac{GVA}{Total\ value\ of\ assets} 100\%$$

Future Expectations of the Industry indicator:

The indicator "Future Expectations of the Industry" can be interpreted as a proxy for the industry's intent to remain in the market in the medium/long term. If investment minus depreciation is positive, it has the meaning that the sector is allocating resources to increase its production capacity, and therefore it expects to remain in the market to recover the cost of the investment. If investment minus depreciation is close to zero, it could be interpreted as an indicator that the sector is only wishing to maintain its production capacity in the future, and that it is not planning to expand. The third case is where the sector is not even covering its depreciation costs, thus disinvesting with the possible intention to reduce its presence in the market in the future. Therefore, this indicator would be used to approximate the industry's investing behaviour in the future and it has been considered useful by the experts.

$$FEI = \frac{(Net\_investment - Depreciation)}{Total\_value\_of\_\ assets} * 100\%$$

Change 2014-13:

The indicator of the relative change in corresponding indicators compared to the previous year. Expressed in a percentages, calculated as following:

$$Change\ 2014 - 13 = \frac{(X_{2014} - X_{2013})}{X_{2013}} * 100\%$$

Development 2014/(2008-2013):

The indicator of the relative change in corresponding indicators compared to the average of previous years for which the data is available (usually 2008-2013). The estimate is showing the long term development of the corresponding indicator. Expressed in percentages, calculated as following:

$$Development\ 2014/(2008 - 2013) = \frac{(X_{2014} - average(X_{2008,}X_{2009,}X_{2010,}X_{2011,}X_{2012,}X_{2013}))}{average(X_{2008,}X_{2009,}X_{2010,}X_{2011,}X_{2012,}X_{2013})} * 100\%$$

7 CONTACT DETAILS OF EWG 16012 PARTICIPANTS

[1] - Information on EWG participant's affiliations is displayed for information only. In any case, Members of the STECF, invited experts, and JRC experts shall act independently. In the context of the STECF work, the committee members and other experts do not represent the institutions/bodies they are affiliated to in their daily jobs. STECF members and experts also declare at each meeting of the STECF and of its Expert Working Groups any specific interest which might be considered prejudicial to their independence in relation to specific items on the agenda. These declarations are displayed on the public meeting's website if experts explicitly authorized the JRC to do so in accordance with EU legislation on the protection of personnel data. For more information: http://stecf.jrc.ec.europa.eu/adm-declarations

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8 ANNEXES

8.1 Segment codes

Code	Segment name	Main species	Environment
seg.01_1	Salmon Hatcheries & nurseries	salmon	Hatcheries & nurseries
seg.01_2	Salmon on growing	salmon	Finfish salt water
seg.01_3	Salmon combined	salmon	Finfish salt water
seg.01_4	Salmon cages	salmon	Finfish salt water
seg.02_1	Trout Hatcheries & nurseries	trout	Hatcheries & nurseries
seg.02_2	Trout on growing	trout	Finfish fresh water
seg.02_3	Trout combined	trout	Finfish fresh water
seg.02_4	Trout cages	trout	Finfish salt water
seg.03_1	Sea bass & Sea bream Hatcheries & nurseries	sea bass & sea bream	Hatcheries & nurseries
seg.03_2	Sea bass & Sea bream on growing	sea bass & sea bream	Finfish salt water
seg.03_3	Sea bass & Sea bream combined	sea bass & sea bream	Finfish salt water
seg.03_4	Sea bass & Sea bream cages	sea bass & sea bream	Finfish salt water
seg.04_1	Carp Hatcheries & nurseries	carp	atcheries & nurseries
seg.04_2	Carp on growing	carp	Finfish fresh water
seg.04_3	Carp combined	carp	Finfish fresh water
seg.04_4	Carp cages	carp	Finfish fresh water
seg.05_1	Other freshwater fish Hatcheries & nurseries	other freshwater fish	Hatcheries & nurseries
seg.05_2	Other freshwater fish on growing	other freshwater fish	Finfish fresh water
seg.05_3	Other freshwater fish combined	other freshwater fish	Finfish fresh water
seg.05_4	Other freshwater fish cages	other freshwater fish	Finfish fresh water
seg.06_1	Other marine fish Hatcheries & nurseries	other marine fish	Hatcheries & nurseries
seg.06_2	Other marine fish on growing	other marine fish	Finfish salt water
seg.06_3	Other marine fish combined	other marine fish	Finfish salt water
seg.06_4	Other marine fish cages	other marine fish	Finfish salt water
seg.07_1	Mussel rafts	mussel	Shellfish
seg.07_2	Mussel Long line	mussel	Shellfish
seg.07_3	Mussel Bottom	mussel	Shellfish
seg.07_4	Mussel Other	mussel	Shellfish
seg.08_1	Oyster rafts	oyster	Shellfish
seg.08_2	Oyster Long line	oyster	Shellfish
seg.08_3	Oyster Bottom	oyster	Shellfish
seg.08_4	Oyster Other	oyster	Shellfish
seg.09_1	Clam rafts	clam	Shellfish
seg.09_2	Clam Long line	clam	Shellfish
seg.09_3	Clam Bottom	clam	Shellfish
seg.09_4	Clam Other	clam	Shellfish
seg.10_1	Other shellfish rafts	other shellfish	Shellfish
seg.10_2	Other shellfish Long line	other shellfish	Shellfish
seg.10_3	Other shellfish Bottom	other shellfish	Shellfish
seg.10_4	Other shellfish Other	other shellfish	Shellfish

8.2 Special chapter data

Annex 1. Paid public spending (or planned spending) on aquaculture in €

	FIGF			EFF			EMFF		
	National	EU	Total	National	EU	Total	National	EU	Total
Austria	3 462 350	2 575 974	6 038 324	2 831 494	2 931 120	5 762 615	4 353 925	3 604 000	7 957 925
Belgium	753 627	724 268	1 477 895	348 575	193 522	542 097	5 790 000	6 725 000	12 515 000
Bulgaria				4 131 128	12 393 383	16 524 511	9 053 750	27 161 250	36 215 000
Croatia							18 420 397	55 261 186	73 681 583
Cyprus	1 035 485	621 291	1 656 776	933 125	933 125	1 866 249	3 150 000	9 450 000	12 600 000
Czech Republic	1 181 139	2 755 989	3 937 128	3 332 110	9 996 314	13 328 424	6 924 050	20 772 150	27 696 200
Denmark	1 407 105	4 207 519	5 614 624	11 742 743	8 755 682	20 498 424	8 583 500	25 750 497	34 333 997
Estonia	926 660	1 935 828	2 862 488	1 872 579	5 617 731	7 490 310	4 467 471	13 402 413	17 869 884
Finland	3 995 776	3 363 553	7 359 329	5 739 738	4 408 481	10 148 218	22 100 000	15 600 000	37 700 000
France	21 708 903	21 206 278	42 915 181	19 369 872	13 058 423	32 428 295	29 596 569	88 789 702	118 386 271
Germany	5 533 934	9 186 502	14 720 436	5 944 830	12 523 925	18 468 755	21 410 667	64 232 000	85 642 667
Greece	10 127 748	35 046 138	45 173 886	8 947 902	6 623 129	15 571 031	22 439 696	67 319 086	89 758 782
Hungary	962 402	3 062 394	4 024 796	8 122 605	24 025 515	32 148 120	8 589 375	25 768 125	34 357 500
Ireland	5 450 960	27 867 457	33 318 417	3 706 033	1 833 451	5 539 484	14 900 000	14 900 000	29 800 000
Italy	40 624 542	32 945 099	73 569 641	9 782 029	18 552 023	28 334 052	110 567 415	110 567 415	221 134 830
Latvia	686 087	1 114 914	1 801 001	6 394 859	19 184 574	25 579 433	11 566 667	34 700 000	46 266 667
Lithuania	1 182 097	1 247 218	2 429 315	3 017 534	9 052 602	12 070 136	7 073 008	21 219 022	28 292 030
Malta	14 135	98 942	113 077	101 253	303 758	405 011	826 706	2 480 116	3 306 822
Netherlands	698 024	418 813	1 116 837	3 060 718	1 513 684	4 574 402	1 640 000	4 920 000	6 560 000
Poland	3 603 519	14 302 468	17 905 987	31 545 226	94 605 496	126 150 722	67 246 817	201 740 451	268 987 268
Portugal	35 469 873	27 509 372	62 979 245	3 766 454	11 299 365	15 065 819	19 666 667	59 000 000	78 666 667

Romania				16 448 179	49 344 538	65 792 717	28 085 982	84 257 945	112 343 927
Slovakia	453 102	1 057 238	1 510 340	6 843 875	5 132 906	11 976 781	3 135 510	9 406 530	12 542 040
Slovenia	94 598	283 270	377 868	1 245 432	3 736 295	4 981 726	2 000 000	6 000 000	8 000 000
Spain	67 841 690	141 376 484	209 218 174	57 367 018	41 434 134	98 801 152	68 635 448	205 905 843	274 541 291
Sweden	400 794	1 787 110	2 187 904	8 088 051	5 380 020	13 468 072	7 914 184	11 871 275	19 785 459
United Kingdom	7 500 466	17 416 421	24 916 887	4 288 218	7 111 962	11 400 180	6 442 778	19 327 305	25 770 083
Total	215 115 016	352 110 540	567 225 556	228 971 580	369 945 156	598 916 736	514 580 582	1 210 131 311	1 724 711 893

Annex 2. Paid total (EU and national) public spending in comparison to total value of production

	Total value of production (turnover) in €	EFF annual average in €	EFF per value of production
Spain	545 682 078	14 114 450	3 %
Poland*	88 586 038	18 021 532	20 %
Italy	556 900 000	4 047 722	1 %
France	916 593 608	4 632 614	1 %
Romania	19 137 252	9 398 960	49 %
Greece	613 300 000	2 224 433	0 %
Germany*	109 295 796	2 638 394	2 %
Portugal	44 800 000	2 152 260	5 %
Latvia*	1 848 852	3 654 205	198 %
Finland	59 700 000	1 449 745	2 %
Bulgaria	17 200 000	2 360 644	14 %
Hungary	30 334 000	4 592 589	15 %
Denmark	159 800 000	2 928 346	2 %
Ireland	116 100 000	791 355	1 %
Lithuania*	7 443 656	1 724 305	23 %
Czech Republic	42 474 000	1 904 061	4 %
United Kingdom	992 603 977	1 628 597	0 %
Sweden	56 900 000	1 924 010	3 %
Estonia*	3 485 673	1 070 044	31 %
Cyprus	32 300 000	266 607	1 %
Slovakia	3 242 000	1 710 969	53 %
Belgium	966 000	77 442	8 %
Slovenia	846 395	711 675	84 %
Austria	19 229 000	823 231	4 %
Netherlands	98 085 562	653 486	1 %
Malta	97 300 000	57 859	0 %

9 ELECTRONIC ANNEXES

Electronic annexes are published on the meeting's web site on:
http://stecf.jrc.ec.europa.eu/web/stecf

List of electronic annexes documents:

EWG 16-12 – Annex 1 - Data

The economic data used to compile this report are provided in an Excel file as data tables at the following address: https://stecf.jrc.ec.europa.eu/data-reports.

10 LIST OF BACKGROUND DOCUMENTS

Background documents are published on the meeting's web site on:
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List of background documents:

EWG 16-12 – Doc 1 - Declarations of invited and JRC experts (see also section "Contact details of STECF members " of this report – List of participants)

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The Scientific, Technical and Economic Committee for Fisheries (STECF) has been established by the European Commission. The STECF is being consulted at regular intervals on matters pertaining to the conservation and management of living aquatic resources, including biological, economic, environmental, social and technical considerations.

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