BIM Ireland's Seafood Development Agency

NATIONAL SEAFOOD SURVEY

Aquaculture Report 2019

Contents

Executive Summary

Aquaculture output for the 2009-2018 period has varied from 30,000 to 50,000 tonnes. It remains mainly export-driven, marine based, with a smaller land-based, freshwater aquaculture sector. Fluctuation in production value over this period is predominately due to production variations for salmon sea-farms, and to a lesser extent, the volume of bottom grown mussels produced. Overall, production value has seen a net gain from under €100 million in 2009 to €180 million in 2018; this despite limitations to output capacity, linked to licensing and consequent reductions in salmon production. This value growth was made possible by steady increases in the unit value of product driven by a growing recognition of Irish product quality and provenance through the achievement of international certifications such as MSC, and Organic Labels. Total turnover is predicted to continue to increase in 2019.

There has been a steady reduction in the number of businesses operating in some sectors of Irish aquaculture from 2009 to 2018. This consolidation process has been fuelled by foreign direct investment by a large multinational in the case of salmon farming and in the case of bottom grown mussels and oyster farming via investments from Dutch and French shellfish farmers. There is a move away from seasonal employment in the shellfish sector, with an increase in automation due to associated rising costs.

Employment over the 2009 to 2018 period, has fluctuated between 1,700 and 1,900. In 2018, 1,948 persons, equating to 1,077 Full Time Equivalents (FTEs) were directly employed. In 2018 employment increased slightly by 1%, when compared to 2017, despite it being a challenging year. Overall employment in 2018 was highest in the North (25%), followed by the Southeast (18%) and the West (15%). Employment is set to remain stable for 2019 and beyond given present production trends and steady market demand.

The main items of expenditure for the aquaculture industry are raw material costs, such as feed and juveniles, in the case of salmon farming. Energy, wages and salaries costs are common to the entire sector. Total costs in 2018 were estimated at €165 million resulting in a Gross Added Value (GVA) of €123 million equating to a GVA per FTE of €114 thousand. Both total costs and GVA are predicted to remain stable for 2019 with a slight 1% increase. Net profit has seen a reduction in 2018, due to a 10% decrease in total turnover and a 2% increase in total costs. Given current trends this is predicted to recover in 2019. Total investment and grant aid subsidies have seen a gradual decline since 2016 and currently stand at €6 million and €1.2 million respectively.

Salmon remains the most economically significant aquaculture sector in 2018 with production at 12,000 tonnes. Salmon in Ireland is exclusively produced to the EU Organic Certification Standard. It is mostly exported to the EU, with lesser volumes going to North America and the Near and Far East. Employment in this sector at primary production sites, increased by 18% despite output decreasing in 2018. There are up to 464 directly employed in the sector.

Farmed oyster (Gigas) output has continued to expand steadily over the 10 years, breaching the 10,000-tonne ceiling to achieve an output of 10,122 tonnes output in 2018. Overall value increased by 2.3% to € 44.3 million. Employment remains a mix of full-time and part-time with a distinct move away from casual labour. Although France remains the main market from a volume of sales perspective, there has been a sharp increase in high value sales to markets in the far east. There is also a trend towards direct selling and value adding branding, moving away from bulk supply via a wholesale intermediary.

Rope mussel production, has varied between 8,500 and 10,000 tonnes over the ten-year period. In 2018, production was 9,192 tonnes, worth just under €6 million, up 7.5% and 3.3 % respectively from 2017. There is a steady trend of consolidation in the sector driven by low margins and the need to achieve economies of scale. Consequently, there has been a decline in overall, particularly seasonal employment. The main market is France, with lower volumes going to Holland, UK and Italy with a small but growing home market.

The seabed cultured mussel sector has suffered from a number of poor fishing seasons in terms of wild seed availability and unit prices have also been quite low. These forces have reduced production by 3% in 2018 as compared to 2017. Currently the sector is comprised of 24 businesses, employing 108 persons directly, mainly full-time. It produced 4,700 tonnes, valued at over €6 million, for the Dutch and French fresh Markets in 2018.

In summary, the Irish aquaculture sector is stable and despite limitations in the growth of the volume of output it continues to grow in value terms. Its products are highly valued in the market place and it provides high value, year-round, jobs all around the coast. Shellfish licensing backlogs are set to be resolved by the end of 2019, which will underpin modest expansion in the output of oysters and mussels in the next five years. It is to be hoped that technology advances and some administrative streamlining will also impact positively on the salmon farming sector allowing some further increases in output to help meet the undoubted pent up market demand for Irish Organic Certified salmon.

1. Overview

1.1. Overview 2009 to 2018

The level of overall aquaculture output has followed a cyclical trend varying from 30,000 to 50,000 tonnes over 10 years as the outputs of salmon farms, historically the most economically important aquaculture sector and to a lesser extent, bottom grown mussel, fluctuated over the period. Overall, value has seen a net gain from under 100 million to 180 million, despite limitations to output. This was made possible by steady increases in unit value in conjunction with growing recognition of product quality. Aquaculture remains mainly export-driven, marine based, with a smaller land-based or freshwater aquaculture sector. Apart from the practice in native oyster culture, there is a move away from seasonal employment in the shellfish sector, due to associated rising costs.

Employment has oscillated between over 1,900 and 1,700 persons. Since 2018 employment is back to the levels it was at in 2009. Employment is biased towards male workers with female employment standing at 7% in 2018. The nationality of workers is shifting to reflect the growing proportion of non-nationals in the workforce.

The limitations to production growth remain unchanged and consist of; a lack of licensed capacity, distance to market, market home competitors, incidence and effects of pathogens or parasites and their importation via seed and the constraints and stresses upon stock grown in the highly dynamic, exposed and unpredictable environment and, climate of Irish sites.

Figures 1-3: Aquaculture Output by Volume and Value, 2009 to 2018

Figure 1: Irish Aquaculture Production – 10 Year Trend

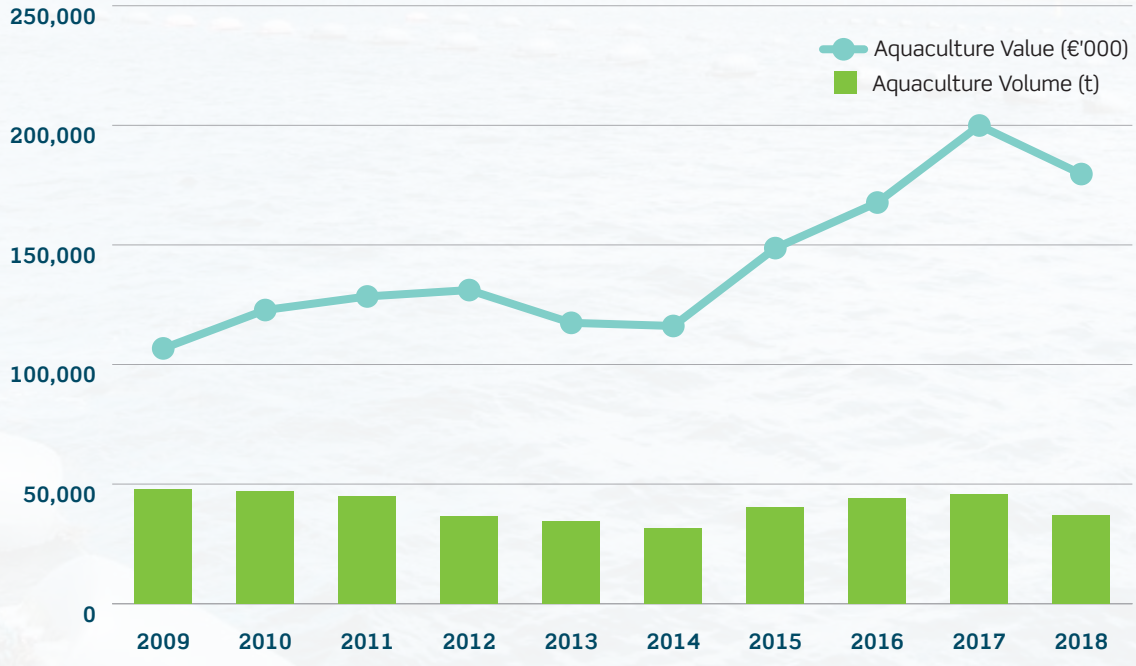


Figure 2: Finfish & Shellfish Production Volumes – 10 Year Trend

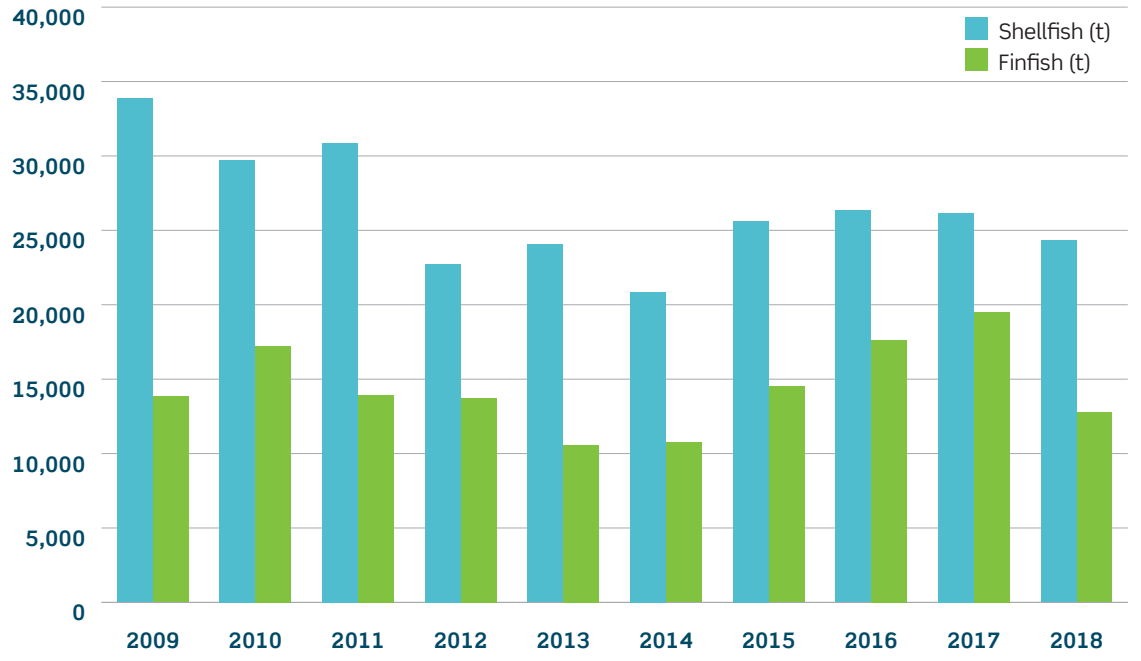
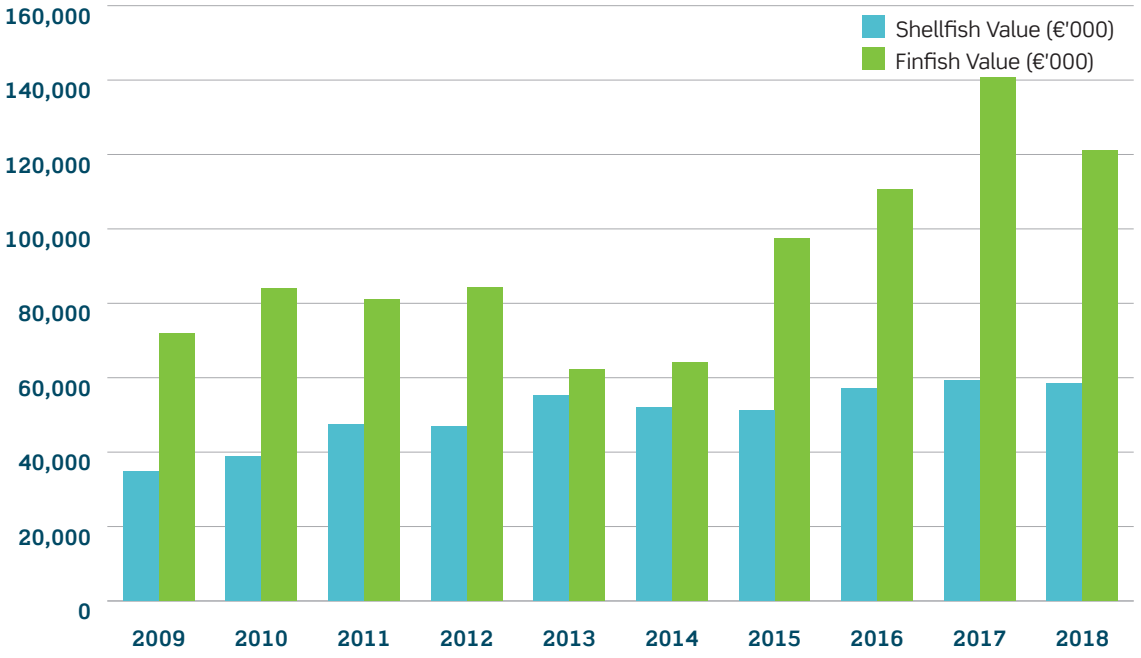


Figure 3: Finfish & Shellfish Production Value – 10 Year Trend



2. Production Output in 2018

The National Seafood Survey indicates that overall output decreased by more than 19 % by volume and 13.5% by value from 2017 to 2018.

The trends are predominantly influenced by the finfish sector which was down 33% by volume and 14% by value. The sectoral trend is specifically set by Atlantic salmon production which is following a cyclical trend of production based on alternating heavy and light inputs of smolts, necessitated by a lack of capacity. The less severe drop in overall value is due to an increase in salmon unit value. Other finfish production, mainly Rainbow trout, has also contracted in output and companies continue to be amalgamated.

The shellfish sector output experienced a less dramatic downturn with a decrease of 7.3% by volume and 1.5 % by value, the latter again partially offset by modest increases in unit value. Bottom-grown mussel production decline was the main trend driver for shellfish. However, the rope mussel and farmed oyster sub-sectors showed modest production increase over 2018 with rope production increasing to 9,200 tonnes and farmed oyster breaking the 10,000 tonne mark for the first time. Minor shellfish culture production has declined. Native oyster production has received a major setback with the increased availability of French oysters depressing export unit value, while the home market has switched to Farmed (Pacific oyster) consumption owing to the recent historical lack of Edulis (native) supply.

Employment has remained stable, even increasing slightly by 22 persons despite a challenging year bringing the estimated total to 1,948 persons, with an FTE of 1,077 in 2018.

The number of production units has also remained stable at 282, although these are controlled by fewer businesses; 238 from 248 as these continue to amalgamate in 2018.

2.1. Irish Finfish Production 2018

Figures 4-6: Irish Finfish Production 2018

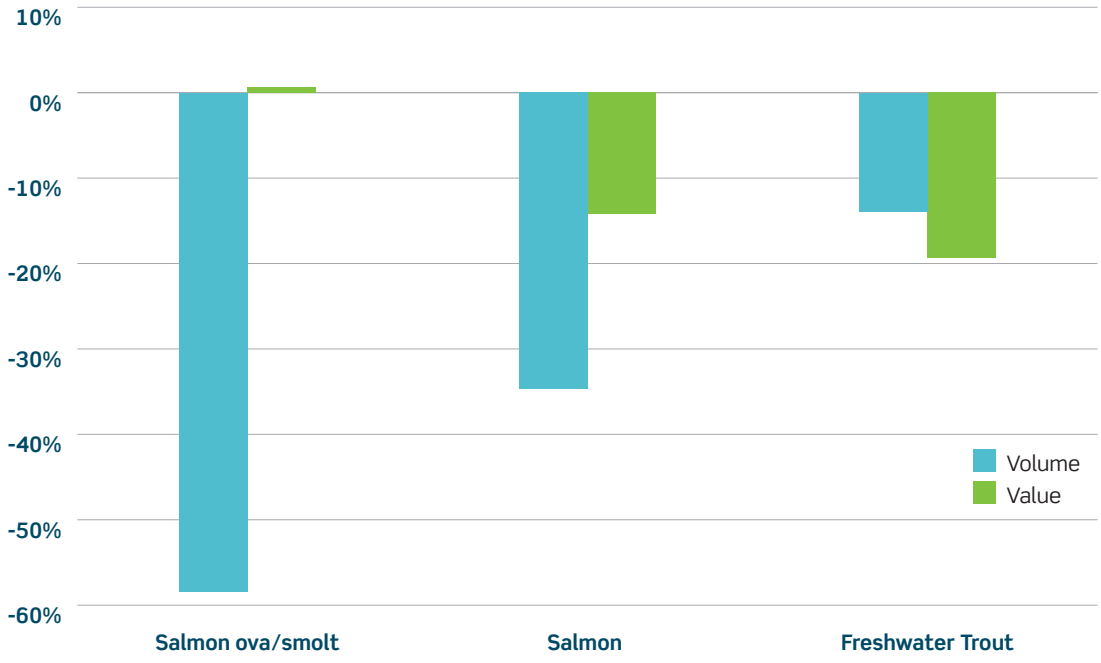
Figure 4: Irish Finfish Production 2018 Volume (Tonnes)

Salmon/ova/smolt	2%
Salmon Volume	94%
Freshwater Trout	4%

Figure 5: Irish Finfish Production 2018 Value (€'000)

Salmon/ova/smolt	4%
Salmon Volume	95%
Freshwater Trout	1%

Figure 6: 2017 to 2018 Finfish Production Trend



2.2. Shellfish Output 2018

Figures 7-9: Shellfish Output 2018

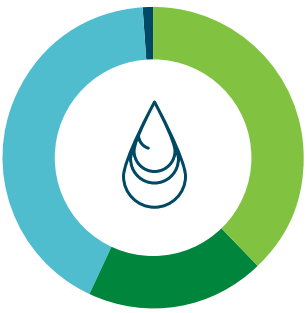


Figure 7: Irish Shellfish Production Volume 2018 (Tonnes)

Rope Mussel	38%
Bottom Mussel	19%
Pacific Oyster	42%
Native Oyster	1%

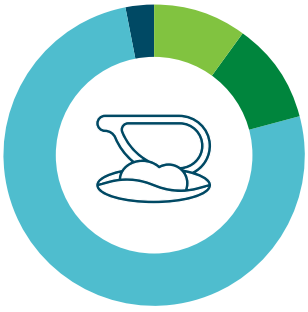


Figure 8: Irish Shellfish Production Value 2018 (€'000)

Rope Mussel	10%
Bottom Mussel	11%
Pacific Oyster	76%
Native Oyster	3%

Figure 9: Shellfish Production Trend

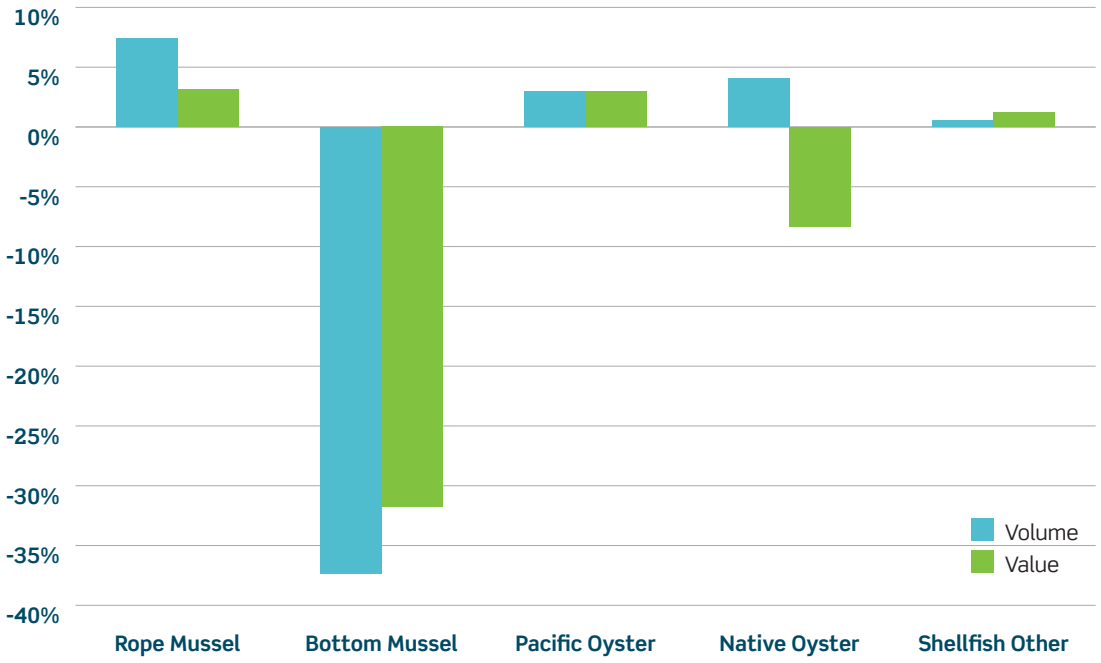
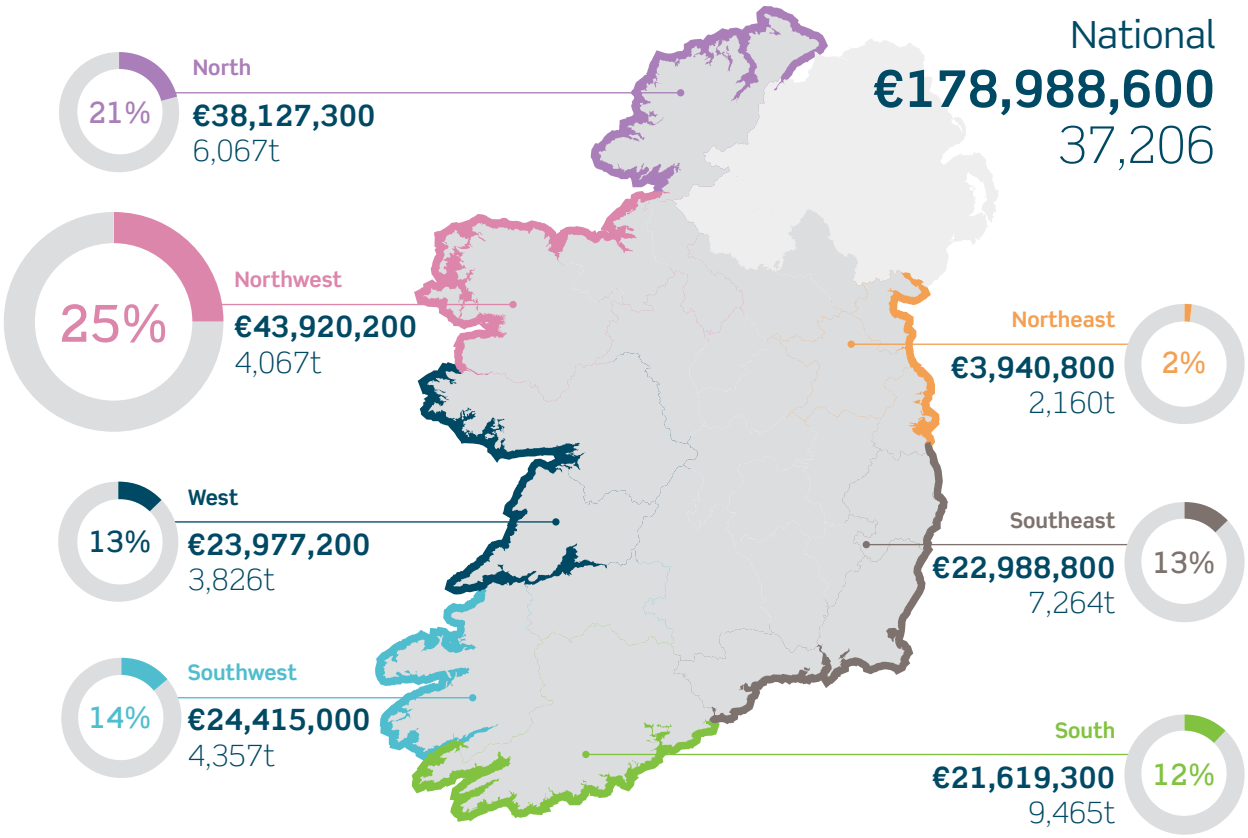


Figure 10: Regional Distribution of Aquaculture Output (rounded figures)



3. Employment

3.1. 10 Year Trend

Employment in 2009 was over 1,900 persons and after some fluctuations has returned to this level in 2018, having dropped to lows between 1,700 and 1,800 persons in 2012. Full-time equivalent employment (FTE) meanwhile varied from just over 900 to 1,050 in the same period. Native oyster employment may have been over-estimated due to lack of data obtained.

Female employment level, over this time, has remained relatively static, ranging from 120 to 150 or from 6.4% to 8.2 % of total employed.

The Shellfish sector was the biggest employer over the period and included the greatest proportion of part-time or seasonal work. The Finfish sector by contrast, provided mainly full-time employment and the best average wage, in excess of €40,000 annually.

Figures 11-12: Employment 10 Year Trend

Figure 11: Aquaculture Employment 2009 to 2018

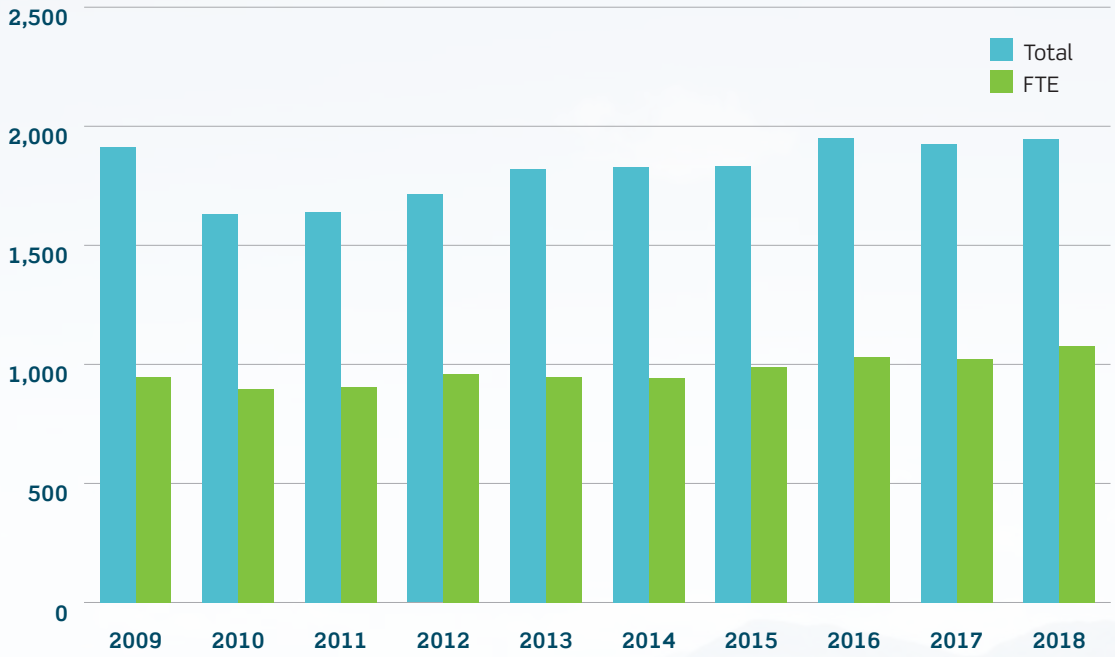
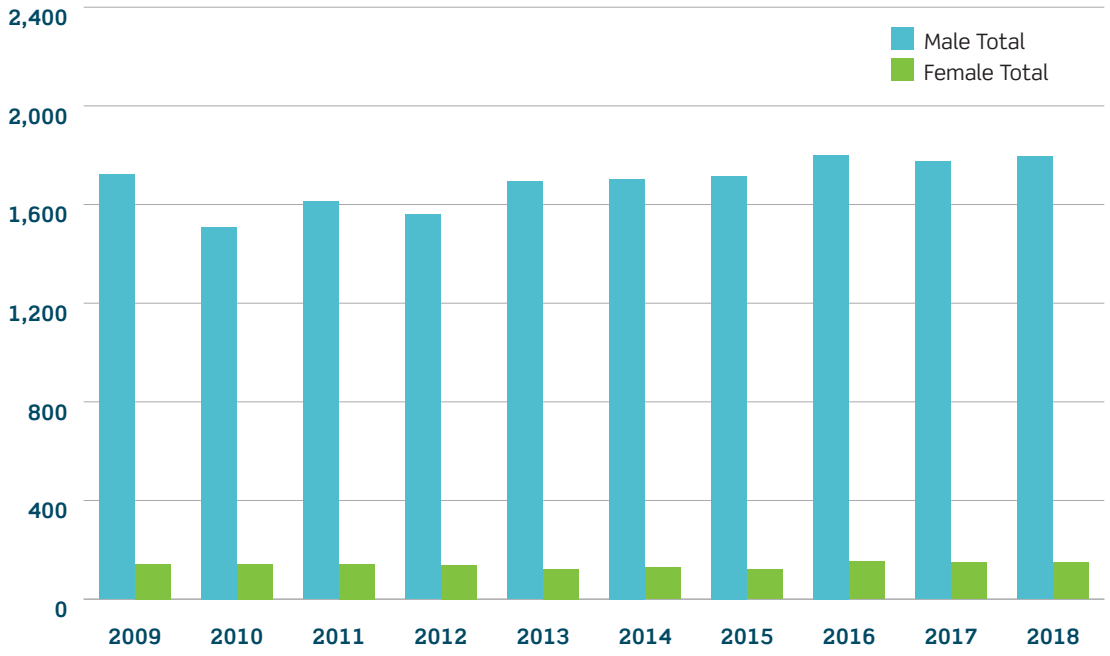


Figure 12: Male to Female Employment, 2009 to 2018



3.2. In 2018

Employment has remained stable from 2017, even increasing slightly by 22 persons despite a challenging year, estimated as 1,948 persons, with an FTE of 1,077 in 2018. Full-time employment has increased in proportion to part-time and seasonal. Employment costs are noted as rising causing a shift towards taking on more permanent staff in the shellfish sector.

Figures 13-15: Employment in 2018

Figure 13: Employment Trends 2017 to 2018

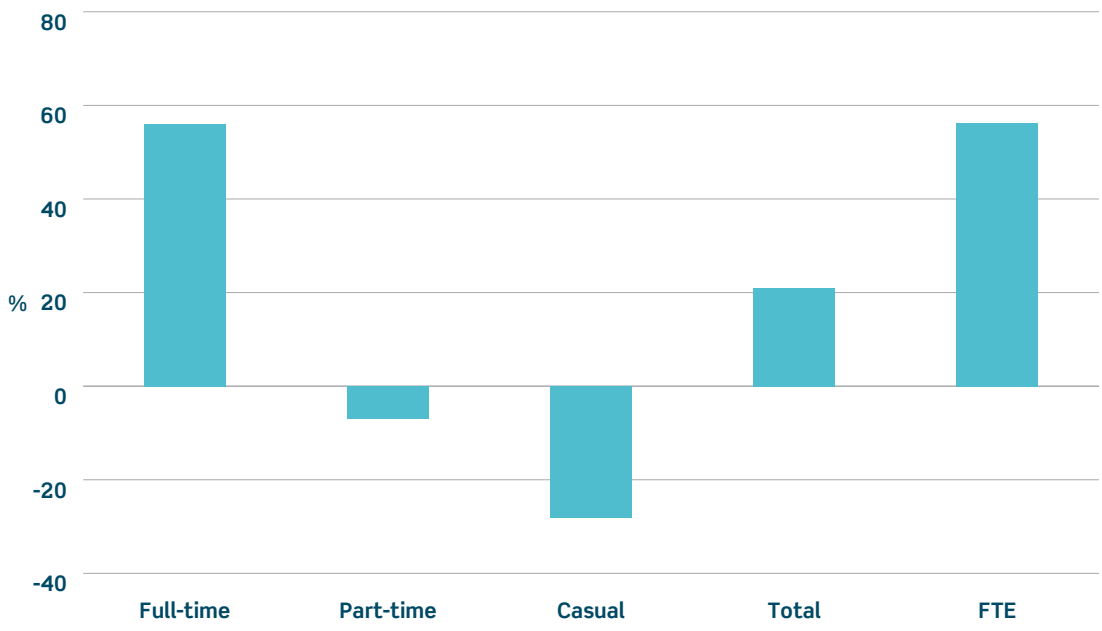
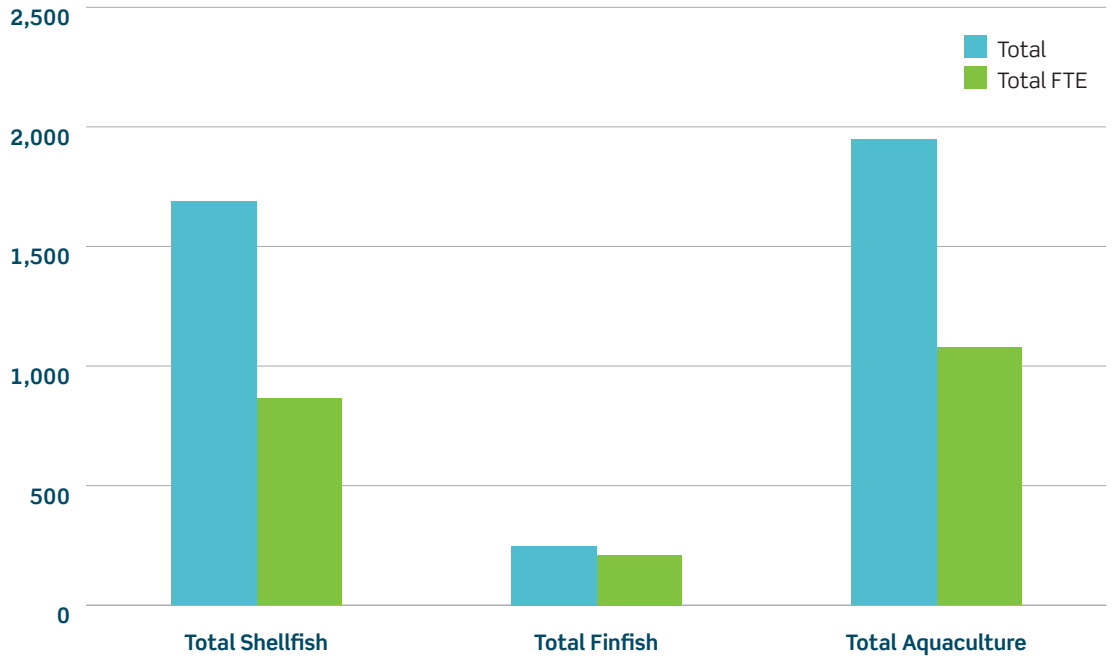


Figure 14: Employment Levels in 2018



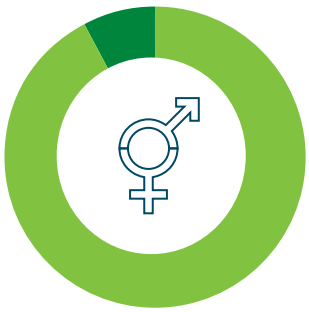


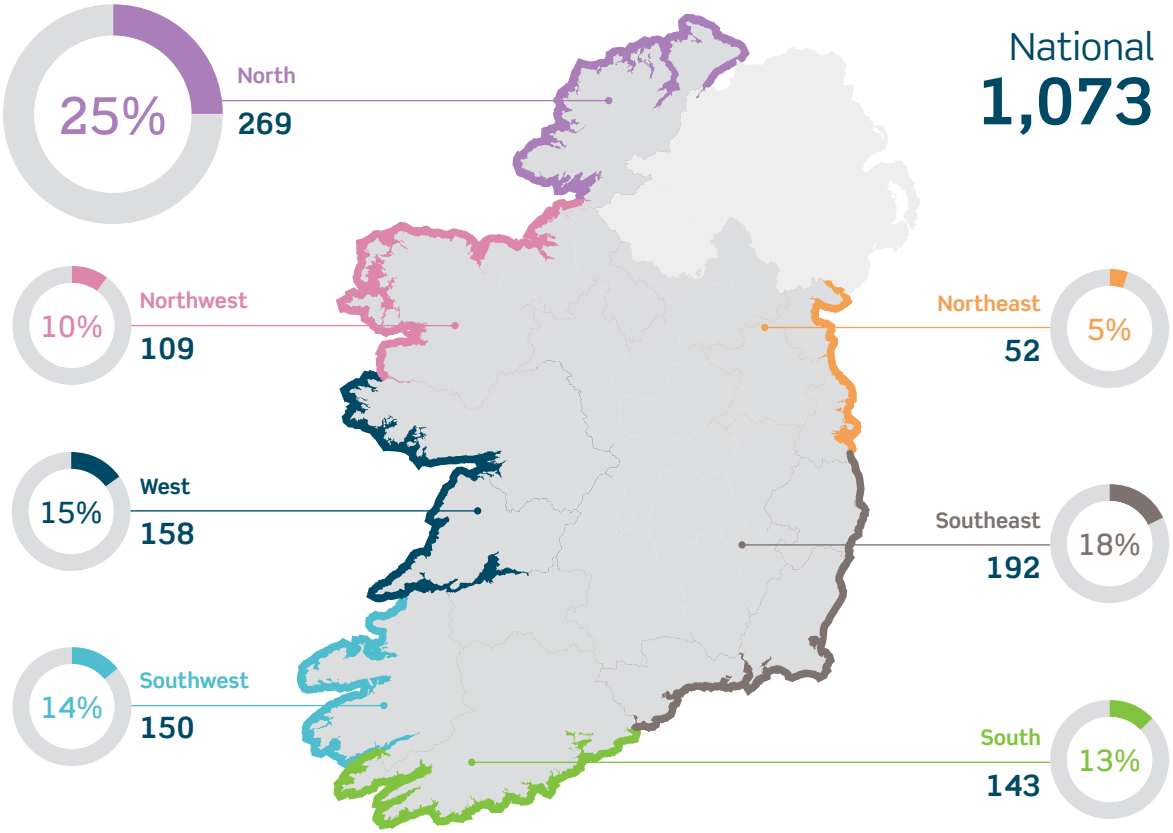
Figure 15: Male v Female Employment in 2018

Male	92%
Female	8%

3.3. Regional Employment

Employment is concentrated along the west, south east and north-east coasts particularly in counties Donegal, Cork, Mayo, Galway, Louth and Waterford. There is also employment created by several inland freshwater units.

Figure 16: Map of Full-Time Equivalent Employment by Region



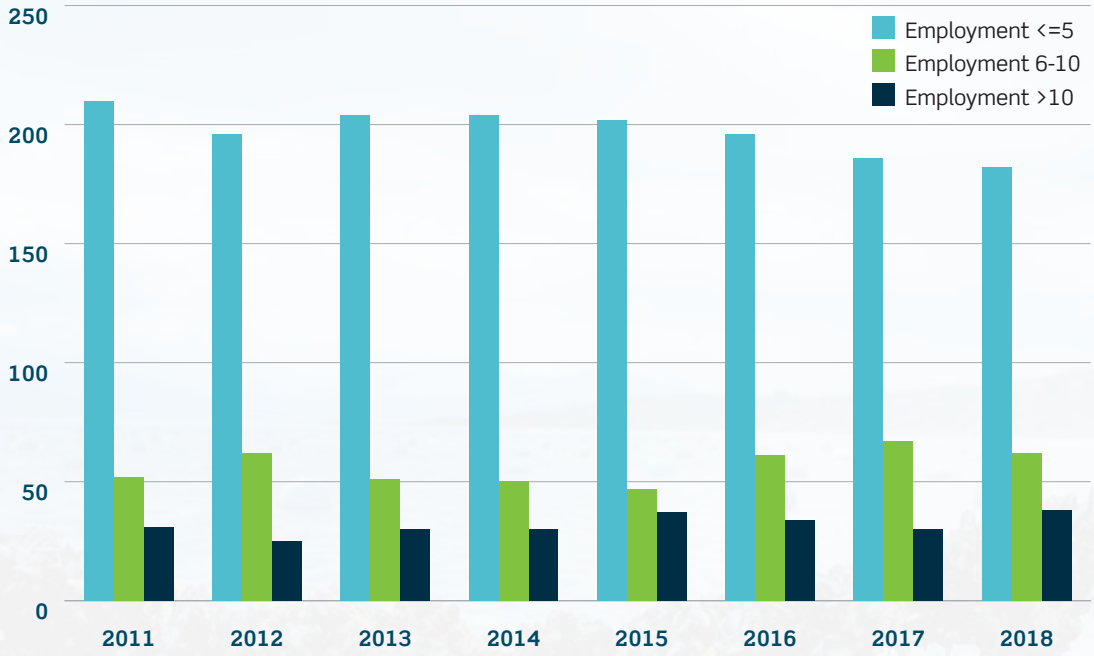
4. Business Organisation; Production units

Most of the businesses, and their production units, are small, employing less than 5 persons and generating €250,000 or less annually.

4.1. 10 Year Trend

There has been a decline in the number of the smallest Production Unit (PU) size category due to pressures to operate businesses full-time and to move towards more capital-intensive production. This can clearly be seen in the Rope-mussel sector and to a lesser extent in the Oyster sector.

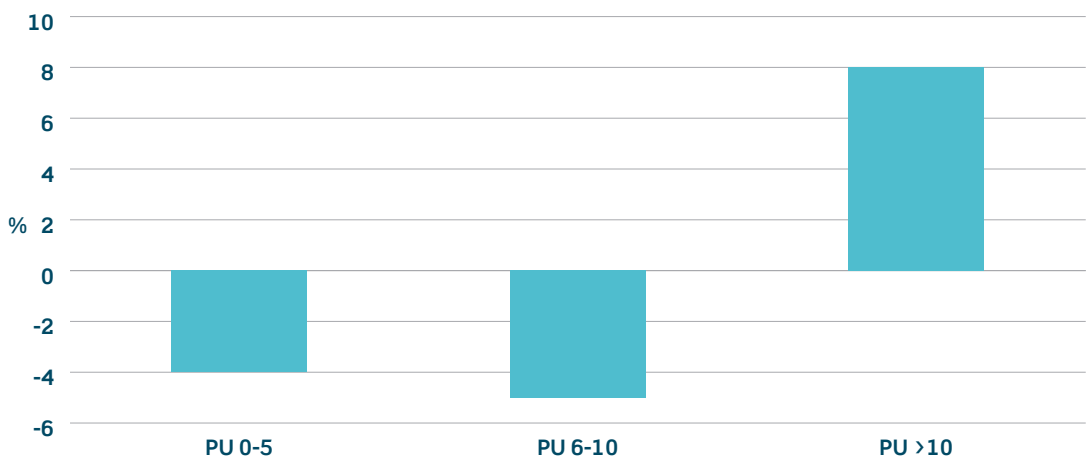
Figure 17: Business Size Category – 10 Year Trend



4.2. 2017 to 2018

The 10 Year declining trend in smaller PU numbers continued in 2018 with an increase in the greater than 10 persons employed category. This reflects an amalgamating trend within the shellfish sector of small PUs into larger enterprises.

Figure 18: Business Size Category Trend, 2017 to 2018

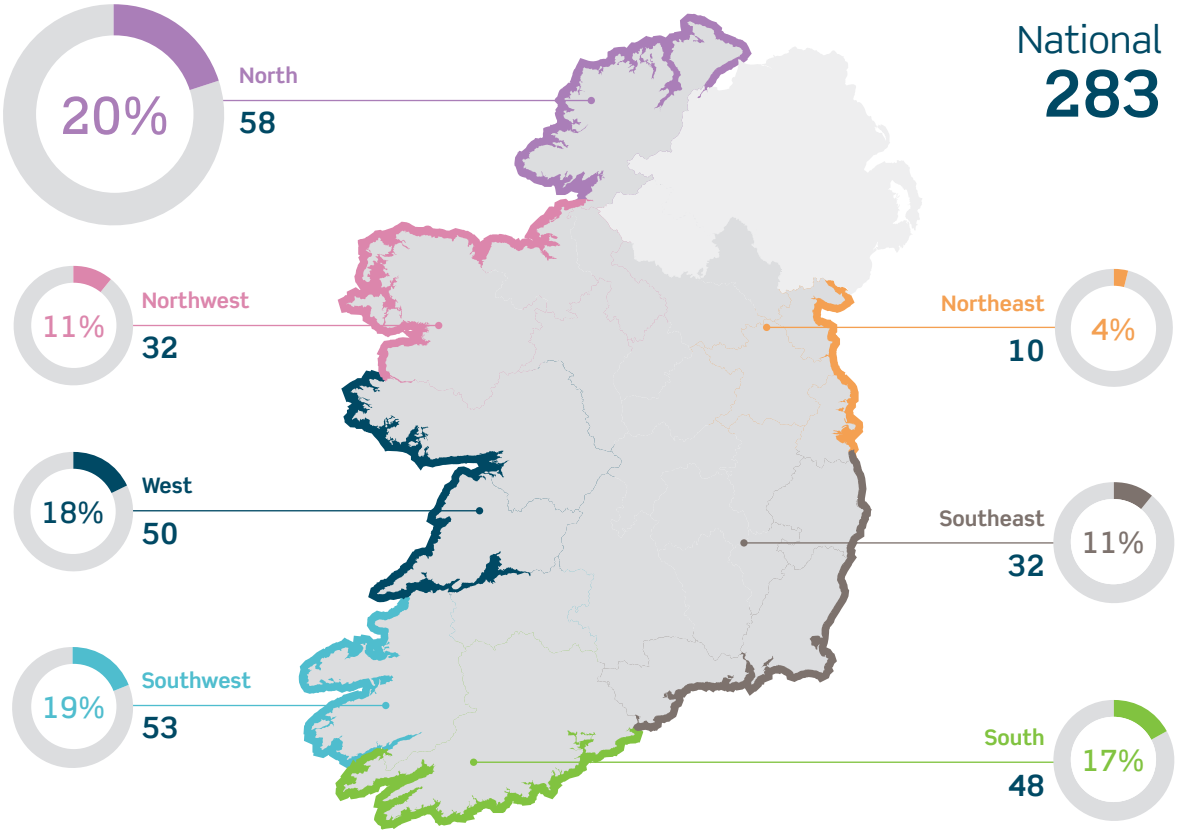


4.3. Regionally

Production units are concentrated along the West, South east and North east coasts with a small number of freshwater finfish units inland, in counties Roscommon, Offaly, Tipperary, Carlow and Kilkenny. There is gradual amalgamation of units within the Trout, Rope mussel and Farmed oyster segments though new farms are also starting up within the Farmed oyster segment.

Production units are concentrated in bays of intense shellfish production, particularly in the bays Dungarvan (FLAG SEast), Bantry (FLAG South), Dingle (FLAG SWest), Killary (FLAG West), Clew (FLAG NWest) and The Bays of Donegal (FLAG North).

Figure 19: Regional Distribution of Production Units



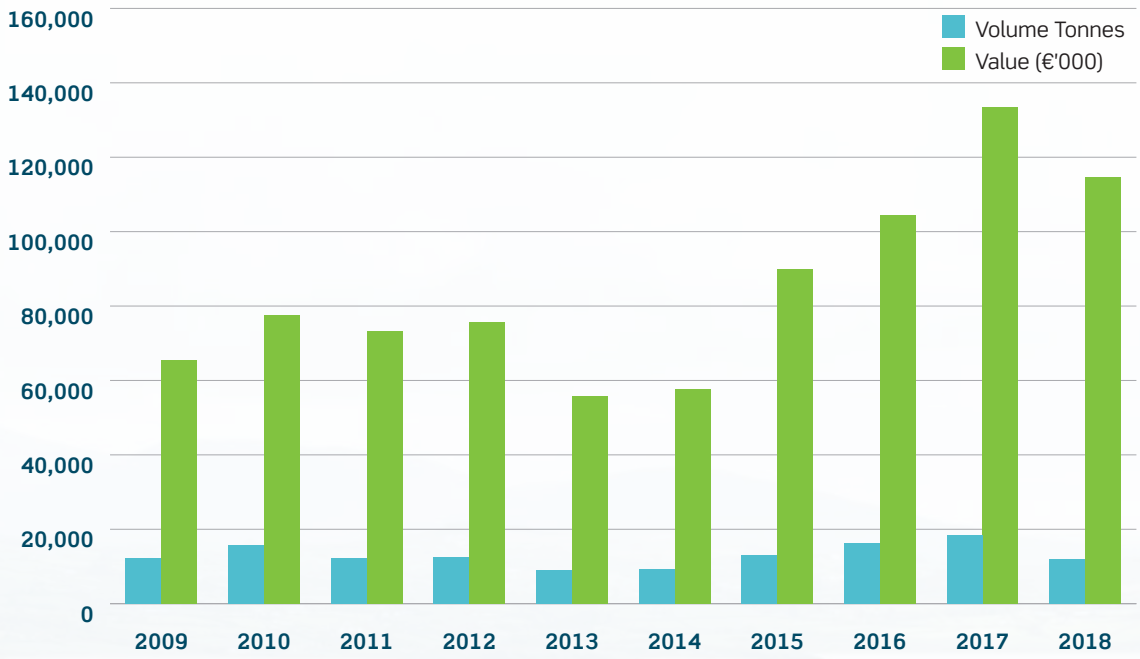
5. Main Segments

5.1. Salmon

Output

Atlantic salmon on-grown production output declined in 2018, following a cyclical trend of production based on alternating heavy and light inputs of smolts, necessitated by a lack of capacity. Output was down 34.7% in volume to just under 12,000 tonnes. Whole-round value was down 14.2 % to € 114.5 million. Smolt production fell to 220 tonnes worth € 5.1 million indicating an increase in unit value due to scarcity of the product.

Figure 20: Salmon 10 Year Production

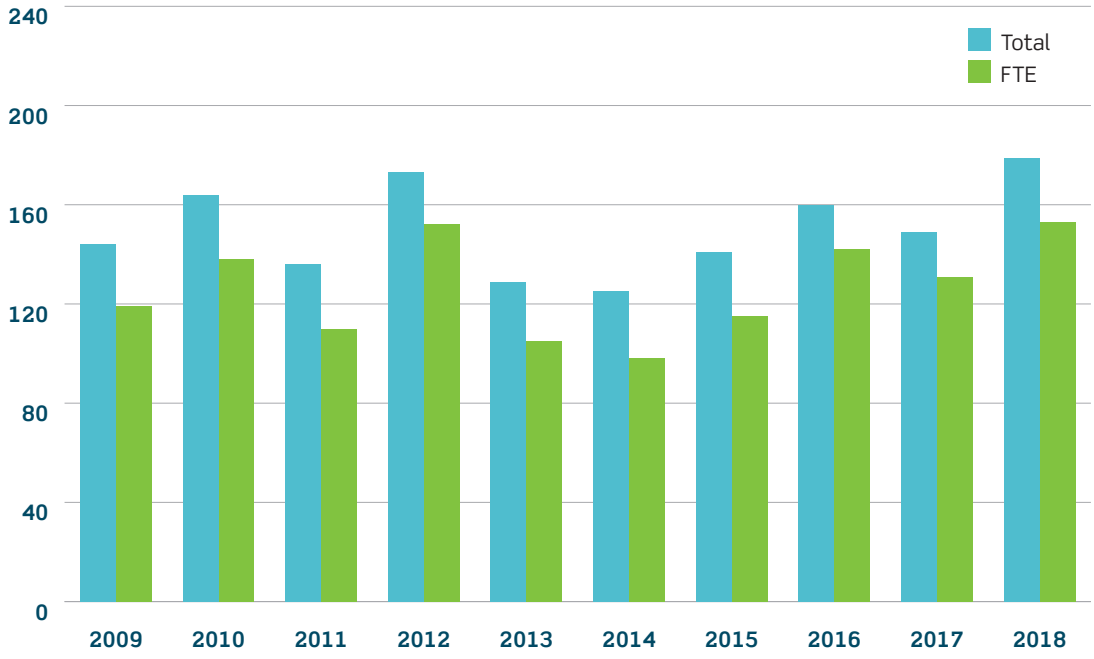


Employment and Production Units

Employment in the salmon sector, mainly full time, increased by 30 persons, despite output decrease, with a total of 230 in direct employment at primary production sites and up to 464 directly employed in the salmon sector as a whole.

Salmon on-grown production occurs in sea-cages, at 34 sites of 15 production units, owned by 5 companies, off the coasts of Donegal, Mayo, Galway, Kerry and Cork. These are supplied by smolt production units located at several land-based facilities. All stages of the production cycle occur within the Irish industry.

Figure 21: Salmon Production Total Employment v FTE, 2009 to 2018



Structures and Production Cycle

Offshore-exposed circular plastic cages of 20,000 metre cube capacity, are used. The production cycle is from 9 to 18 months depending on market size requirements. Smolts are transferred in spring to on-growing sites, then to finishing sites in preparation for harvesting. Maximum national production capacity is around 20,000 tonnes, though in practice, normally less, in keeping with strict organic stocking requirements. Capacity is restricted by available licensed sites.

The sector is capital intensive, with the greatest cost normally being feed which stood at €19.6 million in 2018. Average wage within the sector in 2018 was estimated at €52,896.

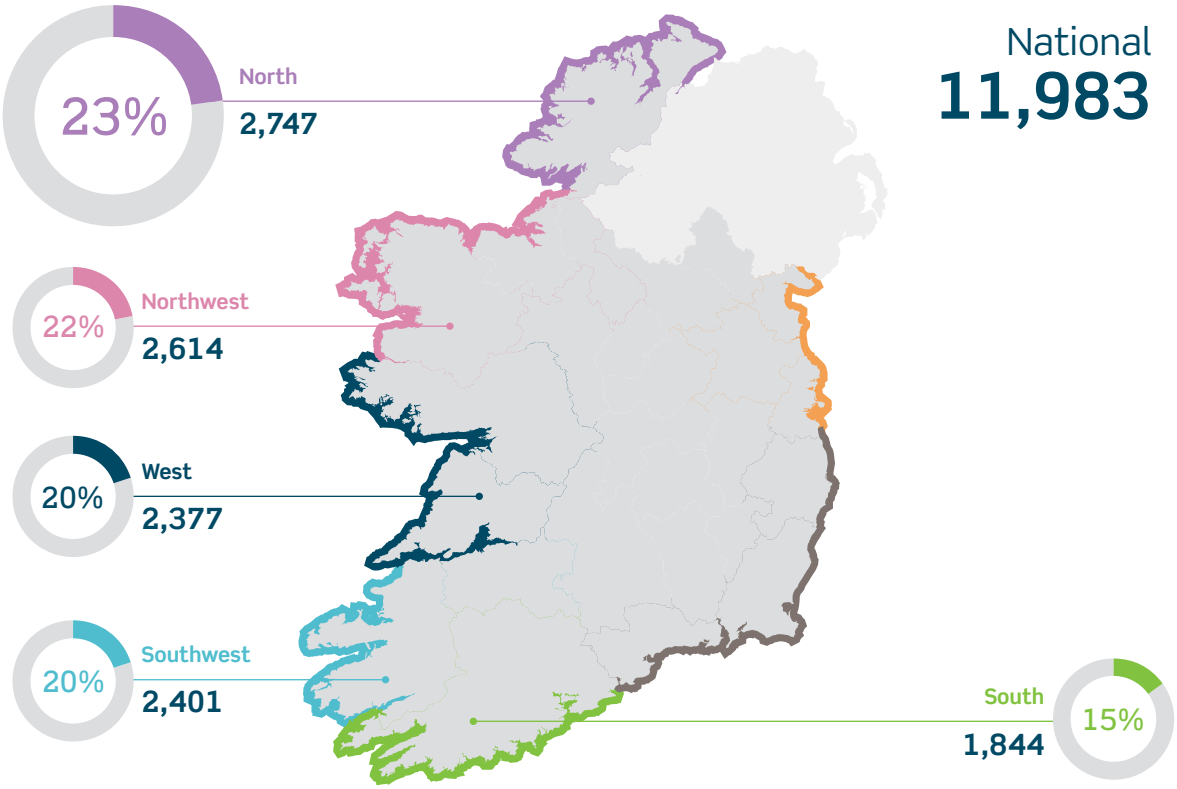
Markets

The consumer-ready product, mainly whole-round or head-on-gutted, is grown to exclusively organic certification standards and is exported to diverse markets; to the EU, North America and the Near and Far East. The less severe drop in overall value for 2018 is due to an increase in salmon unit value which now stands at an average of €9.55 for whole-round.

Mortalities

Despite the stresses that accompany production during extended periods of warm weather, no mortality spikes were recorded in 2018.

Figure 22: Caged Salmon Output in 2018 by Region

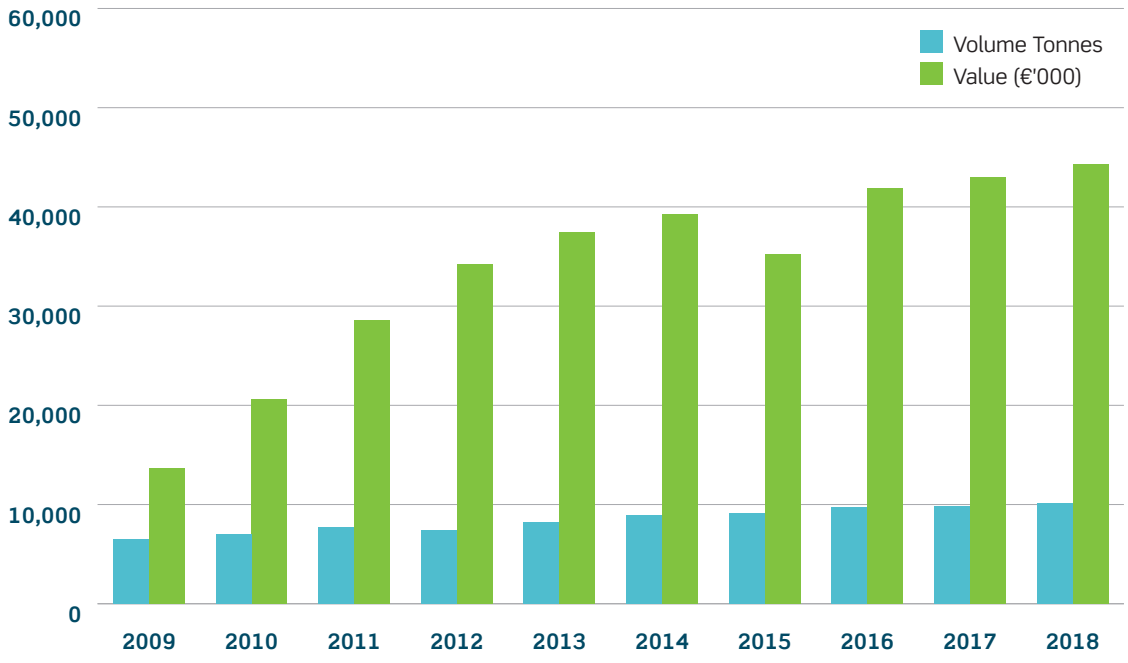


5.2. Oysters

Output

The Farmed Pacific or Gigas oyster (Crassostrea gigas) sector continued to expand modestly by 2.4% in volume in 2018, breaking the 10,000-tonne ceiling to 10,122 tonnes. Overall value increased by 2.3% to € 44.3 million, unit value nationally remains unchanged at €4,380 per tonne (Triploids plus Diploids).

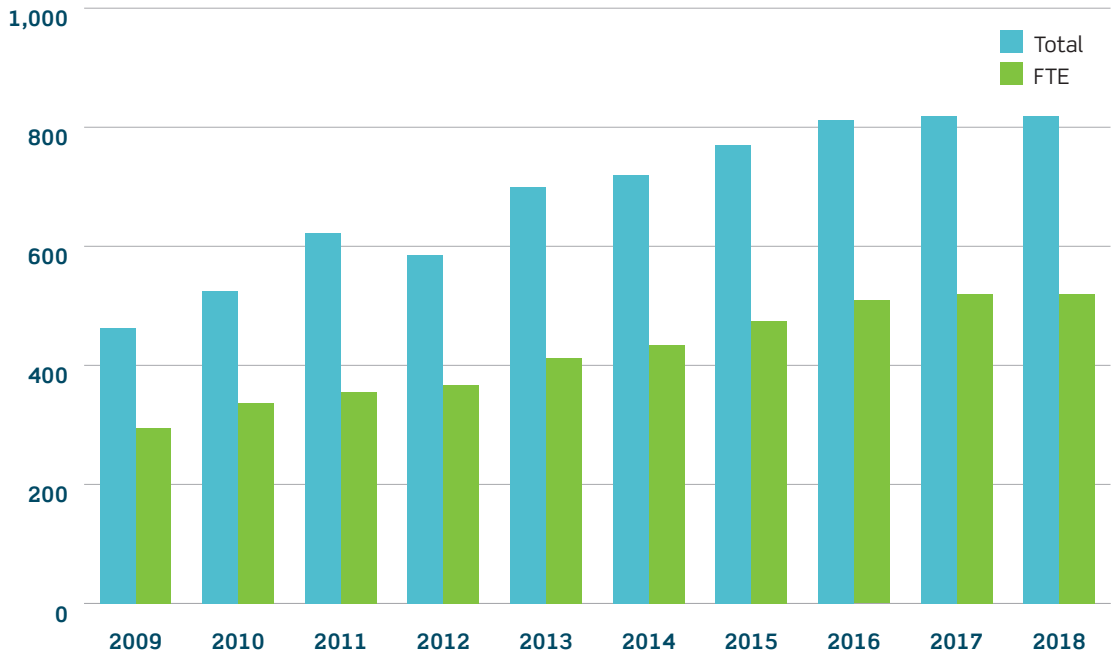
Figure 23: Volume (Tonnes) Gigas Oyster – 10 Year Production Trend



Production Units & Employment

Total employment in the oyster sector, mainly on Gigas oyster farms, is over 1,300 persons. This equals 642 FTEs. Just under half of this work force is in full time employment. Production is carried out across 154 production units, run by 139 businesses and are distributed along the coast with concentrations of production in the South east and North west regions.

Figure 24: Gigas Oysters – Total v FTE Employment – 10 Year Trend



Current Structures

Intertidal production predominantly uses trestle bags but SEPA baskets, floating/suspended baskets and shelved baskets are increasingly used throughout the licensed area. Small seed (6-8mm) is mainly imported from French and UK hatcheries. Bigger, half-grown, stock is bought from sites within Ireland, specializing in earlier stages of the production cycle and some 2-3mm stock is supplied by local hatcheries. The full production cycle is from 3 to 5 years though an increasing number of units specialise in part of the cycle, reducing stock turnover time. The current maximum capacity is just over 10,000 tonnes and is restricted by available licensed ground.

The Market

The market for Irish grown oysters is mainly the EU, mostly France taking 74% of total export volume with smaller volumes going to The Netherlands, the UK, Germany Spain and Italy. There are also buyers from Canada, The United Arab Emirates and South east Asia. The latter, principally China and Hong Kong, took in 6.73 % of total exported volume (553 tonnes). Increasingly, home-branded products are being sold directly to the retail market.

In 2018, 7,570 tonnes (74 %) was sold consumer ready at sizes from 45 to over 150 grams, though mainly sizes 3s to 1s were sold. The value ranged from €2,200 per tonne to €6,000 per tonne, depending on the bay and ploidy. The remaining 2,622 tonnes, mainly 30-64g half-grown oysters, were sold to other finishing farms from €2,200 to €4,500 euros/tonne.

Triploid output makes up 89.1% of the output, with a unit value of €4,477 per tonne. Diploid output had an average unit value of €3,386 per tonne. In 2018, 8,359 tonnes making up all grades and ploidies were exported of which 1,921, 2,032, 2,003 and 1,329 tonnes respectively were half-grown, Size 3s, size 2s and Size 1 or greater.

Figure 25: Gigas; Size Class Average Unit Value in 2018

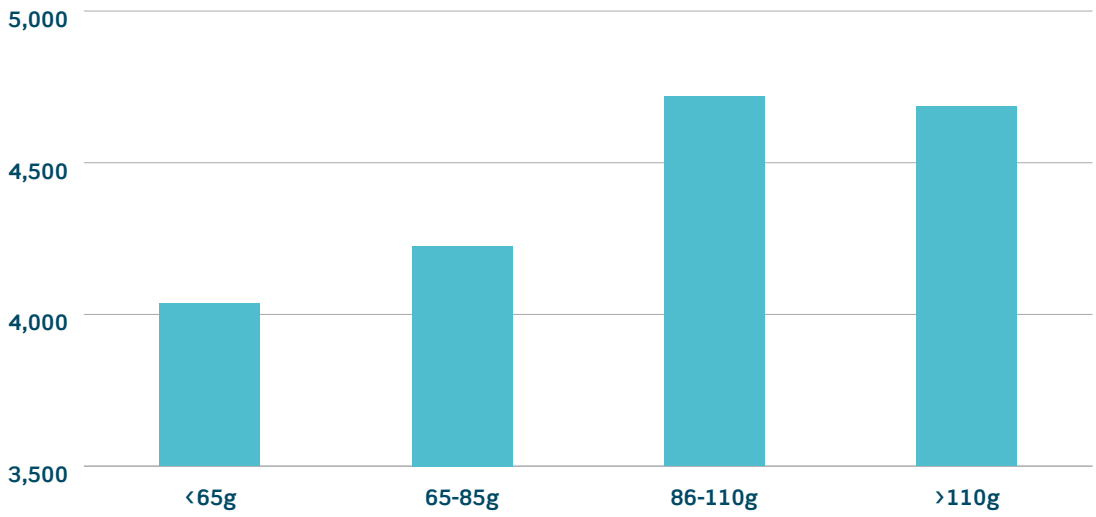
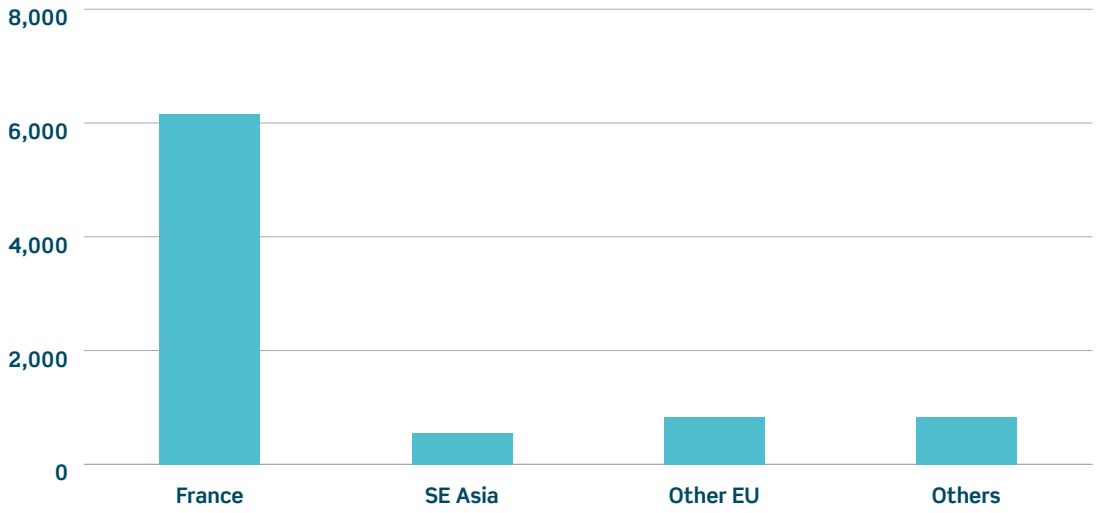


Figure 26: Gigas; Exported Volume in Tonnes in 2018

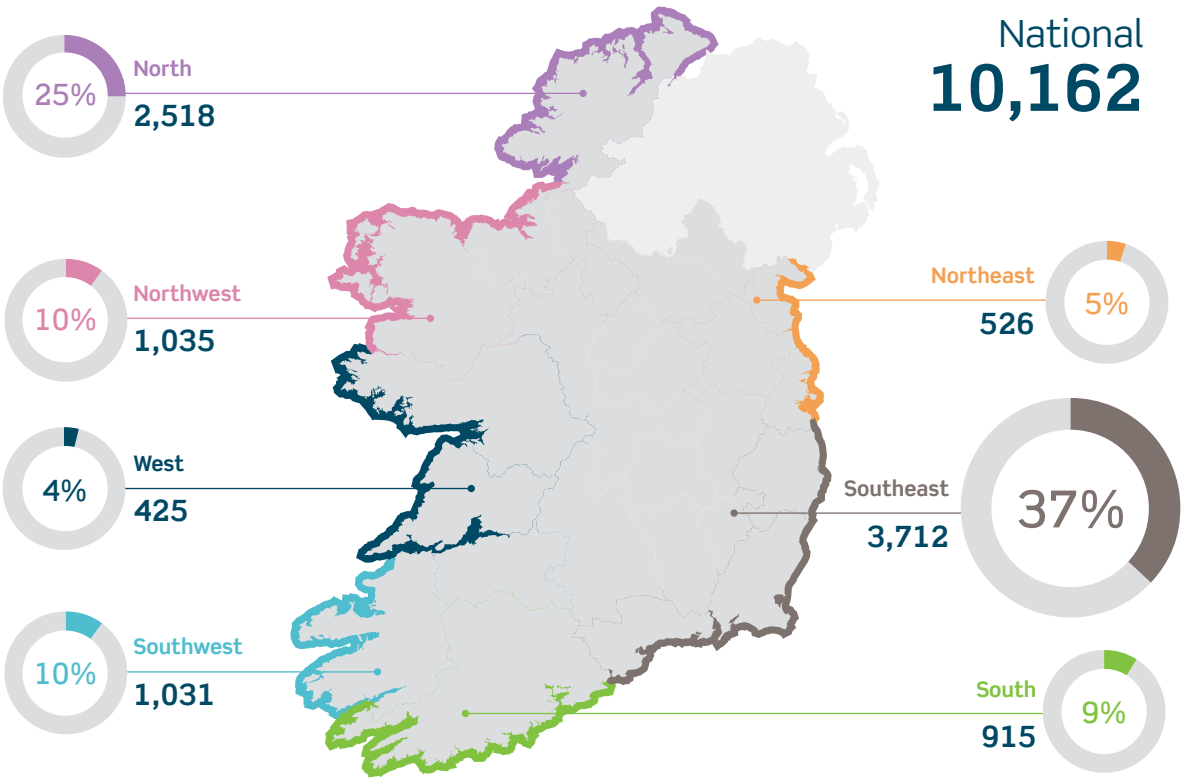


Mortality

Mortality in 2018 varied considerably from bay to bay within regions. The most severely affected regions were locations of the North west, South east and North east. Karenia blooms had severe effects on some seed batches off the West coast while localised occurrence of Vibrio based mortalities were reported for larger stock in the North west.

The most affected areas were bays of mid-Donegal, Clew Bay, the Shannon Estuary, Waterford Harbour and Carlingford Lough (40-80%). The bays of Galway, Dingle, Roaring Water Bay and Bannow had relatively lighter losses (<20%).

Figure 27: Regional Distribution of Farmed Oyster Output

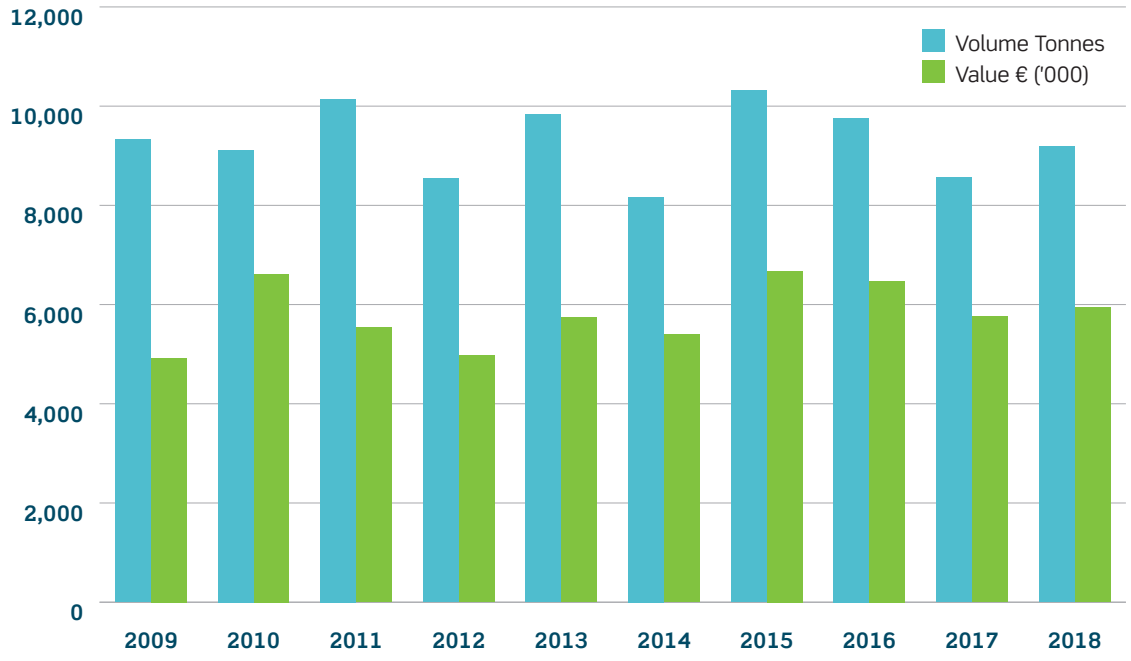


5.3. Rope Mussels

Output

Rope mussel *(Mytilus edulis)* production increased in 2018 by 7.5% in volume to 9,192 tonnes and 3.3 % in overall value to € 5.94 million. There was a slight decrease in average unit value from €673 euros per tonne in 2017 to €646 per tonne in 2018 for the fresh and processed markets.

Figure 28: Rope Mussel 10 Year Production



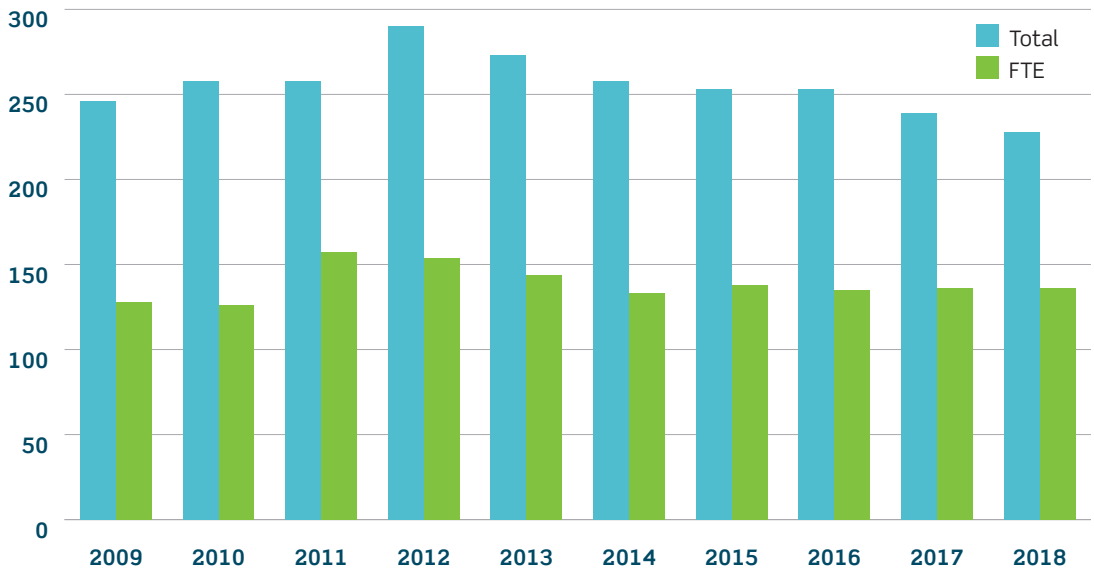
Employment and Production Units

The number of businesses operating was 55 with total employed of 228. Employment continues to decline as the sector streamlines into larger units with specialist crews and equipment servicing a greater number of sites. There is a move away from seasonal employment due to rising associated costs which also adds to the decrease in overall employment.

Seed is sourced mainly from collectors situated close to on-growing areas in the spring or from collected rock seed. Growth cycles vary from 1 to 2.5 years depending on the bay. Fresh product is mainly 55-70 mm shell length (110-80 pieces per kilogram).

Production is concentrated in the South and South west; Cork and Kerry and to a lesser extent in the North west, from Killary harbour to Mulroy Bay. While red tide closures obstruct continuous production flow, the biggest impediment to the sectors growth remain the reliance on those markets that have a large home production stock, leading to periods of over-supply.

Figure 29: Rope Mussel Total v FTE Employment – 10 Year Trend



Markets

The unit value for the fresh market varied considerably from bay to bay, from €490 per tonne to €764 per tonne depending on market timing and stock condition at time of harvesting window. France took 60% of fresh exports, while The Netherlands, UK and Italy took up smaller volumes.

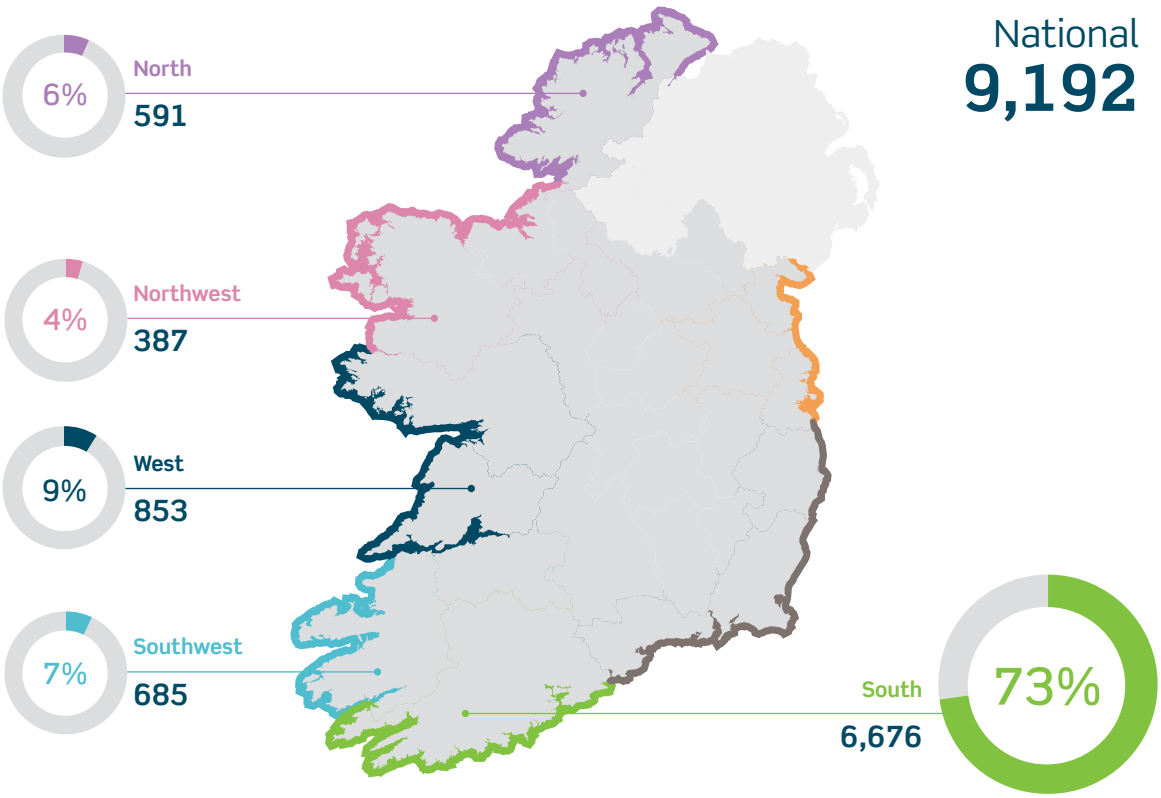
23% of the total volume went to processors for an average €598 per tonne which was then mainly exported. It is unclear from current surveying technique what proportion of total output went to the home market though localised attempts to expand this are occurring for example from Mulroy and Roaring Water Bay.

Structures

Suspended, Head-Rope systems used varies by location. Continuous new Zeeland rope is favoured by larger operators in such locations as Bantry, Killary and Roaring Water Bays. Swedish Strap is used in Kenmare Bay while traditional rope is used among the smaller operators in Roaring Water Bay. Recycled pergolari material is used in Killary Harbour.

The maximum capacity is 15,000 tonnes though this is rarely reached due to restrictions in harvesting opportunity and market trends.

Figure 30: Regional Distribution of Rope Mussel Output

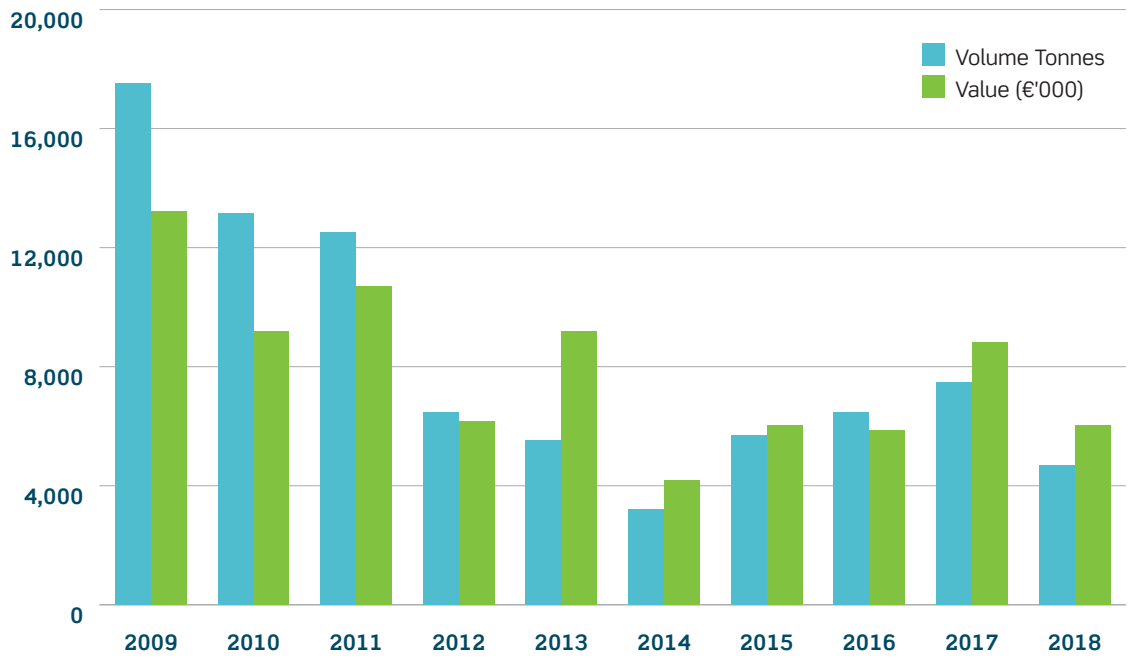


5.4. Seabed Cultured Mussels

Output

Seabed Cultured or Bottom mussel production declined in 2018 by 37% by volume, standing at 4,697 tonnes with a decrease in value of 31% to €6 million, with an average unit value of €1,283. Unit value ranged from €800 to €1,900 per tonne.

Figure 31: Bottom Mussel 10 Year Production



Production Cycle

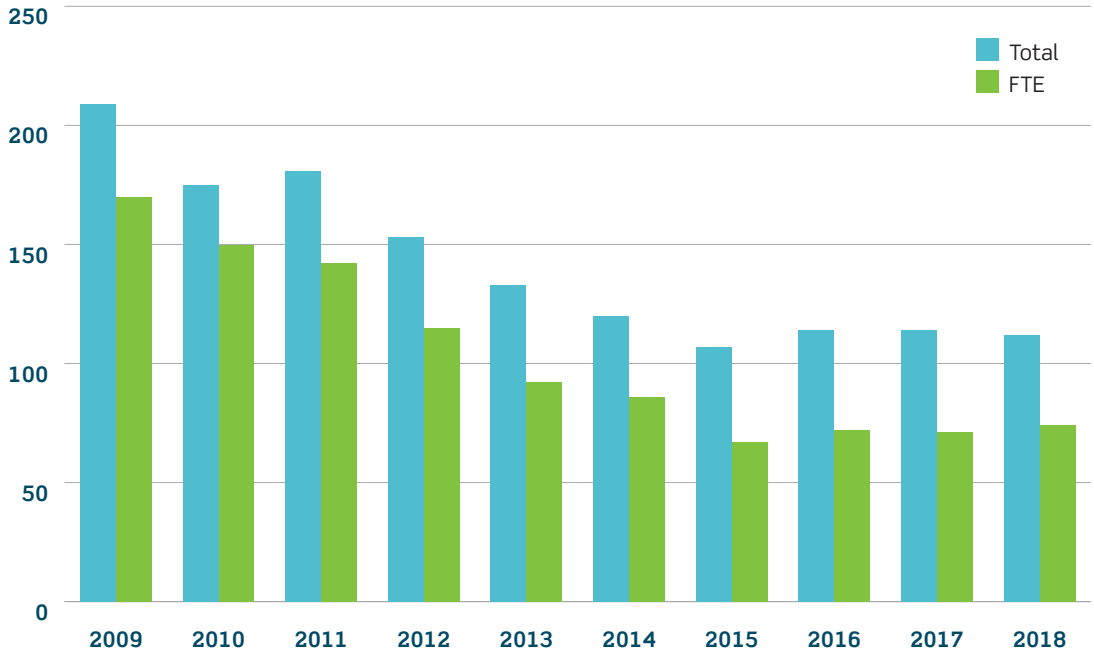
Wild seed is transferred from 20mm shell length (600 pieces per kilogram) from the Irish Sea or from local seed beds and harvested from 1 to 2.5 years later at 55 to 70 mm shell length (80 to 110 pieces per kilogram). The smaller size product (all are sold fresh) may be on-grown or sold as consumer-ready while the Dutch market favour the larger sizes for consumption.

The maximum capacity is 3,000 licenced hectares plus order ground which has held up to a maximum stock of 30,000 tonnes. Production is limited by stock management issues, rather than licensed ground capacity.

Employment and Production Units

The sectors businesses, recently decreased in number by several poor seed settlement years continue in the face of overall declining seed stocks. Despite the seed shortage, poor unit prices, and debilitating uncertainty both in terms of seed management and political issues, the segment shows remarkable resilience and continues with 24 businesses, employing 108 persons directly, mainly full-time.

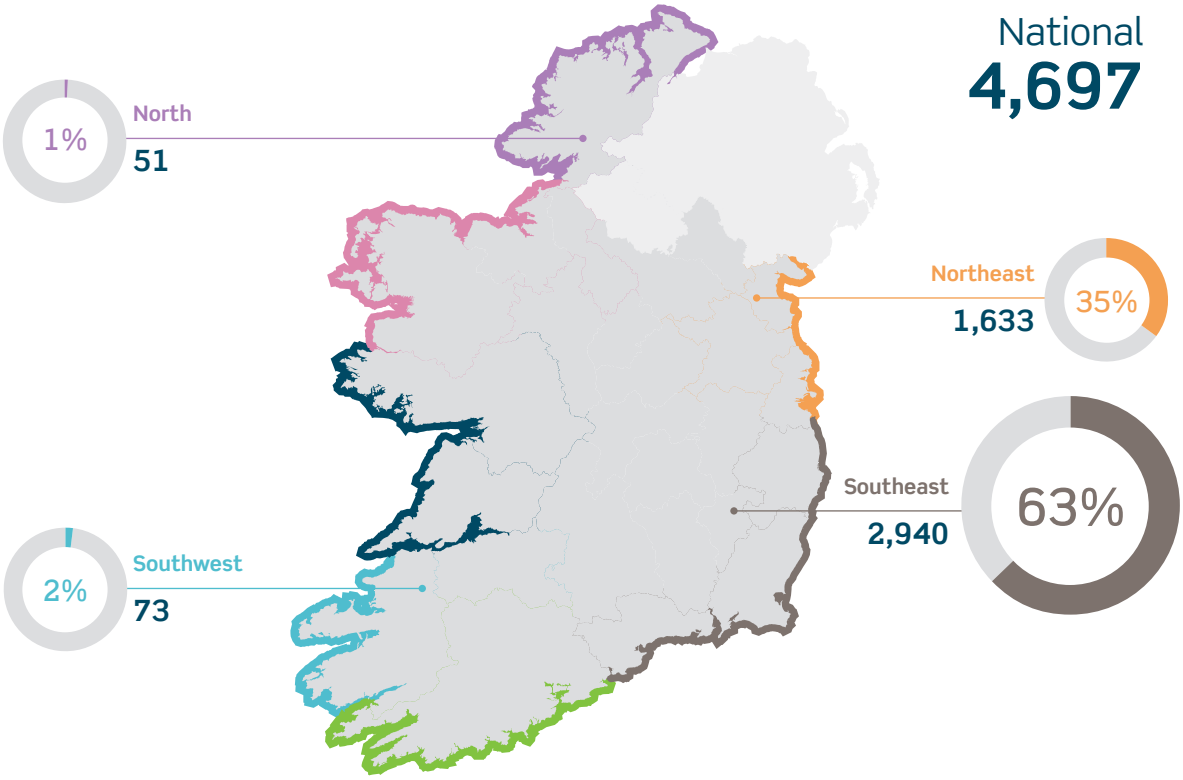
Figure 32: Bottom Mussel Total v FTE Employment – 10 Year Trend



Locations

The sector operates currently in Carlingford Lough, Wexford Harbour Castlemaine Harbour and Lough Foyle. The industry has not, thus far, recovered in the North-West. The industry continues to depend almost exclusively on the level of annual wild seed settlement for its stock input, while cost effective alternative sources are pursued.

Figure 33: Regional Distribution of Seabed Cultured Mussel Output



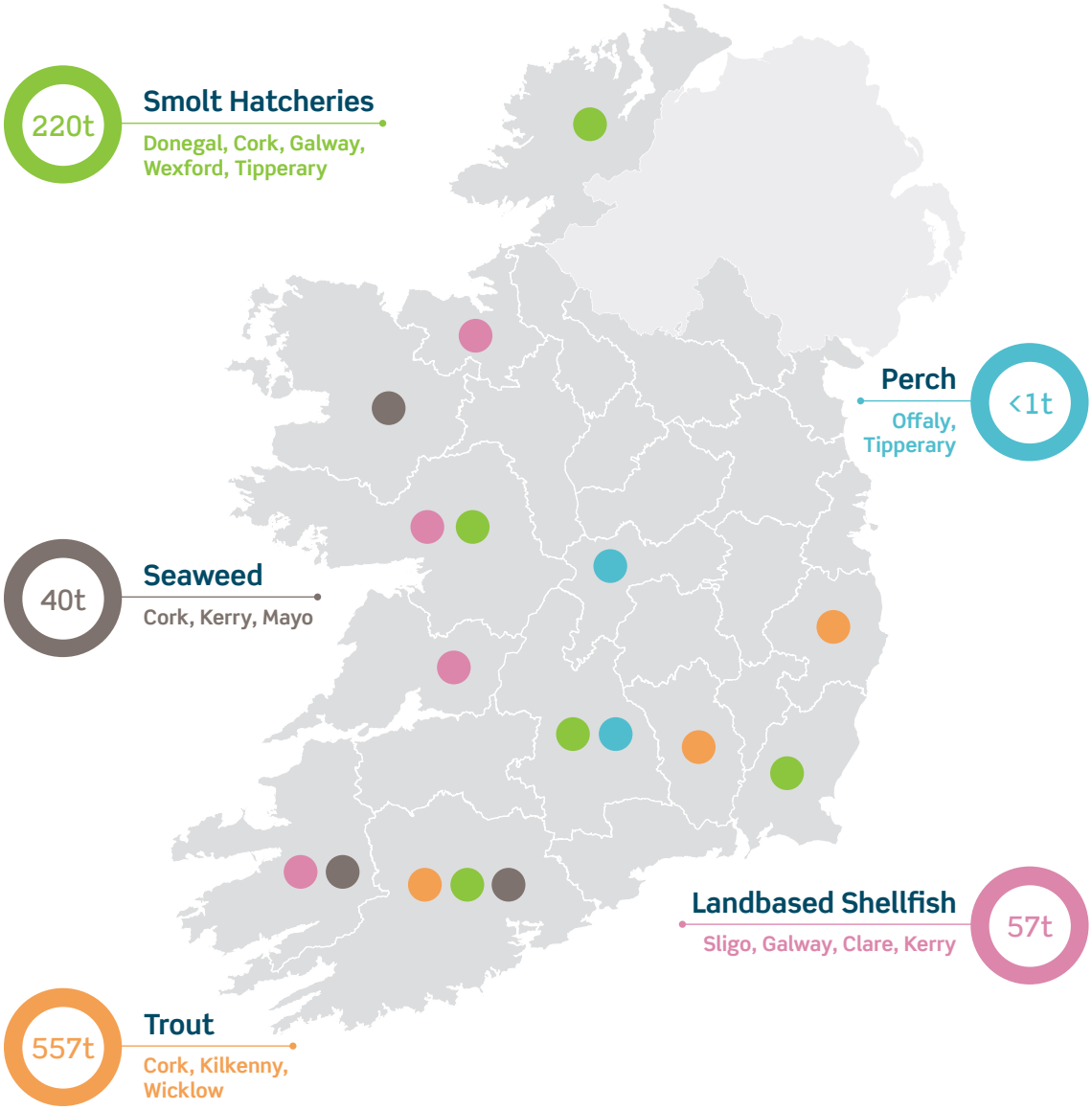
Markets

Product is exclusively exported, mainly to the Netherlands and France with the Dutch taking 55% and the French 41% of exports in 2018.

5.5. Other Sectors

Three hatcheries, based on the West coast, supply Oyster seed to local companies, though much of the seed needs to be imported from France and Britain. The Trout sector, based in the South east, has amalgamated farther with a slight decrease in volume, offset by a slight increase in unit value. A new land-based finfish company has commenced Rainbow trout, Perch and Pondweed production on Bord na Mona property on the Shannon catchment. Seaweed aquaculture, as opposed to the wild harvesting sector, remains a minor component of national output and with the other minor sectors, including Scallop, Perch, abalone and urchin species, remain below 60 tonnes in total output in 2018.

Figure 34: Location of Trout, Perch, Hatcheries and other Operations by County



6. Economic Performance

6.1. 2009 to 2018 Trends

Economic data indicates that total costs in Irish aquaculture are a major challenge to profitability. The years 2013 and 2015 were unprofitable but the industry had shown recovery from 2016. Provisional data for 2018 shows that overall there was a decline in net profit.

Figures 35-36: Aquaculture Economic Performance, 2009 to 2018

Figure 35: Aquaculture; Income v Costs over 10 years

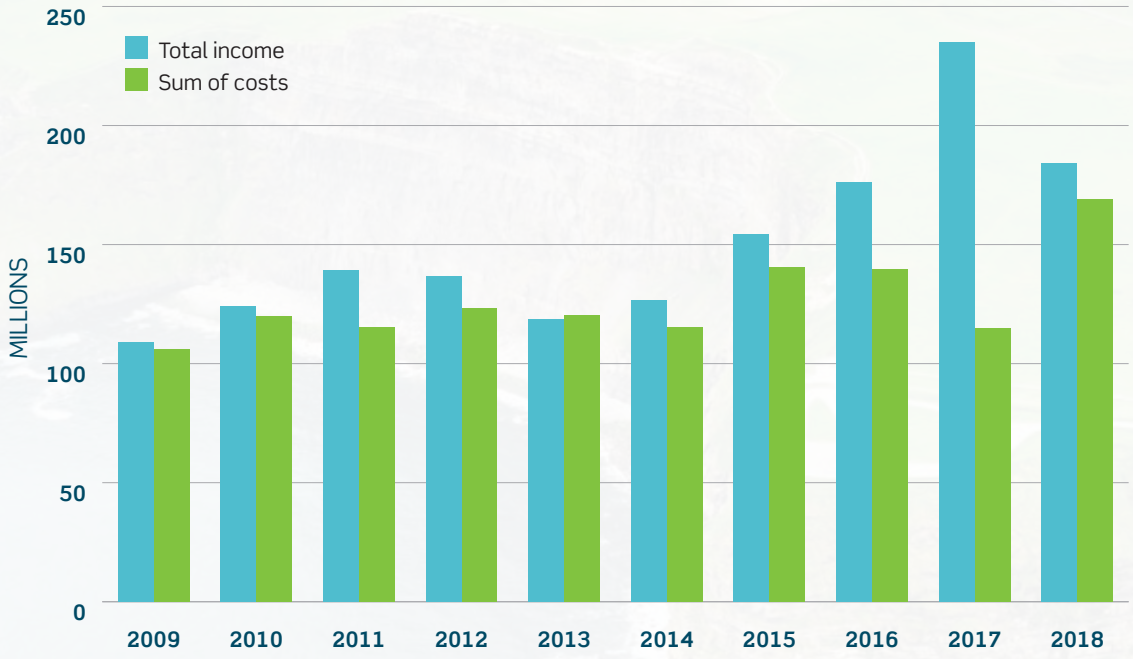
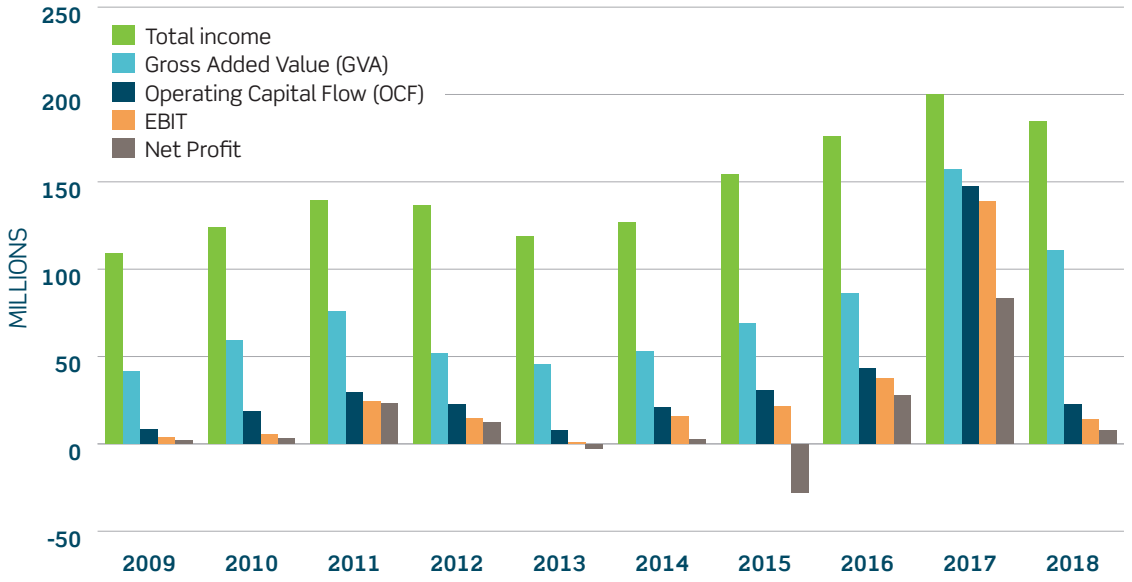


Figure 36: Aquaculture 10 Year Economic Performance Trend



6.2. Economic Performance by Segment

6.2.1. Salmon

The sector has managed to remain profitable throughout most of the 10 Year period, experiencing a non-profitable year in 2013. Income has increased from over €60 million in 2009 to over €160 million in 2017 but costs have also risen in the same period. Though the margin of profitability from costs seems to have increased from 2015 to 2017, the net profit indicator shows a more mixed performance.

Figures 37-39: On-grown Salmon, Economic Performance, 2009 to 2019

Figure 37: On-grown Salmon; Income v Costs 2009 to 2018

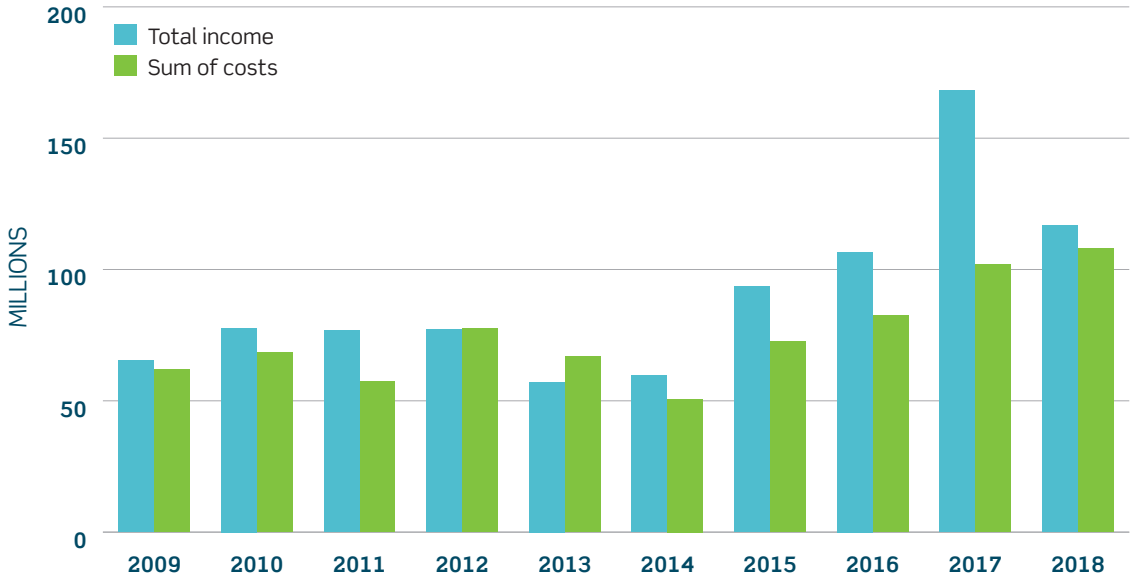


Figure 38: On-grown Salmon 10 Year Economic Performance Trend

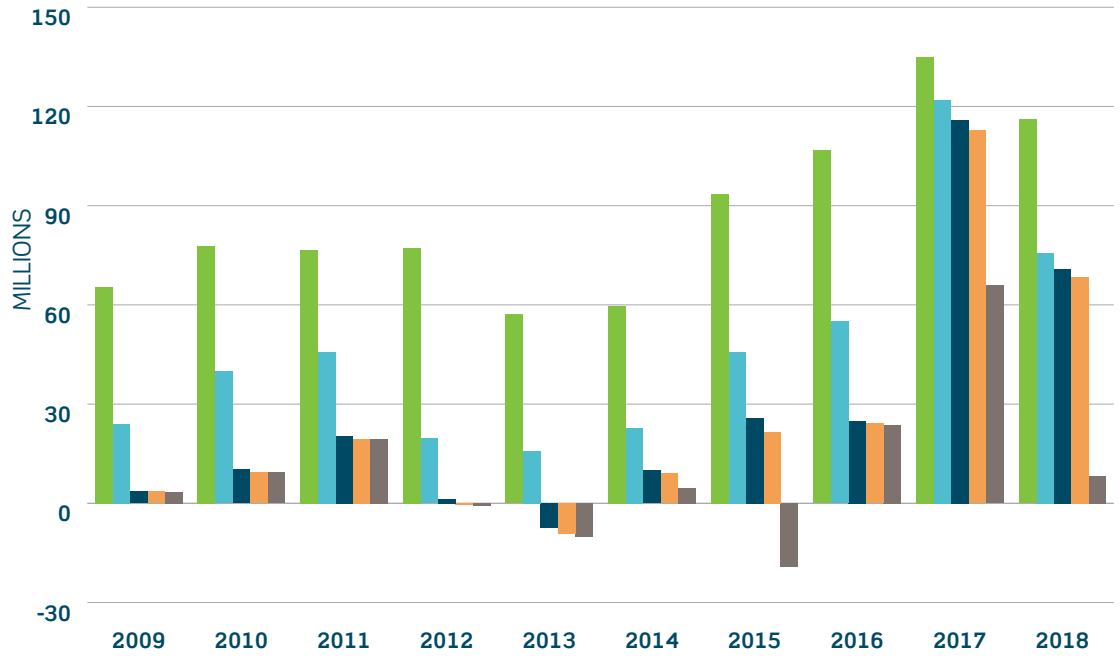


Figure 39: On-grown Salmon Costs in 2017

Wages and salaries	8%
Imputed value of unpaid labour	0%
Energy costs	1%
Raw material costs: Livestock costs	7%
Raw material costs: Feed costs	30%
Repair and maintenance	6%
Other operational costs	45%
Depreciation of capital	3%

6.2.2. Farmed Oyster

There has been variability in the margin between costs and income over a mainly profitable period, with 2013 to 2015 being the most difficult years. The overall trend has been an increase in margins (>20 million in 2018) and profitability (€16.7 million in 2018) from 2009 to 2018. The largest costs are labour and seed supply.

Figures 40-42: Farmed Oyster; Economic Performance, 2009 to 2018

Figure 40: Farmed Oysters; Income v Costs, 2009 to 2018

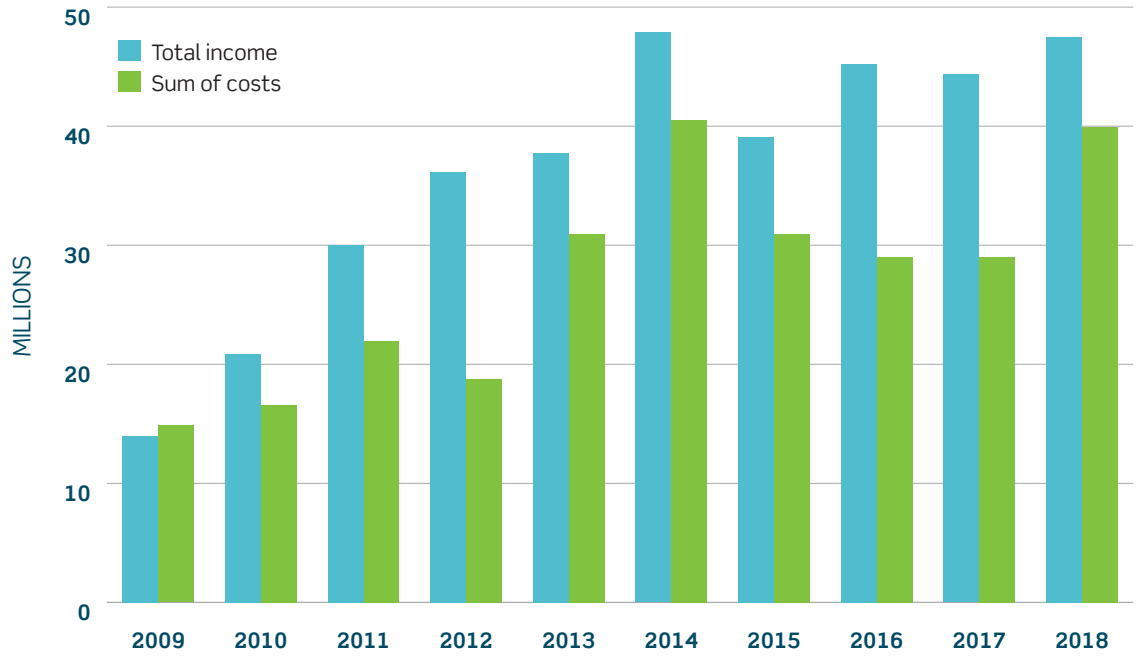
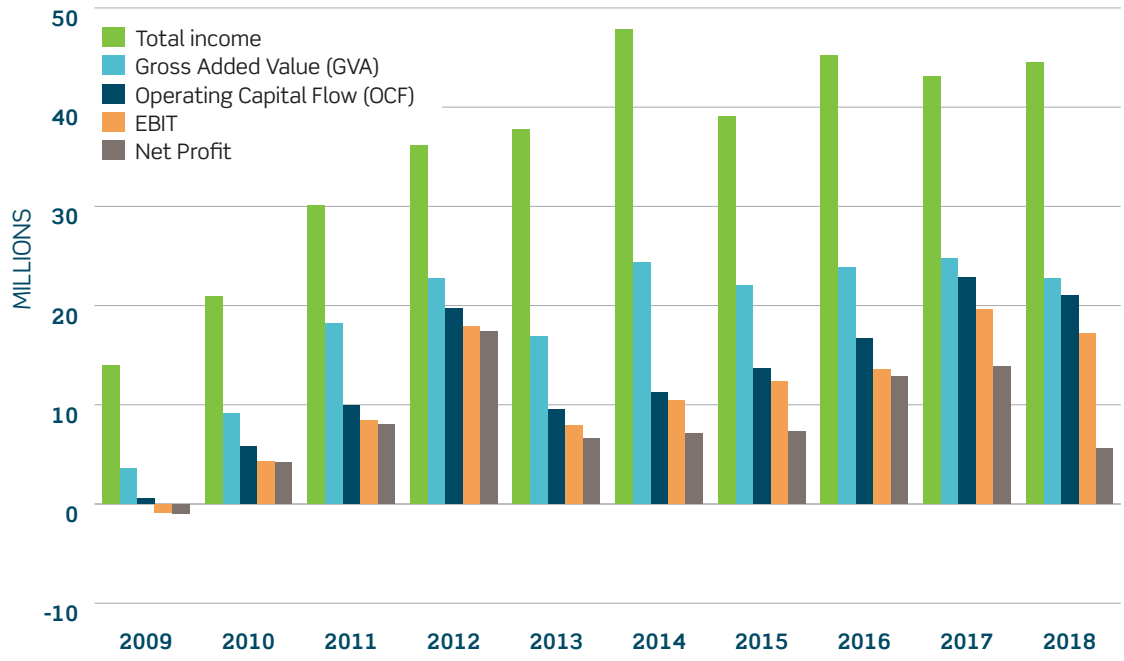


Figure 41: Farmed Oyster 10 Year Economic Performance Trend



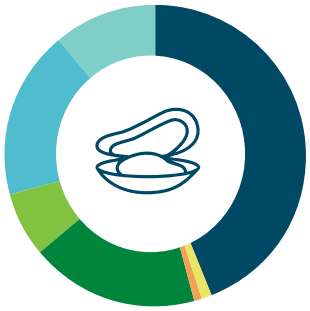


Figure 42: Farmed Oyster; Costs in 2017

Wages and salaries	44%
Imputed value of unpaid labour	1%
Energy costs	1%
Raw material costs: Livestock costs	18%
Raw material costs: Feed costs	0%
Repair and maintenance	7%
Other operational costs	18%
Depreciation of capital	11%

6.2.3. Rope Mussel

Although there are no significant seed supply or feed costs, the margins in this sector are relatively tight, with high labour costs and poor unit value of product determining profitability from year to year.

Figure 43: Rope Mussel; Income v Costs, 2009 to 2018

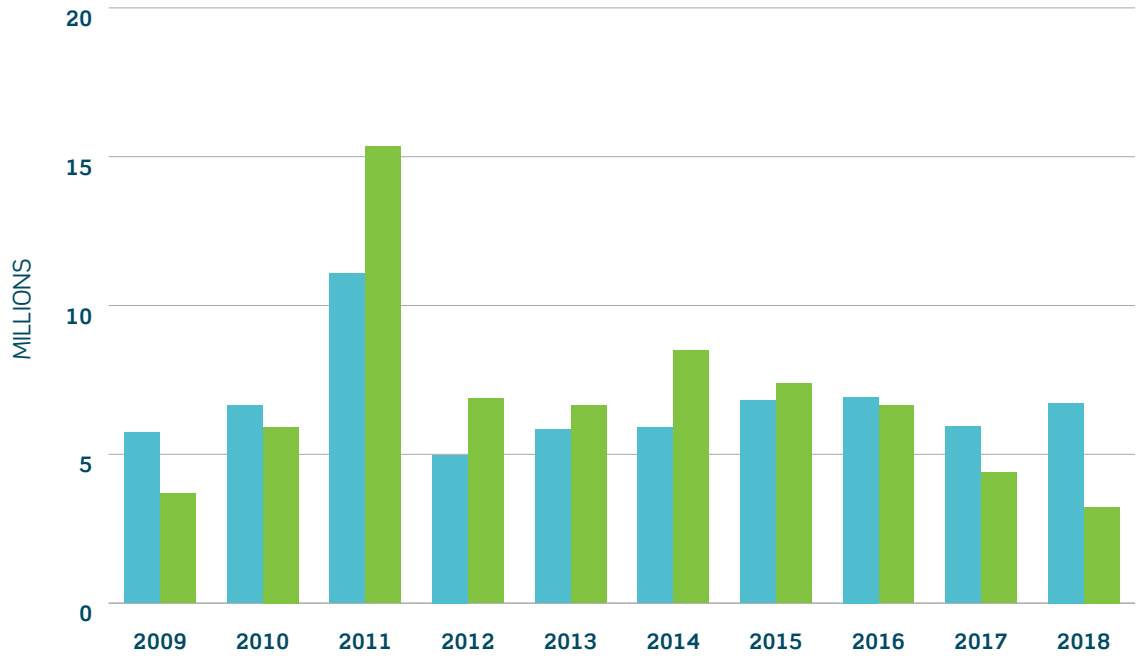
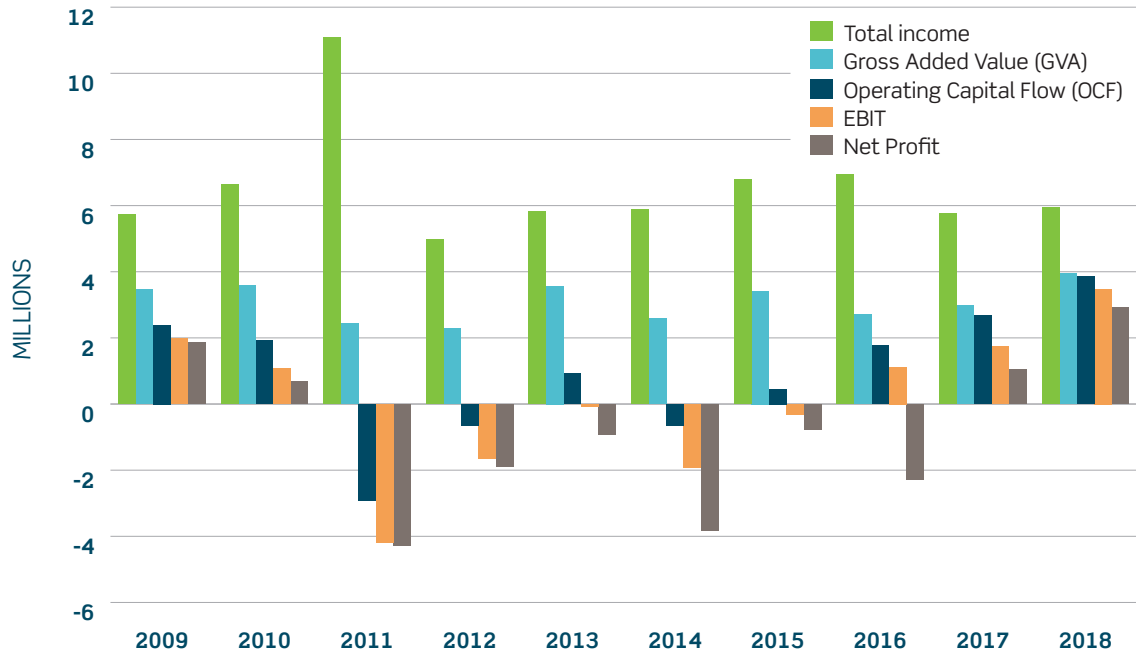


Figure 44: Rope Mussel 10 Year Economic Performance Trend



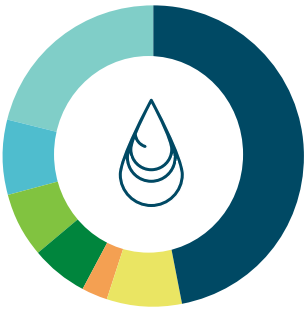


Figure 45: Rope Mussel; Costs in 2017

Wages and salaries	47%
Imputed value of unpaid labour	8%
Energy costs	3%
Raw material costs: Livestock costs	6%
Raw material costs: Feed costs	0%
Repair and maintenance	7%
Other operational costs	8%
Depreciation of capital	21%

6.2.4. Seabed Cultured Mussel

These have been difficult years for the Bottom mussel sector where the costs of running and maintaining a boat and crew and securing seed have eroded profit margins. This is particularly evident in 2010 and 2014-2016.

Figure 46: Bottom Mussels; Income v Costs, 2009 to 2018

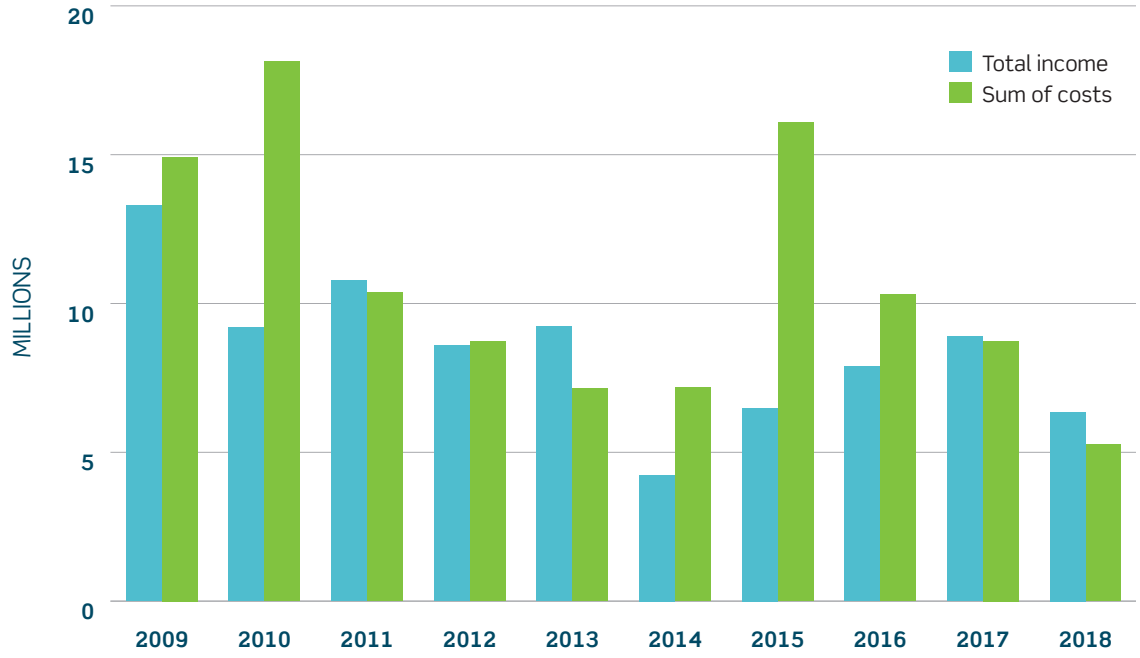


Figure 47: Bottom Mussels; 10 Year Economic Performance Trend

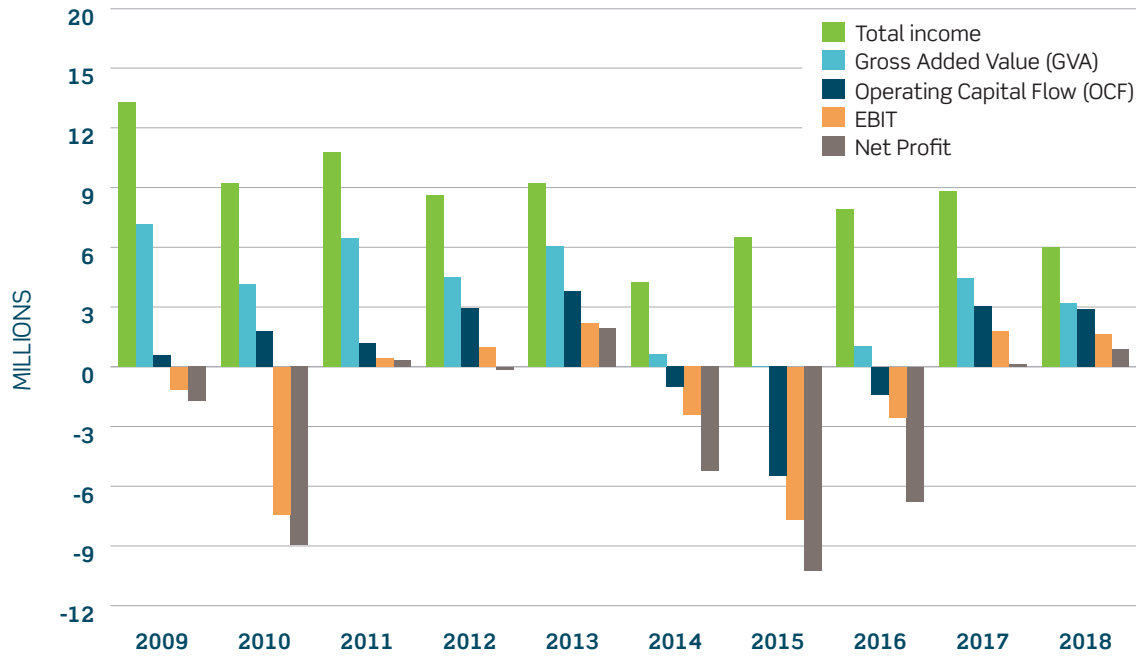


Figure 48: Bottom Mussels; Costs in 2017

Wages and salaries	31%
Imputed value of unpaid labour	0%
Energy costs	11%
Raw material costs: Livestock costs	12%
Raw material costs: Feed costs	0%
Repair and maintenance	18%
Other operational costs	13%
Depreciation of capital	15%

7. Features

7.1. IMTA in Irish Aquaculture

Integrated Multi-Trophic Aquaculture (IMTA) provides the by-products, including waste, from one aquatic species as inputs (fertilizers, food) for another. Farmers combine fed aquaculture (e.g., fish, shrimp) with inorganic extractive (e.g., seaweed) and organic extractive (e.g., shellfish) aquaculture to create balanced systems for environment remediation, economic stability (improved output, lower cost, product diversification and risk reduction) and social acceptability (better management practices).

An example of this in the Irish marine context would be a salmon, mussel-rope seaweed combination production system. Anecdotal evidence in support of this system comes from bays such as Lough Swilly and Killary Harbour where the removal and absence of salmon stock was considered to have a negative effect on mussel meat yield. Trials of this combination are ongoing in Bantry Bay.

IMTA development is also being investigated at freshwater sites including at cutaway peatland in County Offaly. The system is a freshwater IMTA, producing perch and trout in an innovative organic system using duckweed and algae. The farm is powered by wind energy generated at Mount Lucas windfarm. The project is being carried out by Bord na Mona in collaboration with BIM, Goatsbridge Trout Ltd, UCC and Keywater Fisheries Ltd. The project is part funded by the European Maritime and Fisheries Fund.

Freshwater IMTA IN County Offaly (BIM)

7.2. A good News Story, Irish Farmed Seafood Receives a Prized International Accolade!

On the 20 February 2019 The Global Sustainable Seafood Initiative (GSSI) provided formal recognition of the BIM Certified Quality Aquaculture (CQA) scheme for Irish aquaculture products. The highly prestigious GSSI recognition shows that the BIM Farm Standard (Issue 1, Revision 1, November 2018) is in alignment with all applicable Essential Components of the GSSI Global Benchmark Tool (version 1.0, 8 October 2015).

This is a great outcome for farmed Irish Seafood as it 'future proofs' the provenance of our products and gives our producers access to the premium markets.

The BIM Certified Quality Aquaculture (CQA) scheme is only the eighth seafood certification scheme, and only the fourth aquaculture certification, to be benchmarked against GSSI's Global Benchmark Tool and to achieve recognition. The BIM Certified Quality Aquaculture (CQA) scheme is also the first government run scheme to achieve this much sought-after recognition.

GSSI is a benchmark platform that brings partners together from across the seafood sector worldwide to share knowledge and drive change by coming up with solutions to challenges in the sector.

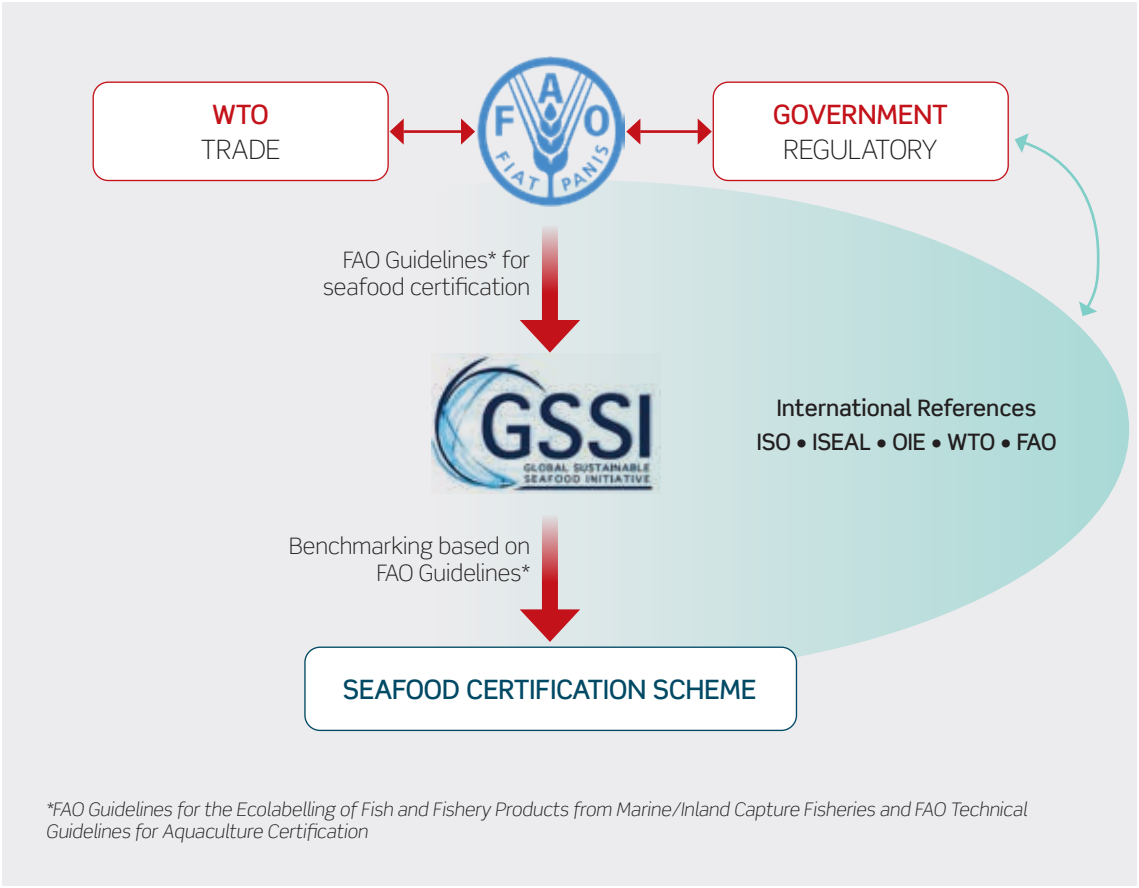
It was set up, under the aegis of the UN FAO to bring more clarity into the marketplace due to the growing number of seafood certification schemes and to ensure consumer confidence in certified seafood, helping to make purchasing decisions more efficient by offering greater choice and driving down costs, while at the same time promoting environmental sustainability.

GSSI used a number of key reference documents as its basis. These included the FAO Code of Conduct for Responsible Fisheries (CCRF), the FAO Guidelines for Ecolabelling of Fish and Fishery Products from Marine/ Inland Capture Fisheries and the FAO Technical Guidelines for Aquaculture Certification (FAO Guidelines) as the foundation to create a Global Benchmark Tool for seafood certification schemes. Through its Global Benchmark Tool GSSI works towards its collective objective to minimize the overall environmental impact of how we catch, grow and deliver seafood to meet a growing global demand.

The GSSI Tool is made up of 3 parts: a Benchmark Process, a Benchmark Framework with Essential and Supplementary Components and a Result. Seafood Certification schemes must go through an exhaustive 7-step Benchmark Process to be recognized by GSSI. The intention behind carrying out the Benchmarking exercise is for a seafood certification scheme to achieve equivalence and public recognition by GSSI as meeting the benchmark standard.

In turn the holders of the BIM CQA standards gain added value from participation as a result of GSSI "equivalence" status and thus stay ahead of emerging market demands so as to allow them to "choose the right customers" and occupy the top value niches in the marketplace.

How it all fits together



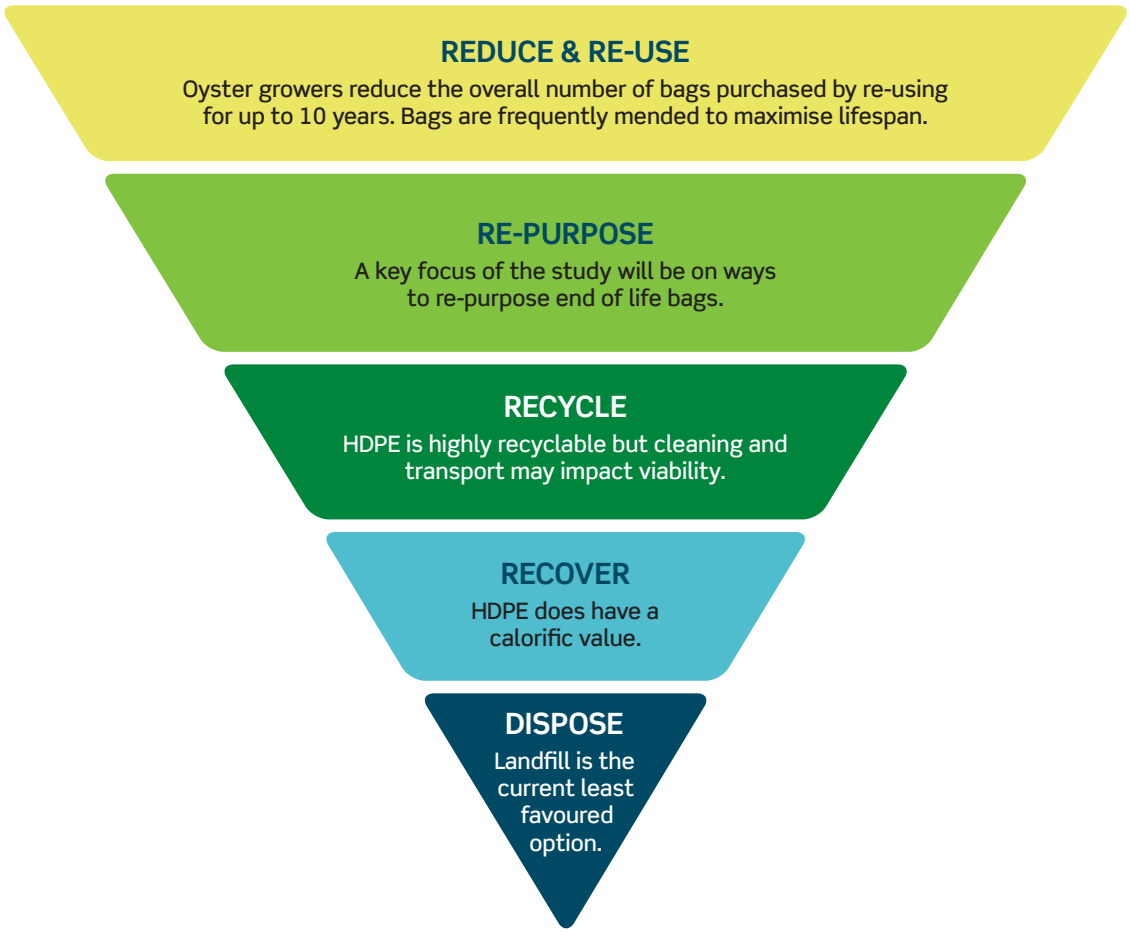
Organic Salmon Production in Ireland

The production of organic salmon has been a success story of the organic movement in Ireland with 100% of the total salmon production now certified as organic under the EU Organic Regulations. Due to its geographical location the hydrography off the west coast of Ireland provides unique salmon producing conditions: the fish are grown in exposed marine sites, experiencing stronger tidal currents and higher wave energy due to gentle sloping continental shelf. This in turn produces distinctive firm textured flesh. On average, the organic salmon has more than 10,000 cubic meters of water to swim around in. The stocking densities in Ireland's organic salmon production are very low (10kg/m3) compared to other producing nations: maximum of 1% fish to 99% seawater, which effectively means that every two fish share 1,000 litres of pure seawater. This fact along with strong marine currents contribute to a very high-quality product and today, Irish Organic Salmon is widely recognised internationally as a premium product of consistent high quality, with a long history of export to leading markets.

7.3. Recycling in Aquaculture; Farmed Oysters

During 2019, BIM were involved in a study to find an environmentally sound and cost effective long-term solution for end of life oyster bags. The bags, comprised of High-density Polyethylene (HDPE) mesh can have a usable lifespan of up to 10 years. Several oyster farmers are storing these bags in anticipation of an alternative solution to landfill becoming available. They prove difficult to recycle due to fouling and salt from their time in the marine environment. One of the major manufacturers is currently recycling bags, but energy and costs associated with cleaning and transport may impact the viability of this as a sustainable solution for the Irish sector. It is possible that bags could be repurposed rather than recycled. We are excited to explore opportunities to develop circular solutions for this problematic waste stream.

The Waste Pyramid for an End of Life HDPE Oyster Bag



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Scientific, Technical and Economic Committee for Fisheries (STECF) – Economic Report of the EU Aquaculture sector (STECF-18-19). Publications Office of the European Union, Luxembourg, 2018, ISBN 978-92-79-79402-5, doi:10.2760/45076, JRC114801

Acknowledgements

The ESSU would like to thank all specialists and regionally based staff who contribute annually to the collection of data presented in the annual aquaculture survey. The unit wishes to thank in particular; Vera Flynn, Damien Toner and Grainne Devine for their feature contributions.

Appendices

Appendix 1: Aquaculture Production Outputs by Volume (Tonnes) and Value (000's €), 2009 to 2018, Using Census Survey Estimates

Irish Aquaculture Production 2009-2018 VOLUME (tonnes)										
	2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Rope Mussel	9,330	9,116	10,147	8,544	9,834	8,169	10,318	9,760	8,558	9,192
Relaid Rope Mussel Seed										
Bottom Mussel	17,521	13,168	12,524	6,484	5,527	3,206	5,697	6,475	7,491	4,697
Pacific Oyster	6,488	7,051	7,700	7,366	8,181	8,888	9,073	9,681	9,834	10,122
Native/Edulis Oyster	358	219	272	247	459	555	474	380	237	247
Clam	162	180	150	30	4	-	-	-	-	-
Scallop	55	59	47	45	37	26	50	33	4	3
Shellfish Other*	-	2	2	11	43	74	74	54	96	97
Shellfish	**33,914**	**29,795**	**30,842**	**22,727**	**24,085**	**20,918**	**25,686**	**26,383**	**26,220**	**24,358**
Salmon ova/smolt*	196	358	489	451	473	488	527	610	528	220
Salmon Volume	12,210	15,691	12,195	12,440	9,125	9,368	13,137	16,299	18,342	11,984
Sea reared Trout	478	434	600	180	180	80	98	-	-	-
Freshwater Trout	896	668	601	601	728	728	705	705	647	557
Others**	62	64	56	50	80	78	45	15	-	-
Finfish	**13,842**	**17,215**	**13,941**	**13,722**	**10,586**	**10,741**	**14,512**	**17,629**	**19,517**	**12,761**
Aquaculture Volume (t)	**47,756**	**47,010**	**44,783**	**36,449**	**34,671**	**31,659**	**40,198**	**44,012**	**45,737**	**37,119**
Seaweed	3	3	3	9	42	70	70	50	41	40

Irish Aquaculture Production 2009-2018 VALUE (€'000)										
	2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Rope Mussel	4,923	6,617	5,537	4,969.00	5,736	5,395	6,673	6,473	5,760	5,942
Bottom Mussel	13,213	9,192	10,691	6,157.00	9,173	4,182	6,016	5,859	8,830	6,024
Pacific Oyster	13,685	20,579	28,566	34,217.00	37,466	39,242	35,206	41,903	43,033	44,304
Native Oyster	1,455	877	1,294	1,204.00	2,441	2,862	2,600	2,259	1,374	1,783
Clam	1,093	1,155	903	159.00	80	-	-	-	-	-
Scallop	386	347	297	210.00	194	133	234	158	13	12
Shellfish Other	29	28	36	60.00	82	235	528	383	342	347
Shellfish Value (€'000)	**34,784**	**38,795**	**47,324**	**46,976.00**	**55,172**	**52,049**	**51,257**	**57,035**	**59,352**	**58,412**
Salmon ova/smolt**	1,874	2,012	3,468	5,687.00	3,261	3,203	4,845	4,167	5,086	5,118
Salmon	65,368	77,609	73,324	75,701.00	55,680	57,725	89,836	104,478	133,519	114,509
Sea reared Trout	1,667	1,933	2,000	648.00	648	440	500	-	-	-
Freshwater Trout**	2,579	1,960	1,934	1,784.00	2,147	2,147	1,962	1,934	1,971	1,590
Others**	506	460	399	322.00	507	546	266	105	-	-
Finfish Value (€'000)	**71,994**	**83,974**	**81,125**	**84,142**	**62,243**	**64,061**	**97,409**	**110,684**	**140,576**	**121,217**
Aquaculture Value (€'000)	**106,778**	**122,769**	**128,449**	**131,118**	**117,415**	**116,110**	**148,666**	**167,719**	**199,928**	**179,629**
Seaweed	3	3	3	9	42	70	70	50	41	40

Appendix 2: Aquaculture Employment and Production by Culture Groups and FLAG Regions in 2018, Using Alternative Sample Based Estimates

Variables	Total FT Male	Total FT Female	Total PT Male	Total PT Female	Total Casual Male	Total Casual Female	Total Employed	Total FTE	Total PU Count	Total Vol	Total Value
Total for 2018	**671**	**40**	**405**	**50**	**729**	**54**	**1948**	**1073.9**	**283**	**37,205**	**178,988,481**
Bottom Mussel	51	3	32	0	25	1	108	74.3	29	4,696	6,024,218
Bottom Oyster	3	0	5	0	480	17	505	89.2	13	250	1,376,150
Caged Salmon	125	2	48	4	0	0	179	153.0	16	11,983	114,509,120
Minor Finfish	11	0	2	2	2	0	17	13.3	5	557	1,590,000
Other Minor Cultures	4	2	7	4	10	4	31	13.8	9	126	347,400
Rope Mussel	73	7	85	8	46	9	228	135.7	56	9,192	5,941,667
Salmon Hatchery	27	3	9	2	3	0	47	36.5	10	237	4,693,321
Trestled Oyster	377	23	217	30	163	23	833	558.0	145	10,161	44,506,603

FLAGS	Total PU	Total FTE	Total Employed	Total Volume	Total Value
NORTH	58	269	469	6,066	38,127,269
NORTHEAST	10	52	65	2,160	3,940,751
NORTHWEST	32	109	217	4,067	43,920,211
SOUTH	48	143	225	9,465	21,619,250
SOUTHEAST	32	192	245	7,264	22,988,829
SOUTHWEST	53	150	418	4,357	24,415,016
WEST	50	158	324	3,826	23,977,154
Grand Total	**283**	**1,074**	**1,963**	**37,206**	**178,988,481**

Appendix 3: Aquaculture Economic Data; 2009 to 2017 (2018 Projection), Using DCF Data Estimates

Aquaculture Economic performance 2009 to 2018										
Variables	**Year**									
	2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Turnover	106,566,401	122,549,552	128,481,409	130,349,969	117,724,288	116,298,661	148,594,293	167,724,372	200,017,543	178,988,481
Total income	**108,991,580**	**124,195,520**	**139,387,364**	**136,543,333**	**118,741,434**	**126,521,383**	**154,505,319**	**176,106,777**	**234,990,748**	**184,367,494**
Wages and salaries	25,127,679	27,391,783	23,501,268	37,911,057	23,556,423	28,256,803	30,872,908	27,854,618	26,830,773	33,380,505
Mean Wage FTE	25,746	28,774	24,520	39,651	24,628	30,015	31,395	27,134	26,150	30,826
Imputed value of unpaid labour	2,276,923	945,322	2,082,785	2,396,209	1,347,506	1,789,891	1,517,451	1,416,301	852,315	1,991,864
Energy costs	1,748,193	3,300,105	6,070,959	10,186,902	11,053,024	3,782,682	4,160,373	4,988,212	2,693,931	5,384,610
Raw material costs: Livestock costs	10,872,951	7,614,269	5,351,171	13,704,060	14,632,886	14,678,690	28,504,784	16,886,284	14,280,006	10,819,745
Raw material costs: Feed costs	28,694,758	25,515,930	27,744,967	22,299,924	23,465,062	24,903,003	20,100,628	36,196,864	31,099,907	21,395,466
Repair and maintenance	7,657,880	5,778,029	7,291,398	10,551,902	11,409,961	7,034,956	9,412,331	9,851,804	9,721,112	7,048,015
Other operational costs	25,996,863	34,794,993	39,011,346	18,633,923	26,211,630	25,238,866	29,141,074	33,084,156	18,099,786	81,130,264
Depreciation of capital	4,503,779	13,288,294	5,667,882	8,058,174	6,926,407	5,028,579	9,132,866	5,745,397	9,057,950	8,467,583
Financial costs, net	1,368,332	2,422,518	847,989	2,097,932	3,025,541	6,367,228	8,979,875	4,877,908	3,084,344	1,293,733
Extraordinary costs, net	-	29,729	-	-	365,602	6,997,236	40,242,642	4,914,061	47,924,575	5,308,483
Total value of assets	168,710,773	170,907,154	142,624,637	189,743,450	165,109,019	199,768,441	175,865,728	190,942,888	194,431,686	243,987,373
Net Investments	18,461,191	8,736,814	3,641,940	2,338,292	3,893,007	20,441,417	3,833,551	7,208,575	7,639,443	12,508,272
Debt	65,252,054	105,570,813	101,609,152	125,647,212	85,266,379	85,968,019	76,138,898	84,362,877	66,635,403	103,021,606
Raw material volume: Livestock	25,260	23,851	21,903	15,221	15,598	15,866	17,592	15,612	14,083	9,958,020
Raw material volume: Feed	16,641	20,486	16,784	16,165	11,049	17,030	13,333	23,883	22,576	14,802
Total sales volume	47,408	46,662	44,789	36,197	34,667	31,659	40,128	44,018	45,726	37,206

Economic Indicator										
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total sales volume	47,408	46,662	44,789	36,197	34,667	31,659	40,128	44,018	45,726	37,206
Total income	108,991,580	124,195,520	139,387,364	136,543,333	118,741,434	126,521,383	154,505,319	176,106,777	234,990,748	184,367,494
Gross Added Value (GVA)	41,700,316	59,331,794	76,064,597	51,924,174	45,251,507	53,180,386	69,049,708	86,105,227	150,927,429	123,812,856
Operating Capital Flow (OCF)	8,045,573	18,758,771	29,761,853	22,738,350	7,629,916	20,906,564	30,496,302	43,169,267	84,985,972	36,773,394
EBIT	3,541,794	5,470,477	24,093,972	14,680,176	703,509	15,877,985	21,363,436	37,423,870	74,460,858	27,059,317
Labour productivity	42,726	62,326	79,361	54,308	47,311	56,491	70,219	83,879	147,101	114,992

Notes

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