





## Contents

<b><u>1. Maximisation of socio-economic benefits – how can aquaculture activities be beneficent for: .....</u></b>	<b><u>3</u></b>
1.1. Sustaining employment and livelihoods .....	3
1.2. Enhancing edible supplies of seafood.....	8
1.3. Contributing to national tax revenue.....	11
<b><u>2. Minimisation of environmental damage - how can aquaculture activities be beneficent for: .....</u></b>	<b><u>15</u></b>
2.1. Minimising pollution and water quality impacts .....	15
2.2. Minimising visual intrusion and landscape impacts .....	18
2.3. Minimising impact on natural seafood stocks .....	21
<b><u>3. SWOT analysis of the aquaculture social acceptance in the region / country ....</u></b>	<b><u>27</u></b>
3.1. Strengths .....	27
3.2. Weaknesses .....	29
3.3. Opportunities.....	31
3.4. Threats .....	33
<b><u>4. Summary of the information .....</u></b>	<b><u>35</u></b>
<b><u>5. Methodologies used for collecting information.....</u></b>	<b><u>39</u></b>



# 1. Maximisation of socio-economic benefits – how can aquaculture activities be beneficent for:

## 1.1. Sustaining employment and livelihoods

### Portugal:

Portugal has a long-standing tradition and history in fisheries. Despite its limited contribution to the gross domestic product (GDP), the Portuguese fisheries' sector represents a primary sector of significant socio-economic importance, particularly in coastal areas.

Aquaculture in Portugal does not represent more than 6 % of the catches; however, it is growing rapidly and could become an important activity for the fisheries sector. At the same time, it offers other socio-economic benefits like employment opportunities and contributes to local coastal economies.

In 2013, the aquaculture sector produced 10 300 tonnes, corresponding to EUR 53.7 million. In the same year, Portuguese aquaculture comprised 1 443 farms employing 2 572 workers, or 2 083 FTEs (full time equivalents).

Portugal is by far the main fish consumer inside the EU 27 with 56.9 kg per capita/year, while the EU average is 21.4 kg/ head/year. However, Portuguese consumers are skeptical about aquaculture. This might be related with unconstructive messages, commonly spread among consumers, which result in the preconceived idea that seafood from aquaculture is generally of a worse quality compared to wild fisheries. Vast improvements in the public image of the aquaculture sector need to be undertaken. Stakeholders have the huge challenge of clarifying consumers about the positive aspects of aquaculture products and in the demystification of several erroneous ideas.

Most Portuguese farmers work with typical extensive and semi-intensive systems in earth ponds and cannot compete with other EU producing countries which rely mostly in intensive systems with higher densities and lower production costs. Therefore a huge marketing effort should also be made near consumers in order to distinguish between products from different origins and to promote extensive and semi-intensive fish as high quality goods. New niche markets to these high quality products should then be created and explored, internally but also for export. Still, Portuguese consumers are very skeptical concerning aquaculture products. An effort to demystify some of these misconceptions and promote aquaculture products as high nutritional value, high quality, easily available, highly controlled, healthy and safe food, is urgent.

Employment in the aquaculture industry in Portugal for 2011, represented 2.316 direct jobs where 18% were women, and with only 5 companies employing more than 10 people. Most of the workers have low qualifications and working within a family business, but there are also a significant number of people with higher education (university level). The national production of aquaculture for 2012 only contributed 5.4 % (10.317t) to the total seafood landings, and therefore cannot yet be considered an alternative to the traditional fisheries sector.

## Spain:

Among the 35 respondents the majority stated that they do think that aquaculture activities in Andalusia have the potential to provide employment, as the sector is growing and will therefore create direct and indirect staff needs. Indirect needs would include secondary activities resulting from the primary aquaculture activities, i.e. production; these include, for example, animal care, veterinary and quality control, product transformation, feed, construction of installations, processing, packaging, among others. However, none of the replies were a clear “yes”, especially in terms of long-term or sustainable employment and livelihoods. The general consensus was that it depends on numerous factors and/or conditions, for example, there must be more interest and commitment from public administration, as well as a more structured development of the sector. Moreover, it depends on the type of aquaculture, and access to qualified staff required for the majority of the positions. In general, respondents seem to think that aquaculture activities have the potential to create employment, but there remain numerous limiting factors and the sector is not sufficiently developed yet.

When considering the different sectors, the industry states that currently the aquaculture sector is not considered by the public administration as a sector that creates stable employment and/or economic wealth. However, by establishing a network and cooperation between research and industry it could become more sustainable in sustaining employment and livelihoods. The response from the general public also shows that there is potential but it depends on how the sector will develop and competition from other countries, for example. The academic view in this regard was that there are many influencing factors, like any sector, resulting more from the politics in the respective country than from the sector itself. It can create jobs, but it's not a wide-ranging sector that offers many employment opportunities. The response from public administration seemed to be more focused on the fact that the sector can offer stable employment, but this is dependent on availability of the required expertise.

Finally, when asked if the respondents knew of any regional or local funding mechanisms aimed at creating sustainable employment in the aquaculture sector, the reply was either that there are no mechanisms or that they didn't know of any.

## France:

There is a strong support from regional and local authorities to increase the number of jobs in aquaculture in Brittany. The European funds from the European Maritime and Fisheries Fund is a key tool in this respect. The creation of jobs in aquaculture is viewed as a mean to boost the regional economy and to create other activities such as maintenance or navigation.

However, the sector is not structural for the local economy yet as it is not able to employ employees during the whole year according to representatives of the CRC Bretagne Nord. The aquaculture sector in Brittany is dominated by shellfish culture and the latter employs workers during the high season, which is in winter. During the other months, the aquaculture sector is not employing enough persons to be considered as being structural for the region. Thus, this argument can be contested by local population and is hardly useable to raise the acceptability level.

Academic researchers explained that overall, compared to other regions in France, aquaculture is having an important role in the economy of Brittany.

According to administrative managers of the Brittany region, the importance of the aquaculture sector is not recognised as being significant by local citizens, despite aquaculture's strong contribution to the maritime economy in Brittany. Most of citizens do not have enough knowledge on maritime issues to consider aquaculture as being an important sector for employment in Brittany. One of the solutions to increase the contribution of aquaculture on regional employment would be to increase the exploited surfaces.

In order to increase the number of employments in the aquaculture sector, new farms must be created on possible sites.

Finally, the SUCCESS's survey on consumer preferences demonstrates that over 69% of French interviewees agree to say that the development of fish farms is creating jobs. This latter survey shows that aquaculture can be seen as having a significant role for creating jobs and boosting the national economy.

## Ireland:

Aquaculture activities are very important to sustain the employment and livelihoods of the people in Ireland. A reliance on the aquaculture industry in remote coastal areas of the northwest and southwest of Ireland, where economy faces greater challenges in a national context due to its geographic isolation. The economic significance of the aquaculture industry in these peripheral areas is indisputable. All jobs created in these regions will have a knock on effect on improved livelihoods for the people as they have a regular income.

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 fueled 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 Equivalent (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.

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.

### **United Kingdom:**

The UK produces a narrow range of aquaculture species. Rainbow trout dominates freshwater culture. Salmon smolts (juvenile salmon) are also grown in freshwater before ongrowing in the sea, with 45.5 M individuals put to sea in 2015 (Marine Scotland Science 2016), equivalent to ca. 3000 t biomass. Scotland is by far the biggest aquaculture producer in the UK by volume and value (Table 1). In the marine environment, Atlantic salmon (*Salmo salar*) dominates, and is almost entirely produced in Scotland. Scotland also produces a third of UK mussels. While Wales is home to one of the largest mussel farms in the UK, farmed oysters are also grown in bags attached to metal trestles on the shore in sheltered areas around the coast.

Wales is also leading the production of native lumpfish. Parasitic sea lice are the biggest threat to salmon farming, a £15 billion industry and the cornerstone of Europe's aquaculture. Lumpfish can reduce the use of anti-parasitic drugs by 80%.

The Centre for Sustainable Aquatic Research pioneered in collaboration with The Cleaner Fish Company the use of native, disease-screened lumpfish in the UK. The research has influenced all the Cleanerfish sector and supported the creation of the Welsh cleaner fish industry, which now supplies the biggest salmon producers including Marine Harvest (Scotland) Ltd (now Mowi). Innovation has allowed production of lumpfish at CSAR to increase from 5,000 juveniles in 2014 to over 2 million in 2019, most of which is now coming from locally sourced stocks

The UK fish and seafood market is currently dominated by imports (43 per cent) and capture fisheries (40 per cent) with aquaculture making up only 17 per cent of domestic supply. The main export markets for UK salmon are the USA (34 per cent), France (23 per cent) and China (12 per cent).

The English industry is predominantly re-laid in intertidal bays but considerable expansion of suspended mussel production in England is proposed (e.g. Offshore Shellfish Ltd, n.d.). There are no marine finfish farms in England and Wales but other marine farms do exist on land.

### Comments:

In Portugal, aquaculture sector represents about 6 % of the catches, but this activity is growing rapidly and could become an important activity for the fisheries sector. Moreover, it offers other socio-economic benefits like employment opportunities and contributes to local coastal economies.

Also, in Spain, stakeholders believe that aquaculture activities (in Andalusia) have the potential to provide employment. This sector is growing and will therefore create direct and indirect staff needs. Indirect needs would include secondary activities resulting from the primary aquaculture activities, i.e. production; these include, for example, animal care, veterinary and quality control, product transformation, feed, construction of installations, processing, packaging, among others.

In France (particularly in Brittany), the aquaculture sector is viewed as a means to boost the regional economy, creating jobs and to create other activities such as maintenance or navigation. Despite the aquaculture's strong contribution to the maritime economy, the importance of the aquaculture sector is not considered as significant.

In Ireland, aquaculture activities are seen as very important to sustain the employment and livelihoods of the people. 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.

As for the UK, data for job creation from 2012 refer a total of 3,321 jobs in England (1,081), Wales (134), Scotland (1,898) and Northern Ireland 118).

## 1.2. Enhancing edible supplies of seafood

### Spain:

Among the 36 respondents there was a clear consensus that products from aquaculture can enhance the supply of seafood. In fact, 21 respondents (55,3%), of which 8 were from the general public, 7 from the industry, 3 from public administration and 3 from academia, stated that the extent to which aquaculture activities contribute to enhancing seafood products from the sea is very significant, followed by 13 respondents (34,2%), of which 5 were from the general public, 5 from public administration, 2 from the industry and 1 from academia, consider it significant. Although the explanations ranged, there were clear overlaps between the advantages of consuming products from aquaculture compared to other sources. For example, the most common denominator among the responses are price/quality ratio, continuous availability, environmental benefits, e.g. avoiding overexploitation of wild populations, and standardized quality control from the start, e.g. avoiding risks of contamination and controlled animal welfare.

When examining the responses according to sector, there does not seem to be clear differentiation among the respondents. The main advantages remained represented in all sectors, e.g. respondents from the general public seemed to be just as aware of the traceability and consistent quality control as respondents from the industry; and in terms of advantages of price/quality ratio, all sectors seemed to agree. There seems to be more skepticism, however, among the general public regarding the feed component, mainly with regard to origin and quality.

When asked which strategies they could think of to increase consumption of products from aquaculture, there was also a clear consensus that the principle limiting factor remains social acceptability. There is a need for communication, marketing, and awareness raising about the aquaculture sector in general and about individual products and processes, increased availability of information about and traceability of the products, not only on farm level, but also traceability of the feed administered. Apart from awareness raising among the general public, there was also a suggestion to direct the sector itself in a more sustainable direction, as well as the creation of (Protected) "Denomination of Origin" (PDO) labels, increased traceability of products, information about the origin and

composition of feed, among others, which would automatically improve the image of aquaculture.

### France:

According to the CRC Bretagne Nord, shellfish consumers in Brittany are motivated to buy mussels to increase their edible supplies of seafood and of protein. Mussels have specific nutritive qualities; this argument is used to defend these products. Moreover, mussels do not lose their nutritive value during the cooking process, which is very convenient and consumers recognise this advantage. The situation differs regarding oysters as they are not consumed as often as mussels and are more likely to be consumed during special days such as new years' eve or Christmas dinners. Therefore, the arguments to defend the nutritive quality of oysters are focusing on the pleasure to savour few of them.

Administrative managers of the Brittany region had a similar opinion, they considered that aquaculture products in Brittany are consumed for special events and not as a daily meal.

Nevertheless, the nutritive quality of aquaculture products is not the only element that consumers take into account before buying them. Indeed, the price is having a significant influence on consumers' choice according to academic researchers. In order to enhance the consumption of aquaculture products, focusing on the reduction of their price could also be a possible strategy.

There must be discussions between all stakeholder in order to define to what extent we can increase the supply of seafood products depending on economic, social and also ecological factor. Due to climate change, this supply of seafood will change and a certain limitation on what is produced must be studied.

Thus, we can conclude that arguments on the nutritive qualities of aquaculture products can be used to enhance its production and the edible supplies of seafood.

### Ireland:

Aquaculture provides important employment in peripheral areas, increases the range and accessibility of fish, shellfish and other edible aquatic species to the consumer and helps to reduce the EUs trade deficit on sea products. 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.

## United Kingdom:

England, Wales and Northern Ireland

The contribution of aquaculture to the economies of England, Wales and Northern Ireland is modest; but it is diverse, spread widely across all three countries, closely associated with quality seafood and aquatic products important to the image of some regions, and locally important in rural areas. It also produces healthy seafood, with opportunities for growth that do not exist in capture fisheries. Indirectly aquaculture makes a substantial contribution to healthy recreation and leisure for millions of people through countryside visits, angling and ornamentals. Aquaculture produces healthy seafood, with opportunities for growth that do not exist in capture fisheries. Indirectly aquaculture makes a substantial contribution to healthy recreation and leisure for millions of people through countryside visits, angling and ornamentals.

Aquaculture in Wales is worth £11.8m (2017)

Scotland

In 2018, the total number of staff employed in marine salmon production in Scotland increased by 77 (5.5%) to 1,466 people, despite a cyclical decrease in the production of Atlantic salmon, rainbow trout, brown and sea trout.

The report published in 2017 by the Government Office for Science entitled "The future of the sea: trends in aquaculture" states that Aquaculture has considerable social benefits: for example, Scottish aquaculture production generates at least £1 billion in turnover across the UK and supports 8,800 jobs. This report highlights that There are relatively few studies on public attitudes to aquaculture development but those that have been undertaken do not point to a widespread antipathy to aquaculture, especially when appropriate information is provided.

## Comments:

Spanish stakeholders, coming from the general public, industry, public administration and academia, seem to be in consensus in what concerns the enhancement of seafood supply from aquaculture products. However, there seems to be more skepticism regarding the origin and quality of the seafood from aquaculture, particularly coming from the general public, suggesting that a raise of awareness is needed towards a more sustaina-

ble direction, as well as the creation of (Protected) “Denomination of Origin” (PDO) labels, increased traceability of products, information about the origin and composition of feed, among others, which would automatically improve the image of aquaculture.

In France, the administrative managers of the Brittany region consider that aquaculture products are consumed for special events and not as a daily meal. The nutritional quality of aquaculture products is a key element for consumers, as well as the price. In fact, academic researchers suggest that, in order to enhance the consumption of aquaculture products, there should be a reduction of their price, as a possible strategy to increase the consumption.

In Ireland, the aquaculture sector provides important increase on the range and accessibility of fish, shellfish and other edible aquatic species to the consumer and helps to reduce the EUs trade deficit on sea products.

The UK states that aquaculture produces healthy seafood, with opportunities for growth that do not exist in capture fisheries.

### 1.3. Contributing to national tax revenue

#### Portugal:

The Portuguese aquaculture industry produces marine finfish species and shellfish. The former far exceeds the latter in size — marine fish production accounted for more than 57 % of the total sales value in 2013. The main cultured marine species are sea bream, sea bass and turbot. In 2013, Portuguese aquaculture production totaled 10 300 tonnes and EUR 58.8 million in value.

It is estimated that the blue economy represents 3 % of the Portuguese GDP.

The total production of aquaculture in the Algarve region in 2013 represented a total of 4.403t with an estimated value of 27M euros, which represented an increase compared with 2012, with a production of 3.509t and a value of 24,1M euros. The bivalve aquaculture is still the most important aquaculture type in the Algarve; fish produced in ponds represent only 9, 2%. Most of the bivalve aquaculture sites are located within the Ria Formosa lagoon, where the extensive aquaculture contributes to 88% of the total production. The good clam (*Ruditapes decussatus*) is the main species being produced, but mussel production doubled from 2012 to 2013 with a total 1 547t, mostly due to the recent offshore installations.

## Spain:

Among the 37 respondents, 17 (45,9%) state that the contribution to national tax revenue (national GDP) is minimal, followed by 10 (27%) giving the contribution slightly more importance. However, there was a clear consensus that a growing sector would, of course, create employment and, consequently, contribute not only to national GDP in Spain but also to regional economic growth in Andalusia.

## France:

Considering the weight of Aquaculture at the national level, its contribution to the national tax revenue remains low. Enhancing its production and the consumption of its products would be a strategy to increase its contribution to national tax revenue.

Moreover, we don't have the figures for the regional level. We don't know the contribution to regional revenue of shellfish or more globally for marine aquaculture.

## Ireland:

Estimated GDP in 2018 was €1.25 bn

## United Kingdom:

Total benefit to the economy as whole is likely to be closer to £100 million in revenue and 1,700 FTE jobs (including indirect and induced). The industry also makes a substantial contribution to household (aquaria, ponds, etc.) and countryside education and recreation (lakes, rivers, fisheries, countryside destinations, etc.). Most of the jobs in aquaculture in England, Wales and Northern Ireland are associated with small businesses serving relatively local demand, especially in recreational fisheries. Some producers are closely integrated with these fisheries and other service/retail activities, and it is difficult to separate the contribution of aquaculture from these other activities.

## Comments:

Portuguese data show that, in 2013, aquaculture production totaled 10 300 tonnes and EUR 58.8 million in value, where it is estimated that the blue economy represents 3 % of the Portuguese GDP.

In Spain (particularly Andalusia), the stakeholders consider the contribution of aquaculture products to national tax revenue (national GDP) to be minimal. Despite that, it is consensual that a growing sector would create employment and, consequently, contribute not only to national GDP in Spain but also to regional economic growth in Andalusia.

France data consider that the weight of aquaculture contribution to the national tax revenue remains low, at the national level. Enhancing the production and the consumption of aquaculture products could be a strategy to increase its contribution to national tax revenue. At the regional level (e.g., Brittany) that are no figures available.

The Irish estimations, in 2018, state that aquaculture products represent €1.25 bn of the GDP.

In the UK, the total benefit to the economy is likely to be close to £100 million in revenue.



## 2. Minimisation of environmental damage - how can aquaculture activities be beneficial for:

### 2.1. Minimising pollution and water quality impacts

#### Portugal:

The majority of Integrated Multitrophic Aquaculture (IMTA) in Portugal is on land, taking advantage of existing aquaculture tanks. IMTA offshore is still taking its first steps, but some tests with filter feeding species (oysters, mussels) have already taken place. Two systems have been detected – joint cultivation or separated cultivation – involving, in general, three trophic levels. Joint cultivation of: oysters with meagre or gilt-head bream; macroalgae, oysters, meagre, sea bream and mullet. Separated cultivation of: sea bass, sea urchins and macroalgae; macroalgae, sea bass and gilt-head bream; halophytes associated with aquaculture effluents. The production scale is generally low, with a range of final products from the direct sale to species production to extract bioactive compounds.

IMTA is a special field of aquaculture which presents a huge potential in terms of sustainability. This type of production integrates, on a same system, species that use artificial food with others, such as herbivores/filter feeders and/or micro and macroalgae, taking into account their interactions, as well as the use of nutrients and metabolites from the excretion of the fed species. In IMTA systems, unused excretion metabolites of fed species are recycled, producing food, energy and/or fertilizer used on the production of other integrated species. The negative effects of effluents in the environment are, therefore, reduced. On a minor extent, the amount of food needed for the species on the top of the food chains is also reduced, allowing to release the pressure on marine stocks. IMTA is a solution that goes beyond environmental sustainability, stimulating economic diversity and allowing the reduction of economic risk, as well as promoting the acceptability of the aquaculture sector by the general public. Thus, IMTA may be the next step on the future of aquaculture.

IMTA is very flexible, as systems can be implemented onshore or offshore, on seawater or freshwater, and with several combination of species. The most common combinations are shrimps/molluscs, fishes/molluscs/algae, fishes/shrimps and shrimps/algae.

## Spain:

**Society:** In general, climate change is affecting the marine environment, water quality and the environment.

**Administration:** Climate change is affecting the aquaculture sector deeply in terms of production, species, farming systems, etc. One of the most important changes is taking place in the temperature change, affecting water quality, causing imbalances in production cycles and even affecting the type of cultivated species and, consequently, affecting oxygen, salinity, changes in the currents, and creating a greater frequency of storms that cause damage to the facilities, etc.

**Academia / Industries:** Other consequences are that these changes are providing pollutants that end up in farm animals, reducing water oxygen, facilitating the spread of pathologies. Likewise, anthropogenic discharges increase the quality of nutrients and, therefore, eutrophication. In addition, they may contain other compounds such as drugs that can pass directly to the fish; it can incorporate elements that produce malformations in fry, which finally affects the mortality rate.

Aquaculture, like any agri-food industry, faces the challenge of sustainable development. Aquaculture has grown exponentially in the last 50 years, but today, improving sustainability remains a challenge.

According to the data collected, aquaculture is decisive for the conservation of the marshes and their biodiversity. The salinas, estuaries and current aquaculture techniques improve biodiversity, maintaining marine wetlands, capturing CO<sub>2</sub>, etc.

## France:

Having shellfish products in specific areas is an indicator of the water quality. Indeed, shellfish can only be produced in high quality waters, thereby having a negative impact on water quality would be counterproductive for the shellfish sector. The shellfish culture is rather a victim of other activities having an impact on their production area than a polluting activity. In some cases, shellfish producers must stop the production of shellfish on some sites due to the low quality of water caused by external activities such as intensive agriculture.

In addition, producers must face up climate changes and need to consider alternative solutions such as using new areas or producing new species.

One of the solutions to increase the production level and the level of social acceptance would be to combine the aquaculture sector with the growing renewable energies sector. Indeed, creating new offshore wind turbines would facilitate the offshore production of shellfish in the same areas as both activities are compatible. Showing that aquaculture activities can be supported by the energy sector would increase its social acceptability

level as it will contribute to the energy transition as well.

Academic researchers explained that the finfish production is having a negative impact on the environment in the Mediterranean area; thus, producers need to move their plants regularly to reduce this impact. Academic researchers pointed out that consumers do not have enough knowledge on this topic.

Nevertheless, administrative managers of the Brittany region explained that marine finfish production is not having a negative impact on water quality in Brittany (because we hardly have marine fish farms). The most important barrier to the development of aquaculture in Brittany is linked with space conflicts.

There is a lack of knowledge of the general public on the real environmental impacts of aquaculture farms. Environmental arguments are often used for political reasons without having a scientific reality.

Improving citizen knowledge on aquaculture effects on the environment is therefore a future challenge for this sector. Regarding citizen's knowledge, the SUCCESS's project showed that 51,8% of French people considers to have no knowledge on fish farming.

### **Ireland:**

#### 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.

### **United Kingdom:**

It is generally understood that lower trophic species (e.g. seaweeds, bivalves) have a lower impact than finfish aquaculture.

The production of cleaner fish (lumpfish, wrasse) is seen as a good alternative to delousing with chemicals.

## Comments:

Portugal is looking at IMTA as a developing solution that can go beyond environmental sustainability, stimulating economic diversity and allowing the reduction of economic risk, as well as promoting the acceptability of the aquaculture sector by the general public.

In Spain, climate change is considered as a risk factor, influencing the aquaculture sector deeply in terms of production, species, farming systems, etc. One of the most important changes is temperature change, which can affect water quality, causing imbalances in production cycles and even affecting the type of cultivated species and, consequently, affecting oxygen, salinity, changes in the currents, and creating a greater frequency of storms that cause damage to the facilities.

In France, aquaculture is considered as decisive for the conservation of the marshes and their biodiversity, by improving biodiversity, maintaining marine wetlands, capturing CO<sub>2</sub>, etc. Moreover, some aquaculture products can act as water quality indicators, such as shellfish. In fact, shellfish can only be produced in high quality waters and its production can be affected by low quality of water and also by external activities such as intensive agriculture.

Irish experiments refer to recycling in aquaculture (e.g., farmed oysters) as an example of an environmentally sound and cost-effective long-term solution for end of life oyster bags. There are manufacturers already 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.

In the UK other solutions are referred to as having lower impact than finfish aquaculture, such as seaweeds and bivalves due to their lower position in the food chain. Also, the production of cleaner fish (e.g., lumpfish, wrasse) is seen as a good alternative to de-lousing with chemicals.

## 2.2. Minimising visual intrusion and landscape impacts

### Spain:

In Andalusia it is obvious that marine aquaculture is beneficial for minimizing the visual impact compared to other economic activities.

In the southern Atlantic area, aquaculture activity is the true conservator of estuaries and wetlands, favoring the biodiversity of the environment, both from the point of view of fauna and flora.

In the Mediterranean area, the activity hardly causes visual impact because the floats and other artifacts are almost imperceptible, especially when compared to other activities (greenhouses in the eastern area, tourism and buildings near the coast).

It is a compatible activity and, depending on the place where it is carried out, it can even contribute to the improvement of the visual impact with the recovery of flood areas.

### France:

Some areas in Brittany are benefitting from tourism linked with the production of oysters such as the bay of Cancale. There, oyster producers are organising tours and are able to disseminate information on their activities which is raising the social acceptance level of aquaculture at the local scale. As a consequence, shellfish production areas are viewed as being part of the landscape. Therefore, it would be interesting to support the touristic development of the aquaculture sector to minimise the visual intrusion feelings of citizens.

However, this is not the case for all shellfish producers as many of them in Brittany suffer from criticism on visual intrusion and space conflict. There is an existing competition between space users and production areas are seen by actors such as pleasure sailors as privatizing a common space. This is one of the most important challenge for aquaculture producers as criticism against the privatization of space is the most common argument against the development of their activities.

Spatial conflicts must be solved through public policies according to academic researchers. Although this solution might be facing some serious limits, including stakeholders in the decision process appears to be necessary to further develop the aquaculture sector onshore and offshore.

Social acceptability of aquaculture farms in the Brittany's landscape is quite high as it is considered as being part of the territory. Although, efforts can be done to increase this acceptability even more through the development of farms visits. Informal relations exist between aquaculture actors and restaurants' managers. These relationships could be institutionalised to enhance touristic visits in aquaculture farms and increase their acceptance in the regional landscape.

### Ireland:

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.

### **United Kingdom:**

This is highly dependent on the type of farming and where it takes place. As an example, in Swansea, mussels are farmed in a dock which has minimal visual impact or intrusion.

Whereas salmon cages, or mussel ropes in locks in Scotland are seen as highly intrusive by locals.

### **Comments:**

Spanish previous experience states that aquaculture activities are not likely to cause major visual impact because the floats and other artifacts are almost imperceptible, especially when compared to other activities (greenhouses, tourism and buildings near the coast), in the Mediterranean area.

In France, and particularly in Brittany, there is a variety of touristic activities that can be associated with bivalve production, suggesting that touristic development of the aquaculture sector could contribute to minimise the visual intrusion feelings of the general public.

In Ireland, benchmark platforms have been created in order to bring partners together from across the seafood sector worldwide, to share knowledge and drive change by coming up with solutions to challenges in the sector. These platforms contribute to minimize the overall environmental impact of how the catch, grow and deliver of seafood functions to meet a growing global demand.

In the UK, there is a high dependence on the type of farming and where it takes place. For instance, mussels are farmed in a dock which has minimal visual impact or intrusion, whereas salmon cages, or mussel ropes in locks are seen as highly intrusive by the general public.

## **2.3. Minimising impact on natural seafood stocks**

### **Portugal:**

The aquaculture of carnivorous species, in particular, has been subject to intense criticism, due to the impact on natural marine stocks. This activity uses more fish biomass as a source of raw materials fish flour and fish oil incorporated in the artificial food, than that it can produce. Thus, the argument used is that of elevated losses of live marine resources, being unsustainable due to its continuous expansion.

The capture of wild stocks for posterior fattening (practice from capture based aquaculture) is another factor that contributes to the reduction of natural stocks. For a long time, world aquaculture depended of wild eggs and hatchlings, by its recollection for posterior fattening in aquaculture facilities. In general, with the development of reproductive techniques in captivity, the recollection of wild hatchlings is only performed for non-threatened species, as a way to guarantee that natural stocks are not put in risk, as in

the case of several molluscs. However, there are still some species which life cycle is not closed in captivity and that are excessively captured for posterior fattening, such as the tuna.

Diversified scientific studies have been conducted as to identify alternative sources of lipids and proteins that produce no negative effect in growth, quality and animal wellbeing in aquaculture. There are other measures related to artificial feeding that can ensure the sustainability of aquaculture at a global level, namely the certification of raw materials sources used of aquaculture feeds, the development of new technologies on feeds production to improve its quality and optimize the use of diets.

### **Spain:**

Currently, there is competition between fisheries and aquaculture.

Competition between both sectors should be taken into account not as a threat but rather the opposite, since aquaculture is an activity that can be complementary and should be treated as a strategy to reduce the impact on the preservation of the marine environment. Aquaculture is a complement that attempts to solve the main current problem that is the limitation of fishery resources and consequent limitations.

In the case of the Bay of Cádiz, the aquaculture sector contributes to the preservation of marine natural resources, to the improvement of the landscape, increased biodiversity and recovery of a traditional trade.

Aquaculture can help ensure the supply of global demand for fish that is impossible to maintain due to fishing without depleting natural resources, so it can help preserve them.

### **France:**

The argument of using less natural seafood stocks is less used by shellfish producers as they do not want to start a conflict with the fishery sector. However, they recognise that their activity is beneficent for minimising the impact on natural seafood stocks. Currently there is no competition between both sectors.

A survey done in the framework of the H2020 SUCCESS project shows that 46,7 of French interviewees considers that consuming wild fish contributes to the depletion of natural resources. Moreover, 58% considered that consuming farmed fishes preserves natural resources.

Administrative managers of the Brittany region explained that in Brittany, the fisheries industry and the aquaculture sector are focusing on different species, thus, the consumption of aquaculture products is not having an impact on the fisheries industry and seafood stock. However, both sectors can cooperate with each other. For instance, fishermen can operate in neighbouring areas of the aquacultures farms in order to catch predators of aquaculture products.

Therefore, even if citizens consider that consuming farmed fishes allow to preserve natural resources, the difference of products between aquaculture and the fisheries is too important in Brittany to have an economic impact on each other. As a result, the fisheries industry can expand itself independently from the development of aquaculture.

## **Ireland:**

### Structures and Production Cycle

#### Salmon

Offshore-exposed circular plastic cages of 20,000 metres 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.

#### Oysters

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.

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.

#### Rope Mussel

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.

## Seabed cultured Mussel

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.

The BIM Certified Quality Aquaculture (CQA) scheme 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.

### **United Kingdom:**

This depends on the species farmed. Carnivorous species depending on fish meal and fish oil have a negative impact on natural stocks. Native species in the lower trophic chain have minimal impact.

### **Comments:**

Portuguese studies have been identifying alternative sources of lipids and proteins that produce no negative effect in growth, quality and animal wellbeing in aquaculture. Moreover, other measures related to artificial feeding can ensure the sustainability of aquaculture at a global level, namely the certification of raw materials sources used of aquaculture feeds, the development of new technologies on feeds production to improve its quality and optimize the use of diets.

In Spain, a competition between the fisheries and the aquaculture sectors has been reported, since aquaculture is an activity that can be complementary and should be treated as a strategy to reduce the impact on the preservation of the marine environment, and that attempts to solve the limitation of fishery resources and consequent limitations. Aquaculture can, thus, help to ensure the supply of global demand for fish that is impossible to maintain due to fishing without depleting natural resources.

On the contrary, in France, there seem to be no competition between both sectors, as aquaculture is recognised as an activity beneficent for minimising the impact on natural seafood stocks. Therefore, even if the general public consider that consuming farmed fishes allow to preserve natural resources, the difference of products between aquacul-

ture and the fisheries is too important to have an economic impact on each other. As a result, the fisheries industry can expand itself independently from the development of aquaculture.

In Ireland, the certification of aquaculture brought more clarity into the marketplace due to the growing number of seafood certification schemes and to the guarantee of 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.

In the UK, the minimization of the impact of aquaculture on natural seafood stocks depends on the species farmed. For example, carnivorous species depending on fish meal and fish oil have a negative impact on natural stocks, and native species in the lower trophic chain have minimal impact.



### 3. SWOT analysis of the aquaculture social acceptance in the region / country

#### 3.1. Strengths

##### Portugal:

- Good environmental and climatic conditions
- Good spatial planning
- Clear identification of available areas (both offshore and in lagoons)
- Skilled human resources
- Access to the country's research facilities are the main factors that can boost the aquaculture sector.

##### Spain:

- There are many aquaculture facilities in Andalucia
- It is a determining activity for the conservation of the marshes and their biodiversity
- Fresh products, nutritious and without risk of contamination (sound sanitary controls)
- More precise control of their origin and availability
- Accessible price
- Lower environmental impact
- Reduction of overfishing
- Improves the diet of the population
- Creates a new business economy that in most cases is local
- New employment opportunities
- Existence of technological platforms

### France:

- The relocation of these activities is nearly impossible so they are “sustainable activities” for our territories and can create indirect employment such as tourism, processing activities...
- Nutritive quality of shellfish (proteins for mussels and iron for oysters)
- Employment capacities
- Oyster and mussel productions have positive outcomes on the quality of water

### Ireland:

- Nutrient rich waters
- Sheltered bays suitable for aquaculture production
- Environmentally sustainable production techniques
- Global recognition as a leading producer of organic species
- Established Production and capabilities
- Experienced operators with proven track record
- Technically advanced systems

### United Kingdom:

- Salmon aquaculture is well established
- Rope mussels are also well established.
- Sheltered lochs are ideal for aquaculture production.
- Research institutions provide direct support to the aquaculture industry in developing new products (e.g. species, feed) and processes (welfare guidelines, certification).
- Close proximity with EU markets, and main importers of mussels (e.g. Belgium).

### 3.2. Weaknesses

#### Portugal:

- Preconceived idea that seafood from aquaculture is generally of a worse quality compared to wild fisheries.
- The difficulties faced by the aquaculture industry are mostly due to bureaucratic impediments, incomplete use of EU structural funds, insufficient coastal management plans and decreasing market prices, leading to poor investment and delaying the progress of Portuguese aquaculture.
- Most coastal areas in Portugal are not ideal for aquaculture mainly due to strong hydrodynamics and high water depth; these disadvantages encourage the development of new and innovative ways to explore farmed species.

#### Spain:

- Environmental damage
- Few companies dedicated to the aquaculture sector
- Lack of technical scientific knowledge and research infrastructures for the aquaculture sector
- Automization of the sector
- Little tradition of R&D in companies (there are not enough R&D departments)
- Low investment and financing in R&D
- Low dimension of production with a view to the market
- Long term research
- Lack of confidentiality and difficulty protecting knowledge
- Automization of research groups
- Need for improvement in the logistics and distribution structure
- Low technology transfer
- Low species identification
- Insufficient training of agents in the commercialization chain of fishery and aquaculture products
- Poorly differentiated products (need for improvements in labeling)

## France:

- Spatial conflict
- Offshore production is very limited
- Regulation weight and mostly the complexity that favour possibilities for opponents to discuss projects and file appeals
- Lack of knowledge of citizens on aquaculture and farmed fish
- Lack of knowledge of citizens on aquaculture's impact on the environment
- Aquaculture is rather a victim of the pollution of water than a contributor
- Resorts and the opponents are often dominated by private interests and not by general interest

## Ireland:

- Complex Environmental requirements leading to delays in licensing process
- Insufficient investment in R&D
- Insufficient product availability to meet market demand
- Limited business planning from smaller operations
- Fragmentation within certain sectors
- Lack of private investment
- Narrow focus of skills base and lack of entrepreneurship in the sector
- Lack of scale in comparison to competitors and market size
- Uncertainty in seed supplies for oysters
- Uncertain seasonal availability of mussel seed
- Lack of support services and ancillary industries

## United Kingdom:

- Regulatory constraints
- Unsuccessful knowledge exchange between stakeholders - consumers, producers, funders, regulators and researchers
- Not enough research - many industry gaps in knowledge

- Limited effective long-term disease management
- Number of differing topics

### 3.3. Opportunities

#### Portugal:

- By 2023, aquaculture activities are expected to treble, contributing to food supply, environmental protection and employment.
- Bordered by the North Atlantic Ocean on the west and south coasts, Portugal is the western limit of the European Continent. The strong influence of the Mediterranean Sea in the southeast coast makes ocean waters relatively warm and calm all year long. On the contrary, southwest and west coasts are under the intense influence of the Atlantic Ocean with stronger winds and waves, especially during the winter. Portugal is therefore located in an interface between two distinct geographical features, presenting different ecological and climatic characteristics according with the regions.
- Offshore aquaculture and IMTA are positive prospects, which can overcome competition for marine space (offshore) and reduce environmental impacts.

#### Spain:

- Growing demand for seafood
- Growing environmental awareness
- 70% of respondents have knowledge about aquaculture.
- 60% of respondents consume aquaculture products about 2 to 3 times a week, compared to 15% who consume products 0 to 1 times a week
- Regarding the marine products they consume, 76% say they are products from marine aquaculture
- 75% of the people surveyed believe that it is a sustainable activity for the environment
- Specialized R&D centres and large research capacity

### France:

- Combination of offshore renewable energies and offshore shellfish production (although it is currently impossible in Finistere)
- New planification plan
- Local distribution channel
- Combination of fisheries activities and aquaculture
- Inclusion of citizen and stakeholder's participation in spatial planning
- Creation of Breizhmer, a new organisation gathering all the professional (aquaculture/fish farmers) in order to defend together their activities

### Ireland:

- Employment potential in Coastal Communities
- Significant Export potential
- Significant Export potential
- Global demand for high-quality seafood
- Global demand for high-quality seafood
- Off-shore aquaculture sites
- Cost/efficiency benefits from consolidation
- Underutilised aquaculture sites
- Land and sea based nursery sites
- Market gaps (e.g. oysters)
- Development of shellfish hatcheries
- Novel species and niche products
- Use of Financial instruments

### United Kingdom:

- Research increased from current levels
- Rapid increase in knowledge exchange between stakeholders - consumers, producers, funders, regulators and researchers

- Improve public perception
- Robust political commitment to industry with financial backing
- Number of differing topics

### 3.4. Threats

#### Portugal:

- Despite that, the characteristics of the national coast are not very attractive for installation of offshore aquaculture which requires more advanced technological solutions in order to overcome the hydrological conditions (PCM, 2014). Such 35 solutions are gradually emerging as an effect of cooperation between private and public sectors and aided by scientific research.
- In Portugal, the aquaculture sector is based on SMEs, which limits innovation and reduces the capacity of reaction and adaptation to difficulties, either from administrative or regulatory nature, or regarding production costs. In other sense, a dispersed and reduced production strongly limits the capacity of negotiation with the buyers. Due to low entrepreneurial level and to business risk, companies of the sector feel significant difficulties to financing access.

#### Spain:

- Minimal interest and support from the public administration
- Negative image of aquaculture among the public (and other sectors)
- Competition from abroad
- The budget lines of funding mechanisms usually do not meet companies' needs
- Conflicting interests among Administration, Industry and Research sectors
- Difficulties for aquaculture production due to topographic, or other environmental characteristics
- Shortage of financial resources and/or investment

#### France:

- Climate change
- Decrease of water quality due to other activities
- Fear on new diseases development

- Social acceptability changes from a place to another place (highly “local”)
- Opponents are not anymore only NIMBY but BANANA ((Built absolutely nothing anywhere near anybody), hampering any development for the aquaculture sector and hampering “rational discussions”

### **Ireland:**

- Fish diseases and parasites
- Co-existence with other marine activities
- Public opposition to industry
- Natural occurring events such as algal blooms and diseases such as Amoebic Gill Disease
- Spatial restrictions on aquacultural activities
- Increased competition from companies outside the EU
- Competition in the organic salmon sector
- Further revisions of regulatory limits for biotoxins
- Lack of access to finance
- Constrained national public co-funding
- Impacts of climate change on aquaculture
- Impact on biodiversity from alien species
- Impact on aquaculture due to eutrophication of marine water

### **United Kingdom:**

- Disease management and treatment
- Industry Regulations - site expansion, access new sites, consents
- Sustainability - feed restraints, sector growth
- Limited funding - research, industry grants, start-ups
- Number of opinion topics

## 4. Summary of the information

### Spain:

From the results of the questionnaire, it seems that the perception of Aquaculture in Andalusia is generally positive. This is also a result of the ubiquity of Aquaculture facilities in the region and the knowledge of the sector among the respondents. The image of aquaculture is that of fresh and healthy products available year round for an accessible and constant price, lower risk of contamination and higher sanitary controls and traceability. Furthermore, the awareness among the respondents of the reduced environmental impacts, including reduction of overfishing, compared to the fisheries industry, is notable. There was also general consensus that the aquaculture sector is growing and, consequently, has the potential to provide employment opportunities in Andalusia, thus also supporting regional economic growth. Nonetheless, although there seems to be general social acceptability among the respondents of the questionnaire, this represents only a small portion of the population (38 respondents) and may be biased towards those with prior knowledge of (70% of the respondents) and/or experience in the sector. In fact, almost all respondents mentioned the lack of social acceptability among the general public, one of the sector's main limiting factors. There was a general consensus that although the sector is growing and therefore has the potential to provide employment, concern was expressed among the majority of respondents about the longevity/sustainability of the employment with regard to sustaining livelihoods and the minimal effect that the sector has on Spain's national GDP at the moment. Concerns were also expressed regarding the lack of suitable financing and investment and adequate development of the sector, both in terms of companies themselves not investing in R&D, for example, but also regarding the lack of financial support from the administration. If interest and support were to increase from the side of the administration, not only would this result in financial support, but also better differentiation of products from aquaculture, greater visibility and traceability and, consequently, greater social acceptance among consumers.

### France:

Aquaculture is viewed by professionals as being an important sector in the regional economy in terms of employment capacities and also for cultural aspects. However, interviewees considered that the majority of citizens have little knowledge on aquaculture and maritime issues in general. This lack of knowledge can be the reason of many spatial conflicts and lack of support for the development of aquaculture. All interviewed stakeholders consider spatial conflicts as being the major barrier to aquaculture development.

The development of aquaculture can be done through several ways. New innovative methods must be adopted such as the creation of IMTA or through a more efficient beacons system allowing to expand farms to new areas.

Regarding issues on water quality, aquaculture in Brittany does not seem to have a negative impact even though local citizens seem to lack of knowledge on this topic. Thus, more communication on the impact of aquaculture on water quality is needed to improve the sector's social acceptance. Finfish aquaculture is too limited to have any impact on the environment in this region.

In order to limit social conflicts, visual intrusion and to enhance the social acceptability of aquaculture, stakeholders explained that the sector must work in cooperation with other areas such as the fisheries industry, marine renewable energies and tourism. By doing so, the utilisation of the marine environment will be optimised and the feeling that the sea is privatised by one sector could decrease.

Aquaculture in Brittany concerns mainly the production of shellfish such as oysters and mussels. Companies remain very small, only a few of them are considered as big groups. The consumption of these products remains limited as they are not considered as being edible products of the daily life. Most of consumers buy these products for exceptional events such as over the Christmas and new years' eve period. As a consequence, these products cannot replace edible supplies of natural seafood stocks and no real competition exists between aquaculture and the fisheries sector.

To conclude, the aquaculture sector in Brittany, concerning mainly shellfish culture and composed of small companies, lacks of visibility at the regional level. It struggles to be identified as a strong sector by the general public and even by some local politicians. Nonetheless, these companies offer employments that cannot suffer from offshoring and the sector is creating direct and indirect employments. Moreover, opportunities exist in order to increase social acceptability such as the development of tourism or recent consumers trends, consisting of consuming products from the local level. The professionals are structured to make their voices heard better and have just created Breizhmer.

## **Ireland:**

Encouraged that growth and development in the aquaculture industry has progressed in 2018 and 2019.

It is disappointing that the 2018 provisional data shows that overall there was a decline in net profit. 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.

The unique selling point has developed a stronger position. 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.

There is positive news that the mortality rate has not increased.

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

### **United Kingdom:**

Aquaculture is a general term to describe the production of aquatic organisms. Within this term there are many categories, not only related with the species produced but also, with the type of culture systems, intensity of culture and water exchange (open vs. RAS).

Different stakeholders have different views.

### **Comments:**

Aquaculture activities in Spain, particularly in Andalusia are regarded as generally positive, as the image of aquaculture is that of fresh and healthy products available year-round for an accessible and constant price, lower risk of contamination and higher sanitary controls and traceability. There was also general consensus that the aquaculture sector is growing and, consequently, has the potential to provide employment opportunities in Andalusia, thus also supporting regional economic growth.

In France aquaculture is viewed, by professionals, as being an important sector in the regional economy, in terms of employment capacities and also for cultural aspects. However, the general public has little knowledge on aquaculture and maritime issues in general and this lack of knowledge can be the reason of many spatial conflicts and lack of support for the development of aquaculture. Spatial conflicts are regarded as the major barrier to aquaculture development.



## 5. Methodologies used for collecting information

### Portugal:

Studies, reports, scientific papers.

Information taken from "Plano Estratégico para a Aquicultura Portuguesa 2014 – 2020".

[https://www.dgrm.mm.gov.pt/documents/20143/43770/Plano\\_Estrat%C3%A9gico\\_Aquicultura\\_2014\\_2020.pdf](https://www.dgrm.mm.gov.pt/documents/20143/43770/Plano_Estrat%C3%A9gico_Aquicultura_2014_2020.pdf)

### Spain:

We have created a questionnaire based on the questions in the document presented by the WP leader.

Through this questionnaire an analysis of the Social Acceptance that the Aquaculture Sector in the Atlantic Region of Andalusia has been carried out from the perspective of different related interest groups (society, academy, industry and administration).

This document was shared publicly via different social and professional networks; we closed the questionnaire after 2 weeks with approximately forty responses from the different interest groups.

Finally, we have compiled the different responses received in order to create a global report that answers the questions requested.

### France:

Stakeholder interviews:

Benoit Salaun, Comité Régional de la Conchyliculture Bretagne Nord (representative of aquaculture sector)

Jose Perez, Marianna Cavallo, AMURE Université de Bretagne Occidentale, Brest. (researchers in the blue economy)

Olivier Le Pivert, Cyril Rouault, Région Bretagne (Responsibles for aquaculture policies in Brittany)

Didier Grosdemange, Gaïa Terre Bleue (Consultant in maritime projects)

SUCCESS (2015), Consumer preferences for sustainable seafood products from Europe, from: <http://www.success-h2020.eu/outputs/deliverables/>

Rapports

CESER Bretagne (2017), Produire et résider sur le littoral en Bretagne !

CESER Bretagne (2004), Pour une gestion concertée du littoral en Bretagne

### **Ireland:**

Bord Iascaigh Mhara (BIM) is Ireland's Seafood Development Agency. BIM helps to develop the Irish Seafood Industry by providing technical expertise, business support, funding, training and promoting responsible environmental practice.

Information taken from their 2019 survey of the National Seafood Survey Aquaculture for Ireland.

<http://www.bim.ie/media/bim/content/publications/aquaculture/BIM-National-Seafood-Survey-Aquaculture-Report-2019.pdf>

### **United Kingdom:**

The first section was based on reports available online, given that the questions can be checked based on data. However, UK data is not easily accessed, or centralized. The UK is constituted by 3 nations with individual governmental bodies, which makes the information sparse.

The SWOT analysis was based on a survey performed during Aquaculture UK 2017 by the Centre of Sustainable Aquatic Research.

A total of 60 participants answered the questionnaire:

Researchers = 26

Producers = 24

Funder/Regulator = 8

Retailer = 1

The questionnaire included three questions:





## Lead Partner



Centro Europeo de  
Empresas e Innovación

### CEEI Bahía de Cádiz

C/ Manantial, 13. Edificio CEEI  
Polígono Ind. Las Salinas de San Jose Bajo  
11500 El Puerto de Santa María (Cádiz) - Spain  
Tlf: (+34) 956 860 654 / Fax: (+34) 956 860 028  
E-mail: [asuarez@ceecadiz.com](mailto:asuarez@ceecadiz.com)  
Web: [www.ceecadiz.com](http://www.ceecadiz.com)



## Partners



CENTRO TECNOLÓGICO  
DE LA ACUICULTURA

Centro Tecnológico de  
Acuicultura de Andalucía  
Muelle Comercial S/N  
11500 El Puerto de Santa María (Cádiz) - Spain  
Tlf: (+34) 956 56 93 63  
E-mail: [mm.agraso@ctaqua.es](mailto:mm.agraso@ctaqua.es)  
Web: [www.ctaqua.es](http://www.ctaqua.es)



Swansea University  
Centre for Sustainable Aquatic Research  
Wallace Stores, Singleton Park  
SA2 8PP - Swansea  
Tlf: +44(0) 1792 29 53 83  
E-mail: [p.n.howes@swansea.ac.uk](mailto:p.n.howes@swansea.ac.uk)  
web: [www.swansea.ac.uk](http://www.swansea.ac.uk)



Údarás na Gaeltachta

Údarás na Gaeltachta  
Na Forbacha, Co. Dubhlin, Galway  
Tel: 091-503100  
Fax: 091-503101  
E-mail: [foh@udaras.ie](mailto:foh@udaras.ie)  
web: [www.udaras.ie](http://www.udaras.ie)



Innovation & Management Centre  
CLG T/A WESTBIC  
11 Galway Technology Centre, Wellpark Road  
Galway, H91 E2W5 - (Ireland)  
Tlf: (+353) 86 2574978  
E-mail: [smccormack@westbic.ie](mailto:smccormack@westbic.ie)  
web: [www.westbic.ie](http://www.westbic.ie)



Technopole Quimper Cornouaille  
2 rue François Briant de Laubriere  
29000 Quimper - Francia  
Tlf: +33(0)298 100 200  
E-mail: [rachel.sellin@tech-quimper.fr](mailto:rachel.sellin@tech-quimper.fr)  
web: [www.tech-quimper.fr](http://www.tech-quimper.fr)



CIIMAR

Centro Interdisciplinar  
de Investigação  
Marinha e Ambiental

CIIMAR | Interdisciplinary Centre of Marine and  
Environmental Research of the University of Porto  
Novo Edifício do Terminal de Cruzeiros do Porto de Leixões  
Avenida General Norton de Matos, S/N  
4450-208 Matosinhos | Portugal |  
Tlf: (+351) 223 401 852  
E-mail: [rodrigo.ozorio@ciimar.up.pt](mailto:rodrigo.ozorio@ciimar.up.pt)  
web: [www.ciimar.up.pt](http://www.ciimar.up.pt)



UALg

UNIVERSIDADE DO ALGARVE

University of Algarve  
CRIA - Pavilhão B1  
8005-139 Faro (Portugal)  
Tlf: +351 289 800 097  
E-mail: [ajmarq@ualg.pt](mailto:ajmarq@ualg.pt)  
web: [www.ualg.pt](http://www.ualg.pt)



INVESTIR EN  
FINISTÈRE

Investir en Finistère  
46, quai de la Douane  
CS 63825 29238, Brest cedex 2  
Tlf: +33 (0)298 339 773  
E-mail: [a.coppens@investir29.fr](mailto:a.coppens@investir29.fr)  
web: [www.investir29.fr](http://www.investir29.fr)



## Associated Partners

✓ Technopole Brest Iroise  
[www.tech-brest-iroise.fr](http://www.tech-brest-iroise.fr)

✓ Cuideachta Feamainn Turtar Gorm Teo (TSC - Bleu Turtle)  
[www.theseaweedcompany.com](http://www.theseaweedcompany.com)

✓ Association of Aquaculture Marine  
Businesses of Andalusia (ASEMA)  
[www.asemaonline.com](http://www.asemaonline.com)

✓ Union Chamber of Algae and Marine Vegetables (CSAVM)  
[www.chambre-syndicale-algues.org](http://www.chambre-syndicale-algues.org)



[www.access2sea.eu](http://www.access2sea.eu)