Case Study: Salmonids

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The market for salmonids is marked by a wide range of species and products. Species include commonly called salmons such as Atlantic salmon (*Salmo salar*) or Pacific salmon (*Oncorhynchus keta),* trouts such as rainbow trout (*Oncorhynchus mykiss)* or Fario trout (*Salmo trutta*) and other salmonids such as Arctic char (*Salvelinus alpinus)*. Salmonids can be marketed as whole fresh (portion size fish - up to 350 g - or bigger sizes), sliced fresh or processed (mainly smoked)…

Most of the salmonids that are sold on the EU market come from aquaculture, especially Atlantic salmon and rainbow trout, which are the main farmed fish species in Northern Europe. The supply and demand of farmed salmon have been steadily growing in the EU. However, most of the salmon is imported to EU from Norway, while the aquaculture sector within the EU is facing many challenges to remain profitable and match the growing demand. EU production systems need to adapt to strict environmental regulations and increasing competition from countries with lower production costs and environmental conditions. Therefore, it is highly important to find new innovative solutions to enable environmentally and economically sustainable production growth in the EU aquaculture sector.

The analysis will focus on rainbow trout. Large rainbow trout (known in business language as salmon trout) is one of the major fish species in aquaculture, fish processing and trade in Finland and Sweden. Salmon trout together with farmed Atlantic salmon are the most important farmed fish species in the Nordic fish market. Furthermore the case study will analyse rainbow trout production and value chains in important countries in Central and South Europe like Italy, France, Denmark, Poland and Germany.

The project will also address Icelandic farmed Arctic char. This species is well adapted to cold environment and has therefore been assumed to be a good choice for fish farming in Iceland but faces competition with salmon and trout on the global market.

Case Study "Salmonids"

The "Salmonids" case study is part of the SUCCESS project, funded by the EU. The following partners are involved in this case study:

- Fish-Pass (France)
- Luonnonvarakeskus (Finland)
- Haskoli Islands (Iceland)
- Ifremer (France)
- National Marine Fisheries Research Institute (Poland)
- Von Thuenen-Institut (Germany)

European Commission

SUCCESS

SUCCESS is a H2020 Research and Innovation Project (2015-2018)

Main topic

The main objective of the salmonids case is to explore how EU and Icelandic salmonids production and regulations should be developed in the global competition to enable environmental-friendly profitable growth of the aquaculture sector for the needs of consumers.

The salmonids case study concentrates on the economic analyses of Icelandic Arctic char and rainbow trout farming methods and value chains from different countries within the EU. The case study will do an empirical economic analysis of the value chains on a high detail level and will draw comparisons to selected countries and production systems outside the EU concerning production costs and management measures as well as environmental conditions.

Case study proposal

The Salmonids case study will be made up of five national subcases:

1) Rainbow trout farming (France)

   The level of production has slightly decreased from the nineties when it reached more than 50 000 t and has been remaining quite stable at about 30 000 t over the recent years. The reasons of the decrease lie in low prices and in the competition with imported marine salmon (165 000 t net weight in 2013). The French salmonid industry has reacted to the competition with salmon in developing salmon trout production. More recently, the French market for salmonids has experienced a decline in the consumption of imported salmon that may have resulted in a positive substitution effect with domestic trout. In link with consumer expectations, development of organic productions and certification of the local origin of trouts.

   The PSNPDA 2014-2020 expects an increase in the freshwater aquaculture production (up to 30 %). The lack of flow-through production sites (due to social, environmental and legal constraints) may lead to the development of water recirculation systems.

2) Salmon trout farming (Finland)

   The Finnish aquaculture sector produced 13 700 tonnes of food fish and fry in 2014, with the total value of €60 million. The food fish supply consisted mainly of large rainbow trout (also called salmon trout): rainbow trout accounted for 93 % of total volume and 83 % value of food fish production. Marine fish farms produced most of the production, around 12 million kilos, while inland farms produced close to 2 million kilos.

   Production has stagnated in Finland in past 15 years. Major constrain has been and still is environmental licensing. The production units have remained in moderate size and Finnish fish farmers have not been able to achieve economies of scale in order to lower their unit cost of production. At the same time Finnish fish farmers have faced tight international competition, because the import of Norwegian salmon has steadily grown during the last 15 years.

   Finnish companies have consolidated and also expanded to Sweden, because it has been possible to get new larger licenses there. Swedish production is imported to Finnish markets such as the aggregated Finnish and Swedish production has grown around 1 000 tons in past 10-15 years. Vertical integration in the fish value chain has become more common.

In addition, some new recirculating aquaculture systems (RAS) farms have been established. However, RAS-farms have suffered from profitability and technical problems.

3) Rainbow trout farming (Germany)

It is felt that, that due to technical and environmental constraints, expanding German production is only possible by improving rationalisation or by intensification of existing farms. The big chance for German farms is the deep regional roots of salmonid products. German farms can sell fresh and high quality products on local markets at high prices. By this, production in Germany will be stable in future, but it won´t be possible to get significant growth (Sindilariu 2011, Wedekind 2014).

4) Rainbow trout farming (Poland)

Trout (16 100 t, mainly rainbow trout *Oncorhynchus mykiss* in 2014) is the second farmed species in Poland after carp (*Cyprinus carpio*, 20 300 t). Other aquaculture species are produced in minority (3 700 t) (Lirski and Hryszko 2015). Trout is produced mainly in inland concrete raceways in Pomerania in the North part of Poland, alongside the Baltic Sea. Currently there are only few Polish trout farm which are using partly recirculating aquaculture systems (Juchniewicz 2013).

5) Arctic char farming (Iceland)

With 3 411 t in 2014, farmed Arctic char represents about 45 % of the Icelandic aquaculture production on a par with Atlantic salmon and far ahead of rainbow trout and cod. Most of the Icelandic Arctic char is exported. The largest markets are in the US (34 %) followed by Europe where Britain and Germany (33 % together) are becoming increasingly important markets. A large percentage of the exported Arctic char is purchased by wholesalers and distributed forward to restaurants as far as fresh fish (whole and fillets) is concerned. Most of the frozen products end up in supermarkets or cruise ships.

The Icelandic government has initiated an Arctic char genetic improvement program which seems to have been highly successful. Production in Iceland has since 1987 been increasing annually on average by some 19 %. Natural conditions for farming Arctic char in Iceland are favourable with abundant water supplies and in particular on the Reykjanes peninsula where the water temperature is optimal. Arctic char cannot live in full salinity all its live hood and can thus not be bread in marine cages in fjords like salmon. For these reasons most of the operations are land based. Land based farms are often considered ideal for production because they enable the farmers more control over factors that affect production such as environmental, disease, feed utilization etc. than ocean cages.

However, it does not seem like these natural conditions provide a competitive advantage compared with other salmonids farming. This can be explained by the fact that Arctic char simply cannot compete against other species like Atlantic salmon and rainbow trout when it comes to marketing. Salmon and trout have pretty much secured their position as a consumer product, while it has proven hard for Arctic char to do so, thus demand has not increased as needed. This is very important, because aquaculture production relies on economics of scale to be profitable.

6) Atlantic Salmon farming (Scotland)

The salmon aquaculture production held in Scotland is by far more important than in the rest of the UK, with Scotland producing 97 % of the farmed fish, in quantity or value in 2013. Salmon production represents between 36 % and 40 % of all seafood productions in Scotland between 2010 and 2013. It also accounts for 97 % of all aquaculture productions. Overall, salmon is the first species produced by

the Scottish seafood sector (wild catch and aquaculture), weal ahead of the mackerel catch which only represented two third of the salmon production in 2015 (120,000 tonnes), which was a pike in the mackerel production.

Most of the current sector is now under foreign interests (mainly Norwegian). In the same time, the capacity of the sector has almost constantly increased, with the overall production now close to 180,000 tonnes. The Scottish production is more and more reliying on export markets to absorb all the salmon produced, with the USA becoming the first export market for Scottish salmon.

Several identification initiatives have been pursued to differentiate the Scottish salmon products from the competition, notably the push for use of the Label Rouge and the definition of a specific Protected Geographical Indication for the Scottish farmed salmon.

Main issues at stake

The main issues at stake in every national case study are the following ones:

- *Finland:*
    - Actions for production increasing volume:
        - New licenses by consolidating the environmental policy and food production
            - Co-operation with environmental authorities
            - Make production licence applications bureaucracy smoother for companies
            - New technology for monitoring and evaluating environmental impacts
        - Marine spatial planning: Identify new production sites and sustainable production volumes for fish farming: offshore farms
        - Baltic Sea fish feed: closing the nutrient look by recycling the nutrients using Baltic Sea fish for feed
        - Technical development for new production environment and new technology (Recirculation farms and offshore farms)
    - Actions for increasing the value of fish farming
        - Secure stable quality and contribute sufficient year round supply
        - R&D to develop new species and valuable products into market
        - Designing and developing marketing and communication through conventional and new communication channels

- *France:*
    - Reducing the administrative burden which is likely to constitute a stumbling block for further development of the sector

      This point is the first issue of the French PSNPDA (*Plan stratégique pluriannuel de développement aquacole*) 2014-2020.
    - Lack of production sites and water recirculation systems

      The PSNPDA 2014-2020 expects an increase in the freshwater aquaculture production (from 0 to 30 %). The lack of flow-through production sites (due to social, environmental and legal constraints) may lead to the development of water recirculation systems.
    - Certification, labelling

In link with consumer expectations, development of organic productions and certification of the local origin of trouts.

- *Germany:*
  - Geographical, natural issues:
    - Scarcity of water and suitable locations.
    - Lower production costs in other countries like Turkey due to geographic location.
    - Losses due to fish predators like herons, cormorants and otters.
  - Political/legal and societal issues:
    - There are severe restrictions related to construction law, water legislation and nature conservation legislation. For that reason, it is difficult to get permission for new farms as well as for expansion of existing farms. At the same time, permits in other countries especially in Eastern Europe or Turkey are easier to get, which increases competition. According to the German Fisheries Association (DFV 2014), expansion and growth is "excluded per se".
    - In some cases, legal restrictions are not coherent within the administrative levels (Federal State, Germany, EU) and are differently implemented by authorities. This creates insecurity for operational planning.
    - Growing legal standards for animal welfare and health, and hygienic control of epidemics need to be met. According to a regional fisheries and aquaculture organisation, some smaller farms, that don´t have aquaculture as main activity, give up production because of tough legal requirements (Eberts 2013).
    - Growing administrative burdens, growing standards for product quality and food security lead to higher production costs.
    - Local shortage of production licences.
    - A real political will of having aquaculture in their county is often lacking. At least it is quite different between the federal states and leads to a wide variation of costs, competitiveness and production opportunities. Sindilariu (2011) suggests that other kinds of water use in Germany and Central Europe are political more desired.
    - Organic production may replace parts of existing production, but will not lead to higher production.
  - Sectoral issues:
    - Scarcity of high-quality feed.
    - Insufficient number of educated and motivated staff.
    - Lack of powerful producer organisations in order to achieve aquaculture´s own interests against decision makers.
    - The aquaculture sector has not managed yet to communicate the quality advantage of regional products to the consumer. There is a lack of data about environmental and quality advantages, which makes communication difficult. At the moment, future perspectives are not good and young people do not choose to become fish farmer

- *Iceland:*
  - A new regulatory framework is in place but the functioning of the system is still not efficient and companies are currently experiencing lengthy procedures to provide licences

for new establishments and for enhanced production, also complexity regarding surveillance.

- Competition with salmon and trout on the global market – economies of scale
- Competition between Arctic char farms in Iceland ? A recent approval for a new farm on the Reykjanes peninsula (Matorka) with a production capacity of 1.500-3.000 tons of Arctic char will enhance the competition, or it could be an opportunity for Icelandic Arctic char to be more visible on the market?
- Assessment of key environmental performance indicators, like feed use and energy use per kg product and emissions e.g. CO2eq/kg product has shown that the environmental impacts of the Arctic char products are in many respects similar to the salmon products. The main difference in the environmental performance can be explained by the FCR and therefore improved feeding technologies including selection of feed ingredients to minimise environmental impacts of feed.
- When considering the Arctic char supply chain, the environmental impacts of processing and transport are similar as for the salmon. The long distance from Iceland to the markets in Europe and US is the main challenge, since the fresh fish is transported by airfreight, which has considerable higher carbon footprint than transoceanic transport. For improved environmental performance, products with longer shelf life could be transported by seafreight and logistics optimised to lower the carbon footprint

- *Poland:*

- *Scotland:*
  - Further development of the sector is mainly related to the access of potential new sites. Several coastal areas are already close to their full capacity. One of the main technical issue is the ability to develop production sites situated less close to the shore. There is a joint issue about marine planning as the sea areas around Scotland are under high pressure from different interests (fishing, renewables…) and offshore aquaculture should find its place in this complex landscape.
  - There are attempts to move toward more efficient production system, for example by the use of cleaner fish – wrasse and lumpsuckers – as alternatives to sea lice medicines to help minimise environmental impact.

Challenges

The above issues at stake result in five broad categories of challenges influencing the competitiveness and the sustainability of the sector that European salmonid producers are facing:

I. Competition with other products and imports from countries with lower production costs (Norwegian and Chilean salmons, Turkish trout…)

II. Competition for space and use-conflicts with other activities (professional and recreational fishing, fluvial or marine transportation, river water-sharing issues, natural reserves…)

III. Linked to the previous challenge but also to the growing legal standards for animal welfare and health, and hygienic control of epidemics need, producers are facing administrative burden.

IV. Emerging consumers' demand for healthy and/or environmental friendly products represents a strong opportunity of market valorisations.

V. Competitive production technologies: production methods and operational innovations to utilise increased production opportunities.

Links between CS and WPs - Room for improvement / Innovative approach / Opportunities (tasks 2.4, 3.3 and 4.4)

The salmonids national case studies will directly contribute to WPs in the following ways:

WP 1: *Effects of global drivers, policies and regulations on growth, jobs and innovation in European fisheries and aquaculture sectors.*

The price of salmon trout (i.e. big rainbow trout) is determined in the global salmon market, where Atlantic salmon is the main product affecting the market for other salmonids. Furthermore the price for small rainbow trout is influenced by imports from non-EU-countries like Turkey.

The salmonid case study participates in the demand, supply, trade analyses and provides inputs for the economic models as well as future scenarios.

WP 2: Consumer preferences, market acceptance and social awareness towards seafood.

The salmonids case studies will contribute by providing insights on consumers' expectations on healthy and environmental friendly products:

- Competition between locally produced Finnish salmon trout/Norwegian imports (Luke-Finland)
- The decline in the French consumption of imported salmon in 2014-2015 (Fish-Pass, France)

The salmonids case studies will be concerned by the online survey undertaken within task 2.3. The task 2.4 will be contributed, if it is considered to include relevant innovation aspects.

WP3: Competitiveness and sustainability of European fisheries and aquaculture sectors

Task 3.1: The salmonid case studies will give an overview of governance and regulation systems influencing competitiveness and sustainability of the European salmonids farming industry.

- Rainbow trout: France (Fish-Pass, Ifremer), Finland (Luke), Germany (TI), Poland (NMFRI)
- Arctic char: Iceland (IoES)
- Atlantic salmon (Scotland)

Task 3.2: The salmonid case studies will give an overview of the production systems (farming industry structure, cost and revenue structure, distribution channels, prices).

Task 3.3: In each country, several initiatives have responded to the challenges listed above. The salmonid case studies will prepare an inventory of initiatives implemented by producers for competitiveness improvement at the production stage (3.3a) and will focus on specific initiatives (3.3b):

Marketing strategies based on product differentiation through labels or certification, new sale organisations, new products, aim at answering challenges I and IV as do organisational innovations such as new forms of cooperation between producers (producer organisations):

- Certification, labelling
    - Baltic Sea fish feed – Finland
    - Germany?, Iceland?; Poland?, Scotland ?

- New marketing strategies and sales organisation
    - Bretagne truite, producer organisation in Brittany - France (Fish-Pass, Ifremer)
    - Finland, Germany?, Poland?, Iceland?, Scotland?

- New production methods (Spatial planning and offshore fish farming, RAS technologies) On the side of competition for space, the reduction in the conversion rates provides with an opportunity to increase production without extending farms (challenge V) as far as legal authorisation allow for such an increase.

    - France: not relevant. Finland, Germany?, Iceland?, Poland?, Scotland?

Task 3.4: The CS will contribute to the comparative analysis of production systems by providing required indicators as far as availability will make it possible.

WP 4: Trade and Value Chain

The contributors will provide a broad description of their national value chains for salmonids (4.1). They will also provide price data on a monthly basis from January 2010 to December 2014, as far as data is available, at various stages in the value chain in order to perform a price analysis (4.2).

This will allow analysing potential substitution effects between species (trout/salmon/Artic char), products (portion size/big fish) and origins (domestic production/imports). It is of particular interest to update former academic results showing there were no competition between portion rainbow trout and large salmon imports since some stakeholders now report otherwise. As far as salmon trout is now sold in fillets it more likely competes with portion trout.

This will also allow for analysing rooms of improvement that concern the whole value chain, by impacting the vertical coordination of the value chain and the sharing of value added all along the chain (such as, in France, the quality charter *Aquaculture de nos régions*).

The cases to be studied are the following ones:

- Finland: Finnish salmon trout vs Norwegian salmon

- France: French trout vs Norwegian salmon

- Iceland ?

    According to Icelandic producers arctic char is "unique". It is hence interesting to explore whether this uniqueness is required for the product to be a success. The assertion of "uniqueness" to be meaningful is an assertion of price elasticity and cross price elasticity.

- Poland, Scotland?