Funded by the European Union

Grant Agreement number: 635188

SUCCESS

Strategic Use of Competitiveness towards Consolidating the Economic Sustainability of the European Seafood sector

Start date of project: 01/04/2015 **Duration: 36 Months**

Deliverable: 5.1

Impact assessment of technological and regulatory innovations

Project co-funded by European Commission within the H2020 Programme		
Dissemination level of this deliverable		
PU	Public	X
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including Commission Services)	
CO	Confidential, only for members of the consortium (including Commission Services)	

Document Status Sheet

Due date of deliverable	Month no. 32 (submission of draft version)
Actual submission date	
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Version	2.0
Document Status	Draft

Change history of document

Version	Date	**Details** (additions, changes, reviews, performed by whom)
1.0	15.2.2018	Draft outline for discussion in Salerno
2.0		
3.0	.....	.....

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OBJECTIVES AND EXECUTIVE SUMMARY

OBJECTIVES

The main objectives of Deliverable 5.1 are to provide an impact assessment of the main technical and regulatory innovations reported in the various cases and other findings of the SUCCESS project. The document is divided into four main parts.

- Part I provides definitions and discussions regarding technological and regulatory innovations found in the SUCCESS project and how to measure the impacts.
- Part II lists the main technological and regulatory innovations reported in the SUCCESS project.
- Part III summarizes the main results and concludes.

EXECUTIVE SUMMARY

Innovations in fisheries and aquaculture appear in much of the material presented in the different workpackages of the SUCCESS project, either directly or indirectly. These innovations can roughly be divided into five categories:

1. Technological innovations (Chapter 4)
2. Regulatory systems (Chapter 5)
3. Marketing, labelling, branding and consumer preferences (Chapter 6)
4. Market structure and the value chain management (Chapter 7)

The case studies of the SUCCESS project are classified in seven different groups.

1. Salmonids
2. Flatfish
3. Seabass/seabream
4. Mussels
5. Whitefish
6. Coastal fisheries
7. Carp

The main innovations have aimed for; 1) increasing producer market power along the value chain in order to receive higher prices, gain more economic stability and secure livelihoods, e.g. through the use of producer organizations and co-management measures, 2) enhance product differentiation, e.g. through labeling schemes and product innovation, 3) technical innovations, e.g. gear technology, new production

methods and new processing methods, and 4) regulatory innovations, such as quota trades, rewarding positive environmental externalities.

The SUCCESS project has provided numerous examples of innovations for European fisheries and aquaculture. The effects are mostly qualitative in nature but some are quantitative and provide material for further analysis in the project as well as for other researchers.

PART I - INTRODUCTION

INTRODUCTION

The European Regulation framework has evolved over the last 20 years from resource conservation towards emphasis on marine and ecosystem preservation. The framework is complex and although it has a major impact on fisheries and aquaculture in the member states, national legislation is still important, especially for aquaculture.

With regards to technical and regulatory innovations very few concrete examples of specific innovations can be found in the European regulatory framework. In this respect it is interesting to note that the funding of the Common Fisheries Policy is secured by the European Maritime and Fisheries Fund (EMFF). The objectives of the fund are to; help fishermen in the transition to sustainable fishing, support coastal communities in diversifying their economies, finance project that create new jobs and improve quality of life along European coasts and make it easier for applicants to access financing.

It is left to the Member States to come up with operational programmes explaining how they intend to use the money allotted to them through the EMFF to achieve these goals. It is therefore up to them to decide whether and how they can incite regulatory or technical innovations in order to achieve the objectives outlined above.

Aquaculture and capture fisheries differ in many respects mostly due to the differences in production processes. The products are however in many ways similar, but not totally perceived the same way by the consumers.

There are many possible ways to present and classify technological and regulatory innovations in fisheries. The SUCCESS project is constructed around *Case studies* and *Scenario approaches* in different Work Packages.

Innovations in fisheries and aquaculture appear in much of the material presented in Work Packages 2 – 4, either directly or indirectly. These innovations can roughly be divided into five categories:

5. Technological innovations (Chapter 4)
6. Regulatory systems (Chapter 5)

7. Marketing, labelling, branding and consumer preferences (Chapter 6)
8. Market structure and the value chain management (Chapter 7)

Although many of the deliverables and the case studies touch base on many of these issues in the following table they have been classified in different categories based the most prevalent emphasis.

The following table provides an overview of how the main elements of different deliverables accordingly fit into the different categories of innovations.

Deliverable	Name	Category
D1.2	Non-tariff measures (NTMs) of the EU and partner countries	Regulatory systems
D2.1	Economic patterns of seafood consumption and demand. Analysis of the consumption functions in the period 1990-2011	Consumer preferences and demand
D2.2	Results on consumer preferences for sustainable seafood products from Europe	Consumer preferences and demand
D3.1	Basic description of regulation systems applied to case studies	Regulatory systems
D3.2	Description of production systems – synthesis of available data	Market structure
D3.4	Reviewing of successful practices and approaches for strengthening the competitiveness of fisheries and aquaculture.	Regulatory systems
D3.4	Reviewing of successful practices and approaches for strengthening the competitiveness of fisheries and aquaculture.	Technological innovations
D3.6	Comparative analysis of production systems in fisheries and aquaculture	Market structure

D4.1	Value chains for fishery and aquaculture products in the EU	Market structure
D4.2	Impact of buyers' market power on European fish and seafood producers' profit margins: A structural equation analysis	Technological innovations
D4.4	Price transmission and market power in the value chain of seafood products in developed countries	Market structure

The case studies of the SUCCESS project are classified in seven different groups.

8. Salmonids
9. Flatfish
10. Seabass/seabream
11. Mussels
12. Whitefish
13. Coastal fisheries
14. Carp

This classification of the case studies is based on the type of fish caught or harvested, with the exception of the coastal fisheries case studies groups. What we are interest in here are the technological and regulatory innovations that are studied or discussed in the different case studies.

The following table provides an overview of how the main elements of different case studies accordingly fit into the different categories of innovations.

Group	Case	Category
Flatfish	Netherlands	Technical innovations
Salmonids	Arctic charr (Iceland)	Marketing – labelling, branding and consumer preferences
Salmonids	Trout farming (Germany)	Regulatory systems

Seabass/seabream	Aquaculture (Greece)	Regulatory systems
Seabass/seabream	Italy	Regulatory systems
Seabass/seabream	Spain	Market structure
Seabrass/seabream	France	Marketing – labelling, branding and differentiation
Mussels	Greece	Consumer preferences and demand / Technological innovations
Mussels	Italian farming	Marketing – labelling, branding and consumer preferences
Whitefish	UK and EU fleets	Regulatory systems
Coastal fisheries	Sicily small scale fisheries	Marketing – labelling, branding and consumer preferences
Coastal fisheries	Sicily	Marketing – labelling, branding and consumer preferences
Coastal fisheries	Cuttlefish in the Gulf of Salerno	Market structure
Coastal fisheries	Northern Adriatic (Italy)	Regulatory innovations
Carp	Germany	Market structure
Carp	Germany and Poland	Technological innovation
Carp	Poland	Marketing – labelling, branding and consumer preferences

Some challenges are common to both catch fisheries and aquaculture, especially those related to market access and competition, while others are quite different. Also there is a common problem with the aging of fishers/producer community.

ECONOMICS OF INNOVATION

According to economic theory various types of innovations spur economic growth, which in turn leads to prosperity. Here, the term innovation is used broadly. It not only refers to technological innovations, but it also innovations in business practices, institutions and in improved regulatory frameworks. Innovation in different domains can be intertwined. For instance, a new technology, which lowers the cost of monitoring can allow for a more efficient regulatory framework, which in turn increases incentives for innovation in product development. Hence, in a ripe environment, innovations bring about more innovations, leading to continuous economic growth.

But innovation is not only important for growth but also for competition. Having a better technology, methods, or institutions than the competitor can not only allow businesses to survive but also to thrive. The innovative entity can either make a better product or produce at lower cost (or both). A better product has competitive advantage because consumers are usually willing to pay more or buy higher quantity of the good. A good produced at a lower cost has a competitive advantage as it allows the company either to increase its' profit margin or lower its' price and increase quantity sold.

Theoretical background

The literature of innovation has, for the last decades, been surprisingly sparse. This applies both to economics and other sciences. For instance, there is no single accepted precise definition of what innovation is or how it is to be measured. In fact, there are over two hundred different metrics that have been defined to capture some aspects of innovation (Edison, Ali, & Torkar, 2013).

The oldest, and still one of the best-known work, on the topic is from Joseph Schumpeter (1942) who popularized the term „creative destruction ". He used the concept to explain how new technology undermines the older production units, sometimes with damaging effects for some stakeholders.

Schumpeter's work was mostly influential in unorthodox economics, whereas in mainstream economics, economic growth, and innovation by extension, was determined by exogenous factors not influenced by public policy. This believe was reinforced by the observation that economic prosperity differs greatly between countries even though most of today's technology is openly available for anybody to study and adopt.

It seems evident that the only ways to increase output of the economy is to either increase the number of inputs that go into the productive process, or if you are clever, you can think of new ways in which you can get more output from the same number of inputs, in other words use innovation (Rosenberg, 2004). According to neo-classical economic theory, the focus was much more on capital accumulation, which was considered the most malleable. Technological progress was treated as residual metric the models, i.e. economic growth that was not contributable to factors of production (inputs) was thought to be a result of innovation and technological progress. Despite accounting for bulk of the economic growth, innovation in general did not interest economic scholars. Although the models have become more sophisticated, innovation is still for the most part treated the same way.

In the eighties, there was an effort to address these shortcomings with so-called endogenous growth models. This was an effort to find what factors led to more efficient use of labor, capital, natural resources and other factors of productions, such as investments in human capital and innovation (Romer, 1994).

In the past decade or so, innovation has been much more in the spotlight. This renewed interest in seems to be have been driven more by practical consideration rather than scientific interest, at least in the beginning. Both policy makers and the private sector have been seeking ways to increase productivity through innovation. Most firms seem to believe that innovation is a key factor in becoming, or remaining competitive (Lengnick-Hall, 1992). However, there is consensus among economists that R&D has some characteristics of public good (i.e. that the benefit is also enjoyed by others than those conducting the R&D) and is thus underprovided by the market. This is a form of market failure, and as such, it is theoretically possible for the government to improve up on the market results.

Innovation has also been a key focus for OECD and other international organizations, which have published numerous reports on the topic and a few larger projects.

INNOVATION POLICIES TO PROMOTE GROWTH

The relationship between public policy, regulatory frameworks, R&D, innovation, and economic growth is very complex, and researchers have not yet been able to create a single framework that links different results. Although it has been established that innovation is essential to economic growth and prosperity, finding which factors foster innovation can be elusive, both on a firm level and on an aggregate level. The most straight forward way to foster innovation is to offer financial incentives for R&D, either with subsidy or tax breaks. But this policy is not without controversy. First, there is a debate of weather these measures do really increase R&D at all. The argument against it is that R&D is so inelastic that subsidies had to be extraordinarily high to generate desirable level of spending.

Even if subsidies do generate more R&D, it is by no means certain that it leads to innovation (in the sense that it fosters higher productivity) (Dimos, Christos and Pugh, Geoff, 2016). If they do work at all, it seems to really matter how such incentives are structured. In a recent study (Acemoglu et. al, 2013) found that industrial policy that subsidizes either the R&D or the continued operation of incumbents can reduce growth and welfare if the incumbents as it can hinder innovation through new start-ups. These effects are called an example of so called selection effects, which occur when public officials try directly or indirectly to select the winners, and thereby crowding out who would otherwise have been more effective, and thereby affecting the market outcome.

The results of the literature seem mixed. Even though there is arguable a market failure (i.e. existence of negative or positive externalities) that leads to insufficient R&D compared to a social optimum, there are no evidence of substantial effects of public policy measures as reported in a recent meta-analysis (Dimos, Christos and Pugh, Geoff, 2016). Another review, promoted by the European commission in preparation of the 2014–20 programs, found that the effects of grants was to make enterprises larger, rather than more efficient (Mouque, 2012). In other words, the increased competitive advantage of the receivers of grants is only superficial. Those papers that show some positive effects from public support to R&D, show that the effects of public policy on innovation is complicated and depends on many factors, such as market structure, firm structure, and the type of innovation in question (e.g. technological, managerial or structural) and can be different between different sector (Malerba, F., 2006).

Some Member Countries have put innovative practices on their national agendas and have directed financial support in that direction, especially technological development, innovation and knowledge transfer. The impact of such support for technological innovation is not easily measurable and few, if any studies, exist that shed a light on the economic impact in fisheries and aquaculture. Radicic et al. (2015) show that when looking at innovation support in traditional manufacturing industries in seven EU regions, the probability of estimated effects is positive, typically increasing probability of innovation and its commercial success by around 15%. They also show that a greater return on public investment could have been possible by selecting firms for support at random.

Despite lack of a single framework, on common conclusion is that public policies must be tailored to each case, rather than relying on a one-size-fits-all policy.

Even if public policy can foster growth through innovation, there are other factors that need to be considered.

As Schumpeter's creative destruction theory implies, technological advancement does not only bring about economic growth and increased average prosperity, but also distributional effects. These effects can have social effects as well as economic, especially on an aggregate level, i.e. between sectors or towns and cities, which must be taken into consideration.

As has been mentioned here above, most companies believe that innovation gives them competitive advantage. For that reason, market competition usually motivates the private sector to innovate. In fact, it has been argued that this is the main role of competition (Hayek, F.A., 2002). Policies that aim to bolster competition can therefore also bolster innovation. But for that for work, those who invest in innovation need to reap much of the benefits, i.e., property rights need to be in place (Denison, M. & Klingler-Vidra, R.,2012)

INNOVATION IN FISHERIES AND AQUACULTURE

There has been tremendous innovation in fisheries and in aquaculture for the past decades. The proof is in the monumental surge in measures such as catch per unit of effort, for almost all measures of effort. This is true despite some cases where the

stock sizes are declining in fisheries and increased prevalence of parasites are to be found aquaculture.

MEASUREMENT

The level of technology is not measurable with any single metric. What is measurable, at least in theory is the consequences of different levels of technology, which is the level of efficiency. Hence, efficiency and technology is often used interchangeably in the economic literature. Note however that there is no one-to-one mapping for these terms. The effects of new technology on efficiency can depend on many factors, such as the market structure, the other technologies in use, economic institutions, and regulatory framework. Because of the effects of regulatory framework, increased efficiency is sometimes separated depending if they are caused by innovation in mechanism or methods (technical innovation), innovation in management, or changes in regulatory framework.

However, measuring the level of innovation or technological improvement is very problematic because the yield is not only dependent on level of technology, labor, capital (e.g. the vessels and machinery) and fuel, but also on the level of stock sizes. The imprecision of the biomass estimates, on top of complex, non-linear, dynamic relationships between these measures, deem it all but impossible to correctly estimate the level of technology.

Because of these difficulties, the level of technology is often estimated as a residual size in in economic modeling (meaning that everything that is not attributed to other factors is attributed to the level of technology). Another way is to proximate the technological level with other variables, some of which are discussed thoroughly in Deliverable 3.3.

Despite severe limit on the accuracy of the measurements, they can be very useful, because the differences in efficiencies can in many cases be even greater.

PART II – TECHNOLOGICAL AND REGULATORY INNOVATIONS IN SUCCESS

Below we provide an overview of technological and regulatory innovations mentioned, directly or indirectly, in the different deliverables and case studies in the SUCCESS project (refer to tables in Introduction). First we discuss technological innovations, then regulatory systems, followed by consumer preferences and demand. Finally we present some information regarding innovations related to marketing – labelling, branding and consumer differentiation

TECHNOLOGICAL INNOVATIONS

There are mainly three outputs in the SUCCESS project that explicitly cover technological innovations, although they also cover other aspects of innovations as well. These are; impact of buyers' market power on European fish and seafood producers´ profit margins (especially Deliverable 4.2) the Case Study on Flatfish in the Netherlands and the Case Study on ways to increase the shelf-life of mussels in Greece.

BUYERS´ MARKET POWER

Results from Deliverable 4.2 show that the level of technical efficiency, defined as ratio of output to potential output, is vastly different between countries in Europe. Denmark, Estonia and Spain have efficiency scores over 90%, while Malta, Lithuania, Finland and Belgium have an efficiency score under 30%. This shows that the potential benefit of increased technical efficiency is tremendous. This indicates that further research is needed to study the difference in technology, what causes it and how to bridge the technological gap.

CASE STUDY: FLATFISH IN THE NETHERLANDS

The Case Study on a flatfish fishery in the Netherlands contains descriptions and information on the effect of an innovation in gear technology. One of the main challenges of this fishery was high production costs. A technical innovation in the

design of the trawl resulted in considerable reductions in cost of effort, especially related to fuel efficiency. According to the Case Study this innovation halved the energy consumption of the part of the fleet, which adopted the new technology. This new technology innovation was financed by European research funds. These findings are presented in videos, which are an integral part of the SUCCESS project´s outputs.

CASE STUDY: NEW APPROACH TO EXTEND SHELF-LIFE AND IMPROVE QUALITY OF UNVALVED MUSSEL PRODUCTS IN GREECE

This case study provides information on how new processing methods, i.e. using brine and aquaeous vinegar solutions at specific concentrations, can improve taste and appearance of unvalved mussel products as well as increase its shelf life. Increasing shelf life and improving quality of marine products can, other things equal, improve competitiveness of production firms through increased sales, prices and reduce waste.

CASE STUDY: LABORATORY EXPERIMENTS ON ALTERNATIVE SPATIAL MANAGEMENT SYSTEMS FOR GREEK MUSSELS

Experiment was conducted in Greece, to follow up on previous simulation results, on the effects of hydrodynamics, farm orientation and cultivation density on productivity. One of the results was that groups of small farms produce higher quality. The implications for economic efficiency are still unclear.

Case Study: Carp in Poland and Germany – product innovation

Promotion of local production can be an effective marketing tool in all markets, with the sole exception of carp. Research carried out in the SUCCESS project has identified “new” products, such as bonecut carp, carp sausages, carp meat balls in vinegar and carp crisps. Of these the carp boncut filet seems to be a promising innovation in Germany and Poland.

Due to the heterogeneity of markets promotion strategies have to consider each countries differences. This is a running theme throughout much of the SUCCESS project.

CASE STUDY: FLATFISH –SUMWING AND PULSE TRAWL

In recent years, two distinct new fishing gear technologies have been developed in the Netherlands. One technological innovation has been given the name of SumWing. SumWing is added to the trawl and serves as an aerofoil which lifts the gear from the seabed, reducing drag and therefore fuel consumption of the vessel. The proponents of the SumWing technology estimate fuel savings of around 20%, compared with traditional gear use. The other technological innovation has been coined the pulse trawl. In the pulse trawl, electrofishing technologies are added to the gear whereby electric currents are used to stun the fish so it floats upwards and is easier to catch. The use of this technique has shown that fuel costs are 46% lower than using traditional gear. This technology is controversial to some as it not only affects the targeted stocks but also other marine life. The European parliament has therefore voted to ban commercial fishing in EU waters using this technique. In the flatfish case study an analysis was carried out that evaluated the impact of lower fuel costs for selected EU sole fleets in Netherlands, France and the UK. Special attention was given to the economic impacts of investing in such technologies on the financial performance of those fleets. Making realistic assumptions regarding costs of investment in new technologies as well as regarding fuel savings calculations show that increased fuel efficiency has to be balanced against the cost of investment and there are different outcomes for different fleets fishing for sole. Uncertainty in fuel prices coupled with an outlook for rising oil prices in the future indicate that the cost of investment may well be too high to offset the increased profits realized through less fuel consumption, at least when looking at the next five years. This holds true for most different fleet segments targeting sole in most countries. The calculations also indicate that some time may elapse between the adoption of fuel saving technologies and an increase in the competitiveness of the fleet, measured as the ratio between net profits and revenues.

Finland has stringent environmental regulations when it comes to aquaculture. At the same time the national multiannual strategic plan for the industry has set a target of some 10 thousand tonnes of production. The SUCCESS project has examined three different approaches in reaching the production target, while at the same time fulfilling the environmental regulations. These three approaches are;

- RECIRCULATION AQUACULTURE SYSTEM (RAS)
- OFFSHORE AQUACULTURE PRODUCTION
- BALTIC SEA FISH FEED (FSFF)

By using recirculation aquaculture systems, it is possible to control nutrient loadings into the environment. There still remain technical and economic challenges to such methods. This technique is currently not economically viable for salmonids production, but might be viable for niche high-end products when prices are high.

Offshore farming allows for up to three times greater production volume per farm than is currently the case. Calculations show that offshore farming is economically competitive, due to economics of scale. However, it would require new technologies, so it is still unproven whether this can be profitable in practice.

The Baltic Sea Fish Feed is designed to close the nutrient loop in the industry using under-utilized fish stock in the Baltic Sea as feed for fish farming. This innovative approach can possibly create a new industry, integrating fisheries and aquaculture, while at the same time meeting consumer demand for farmed fish.

REGULATORY SYSTEMS

The interplay between regulatory frameworks and efficiency of industries is complicated. One of the conclusions of both the MC model (Deliverable 1.4) and the structural equation analysis (D4.2) is that the seafood fishing production systems show an increasing return of scale. Aquaculture on the other hand has a decreasing return of scale. This entails that efficient regulatory systems need to be completely different for the two components of the seafood industry.

Information contained in the work of Work Package 3 (Deliverable 3.1) provides important insights regarding the characteristics of regulatory systems in European fisheries. Here we focus on the most important issues related to technical and regulatory innovations.

CASE STUDY: THE SMOOTH CLAM FISHERY IN NORTHERN ADRIATIC (ITALY)

The smooth clam fishery in the Northern Adriatic provides information on how management structures can change and adapt over time. Over the years the management has evolved towards decentralisation of the decision level ending up with a co-management regime. Using co-management and Territorial User Rights has been in place since the middle of the 1990s. A total of 19 Consortia have been established to manage these fisheries and producer´s organisations have been formed to match supply and demand. Roughly speaking the Consortia are responsible for management measures such as limiting fishing days and maximum daily catches, while the POs are concerned with markets and help in the creation of added value. The measures taken have led to a reduction in fishing effort which hopefully will help in the recovery of the stocks, have stabilized the economic performance of the sector, have induced market price stability and eliminated the “race to fish” in this specific fishery.

This is a good example of innovative solutions that can be classified as regulatory.

Case Study: Seabass Aquaculture in Greece

Marine aquaculture sector in Greece is relatively young, with only 3 decades of history. The sector grew rapidly early on but stabilized. The seabass aquaculture sector increasingly established foreign subsidiaries. This internationalisation of the industry resulted in the innovation, reflected in new management structures with an increased emphasis on quality control and the adoption of globally accepted food safety standards and more environmentally friendly production practices. At the same time the legislative framework evolved with the development of the sector. This underlines that increased competition acts as an important driver for innovation, both

for the private firms as well as for public authorities. It also highlights how important it is that the regulatory framework adapts to changes in the market.

Case study: Whitefish fisheries

In a sub-case study for the whitefish fisheries the recent landing obligation in EU fisheries was analysed. The focus of the analysis was on the effect of the landing obligation on two fisheries, i.e. firstly, UK fleets and the supply of cod and haddock to the UK market, and secondly, EU fleets fishing for whitefish in North Western Waters and the North Sea. Since 2016 a landing obligation has been applied to EU fleets with a transition period until 2018 where only key stocks are introduced. In 2019 all TAC based stocks are succumbed to landing obligations. Landing obligations can be challenging for mixed fisheries, as vessels may have to cease fishing as soon as they have filled up their most restrictive quota species (so-called choked species). Recent studies have shown that due to landing obligations, choke species can significantly reduce catching opportunities for fleets. Building on certain assumptions with regards to different sources of supply and competition between EU fisheries and exports, bio-economic models for scenario analysis provide interesting insights into the effects of the landing obligations. With regards to the UK whitefish fleets, results of the modelling exercise show that the effort may be reduced by 35-50%, with regards to a base level, to break-even in operations. National quota trades may help in alleviating the economic hardships for many firms but supply from the UK may be reduces significantly while the fleet adjusts to the landing obligations. For the EU fleet, the model outcomes suggest that international quota trades may help to alleviate the negative effects of choke on competitiveness. International quota trades raise other questions that have to do with reducing diversification of the fishing fleet.[1] Experience shows that such effects can be mitigated through other policy measures.

NON-TARIFF MEASURES

Considerable work has been conducted within the SUCCESS project in identifying indicators and collecting data on non-tariff measures (NTMs) with regards to European fisheries. The data period was from 2007 to 2015. Fish and seafood

[1] Mardle, S. and S. Metz (2017). "Impacts of current EU regulation on the UK whitefish value chain." Marine Policy 84: pp52-59.

products comprise 121 product codes and it was necessary to aggregate the data. The aggregation is somewhat troublesome because it can lead to double counting of NTMs.

Merely counting different NTMs does not in itself provide much information on the magnitude of their effects. Therefore the SUCCESS project specifically studied the implementation and enforcement of NTMs from the business perspective to gain additional insights into their effects. Also, a gravitational model was estimated which provides information on the possible trade effects of NTMs, while controlling for factors such as distances between markets, cultural differences etc. This analysis allows us to identify which measures are most concerning from a trade perspective.

One interesting finding is that fishmeal seems to be less prone to NTMs. Fish meal is generally used as an input in other production, such as aquaculture, rather than for direct consumption. It would be interesting to study the effects of this fact on the competitiveness of European fisheries and aquaculture in greater detail.

MARKETING – LABELLING, BRANDING AND CONSUMER PREFERENCES

Consumers are heterogeneous with regards to their willingness to pay for different product attributes. Similarly, producers are heterogeneous with regards to products and production processes. This heterogeneity provides opportunities for innovative solutions to meet the demands of different consumers and market segmentation, through specialization and marketing, of different firms.

Economic patterns of seafood consumption and demand

The SUCCESS project provides interesting and important insights on consumer preferences in the seafood markets. Models show different trends in both consumption and demand for seafood between countries and groups of countries, and these different trends can be explained by various factors, such as changes in income, prices and population (Deliverable 2.1).

One of the conclusions is that seafood consumption and demand is to a great extent influenced by economic factors, although these factors and their effects differ between countries (markets) and species. The outcomes regarding European countries, specifically, and different species clearly indicate a segmented market for

seafood. Some species are clearly superior goods, in the sense that demand grows with increasing wages, while others are inferior goods.

Furthermore, farmed species seem to be gaining ground among consumers at the cost of wild species.

The models tested do not take into account technical or regulatory innovations and their possible effects on seafood consumption or demand. However, the outcomes may provide policymakers with a toolbox that can help them evaluate the effects of specific innovations. The analysis indicates that technical and regulatory innovations that lower cost of production may differently affect the consumption pattern of different species in different markets.

Consumer preferences for sustainable seafood products

Studies have shown that consumers are often willing to pay a premium for various attributes such as sustainability in production and locally produced foodstuffs. Deliverable 2.2 specifically looks at whether and how consumers are aware off, and prefer, European seafood production to others and whether they prefer ecologically and socially sustainable production. This was done through an online survey that included a contingent valuation component. More specifically, the survey sheds a light on how consumers view European and local production, sustainable fisheries and farming and fish farming associations.

Concerning caught fish the results indicate that consumers seem to perceive fish as healthy, nutritious and easy to prepare. They seem to prefer domestic origin of the fish they consume, followed by local production and then European origin. The support of consumers for locally fished products seems to be mainly due to willingness to support the local economy and is stronger than the willingness to support European firms and industries. European origin of productions is mainly preferred to non-European production due to food safety and ethical production methods considerations.

Aquaculture is seen in positive light and is seen as an industry that supports job creation and as an important factor to meet increased global demand for fish. With regards to taste, wild fish is still preferred to farmed fish. Sustainability, both for wild fish and aquaculture, is associated with environmental sustainability, rather than to economic or social sustainability. Animal wellbeing is seen as an important factor related to sustainable aquaculture.

The study reveals interesting results regarding additional willingness to pay for certain attributes. The highest additional willingness to pay is for organic production, followed by sustainable production and standards for animal welfare. Almost 50% of respondents are not willing to pay more for sustainable fish, while 40% are willing to pay 15-20% more. A small segment of the consumers (<10%), are willing to pay additional 50% for fish they believe is produced in a sustainable way.

But sustainability and organic production are not the only attributes that consumers seem to be willing to pay for. Research shows that European consumers seem to be willing to pay for climate-friendly food as well.[2]

Although technical and/or regulatory innovation methods are not specifically discussed it is clear that the results provide valuable lessons learned regarding the role and effects of different innovations.

Emphasizing sustainable and organic production methods, as well as animal welfare could target this small segment of the consumer market. The EU seems to have achieved recognition in the consumer market for being a credible controlling agent when it comes to food safety and guarantee of ethical production methods.

Regulatory innovations that target or strengthen sustainability of productions, enhance organic production methods and secure animal welfare have clear economic impacts through a higher willingness to pay, for a small segment of the consumer market. These results provide an interesting and important message to policymakers and others dealing with technical and regulatory innovations as it helps to focus efforts on issues which the consumers value the most.

At the same time public authorities can to some extent improve their own procurement practices to enhance the production of fresh, local and sustainable seafood (see MS13.CPI). This provides a scope for innovation.

THE EFFECTIVENESS OF LABELS AND OTHER MARKETING TOOLS

The effects of labelling schemes have been thoroughly studied in the SUCCESS project (e.g. D2.4). In most cases labels have proven to be effective in providing important information to consumers, e.g. with regards to organic production methods, sustainability and product origins.

[2] Feucht and Zander (2017).

There are signs of heterogeneity between different countries with regards to which labels consumers think are of most value and the magnitude of the effects. There are some signs of 'label fatigue' in some markets, especially in Germany. Interestingly, the use of labels to convey information about sustainability has a lot to do with trust between consumers and producers. Of all the countries where focus group studies were conducted, Iceland was the only one in which no participant expressed a need for specific sustainability labels. This can reflect the importance of trust and the need for labels to be carefully implemented taking into consideration different characteristic in different markets and countries.

In all countries studies and all focus groups, taste scored the highest among desired attributes, with healthiness, easiness of preparation and price following suit in different ordering.

Using smartphones and buying seafood on-line does not seem to be a matured marketing tool yet in the European markets studied. As of now, only a fraction of the people asked would be willing to buy seafood on-line.

Case Study: Multispecies coastal fisheries in the Province of Trapani

This case study considers multispecies coastal fisheries of the west coast of Sicily, i.e. the Province of Trapani. This is a multispecies fishery where around 100 vessels have formed three cooperatives of the maritime areas of Trapani and Porto Epedocle (province of Agrigento).

These vessels capture many species including anchovy, sardines, hake, red mullet, and also molluscs like flying squid, cuttlefish and crustaceans like rose and red shrimp.

Not only is this a multispecies fishery, but also a multi gear fishery where hooks and lines, surrounding nets, gillnets and bottom trawls are all used.

These fisheries were facing various challenges, such as unhygienic handling, low quality products, losses along the value chain, intractability, overfishing and activities that were ecosystem unfriendly. These challenges led to a decrease in sales of around 5 million EUR per year.

The producer organizations were formed to help these fisheries develop and the main initiatives are

- Introduction of new products

- Diversification of activities (tourism and restaurants)
- Marketing innovations such as on-line selling, on-line traceability, direct selling and matching supply with demand in real time
- Quality labels

What is interesting about the arrangement today is that the POs have made it possible to build a vertically integrated supply chain, governed by the producer organizations. These can be regarded to be examples of how innovations in marketing and labelling can improve on the value chain.

[Information being processed concerning economic impacts]

Case Study: Consumer preferences for certified seafood in Greece

This case study in Work Package 4, on the Greek market, looks mainly at three attributes of seafood products, i.e.

1. Sustainability certification
2. Origin (Greek, EU, non-EU)
3. Prices

The results indicate that few consumers are aware of sustainability labels and the average consumer is indifferent to sustainability certification. The average Greek consumer prefers seafood of Greek origin. However, 31-41% of consumers are willing to pay for more *producer* sustainability certification, 30-36% are willing to pay more for *retailer* sustainability certification. Interestingly this means that the average consumer is indifferent to sustainability certification, but many consumers (>30%) are willing to pay more for such certification.

These results strengthen the empirical evidence on the potential benefits of labels as an innovative practice.

Case study: Carp in Poland

The case studies for the aquaculture of carp highlight many of the challenges as well as possibilities, faced by other European aquaculture sectors.

With a long history, carp farming is to a considerable degree traditional and considered to be environmentally friendly. Most firms are small but there are few big companies. Although data is somewhat missing there are indications that for many small-scale farmers the aquaculture activities go hand in hand with other employment. Due to decreasing competitiveness, following decreasing production as

water shortages and high temperatures, carp farmers have had to find innovative ways to survive. These include more processing of the product at the farm level, such as filleting and smoking, but also to figure out new ways to link their aquaculture activities with tourism and recreational fisheries. “Region marketing” is an interesting innovative approach to strengthening the links between aquaculture and other industries such as tourism and related services. Although data on the impacts of these innovations is somewhat lacking, these provide insights into how innovation can help a struggling industry.

Case Study: Carp in Germany and Poland

Carp farming has a long history in Germany and holds second place as the most important species. (after trout). Traditionally, the carp is grown in ponds or in polyculture with other species. The ponds may differ in scale, stocking density and source of water. Rain and surface water are the most common water sources. The close proximity of ponds creates challenges for disease management. As in Poland, the cultural significance and environmental positive externalities can provide possibilities for innovation to enhance the competitiveness of this industry, especially by linking the aquaculture activities with tourism. Safeguarding the environmental services that the ponds provide is something that the authorities have already committed to doing. If the carp farming ceases the authorities would have to use funds to secure that these environmental services will be provided, in one way or another. Supporting the carp farming has thus double benefits. Funds from the EU have been used to this effect, but more and better data is needed to measure the impacts from such innovations.

Case Study: Labelling traditional farming for French mussels

France is an important producer of mussels in Europe. The domestic demand is to a large extent met by domestic production but supplemented by mostly European imports. The demand for mussels in France is seasonal but the market shows a clear preference for a traditional production process called “bouchot”. This offers opportunities for market innovations in form of labels that can, at the same time, increase the market power of producers within the value chain. Labels that signal

production methods, such as “bouchot” can also be used with other labels such as those depicting specific locations, quality and environmental friendliness.

CASE STUDY – COOPERATIVE BRANDING OF TROUT IN FRANCE

Bretagne Truite is a Producer Organization for trout in France, which enables farmers from Brittany to sell their produce under a single brand and gives members the opportunity to establish commercial outlets collectively. This allows them to differentiate their trout from trout produced other regions of France. Furthermore, Bretagne Truite has played a role in production planning and provided assistance to individual producers with business strategies and with fulfilling more stringent regulatory requirements. The PO has also enabled them to share R&D cost between producers.

Bretagne Truite has provided numerous benefits to the producers. First and foremost it has regulated competition between them. As a result, no producer has suffered bankruptcy. There is, however, still fierce competition with other organic producers that puts downward pressure on producer prices.

Case Study: Sea Bass Breton label for coastal line fisheries in Bretagne

A small-scale fleet fishing with line of the coast of Brittany in France has used a specific labelling scheme to differentiate their catches on the market. This is a private collective initiative. A statistical analysis (ANOVA) shows that there is a significant difference in average ex-vessel prices between labelled and non-labelled fish. The analysis shows that prime premiums are due to freshness of the product and the way of fishing (i.e. line fishing techniques), while at the same time environmental criteria are not easily understood by the consumers.

CASE STUDY: ARCTIC CHARR IN ICELAND

Salmon and trout are by far the biggest species in salmonid aquaculture both globally and in Europe. In Iceland, the farming of Artic charr is a way of product differentiation. Arctic charr seems to be well suited for being farmed in Iceland, although the economic success has until now been modest, there seems to be possibilities in increasing the profitability of the sector, not least if the product can be differentiated from other salmonids in the market and receiving higher prices. The main bottleneck

for increased growth of this sector is regulatory and administrative burdens. This is interesting as the production takes place on land, but not in the marine environment, which lowers the risk of environmental hazards due to escapees.

THE MARKET STRUCTURE – THE VALUE CHAIN AND MANAGEMENT

The value chain for seafood markets in the EU have experienced significant changes in recent years as results from the SUCCESS project clearly shows

Value chains for fishery and aquaculture products in the EU

Advances in logistics and communications have led to new agents operating outside traditional channels, especially downstream (Deliverable 4.1). In addition, new channels have emerged, often driven by technological changes and innovation, which have changed relative costs along the value chain. On-line platforms have made it easier for producers to sell more directly to consumers. New channels have emerged, sometimes driven by technological changes that change the relative transaction cost.

In some markets large producers have become more vertically integrated and have in fact at least partly taken over the wholesale link in the value chain. At the same time, smaller agents have become more united through the forming of producer associations, which has in led to an increase in their bargaining powers.

Despite these trends, there is immense difference between markets in the EU.

Case Study: The Amap Poisson fish-box scheme

The Yeu fish-box scheme is a good example of the above-mentioned trend where fishers from the Ile-de-Yeu have united their forces in a fisheries organization that buys the fish from wholesalers and sells fish boxes (of 3 kg) to consumers through fixed contracts which can be described as subscriptions. This service is usually provided to consumers once a month from the period from September to June. The price to the consumer is not higher than in retail stores but the difference between the selling price and auction price is split between a wholesale cooperative, transport costs and fishermen. The economic impact of this innovative sales and marketing method is non-negligible. It amounts to around 6 800 EUR per vessel per year which

is equivalent to a thirteen month salary for the members of the crew. The additional margin is shared on egalitarian basis between members of the crew. Additionally this innovative marketing strategy has led to more stability in prices for those that take part in the scheme.

Case Study: Vertical integration strategy in Italian mussel farming

For the longest time, the Italian mussel farmers were built on a small scale and were highly fragmented. This has resulted in simultaneously low prices and high cost. Therefore the profitability of the sector has been limited. In the last five years however, mussel farms have organized themselves in cooperatives and consortiums, enabling farmers to use large-scale retailing to their advantage and acquired Protected Designation of Origin (PDO) trademark with the associated protection. This has allowed them to put in place a new co-management system, based on vertical upstream integration and quotas in production. Moreover, the profits of the consortium are distributed between the farmers. This has ensured an economic balance between producers and enhanced the effective monitoring of the biomass. However, the price has not been significantly affected.

Case Study: New ways of marketing the Common Cuttlefish in the Gulf of Salerno

In the Gulf of Salerno, as well as in other Italian harbors, there is a tradition of direct sales. Recently, new initiatives have been launched by local fishers organizations. These initiatives have been supported by the Fisheries Local Action Group (FLAG) and by European structural funds. One initiative is the digital marketplace, where technology solutions are suggested to help in promoting and selling local seafood produce. The other initiative is “Fish Basket Schemes” aimed at shortening the value chain through the use of contractual agreements between local fishers and buyers. These initiatives have not been taken into consideration by the fishers in the region, who are more concerned about the reduction of landings due to over exploitation and degrading marine habitat. This shows that marketing innovations are not always well received by stakeholders, despite potential benefits, if other concerns weigh heavier.

Price transmission and market power in the value chain of seafood products

Deliverable 4.4 contains a database that provides comprehensive analysis about the price transmission mechanism in fisheries throughout Europe. The outcome can be a

vital tool for both market players and policymakers with regards to decision-making. There are however some general results worth highlighting in this context.

- Product differentiation is high at species level and across production systems. For instance, farmed fish is not always a direct substitute to the corresponding wild spices.
- Competition across countries depends on the level of differentiation across products.
- Cost can be more readily transferred downstream for differentiated products.
- In contrast, when products are not differentiated, price transmission tends to be only upstream and the producers are fragmented.
- There is a premium on organic and quality labelled products. The price fluctuations still depend heavily on the price set by the market leaders. The price premium is, however, offset by differences in cost. This is what one would expect in a market equilibrium.
- Advances in logistics and communication technologies have facilitated vertical integration and consolidation among the retailers. Those have developed logistic platforms that enable more direct links to the producers and have thereby shortened the value chain.
- Small producers must innovate at all levels, i.e. organization, commercialization and at the product level, in order to remain competitive in the distribution channels that are being created by the big retailers.

These results all point to the importance of differentiation for the suppliers. Labelling schemes may lead to better results for the producers, especially for producers that are already producing high quality products. One of the findings in Deliverable 4.1, which further strengthens these conclusions, is that limited knowledge of workers at the seafood section in supermarkets, generally leads to lower demand of quality products than could be expected.

It is, however, not possible to draw the conclusion, based on these results, that the gain from increasing the quality of the product and receive higher prices is in all cases enough to justify the extra cost.

PART III – CONCLUSIONS AND RECOMMENDATIONS

The notion of innovation is often solely associated with technological advancements, either in machinery or methods. The SUCCESS project reflects the sentiment that that innovation is a broader concept and that other types of innovations are as important.

The SUCCESS project has yielded many insights and evidence regarding technical and regulatory innovations in fisheries and aquaculture. These innovations partly reflect the main challenges faced in the industry.

There seem to be mainly three innovative types of measures taken by industry, i.e.

1. Market initiatives such as certification/labelling, direct sales, new outlets
2. New organisational forms and sales organisations
3. New forms of management systems such as co-management, integrating stock conservation and marketing objectives

Certification and labelling schemes aim to differentiate products in the market and receive higher prices for the products.

New organisational forms and sales organisations are similarly put in place to add value to fishers further along the value chain.

The third type of innovation measures includes not only traditional management measures or co-management, but also examples where fisheries and fishing activities are linked to other economic and social activities, such as tourism, culture and cultural landscapes.

It is interesting to note that one of the challenges often mentioned regarding European fisheries, i.e. the lack of interest of younger people to engage in fishing and fish related industries is not tackled directly through technological or regulatory innovations. This is perhaps not surprising as the attractiveness of the industry for young people depends to a great extent on the economic performance of the sector, which is generally not very good.

Finally, there is a lack of data needed to accurately measure the economic impacts of the different innovations in European fisheries and aquaculture. This lack of data is evident from the discussion in this report. It is of great importance to systematically

collect such data in order to be able to design policy options to increase competitiveness of fisheries and aquaculture in Europe.

The following table provides a summary of different case studies and how they relate to possible policy options.

Category	Case Study	Description	Objectives	Methods	Challenges	Policy Options	Benefits from improved policies	Cost of policy options
Flatfish	Netherlands	Design of SumWing, a fuel saving trawl design.	Improve fuel efficiency	-Experiment -Observational study	High production costs	Public support for R&D	-Improved fuel efficiency -Lower cost -Reduced environmental damages	Cost of public funds
Salmonids	Arctic charr (Iceland)	Study on the profitability of aquaculture farms.	-Identify bottlenecks	-Data analysis	-Low profitability - Low growth of industry	Regulatory improvements	-Higher profits	Cost of public funds.
Salmonids	Trout farming (Germany)	Descriptive study on production and value chain.	Description of production systems.	-Data analysis.	-Low market power -Scarcity of high quality feed -Perception challenges -High production costs compared with competitors -Scarcity of water and suitable locations.	Regulatory improvements	-Lower compliance costs -Increased growth possibilities and economics of scale	Cost of public funds
Seabass/sea bream	Aquaculture (Greece)	Qualitative and quantiative research on consumer behavior	Increase producer price	-Surveys -Experiment -Data analysis using dicrete choice models	-Low producer price	-Labels do not seem as a good policy option for fisheries or aquaculture in Greek	-Consumers are not willing to pay more for sustainability certificated products	Cost of implimentation
Seabass/sea bream	Italy	Descriptive economic study on producers	Improve profitability	Data analysis	-Decreased economic performance - Producers have had to exit or diversify - Difficulties in financing	-Regulatory improvements - Reduce administrative burden -Enable producers organizations	-Lower compliance cost -Increased growth opportunities -Increased living standart of producers -Increased sustainability	-Cost of implimentation -Cost of public funds
Seabass/sea bream	Spain	Comparison between countries and industries	Identifying main issues at stake	Data collection and analysis	-Uneven market powers along the value chain	Market structure	-Market power to producers -Higher producer prices	-Negligible
Seabrass/se abream	France	Quantitative study on the effect of labels on prices.	-Increased producer price	-Numerical analysis (ANOVA)	-Product homogeneity	Marketing – labelling, branding and differentiation	-Higher producer prices	-Implementation costs -Public funding -Administrative costs
Mussels	Greece	Study on product innovation for taste and improved shelf-life.	-Identify processing methods to increase shelf-life	-Experiment -Observational study	-Waste	Consumer preferences and demand / Technological innovations	-Price increase -Reduced waste	-Implementation costs -Public funding -Administrative costs
Mussels	Italian farming					Marketing – labelling, branding and differentiation		-Negligible
Mussels	Spanish farming					Marketing – labelling, branding and differentiation		-Negligible
Whitefish	UK and EU fleets					Regulatory systems		-Negligible
Coastal fisheries	Sicily small scale fisheries	Study on Producer Organizations and market innovations.	Enhance the sustainability of the industry.	Data analysis.	- Unhygenic handling -Low quality products -Losses along the value chain -Intractability -Overfishing and environmentally unfriendly fishing practices	Marketing – labelling, branding and differentiation	-Increased traceability -Increased demand for all species -Reciprocal support from tourism and fisheries -Increased sustainability of industry and ecosystem	-Implementation and operations costs -Public funding -Administrative costs
Coastal fisheries	Cuttlefish in the Gulf of Salerno	Analysis of production system, prices and demand.	Investigate the role of direct sales.	Descriptive analysis.	-Decreasing producer prices -Lack of organization	Market structure /	-Higher producer prices -Higher share of producer prices going to fishers	Implementation costs
Coastal fisheries	Northern Adriatic (Italy)	Study on co-management and innovations in management.	Estimate effects of new management structures and possible generalizations for other fisheries.	Value chain analysis.	-Lack of balance between fishing effort, stock sizes and market conditions. -Lack of local consumption.	Regulatory innovations	-Increased coordination between management and the market organizations	Cost of public funds
Carp	Poland	Interviews and focus groups	Identification of strategies to improve profitability and sustainability.	Qualitative study	-Low demand - Low profits - High median age of producers	Marketing – labelling, branding and differentiation	-Positive externalities on the environment -Cuts government cost in sustaining areas	-Implementation and operations costs -Public funding -Administrative costs

These policy options have different benefits and costs. These are are based on various workpackages in the SUCCESS project and are further analysed in deliverables D5.2 and D5.3.

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