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Lead Scientist preparing the Deliverable: Borgh, W. van der (P10. TU/e),

Other Scientists participating: Nijssen, E.J. (P10. TU/e), Reinders, M. (P6. DLO), Tacken, G. (P6. DLO), Beukers, R. (P6. DLO)

Objective: The objective was to analyze the current business model and supply chain of the participating SME's. Specifically, the presence or absence of critical success factors and opportunities for improvement will be identified. These identified models will be used as input for WP 30 Business model and marketing strategy development, where new strategies will be developed for the new products using the new species.

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1 Introduction

In this Deliverable, the objective was to analyze the current business model and supply chain of the SME participating in DIVERSIFY. A business model describes the rationale of how an organization creates, delivers, and captures value (Osterwalder, 2004). Using the Canvas business model theory (Osterwalder and Pigneur, 2010), the value propositions, customer interface, management infrastructure, and costs and revenues of the participating SME's are mapped with a focus on the selected species. This validated methodology provides a framework that helps identify the presence or absence of critical success factors and opportunities for creating and appropriating value for products of the selected fish species (*i.e.*, meagre, greater amberjack, wreckfish, Atlantic halibut, grey mullet, and pikeperch). Mapping the business models, thus, provides the money making logic for the six fish species and shows how producers allocate resources over channel partners.

At the Annual Coordination Meeting (ACM 2014) in Bari Italy, a workshop was organized. Using the Canvas business model theory the workshop allowed the different SME's to clarify and reflect on their current business models and use/influence of the supply chain. The Canvas business model mapping was done for the SME's represented in DIVERSIFY, which are operating in five main production countries and are interested in some of the selected fish species (Error! Reference source not found.).

Table 1: Fish species and production countries included in the DIVERSIFY project.

Species	Selected production countries	SMEs
Meagre	Spain, Greece, Italy	CULMAREX (Spain), ARGO (Greece)
Greater amberjack	Spain, Greece, Italy	ITICAL (Italy), CANEXMAR (Spain), FORKYS (Greece), ARGO (Greece)
Wreck fish	Spain, Greece, Italy	FORKYS (Greece)
Atlantic halibut	Norway	SWH (Norway)
Grey mullet	Spain, Greece, Italy	ITICAL (Italy), DOR (Israel), GEI (Greece) and IRIDA (Greece)
Pikeperch	France	ASIALOR (France)

2 Theoretical Framework

The Osterwalder (2004) business model concept is based on four pillars, namely; *product, customer interface, infrastructure management, and financial aspects*. These four pillars are divided into nine building blocks (Customer segments, value propositions, customer channels, customer relationships, capability, value configuration, partnerships, revenue streams, and cost structure). The model facilitates the ability to create a transparent big picture, with common and understood language to improve communication and understanding of the fundamental question of a business. Business models create core assets, capabilities, relationships, and knowledge (Linder and Cantrell, 2000). It is important to make business transparent to show where costs and risks come from (Osterwalder, 2004). With a clear business model a company can enhance their organizational focus and establish easily a business framework for competing in the market (Linder and Cantrell, 2000). See Figure 1 for an overview.

Value Proposition. The value proposition describes the bundle of products and services that create value for a specific customer segment (Osterwalder and Pigneur, 2010). It represents value for one or more target customer(s) and is based on the internal capability (ies) of a firm, and can be decomposed in one or several offering(s) (Osterwalder, 2004). The value proposition provides value through various elements such as



newness, performance, customization, "getting the job done", design, brand/status, price, cost reduction, risk reduction, accessibility, and convenience/usability. Value propositions may be quantitative (e.g., speed of delivery, price or service) or qualitative (e.g., taste or customer experience). In essence, it is why the customer chooses one offering over another.

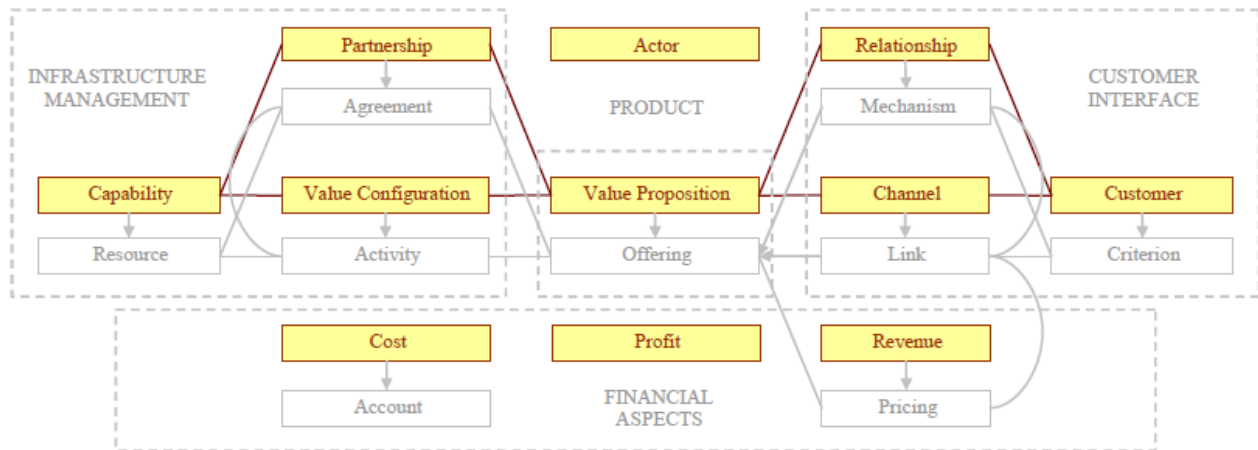


Figure 1: Business model ontology (Osterwalder, 2004).

Target Customer (Customer segments). The target customer refers to the type of customers a company wants to approach with its offerings (Osterwalder, 2004). Customer can be segmented using three main factors: behavioral, psychographic and profile factors (Jobber and Fahy, 2009). Behavioral segmentation (benefits sought, purchase occasion, purchase behavior, usage, perceptions and beliefs) can be considered the ultimate basis for segmentation. Psychographic segmentation is applicable when it is believed that purchasing behavior is correlated with personality or lifestyle of customers. Profile segmentation can be based on demographic, socio-economic, and geographic variables (Jobber and Fahy, 2009). Different types of segments include mass market, niche market, segmented (*i.e.*, segments inside a segment), and diversify (*i.e.*, target multiple segments). WP29 Socioeconomics – Institutional and organizational context focuses mainly on this aspect.

Customer Relationship. Customer relationship describes the link a company establishes between itself and the customer (Osterwalder, 2004). Johnson and Selnes (2004) identify four types of relationships, namely: strangers, acquaintances, friends and partners. As the relationship evolves from acquaintance to friends and then to partners, the trust and commitment in these relationships suggests that the social mechanism for creating value changes (Johnson and Selnes, 2004). This relationship can be different for every offering within a company and thus within the business model. For example, a service offering may require a different relationship (*e.g.*, long-term relationship) with the customer than a fast moving consumer product (*i.e.*, transactional).

Distribution Channel. The distribution channel indicates how specific value offerings are communicated to the targeted customers (Osterwalder, 2004). In general it is distributed through communication, distribution, and sales channels. Channels can differ for every offering, and therefore also for every fish species. Effective channels will distribute a company's value proposition in ways that are fast, efficient and cost effective. Examples of channels are own channels (*e.g.*, stores), partner channels (*e.g.*, major distributors), or a combination.

Value Configuration (Key activities). The value configuration describes the arrangement of activities and resources that are necessary to create value for the customer (Osterwalder, 2004). Key activities reflect the most important activities in executing a company's value proposition. Porter's (1985) value chain and other



extensions (Stabell and Fjeldstad, 1998) contain the different activities (e.g., buying raw materials, processing the material, selling the products, providing service, R&D activities, purchasing, human resource management) that create the value configurations within this model. Otherwise put, the value creation logic of a value chain revolves around the transformation of inputs into products (Stabell and Fjeldstad, 1998).

Key Capabilities (and resources). Wallin (2000) describes capabilities as repeatable patterns of action in the use of assets to create, produce, and/or offer products and services to the market. These capabilities depend on the assets or resources of the firm (Bagchi and Tulske, 2000) or its partners (Osterwalder, 2004). A firm needs to have a number of key capabilities to be able to offer its value proposition. The capabilities used can be very different for every separate offering within a company.

Key partnerships. A partnership is a voluntarily initiated cooperative agreement formed between two or more independent companies in order to carry out a project or specific activity jointly by coordinating the necessary capabilities, resources, and activities (Osterwalder, 2004). Companies often focus on core activities (e.g., SME's focus on farming fish) and outsource other activities to specialized partners (e.g., marketing or logistics of fish products).

Cost structure. The cost structure delineates all the costs the firm incurs in order to create, market, and deliver value to its customers. It puts a price tag on all the resources, assets, activities and partner network relationship, and exchanges that demand financial capital (Osterwalder, 2004). Important to note is that in many instances only part of the costs can be assigned directly to specific product offerings, while other costs, such as overhead, are more difficult to assign to a specific offering. In general there are two classes of cost structures: cost-driven (i.e., minimizing costs) and value-driven (creating value). Important characteristics of costs are fixed and variable costs and economies of scale and scope.

Revenue model. The revenue model describes how a firm appropriates money from specific offerings. It can be composed of one or more revenue streams and pricing models. Revenue streams and pricing elements describe an incoming money stream from the value offered by the company. Next to that, the price-model is defined (Osterwalder, 2004). There are many ways to generate revenue. Most common type is asset sale. Other types are subscription fees, lease, usage fee, and licensing.

3 Methodology

3.1 Rationale for Data Collection Approach

We mapped the business models SME's currently use, using information collected during a workshop organized at the 2nd Annual Coordination Meeting (ACM) of the DIVERSIFY project (Bari, Italy, 4-6 November, 2014). A workshop is a brief intensive session emphasizing interaction and exchange of information among a small number of participants. A workshop approach was chosen, as this enables the researchers to quickly map the business models for the fish species farmers while its interactive nature ensures validity and reliability.

3.2 Sample

The workshop involved key informants. Selection criteria for key informants include: (1) extensive exposure to and knowledgeable about business processes of fish producers; (2) the respondents represented all 6 fish species of the DIVERSIFY project; and (3) ability to be physically present during the workshop (P26. GEI and P27. FORKYS did not attend the meeting).

Two months before the ACM, the project coordinator send to the SME's an invitation to participate in the workshop. After two reminders (one before the ACM and one during the first day of the ACM), 8 informants



agreed to participate. These informants included 5 SME representatives (P22. SWH, P25. DOR, P23. ARGO, P28. CANEXMAR and P29. ASIALOR) and one representative from the professional associations (P34. BVFi). In most instances one respondent and in a few instances multiple respondents represented each fish included in this study. These six representatives covered the six species of the DIVERSIFY project, thereby ensuring 100% coverage of the fish species.

3.3 Data Collection Protocol & Analysis

During the workshop the participants first listened to a short presentation (prof. Ed Nijssen, P10. TU/e) explaining the basic principles of the business model approach and the protocol for the workshop. After the presentation, the group was split in two subgroups. After discussing the business models for the fish species in general, Group 1 covered Atlantic halibut (P22. SWH), Pikeperch (P29. ASIALOR), and grey mullet (P25. DOR), while Group 2 covered greater amberjack (P28. CANEXMAR), meagre (P23. ARGO), and wreckfish (P34. BVFi). Each subgroup was led by one business model expert and another person took minutes.

Each participant was asked to write down their specific approach for one of the building blocks of the business model on post-its and place it on an A0 format print-out of the Business model canvas (Figure 2). After that s/he was asked to explain it. This not only ensured that what the person meant also was understood by others but also lead to in-depth discussions on how certain SME's conducted their business in a particular manner and how it compared with that of the other participants.

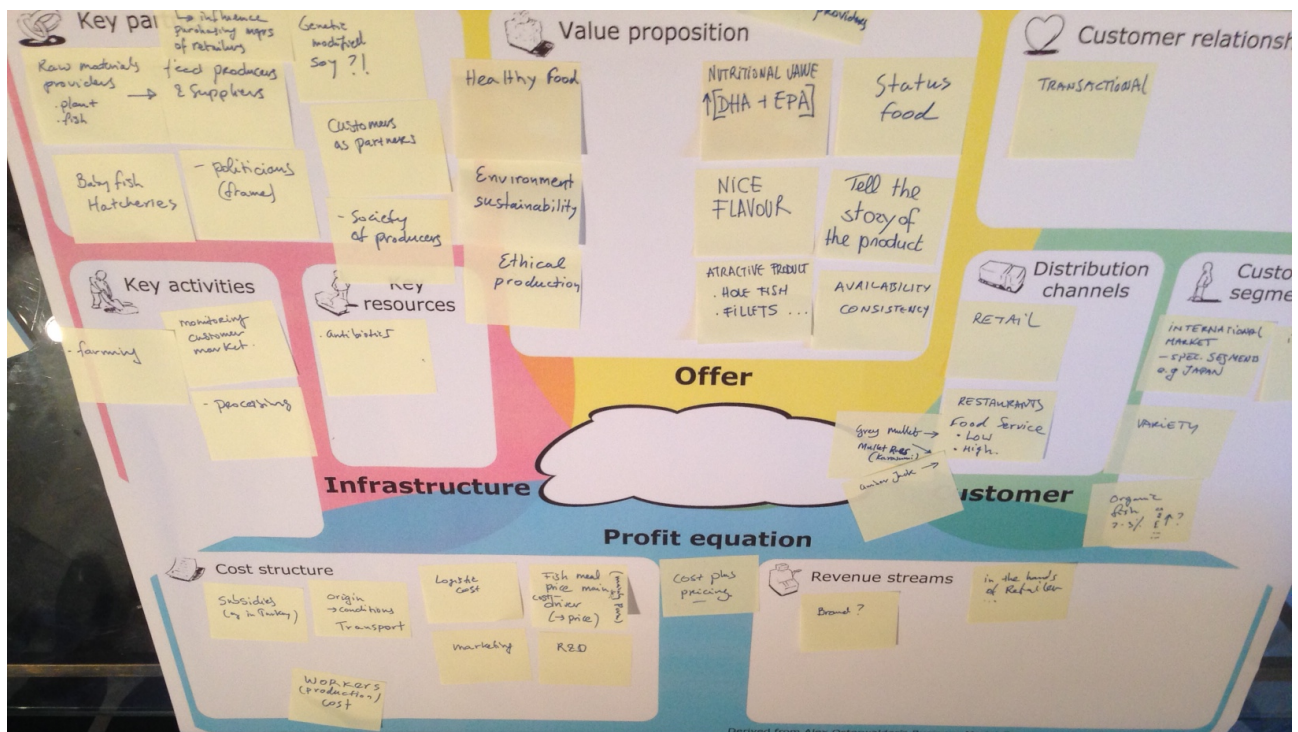


Figure 2: Example of filled-out Business model canvas for three farmed fish species of DIVERSIFY.

At the end the two groups joined and discussed their results. This served as a cross-case comparison and identified similarities and differences between the two groups.

After the workshop, the researchers registered systematically the data (*i.e.*, business models canvasses and minutes) and analysed it systematically. First, within-species analyses were conducted to fine-tune and validate the business models for each species. When necessary, secondary data was collected to further support findings or fill blind spots. Second, a cross-species analysis was conducted with the aim to identify generic business models across the six species.

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Table 1: Overview of business model canvas for 6 fish species.

		<i>Grey mullet</i>	<i>Atlantic halibut</i>	<i>Pikeperch</i>	<i>Meagre</i>	<i>Greater amberjack</i>	<i>Wreckfish</i>	
Product	<i>Value proposition</i>	<ul style="list-style-type: none"> Environmental friendly (Farming vs. wild catch) Easy to cook Versatile in type of preparation Premium product: Gonads - Bottarga Low trophic level 	<ul style="list-style-type: none"> Branded product (sterling) High quality flesh Scarcity (high demand, low volume farmed fish; quota wild catch) 	<ul style="list-style-type: none"> Sold whole Continuous supply (year round) High quality flesh French fish (country of origin) Customizable size (near future) Scarcity (increasing demand, low volume farmed fish; wild catch dominates) 	<ul style="list-style-type: none"> Sold whole or as fillets. The largest filets can be smoked in some cases. An application for quality labelling has been filed (Label Rouge and Indication Geographique Protégé - IGP) Good quality flesh, low in lipids with a high proportion of polyunsaturated fatty acids Appropriate size for processing (filleting and smoking) Long shelf life Scarcity (high demand, low volume) 	<ul style="list-style-type: none"> Fast growing fish Excellent flesh quality Large size (easy to process) High consumer acceptability and demand 	<ul style="list-style-type: none"> Fast growing fish Easy to bone Easy to cook Good flesh quality High market price (high demand, quota on wild catch) 	
	Customer interface	<i>Customer segments</i>	<ul style="list-style-type: none"> Mass market: grey mullet (housewife) Niche market: Bottarga Main markets southern and eastern Mediterranean area. No export. 	<ul style="list-style-type: none"> Niche market: Dealers & Chefs 	<ul style="list-style-type: none"> Niche market: Dealers & Chefs Main markets Western Europe (e.g., Germany and France) 	<ul style="list-style-type: none"> Niche market: Dealers & Chefs Market not sufficiently developed as species is poorly known by the general public. Main markets Southern France and Italy. 	<ul style="list-style-type: none"> N.a. 	<ul style="list-style-type: none"> N.a.
		<i>Customer relationship</i>	<ul style="list-style-type: none"> Close relationships Big market with tradition 	<ul style="list-style-type: none"> Short & long term relationships (building) 	<ul style="list-style-type: none"> Short & long term relationships (building) 	<ul style="list-style-type: none"> Short & long term relationships (building) 	<ul style="list-style-type: none"> N.a. 	<ul style="list-style-type: none"> N.a.
<i>Distribution channels</i>		<ul style="list-style-type: none"> Partner channels: Dealers (face/phone) & Bottarga makers (face/ phone) 	<ul style="list-style-type: none"> Partner channels: Small set of distributors (face/ phone) 	<ul style="list-style-type: none"> Partner channels: Small set of distributors (face/ phone) 	<ul style="list-style-type: none"> Partner channels: Small set of distributors (face/ phone) 	<ul style="list-style-type: none"> N.a. 	<ul style="list-style-type: none"> N.a. 	
infrastructure management	<i>Key activities</i>	<ul style="list-style-type: none"> Breeding Farming Processing 	<ul style="list-style-type: none"> Breeding Farming Processing (transfers to customer given difficulty in processing fish) 	<ul style="list-style-type: none"> Breeding Farming Processing 	<ul style="list-style-type: none"> Breeding Farming Processing 	<ul style="list-style-type: none"> N.a. 	<ul style="list-style-type: none"> N.a. 	
	<i>Key resources</i>	<ul style="list-style-type: none"> Money / capital Knowledge Water quality Oxygen Temperature Energy 	<ul style="list-style-type: none"> Money / capital Knowledge Water quality Oxygen Temperature Energy 	<ul style="list-style-type: none"> Money / capital Knowledge Water quality Oxygen Temperature (constant) Energy 	<ul style="list-style-type: none"> Money / capital Knowledge Water quality Oxygen Temperature (constant) Energy 	<ul style="list-style-type: none"> N.a. 	<ul style="list-style-type: none"> N.a. 	
	<i>Key partners</i>	<ul style="list-style-type: none"> Hatchers Farmers Feed co. Scientists Processing 	<ul style="list-style-type: none"> Scientists Processing industry 	<ul style="list-style-type: none"> Scientists Broodstock (limited number of broodstock farms) Transport 	<ul style="list-style-type: none"> Hatcheries (Number of hatcheries very limited; 6 in France) Scientists (Little knowledge or scientific work on the species, relatively limited rearing experience) 	<ul style="list-style-type: none"> N.a. 	<ul style="list-style-type: none"> N.a. 	
financial aspects	<i>Revenue model</i>	<ul style="list-style-type: none"> Cost price plus (market price wild catch) 	<ul style="list-style-type: none"> Cost price plus (market price wild catch) 	<ul style="list-style-type: none"> Market price wild catch 	<ul style="list-style-type: none"> Market price (based on total availability of catch + farmed) 	<ul style="list-style-type: none"> N.a. 	<ul style="list-style-type: none"> N.a. 	
	<i>Cost structure</i>	<ul style="list-style-type: none"> Cost-driven (grey-mullet) Value-driven (Bottarga) Fingerling (10%) Feed (20%) Labour (25%) Energy (15%) Health (5%) Depreciation (5%) Transport (20%) 	<ul style="list-style-type: none"> Cost-driven Juveniles (7-8%) Feed (25-30%) Labour (17-20%) Maintenance (10%) Depreciation (5%) Admin (20-30%) 	<ul style="list-style-type: none"> Cost-driven Feed (25%) Energy (25%) Oxygen (10%) Labour (40%) 	<ul style="list-style-type: none"> Cost-driven Since the number of production units is low, cost comparisons are difficult to make. Fast growing species 	<ul style="list-style-type: none"> N.a. 	<ul style="list-style-type: none"> N.a. 	

4 General Business Models

Two different types of business models can be distinguished. The first business model type incorporates relatively cheap fish that can be produced in large quantities and sold to a mass market. The selling of this fish is more transactional in nature. The second business model is a niche-marketed product aiming to deliver high quality at relatively high margins. For these types of products producers adopt a more relational selling approach and emphasize the good quality of the fish. Often the niche market strategy is the result of production bottlenecks or limited market demand. As soon as either production, demand bottlenecks or both are solved and market demand increases, suppliers can adjust the marketing strategy to address other market segments or even the entire market.

We also noted that attractive fish species that enter the aquaculture industry are prone to the ‘pork cycle’¹ where the attractiveness of these fish species (and resulting market demand) attracts many investors. After a while the market becomes saturated, which leads to sharp declines in prices after which production is reduced (*e.g.*, farmers switch to other species or go bankrupt). After a certain time the cycle may repeat itself. It is important for farmers, therefore, to ensure that supply and demand are balanced. In Portugal, for example, farmers have reached balance by installing corporations of fish producers that help regulate the market (Karadzic et al., 2013). Other approaches are to position a product as unique (*e.g.*, branded fish, country of origin or ecologically produced species).

5 Results of the within-species analyses

Below, we describe in detail each business model for farmed fish species along the four pillars of the business model; *product, customer interface, infrastructure management, and financial aspects* (Table 1).

5.1 Current Business Model for Grey Mullet

Product. Grey mullet² is a species that has been farmed for centuries in ponds in many countries, among others, in the Mediterranean region. Grey mullet is a diurnal feeder consuming mainly zooplankton, dead plant matter and detritus (*i.e.*, low trophic level). The grey mullet is considered an easy to cook, cheap fish that has a versatile range of preparations. In addition, a premium product made from grey mullet is Bottarga. This is an expensive Mediterranean delicacy of salted, cured fish roe (fish eggs), typically from grey mullet or tuna. The product is similar to the softer cured mullet roe, called “karasumi” in Japan and East Asia.³ Bottarga is a hand-made product that is massaged by hand to eliminate air pockets, then dried, and cured in sea salt for a few weeks.⁴ Market prices for this product easily go up to €100/kg.

Customer interface. Whole mullet is usually marketed fresh or chilled to a traditional mass market, but gutted mullet is also accepted. Older (larger) and frozen mullet are considered of inferior quality in its main markets in the southern and eastern Mediterranean region. Most of grey mullet is sold in the country of origin, where demand is increasing (no export). Farmers have close relationships with their buyers and communicate with dealers and bottarga makers face-to-face or by telephone.

Infrastructure management. Farmers focus mainly on breeding, farming and processing of the grey mullet. Most of the grey mullet fry is collected from the wild (coastal waters and estuaries). Then the fry is nursed to fingerlings in grow-out farms and brought to ponds for further on growing. Often, these stages are carried out by different companies. The future expansion of grey mullet farming (with the existing state-of-the-art) is expected to be limited, because it depends mainly on wild fry or fingerlings (which is cheaper than hatchery produced fry or fingerlings). Key resources for farmers include money/capital for the production facilities, knowledge of the farming process, good water quality, oxygen, temperature and energy. Farmers work closely with hatcheries, other farmers, feed suppliers, scientists and processing companies.

Financial aspects. The cost model is cost-driven (*i.e.*, lowering production costs). Labour, feed and transport take up 65% of the total costs of production. Market prices are determined mainly by market prices of wild catch (*i.e.*, availability of fry or fingerlings for grow out).

¹ http://en.wikipedia.org/wiki/Pork_cycle

² http://www.fao.org/fishery/culturedspecies/Mugil_cephalus/en

³ <http://en.wikipedia.org/wiki/Botargo>

⁴ <http://www.taiwantoday.tw/ct.asp?xItem=186453&CtNode=429>



5.2 Current Business Model for Atlantic Halibut

Product. The Atlantic halibut is among the largest bony fishes and the largest flatfish in the world (up to 4.7 m in length and 320 kg in body weight). Atlantic halibut consumes mainly other fish (*e.g.*, cod, haddock and herring) and, therefore, has a relatively high trophic level. The Atlantic halibut was formerly a popular food fish, but due to overfishing and slow population growth its fishery has largely collapsed. In response to this, Atlantic halibut has attracted investment in fish farming. As of 2006, five countries - Canada, Norway, the UK, Iceland and Chile- were engaged in some form of aquaculture production.⁵ Currently, Atlantic Halibut is fished commercially under very strict quotas or is obtained from other targeted fisheries, as by-catch and farming is considered a viable option. Farmed Atlantic halibut is marketed as a branded fish (*e.g.*, Sterling White Halibut) with a high quality flesh. Low production volumes and relatively high demand keep market prices high. Some of the farmers interviewed for the present study regard Atlantic halibut as a difficult to prepare fish.

Customer interface. The market for farmed Atlantic halibut is a niche market. Main customer segments for farmers are specialized fish dealers and chefs from restaurants. Farmers hold close relationships with the customers and aim to further develop the small set of relationships in a personal manner (face-to-face and telephone contact).

Infrastructure management. Farmers of Atlantic halibut have now mastered the breeding and farming of the fish species. But this was difficult as little was, and still is, known about the breeding and growth in the wild. Farmers also carried out part of the processing of the fish, but given the high demands of customers and difficulty in processing the fish, farmers outsource increasingly this to specialized partners or customers. Key resources for farmers include money/capital for the production facilities, knowledge on the farming process, good water quality, oxygen, temperature and energy. Farmers often manage a large part of the farming process themselves (*i.e.*, from hatchery to mature fish). To support and improve this process they work closely with scientists. Moreover, they collaborate increasingly with processing companies.

Financial aspects. The cost structure is cost-driven but in the near future can also move more towards a value-driven model with a focus on branded Atlantic halibut. Labour, feed, and administration take up 62-80% of the total costs of production. Market prices are mainly determined by market prices of wild catch (*i.e.*, availability of fish).

5.3 Current Business Model for Pikeperch

Product. Pikeperch (a.k.a. zander) is a freshwater fish that has a long tradition as farmed species. It is considered one of the most valuable food fishes native to Europe.⁶ Pikeperch is especially well-suited for fish fillets, sushi, and sashimi.⁷ It can also be served whole, baked, smoked or cooked. In some culinary circles, pikeperch is appreciated even higher than salmon. The fish is low in fat content (usually 1-2 percent) and has highly assimilable protein, which makes pikeperch meat highly valued by dieticians. The fish is usually sold frozen as gutted whole fish, fillets with skin or skinned fillets. The fillets are usually sold in the following weight categories: 120-170 g, 170-230 g, 230-300 g, 500-800 g, >800 g. Pikeperch is less frequently sold fresh. Smaller pikeperch (total length >45 cm, body weight <1.0 kg) is perfect for frying, poaching or grilling. The main producing countries are the Czech Republic, Denmark, Hungary, Romania, Tunisia and Ukraine. In addition, pikeperch are also grown in the Netherlands and Poland. Currently most fish is imported from capture fisheries from countries such as Russia or Kazakhstan. But supply is characterized by large fluctuations. As a consequence, wholesale prices for pikeperch fluctuate significantly, but usually range from \$5.6-12.5/kg (whole fish) with a mean of about ~\$8.3/kg. Pikeperch farms can counter this by supplying fish year round (by controlling water temperature). In addition, these fish are of high quality and in the near future can be supplied in customized sizes. Finally, in some countries such as France, country of origin is important and it is considered more advantageous to farm the fish in France itself, than to import from abroad. However, to date the total volume of farmed fish is relatively small.

⁵ http://en.wikipedia.org/wiki/Atlantic_halibut

⁶ <http://en.wikipedia.org/wiki/Zander>

⁷ http://www.fao.org/fishery/culturedspecies/Sander_lucioerca/en



Customer interface. Pikeperch is mainly sold in countries of western Europe, such as Germany and France. In these countries prices can be as high as \$22.2/kg. The fish is sold as a high quality domestic fish through a small set of dealers and chefs. Farmers retain close relationships with their main customers.

Infrastructure management. In the last decades farmers have gained more knowledge on intense farming of pikeperch (as an alternative to farming in ponds). Farmers collaborated with scientists to develop methods for intense pikeperch aquaculture production, mainly in recirculation aquaculture systems (RAS). Only a few farms keep broodstocks, implying that most farm facilities depend on these hatchery producers for supply of fry or fingerlings. Culturing pikeperch in the isolated environment of RAS facilities use mostly water from wells that in some cases deliver constant water temperature (~25°C). This ensures year round production capability, but also lowers energy costs (*i.e.*, no costs for heating water). One of the bottlenecks in this field remains the low effectiveness and high costs of rearing larval pikeperch in RAS.

Financial aspects. The cost structure is cost-driven, but in the near future can also move more towards a value-driven model with a focus on branded pikeperch. The following contribute to the costs of producing fingerlings in RAS: labour 40%, energy 28%, feed 12% and fry 20%. The cost of producing 10 g fingerlings in RAS (2009) was ~ \$0.6/individual.⁸ Labour costs are high due to small scale of production and low level of automatization of farming processes. The cost of producing marketable pikeperch (final body weight 1.5 kg) is estimated to be around \$6.2-7.0/kg. Market prices are benchmarked against the price for wild catch and imports from outside Europe.

5.4 Current Business Model for Meagre

Product. The meagre (also known as shade-fish, salmon-basse or stone basse) is found mainly in the Mediterranean and Black Seas, and along the coast of West Africa (Haffray et al., 2012). It has attractive attributes for the consumer market that include large size, good processing yield, low fat content, excellent taste and firm texture (Monfort, 2010). Meagre is a carnivore and, therefore, has a relatively high trophic level. The history of meagre in aquaculture is quite recent and the first commercial production (in France) was recorded in 1997, while the first commercial fry and juvenile production (Italy) was first reported in 2002⁹. Meagre is mostly sold as a whole fish or in fillets. However, meagre farmers are trying to differentiate between products. Its size is very suitable for processing. Smaller fish (body weight from 600 g to 1 kg) are sold whole or filleted. Larger fish (body weight from 1 to 3-5 kg) are sliced or filleted and smoked. The smoking procedure is a relatively new technique and provides good results. Because of its very high content of polyunsaturated fatty acids (as most of the marine cultured fishes), meagre meat quality is considered very good. Production of farmed meagre is limited with 10,221 tonnes in 2012¹⁰, but it is carried out throughout the Mediterranean region from Spain to Egypt.

Customer interface. Meagre is mainly sold in Spain, southern France and Italy. Prices are around €7-12/kg. Fish is supplied from both capture fisheries and aquaculture. However, demand for meagre is still low as it is relatively unknown to the consumer (European sea bass and gilthead sea bream is more known and appreciated). Yet, given the high quality of the flesh (also quality labels installed such as Label Rouge), diversity in processing, and the rapid production it may become an interesting alternative in the coming years. Currently the fish is sold to a close set of customers (*e.g.*, dealers and restaurants).

Infrastructure management. The farming of meagre is similar to European sea bass and gilthead sea bream. Also meagre feed is comparable, as no special feed has been produced so far. There are several reasons why farmers have not yet scaled up their production. First, the number of hatcheries is limited. This is due to the fact that market demand remains low, resulting in firms not investing in building hatcheries. Third, meagre is often produced in farms that also produce European sea bass and gilthead sea bream, causing internal competition for resources in favour of the latter. A major bottleneck in the production of meagre is the still limited knowledge about the rearing procedure (caused due to limited number of hatcheries and broodstocks). Collaboration with scientists, therefore, is important in the coming years to overcome this bottleneck in meagre production.

⁸ http://www.fao.org/fishery/culturedspecies/Sander_lucioperca/en

⁹ http://www.fao.org/fishery/culturedspecies/Argyrosomus_regius/en

¹⁰ http://www.fao.org/fishery/culturedspecies/Argyrosomus_regius/en



Financial aspects. The cost structure is cost-driven. Costs for the meagre production is difficult to provide, as production numbers are still low. For land-based systems (ponds) costs depend mainly upon the size of the farm, but this type of farming is very limited in the EU (Portugal and Spain), but is used extensively in Egypt. For cage culture, the major expense is the cost of feed and juveniles. Generally, feed is the major cost during grow-out, but lower than other comparable marine fish species, due to a better feed conversion ration (FCR), which for meagre can be lower than for European sea bass and gilthead seabream. Market prices are based on total availability of wild catch and farmed fish, but has relatively low margin due to low demand.

5.5 Greater Amberjack (No current business model)

Product. The greater amberjack is a fast growing bony fish that is found in the Mediterranean Sea, as well as the Atlantic, Pacific and Indian Oceans. The greater amberjack is a carnivore and is a powerful hunter, which feeds on other fish and invertebrates having a high trophic level. Due to its excellent flesh quality it is considered an excellent eating fish (firm texture and rich flavour). Its rapid growth (*i.e.*, short time to market size), large size, worldwide market availability and high consumer acceptability makes this fish very attractive for the aquaculture sector (Nakada, 2000). However, production of greater amberjack remains very low (Mediterranean production in 2012 was only ~2 t) with a limited commercial activity with hatchery-produced individuals in Malta and Spain. Main bottlenecks are the lack of reliable reproduction and lack of juveniles.

Other amberjacks, such as the Japanese yellowtail (*Seriola quinqueradiata*) and the kingfish (*Seriola lalandi*) are produced on a larger scale in Japan, Korea, Australia, Brazil and the US.^{11,12} For instance in Japan 120,000 tonnes are produced each year. Farmers are supplied with wild fry and feed the fish with extruded pellets. Most fish are produced in cages but trials for RAS culture have also been tried recently, but with limited success. Costs for greater amberjack feed can not be determined accurately now, since there is no commercial feed available, but it is expected that it will be similar to feed for other marine cultured fish.

5.6 Wreckfish (No current business model)

Product. Wreckfish is a marine fish that can be found in the Mediterranean sea, as well as the Atlantic and Pacific Oceans, usually in water depths from 40 to 1,000 m. It is a fast-growing fish that is easy to bone and has excellent quality flesh that is easy to cook. Wreckfish is also attractive for the aquaculture industry because of its high market price and limited fisheries landings, and ease of adaptation to captivity. However, lack of reproduction control and limited broodstock has inhibited the commercialisation of farmed wreckfish.

6 Conclusions

Having carried out an analysis to map the current business models for the six fish species, these are our main findings:

- Business models are either determined by production volumes (niche market), market demand (mass market) or both. Low production volumes often are due to bottlenecks in the production stage (*e.g.*, limited amount of broodstocks and/or fingerling/fry production), low investments made (up till now) in producing the fish, or customer unawareness (*e.g.*, meagre). New farmed species start mainly in a niche market, but when organized successfully they can develop towards other markets (*e.g.*, with product innovation) or evolve into a mass marketed product.
- Fish farmers have relatively little differentiation in value propositions. Fish is either sold whole or processed. In some cases farmers develop marketing strategies that aim to increase customer value (*e.g.*, branded fish; specialty products such as Bottarga; quality labels). Also some new value propositions that focus on fish as a convenience product are identified (*e.g.*, fish burger in food service sector), but often these innovations are initiated and coordinated by more downstream actors in the food service sector and/or wholesalers.

¹¹ <http://en.wikipedia.org/wiki/Seriola>

¹² http://en.wikipedia.org/wiki/Japanese_amberjack



- Key activities of farmers are similar across countries and species. More prioritization could be given to those activities that help in executing a farmer's value proposition. For instance for branded fish it is important to focus on marketing activities across the value chain (*i.e.*, consider the customer's customer).
- Cost structures mainly follow a cost-driven model that aims to lower all costs in farming fish (*e.g.*, lowering labour costs, increasing scale (*i.e.*, volume)). Some farmers try to transfer to a more value-driven model by means of branding.
- Farmers are prone to the 'pork cycle' and although they are aware of this mechanism they have no clear guidelines on how to deal with this phenomenon. Important in this respect is to balance supply and demand and not focus too long on a cost-driven model. Differentiation in offerings and adding value to the products are important assets for farmers. Also, flexibility in production (scale and switching to other species) is an important capability.

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Deviations

There is very limited aquaculture production of greater amberjack, while there is absolutely no aquaculture production of wreckfish, so for these species it was impossible to define the current business model.