Deliverable Report

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Status:	Delivered	**Expected month:**	48
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Objective: Analyze cost structures and possibilities to further drive down costs together with the SME Partners. The way different companies along the value stream are involved and will get an income from cooperation or customer segments will be described and analyzed. This will be linked to price decisions to allow for estimating revenue streams. Several ways to generate revenue streams will be explored. The effort will draw on market data and trends from Task 27.1. Deliverable D30.4 results in business models for the selected species, and more in detail for the ones for which new products are developed. As part of this business model development effort, the revenue model will be specified, also identifying - based also on e.g. D30.3. - opportunities to further drive down cost levels. Next all elements will be integrated in an overall business model reporting, with conclusions for the SME partners on how to proceed their business development process for the species involved.

Deviations: Due to limited progress in product development and production readiness, it is difficult to clearly anticipate revenue streams. Furthermore, the focus is on the species meagre, greater amberjack, and pikeperch.

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1 Introduction

This deliverable involves the development of revenue (pricing & costs structures) models per species, i.e. for SMEs farming pikeperch, meagre, and greater amberjack. As part of the development of business models, revenue models are specified and opportunities to drive down cost levels in the future identified. It offers an outlook on the financial aspects of the new business. The main production countries are Spain, Italy, France, Belgium, Portugal and Greece.

We first discuss the relationship between a firm's business model and revenue model. This discussion will show that a revenue model is a key element of any business model; it explains a firm's anticipated revenue streams, pricing mechanisms, and cost structures, and thus how a firm (and its partners) plans to make money, i.e. a profit.

We then discuss the method used to collect data from the DIVERSIFY partners involved in farming these new species. The empirical data from SMEs were complemented with expert opinions, data from secondary sources and of previous deliverables, for example Deliverable D30.1 on business models for the species. The data were analyzed and integrated.

In the results section we identify and discuss the revenue models of pikeperch, meagre, and greater amberjack. Revenue streams, cost structures, and pricing practices are identified and break even estimates made per species. Finally, we discuss possibilities for the SMEs for cost reduction and impact on firm viability. We conclude with guidelines for SMEs regarding their current and future revenue models.

2 Theoretical Framework

2.1 Financial aspect of the business model

The Osterwalder (2004) business model concept consists of nine building blocks, i.e. value propositions, customer segments, distribution channels, customer relationships, capability, value configuration, partnerships, revenue streams, and cost structure. The concept facilitates creating a transparent 'bigger picture' of how a business works. It offers common language to improve communication between partners and facilitates the understanding of the fundamental question of a business: which value it creates and delivers to its customers and how it sustains itself.

An important function of the business model is showing where costs and risks come from, and how money will be earned and profits sustained (Osterwalder and Pigneur 2010; Osterwalder, 2004). **Figure 1** provides a visual representation of the business model and highlights the financial elements of the business model.

The business model per species was first discussed in Deliverable 27.3.2. In Deliverable 30.1 the elements of product (value proposition), channel relations, and customer interface (customer segments) were detailed, while Deliverable 30.3 addressed the identification and relationship development with partners in the supply chain and other stakeholders.

In the current deliverable the focus is on the financial elements of the business model, i.e. the revenue model. The aim is to detail the elements of revenue streams and cost structure in the above list of elements of the business model and thus provide insight into the business models per species.

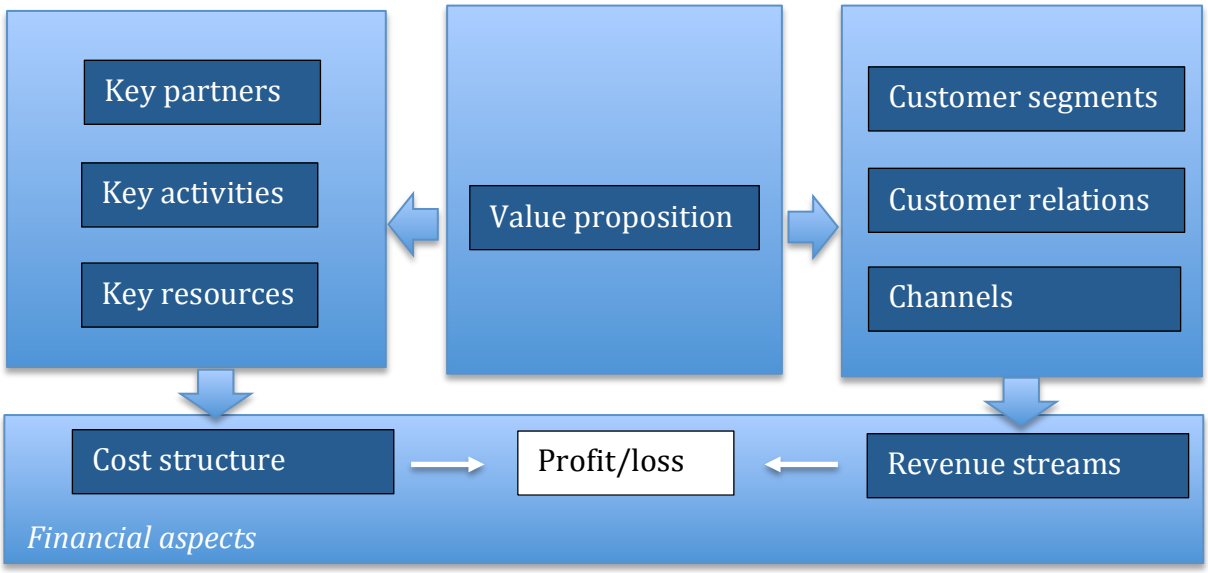

Figure 1. Business model Canvas (based on Osterwalder 2004).

The financial aspect of the business model is often referred to as *revenue model*. Although it includes cost structure and revenue streams, other elements such as pricing mechanisms and the overall result, i.e. profits (revenue -/- cost) are also important elements to consider. **Figure 2** offers a visual representation of the revenue model using a more detailed perspective of components and their interrelationships.

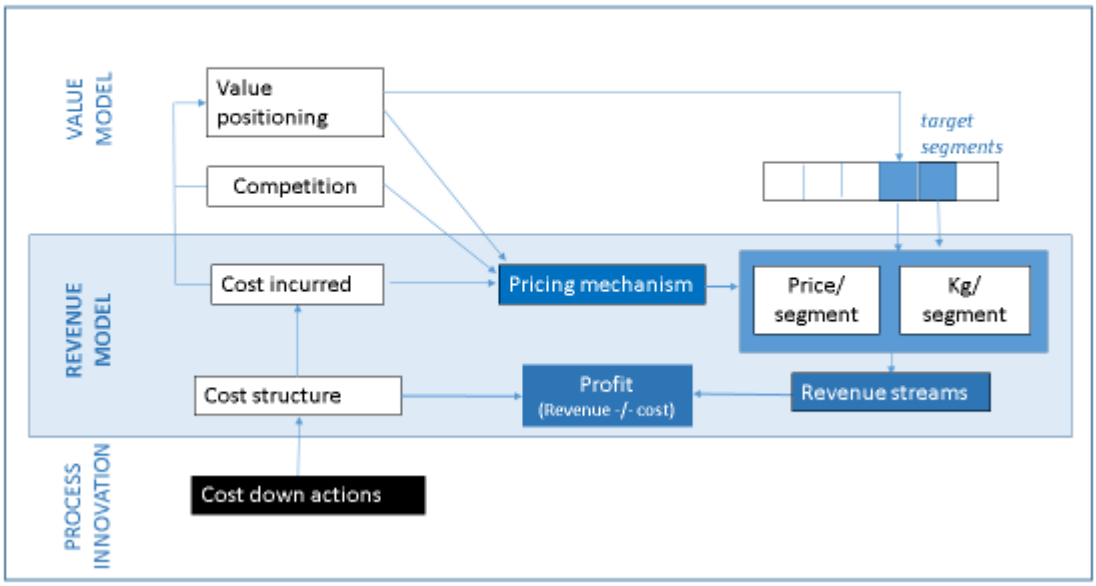

Figure 2. Revenue model based on cost, competition or value positioning.

2.2 Detailing the revenue model.

A revenue model consists of four key components: the revenue streams, the cost structure, pricing mechanism, and the outcome: profits. A company's revenue model can be composed of different revenue streams that can have different pricing mechanisms (Osterwalder & Pigneur 2010). Together these

components explain the way a firm makes money (or a loss). Below, we discuss these components in the context of SMEs involved in farming fish.

Revenue streams. According to Osterwalder and Pigneur (2010), revenue streams represent the cash firms generate from each of their customer segments, or funds the firm generates for other services it provides. There are several ways to generate revenue streams. These include: *Asset sales, Usage fees, Subscription fees, Lending/Renting/Leasing, Licensing, Brokerage fees,* and *Advertising*. However, SMEs in EU aquaculture mostly generate revenue from selling the physical products e.g. fillets or whole fish. In this case the firm's revenue stream is the number of units sold multiplied by the selling price. The price is set by the firm but influenced by market conditions and costs. The price paid reflects the value created and delivered to the customer. The end consumers' price is based on this selling price and a markup for the distributor/retailer. The means through which SMEs arrive at the decided selling price are referred to as *pricing practices* (Ingenbleek & Van der Lans, 2013). In general, firms distinguish between *value-based, competition-based*, and *cost-based pricing*. High prices focused on creating customer value relate to value-based pricing, where SMEs should understand customers quality perceptions, quality-price trade-offs, and customers' willingness to pay. Prices intended to match or follow competitors' prices relate to competition-informed pricing. Prices intended to be low and based on the feasibility of offsetting incurred costs relate to cost-based pricing (Ingenbleek & Van der Lans, 2013).

For the SMEs in the DIVERSIFY project, it is important to understand their target customer and the price these customers are willing to pay, i.e. what value (product aspects, services) they are paying for, in order to determine the optimum selling price. The number of target customers present and particularly the share of consumers of the target segment buying the SME's products will determine the actual revenue stream. That is, market share of target consumers times the selling price makes up the revenue stream. In general, two different types of revenue streams can be distinguished: 1) Transaction revenues, resulting from one-time customer payments, or 2) Recurring revenues, resulting from ongoing payments, for example the sales of loyal customers. Both of these could be applicable in the context of aquaculture. In the process the SMEs distributors or business customers play a key role. They need to be convinced first to adopt the SME's products. Being able to sell products on a continuous basis and quality level can be of value to customers and create a stable revenue stream. For example, more premium and sustainable examples of fish farmers such as Veta La Palma in Spain sell directly to high-end restaurants. Their fish (sea bass, sea bream, meagre) are caught daily and the limited produce is sent directly to high-end restaurateurs and clients (vetalapalma.es, July 2017). The company guarantees optimum conditions of freshness and reserves part of the supply, which is possible through specific contracts with their customers.

- ***Pricing mechanisms.*** Different pricing mechanisms can exist that help the firm set its price. We distinguish between fixed and dynamic pricing. Fixed pricing mechanisms are based on static variables, such as list prices, product feature-dependent prices, customer segment-dependent prices, and volume dependent prices. By contrast, dynamic pricing mechanisms are based on market conditions and can be based upon negotiation or bargaining, yield management, real-time-markets, or (online) auctions. Since this deliverable focuses mainly on the SMEs producing farmed fish and selling at an estimated fixed farmer's price, we assume fixed pricing mechanisms. Each revenue stream can have a different pricing mechanism.
- ***Cost structures.*** The (expected) cost structure sums up the monetary consequences of the means used by the firms in the business model in the process of creating customer value. Cost structures are composed of *fixed costs* and *variable costs*. Fixed costs are those costs that remain the same despite the volume of goods or services produced. Examples may include salaries (when producing more products does not require more labor) and physical manufacturing facilities. Variable costs are those costs that vary proportionally with the volume of goods produced, such as feed costs. A cost structure thus includes all the costs SMEs incur in order to create, market, and deliver fish products to customers, such as costs for juveniles, feed, production means (incl. water treatment), labor, medical treatments, marketing/sales costs, etc.

- ***Profitability.*** The profit element is the outcome of the difference between an SME's revenue and cost. For example, while marketing and customer relationship management increase revenues, efficient production methods minimize costs, which jointly improve an SME's expected profitability. So, it refers to the bottom line and whether (or when) the firm will make money.

Figure 3 offers not just a more detailed perspective on the revenue model, but also shows the interrelationships between components and thus how it works. It shows that the cost structure of the organization determines the cost the SME incurs. This cost is made to create and deliver value for its target customers in the market place. It includes direct cost (e.g. production, marketing/sales, and delivery cost) and indirect cost (e.g. overhead).

In return for the value delivered to the marketplace the SME will be paid and thus will receive revenue. It refers first and foremost to exchange of its products at a certain price with its target customers. However, income may also accrue from selling juveniles to other farmers/outgrowers. The higher a firm's market share the more kilograms fish per target segment (or activity) will be sold and the larger this revenue stream will be. The total size of the firm's revenue stream (or streams) can be calculated by multiplying the price per segment with the volume sold per segment.

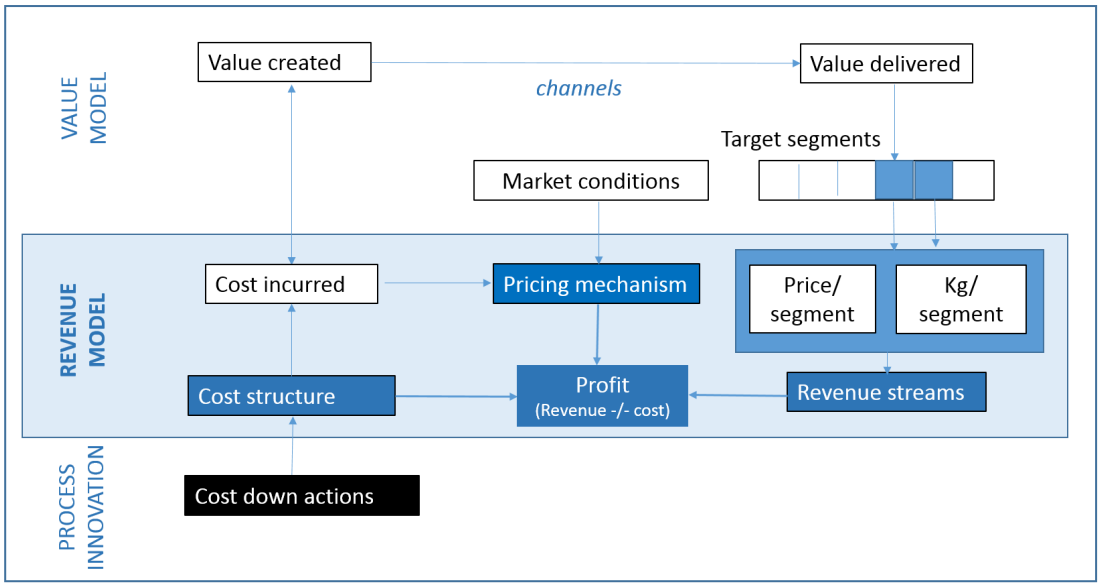

Figure 3. Visual representation of the revenue model.

To set its price a firm will use a pricing mechanism and pricing practice. A relationship with the firm's cost structure exists as the firm will need to recoup its costs in order to sustain itself in the long run. The difference between revenue and total costs for value creation (and delivery) reflects the profit or loss the firm will experience. However, the actual or going price is not only determined by the firm's cost level but also depends on market conditions. Scarcity and a heterogeneous product (e.g. high quality, local brand, traceability certificate) implies more favorable market conditions with high prices (i.e., value-based pricing practices), whereas oversupply and homogeneous products stand for unfavorable and low price conditions (i.e., cost-based pricing practices).

Figure 3 shows in the top part the SME's *value model*. It shows the value created that is delivered to the market and is used to sell to specific target segments that are best aligned with the value proposition chosen.

This segmenting, positioning and targeting aims to ensure that the value is recognized by and resonates with these target customers. In our case this refers to the sales of the new products of the new species such as whole fish, high quality fillets but also convenience products such as fishburgers (see Deliverable D28.2 and 28.4). In the middle of the figure the *revenue model* is displayed. In this report we assume that the price (P), equals the SME/farmer´s estimated price per kilo per segment. According to Leeflang et al. (2000) we assume that the revenue stream per species (Rev) is equal to the price per kilo (Pk) * the amount of kilos sold per segment (Sales in kilos, Sk) (see right hand side of figure):

$$\text{Revenue} = \text{Price}_{\text{kilo}} * \text{Sales}_{\text{kilo/segment}}$$

We also assume that profit equals revenue minus cost, more specifically: price per kilo – (variable costs per kilo * Sales in Kilo, Sk) – fixed costs. Fixed costs are production means (buildings, ponds etcetera) and overhead. Variable costs include feed, medical care, packaging, transportation that increase as production volume increases:

$$\text{Profit} = \text{Price}_{\text{kilo}} - (\text{Variable costs}_{\text{kilo}} * \text{Sales}_{\text{kilo}}) - \text{Fixed costs}$$

Accounting for the fact that multiple customers exist in the market that place and order multiple times over time, we can further detail our calculations: The amount of kilos sold (Sk) is a function of the number of buyers (Nb) * the average amount per purchase (Sk/p) * the frequency of each purchase (Fp):

$$\text{Sales}_{\text{kilo}} = \#\text{Buyers} * \text{Sales}_{\text{kilo/purchase}} * \text{Purchase frequency}$$

At the bottom part of **Figure 3** we see an SME's opportunities to enhance its business model using process innovation using cost down actions. This is referred to as *innovation model*. It concerns a continuous process to remain sustainable and improve profits.

3 Methodology

To develop the revenue models per species we collected, using a survey instrument, data regarding prices, cost structures, and sales of the SMEs currently developing and marketing pikeperch, greater amber jack, meagre, and grey mullet. We also collected information about their current revenue streams and pricing mechanisms used. Finally, we asked about anticipated changes in cost structure, i.e. anticipated cost reductions.

A survey instrument was developed covering all elements of the revenue model, and was sent to all SMEs participating in the project, as well as a Portuguese SMEs and several Spanish SMEs who are relations of CTAQUA and APROMAR. In addition, we developed half open questionnaires to collect additional data information from project leaders and a director of a producer association.

Despite a personalized letter and several reminders, the response to the survey was limited (n<10). Consequently, the data were analyzed and interpreted using simple descriptive statistics (e.g. means) and tabulations. To increase reliability and validity of the results, we triangulated the survey data with data from other sources (i.e., secondary reports), expert opinions, and insights gained in other subtasks of WP30 (e.g., D30.3). However, respondents did not provide data on all elements which leaves some parameters open for speculation/estimation. Furthermore, no reliable data on grey mullet were received. As a result, we excluded this species from the results.

Results are clearly affected by the fact that the farming of the species is still in an experimental stage. Consequently, production is limited and a physical market test impossible (see Deliverable D30.1). While some SMEs are optimistic about the future, the data confirm that SMEs venturing the new species come and go. The current SMEs pursuing the farming of the species expect that meagre and greater amberjack will take several years before their organizations will be fully operational and successful.

4 Results

In the next section we discuss the revenue streams and cost structures of different types of farms growing the above-mentioned fish species, according to the different cost structures. Based on self-reported pricing strategies and cost estimates we will estimate current and future profits and the break-even point for each species. As mentioned, these predictions are hindered by the fact that for none of these farmed species a continuous flow nor new products have been brought to the level of actual test marketing yet.

We supplement our initial results with anticipated costs-down actions and draw conclusions on how this will benefit break-even results and sustainability of the revenue models. Specific attention will be paid to providing clear insights into the expected profitability and time horizon based on each species' progress and anticipated, self-reported production levels.

4.1 Business model of pikeperch

Revenue streams. SMEs farming pikeperch report two important revenue streams: revenue from selling whole fish or fillets, and from selling juveniles. Most revenue comes from the sale of whole fish to processors and fish mongers. The secondary revenue stream concerns selling juveniles to grow out farms, e.g. by Swiss retailer Migros. Also, sales to armature fishing ponds occur and may render revenue. Focusing on the first two opportunities we detail each revenue stream below:

Consumable fish revenues. Currently, individual SMEs sell on average over 100 kilos monthly. Whole fish is sold at approximately €9/kg, according to self-reported pricing strategies. The fillet value in Germany/Benelux is approximately €30/kg, while in Switzerland fillets can be sold at approximately €50/kg. Pikeperch is considered to be a high-quality fish, with an average market weight of 750 grams and a yield of fillets without skin of approximately 45%. Wholesale prices for pikeperch fluctuate significantly, with great differences between European countries. The pricing mechanisms are fixed, based on market segments and product features such as the size of the fish and processing, i.e. if the fish is sliced or filleted.

Juvenile revenues: Juveniles are sold at a price of €1.25-1.50 per 10-15gr. There is a shortage of juveniles in the market. These revenues can be considered as transaction revenues from asset sales, with fixed pricing mechanisms based on static volume dependent prices.

Cost structure.

Percentage of variable costs per kilo:

Labor: 30%

Feed: 10%

Fixed costs:

Investments made: € 1.000.000

Medicine: 10%

Fry: 3%

Energy: 25%

Possible other future costs: Promotion and marketing (tbd).

Loss:

Cannibalism and illness: 50% in early juvenile farming, but expected to decrease through selection process. Less than 10% in grow out farms.

The current business model for pikeperch is rather cost-based. However, it could be changed into a value-driven model with a focus on locally branded pikeperch in the near future and SMEs indicate that they are

currently looking into this option. Pikeperch is often sold as a local delicacy. Important assets that are required to facilitate such transitions are the development of market knowledge and an improved market image using a strong marketing campaign.

The costs of selling whole fish are higher than for selling juveniles. This can be explained by the longer rearing period of whole fish, thus requiring more feed. Furthermore, the largest variable cost component is labor. Due to the small scale of production and low level of automation of the farming process, pikeperch farming is more labor intensive compared to other species.

Profitability. Despite high initial investments, SMEs pursuing the farming and commercialization of pikeperch expect to attain profitability in or shortly after 2 years. A major *challenge* is achieving continuous supply, which is necessary to win and retain the retail channel. According to the SMEs in our sample, variable costs mostly come from labor (30%), energy (25%), and feed (10%). Energy consumption is expected to decrease by at least 10% as production methods improve[i]. Labor and feed costs are expected to increase as production increases. Similar estimates were made in FAO aquaculture reports (2012), where the cost of producing marketable pikeperch was estimated to be USD 6.2-7.0/kg.[ii] A serious challenge for SMEs is decreasing the level of cannibalism. In early phases of production, 50% or more is lost due to cannibalism (and illness). By careful selection of non -cannibalizing juveniles, further improvements can be made which can grow productivity further.

Revenue model. We estimate the current revenue (Rev) of SMEs farming pikeperch today by multiplying the price per kilo of whole fish (9) * the amount of kilos sold (35000) per firm. We also assume that profit equals price per kilo (9) – variable costs per kilo * Sales in Kilos (35000) – fixed costs (1.000.000+(0.03*running costs). At the current pricing and sales level, selling 35 tons of whole fish yearly would take a little over 3 years to break even.

We first assume the lowest price per kilo of fillets (30) * the amount of kilos sold (35000*0.45) per firm. We also assume that profit equals price per kilo (30) – variable costs per kilo * Sales in Kilos (35000*0.45) – fixed costs (1.000.000+(0.03*running costs)). At the current pricing and sales level, selling 15.75 tons of pikeperch fillets yearly would take a little over 2 years to break even. This would shorten to approximately 1.5 years if SMEs are able to directly sell all of their production as fillets to Switzerland. When SMEs would be able to increase the yield, sales revenues will also increase.

The amount of kilos sold (35000) is a function of the number of buyers (Nb) * the average amount per purchase (Sk/p) * the frequency of each purchase (Fp). SMEs can therefore increase the amount of kilos sold monthly by increasing the number of direct customers and/or the purchase frequency.

Since labor costs comprise the largest cost component for farming pikeperch, increasing production by automating parts of the farming process (especially feeding) can help to substantially reduce the variable costs per kilo. Since wholesale prices fluctuate, SMEs also may consider moving to more long-term contracts with specific customers to ensure more stable revenue streams and thus reduce risks. **Table 1** summarizes the main parameters of the revenue model of pikeperch.

Table 1. Main parameters revenue model pikeperch

Pikeperch	Whole fish	Fillets	Juveniles
Price	€9/kg	€30-€50/kg	€1.25-1.50/10-15 gr.
# Amount of kilos/pieces sold annually	35 tons	15.75 tons	Unknown
Buyers	Local fish mongers, supermarkets, processors		Ponds, Ongrowers
# of Buyers	Tbd.		
Average amount of kilos per	Tbd.		

purchase			
Purchase frequency	Tbd.		
Loss (cannibalism, illness)			50%
Variable costs per kilo	%		
Labor	30		
Energy	25		
Feed	10		
Medicine	10		
Fry	3		
Fixed costs (investments made)	€ 1.000.000		

4.2 Business model of meagre

Revenue streams. SMEs involved in farming meagre have two main revenue streams: (i) selling fillets or whole fish, and (ii) selling the fish as juveniles. The most important revenue stream concerns the sales of whole fish and fillets. These products are generally sold to restaurants and mongers. The second revenue stream involves sales of juveniles to recreational ponds or other fish farmers[iii]. Meagre is generally sold by farms that also produce seabass and seabream.[iv]

Consumable fish revenues. At the moment, individual SMEs sell on average approximately 1800 kg of meagre a year, at a price ranging from €5 to €15 per kilo on average. Smaller fish (body weight from 600 g to 1 kg) are sold whole or filleted. Larger fish (body weight from 1 kg to 3-5 kg) are sliced or filleted and/or smoked[v]. This turnover can be considered as transaction revenues from asset sales. The price is size-dependent. SMEs report prices around €15/kg for fish bigger than 2 kg, and €5-6/kg for fish smaller than 2 kg. Meagre has a processing yield of approximately 45%[vi]. The pricing mechanisms are fixed, based on product features such as the size of the fish and whether it has been sliced, filleted and/or smoked. Because meagre is an unfamiliar fish, consumer demand is low at restaurants and supermarkets. This explains the low price levels and margins.

It is important to note that the consumption of meagre is seasonal. Consequently, prices and demand are volatile. Competition between farmed meagre and wild meagre is limited because of the difference in size; wild meagre generally reaches weights of 20- 40 kg while farmed meagre rarely grows to more than 4 kg.

Juvenile revenues: SMEs also sell meagre juveniles to recreational ponds or other fish farmers. Juveniles are sold at EUR .55 each. Again this involves transaction revenues from asset sales, with fixed pricing mechanisms based on static volume dependent prices.

Cost structure.
Percentage of variable costs per kilo:
Feed: 30-50%
Fixed costs:
Investments made: € 25.000
Labor: 12-40%
Medicine: 10%
Fry: 10-20%
Energy: 10-15%
Possible other future costs: Promotion and marketing (tbd).

Loss:

Cannibalism and illness: 30%, reducing to 15% in juvenile farming.

Business models and pricing practices of SMEs farming meagre tend to be cost-based, focused on reducing costs and creating a lean cost structure. The variable costs of selling fillets or whole fish are higher than selling juveniles due to the longer rearing period. Since the costs for feed comprise the largest cost component, these also cause the biggest difference in costs increase between selling juveniles and fillets or whole fish. While the revenue streams are similar, cost structures differ depending on the production system. For land-based systems (ponds) costs depend mainly upon the size of the farm. For cage culture, the major expense is the cost of juveniles[vii]. This gives SMEs that have their own hatcheries an advantage.

Profitability. SMEs estimate that it will take up to five years before meagre production becomes profitable. New ventures pioneering solely meagre would take more time, as opposed to established farms using this species for diversification purposes. These established farms estimate that it will still take up to 2 years. According to the respondents, important future assets that may increase sales and profitability are market knowledge and marketing campaigns. If meagre becomes more familiar, consumer demand may grow and possibilities to sell at value-based prices could increase. The production of meagre in Spain is expected to grow in the next years, while costs related to energy and fry are expected to decrease. In earlier production phases of juvenile farming, 30% is lost due to cannibalism and illness. This is expected to decrease to 15% over the next 2-3 years of production.

Revenue model. We estimate the revenue of selling whole fish per SME (Rev) involved in meagre farming to be equal to the conservative price per kilo (5) * the amount of kilos sold annually (1800). Further, we assume the profit to equal price per kilo (5) – variable costs per kilo * Sales in Kilos (1800) – fixed costs (25.000+0.1*running costs). At the current price level of €5/kg and sales volume of 1800 kilograms per year, it would take SMEs a little less than 3 years to recover the investments if they would solely farm meagre. If price levels would increase to €15/kg at similar production rates due to selling higher quality, smaller fish, SMEs should be able to achieve break even within a year. However, for SMEs farming meagre together with other species these costs would be shared, which allows them to break-even sooner. Thus, much depends on the diversification of the SMEs' stock, the speed with which the production levels can be seriously increased and market demand stimulated.

An advantage for SMEs is meagre's easy processing characteristics. SMEs indicate an interest to diversify to other processed products as well, depending on market demand, such as smoked fillets, sausages, burgers or canned fish. Sales could be stimulated by and benefit from the growing consumer demand for portion-sized ready-to-eat/cook products, provided that the farmed fish will reach large commercial size of >2 kg (e.g., Hernández et al., 2009) (see Deliverable 27.3). Another option is that growers aim to produce and sell small specimens. These can be sold at a higher price per kilo against lower costs, as feed costs exceed the costs of fry.

The amount of kilos sold (1800) is a function of the number of buyers (Nb) * the average amount per purchase (Sk/p) * the frequency of each purchase (Fp). SMEs can therefore increase the amount of kilos sold monthly by increasing the number of direct customers and/or the purchase frequency. Since the production of meagre is expected to grow in the forthcoming years[viii], SMEs could realistically expect an increase in the amount of kilos sold. If market demand increases as expected, this should positively affect reaching break-even, thus leading to SMEs becoming profitable sooner. Since the current demand from restaurants and supermarkets is low, SMEs should consider to invest more in marketing and promotion activities in order to grow demand for meagre in a timely fashion and prevent disappointing sales later on. **Table 2** summarizes the main parameters of the revenue model of meagre.

Table 2. Main parameters revenue model meagre

Meagre	Whole fish	Fillets	Juveniles
Price	€5-15/kg	Unknown	€0,55/10 grams
# Amount of kilos/pieces sold annually	1800	810	Unknown
Buyers	Restaurants, Supermarkets		Ponds
# of Buyers	Tbd.		
Average amount of kilo's per purchase	Tbd.		
Purchase frequency	Tbd.		
Loss (cannibalism, illness)			15-30%
Variable costs per kilo	%		
Labor	12-40		
Energy	10-15		
Feed	30-50		
Medicine	10		
Fry	10-20		
Fixed costs (investments made)	€ 25.000		

4.3 Business model of greater amberjack

Revenue streams. SMEs involved in farming greater amberjack currently depend on two revenue streams: (i) revenue from fish sold as consumable fillets or whole fish, and (ii) revenue from juveniles. The former is the more important one. The whole fish and fillets are sold to restaurants, mongers, and supermarkets. Because amberjack is a large species, it is easy to process (fillets, portions, etc.) and highly marketable. It is generally considered to be of good quality and thus well received by the market. Compared to European sea bass and gilthead sea bream, it grows fast. Large harvesting sizes (>3kg) can be achieved with very reasonable production cycle times of less than 2 years.

Consumable fish revenues. SMEs sell fish directly fresh, sized up to 3-5 kg to both restaurants and wholesalers, while smaller fish (about 2 kg) are sold to supermarkets. At the moment, SMEs indicate that they sell on average 600 kilograms a year, at a price ranging between €10/kg to €20/kg. The prices differ for smaller or larger fish and per country, as prices in Italy and Spain tend to be higher than in Malta[ix]. Producers tend to get more money per kilo, so bigger fish can be sold at higher prices. Greater amberjack has an excellent high yield of up to 50%. Fillets can be sold for higher prices than whole fish, ranging between €25-30/kg. The revenues from greater amberjack can be considered as transaction revenues from asset sales using fixed pricing mechanisms; that is, based on product features such as the size and level/type of processing.

Juvenile revenues: Revenues from greater amberjack juvenile sales to grow out farms also occur. These can be considered as transaction revenues from asset sales, with fixed pricing mechanisms.

Cost structure.
Percentage of variable costs:
Feed: 55%

Fixed costs:
Investments made: € 50.000 (for established farms), with app. 175.000 still needed.
Labor 15-20%
Fry: 10%
Energy: 10-15%
Medicine: 10%
Possible other future costs: Promotion and marketing (tbd).

Loss:

Cannibalism and illness: 45%, reducing to 10%[x] in early juvenile farming, but expected to decrease through selection process. Less than 10% in grow out farms.

Business models and pricing practices of SMEs farming greater amberjack tend to be cost-based, focusing on reducing costs and creating a lean cost structure. The variable costs of selling fillets or whole fish are higher than selling juveniles due to the longer rearing period. Since the costs for feed comprise the largest cost component, these also cause the biggest difference in costs increase between selling juveniles and fillets or whole fish. Availability in the production area of appropriate or exploitable processing facilities helps, as most SMEs are only prepared for boxing bass and bream with almost no processing capacity. Production costs vary considerably, depending on the culture system, geographical area and the level of technology applied. For land-based systems costs depend mainly upon the size of the farm[xi]. Information for this species is minimal due to the lack of closed cycle production, but as in other cultured finfish, feed represents the major portion of the total costs.

Profitability. Respondents of SMEs already farming other fish species indicate that 2-4 years before being profitable should be attainable. Investments involve resources such as buying breeding stock/juveniles, hardware, health treatments, and marketing campaigns. In early experimental production phases, 45% of juveniles are lost due to cannibalism and illness. This is expected to decrease to 20% in the next 2-3 years, as farmers become more familiar and better master the processes. Cannibalism and illness do not have a significant impact on grow out farms. There is currently very little supply of juveniles, but the expectation is that in 3-5 years the price will drop marginally as other farms start juvenile production.

Revenue model. We estimate the revenue per SME farming greater amberjack (Rev) as equal to the price per kilo (10) * the amount of kilos sold annually (600), i.e. 6000 euros. We also assume that profit equals price per kilo (10) – variable costs per kilo * Sales in Kilos (600) – fixed costs (50.000+0.1*running costs). Using a conservative estimate, we conclude that it will take up to 9 years to recover the investment made. In the most optimistic scenario with a price of €20 per kilo, the firms would break even after approximately 4.5 years. However, some SMEs indicated that additional investments are still needed. Additional investments of €175.000 at the current price and production levels would greatly increase the number of years before attaining break even.

We assume the lowest price per kilo of fillets (25) * the amount of kilos sold (600*0.5) per firm. We also assume that profit equals price per kilo (25) – variable costs per kilo * Sales in Kilos (600*0.5) – fixed costs (50.000+(0.01*running costs)). At the current pricing and sales level, selling 300 kilos of greater amberjack fillets yearly would take SMEs approximately 7 years to break even. This would shorten to approximately 5.5 years if SMEs are able to sell all of their fillets at higher price levels. When SMEs would be able to increase the yield, sales revenues will also increase.

The break-even period can be seriously decreased by mastering the farming process and stepping up production levels. However, it should be complemented with sufficient customer relationship development and marketing efforts to ensure adequate market demand to absorb the extra product.

SMEs farming greater amberjack should involve customers during their new farming efforts to ensure adequate channel access and market potential. In order to ensure their survival and profitability, SMEs need to grow the number of customers and/or the repurchase frequency of existing customers.

Because greater amberjack is a fish that can be easily processed, value creation may be more with the processing firms/partners than with the farmers. Processing firms may add more value than farmers to the product and may thus decide to protect their revenues using brands. As a result, they might own the customer rather than the fish farmers selling homogeneous products. By selling fillets but also products that help exploit the fish and its discards at higher value-based prices, profits can be optimized or even maximized. **Table 3** summarizes the main parameters of the revenue model of greater amberjack.

Table 3. Main parameters revenue model amberjack

Greater Amberjack	Whole fish	Fillets	Juveniles
Price	€10-15/kg	€25-30/kg	€2 per piece
# Amount of kilos/pieces sold annualy	600	300	Unknown
Buyers[xii]	Restaurants, fish mongers, supermarkets, wholesalers		Grow out farms
# of Buyers	Tbd.		
Average amount of kilos per purchase	Tbd.		
Purchase frequency	Tbd.		
Loss (cannibalism, illness)			20-45%
Variable costs per kilo	%		
Labor	15-20		
Energy	10-15		
Feed	55		
Medicine	10		
Fry	10-15		
Fixed costs (investments made)	€ 25.000 - 50.000		

4.4 Cost reduction opportunities

We also collected information about the opportunities for cost down actions of SMEs. **Table 4** provides an overview of all anticipated changes. The results show that SMEs anticipate several cost changes as production evolves and matures.

Costs incurred due to cannibalism and illness are mostly relevant for juvenile farms and expected to decrease after several years, which will result in a major cost advantage and improvement of profitability. As a result, SMEs' chances for survival would increase. Energy costs are also expected to decrease over time depending on the production method used, the energy policies of local countries, and if farming becomes more efficient and SMEs will be able to shift to and integrate more sustainable energy resources. Overall, the SMEs indicated that they are currently not substantially investing in marketing efforts. As marketing investments are necessary to further grow each species market and the farmed fish category overall, these costs are expected to increase for each species.

Experts indicate that pikeperch juvenile farming is expected to require more labor for nursery activities, as hatchery nursery is very labor intensive. Feed costs may also increase as production intensifies. In grow out farms, introduction of automation and scaling of production would decrease these costs. The price of juveniles for grow out farmers will decrease as survival rate increases. If SMEs still rely on manual feeding, labor costs will remain stable as production increases. Pikeperch feed conversion may increase slightly, although currently no volume or price effects exists. The fact that labor costs concern the largest cost component for farming pikeperch, production automation could help to substantially reduce the variable costs per kilo and thus resolve this potential bottleneck.

Currently, costs of fry are only expected to decrease for meagre. Despite the positive effect this will have on the cost structure, SMEs farming meagre face serious challenges with becoming profitable. Experts indicate that production is currently stable and may slightly increase, but not significantly. Labor costs are thus expected to remain stable in the forthcoming years. In some countries, meagre farmers currently face issues with parasites, although treatments are not that expensive and are also used for other species that they are growing. Furthermore, meagre does not have any major health issues. Medicine costs are thus expected to remain stable. Feed costs per kilo will probably remain stable in the forthcoming years as SMEs are experimenting with different types of feed. When production or conversion increases or better quality feed is used, total feed costs per kilo might decrease. Another option of keeping feed costs under control could be the selling of younger and thus smaller specimens.

SMEs farming greater amberjack anticipate little changes in their variable costs. Only juvenile farmers anticipate serious cost reductions due to reduced cannibalism /illness. However, experts suggest that in time labor costs for grow out farms may decrease, since automatic feeding will be adopted when production is moved offshore. Moving amberjack farming offshore will however increase energy costs and require higher main investments. However, if SMEs initially invest in solar energy, energy costs may increase less. Medicine costs will probably remain stable until production is moved offshore, after which they may decrease. Other costs are also expected to remain stable in the foreseeable future.

Table 4. Expected costs changes

	Expected change in production costs per kilo		
	Pikeperch	Meagre	Greater Amberjack
Cost drivers:			
Loss (cannibalism, illness)*	-	- 15%	- 25%
Labor	+	o	-
Energy	-	-	o/+
Feed	o	o	o
Medicine	o	o	o /-
Fry	o	-	o
Marketing/Sales investments	+	+	+

Symbols: o: cost level expected to remain stable; +: cost level expected to increase; -: cost level expected to decrease, *: relevant for juvenile farming.

5 General conclusions

Our empirical data suggests that several SMEs had stopped farming new species. However, new firms have begun farming them again and thus have taken up the challenge. The latter SMEs are optimistic and think that they can master the production of these species in the near future, and can make their business model profitable. Mostly, this concerns SMEs exploring the new species in an attempt to expand their current portfolios. For these firms it offers an opportunity to leverage their existing production means and contacts and enhance their chance of success. Yet, biological bottlenecks remain and seem to require at least several years in order to be resolved, particularly in the case of juvenile farms. The extended time period SMEs

report for being able to master the production process reflects on their business model opportunities. Future developments or changes in production may influence their break-even period, such as if amberjack farmers will move production offshore in several years. Overall, based on current sales numbers and progress reports, some SMEs might indeed become profitable within the next 10 years.

SMEs should be able to use the revenue models and the parameters developed in this report to calculate their revenue after each year by taking the price per kilo and multiplying it by the amount of kilos sold. In order to increase revenues, special attention should be paid to increasing the number of buyers and the average amount per purchase, or purchase frequency. This will require serious marketing and sales efforts. Because current sales, i.e. revenue streams are modest at best due to the experimental stage most SMEs are in, and the large investments required, break even periods are substantial. An exception may be grow out farming for pikeperch. For this species the business model seems most bright. This is fueled by the fact that in German speaking countries there is both manifest and latent demand that can absorb the extra supply. A break even period of less than 2 years should be possible. Based on the results of the formal revenue model it would take some SMEs farming meagre up to 3 years to break even, considering the least optimistic scenario. However, as variable costs for farming meagre are expected to decrease and SMEs decide to sell fish at higher market prices, this would shorten the profitability period. Becoming profitable within a two-year period could indeed be feasible and realistic. SMEs selling greater amberjack would be able to pay off their initial investments after 4-9 years if production develops as expected.

The main limitation seems to be the low production numbers. It matches the observation that the farming of these species is still largely experimental. The low volumes and limited size of the specimens/fish produce limited sales and profits. SMEs do anticipate improvements in production quality and efficiency in the next few years. However, according to experts, this progress is uncertain. The first thing to resolve is the current inability to ensure a continuous stream of raw fish. Related to this, firms will need to begin investing in marketing efforts. They need to grow their number of customers and stimulate market demand. Investments in obtaining a quality /traceability label will also be essential. In the above discussion this has not been included, yet firms that mastered for example production of catfish found they were unable to convince retailers to buy their fish[xiii]. It hampered their development and could cause foreclosure or at least the need to discontinue their activities for these species.

SMEs current focus is on production costs, and they often use cost-based pricing practices. Little attention seems to be paid to overheads and marketing costs. Consequently, the estimates for break-even periods discussed for each species are on the optimistic side. Focusing on lowering cost and increasing volume can make firms profitable. However, relying on a relatively homogeneous product brings the risk of price pressure, particularly as production is ramped up and new entrants appear. Buyers of retailers and food service companies often operate in markets with dynamic pricing mechanisms. In these markets buyers purchase fish directly from wholesalers or processing companies. Extra supply from new entrants can create oversupply and decreasing price levels. It would require the SMEs that are first to market to continuously improve efficiency in order to survive. Another escape to the commodity magnet would be to establish a brand. This could add to a certain level of product differentiation and customer loyalty that insulate the firm from a potential downward spiral. Focusing on a quality positioning and using a traceability label and regular brand can help firms build and sustain their position. For example, more premium and sustainable examples of fish farmers such as Veta La Palma in Spain sell directly to high-end restaurants. Their fish (sea bass, sea bream, meagre) are caught daily and the produce is sent, guaranteeing optimum conditions of freshness, to high-end restaurateurs and clients from all over Europe[xiv]. Farmers with such triple bottom line business models can also extend their revenue models through sustainability activities, communication, and branding.

In such a value-based approach, differentiation rather than cost leadership is the firm's aim. However, marketing costs are high. The advantages of this approach are brand equity and a loyal customer base, which make the firm less sensitive to price competition and other volatilities. Value based approaches may ultimately be the better option. Offering value to a loyal customer base will create stability and insulates from general price competition. It does, however, require continuous and high-quality supply of farmed fish products. Low production output may also match this high quality/end low volume approach.

Lastly, SMEs that are interested in selling organic or sustainable seafood would be able to charge a premium price, as prices of organic seafood are considerably higher than prices of comparable seafood. This is mostly due to the (initial) higher production costs of organic seafood, and higher costs of sales and distribution, as volumes are relatively low compared to conventional seafood[xv]. However, the consumption of organic seafood products is constantly increasing in the EU, thanks to the increased awareness of consumers, and retailers are increasingly adapting sustainable and/or organic seafood[xvi]. While the costs for farming organic seafood may be high, the SMEs participating in the DIVERSIFY project already benefit from sustainability characteristics and improved traceability of the products. Sustainability has become the big competitor to organic seafood, and large-scale retailers adopt more sustainable-driven fish purchasing policies rather than organic oriented, because consumers are skeptical and confused in front of a variety of ecolabels and organic logos[xvii]. Focusing more on farming sustainable fish may thus offer European SMEs a competitive advantage and enable them to ask premium prices, which also offers possibilities to move toward a value-based approach.

In sum, the farming of pikeperch, meagre, and greater amberjack by the SMEs participating in the DIVERSIFY project is slowly moving out of the explorative stage. However, profitability outlooks are positive given that these SMEs are able to increase production and the number of buyers or are able to switch to value-based approaches.

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