

Deliverable D3.1

# Consumer aspects: Report on consumer aspects related to European organic aquaculture

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## CONTENTS

<b>1</b>	<b>SUMMARY</b> .....	<b>3</b>
<b>2</b>	<b>OBJECTIVES</b> .....	<b>5</b>
<b>3</b>	<b>INTRODUCTION</b> .....	<b>5</b>
<b>4</b>	<b>METHODOLOGY</b> .....	<b>5</b>
4.1	Literature review .....	5
4.2	Consumer survey .....	6
4.3	SWOT analysis .....	6
<b>5</b>	<b>RESULTS</b> .....	<b>7</b>
5.1	<b>Consumers' perception, sentiments and acceptance of organic seafood</b> .....	<b>7</b>
5.1.1	Consumer impressions about aquaculture .....	7
5.1.2	Consumers and organic aquaculture .....	8
5.1.3	Consumer perceptions of specific issues related to organic aquaculture .....	16
5.2	<b>Consumers' perception, knowledge, trust and confidence in organic food labelling</b> .....	<b>22</b>
5.2.1	Need for organic aquaculture labelling.....	22
5.2.2	Consumers' perception of organic certification schemes.....	22
5.2.3	Consumers' behaviour related to organic certification schemes .....	25
5.3	<b>Review and determining the added value of organic production and certification to the consumer perception and global market of aquaculture products (SWOT)</b> .....	<b>28</b>
5.3.1	External factors .....	29
5.3.2	Internal factors.....	34
5.3.3.	The SWOT-analysis .....	39
<b>6</b>	<b>CONCLUSION</b> .....	<b>41</b>
<b>7</b>	<b>REFERENCES</b> .....	<b>44</b>

## 1 Summary

The objective for this Deliverable is to assess consumer perceptions, sentiments and understanding of organic aquaculture to promote consumer confidence and acceptance of organic farming principles.

Consumers are unsure about the concept of organic fish farming due its overlap with several available concepts such as sustainable, biological, ecological, fair trade and environmental friendly. Consumers also show ambivalent impressions about the placement of organic fish between wild fish and farmed fish. Furthermore, consumers' knowledge about practical details of fish production is limited. Consumers in Europe are generally not aware of how fish is produced, which creates a fertile ground for negative reactions to information about production issues such as feed, welfare, types of production system and their environmental impact. As shown in previous research, exposing a population with a low knowledge to details about improvements of production system leads to a negative reaction to the details of the production as such. It is therefore suggested that a well-prepared communication strategy needs to be established to ensure increase of consumer knowledge on the key issues related to fish production, including organic fish production. This overall increase in knowledge will lead to a more fertile ground for interactive communication of production issues in the future too.

The consumers' perception of organic farmed fish is heavily influenced by their perception of fish farming in general and influences from agriculture. Aquaculture is by some consumers perceived as negative, "industrial" production, comparable to large agricultural units in Europe. Fish consumption in Europe is low in general but if it is increased as recommended, it could be done while protecting wild stocks due to the availability of fish from aquaculture. Some consumers may increase their fish consumption by eating conventionally farmed fish. The consumer segment with a preference for organic food production may increase their fish consumption in general, potentially buying more fish products that are organic. However, total health promoting fish consumption depends on the image of all fish products. Offering wild, farmed and organic fish to a market of diverse consumers with particular demands is a way to ensure that health policy targets are met regarding seafood consumption. Consumers that would buy organic meat will potentially buy organic fish more often if organic fish and its relevant certification schemes are well documented and communicated. However, the fish market in Europe needs to be supported as a whole as well, to avoid undesirable side effects from image transfer between fisheries, conventional aquaculture and organic aquaculture. In addition, price sensitivity has to be taken into account, as some consumers may reduce the purchased quantity of fish if the price of organic/eco-labelled products is too high.

Consumer awareness of organic labels in Europe differs between countries. There is some confusion about the different eco-labels in the market, and the consumers do not necessarily see the difference between organic and eco-labels. The EU leaf is practically unknown among the consumers in the surveyed countries (France, Italy, Germany and UK), and the reported use of the organic leaf is very low, even among users of organic seafood. The national organic labels are more familiar in all four countries surveyed in OrAqua. This reveals a need for communication about the logo in all EU countries.

Therefore, well-designed and pretested communication campaigns can have a positive effect on seafood consumption in Europe and can be used to create awareness about organic aquaculture, building a positive and reliable image of certification schemes.

Another question in this research has been to study which benefits the European organic aquaculture sector offers and how they can be further strengthened. With respect to the first part of this question, organic aquaculture contributes to a number of issues. First and foremost, organic aquaculture's contribution is based on its care for

the environment. Other issues such as supporting local economies, building consumer trust and contributing to consumer choice are also important contributing points.

Capture fish landings will not be able to cover the global demand for seafood which is forecasted to increase. As such, aquaculture is needed to fulfil worldwide and European demand for fish. However, aquaculture may affect the environment significantly. Therefore, the organic version of aquaculture is the better option. Even though it does not only contribute to the increasing the supply of fish, it is more sustainable and takes care of the environment. Organic aquaculture meets high standards with respect to environmentally sustainable production techniques.

Organic aquaculture is fostering local economies. First of all, by farming and processing fish, direct and indirect jobs are created. Furthermore, organic aquaculture is also easy to combine with other purposes like recreational or educative ones. Due to its local orientation (location, species) it has the potential to re-connect, re-attach and twine in its region. As such, in the end, organic aquaculture is becoming more regional bounded and it is countervailing the processes at the basis of the dominant trend of large, global supply chains.

Moreover, these above-mentioned practises and the philosophy of organic aquaculture address consumers who are concerned about the origin of food and the production methods. This relates to relevant themes like transparency and consumer trust. In addition to this, a controlled and certified system is used to prove the way of producing. The European logo gives also visual identity and helps consumers to recognise organic aquatic products in a quick and simple way. (Although there is still a risk of consumer confusion, simply because they are faced with a proliferation of labels).

Organic aquaculture is also extending consumer choice. It delivers products with a clearly distinctive element for consumers who are looking for something else than products from large, global supply chains. It also provides a healthy option, or as EUFIC promotes “...eating more fish is one way that most of us can help improve our diets—and our health ...increasing your consumption of all types of fish and seafood is recommended.” So, organic aquaculture products relates positively to the growing expectations from consumers for quality and diversity of food products.

However, organic aquaculture faces some challenges: effectively attracting consumers and strengthening the sector. High environmental standards, the regional focus and a certified, transparent production are among the EU organic aquaculture's main competitive factors and should be more effectively exploited to compete in the markets. At the same time, working more closely together will increase strength and innovativeness of the sector and open windows of opportunities. For instance with respect to technological shifts which will positively influence costs like the feed conversion ratio. Another possibility is the extension of the product variety with for example more convenience products. Alternatively, as became clear from the WP3 consumer survey, build a systematic long-term communication strategy that could increase the consumers' knowledge level to a point of having the ability to evaluate and conclude about the risks and benefits of production systems related to organic aquaculture.

Finally, many arguments are not only applicable to organic aquaculture, but also conventional aquaculture copes with a number of the issues. But if the organic aquaculture sector manages to work on their challenges, it follows that the organic aquaculture will be able to substantially grow and meet an increasing demand for the organic aquaculture product, and will benefit Europe..

## 2 Objectives

The overall Aim of WP3 is to collect and review available information on economic, market and consumer related issues, and regulatory and institutional frameworks related to organic aquaculture.

The specific objective for this Deliverable is to assess consumer perceptions, sentiments and understanding of organic aquaculture to promote consumer confidence and acceptance of organic farming principles.

## 3 Introduction

This report is deliverable D3.1 (Consumer aspects: Report on consumer aspects related to European organic aquaculture) resulting from WP3 in OrAqua project. The aim of WP3 was to collect and review information on economic, market and consumer related issues, together with information about the institutional frameworks for organic aquaculture.

Several research activities have been performed within the European community, dealing with ethical and environmental aspects of food production (Sachez et al., 2002). Besides biological and natural science in general, social science can provide valuable information on the potential improvements of, risk related to and public perception of aquaculture (Schlag, 2010). However, little effort has been placed by the EU in incorporating social sciences in the development of regulatory recommendations about conventional and organic aquaculture. Regulatory recommendations about organic aquaculture practices is a complex topic, with dynamically evolving regulations. However, up to the beginning of OrAqua, no thorough review of the available scientific knowledge on consumer and marketing issues related to organic aquaculture and associated perception of certification schemes and labelling was included in the development and improvement of these regulations.

The overall aim of task 3.1 was to collect and review available information on market and consumer related issues in order to reach the objective of assessing consumer perceptions, sentiments and understanding of organic aquaculture to promote consumer confidence and acceptance of organic farming principles. Task 3.1. also aimed to review and determine the benefit of organic production and certification to the consumer perception and global market of aquaculture products.

The report is organised as follows: Chapter 4 will give an overview of the methodology used in the work package. Chapter 5 will present results. In 5.1 and 5.2 a review of the literature is presented together with the results from a consumer survey. Chapter 5.3 will present results from the SWOT analysis. Chapter 6 presents the conclusions from the work in OrAqua on consumer issues related to organic aquaculture.

## 4 Methodology

### 4.1 Literature review

The methodology used to perform the literature review related to consumers begun with the definition of all relevant terms for the project's topic. Once the relevant terms were in place, the group of researchers working on the review task listed synonyms for each relevant term. The terms and synonyms were then organised and compiled into search term chains, using appropriate coding that is applicable to search engines such as Web of Science. The final search term chains were defined and tested by a trained librarian, on the extensive database called ProQuest Dialog, including 97 databases. Having the search terms tested in such a thorough way, secured their effectiveness during the final literature search. The final literature search was performed in Web of Science and led to a large amount of results. Additional searches were performed in Organic e-prints, Cordis and national institutional databases for available grey literature on the field of organic aquaculture and consumer perception.

Non-English literature was searched by native speaking researchers, to ensure the inclusion of relevant publications that are not internationally accessible due to language. After careful filtering of the resulting current literature (after year 2000), 784 relevant publications were listed, organised thematically and reported as a bibliography (see relevant bibliography document/report and database). The most relevant and best quality publications were analysed and used to prepare this review report. The software used to organise the literature database was EndNote. In Endnote, ranking of quality of the literature was also applied, in order to reflect the differences between peer reviewed publications and grey literature that provides input that could be scientifically tested in the future.

## 4.2 Consumer survey

The results from the review of relevant literature will be used further in OrAqua as input for the recommendation for the regulations regarding organic aquaculture. However, knowledge gaps were also identified and were further addressed by a consumer survey in four European countries: Germany, Italy, France and the UK. The survey design was based on established scientific methodology and relevant parts of the regulatory framework (EC 834/2007, 710/2009). The survey started with questions about terms and concepts consumers regarded relevant to the official EU definition of organic fish and how they are perceived to influence the quality of the fish (including feed, production system characteristics, etc.). Then the survey included questions about consumers' attitudes towards organic fish and their familiarity and use of relevant labels. Perceptions and attitudes (including naturalness, quality, health, sustainability, safety, etc.) about wild, conventionally farmed and organic fish were also reported by consumers. Consumers also reported their knowledge about organic fish, their consumption behaviour and socio-demographic characteristics.

After the consumer survey was designed by the scientists in OrAqua, it was distributed to the four best international survey provider companies identified by the partner responsible for task 3.1.3 (Nofima). The companies were contacted and their offers for performing the survey (recruiting a representative sample of consumers and collecting the data) were evaluated for price and quality. The best company that performed the survey and delivered the resulting data to the researchers responsible for task 3.1.3 for analysis was Ipsos. The results from the survey were delivered in raw data format. The final sample consisted of 2007 participants from Germany, Italy, France and the UK (~500 participants from each country). The samples included a quota of minimum 25 % organic food consumers. Nofima analysed and interpreted the results using statistical methods such as analysis of variance to compare group means, post-hoc tests to define where differences are significant and chi square tests to compare data matrices related to socio-demographic characteristics and organic fish consumption levels. The analysis was performed using the statistics software SPSS statistics version 22.

The results from the literature review and preliminary findings from the consumer survey were presented in the first stakeholder meeting (D5.1). During this meeting, feedback was given by the stakeholders about relevant topics to be analysed in more depth (D5.2). This feedback was taken into account and task 3.1 continued with further analysis of the findings. The conclusions from the consumer survey are reported at relevant parts of the document below.

## 4.3 SWOT analysis

A SWOT<sup>1</sup> analysis on organic seafood has been carried out. SWOT is an acronym for Strengths, Weaknesses, Opportunities, Threats and the analysis involves the collection and portrayal of information about external and

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<sup>1</sup> SWOT = Strengths, Weaknesses, Opportunities and Threats

internal factors. In order to provide a better understanding of European organic aquaculture's external context a PEST<sup>2</sup> analysis was executed. This analysis identifies underlying trends with respect to Political, Economic, Social and Technological factors that have an impact on the development of the organic aquaculture sector in Europe, and how it adds value to the European consumers. To determine the strengths and weakness of the sector, the following questions were relevant:

- Where is the organic aquaculture sector performing well or where does it excel? (*strengths*)
- Where is the organic aquaculture sector performing badly and what are its vulnerabilities? (*weaknesses*)

Main source for the SWOT was a desk research completed with expert information to the extent necessary. These additional interviews deepened the data collection with respect to mainly the internal analysis. Once listed, the factors were discussed and given coherence in order to clarify what weaknesses the European organic aquaculture sector solves and what strong points may strengthened further.

Data were collected during February 2013 – April 2015 by means of Scopus (abstract and citation database of peer-reviewed literature) for scientific literature, Google (a web search engine) for grey literature in addition to interviews by phone

## 5 Results

In this chapter, results from the literature reviews, survey and the SWOT analysis will be presented. Chapters 5.1. and 5.2. will first focus on findings in the literature and fill in the gaps based on results from the consumer survey. Chapter 5.3. will present the SWOT results focussing on markets and consumer aspects.

### 5.1 Consumers' perception, sentiments and acceptance of organic seafood

#### 5.1.1 Consumer impressions about aquaculture

Fish is a protein source with a wide range of species and related sensory characteristics a consumer could pick from (Warm et al., 2000). However, fish in general, is not liked by everyone. This is partly due to its sensory attributes (smell, fish-bones), relevance for health (health-related associations are not perceived directly relevant for all consumers), potential risks and expected inconvenience during the preparation of a dish, and lack of cooking skills (Leek et al., 2000; Marette et al., 2008; Olsen, 2001; Olsen, 2003; Olsen et al., 2007; Trondsen et al., 2003; Van Dijk et al., 2011; Verbeke et al., 2005; Verbeke et al., 2008). Despite the perceived good quality of farmed fish found in blind tests (Hernandez et al., 2001; Kole et al., 2009; Luten et al., 2002), fish of wild origin are often considered superior in comparison to fish from aquaculture, even in countries with high seafood consumption (Davidson, et al., 2012). This may be due to safety related concerns (Arvanitoyannis et al. 2004; Batzios et al., 2004) and possibly due to implicit reactions driven by the image of intensive terrestrial animal production (Verbeke et al., 2007a). Furthermore, the image of aquaculture is often attacked by environmental organisations. These may not always represent the societies surrounding the production region, but can damage the general image of the aquaculture industry (Howgate et al., 2002; Whitmarsh & Palmieri, 2009).

However, consumers are often not aware of the aquaculture origin of seafood and behave based on habits or factors they consider important when choosing fish such as availability, quality, individual or child's health benefits and overall image of the originating cultures: e.g. the Mediterranean diet being associated to health and sea bass – sea bream consumption (Altintzoglou et al., 2011; Dewailly et al., 2007; Honkanen et al., 2005; Juhl & Poulsen,

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<sup>2</sup> PEST = Political, Economic, Social and Technological factors

2000; Trondsen et al., 2003; Vanhonacker et al., 2013; Verbeke et al., 2007a; Verbeke & Vackier, 2005). Finally, the image of farmed seafood can be positively influenced and assist increasing seafood consumption by the implementation of tailor made production and strategically targeted advertising campaigns (Borresen, 2009; Myrland et al., 2004; Scholderer & Grunert, 2003). Another potential improvement of the image of fish from aquaculture could be based on improved production methods, such as organic, which will be discussed in depth in this report.

### 5.1.2 Consumers and organic aquaculture

Despite the large and fast growth of the conventional aquaculture and organic food sector, organic aquaculture fails to provide large quantities and diversity of products (Guillotreau, 2004; Tacon & Brister, 2004). However, organic aquaculture is a very young industry with new products with very short if any marketing history. For instance, regulation of organic aquaculture at EU level was first established in 2010. Furthermore, it has been discussed, that due to price differences, the expansion of the organic (sea)food sector should be done based on good planning and targeting of market demands, consumer's ability to afford such upscale products (Falguera, Aliguer, & Falguera, 2012). In addition, it will be important to ensure that feed of the right content and amount will be available (Halberg et al., 2012) as well as maintaining critical quality criteria such as pigmentation of salmon (Olesen et al., 2010). Furthermore, consumers need to be continuously informed in order to be educated about the criteria of domestic and international organic aquaculture (Hamm et al., 2002; Prein et al., 2010). Nevertheless, despite the potential overall growth of the organic seafood market, there is a high probability that this market will remain a niche (Toften, 2008).

As mentioned, quality is an important factor consumers consider when choosing food. The quality characteristics of for instance organic farmed rainbow trout have not been found to be different from conventionally produced fish (Manthey-Karl et al., 2010). However, looking into the case of farmed salmon it is suggested that even though consumers may be willing to pay more for organic products, they are not willing to sacrifice quality and appearance of the products for it (Olesen et al., 2010; Renesto 2012). This difference between species indicates the need to be species specific when communicating about organic fish and its quality characteristics.

The image of aquaculture in general is transferred to the image of fish from organic aquaculture. Consumers that are positive about aquaculture tend to be also positive about organic aquaculture and if they are negative, they tend to remain negative. A segmentation study in Greece (Polymeros et al., 2014) reported that a negative image of aquaculture products could damage the image of organic seafood among a part of the population. Furthermore, they reported that a larger part of the sample (66%) in their study was positive towards aquaculture products and even more positive towards organic seafood. This positive segment reported higher income and education, while being younger, revealing a potential market for organic seafood in Greece. Similarly, a study of organically farmed sea bass in Turkey showed that 91.5% of the respondents would be willing to pay more for organically farmed sea bass. This result was mainly related to household income, education, food safety concerns, whether the respondent is the primary food shopper in household, and whether there are children under the age of 10 in the household (Budak et al. , 2006). This is a very high figure and should be interpreted carefully. It is probably partly due to a measurement and social desirability bias. This is a hypothetical question asked in a survey, having no consequences for the consumer. There is evidence that results from WTP questions are not in agreement with actual buying behaviour. However, in a non-hypothetical choice experiment, a sample of Norwegian consumers preferred organic and Freedom Food salmon to the otherwise identical salmon from conventional salmon farms. Further, he or she was willing to pay a price premium of approximately 2 euros per kg (15%) for organic compared to conventional salmon of the same filet colour (Olesen et al., 2010). Similarly, in

specific regions in Turkey, consumers would be willing to pay 10-30% more for organic fish. The main factors that influenced organic fish consumption were: shopping place, quality, health and price, which explained 65.34% of the variation (Dagistan et al., 2009). Similar positive associations of education and health-related behaviour and high organic food consumption have been reported in a French study (Kesse-Guyot et al., 2013). Therefore, there is a segment of consumers that are positive about organic production are also those that are willing to buy organic, especially when they have high education, high income, high knowledge about organic and if they have young children.

Knowledge about production methods related to organic seafood was found to influence consumers' perception of production methods. Lack of knowledge about (sea)food production methods can lead consumers to react towards food production methods that can be communicated as natural or unnatural; i.e. organic vs. use of antibiotics or pesticides (Teisl et al., 2009). In a study based on interviews of Dutch consumers (Schosler et al., 2013), it was reported that being exposed to knowledge and experiencing how traditional sourcing of food and preparation of it using raw material (cooking from scratch) could lead consumers to deeper philosophical considerations about (sea)food and lead them to the search for organic and sustainable products. A shift towards organic (sea)food consumption is often related to health, quality and safety issues, as well as local food production, which is not necessarily the origin of organic products that are available in each market (Miele, 2001). A study about consumers' acceptance of farmed sea bream in Italy (Stefani et al., 2012), showed that consumers prioritised the domestic origin of the fish followed by fish farming in marine cages and organic certification. The feed of the fish did not influence consumers' choice and those who reported willingness to pay more for high quality products clarified that they would do so while sacrificing quantity for quality. Exposing consumers to details about organic aquaculture should therefore be handled with appropriate pre-testing, to ensure the development on an objective opinion that can lead consumers to confident and informed choices in the market. The fact that increasing organic consumption, provided a higher price, could lead to reduction in total seafood consumption because the consumers who are willing to pay more could reduce the quantity they buy.

Interesting information about organic aquaculture is also available in forms other than scientific articles. In this literature, it was described that in Europe, organic seafood is often sold by supermarket chains which should facilitate informative introductions of potential new organic seafood species and products (Bergleiter et al., 2004). Strategic market expansion could also take place in Europe, when planned thoroughly to secure its success. For example, the organic trout market could be expanded in Germany and Austria, while the market for organic carp is more complex, due to high seasonality (Lasner et al., 2010). An increased availability of these products may increase their visibility and reach new consumers of organic (sea)food. (Gross, 2001). Brendehaug and Groven (2000) reported that labelling some products of a brand as organic might give economic and competitive benefits for the company, because it improves the environmental profile and gives commercial advantages. Hence, the whole brand including the conventional products may be strengthened. The concept of organic seafood is generally appealing and particularly positive to some consumers with existing interest in organic food in general (Gross, 2001). One reason for such an appeal could be driven by the fact that consumers may assume that organic aquaculture is also including better animal welfare (Pascoli, 2012). Olesen et al. (2010) reported that a majority (53%) of the Norwegian respondents in a survey partly or totally agreed that organic production promoted fish welfare better than did conventional production. This may indicate that many were aware that organic production emphasizes fish welfare. In the same study, a majority agreed or partly agreed that organic food was healthier (56.5%) and that organic production was better for nature (74.6%). Several characteristics can define what consumers consider organic seafood, including (in order of ranking in the US): pesticide/antibiotic free, better for environment, nutritious, safe, quality, taste and animal welfare (O'Dierno, Govindasamy, Puduri, Myers, & Islam,

2006). This study shows how important it is to retain the basic characteristics of fish products and the need to define what makes seafood products being perceived as organic due to the about 30% of the participants reporting the characteristic “other” or “none” as important. Little attention has been given on consumers attention to organic products’ design and packaging, in order to improve the products visibility in a retail setting (Schleenbecker & Hamm, 2013). Similarly, the organic aquaculture sector would benefit by the application of additional marketing differentiation strategies besides the most commonly used labelling.

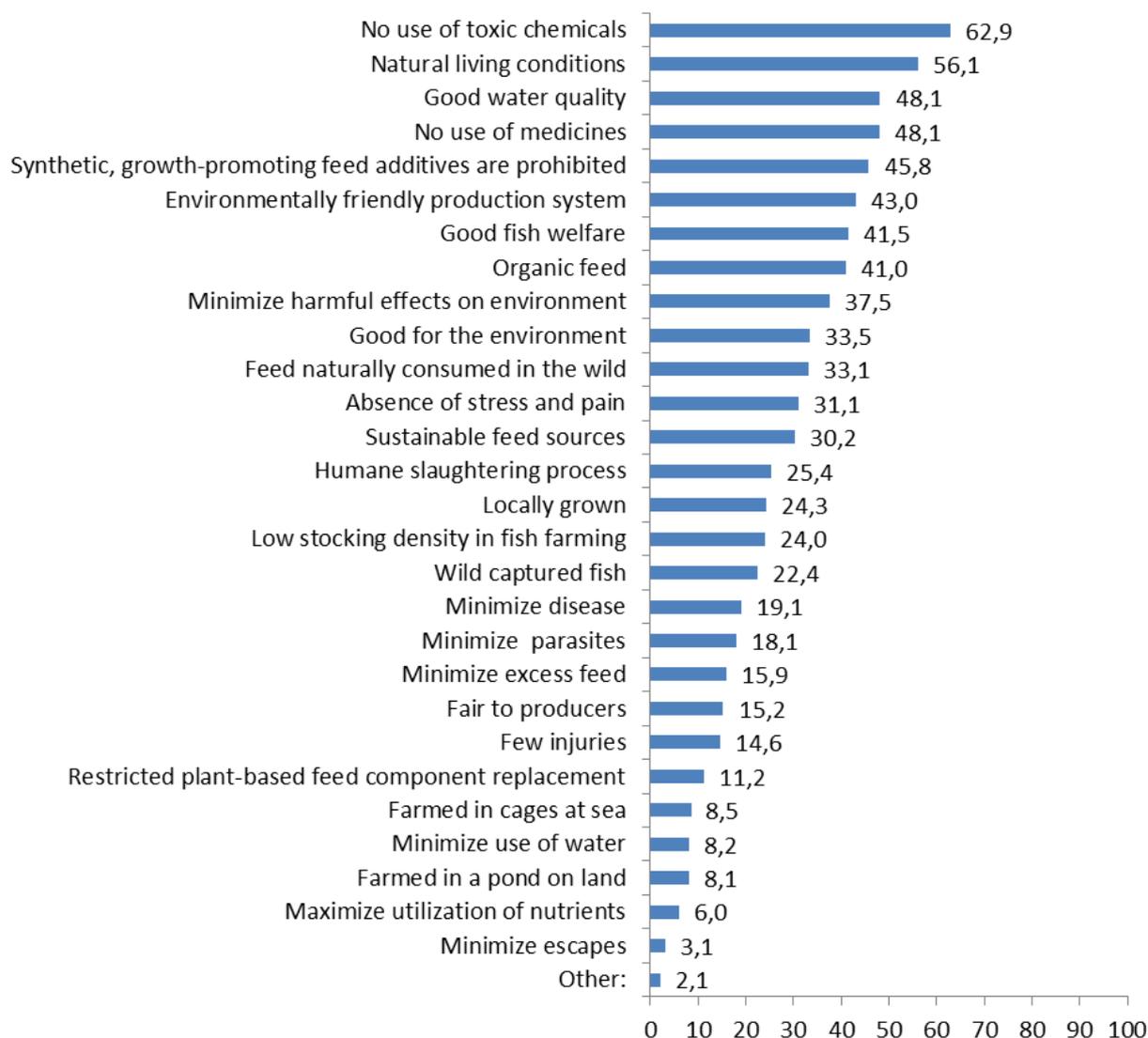
As mentioned before, a survey was conducted in the UK, France, Italy and Germany. The sample’s social and demographic characteristics per country are presented in table 1. The sample’s characteristics indicate a relatively balanced sample between countries. Significant differences exist, but they are mostly due to the size of the sample or inherent country differences but not relevant once looking at the actual values in the table. The differences in income may not be representative for the counties’ population and should therefore be interpreted with caution.

*Table 1 Social and Demographic characteristics of the sample population from the UK, France, Italy and Germany.*

	Countries				Total	Sig *
	UK	France	Italy	Germany		
N	503	501	501	502	2007	
Age (years)	45a	45a	43b	45a	45	0.027
Yearly household income (euros)	44567a	30539b	28230b	22864c	23472	<0.001
<i>Age groups (%)</i>						0,006
18-24	8,0	4,6	4,4	9,8	6,7	
25-34	19,5	17,6	21,4	15,5	18,5	
35-44	23,5	27,7	29,5	25,9	26,7	
45-54	23,5	25,5	23,6	23,9	24,1	
55-65	25,6	24,6	21,2	24,9	24,1	
<i>Gender (%)</i>						<0.001
Male	43,5	38,1	34,5	52,2	42,1	
Female	56,5	61,9	65,5	47,8	57,9	
<i>Household size (%)</i>						<0.001
1	29,8	41,5	22,6	56,6	37,1	
2	34,0	27,9	26,3	27,9	28,5	
3	16,1	10,8	23,6	8,4	14,1	
4	11,1	12,6	18,2	5,2	11,2	
5+	8,9	7,2	9,4	2,0	6,7	
<i>Education (%)</i>						<0.001
Secondary or less	44,5	37,1	44,7	77,3	50,9	
Technical higher	41,0	24,8	21,0	5,0	22,9	
Theoretical higher	14,5	38,1	34,3	17,7	26,2	

\*One way analysis of variance between countries or chi-square tests between percentages; a-c indicate differences between countries.

A first general view from the survey performed within task 3.1 in OrAqua regarding terms/concepts that consumers in UK, France, Italy and Germany considered relevant to the EU official definition of organic fish (EC 834/2007 and 710/2009) are presented in figure 1. More than half of the participants in all countries reported that the factors that fit the definition of organic fish the most are: 1) No use of toxic chemicals and 2) Natural living conditions. Almost half of the participants reported that good water quality is important and no medicine use is allowed. Lower on the ranking scale were: environmentally friendly production system, good fish welfare, organic feed and minimize harmful effect on environment, with about 40% or the participants choosing for them. About a third of the participants selected the factors: good for the environment, feed naturally consumed in the wild, absence of stress and pain and sustainable feed sources. About a quarter of the participants reported: humane slaughtering process, locally grown, low stocking density in fish farming and wild captured fish. About 10-20 per cent of the participants reported in order from most to least: minimize disease, minimize parasites, minimize excess feed, fair to producers, few injuries and restricted plant based feed component replacement. Finally, lowest at the ranking order were the factors: farmed in cages at sea, minimize use of water, farmed in a pond on land, maximize utilization of nutrients and minimize escapes.



*Figure 1 Factors that define organic fish for consumers in the UK, France, Italy and Germany, ranked in order of relevance to the total sample. Relevance is reported as percentage of participants in all countries that agree that each factor is relevant to the official EU definition of organic fish.*

There were differences between the countries, which are presented in more detail in Table 2. Many of the differences between countries were statistically significant. However, the most striking differences were: a) relatively higher relevance of feed and welfare in the UK, b) higher relevance of feed, density, origin of the fish and fair trade in France, c) Higher relevance of the prohibition of additives and medicines, fish health issues (minimize disease and parasites) and farming in cages at sea in Italy and finally d) a general higher rating trend in Germany, with the exception of environmental friendly production system, organic feed, feed consumed in the wild, locally grown fish, wild captured fish, fair to producers, farmed in cages at sea and minimize escapes.

Table 2 Factors that define organic fish for consumers in the UK, France, Italy and Germany, ranked in order of relevance\* to the total sample.

Regulation		Questionnaire	Country				Sig**
EC 834/2007	710/2009	Definition of organic fish	UK	FR	IT	GER	
N.A.	N.A.	No use of toxic chemicals	56,5	63,5	61,7	69,9	<0,001
II/5h, III/15/ii	N.A.	Natural living conditions	54,7	53,5	51,3	64,9	<0,001
N.A.	II/25f/1b	Good water quality	39,4	48,7	49,5	55,0	<0,001
N.A.	N.A.	No use of medicines	30,6	49,7	50,3	61,8	<0,001
III/15d/iv	II/25m/2	Synthetic, growth-promoting feed additives are prohibited	33,8	45,5	56,9	47,0	<0,001
I/1, II/3c I/17, II/5h, III/15/ii	N.A. 10	Environmentally friendly production system	36,6	48,5	43,3	43,6	0,002
II/4b/i	II/25k/1a, 1b	Good fish welfare	46,9	31,3	39,5	48,0	<0,001
III/15/iii	4	Organic feed	45,5	43,3	38,7	36,3	0,011
I/1, II/3c	N.A.	Minimize harmful effects on environment	32,4	35,7	37,5	44,4	0,001
N.A.	II/25l/1	Good for the environment	32,2	32,1	31,7	37,8	0,124
III/15/vi	II/32a/3	Feed naturally consumed in the wild	35,4	40,7	28,3	28,1	<0,001
II/4a/ii, II/5o	II/25k/1c	Absence of stress and pain	29,4	25,0	22,0	48,2	<0,001
III/15/vi	II/25h/5	Sustainable feed sources	34,4	25,3	23,8	37,3	<0,001
N.A.	II/25d/1	Humane slaughtering process	23,1	12,6	24,2	41,8	<0,001
I/17	II/25f/1a, 2	Locally grown	14,9	29,3	27,5	25,3	<0,001
N.A.	N.A.	Low stocking density in fish farming	19,3	31,3	13,0	32,5	<0,001
I/17, II/51	17	Wild captured fish	20,5	27,5	18,8	22,7	0,006
N.A.	10	Minimize disease	17,3	10,4	21,4	27,3	<0,001
N.A.	1/6b/4	Minimize parasites	16,9	10,6	20,0	24,9	<0,001
I/3	N.A.	Minimize excess feed	11,9	16,8	10,4	24,5	<0,001
N.A.	II/25h/1	Fair to producers	16,7	25,7	4,6	13,9	<0,001
N.A.	II/25k/1d, 3	Few injuries	11,7	10,8	10,0	26,1	<0,001
I/1, II/3a/iii	N.A.	Restricted plant-based feed component replacement	8,7	15,6	8,6	12,0	0,001
N.A.	N.A.	Farmed in cages at sea	7,4	7,8	11,0	8,0	0,151
N.A.	N.A.	Minimize use of water	4,8	10,6	5,2	12,4	<0,001
N.A.	N.A.	Farmed in a pond on land	8,7	8,4	2,2	12,9	<0,001
III/15/iii	II/25k/1c	Maximize utilization of nutrients	8,0	4,6	4,2	7,2	0,025
N.A.	N.A.	Minimize escapes	4,6	2,8	2,6	2,4	0,167
		Other:	2,4	2,2	1,2	2,6	0,423

\*Percentage of participants in each country that agree that each factor is relevant to the official EU definition of organic fish;

\*\*Chi-square tests between countries

The participants of the survey also provided information about their consumption behaviour. Table 3 provides a clear overview of organic food consumption in the four countries that were chosen to represent main European markets for organic fish. In addition to several differences that can be observed between countries, the position of organic fish was found to be the second lowest, just above the consumption of grains.

Table 3 Consumption frequency of organic food categories\* in the UK, France, Italy and Germany.

	Countries				Total	Sig **
	UK	France	Italy	Germany		
Vegetables	2.3b	2.3b	2.6a	2.3b	2.4	0.016
Eggs	2.0b	1.9b	2.3a	2.0b	2.0	0.004
Dairy products	1.9	1.9	2.1	2.0	2.0	0.677
Fruit/juice	1.7b	1.9b	2.2a	1.8b	1.9	<0.001
Poultry	1.6b	1.6b	1.9a	1.4c	1.6	<0.001
Beverages	1.6	1.5	1.8	1.6	1.6	0.077
Other	1.4b	1.5b	1.9a	1.5b	1.6	<0.001
Red meat	1.3cd	1.5b	1.8a	1.1d	1.4	<0.001
Fish/seafood	1.3bc	1.2cd	1.5a	1.1d	1.3	<0.001
Grains	1.4a	0.9b	1.0b	1.4a	1.2	<0.001

\*Times per month; \*\*One way analysis of variance between countries; a-d indicate differences between countries

The frequency in which consumers consume organic fish products is a relevant factor that clearly discriminates the participants of the European survey in two groups for relevant comparisons. These groups were defined as “low” and “high” consumption frequency groups, based on the estimation of the median (consumption frequency of once a month). Therefore, two groups, across countries, were revealed and led to more useful comparisons than comparing countries and are presented in table 4. The differences between age, gender and education level were not significant between the low and high organic fish consumption groups. However, significant differences were found between the two groups on income, country of origin and household size. Consumers with a high consumption of organic fish tended to have a higher income live in Italy and have larger families.

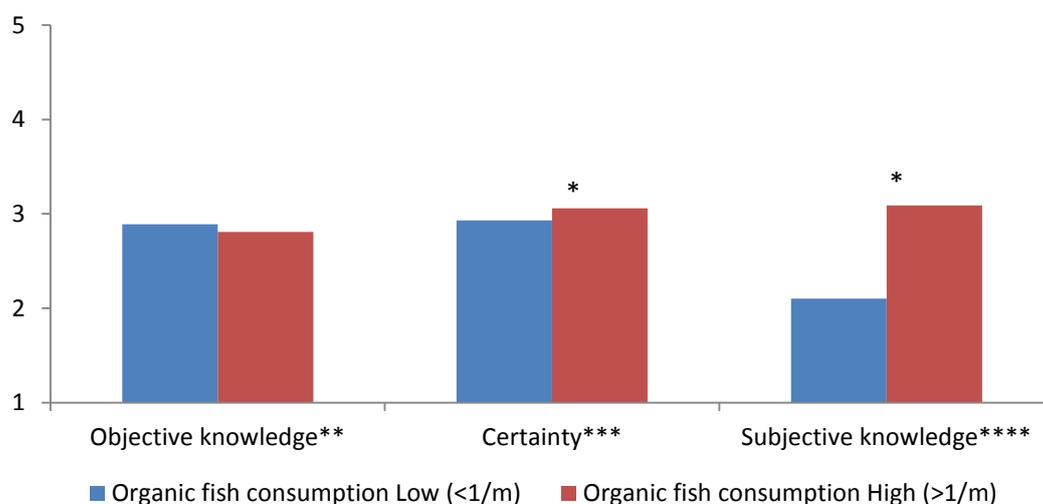
Table 4 Social and demographic characteristics of “low” and “high” organic fish consumption groups in Europe.

	Organic fish consumption			Total	Sig.*
	Low (<1/m)	High (>1/m)			
N	1133	874	2007		
Age (years)	44,9	44,1	44,6		0,129
Gender					0,273
Male	41,0	43,5	42,1		
Female	59,0	56,5	57,9		
Yearly Income (€)	30250	33254	31558		0,006
Country (%)					0,001
UK	25,1	25,1	25,1		
France	26,5	23,0	25,0		
Italy	21,7	29,2	25,0		
Germany	26,7	22,8	25,0		
Household size (%)					0,013

	Organic fish consumption			Sig.*
	Low (<1/m)	High (>1/m)	Total	
N	1133	874	2007	
1	40,5	33,9	37,6	
2	28,4	29,9	29,0	
3	14,4	15,1	14,7	
4	10,9	12,8	11,8	
5+	5,7	8,4	6,9	
<i>Education (%)</i>				0,881
Secondary or less	51,4	50,3	50,9	
Technical higher	22,9	23,0	22,9	
Theoretical higher	25,8	26,7	26,2	

\* Significance based on one way analysis of variance tests between organic fish consumption group means or chi-square testing of percentages between groups

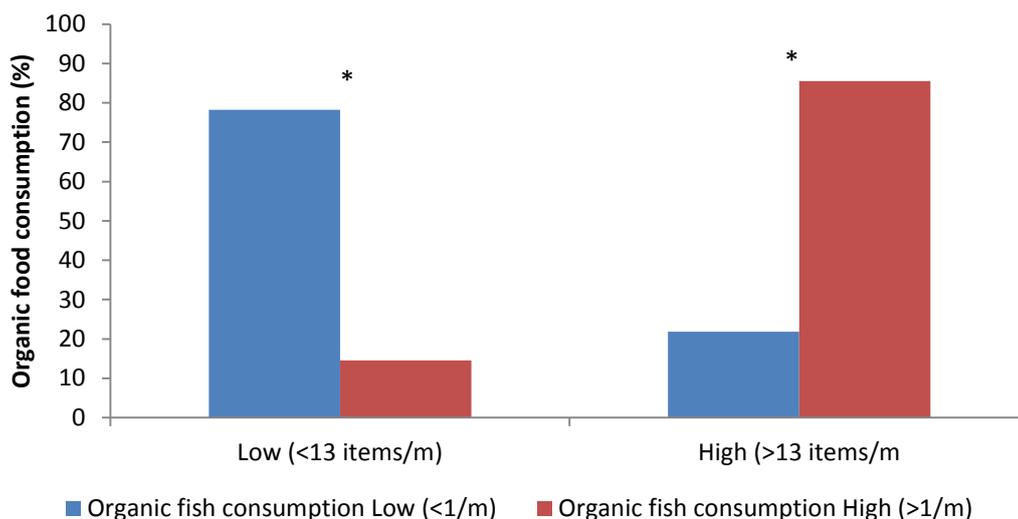
Feedback from the first stakeholder event led to the need for a more in depth exploration of the knowledge levels of consumers of organic fish and those that do not consume it as often. Figure 2 shows the levels of objective knowledge between low and high consumers of organic fish to be very close. However, the high consumption group reported being more confident about their answers on the knowledge items, as well as a significantly higher subjective knowledge.



\* Significance based on one way analysis of variance tests between organic fish consumption group means; \*\* Sum of five correct answers within country, based on true false answers to statements; \*\*\* Measured on a 5-point scale from 1=very uncertain to 5=very certain; \*\*\*\* Construct of several statements measured on a 7-point scale from 1=strongly disagree to 7=strongly agree.

Figure 2 Knowledge differences between “low” (n=1133) and “high” (n=874) organic fish consumption groups in Europe.

Furthermore, as expected, the group that consumed the most organic fish was also belonging to the group with a high consumption of organic food in general (Figure 3).



\* Significance based on chi-square testing of percentages between groups.

Figure 3 Organic food consumption differences between “low” (n=1133) and “high” (n=874) organic fish consumption groups in Europe.

Additional specific results regarding consumers’ perceptions related to issues relevant to organic aquaculture are presented at the relevant parts below, where knowledge gaps were found in the literature review.

### 5.1.3 Consumer perceptions of specific issues related to organic aquaculture

Consumers’ perception of organic (sea)food products is influenced by their knowledge and perception of organic production, but the way they conceive the organic concept is overlapping with ethics related to other production conceptualizations such as ecological, fair trade, sustainable, natural and so on (Honkanen et al., 2006). There is evidence that consumers think in several levels of abstraction regarding sustainability and the environmental impact of food production, which should be taken into account by scientists and policy makers (Verain et al., 2012; Zander et al., 2013). However, some elements related to aquaculture production are of particular relevance to the regulatory framework about organic seafood and will be covered in this section. These issues are: a) feed, b) welfare, c) production systems and d) environmental impact.

#### 5.1.3.1 Feed

Almost no published research was found on the topic of consumer perception of feed ingredients in organic or conventional aquaculture nor how consumers perceive the impact feed has on the health and welfare of the animals and therefore their own. Studies reported that consumers will receive healthier fish and safer products when fish is fed with feed balanced in health promoting fat content (Farrell et al., 2010), but consumers cannot discriminate between products from salmon that received a diet with fish oil vs. rapeseed oil (Schacht & Busch-Stockfisch, 2009). However, the latter study did not report consumers’ perception of the feeding system, while another study reported that consumers in Australia generally preferred conventional fish meal feed for conventional aquaculture and a segment of the participants was also positive towards GM oilseed (Cox et al., 2008). This partial input from the literature is not conclusive on the topic of feed used in organic fish farming.

Minor additions to the pool of knowledge were made from two research reports. The first report indicated that organic trout products may lead to organoleptic differences perceived by consumers, depending on the feed they are provided (Jokumsen, 2008). The second report added that consumers associate feed with fish welfare and

consider it as one of the main and easier to control factors in aquaculture systems (Kole et al., 2008b). However, none of the above provided a direct link between feed used in fish farming and the importance consumers place to feeding practices in relation to organic fish farming.

In the field of land animal agriculture, feed is considered one of the main factors that can be influenced in an organic production and is also associated to animal welfare (Tuyttens et al., 2010). However, feed costs can be a crucial economic factor that may make stocking density economically viable (Verspecht et al., 2011). It may therefore lead farmers to a difficult economic decision. The feed costs were indeed found to be responsible for the largest contribution to the raising of the cost price in OrAqua deliverable D32. However, communication about the feed may add value to the end-product and support the farmer's decision for feeding practices closer to the organic standards. It has been suggested that the specificity of feed type is a communication dimension that may attract different consumers than the concept of organic food as a total (Janssen et al., 2009). Therefore, referring to details of the organic concept may make consumers more responsive to the tangibility of the effects of their shopping choices. However, even though feed is an important attribute for some consumers' choice of organic eggs, a price premium for appropriate feeding practices is not reported as acceptable (Mesias et al., 2011). We therefore see that the issue of feeding practices in all farming, including organic, is considered relevant for consumers.

Some additional research on this topic was performed within the frames of OrAqua (Table 5). The relevance of feed issues to the official definition of organic fish in Europe and the expected impact of feed issues on the quality of fish were the questions that cover this topic. One first general result is that no feed-related issue was considered as relevant for the definition of organic aquaculture by the majority of consumers. High relevance was reported for the prohibition of synthetic, growth-promoting feed additives, which was a topic that was higher rated by consumers with a low intake of organic fish. The use of organic feed was rated similarly by the two consumption groups. A third of the consumers from both groups found feed naturally consumed in the wild and sustainable feed sources to be relevant to organic aquaculture. Only few consumers reported "minimize excess feed", "restricted plant-based feed component replacement" and "maximize utilization of nutrients" as relevant for the definition of organic fish farming. However, consumers with higher organic fish consumption rated "minimize excess feed" and "maximize utilization of nutrients" higher than those with low consumption. Similarly, the high consumption group expected a balanced feed composition and feed naturally consumed in the wild to be important for the quality of the final fish products. These results show that consumers associate issues related to feed composition and utilization to the quality of the final fish products. However, they do not necessarily associate these issues as important for the definition of organic aquaculture. This result may confirm the previous challenges shown in the literature, regarding expected quality of organic products and the consumers' low willingness to sacrifice quality when buying organic products. However, this direct link was not tested here, but it would be a relevant future research direction. As a conclusion, consumers' interest in the impact of feed on fish quality indicates that references to feed practices within organic fish farming should be followed by the tangible impacts these practices may have on the quality of the final product. Such strategic communication could be designed and tested for its effectiveness towards building realistic consumer expectations regarding their demands for feeding practices and perceived organoleptic quality of the final products.

Table 5 Consumer opinions about issues related to feed used in organic fish farming

	Organic fish consumption			Sig.*
	Low (<1/m)	High (>1/m)	Total	
N	1133	874	2007	
<i>Feed issues relevant to the definition of organic fish**</i>				
Synthetic, growth-promoting feed additives are prohibited	47,7	43,2	45,8	0,045
Organic feed	40,1	42,1	41,0	0,358
Feed naturally consumed in the wild	32,9	33,4	33,1	0,818
Sustainable feed sources	30,2	30,2	30,2	0,992
Minimize excess feed	13,9	18,5	15,9	0,004
Restricted plant-based feed component replacement	11,9	10,3	11,2	0,255
Maximize utilization of nutrients	4,9	7,4	6,0	0,016
<i>Feed issues important for quality of fish products***</i>				
Balanced feed composition	5,32	5,55	5,42	<0.001
Feed naturally consumed in the wild	5,25	5,56	5,38	<0.001

\*Significance based on one way analysis of variance tests between organic fish consumption group means or chi-square testing of percentages between groups; \*\*Percentage of participants that agree that each factor is relevant to the official EU definition of organic fish; \*\*\*Measured on a 7-point scale from 1=not important at all to 7=Very important.

### 5.1.3.2 Welfare

It is commonly accepted that fish can perceive parameters that are related to its welfare (Lund et al., 2007). Consumers can perceive small differences in the fish characteristics when fish originates from a production system that provides better fish welfare (Sveinsdottir et al., 2010). Furthermore, ethical practices are feasible without losses in quality (Sorensen et al., 2004). But, fish welfare is not a main concern for most consumers (Honkanen & Olsen, 2009; Vanhonacker et al., 2011; Vanhonacker et al., 2010), mostly due to consumers' impression that compared to land animals, fish feel no stress or pain (Frewer et al., 2005; Kupsala et al., 2013) or due to placing higher priority to product characteristics such as freshness and quality of fish (Verbeke et al., 2007b). However, consumers who purchase farmed salmon report high willingness to pay for increased fish welfare during the production (Grimsrud et al., 2013; Olesen et al., 2010). The latter willingness to pay more for farmed fish welfare can cover additional costs the producers may face in order to establish improved welfare (Kankainen et al., 2012; Noble et al., 2012). Similarly, fish welfare regarding catch method of cod can lead to 18 % price premium (Sogn-Grundvåg et al., 2012). It can be concluded, that fish welfare is relevant for a group of consumers that could support a part of the organic fish market. However, some consumers may expect a lower fish welfare when fish is farmed compared to wild (Kole, 2003). The latter perception can be improved by informing consumers about high levels of control in the production and good welfare practices in the fish farming sector.

Scientific reports have added some knowledge to the topic of welfare and ethics related to aquaculture. One key finding is that ethical issues such as animal welfare are important for some consumers, but not more important than quality characteristics of the product consumed (Kole et al., 2008a). The health of the fish and the stress it experiences during its production in aquaculture are mostly associated to intrinsic characteristics of the fish, while mortality and fin damage represented direct associations consumers made with fish welfare conditions (Kole et al., 2010). Therefore, some welfare issues need to be explained to consumers in order to ensure that strategic communication about fish welfare will actually lead to consumers' understanding of the issues involved. The

above, when tested in a real life experiment, consumers reported willingness to pay more for salmon produced under good animal welfare, while they would buy a smaller amount of salmon to compensate for the high price, leading to an estimate 30% increase in sales value (Kole et al., 2010). These reports indicate a potential for communication strategies that not only directs attention to the parts of the production method that reaches consumer understanding, but also towards suggested solutions, such as reduced package size, retained quality and increased understanding of value for money. Indeed, as OrAqua deliverable D2 found, production efficiency, quality and quantity are often coupled with good welfare. Considering these parameters and testing them in future, research could lead to effective and practical communication and marketing strategies. Finally, communication and marketing strategies should take into account that animal welfare in general (beyond seafood) is associated with several parts of a production system. OrAqua deliverable D2 raised some interesting questions about the ethical issues related to welfare, which will also have importance for the consumers. The importance of these factors differ when compared between the perspectives of producers and consumers, with producers focusing on biological animal welfare (feed, animal health) and consumers focusing on more parameters, including affective ones (e.g. good behaviour towards the animals) (Tuytens et al., 2010). Therefore, the development of communication and marketing strategies should be tested in terms of its effectiveness towards targeted receivers, which implies all stakeholders, including consumers.

### **5.1.3.3 Production systems**

Limited research has been performed on the specific issues related to consumers' perceptions related to production systems in aquaculture. However, Yip et al (2012) revealed a willingness to pay a price premium of 9.8% and 3.9% for integrated Multitrophic aquaculture (IMTA) and Closed Containment Aquaculture (CCA) systems, respectively, over conventionally produced Atlantic salmon. Results of the survey also revealed that 44.3% and 16.3% of the respondents preferred the adoption of IMTA and CCA to conventional salmon farming, respectively. A recent study reported that consumers in Germany discuss a higher preference for natural production systems, despite their lack of knowledge and low need for information about sustainable aquaculture (Feucht & Zander, 2014b). We therefore see a need for a strong association between naturalness and the production systems used in organic aquaculture. It is also suggested that even though some production systems may be preferred over others, public involvement in decision making and increased transparency on issues related to aquaculture production could improve the image of the sector (Kaiser & Stead, 2002). However, this involvement and transparency do not necessarily imply the exposure of consumers to all details of each production system. An efficient way to increase consumers' perception of transparency and involvement could be by creating documentation of organic standards that is more relevant and tangible for the consumers, with links and appendixes to details, for those consumers that want to read further. Making such documentation available could indicate inclusion of the public in the targets of the organic standards' documentation and increase the perception of trust in the controls of such a system.

An example of the effects of communication about a production system was reported by Robertson and Carlsen (2000). They reported that providing balanced information to consumers about open ocean aquaculture has a negative effect on their attitudes towards the system, especially if they are unsure about their level of familiarity with the issue. The limited amount of literature on the effects of production systems on consumer perception of aquaculture and its products indicates a need for more research of this area. Several possible production systems may be compared by consumers and their attitudes and general impressions can be collected. However, as many consumers may lack knowledge about most production systems, there is a risk that a general negativity about all details of the systems may be created by implicit reactions to the exposure to this information as discussed by e.g. Kole et al. (Kole et al., 2009). Therefore, the information about production systems to which the consumers

will be exposed to need to be carefully prepared in order to represent a balanced, objective and comprehensible description of each system. The latter could be achieved with a higher abstraction level used in the description of the system, referring to resulting effects of the system on fish welfare and avoiding crude production details.

In OrAqua, we expanded the existing knowledge by including production system issues in the consumer survey. As described in the methods, the survey was built based on the organic standards and general organic food literature. However, in the production of terrestrial animal species, the production system alternatives are not directly comparable to those of aquaculture. The existence of water treatment, multi-trophic opportunities and options between sea or land placement of the production has no parallel to the production of beef, pork, eggs, fruit or vegetables. We therefore limited the use of knowledge from general food research to methodologies for evaluating consumer perceptions.

The results from the consumer survey, related to the issue of production systems are presented in table 6. No significant differences were found between the low and high consumption groups on production issues relevant for the definition of organic fish. More than half of the participants considered “natural living conditions” to be a relevant issue to the definition of organic fish. Almost half reported the same about “good water quality”. Very few consumers considered “farmed in a pond on land”, “farmed in cages at sea” and “minimize use of water” relevant for the definition of organic fish. Finally, the cleanliness of the water was considered important for the quality of the resulting fish products by both groups. Consumers with a high level of consumption of organic fish reported and even higher importance of the cleanliness of the water for the quality of the fish.

Table 6 Consumer opinions about issues related to production systems in organic fish farming

	Organic fish consumption			Total	Sig.*
	Low (<1/m)	High (>1/m)			
N	1133	874	2007		
<i>Production systems issues relevant to the definition of organic fish**</i>					
Natural living conditions	56,7	55,4	56,1	0,565	
Good water quality	47,7	48,7	48,1	0,631	
Farmed in a pond on land	8,3	7,8	8,1	0,674	
Farmed in cages at sea	8,6	8,5	8,5	0,940	
Minimize use of water	7,4	9,3	8,2	0,134	
<i>Production system issues important for quality of fish products***</i>					
Clean water	5,99	6,13	6,05	0,011	

\*Significance based on one way analysis of variance tests between organic fish consumption group means or chi-square testing of percentages between groups; \*\*Percentage of participants that agree that each factor is relevant to the official EU definition of organic fish; \*\*\*Measured on a 7-point scale from 1=not important at all to 7=Very important.

We therefore see that consumers relate the naturalness of the production and the quality of the water to organic fish farming practices. This balance could be practically difficult to achieve in a production system, since reduced naturalness could introduce increased control of the water quality. Furthermore, the cleanliness of the water is associated with the quality of fish products. The cleanliness of the water is however something subjective, when it comes to consumers. Natural production systems may not result to water with a clean appearance. However, unclear water may still be of high quality for the fish. The complexity of the issue of naturalness, cleanliness and water quality indicates that future communication on this issue should be carefully designed and pretested. A first exposure of consumers to information on these issues could lead to unpredictable first impressions. However, a

systematic long-term communication strategy could increase the consumers' knowledge level to a point of having the ability to evaluate and conclude about the risks and benefits of production systems related to organic aquaculture.

#### **5.1.3.4 Environmental impact**

The last of the four relevant topics regarding organic aquaculture is the environmental impact of aquaculture production. Consumer data have previously indicated that the farmed origin of fish is of relatively low importance to them (Claret et al., 2012). However, the latter study reported that only few consumers would prefer farmed fish because of their knowledge about the positive effects their behaviour may have on the wild fish stocks. The image of aquaculture as an environmental friendly and safe production system has been found to be related with the knowledge participants have on this subject (Fernandez-Polanco & Luna, 2012). Furthermore, some consumers reported that they disagree with the fact that farming salmon harms the environment, while the environmental impact of wild salmon harvesting has been found to lead to ambivalence (Gaedeke, 2001). On the other hand, consumers that are highly concerned about the environmental impact of seafood production are less prone to buying farmed fish (Whitmarsh & Palmieri, 2011) and are concerned about environmental impacts of aquaculture and the indirect economic effects this may have on the tourism sector (Freeman et al., 2012; Hugues-Dit-Ciles, 2000). Therefore, communicating the protective effect of aquaculture on wild fish stocks could be a successful differentiation strategy for the aquaculture sector as a whole (Honkanen & Olsen, 2009). Furthermore, the underestimation of the impact of land-based livestock production on the environment, compared to fish farmed under sustainable practices, may lead to an image improvement for sustainably farmed organic seafood (Vanhonacker et al., 2013).

However, when communicating the latter, one should not forget that in general, fish production, as all animal production, has a significant impact on environmental resources (Mancini et al., 2012). Furthermore, when it comes to consumers in general, new technologies or production systems are often expected to have a negative impact on the natural environment surrounding a seafood production plant. For example, the size of the production and the degree of naturalness of new technologies can influence how consumers accept new technologies regarding prawn production (Cox et al., 2007). Therefore, avoiding confusing differentiation schemes that do not refer to tangible information and estimated environmental impact but specify to parts of the production such as catch area and method may lead to consumer confusion instead of increase of knowledge that can lead to informed choices (Roheim, 2009). On the other hand, that information should be balanced and not charged negatively or positively, to avoid social desirability in the consumers' reporting of more positive opinions about seafood that originates from an environmentally friendly production or the reverse (Asche, 2010).

In conclusion, it is found that when consumers realise that aquaculture protects wild stocks, they perceive aquaculture as something good for the environment. When consumers are aware of the potential impact aquaculture may have to its surrounding environment, the image of aquaculture is less positive. These two conflicting opinions and the balance between them that can be found among several production systems indicate the importance of communication of the benefits of organic aquaculture regarding environmental impact. OrAqua deliverable D2 summarises the importance of the environment: "the rationale behind organic food production is to minimise the impact of production on the environment" (p. 173). The level of knowledge consumers have about aquaculture practices and their impact on the environment can lead to either an implicit or more informed development of the image they have about aquaculture. When knowledge is low, as is the case in our survey (table 3), a general negativity about the impact of aquaculture practices on the environment may lead consumers away from products resulting from it. An informed consumer opinion about how each aquaculture

practice influences the environment could lead to a more positive image of organic aquaculture. Therefore, there is need for tangible information that can lead to a more trustful acceptance of how a well-regulated organic aquaculture can be protective of wild stocks. This communication strategy would have to be carefully planned and tailored for targeting consumer groups in order to reach positive results even for those consumers with little prior knowledge on this topic.

## 5.2 Consumers' perception, knowledge, trust and confidence in organic food labelling

### 5.2.1 Need for organic aquaculture labelling

The image of fish labelled as farmed has been reported as less preferable by the consumers. Some suggest using labelling, explaining the benefits of good aquaculture practices (Gaviglio & Demartini, 2009), while others find no positive impact of such information (Kole et al., 2009). Experts of the organic food market report the need for common EU standards in all areas that may begin farming organic fish (Padel & Midmore, 2005). This need becomes more pronounced, once one considers the increasing imports of fish from developing countries (Little et al., 2012; Roth & Rosenthal, 2006), the increased production and local certification of organic seafood in countries outside Europe, such as China (Sheng et al., 2009) or the confusion unbalanced and unreliable information may create (Cawthorn et al., 2011). However, national natural characteristics and the dynamics of each market need to be taken into account, allowing country-specific definitions of parts of the regulations regarding organic seafood certification (Perdikaris & Paschos, 2010). Finally, the fact that conflicting information presents the possibility that organic aquaculture is not necessarily beneficial for the environment (Pelletier & Tyedmers, 2007), introduces an extra challenge towards appropriate, flexible and applicable certification schemes and relevant, effective labelling.

Research reports from grey literature have also looked into this subject. Studies reported that producing seafood products with welfare attributes and labelling them as such can lead to increased profit (Kole & Kankainen, 2010). However, stakeholders are sceptical about the implementation of animal welfare labelling due to expected low consumer awareness and understanding of labelling (DG-SANCO, 2009). Therefore, a well-designed and performed regulation and certification scheme needs to be established in order to cover consumers' demands for welfare labelling due to food incidents and expectations for good regulation of the food market. The adaptation of regulations, certification and labelling, needs to be applied strategically and in harmony with social and economic aspects of dynamic developments of its time, to avoid risking failure of existing investments and a resulting decrease of popularity of organic seafood due to lack of control and availability (Heinze, 2014).

Therefore, we could conclude that a holistic approach to the issue of labelling, including organic labelling needs to be undertaken in order to guarantee success in communication of the content of all labels towards the consumers. Such holistic labelling system would require a reevaluation of existing labels outside or surrounding the concept of organic aquaculture, to ensure simplicity and effectiveness of this communication with the consumers.

### 5.2.2 Consumers' perception of organic certification schemes

Consumers in Europe are confused about the meaning of the term "organic". Many Europeans are unaware of organic seafood certification and labelling. Once confronted with the existence of an organic certification and labelling system, many consumers were sceptical about the concept of organic farmed salmon. Distrust was expressed towards the regulatory processes and differences were expected between countries and the consumers trust in local authorities (Aarset et al., 2004). Knowledge about fish and trust in information sources influence consumers' perception and use of targeted information about fish in general and farmed fish in

particular (Pieniak et al., 2013; Pieniak et al., 2007). Consumers also believe that several steps of seafood production systems face different challenges with maintaining animal welfare and therefore would trust labelling if transparent, enforceable and traceable monitoring systems were also in place (Frewer et al., 2005). Furthermore, it has been shown that consumers that are highly educated and well informed about the state of marine resources are also those with low trust in labelling related to the regulation of sustainable fisheries (Brécard et al., 2009). However, conflicting results showed that some consumers in Europe associate information about a European origin guarantee to improved sustainability of aquaculture (Altintzoglou et al., 2010). When designing information and certification schemes, the current general image of aquaculture for the target population should be evaluated and taken into account in order to achieve appropriate information transfer and positive label perception (Roheim et al., 2012). There is a strong link between the perception of aquaculture in general and organic aquaculture, which can influence each other positively and/or negatively. Therefore, a holistic communication approach, which differentiates organic aquaculture from conventional, without competing and lowering the image of conventional aquaculture, would be a secure direction for the development of communication and labelling schemes.

It is generally accepted and clearly described that information about seafood practices and labelling may not always be perceived as expected and needs to be carefully designed and pretested (Hallstein & Villas-Boas, 2013). However, some manage to get their message across to the market. An example is MSC labelling for sustainable fisheries. MSC labelling convinces the market players that MSC-certified seafood is 3-5 times less likely to be subject to harmful management of fish stocks than uncertified seafood (Gutierrez et al., 2012). We see that communication strategies employed by certifiers like MSC can lead to market influence on a business level, even when consumers do not understand who exactly is behind the certification scheme, what sustainability exactly means or any particular details of the exact practices of sustainable fisheries. A study from 2011 showed that even though some consumers recognise the MSC label (31% in the UK and 18% in France), few actually use the label when buying seafood: 57% in the UK and 68% in France (Honkanen, 2011). MSC is primarily a B2B label, explaining some of the low usage figures. Consumers tend to trust that the supermarkets purchase their seafood from sustainable sources. So, the amount and type of information provided to consumers should be specific, include details about the production origin, with limited details, in order to lead to better comprehension and trust by the consumers, as shown in recent studies in Germany (Feucht & Zander, 2014a, 2014b; Korn & Janssen, 2014). In general, once again, the literature leads to the conclusion for well-planned communication strategies, with just-right amount and type of information. Such a communication strategy can only be prepared and succeed when it is thoroughly pretested with the target populations.

Results from an Italian scientific report indicate that consumers are sceptical towards the concept of organic seafood (Institute for the agriculture market, 2011). The main drivers of this scepticism were: existing pollution in production locations, mistrust towards pricing/marketing being the motivation for the production, unfamiliar association of organic with seafood, conflict of the concepts organic and aquaculture (i.e. preference for wild), wild fish is already organic while farmed cannot reach the organic-ness of wild. Furthermore, robust measurements that can be used for establishing the suitability of products in the organic category would increase consumers' confidence in organic controls and lead to growth of the organic sector (Molkentin, et al., 2012; Rehbein et al., 2003). Finally, the origin of a certification authority and the relationship between certifiers and producers could lead to friction that could damage the image of a label and in turn lead to consumer confusion and reduced trust in certification schemes as well as industry and retailer concern (Nøstvold et al., 2014; Parkes et al., 2009). Therefore, national or European certification schemes could be more effective if they incorporate these essential elements: scope, accuracy, independence, precision, transparency, standardisation and cost

effectiveness. Population-specific studies could lead to a successful targeted communication strategy (Zander, 2012) and the avoidance of consumer confusion and market risks.

The survey performed in OrAqua, revealed some additional information regarding specific consumer trust related to stakeholder groups (Figure 4). In particular, it was shown that consumers with a high consumption of organic fish trusted all sources of information about organic fish more than did consumers with a low consumption. This result was apparent for retailers, independent certifiers, governmental control and organic fish farmers. It is worth noticing that all sources were equally trusted. Usually, independent certifiers have the highest trust among consumers. We should, however stress that in practice, these results show an average situation, with no particular differences between information sources that are much more or much less trusted than others. However, the useful finding in this case is that trust in all information sources could be expected to lead to a higher consumption of organic fish in Europe.

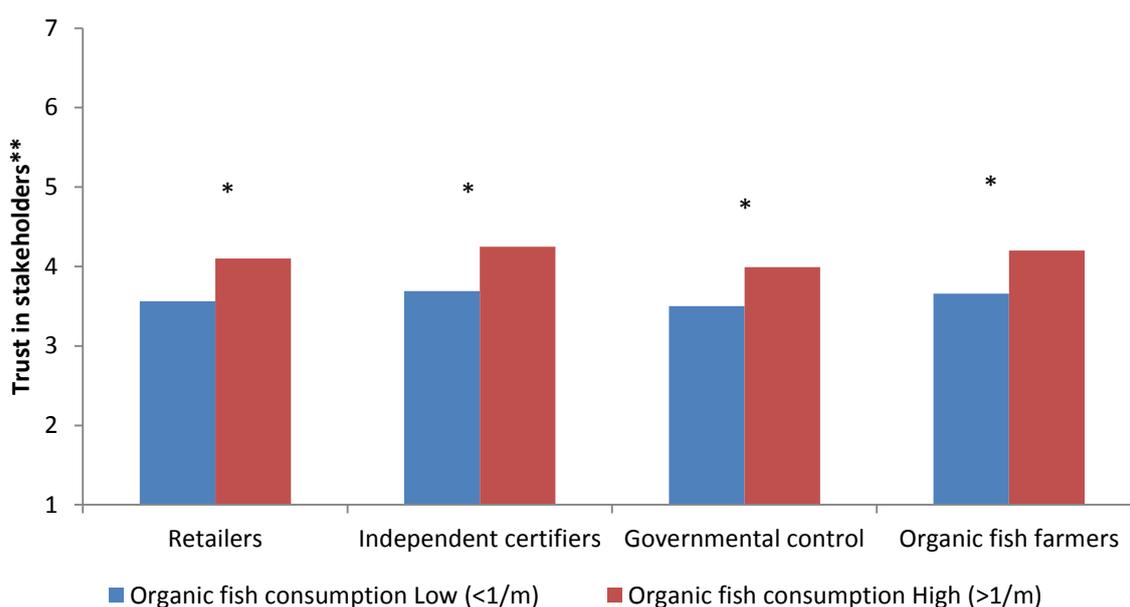


Figure 4 Consumers' trust in stakeholders related to organic fish farming.

\*Significance based on one way analysis of variance tests between organic fish consumption group means; \*\*Constructs of several statements measured on a 7-point scale from 1=strongly disagree to 7=strongly agree.

Concluding, organic labelling is perceived positively and the influential aquaculture labelling is evolving from negative to more neutral. However, the number of eco-labels is perceived as a burden by the consumers. There is consumer demand for legislation that is controlled on an international level, which can remain flexible for adaptations to more location-specific needs. However, this legislation should still fit under organic principles, to avoid consumer confusion. The organic concept in general, but even more for fish, is not clearly understood among consumers (Feucht et al., 2014). Biological, organic, ecological, green, sustainable and even fair trade labels are perceived to be similar by consumers. This may lead them to confusion and misinterpretation of the many labels that cover fish products in today's stores.

There is evidence of distrust in certification schemes, which varies in strength between countries in Europe. Distrust is influenced by knowledge about organic fish, perceived transparency of the controlling agents, tangibility of the provided information, perceived honesty of the carrier of the information and the source of

information (e.g. Official/Government vs. Commercial/Industry). However, the most recent results from the OrAqua survey revealed an improvement of this situation with an average trust in several stakeholders. This increased trust may lead consumers to an increased consumption of organic fish products.

Finally, communication strategies related to certification schemes should be targeted towards specific groups of the population and should be pre-tested in order to result to balanced information material that can build-up consumers' education and trust. The latter would increase the probability that this information is used by the largest possible part of the population.

### 5.2.3 Consumers' behaviour related to organic certification schemes

When information and its sources are trusted, consumers may consider using them. However, this is not necessarily the case, since it requires more factors to be in line in order for that behaviour to be accommodated. The end resulting behaviour of the consumers is that consumers are buying organic fish products, enjoy and consider repurchasing them. Scientific literature has shed light on the topic of willingness to pay, mostly on a hypothetical future purchase level. Consumers of organic trout, who regularly purchase such a product, are willing to pay a price premium for organic production (Disegna, Mauracher, Procidano, & Trevisan, 2009). Those that would not purchase organic trout in general are also the consumers that report low willingness to pay a price premium for organic aquaculture labels. A more specific study with Danish consumers showed that a higher education, income, age and associations of welfare with eco-friendliness, can lead to a willingness to pay up to 25% more for welfare labelled rainbow trout (Solgaard & Yang, 2011). Outside Europe, Chinese consumers with a high education, knowledge and budget prioritisation for seafood, are willing to pay a higher price for green- and eco-labelled seafood, due to the expected personal and societal benefits (Xu et al., 2012). Japanese consumers also report high willingness to pay for eco-labelled organic seafood (Oishi et al., 2010). The latter results are interesting in terms of exports of organic fish from Europe.

A recent study on consumers' understanding and use of various sustainability labels on food products showed that there is little consumers know about the term sustainability. Furthermore, due to little motivation and understanding of the labels, consumers do not use the labels when it comes to their actual choices of products they buy (Grunert et al., 2014). Looking closer into fish products research led to a study with Dutch consumers who reported being generally familiar with and positive about organic fish labels (Hoogland et al., 2007). However, this does not mean that they completely understand what the logo exactly implies, in terms of production method details and even perceptual overlaps towards ethical issues regarding animal welfare, good for nature and environment, health benefits, etc. Fish products carrying information about organic production were also perceived as more expensive. Greek consumers that were aware of the term "organic", reported low willingness to pay for organic sea bass and sea bream than organic e.g. fruits and vegetables (Krystallis & Chryssohoidis, 2005). Their willingness to pay for the various organic food categories was influenced by quality, safety, trust in certification and in some cases the brand of the product. In a study in Italy, consumers were more willing to pay for sea bass labelled for the country of origin than the organic production and breeding method (Mauracher et al., 2013). The latter study concluded that diversification via organic aquaculture production can be achieved only by implementing a tailor made communication and labelling strategy based on commercial and public policy expertise. On the contrary, an Australian study revealed that the particular type of consumers that follow a partially organic diet, may reach about 30% of organic fish per week, of which most is not officially certified (Oates et al., 2012). We therefore see that one rule cannot satisfy global consumer needs for information.

A communication strategy, diversified for countries and consumer groups, should be tested before being implemented, in order to guarantee its efficiency for all target audiences. An exemplification of this need, specified for social and demographic influences on label perception was presented in a study in France. Young, educated, non-coastal French consumers report higher acceptability of eco-labelled seafood due to ethical and moral reasons than product characteristics and are more influenced by official regulation than other types of information (Salladarre et al., 2010).

However, measured in an empirical survey, consumers' forced choices for sustainability-labelled MSC seafood contrasted their high reported planned behaviour (van Dam & van Trijp, 2013), exemplifying the difference between reported intentions and ethical values and how they may not lead to actual behaviour due to feasibility and practicality of the behaviour as such. The latter was also tested and in a report from Denmark. Danish consumers reported very positive opinions about ecologically farmed fish, but their actual buying behaviour was not measured (Fisher et al., 2006). Looking in to the field of consumer behaviour related to labelling led to evidence of differences between Norwegian and North American consumers (Donath et al., 2000; Johnston et al., 2001). Americans are less likely to buy certified seafood due to low budget, low trust in certifier, being female and buying salmon. However, American consumers are more likely to choose certified salmon than Norwegians are due to having higher education, being members of environmental organisations or due to facing a high price premium. Factors that can lead to differences between countries are therefore: budget, trust, gender, species, education, environmental membership, price premium level, income and environmental consciousness. Looking into literature on more empirical measurements of actual consumer behaviour led to the knowledge that MSC labelling of haddock and Alaska Pollock in the UK can lead to a 10% and 14% price premium respectively (Roheim et al., 2011; Sogn-Grundvåg et al., 2012). We therefore see that there is a price premium that consumers would be willing to pay for organic certified fish products. However, not all consumers report that they would be willing to do that. From those consumers that report willing to buy organic certified fish products, few will actually take this particular action in real life.

There are some specific issues that could improve the willingness and actual purchase of organic fish products by consumers. One example is by retaining and communicating the good quality of organic fish products. For example, Norwegian consumers reported willingness to pay for organic certified salmon products, but were not willing to pay more when the label was not supported by high quality products (Olesen et al., 2010). Results similar to the latter were shown when consumers reported their potential food choices regarding sustainability-labelled seafood in the UK and eco-labelled wild seafood in the USA, exemplifying the known global relevance of the quality factor in the choice for seafood (Brunsø, 2003; Jaffry et al., 2004; Johnston & Roheim, 2006; Verbeke et al., 2007c). Besides quality guarantee and its communication, tangible information about the environmental benefits of organic production systems could lead to a higher consumer acceptance. For example, labelling carbon footprint may be an effective method to achieve directness and trust, by allowing consumers to see a direct measurement for which they can feel that they decide and compare to other products when choosing what to buy and eat (Vazquez-Rowe et al., 2013). This way the impact of consumers' actions can also be understood, at the purchase point.

In OrAqua, the consumer survey shed some additional light on consumers' use of information sources and their use of the EU organic certification logo (Table 7). In this table, we clearly see that consumers with high organic fish consumption use all available information sources more often than do those with a low consumption. We also see that the internet, fishmonger, family and friends, television and supermarket are more often used than doctors and the government, who rank last on this list. An additional general effect shown in table 9 is that most

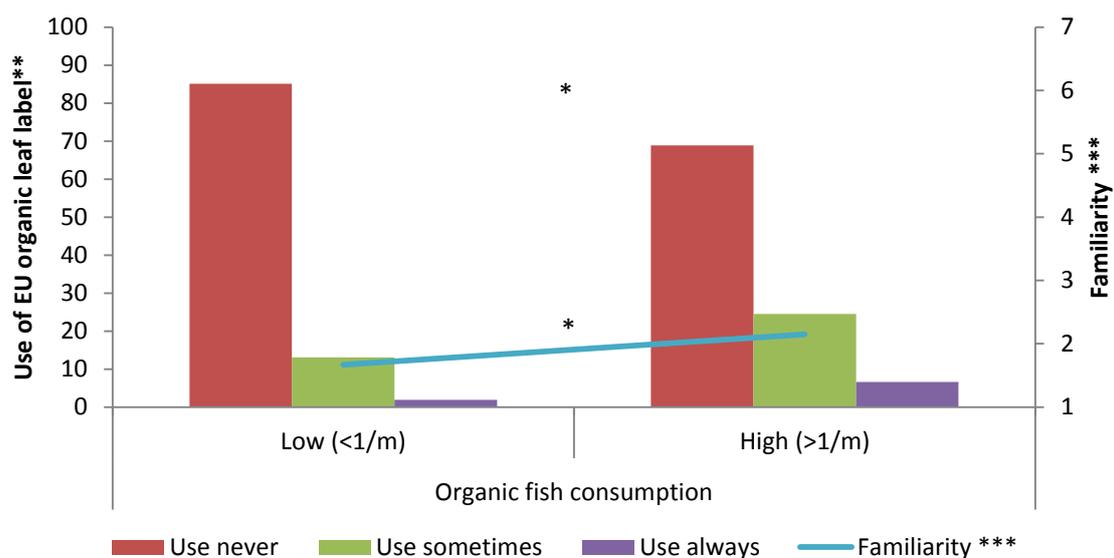
information sources are not used very often. None of them scores an average as high as the midpoint of the measurement scale. The latter may be related either to a search for information when buying organic fish, which is not very often, or due to reduced efficiency of all information sources on this topic. The first could be increased on increase the consumption of organic fish of both low and high frequency groups. The second, efficiency of information sources could be improved by introducing a well-planned strategic information campaign. This campaign, targeted to specific consumer groups and markets, could lead to an increased use of information, originating from the most effective information sources. For example, the use of social media throughout Europe is high. However, social media is not a commonly used source of information about organic fish products. A communication strategy focus on that alone, could lead to an increase of visibility of the organic fish sector.

Table 7 Consumers' use of information sources.

	Organic fish consumption			Total	Sig.*
	Low (<1/m)	High (>1/m)			
N	1133	874	2007		
<i>Use of information sources**</i>					
Internet	2,21	3,60	2,81	<0.001	
Fish monger	1,99	3,38	2,60	<0.001	
Family and friends	1,95	3,19	2,49	<0.001	
Television	1,99	3,11	2,48	<0.001	
Supermarket	1,90	3,16	2,45	<0.001	
Consumer organization	1,85	3,04	2,37	<0.001	
Newspapers	1,83	3,03	2,35	<0.001	
Public health recommendations	1,81	3,00	2,32	<0.001	
Fishermen/fish farmers	1,69	2,84	2,19	<0.001	
Scientists	1,69	2,77	2,16	<0.001	
Advertising	1,71	2,71	2,14	<0.001	
Social media	1,60	2,61	2,04	<0.001	
Dietician	1,59	2,57	2,01	<0.001	
Radio	1,57	2,58	2,01	<0.001	
Fish industry	1,51	2,54	1,96	<0.001	
Doctor	1,56	2,48	1,96	<0.001	
Government	1,50	2,40	1,90	<0.001	

\*Significance based on one way analysis of variance tests between organic fish consumption group means or chi-square testing of percentages between groups; \*\*Measured on a 7-point scale from 1=never to 7=very often.

Figure 5 includes results on the use of the EU organic leaf label, by consumers in key markets for organic fish in Europe. Most consumers, from both groups are not familiar and almost never use the EU organic leaf logo. There is a significantly higher familiarity and use of the EU organic leaf logo by consumers with high organic fish consumption. However, this higher use and familiarity remain in the low levels. These results indicated the need for improvement in the development and implementation of certification labelling schemes that represent the organic fish farming practices on an EU level as efficiently as national logos. The EU organic logo can become more efficient as a representation of the EU organic standards. However, research on strategic communication of these standards to the consumers is needed to ensure the effectiveness of such a process.



\*Significance based on one way analysis of variance tests between organic fish consumption group means or chi-square testing of percentages between groups; \*\*Percentage of participants selecting each answer per group; \*\*\*Measured on a 7-point scale from 1=not at all familiar to 7=extremely familiar

Figure 5 Consumers' use of the EU organic leaf logo.

Considering the above results, there is a need for effective communication of the EU organic leaf logo in order to reach consumers as effectively as national certification schemes do. However, this may be a complex issue due to several differences between national or private certification schemes and the EU organic leaf. One crucial difference is that EU organic certification has the lowest standards, in order to ensure that all nationally certified products can be included. This in itself introduced a system with requirements that are further from the organic principles than other certification schemes. Furthermore, national certification schemes carry an origin of the certification body in their labelling. This origin is embodied in the logo indirectly, leading to consumer impressions about the credibility and level or requirements for the companies enrolled. The EU organic leaf logo carries the European control concept, which is not as powerful as a more specified one. However, with an appropriate communications strategy, the EU organic logo could gain popularity and use by the consumers, due to its powerful political image; i.e. being of EU origin and unifying scattered certification schemes. However, this strategy would have to be designed and pretested in terms of relevance and effectiveness for diverse consumer types and cultures within Europe. However, the effect of European origin may be threatened by imported organic seafood that is labelled with the leaf.

### 5.3 Review and determining the added value of organic production and certification to the consumer perception and global market of aquaculture products (SWOT)

Another task in work package 3 was to review and determine the benefits of organic production and certification to the consumer perception and global market of aquaculture products, i.e. what weaknesses does it solve and what strong points may be even stronger. The task has a wider perspective and explores a broad spectrum of factors influencing consumer behaviour related to organic aquaculture. As such, this task will contribute to the goal of the work package to identify socio-economic issues/bottlenecks that need to be addressed for successful implementation of organic aquaculture in order to support future growth in the sector. The SWOT analysis will

also contribute to WP6, which focuses on developing the recommendations for updating the EU regulatory framework on organic aquaculture. The work in this task is limited to organic aquaculture in Europe. As such conventional fish and wild fish captures are beyond the scope of this analysis as well as aquaculture in for example Asia.

### 5.3.1 External factors

In order to provide a better understanding of European organic aquaculture's external context a PEST analysis was executed. The main findings are presented below.

#### 5.3.1.1 Political: stimulate Europe's blue growth

Policies play an important role in agricultural and fisheries markets with policy reforms often changing the structure of markets. As from the start of 2014, the new Common Fisheries Policy has been in effect. At the end of January 2014, the EU institutions also reached a political agreement on the European Maritime Fisheries Fund (EMFF), the policy's financial instrument for 2014-2020. Among others, it will support Europe's blue growth policy. Aquaculture is in focus at the European Commission (EC), which recognizes that this sector faces many challenges. Therefore and according to the EC, "the priority must be to keep the sector economically viable, guarantee food safety and animal welfare, solve environmental problems and stimulate research." Therefore the EC is willing to support aquaculture and has come up with nine actions that include increasing production, improving the use of space, developing the market, marketing and information, improving training, strengthening governance, guaranteeing product safety, animal welfare, protecting the environment and strengthening research (EC, 2006).

In Irish Farmers Association's opinion "reprioritisation is needed to ease the bureaucratic bottlenecks stalling the Irish aquaculture industry" (thefishsite.com), while in Spain the sector finds the growth expectations are "blocked by regulatory excesses and difficulties generated by the public administrations". One representative of the Spanish sector told that the government lacks knowledge and is making mistakes which results in loss of investments for the sector, and as a result also loss of jobs (undercurrentnews, 2014). The EU is aware of bureaucracy being one of the major obstacles in the European aquaculture sector tampering the aquaculture sector and is planning to improve administrative conditions and reduce barriers. Parallel to this, EU thinks about spatial planning in coastal areas and river basins because this will help "guarantee aquaculture producers adequate access to the space and water they require, whilst minimising impact on the environment and related sectors, such as tourism." (DG Maritime Affairs and Fisheries, 2013).

With respect to organic products, consumers are not able to verify whether a product is organic, not even after consumption. Product labelling with organic certification logos is therefore supporting consumers that a product is a certified organic product, provided that the consumers trust the certifying body. Consumers are not able to verify this themselves, so it is a matter of certification and trust. In many European countries, several different organic labelling schemes exist in the market (Jansen and Hamm, 2012). In the specific case of organic aquaculture, this sector has long been regulated through a combination of national rules and various private schemes. With Regulation 710/2009 new rules for organic aquaculture production were arranged EU wide. However, not all relevant market participants are embracing this Regulation. For example, Naturland, one of the world's foremost organisations in the promotion of organic agriculture, commented on their website as follows: "Naturland welcomes these measures of the EU to encourage organic fish production. However, the new standard is only the lowest common denominator, important points were defined too weakly." Zubiurre (2013) refers to Bergleiter when describing the Regulation as more or less a set of requirements that can be audited for compliance with the standard and as such, not one with a broad consensus of a well-managed industry in order

to maintain the good reputation of the sector. The number of organic labels may produce consumer confusion, as was shown in chapter 5.2.2 in this report.

Finally, next to legislation there are other requirements which are not rooted in EU legislation but do shape organic aquaculture markets. These are driven by business' wishes or societal concerns. For example supermarkets emphasize quality products, and green issues could request for 'above-legal' elements, such as stricter requirements for traceability, environmental impact or animal welfare. These requirements are implemented through (product)standards. Some of these standards could be considered as 'soft law', like BRC or Naturland. Especially in the North and West of Europe, sustainability certification has become a market access requirement for large retail organisations (CBI, 2014).

Next to retailers, NGO's will continuously monitor the developments in organic aquaculture. There will be opposition from them towards the system and some aspects. After all, according to Greenpeace, sustainable aquaculture is still a challenge. In 2015, a Dutch NGO campaigned against slaughter conditions of farmed fish (wakkerdier.nl). In this respect, organic aquaculture could compensate for some of the negative sides of conventional aquaculture.

### *5.3.1.2 Economic: production costs will rise but economic recovery is taking place in Europe*

Economic factors have impact on how businesses operate and make decisions. Many economies are still suffering from the (after)effects of the global financial crisis, also at consumer level. The positive development is that a slow and fragile recovery is taking place in the EU and the euro area. GDP growth in the EU, which has turned positive 2013 is increasingly driven by domestic demand. GDP/capita is projected to increase by a factor of 1.7 between 2010 and 2050. The medium-term outlook for the Eurozone remains slightly more positive than in previous years. In line with these developments, unemployment should fall slightly from its peak, as the labour market turns the corner and financial market conditions are foreseen to improve as a result of the better macroeconomic outlook and a sustained low-interest rate environment (EC, 2014a).

In general, production costs are likely to increase. EC (2013) expect the average electricity price in the period 2010-2020 to increase by 31%. With respect to fish, according to OECD-FAO (2013) fish prices are projected to rise more strongly than primary agricultural products. This is a result of strong demand, rising production costs and slowing production growth with continuing price volatility associated with supply swings. Rising prices are also projected for fish-meal and fish oil in the period up to 2022. For captured seafood in 2020 an increase of 23% of the current average price is expected. For cultured seafood a price increase of even 50% is expected (OECD-FAO, 2012).

Despite the economic crisis that has affected Europe over the last four years, the total 2012 expenditure for fishery and aquaculture products in the EU reached its highest point since 2007. In the largest EU markets for organic products expenditure for fishery and aquaculture products grew. Especially in the United Kingdom growth has been strong (+ 11%), while France and Germany experienced lower levels of growth (+ approx. 2%) (FiBL and IFOAM, 2013).

Capture fisheries' output is projected to rise by only 5% by 2022 with aquaculture increasing by 35%. As such, aquaculture is in the process of overtaking capture fisheries as the main source of supply for direct human consumption (FAO, 2013). FAO states that aquaculture's share of human consumption of fish is projected to exceed that of capture fisheries in 2015 and to reach 53% of total human consumption by 2022. The World Bank

has a different outlook. Inclusive other purposes, like fish meal, they forecast aquaculture and capture fisheries will equally contribute to in global supply by 2030. Also in Europe, aquaculture's share is increasing substantially. However, this increase has not been facilitated by EU itself but predominantly by Asia. Aquaculture production in the EU27 is growing much more slowly than it is worldwide (Westhoek et al., 2011). As such, the EU relies heavily on imports for the seafood it is consuming. Actually, EU is by far the world's biggest importer of fish, seafood and aquaculture products. There is no major change foreseen: the European Union will remain not self-sufficient in fish products and will rely on imports. The self-sufficiency rate is on average around 45%, with the lowest for freshwater fish (17%). Only one commodity group scores a self-sufficiency rate over 100% (small pelagics, 113%). In contrast to one of the most consumed fish species – salmon – which scores around 33%. Moreover, only 10% of our consumption is farmed in the EU. At the same time, almost all of EU aquaculture production is consumed in Europe. Norway is the EU's principal supplier of aquaculture products. Next to this, EU is – and will be – one of the main markets with respect to fish that has been farmed according to certified sustainable standards (UNEP, 2013).

For the sake of comparison, growth in organic aquaculture is foreseen, both on the supply and demand side. The main results of the global survey on certified organic farming show that 35 million hectares of agricultural land are managed organically, there are 0.4 million hectares of certified organic aquaculture (Willer and Kilcher, 2010). The number of aquaculture locations will increase, globally and in Europe according to FAO. However, the availability of production area is expected to become a restriction for further production increase. The demand for aquatic food products is expected to increase. Total demand for organic food and beverages in Europe has grown an average of 10.5% per annum between 2004 and 2011 to EUR 21.5 billion (Triodos). Further growth is foreseen, albeit not exponential.

Sales of organic products is not limited to specialised shops anymore, it is now also more broadly available in regular supermarkets. As a consequence, organic aquaculture products are more easy to obtain for consumers, which meets the requirements of modern consumers. Buder (2014) show that consumers prefer to buy organic fish among others in regular food retail outlets. For instance, in Germany, 54% of organic sales were sold via regular food retailers. Currently, regular supermarkets emphasize quality products and green issues and many of them included sustainability in their strategy.

Next to this, food retailers have increased their market share continuously. In 2011 the top 10 European food retailers accounted for a 31% market share compared to 26% in 2000 (EC, 2014). For the individual countries the rate is sometimes even higher, especially in countries where consumers are already accustomed to buying organic products. For instance, in Germany the top three supermarkets account for 60% market share in organic sales, in France for 49% and in UK for 55% (Tackett, 2014). This implies that these parties can exert some power and “there has also been concern about the growing role and increasing concentration of retailers on the food supply chain as a whole; the range of concerns stretch beyond seller power to the implications for suppliers at the manufacturing and farming sectors.” (OECD, 2014). The benefit side of this concentration development may be that it could lead to increased focus on added value aspects such as organic (CBI, 2014), which is easily to fulfil for the European organic aquaculture sector.

### ***5.3.1.3 Social: fish consumption will continue to increase, just like the demand for organic products***

The EU accounts for a population of more than 510 million inhabitants and potential customers. They will consume increasingly more fish: seafood is considered to be among the fastest growing segments in the food market

(Wijnands et al., 2007). Fish consumption varies greatly throughout Europe, with the highest consumption in southern European countries such as Portugal and Spain, and the lowest consumption in eastern Europe. The OECD forecasts show that in the EU the per capita consumption of seafood will increase from 20.8 kg per capita in 2013 to 22.6 kg per capita in 2023. For meat products the per capita consumption in the same period will grow from 64.6 to 66 kg per capita (OECD-FAO, 2014). These data also reveal an average meat consumption in the EU nearly three times as high as the consumption of fish products, although there is an increasing trend of a “flexitarian diet” (= eating less meat). Consumer surveys revealed that in Germany, the percentages of meat avoiders and meat reducers are higher than in the Netherlands, while in Belgium they are lower. Another finding was that consumers perceive fish as the best alternative to meat (Dagevos et al., 2012).

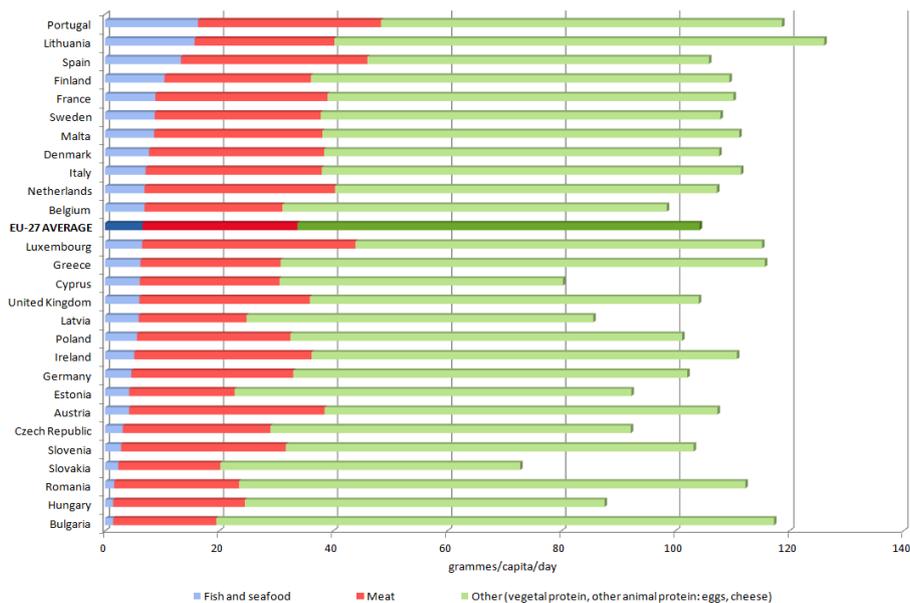


Figure 6 EU protein intake (source: EUMOFA, 2014)

The variety of fish products is smaller in western Europe than in southern Europe. Traditionally, southern European countries have a preference for fresh (whole) fish, while northern European countries prefer processed fish (i.e., canned or frozen). However, due to market trends, such as the introduction of sushi, fresh fish is becoming increasingly popular in northern Europe as well (CBI, 2014a).

In terms of competition/substitution, organic aquaculture products must compete with many substitutes: sustainable fish products, conventional fish products, sustainable animal protein product, conventional sustainable animal protein products and other food products. Therefore, this fierce competition, and factors like perceived costs, availability and uncertainty about how to prepare or cook fish are also elements which influence consumer behaviour and choice.

In general, fish has a low fat content and provides high quality protein, vitamins, and minerals (Smith & Sahyoun, 2005). Therefore, fish consumption has been recommended to prevent cardiovascular and other diseases (Simopoulos, 2008). This also has relevance in terms of another major development that can be identified as the increasing consciousness consumers have concerning health and wellbeing. From the perspective of public health, many Europeans consume too many calories and too much saturated fat, the latter primarily of animal origin. According to dietary recommendations, many people should consume more fish, fruit and vegetables. Obesity is one of the greatest public health challenges of the 21st century (OECD, 2012). In the European Union between

37% and 57 % for women and between 51 % and 69 % for men were dealing with overweight or are obese in 2008/2009 (Eurostat).

The rapid growth of fish production is meeting consumers' demand but also entails negative externalities. It burdens natural resources due to for example the use of chemicals and antibiotics or over-fertilisation of natural water. This strikes the attention of consumers who have concerns about sustainability. Sustainability, taking care of the environment, is an on-going development that has gained solid ground among European consumers. Many consumers expect that the products or services they buy to not cause unnecessary harm to the environment, and to be produced under acceptable social circumstances. As such, more sustainable consumption gains the attention of many Europeans, in their thinking and shopping behaviour. Organic food production has continued to grow in popularity, partly because it taps into consumer concerns such as animal welfare and healthy eating (Hughner et al., 2007). Organic aquaculture profits from the trend that demand for sustainable products has gained solid ground among consumers. Olesen et al. (2012) conclude that their research "add to the growing evidence that animal welfare and the environmental impact of production are important for consumers, and this should be taken into account in the management and breeding of organic and conventionally farmed fish."

#### *5.3.1.4 Technological: the best has yet to come*

Aquaculture is not without its drawbacks. One of the main significant issues is the use of wild fish as fish feed in the farming of carnivorous fish. Currently, more fish is needed than aquaculture yields because of the inefficient feed conversion. According to some authors, aquaculture may in the long-term reduce rather than increase fish production, if the pressure on wild fish stocks used for feed is not curtailed (Naylor et al., 2000). But European aquaculture is at the forefront of technical expertise and one of the progressions they make concerns this feed efficiency; the amount of wild fish consumed per kilo of farmed fish produced is continuously decreasing (EU, 2013). Furthermore, processing is no longer reserved for companies ashore, since a salmon processing boat is developed. Harvesting operations now commence when live fish are pumped from production cages. While these developments are not mainstream yet, it is expected to be a matter of time before slaughtering and processing will move offshore (on board the boat). Efforts are also made concerning more fuel efficient fishing techniques and fishing behaviour.

With increasing demand for food, there is a pressure to intensify farming operations. This is not consistent with organic farming principles and methods. With respect to organic aquaculture, Freucht and Zander (2015) identified that consumers interpret the sector "as a more traditional one, which is less industrialized. This limited knowledge resulted in a romanticized and misleading image of aquaculture and led many of them to the conclusion that an organic aquaculture might use earth ponds or flow through systems but not closed recirculation systems since they were perceived as too technical and artificial. Some participants expected organic fish farms to be small to medium sized. Big dimensions were mostly associated with industrial livestock farming and perceived to contradict the idea of organic production."

However, the sector's focus is not solely on innovations concerning a more efficient aquaculture sector, but also on the consumer market side. One example of an innovative consumer product is a weed burger, a 100% plant-based hamburger, with seaweed as the tastemaker which can be bought in the Netherlands. The burger is marketed as "Tasty, healthy and sustainable." It is worth mentioning the Mintel Global New Products Database in this context. A database which contains new product launches in European countries. As can be seen from figure 7 below, the number of new fish products on the European market has increased sharply over the last two decades. (Innova Database, 2014). In the launched new products there is an increasing focus on local flavours,

convenience and health benefits (Innova Database, 2014). The rise of new products appealing to these benefits meets consumers' demand for fish and seafood as part of a modern and healthy lifestyle.

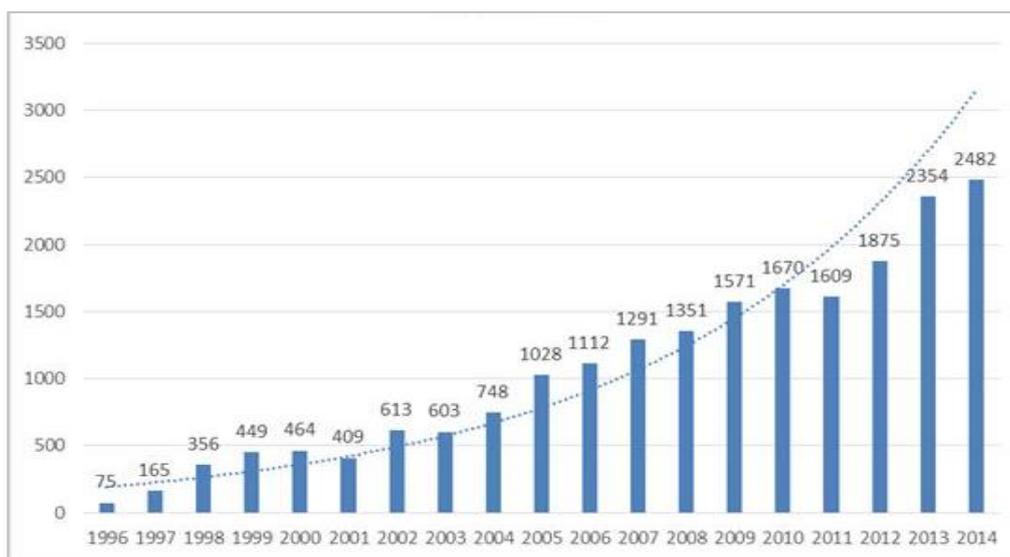


Figure 7 Number of new fish products entered on the European market the last two decades (Source: Mintel GNPD-database, 2014).

### 5.3.2 Internal factors

This section will present the main findings with respect to strengths and weaknesses of the European organic aquaculture sector that may influence consumer behaviour. First we will discuss the benefit side of organic aquaculture and clarify where the sector is performing well. Subsequently its vulnerabilities will be discussed. In the next section these points will be further analysed.

#### 5.3.2.1 Strengths of the European organic aquaculture sector

##### Organic aquaculture is a perfect, resilient match

Aquaculture is one of the booming sectors for its contribution to the future supply of seafood in a sustainable way. The three elements that provide for a positive perspective for organic aquaculture are: (1) filling the gap between consumption and production. For instance, UK domestic fish landings cannot meet government's recommended consumption levels (Thurstana and Roberts, 2014). Compared to the conventional market, organic is (2) a relatively small market. But their *raison d'être* is beyond doubt and the sector has further potential for growth. In 2012 organic aquaculture grew again with (3) six percent compared to 2011 (Fibl, 2014).

##### Organic aquaculture supports the local environment

The organic aquaculture sector contributes to local economies. First of all by farming the fish, and in addition the fact that the fish need to be processed, which generates added value and creates jobs.

Organic aquaculture is for example also easy to combine with recreational purposes. In the end, production of fish is becoming more regionally bounded, which is in contrast with the dominant trend of large, global supply chains. In terms of Wiskerke (Roep and Wiskerke, 2004), organic aquaculture is contributing to local economies and is aiming at developing new products and services, such as local, high quality food as well as rural tourism and green care. Organic aquaculture is countervailing the processes at the basis of the dominant trend of large, global supply chains:

1. Disconnection: The disappearance of a relation between producer and user due to scale enlargements;
2. Detachment: the disappearance of regional specific characteristics of products because of decreasing importance of the place of production;
3. Untwining: production and service chains are untwined because of increasing specialisation and scale-enlargement in these chains.

As such, organic aquaculture has the potential to re-connect, re-attach and twine in the local environment and support the economy.

#### Europe has experience with producing organic fish

The number of worldwide certified organic aquaculture businesses is limited to over two hundreds. Circa half of them are situated in Europe. In 2008 the European farms accounted for almost half world production (EC, 2010). Salmon is the most consumed and farmed specie in the EU, where salmon represents more than 80% of the whole European organic production. Other organic certified species are also farmed but yet in lower quantities, like rainbow trout, sea bass and sea bream. The largest producing countries are United Kingdom, Ireland, Hungary, Greece and France (EC, 2010). But in absolute numbers, it is not enormous. In Italy less than ten companies are active, and in Greece there are three companies currently producing organic certified sea bass and sea bream. Norway - the leading world supplier of salmon – has invested in plants in UK and Ireland where they focus on the production of organic salmon (Castellini et al., 2012; Polymeros et al., 2014).

#### European fish farmers are well equipped for meeting organic regulations

European small companies are used to register and comply with (food safety) laws and traceability systems. Bush et al (2013) believe such entrepreneurs are better positioned to meet stringent organic certification requirements.

#### Perspectives for investments are increasing

Aquaculture is becoming a better recognised commercial sector, with increasing possibilities for investment finance. These investments are necessary, as production is lagging behind and organic aquaculture is a high capital intensive sector. In general, EU aquaculture's output has been more or less constant in volume since the year 2000. This in contrast to global production, which shows growth. This holds for European organic aquaculture, which shows growth over the last ten years, but at the same time represents a small percentage of the total European production (Zubiaurre, 2013).

#### High organic standards

Since enactment of regulation EU /2009 there is harmonization at EU level. Even though some had preferred a higher minimum bar, the current legislation creates a level playing field. Organic aquaculture is meeting high standards with respect to environmentally sustainable production techniques. It for example also specifies that biodiversity should be respected, and does not allow the use of induced spawning by artificial hormones. One aspect is gaining a lot of attention in farming fish: the feed intake. In this view: one of the principles of organic aquaculture is that fishmeal and –oil in feed should be derived from by-products of fish processed for human consumption. So although organic aquaculture requests a significant amount of wild-caught fish processed into feed, no dedicated feed fishery is needed. At least according to for instance Naturland and organicauthority.com.

#### Organic fish farmers can prove their way of producing

Certified organic producers can assure consumers of the integrity of their product by showing the logo. The European logo gives visual identity and helps consumers to recognise organic fish and fish products in a quick and

simple way. This could be useful while generally a decline in consumer trust is associated with the conventional food sector in advanced economies (Renting et al., 2003). Fraud is happening in the food sector, with the EU horse meat scandal in 2013 as a recent example. In the end, this did not result in a food safety or public health issue, but appeared to be an issue of fraudulent labelling. To counteract the potential risk for conventional products being wrongly labelled as organic, a method to verify the identity has been developed for agricultural products, but also for organic salmonid products. So the authenticity can be demonstrated (Molkentin et al., 2015). However, as the survey results in chapter 5.2.3 show, consumers in most European countries do not recognise the EU-leaf, (EU label for organic food), which may represent a problem in terms of trust and confidence.

#### *The organic aquaculture system is flexible and adaptive*

Aspects of organic fish farming make it quite possible to fit into a circular economy. An economy in which the way of producing is characterized by taking a smarter look at cooperation between sectors (Brouwer et al, 2014). This is the case when merging fish farming with other ways of food production like aquaponics does. Aquaponics is a food production system that combines aquaculture with hydroponics (cultivating plants in water) in a symbiotic environment. This fits perfectly in the transition from the current, linear system towards a circular economy (Van der Heijden et al., 2014).

The small scale orientation of the organic sector also allows for other supply chains than mainstream. As such, the organic sector is not depending on supermarkets only. It is well suited to other systems like boxed delivery of produce, farmers' markets, packing plants. Even the home delivery channels could include organic aquaculture products, since developments in this segment have gone quick. Home delivery of frozen and chilled food used to be not that easy but is now possible with the availability of suitable packaging and lockers. A test by the German company Krautz showed positive results: with their isolated box the temperature stayed well within the required limits and no condense was noticeable on the inside or outside of the box or insulation material.

#### *Organic aquaculture products respond to growing consumer demand*

There is an emerging pattern of consciousness among consumers with respect to their food intake and the way it is produced. The growing expectations from consumers for quality and diversity of food products relates positively to organic aquaculture products. namely, the following in any order:

- An important element is the increasing focus on *locally grown* food, which matches the “proximity” of organic aquaculture. In essence, organic aquaculture can be produced in Europe which implies relatively small distances of transport, especially compared to imported products.
- Food *traceability* is another aspect which is getting increasingly more consumers' attention. Organic aquaculture food products are relatively easy to trace due to their short supply chain. Organic aquaculture producers easily allow *producer to consumer contact*. This pleases consumers, who increasingly prefer a *transparent* food system;
- Moreover, consumers are putting a higher value on *health*. Fish is considered as healthy. EUFIC promotes fish as follows “ Although no single food alone can make a person healthy, eating more fish is one way that most of us can help improve our diets—and our health. Many of the studies about beneficial omega-3 fatty acids focus on fish as the primary source. Salmon, sardines, tuna and even shellfish are rich in omega-3 fatty acid content, but increasing your consumption of all types of fish and seafood is recommended.”;

### ***5.3.2.2 Weaknesses of the European organic aquaculture sector***

#### ***Organic aquaculture has several competitors***

The sector itself has a comparatively low profile in the competition for resources. Especially in drought-ridden countries aquaculture has to deal with competing claims. Will the freshwater be used for domestic, agricultural or aquacultural use? Technological solutions could contribute to this, like recirculation aquaculture systems (RAS). RAS is a technology which allows (indoor) farming fish by minimizing the use of natural resources, such as water and energy. Due to this technology, aquacultural husbandry conditions for fish can be optimized, with respect to growth and sustainability. Currently, the RAS is not allowed in organic aquaculture according to article 2j in reg. 889/2008, as shown in OrAqua deliverable D2. The exception is hatcheries and nurseries.

#### ***Organic fish farming adds costs***

Organic aquaculture deals with high input and labour costs resulting in generally<sup>3</sup> high(er) production costs, as shown in deliverable D3.2. The major cost item is feed, which often represents 40-60% of total operation costs. In relation to the traditional feed, the organic certified feed currently present a price-differential of about +30% (Sardinha et al., 2014). Organic salmon production is an example of one demanding expensive feed. Wild fish is used as an ingredient, and especially in organic production the relative share of input is high (vs conventional) – and not easily available. The sometimes small size of the businesses does not contribute always to a profitable existence. Costs are also added further on the supply chain, for instance during processing or selling the fish meat. Due to various factors it is sometimes not possible to sell the organic fish or parts as organic. Subsequently the fish or parts will be sold as conventional fish (at a much lower price). Moreover, organic aquaculture products are processed in smaller volumes, which causes cost per unit to rise. At consumer level, the price gap between conventional and organic fish is usually relatively large, possibly reducing the demand.

#### ***Organic fish farming is not easy***

Organic aquaculture is facing issues, which have not been solved yet. For instance in farming and processing the animals, issues like (need to import) organically certified feeds, use of medicines to control diseases and parasites, effects of escapees, increasing use of land-based vegetables in salmon feeds to stimulate feed intake. One of the major obstacles is the requirement to use 100% organic juveniles by 1<sup>st</sup> January 2016. This could cause some problems to obtain organic juveniles for the production of particular species: livestock producers do not have a sufficient organic inputs (juveniles, feed) for organic production. Also, as shown in OrAqua deliverable D2, there are extensive restrictions on the movement of live animals between countries, which makes the situation even more difficult (*Directive 2006/88/EC on animal health requirements for aquaculture animals and products thereof, and on the prevention and control of certain diseases in aquatic animals*).

#### ***Organic aquaculture is still a relatively small scale business***

Not even one percent of global farmed production is coming from organic aquaculture farms, likewise in Europe. The European organic aquaculture sector is not able to serve the demand for organic fish products. With the exception of salmon industry, organic aquaculture production is fragmented. The vast majority (90%) of enterprises are micro-enterprises (with under 10 employees), although the number of bigger companies (> 10 employees) has increased to 13% in 2011 (STECF, 2013).

#### ***Organic aquaculture sector is not using its full potential***

Within aquaculture, the organic sector is a rather small sector. It deals often with SME's, which are based throughout Europe. This is not always enabling the easy combining of forces, although the entry of internet and

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<sup>3</sup> Of course, there are variations by subsector.

e-mail has opened new opportunities to connect SMEs with each other. Joining forces is also useful for SMEs regarding taking a stand to other stakeholders and becoming more visible. For instance, developing a knowledge base for organic producing and processing could be considered. This is currently lacking; even the Federation of European Aquaculture Producers (2012) has difficulties to collect exact figures about production volumes. The following example also illustrates this: the rather comprehensive EU-report “The EU fish market” aims at providing an economic description of the whole European fisheries and aquaculture industry, but does not even once mention the word “organic”. Joining forces enables making more use of its full potential and offer some countervailing and initiating power.

#### Limited product variety (until now)

Next to a shortage in supply, the organic aquaculture sector is often not able to meet the quality, quantity and price expectations of markets, including institutional customers (such as hospitals). These markets are demanding very stable supply, both in terms of quality and quantity, matching their needs (e.g. distribution logistics).

Moreover, there are just not enough organic fish products in variety. Consumers like to have a certain range of products, and therefore prefer large assortments. However, until now organic fish products come in a limited range of species and product variety's.

#### Even organic rules could be target of criticism

Organic way of producing meets high standards, though even those standards are not satisfying all needs. Some examples;

- Organic regulation does not consider environmental costs of distribution and transportation (Bush et al., 2013).
- No aquaculture operation has been certified under an explicit fair-trade scheme, although this is in preparation (Bergleiter, 2015).
- Currently, with regard to fish, there is consensus that they are sentient beings and do feel pain.

As such, there will be continuous opposition from animal welfare organizations to the limited attention for fish welfare aspects in laid down in regulations and certifications schemes. For example, a number of slaughter methods are used in aquaculture; in the Netherlands, a public campaign was launched against the unstunned slaughtering of fish.

#### Demand for organic products is poorly developed

Even though the expenditures for fishery and aquaculture products grew in the largest EU markets for organic products, it is not yet common to buy organic. So, limited consumer demand for organic fish is still challenging the organic aquaculture sector in Europe. For instance, in the UK a study commissioned by Sainsbury's (2012) also revealed that some 18% of fish-eating adults said they were eating less fish because of sustainability issues. Of this group of people, 40% explained that it was because of confusion about which fish is sustainable, while 37% mentioned the variability in the meaning of sustainability between supermarket retailers. The third most common reason (35%) was the high cost of sustainable fish (Sainsbury's, 2012). The low demand for organic seafood may also be a question of limited availability for the consumers.

#### Confusion impacts demand for organic

Next to EU legislation, there are many (privately held) labels active throughout Europe. To illustrate this with one example: Feucht and Zander found 18 different sustainability labels and eight of them were organic ones. Many

products carried the EU organic logo (40%), followed by ‘Naturland’ (20%) and the German ‘Bio-Siegel’ (12%). According to DG Maritime Affairs and Fisheries (2011) “ ... only a handful, like Naturland, are present in more than one Member State.” This is in addition to other labels in Europe among others the Aquaculture Stewardship Council (ASC). ASC mentions on its website that it is aiming “to be the world's leading certification and labelling programme for responsibly farmed seafood.” According to Naturland: “If one compares the results of the ASC approach, which is based on collating the input of many different interest groups, with the certification standards of organic aquaculture, then the latter are clearly more resilient and stringent, resulting in a genuine "system of organic production". In contrast, the ASC standards are a conglomeration of supposedly "better practice" recommendations dealing with a variety of incoherent and sometimes even contradictory variables.” This implies a risk of consumer confusion, simply because they are faced with a proliferation of labels. The same research discovered that the ASC label was sometimes mistaken for the MSC label. Another trigger for confusion is the origin of the fish. In general consumers are quite unfamiliar with the origin of the fish they consume, despite the mandatory indication of origin on fish labels (Altintzoglou et al, 2011).

### 5.3.3. The SWOT-analysis

With a continuing evolution of consumer behaviour, turning in favour of both organic and aquaculture, it seems that there are many opportunities for the European organic aquaculture sector. The sector’s strengths will help to maximize these opportunities. However, there are also some threats and weaknesses. In table 8, the most important elements for the EU organic aquaculture sector are listed and subsequently aspects are linked and discussed.

Table 8 Opportunities and threats for organic aquaculture in Europe

<p><u>Main opportunities</u></p> <ul style="list-style-type: none"> <li>• European per capita fish consumption is increasing</li> <li>• Increasing attention for and spending on organic products</li> <li>• Crisis' end is near, economic recovery is taking place in Europe</li> </ul>	<p><u>Main threats</u></p> <ul style="list-style-type: none"> <li>• Organic aquatic products are competing with a lot of substitutes               <ul style="list-style-type: none"> <li>○ (sustainable) fish and (sustainable or organic) other protein sources</li> </ul> </li> <li>• Production costs will increase</li> <li>• Retailers continue to concentrate</li> </ul>
<p><u>Main strengths</u></p> <ul style="list-style-type: none"> <li>• Organic aquaculture is filling the gap in a certified and most sustainable way</li> <li>• Organic aquaculture has a local orientation</li> <li>• Organic aquaculture is meeting consumer's expectations for sustainable, transparent food production</li> </ul>	<p><u>Main weaknesses</u></p> <ul style="list-style-type: none"> <li>• Lacking chain cooperation and dissemination of knowledge</li> <li>• Farming organic aquatic fishes culture is not easy, and costly</li> <li>• Sector's output is often not able to meet the quality, quantity expectations of a professional market - at a steady stream</li> </ul>

*Times are changing, and they are just turning in the right way for the European organic aquaculture sector.*

Due to population growth and economic development fish consumption per capita is expected to grow, also in Europe. Between 2000-2012 wild capture fisheries landings decreased (-2.4%, FAO, 2014a). As such, aquaculture is needed to fulfil worldwide and European demand for fish. However, aquaculture may affect significantly the environment if not properly managed and monitored. Therefore, the organic version of aquaculture is an alternative option while it does not only contribute to the supply of fish, but is doing so in the most sustainable

way. Consequently, organic aquatic products could benefit from the increasing attention for and spending on organic products in Europe.

Especially, these products respond to a lot of societal concerns and consumer needs. The philosophy and practises of organic production address consumers, who continue to ask where their food comes from and how it is produced. Moreover, prospects for consuming both fish and organic products are positive. In large parts of Europe consumers are used to eating meat, albeit times are changing. European per capita consumption of fish is increasing and an increasing attention for organic products is perceptible. In addition, as the economic outlook is improving in Europe, both consumers and business will be able to increase expenditure on innovation (businesses) and products (consumers). The unique attributes of organic aquaculture fish products can be used to attract investors and consumers. Products from organic aquaculture sector meet growing expectations with respect to a number of buying motives, including the new must-haves such as: healthy, environmental-friendly and transparency. This creates a window of opportunity for other marketing channels or investors (even by means of crowdfunding). In 2015 a US organic shrimp farm raised \$5m through crowdfunding ([undercurrentnews.com](http://undercurrentnews.com)).

The local orientation of the organic sector can be used as well. Organic aquaculture often supports the local economy. It leads to less reliance on imports and more jobs and growth in local economies. Organic aquaculture also combines with other purposes, for example recreational or educative ones. This is especially interesting, while some consumers nowadays do not just buy a product, they prefer an experience (Gilmore and Pine, 2009). But most of all, organic aquaculture has the potential to re-connect, re-attach and twine. It recovers the relation between producer and consumer due to supply chain based on knowing each other rather than anonymity. Next to this, it integrates regional specific characteristics of products because of the importance of the place of production. Only local species are farmed, not exotic ones. Finally, organic aquaculture is embedded in its environment and provides opportunities for multiple purpose, for instance for educational or recreational purposes.

However, there are some threats too

First of all, organic aquaculture is facing competition, both in terms of resources as well as substitute products, while demand is not always stable and strong. After all, organic aquatic products can rather easily be replaced by other (conventional or sustainable) fish and (conventional, sustainable or organic) other protein sources. However, if someone is specifically looking for an almost identical fish product with comparable quality (organic) this will be much harder. So the position of the organic aquatic products is depending on its buyers and their demands based on their level of knowledge about fish. The position of organic aquaculture can be considered weak for an indifferent consumer, and very strong for a conscious one. What matters is the right strategy to attract and target consumers and consumer segments. The sector should use the uniqueness of organic aquatic products to defend against the treat of substitutes, such as the high environmental standards, the local focus and a certified, transparent production. The organic label may be another winning card which will visually support the product in competition, provided that the consumers will develop familiarity and trust towards the label. The sector itself has a comparatively low profile in the competition for resources. Especially in drought-ridden countries aquaculture has to deal with competing claims, as does organic aquaculture. However, organic aquaculture could have a competitive edge here: it is producing in the most environmentally friendly way and is aiming at careful selection of sites for aquaculture farms and protection of ecosystems and not affecting its environment.

It is a challenge for smaller operators and independent farmers and processors to introduce new products at the retail food level. But coming within reach of a large potential group of customers could be beneficial. Apart from

the buyer requirements, the organic aquaculture sector will face supermarket's bargaining power. The forecast of an even smaller number of supermarket chains operating at European level does not enhance the bargaining power of individual aquatic farms. Countervailing power is needed to respond properly, so forces should be joined in a currently still fragmented sector. One big plus is the organic system, which provides for trust and visibility. A certified and controlled system, which is easy to recognize for consumers, will benefit supermarkets. After all, supermarkets are the gatekeepers of products reaching the market, but are also in heavy rivalry with each other and are looking for added value and ways to distinct themselves from another. Organic aquaculture is then a suitable option.

Cooperation could be a way to strengthen the sector as a whole and will help to create a stronger position towards other stakeholders too. For example, to better match producer needs and research programs, to tackle the feed efficiency challenge, to become better recognized in the mass of products and labels, to find efficient fishing techniques and finding ways to decrease the impact of diseases. A promotion campaign aimed at boosting organic fish consumption could also be a joint initiative. As the WP3 consumer survey concluded, there is a need for building a systematic long-term communication strategy, which could increase the consumers' knowledge level to a point of having the ability to evaluate and conclude about the risks and benefits of production systems related to organic aquaculture. Coordinated action at local level between all types of stakeholders can help stimulate the development of locally, organic produced seafood. In the end, opportunities could be better seized and the sector will be better capable of defending against the threats when forces will be joined.

Finally, the rise of production costs is looming. Translating the increased costs into an increase in consumer prices will probably not be a good solution. Too high prices in the market will risk the effect of substitution with other products. This implies that efficient production will be essential to remain competitive. Besides the production process, efficiency is also important in other aspects of the supply chain (e.g., logistics). This would simultaneously be beneficial in terms of the fact that in general, producing organic is adding costs.

## 6 Conclusion

This deliverable is based on a literature review on consumer perceptions of organic food, aquaculture, organic aquaculture and other relevant issues related to that. In addition a survey in four countries was conducted to cover the knowledge gaps discovered during the review process. Finally, a SWOT analysis was conducted based on literature review and interviews of key people in organic aquaculture.

Consumers seem to be unsure about the concept of organic fish farming due its overlap with several available concepts such as sustainable, biological, ecological, fair trade and environmental friendly. Furthermore, consumers show ambivalent impressions about what production type is organic: wild captured fish or farmed fish. These perceptions are likely to be a result of lack of knowledge of fish production systems in general. However, according to several studies, the consumers express willingness to pay a premium for organic aquaculture products provided that the quality of the product is at least as good as that of a comparable conventional product.

Although consumers did not related feed issues to the concept of organic seafood, their interest in the impact of feed on fish quality indicates that references to feed practices within organic fish farming should be followed by tangible impacts these practices may have on the quality of the final product. Such strategic communication could be designed and tested for its effectiveness towards building realistic consumer expectations regarding their demands for feeding practices and perceived organoleptic quality of the final products.

Literature on fish consumer perception of fish welfare concludes that it is not a main concern for most consumers. However, there is a group of consumers who pay attention to the issue, so fish welfare parameters need to be taken into account when testing the effectiveness communication and marketing strategies. Communication and marketing strategies should take into account that animal welfare in general (beyond seafood) is associated with several parts of a production system. The importance of these factors differs when compared between the perspectives of producers and consumers, with producers focusing on biological animal welfare (feed, animal health) and consumers focusing on more parameters, including affective ones (e.g. good behaviour towards the animals). Therefore, the development of communication and marketing strategies should be tested in terms of its effectiveness towards targeted receivers, which implies all stakeholders, including consumers.

The complexity of the issue of naturalness, cleanliness and water quality indicates that future communication on organic seafood should be carefully designed and pretested. A first exposure of consumers to information on these issues could lead to unpredictable first impressions. However, a systematic long term communication strategy could increase the consumers' knowledge level to a point of having the ability to evaluate and conclude about the risks and benefits of production systems related to organic aquaculture.

Consumer concern about environmental issues is together with health concern the main motivations to consume organic food. Studies show that when consumers realise that aquaculture protects some wild stocks, they perceive aquaculture as something good for the environment from a sustainability aspect. Consumers who are aware of the potential impact aquaculture may have to its surrounding environment, have a less positive image of aquaculture. These two conflicting opinions and the balance between them that can be found among several production systems, indicate the importance of communication of the benefits of organic aquaculture regarding environmental impact. The level of knowledge consumers have about aquaculture practices and their impact on the environment can lead to either an implicit or more informed development of the image they have about aquaculture. When knowledge is low, as is the case in our survey, a general negativity about the impact of aquaculture practices on the environment may lead consumers away from products resulting from it. An informed consumer opinion about how each aquaculture practice influences the environment could lead to a more positive image of organic aquaculture. Therefore, there is need for tangible information that can lead to a more trustful acceptance of how a well regulated organic aquaculture can be protective of wild stocks. This communication strategy would have to be carefully planned and tailor made for targeted consumer groups in order to reach positive results even for those consumers with little prior knowledge on this topic.

Communication strategies related to certification schemes should be targeted towards specific groups of the population and should be pre-tested in order to result in balanced information material that can build-up consumers' education and trust. The latter would increase the probability that this information is used by the largest possible part of the population. Such a strategy should also diversify for countries and consumer groups, in order to guarantee its efficiency for all target audiences. A campaign, targeted to specific consumer groups and markets, could lead to an increase of use of information, by the most effective information sources. For example, the use of social media, throughout Europe, is high. However, social media is not a commonly used source of information about organic fish products. A communication strategy with focus on that alone, could lead to an increase of visibility of the organic fish sector.

Furthermore, there is a need for effective communication of the EU organic leaf logo in order to reach consumers as effectively as national certification schemes do. However, this may be a complex issue due to several differences between national or private certification schemes and the EU organic leaf. One crucial difference is

that EU organic certification has the lowest standards, in order to ensure that all nationally certified products can be included. This in itself introduced a system with requirements that are further from the organic principles than other certification schemes. Furthermore, national certification schemes carry an origin of the certification body in their labelling. This origin is embodied in the logo indirectly, leading to consumer impressions about the credibility and level of requirements for the companies enrolled. The EU organic leaf logo carries the European control concept, which is not as powerful as a more specified one. However, with an appropriate communication strategy, the EU organic logo could gain popularity and use by the consumers, due to its powerful political image; i.e. being of EU origin and unifying scattered certification schemes. However, this strategy would have to be designed and pretested in terms of relevance and effectiveness for diverse consumer types and cultures within Europe.

A general conclusion of the consumer survey was that the consumer perception of what constitutes organic seafood is not in line with the priorities in the EC regulations. This is something that should be taken into account when communication with the consumers and the society. The importance of the features that define an organic product also varies between the countries.

Given that the consumers are confused about organic aquaculture, what are the weaknesses and strengths of the organic aquaculture in Europe? A SWOT analysis showed that organic aquaculture contributes to a number of issues. First, organic aquaculture's contribution is based on its care for the environment. However, supporting local economies, building consumer trust and contributing to consumer choice are also important contributing points

It is obvious that fish landings will not be able to meet the demand for seafood globally. The global per capita consumption of fish is forecasted to increase. As such, aquaculture is needed to fulfil worldwide and European demand for fish. However, aquaculture may affect the environment significantly. Therefore, the organic version of aquaculture is the better option because it not only contributes to the supply of fish, but also is doing so in the more sustainable way and taking care for the environment.

However, some strong points with organic aquaculture may become even stronger. Especially with respect to the challenges: effectively attracting consumers and strengthening the sector. High environmental standards, the regional focus and a certified, transparent production are among the EU organic aquaculture's main competitive factors and should be more effectively exploited to compete in the markets. At the same time, working more closely together will increase strength and innovativeness of the sector and open windows of opportunities.

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