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**OVERVIEW OF THE CONTRIBUTIONS RECEIVED
IN ANSWER TO THE CONSULTATION ON THE
OPPORTUNITIES FOR THE DEVELOPMENT OF
COMMUNITY AQUACULTURE**

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The consultation on the opportunities for the development of community aquaculture was carried out in two ways – through an Internet consultation (10 May—16 July 2007) and specific consultation meetings with stakeholders (fish producers, shellfish producers, feed industry, NGOs and social partners).

In total, 46 written contributions were submitted to the consultation. They may be grouped into different categories of stakeholders:

- Aquaculture producer organisations or business (14)
- Feed industry (4)
- NGOs (4)
- Scientists or scientific bodies (9)
- Social partners (1)
- Public bodies or similar (11); at national level (3) or regional/local level (8)
- Regional interest groups (2)
- Others (1)

This overview of the main points raised in the consultation process is primarily based on the [written submissions received](#) with additional references – where necessary – to oral indications provided in meetings. This document is provided as background information only. It is not a formal report by the Commission, nor should it be interpreted as such.

As most of the contributions received were presented according to the main chapters and associated questions developed in the [consultation document](#) prepared by DG FISH Services, this overview is presented and structured in the same way.

1. AQUACULTURE: A CHANCE FOR EUROPE

1. Do you consider it justified for the Community to develop a specific strategy for aquaculture and why?

2. Do you share the vision for a sustainable development of European aquaculture as set out in the 2002 Strategy? Would you consider that it needs to be adapted to evolving circumstances?

There is a unanimous view and often strong support in all contributions in favour of a Community wide Strategy on Aquaculture. Most of the reasons that are outlined in the consultation document are referred to by contributors when highlighting their justification and views on what they consider should be the scope, the vision and the objectives of such a strategy, although views diverge on one or the other specific domain that should be addressed¹.

¹ As, an example, the Finnish Fish Farmers Association is strongly advocating for a "common and binding European approach to the development of industry", but considers that "fish welfare is not a challenge that should be addressed at Community level", while "Eurogroup for Animals" believes that it is of utmost importance that the Community develops a specific strategy for aquaculture, including

Differences in both the functions of, and the approaches to, fisheries and aquaculture are seen to entirely justify a specific strategy for aquaculture and its different components. Some producers organisations have even expressed the views for "*the need for a Common Aquaculture Policy*" (Finnish fish farmers association) or have invited the Commission to take a less "hesitant" approach, with reference to a "*European Fisheries and Aquaculture Funds*" (French Aquaculture Federation).

Generally, the vision and objectives of the 2002 strategy are fully supported and are considered being still valid, but several arguments are put forward to justify the need for a revision (young and fast moving industry, evolving circumstances, effect of passage of time, etc). However the most frequent reasons put forward refer to the fact that the objectives of the strategy have not been reached in terms of production growth. Some even argue that a strategy is needed not only for developing aquaculture, but also for sustaining "*some aquaculture sectors that are at risk of losing ground and may otherwise be abandoned*" (Committee of professional Agricultural Organisations in the EU : COPA-COGECA).

Contributors with an interest in environmental or animal welfare issues insist on the need to include these dimensions as part of the sustainability of aquaculture. The social dimension of sustainability in aquaculture is also seen as being insufficiently addressed (e.g. European Transport Workers' Federation). However, the most numerous contributors (from business and others) consider that more emphasis should be given to striving for strong growth of this activity, and focusing on the role of aquaculture in providing Europeans with healthy and nutritious food.

According to a number of views, the Strategy should be adapted to new and developing circumstances, with a sharper focus on encouraging successful sectoral development of the business through positive proactive actions, level playing field and a better balance between business development and environment conservation. Several contributions refer to the importance that should be given to aquaculture and to giving it similar support to other sectors (notably to allow an aquaculture strategy to contribute significantly to European Food Policy or to form a significant part of the process to develop a European marine/maritime strategy). However, most contributors do not give any indication of possible targets for the development of aquaculture, and quantitative objectives can be found in two contributions only (one advocating for an EU objective of doubling production over five years, while another one even mentions that the objective for Europe should be self-sufficiency).

2. ECONOMIC OUTLOOK FOR EU AQUACULTURE

3. What effect is globalisation having on the EU aquaculture sector and what are the main factors affecting its competitiveness?

4. How do you see the future of the market for Community aquaculture (niche markets, mass production ...)?

the welfare of fish. As another example, the House of Dutch Provinces "*agrees that the sustainable development of European aquaculture is imperative, with the exception of the specific link with employment*", while the European Transport Workers Federation considers that aquaculture is a strategic sector in terms of job creations.

5. How can the image problem of aquaculture be addressed to increase consumer acceptance of farmed products?

All those that have expressed their views on the above issues recognise that lower **labour** and ancillary **costs** and lower **environmental protection requirements** in a number of non-EU countries allow them to produce large amounts of aquaculture products that are increasingly present on the EU market. Low labour cost also contribute to increasing outsourcing of seafood processing, while processed products represent the highest growth area and consumer preferences. Difficulties in succession - handover of enterprises have also been referred to (Brittany Region).

Several contributors argue either on the need for some forms of "Community preference", or on the fact that trade policy does not allow a level playing field. They contest the fact that fish produced under different and less stringent conditions can easily enter the European Market. As an example, some "traditional" European products (trout and salmon) are now produced in industrial quantities at highly competitive prices outside the Community (e.g. Chile), while some "health measures" (e.g. rules on the use of animal by-products in fish feed) are not applicable in those countries. Another example refers to the trade disputes and the time involved in taking anti-dumping measures while damage is done in the meantime. Some contributors envisage the potential for a permanent and real time monitoring of markets, or the creation of an observatory of European Aquaculture.

Despite the above challenge in a global market, some contributions also highlight the **strengths of Europe** in the aquaculture sector (such as technological advance, know-how, quality products, research...) or weaknesses of non EU production (unacceptable standards for EU consumers, consequences of food-miles).

There is a wide consensus which considers that the European Market allows for the **growth of both mass production and niche products**, and that they are not mutually exclusive in a composite European market. However, there appears to be some different views on the relative importance to be given to mass products vs. niche products, depending on the background or the main field of interest of the stakeholder.

There seems on the contrary to be more diverse, not to say opposed, views among contributors regarding the existence of an **image problem** for aquaculture, as well as the "public" concerned and the nature and the intensity of such a problem. While generally most contributions received from public bodies, the scientific Community or NGOs highlight the importance of transparency and better communication on aquaculture, some producers do not consider that there is a problem in consumer acceptance of farmed fish (Finnish and several Scottish associations, mollusc producers...), argued in particular on the basis of continuous consumer demand and growing market. However, they express concerns about the image problem they face primarily with policy makers and public authorities - notably the Commission - because of some intensive lobbies or bad and misleading press.

Despite the controversy on the nature and depth of an image problem, there is rather a strong common denominator among the contributors for better public education and for promotion campaigns at different levels and with different aims (tackling industry credibility and production method, promotion and marketing of products, highlighting the health benefit of fish...). The CONSENSUS project has been quoted several times as a good example of a pro-active European initiative in this context. Among the different

proposals, one calls on the Commission "to set up a stakeholder forum to produce user-friendly information" (European Aquaculture Society- EAS), while another even considers that "a Europe-wide communication strategy for aquaculture should be developed and provide a promotional base for the acceptance of aquaculture as a valid stakeholder within a sustainable food supply sector" (Federation of European Aquaculture producers - FEAP).

Product demarcations and labelling considerations (aquaculture logo, eco-labelling, organic aquaculture, sustainable aquaculture label ...) are very often referred to in this context, but usually in general terms and principles. The need to set and harmonise standards at EU level is often mentioned (and in line with work developed at the global level, notably FAO), but the views on the way forward do not necessarily coincide (e.g. on roles and limits of private and public bodies). Some contributors however give precise input such as their own very detailed principles and criteria for sustainable fish farming (e.g. Marine Conservation Society) or their views for detailed legislation changes (e.g. Federation of Greek Maricultures regarding Reg. 2065/2001 on consumer information). The future reform of the common organisation of the markets for fishery products is also mentioned in this context.

3. ENVIRONMENTALLY - FRIENDLY AQUACULTURE GROWTH

3.1. Environmental impact of aquaculture

6. What are the most important environmental challenges faced by aquaculture and what are the appropriate avenues to address them?

7. Can you identify, within the framework of Community environmental legislation, business-friendly options to regulate aquaculture activities?

Although it can be noted that contributions from environmental bodies in the consultation process have been rather limited, environmental aspects of aquaculture are confirmed to be very important issues addressed by most contributors.

A very **wide range of environmental challenges** has been cited. The main or most frequent issues refer to:

- Organic waste, discharge of effluents and siting of farm
- Quality of water and efficient use of water resources
- Fish escapes and genetic impact
- Predation by wild animals
- Use of wild stocks
- Sustainable feed sources
- Diseases and infections²...

² Other challenges (such as competition for space, the need for a healthy environment for aquaculture..) have been sometimes evoked under this section on environmental challenges by contributors, but these are dealt with in further sections of in this note.

Classifying them by importance may be subjective; however it is clear that there are different views on the importance of these threats/impacts of aquaculture activity to the environment. As an illustration, organic discharge or escaped fish are often referred to, or seen as, major threats and problems. However, Stirling University states for example that *"the effects of fish farms effluents have been extensively studied and do not appear to be as far reaching as initially feared"*, or the Scottish Salmon Producers Organisation refers to the potential genetic impact of escaped fish as a *"perceived environmental impact that is being given more prominence- particularly in the media"*.

In the contributions received from **public bodies**, protecting the environment from aquaculture impacts seems to be generally of high importance. As an example, the Åland provincial government indicates that its environmental action programme adopted in autumn 2005 aims at *"reducing the load from aquaculture by 80% by 2015 compared to average level for 2001-2003"*. The Dutch Department for Fisheries sees the way forward in reducing dependence on nature, or the comments received from Ministry of Agriculture of Slovakia also illustrate possible divergent views and approaches among public authorities.

There is widespread general view among **producers** that environmental considerations / requirements are important challenges hampering growth or, even, leading existing business to shut down (e.g. problems with licence renewals). Generally, contributions from the aquaculture sector express the view summarised by FEAP when stating that *"there is little in the way of business-friendly environmental legislation, since the latter tends to assume negative rather than positive impacts of aquaculture and impose restrictive actions"*. Some contributions also insist on the fact that environmental services provided by aquaculture to the environment should be recognised and compensated (e.g. fish predators, wetland and habitat conservation...).

Numerous contributors refer to **EU environmental law and its implementation**. Scottish Producers for example consider that a comprehensive retrospective investigation into the additional regulatory burden placed on EU aquaculture over the last decade should be commissioned. However, the most frequent and important concerns refer to legal instruments in two main policy domains, namely water quality and nature conservation.

For example, the contribution from the Brittany region reports *"that –according to the producers- the strengthening of regulations such as the Water Framework Directive (WFD) risks making 50% of the French businesses disappear when applied."* Some producers express important concerns about the classification of water bodies or the definition of "fresh pristine conditions" in this context. Other refer also to national Environment Quality Standards Limits set at very strict levels (e.g. for use of bath treatment medicines) because of fear of EU action (court challenge). The planned repeal of the shellfish-waters Directive is also of significant concerns to shellfish producers.

In terms on nature conservation, many producers see the implementation of Natura 2000 (by some Member States) as a major limiting factor for development and access to space. They also refer to the disproportionate use of the "precautionary principle" by authorities, even at renewal of the existing operating licences. Increased consultation and discussion among stakeholders and authorities (rather than imposed measures) are also called for.

The need for better **level playing field** for aquaculture development appears to be an important common denominator to numerous contributions and comments in this regard. Referring to different levels of imbalance – between MS, between environmental and socio-economic considerations, but also between different competing or comparable

activities - several contributors see benefits from increased forms of harmonisation between Member States. The development of interpretation or guidance documents on EU environmental legislation, of common estimators of "carrying capacity", of scientific evaluations and impact assessment guidelines on the basis of common predictive models, are often quoted as ways forward. Some insist however for such common guidelines to address the need for species and regional specific sets of environmental indicators and critical range values. Other contributors however are more in favour of self regulation and promoting codes of practices developed by the sector rather than at EU level.

The difficulty of conciliating an increasing level playing field at EU level while keeping the possibility to decide on "higher" environmental protection requirement at region or Member States level is illustrated in the contribution from Åland Provincial Government. They considers that detailed regulation should be set according to the subsidiarity principle, while cautioning against possible shifting of aquaculture production to in regions or member States with "more lenient environmental requirements".

In addition to voices for an increased level playing field regarding environmental requirements, for the promotion of best practices and sound management, or for a more reasonable application of the precautionary principle, the aquaculture producers would also see benefit in respecting principles of Better Regulation, such as a more streamlined and business-friendly authorisation process (e.g. concerns regarding the multiplicity and diversity of current approval procedures and numerous licences required to run a business, the various counterpart administrations to work with, etc).

Numerous contributors considers that an important part of impacts of aquaculture on the environment can be managed and minimised through effective siting of farms and understanding of processes involved. Environmental challenges are therefore also viewed in **relation to spatial planning** or development of an integrated European Maritime Policy. (See chapter 6.2).

Finally, the need for **research** on environment aspects of aquaculture appears as a main common point in the contributions received. Some advocate for precise evidence based research (notably for knowledge gaps when assessing specific production sites), but numerous contributors also consider the need for research on horizontal and wider issues, such as the effect of climate change on aquaculture.

3.2. Dependency of Aquaculture on the Environment

8. In a context of increasing scarcity of pure water, what are the main avenues to ensure that aquaculture producers continue to get access to water of the best possible quality for aquaculture development?

All forms of water pollution (including algal blooms and introduction of alien species, highlighted as particularly important risks to shellfish aquaculture) and climate change are the issues most commonly taken up by the concerned stakeholders.

In addressing the issue of the strong dependency of aquaculture on an aquatic environment of high quality, contributors develop their views around two different types of "concepts", namely ensuring that aquaculture is treated as an equal rights user of water resources or developing less water-dependent / water-consuming systems (close recirculation systems, new water technologies, etc). The importance given to one or the other option varies according to the contributors, even within the same group of

stakeholders. Comments made in regard to the availability of water of good quality for aquaculture are also often close, or complementary to, the one made on subsequent questions raised in the consultation document in regard to limits or competition for space.

Aquaculture is presented by a number of contributors as an efficient user of water (often by comparison to agriculture in respect of water consumption to produce high quality food). Aquaculture (notably shellfish) also plays a role as an indicator of water quality. Numerous contributors consider that the aquaculture sector should be seen as an equal rights user of water resources, and insist on its need to be closely associated to the implementation of the Water Framework Directive (WFD) and the EU Maritime Policy in this regard. Several contributions call for actions to be concentrated on the principal sources of pollution or recommend effective regulation and enforcement of other water users whose activities can impinge on aquaculture water quality.

In this context also, some support the development and application of (marine) spatial planning or integrated coastal zone management (ICZM) to facilitate the allocation of appropriate sites - with the correct water quality - for aquaculture applications.

Specific needs are also expressed for shellfish production, especially the necessity to amend the WFD to incorporate the specific microbiological standards contained in the shellfish waters' directive, or to develop some forms of crisis management approach to better anticipate the phycotoxines problems (a problem which is not restricted to coastal areas and could also affect offshore sites).

4. AN AQUACULTURE INDUSTRY PROVIDING HEALTHY FOOD WHILE ENSURING ANIMAL HEALTH AND WELFARE

9. What are the most important challenges related to animal health and welfare and how should they be addressed, in view of the different constraints faced by the aquaculture sector?

The aspects related to aquaculture and animal health, public health and food safety have been commented on in most contributions received, demonstrating the importance of these domains as a key component of a sustainable, well managed and economically viable aquaculture industry. If some contributions can be seen as providing only general views, a number of other contributions dedicate rather long and precise comments to very specific health and welfare issues (e.g. from the Federation of Greek maricultures). A few contributions to the consultation are even practically entirely dedicated to specific aspects of these domains, such as for example those received from some NGOs, particularly those interested in animal welfare.

These latter generally consider that fish welfare is insufficiently addressed at EU level and plead for strong and enforced legislation. They provide very detailed views on an extensive list of practices or issues (such as stocking density, poor health conditions, crowding, handling and grading, transport, starvation, tagging, sea lice, algal blooms and jellyfish threatening farmed fish, mortality, biotechnology, genetic engineering, artificial lighting and photoperiod manipulation, slaughtering...). Animal disease or high stocking densities are also seen as exacerbating environmental impact (such as interaction with wild predators and water pollution). Fish slaughtering and fish transport are also two priorities issues referred to in the contributions from the Dutch Department of Fisheries.

Fish producers are generally supportive for fish welfare, but to be placed in the context of promoting and maintaining the optimum conditions for species. Some consider that the challenge is to resist the temptation of applying pseudo-anthropomorphic suggestions for best practices (FEAP), or that there are many opinions but few facts (Danish aquaculture), or that any Policy on these issues should avoid being exaggerated and counterproductive (French producers). The need to look for robust welfare indicators based on science, but also allowing adaptation to fast developing techniques has been put forward several times. Best practices and codes of conducts for stocking density are given as examples (e.g. SSPO) or as the preferred option by several contributors. The Directive on live transport of vertebrates is also criticised regarding its present scope and provisions applicable to fish.

However, there is a consensus on the need for low stress in animals to contribute to good health status, in association with good water quality, proper risk assessment, and prevention rather than treatment.

The new EU aquatic animal disease legislation (Dir. 2006/88/EC) is generally seen by producers as providing an improved framework to address health issues for finfish, although specific concerns are expressed by some groups (Greek Federation, Austrian carp producers, COPA-COGECA). Shellfish producers however consider that this new directive on "animal health" does not sufficiently take into account the specific characters of shellfish farming that takes place in a very open environment, and that it gives a too strong dimension to trade facilitation in comparison to protecting shellfish production from possible diseases.

Genetic selection (resistant brood stock) and the development of vaccines are often mentioned as solutions to fish health problems. However, in regard to the number of potential diseases and species to be used in aquaculture, vaccine specificity makes development very slow (and mainly for major species, as observed in salmon aquaculture for example). More generally, availability of and access to veterinary medicines is seen as a major difficulty by numerous contributors, who often express concerns regarding the absence of authorised medicines, the cost and length of approval of new medicines, the disparities among MS, the difficulties of addressing health issues in new species (markets without interest for the pharmaceutical industry)... In a comparable manner, the European Feed Manufacturers Federation (FEFAC) consider that the authorisation procedures for feed additives are tailored made for land animals and do not specifically address characteristics of aquatic animals, limiting thereby the possibilities to address specific nutritional needs for some fish species.

Healthy food from fish aquaculture is also often referred to in relation to feeding and the high value of unsaturated fatty acids (see question 11 below). For shellfish producers however, the main concerns regarding public health relate to microbiological testing and biotoxin monitoring. They consider being severely constrained by the "hygiene" package, and the continuous trend on an always stricter approach of legislation on public health and too frequent changes in this domain. The shellfish producers appear critical of the EU health legislation on biotoxins, criticizing sharply in particular the relevance and validity of the "mouse" test and the discrepancies in its implementation among MS. They consider this subject of major concern as they see it as a threat to the viability of their companies in the short-term. The role of the European Food Safety Authority, the position of national reference laboratories and some form of "abuse" of the precautionary principle are also questioned.

Finally, there is a common trend in all contributions received to highlight or illustrate the importance of research in terms of public health and animal health and welfare. There is unanimous call for continuing research on key animal health issues and basic scientific knowledge on fish health and welfare.

5. AQUATIC FARMING: A NEW ERA IN ANIMAL DOMESTICATION

10. What do you see as the most promising avenues in fish or shellfish domestication to provide opportunities for aquaculture growth in the EU?

Some contributors recognise that developing new alternative species could be a promising avenue, but do so only in general terms.

However, the majority of contributions received provide some detailed views on "domestication" of fish and shellfish. A number of contributions from producers identify the "new" aquaculture species that they would see an interest in. For example, recognising climatic differences in the Community, FEAP sees cod and sole to be well placed to succeed in "cold water" aquaculture, while cobia and faster growing sea-bass and sea-brems would look more promising for the Mediterranean area. For fresh water fish, choices seem less obvious, although percid fish or sturgeons are regularly suggested as options. In closed recirculation systems with a controlled environment, the range of option appears wider (eels, catfish, tilapia, barramundi...).

Some contributors, notably NGOs, also insist on domestication as a mean to address specific concerns: improved quality of sterile fish is seen as a way to prevent problems of escapes (EBCD); development of integrated systems of aquaculture associating several species (finfish and shellfish) might reduce environmental impact from aquaculture; shellfish production or development of herbivorous or omnivorous species should be favoured and capture-based aquaculture (e.g. tuna, eels) is not seen as a viable alternative (MCS); new species should only be used for farming when there is sufficient knowledge about their needs (Eurogroup For Animals).

However, if "new" aquaculture species are seen by some as providing possible opportunities for European aquaculture, there is also a strong tendency in a number of contributions received to insist on the need to improve possibilities for "existing" species. Highlighting the successful farming in Europe of salmon, trout, sea-bass, sea-bream, oysters and mussels, a number of producers (generally from the shellfish sector, but also in the finfish sector) consider that, with the exception of cod and a few "newcomers in niche markets", the main route forward lies with producing more of the same species³, produced even more efficiently and also processed with more efficiency. Improved

³ The need for lifting some intra-EU trade restrictions (e.g. on mussels seeds) has been referred to in this context.

domestication of local indigenous species is also seen as important by Dutch national authorities.

It must also be noted also that timescales in relation to domestication are not necessarily perceived in the same manner depending on the main groups of stakeholders. The EAS board of Directors for example considers that "*EU aquaculture is based only on new species, except for the common carp which has undergone a significant period of domestication*". This view is somewhat echoed by SK republic in its contribution when referring to traditional pond farming and to the fact that they do not yet expect an increase of aquaculture in (other) new species.

However, despite possible differences in considering what is a new species or not, there is a common and unanimous view that domestication is necessary to ensure sustainable and economically viable industry, and that domestication still requires extensive and coordinated research and dissemination to realise its full potential. Numerous challenges, gaps and opportunities are mentioned with associated needs for research and development, such as: reproduction control and efficiency, disease resistance, feed source and nutritional needs, food conversion efficiency, brood stock management, selective breeding (including use of genomic tools)...

According to most comments, domestication goes largely beyond issues directly related to animal breeding and management, as it also includes aspects such as effect of the environment, or market considerations (negative appreciation of genetic modification, commercial and financial sustainability issues, etc). Insisting on the fact that farmers will produce what the market demands and that the EU aquaculture will probably develop more on a "product basis" (i.e. easy cooking fillet or added value products) rather than on a "new species" basis, market considerations are viewed sometimes as a main criteria to the orientation of research in terms of "animal domestication". Others also plead for the need to look for innovative products and new market opportunities.

11. To what extent do you consider that fish oil and fish meal would represent a limiting factor to aquaculture growth in the European Community? Which option would you favour to reduce limitations from such feed?

For carnivorous fish - the preferred species of EU consumers - fish meal is seen by many as the ideal product for the major components of feeds, since:

- It is the most natural products for naturally carnivorous species
- It contains a high nutrients concentration whose composition is perfect for effective nutrition, and it does not contain anti-nutritional factors (vs. vegetable proteins) that decrease growth
- It is highly palatable (vs. substitute diets) to fish leading to less feed wastage, and consequently also less environmental discharge.

For fish oil, the objective is to have the best content of omega 3 fatty acids, for the benefit of the consumer.

With very few exception (e.g. Seafood Shetland), common general statements can be found in most contributions to agree that fish meal and fish oil (or FMFO) represent a limiting factor to finfish aquaculture growth. However, the type of limits identified may vary depending on the views of contributors, and these limits are generally not seen or

perceived as "insurmountable" as there is a common view that there is capacity for substitution and improvements, in view in particular of the amount of research done and progress already made to providing alternatives for FMFO.

The International Fishmeal and Oil Organisation (IFFO) considers even that statements on fish meal and fish oil limitations look "*unnecessarily alarmist*" in the Community 2002 Strategy on aquaculture or in the Consultation document, and they provide an extensive set of information and data to support their views. They recognise however that fishmeal and fish oil, "*once commodities, will increasingly become strategic dietary ingredients and that their ideal nutritional profile will make them the ingredients of choice in many aquaculture situations, particularly carnivorous fish*". The use of FMFO will also increasingly be targeted at critical stages in the life-cycle such as starter diets, brood-stock diets, or finisher diets. They consider therefore that production (at a global level) of both aquaculture feed and seafood products will increase, but the feed and farming cost will be controlled.

On the contrary, increasing costs represent a common concern for fish-feed manufacturers and primarily European fish producers. Meal and oil are global products with a transparent market, and their prices fluctuate and reflect global production and demand. Both FEAP and COPA-COGECA consider that what is preventing aquaculture from expanding is not the lack of meal, but its price, and that it could seriously affect production costs of European fish farming, compared to imports from other countries where labour and other costs are much lower. Fish oil availability could be a more serious limiting factor in the future, considering that global fish oil production is already practically totally used for aquaculture purposes, but partial substitution by vegetable oils (e.g. rape seed oil) is already current practice (e.g. for salmon). However, some argue that the increase in rape seed oil, related to the increased demand for bio-fuels, is now the determining process of oil prices (In this regard, Scottish aquaculture producers for example oppose the idea of using rape seed oil as bio fuel, and indicate their preference for exclusive use in feeds).

The fish feed industry agrees that it must reduce the inclusion of FMFO in its formulations in order to be able to support a sustainable aquaculture development. Any further growth in finfish aquaculture has to be based on fishmeal replacement and higher FMFO prices will accelerate substitution rates.

A number of NGOs, public authorities but also economic operators associate their contribution on FMFO availability with concerns about the need to ensure sustainability of industrial fisheries or other environmental aspects of feeding FMFO to farmed fish (e.g. competition with prey stocks of natural predators).

The general current position is seen as one of demonstrating that the industry still requires FMFO for its sustainable development, but alternative raw material will be used more once a better understanding of formulation and nutritional know-how has been achieved. The importance and need for continued research in this area is therefore a common feature in all contributions, although the views on the role to be played by different actors may vary. As an illustration, the Finnish Fish Farmers' Association is of the view that the feed industry is well performing in research and, except for some basic research, there is no need to target this question in an EU strategy, while the Federation of Greek Maricultures considers that research in this area must become a strategic priority, asking also for some particular quantified targets.

Notwithstanding zoo-technical work such as species selection, breed improvements, physiology knowledge, the most quoted key replacements options of FMFO in feed are vegetable protein concentrates or vegetable oil (including GM derived feed materials), land animal by-products (e.g. blood meal) or krill. Some more "anecdotal options" are also foreseen in a few contributions, such as exploring possibilities of bacterial and algal culture (IMARES), producing marine lipids from natural gas (SINTEF) or even using insects (House of the Dutch provinces).

In addition to promoting research, several contributors also call for more immediate political or legal changes. Several contributions refer to a better use of by-catch and discards as a raw material for fish, although FEAP indicates that a practical, logistical, and economic assessment would have to be made whether this portion of discards could make a significant contribution to providing an alternative resource to traditional fish meal and fish oil supplies. The Federation of Greek Maricultures calls for a mandatory gradual reduction of FMFO used to feed land terrestrial animals towards an ultimate prohibition of such use within a decade, arguing that aquaculture is by far the best and most efficient user of FMFO, – a fact that has been highlighted in several contributions from producers or researchers. Some present limitations in EU legislation on fish feed availability are also highlighted. The Austrian producer *Alpenlachs* considers that the intra-species feed ban in respect to fresh water fish should be lifted urgently. The European Fat Processors and Renderers Association calls for an amendment to the TSE regulation as soon as possible to allow terrestrial-non-ruminants-processed animal proteins to be used in feeds for aquatics species, estimating that about 150.000 to 200.000 tonnes of these proteins could be made available per year to the aquaculture industry, position generally also supported by the fish-feed sector .

However, the acceptance by the public and consumers of the possible options for FMFO substitution and alternative sources is recognised by numerous contributors as a very important element, influencing their individual input to the consultation. The British Trout Association, for example, claims that a high level of FMFO is still needed because of the attitude of some retailers who insist on the need of feed fish with FMFO. Comparable issues are expressed by the French aquaculture association which insists on the importance of associating distribution channels and the media to inform consumers on the present evolution (on issues such as for example the re-introduction of blood meal) or by FEFAC which highlights the need to address fish farmer and consumer perception, with regard to omega 3 fatty acids contents of fish and risks and benefits associated with substitution of FMFO. The need for public information and communication is also put forward by some scientists (e.g. EAS board).

Finally, despite the fact that they are not concerned by fish-feed related challenges, the shellfish producers refer to the fact that they are faced with other forms of possible limits on feeds, in the sense that they need to have access to the natural environment that provides the optimal nutrients possibilities for growth of oysters and mussels (cf. water quality or access to space). They see a need for major research in the field of biological carrying capacity and potentially beneficial results from integrated multi-trophic (i.e. multi species) aquaculture.

6. OVERCOMING SPACE LIMITATIONS: THE IMPORTANCE OF TECHNOLOGICAL DEVELOPMENTS AND SPATIAL PLANNING

6.1. Technological innovation

12. What technological innovation would you consider most promising to allow aquaculture development in a limited space context? What are the main obstacles to their development and how could they be overcome?

On-land "recirculation aquaculture systems" and offshore technologies are the main possible innovations referred to by all groups of contributors, with the exception of the feed sector who did not express a view on these questions, and the welfare NGOs who only express some general concerns. These latter consider that technological innovation may lead to a further intensifying of fish farming and higher stocking density, and techniques to increase production, such as biotech and genetic engineering risk being introduced.

There is a consensual trend to consider that **on-land aquaculture systems using recirculation** (and possibly heating) provide most promise where space is the limiting factor for fresh water but also coastal sites. Water recirculation and treatment technology is also seen as an excellent way to address impacts of aquaculture on the environment and for optimal control of environmental parameters most suitable to fish. However, higher skill levels are required in the workforce (system monitoring and surveillance) and task automation is almost a prerequisite.

There is also a general recognition that such technological uptake and development has been limited so far primarily because of costs considerations. Economic expenses (investments and operations, in particular energy costs) combined with market uncertainty have restricted development so far. Except for very sensitive phases in the farming process, such as for hatcheries and nurseries, technology take up has not been greater because production costs are not the same in open and closed systems. Some contributors strongly advocating for development of recirculation systems consider that the "sustainability" criteria should attract for a premium price and allow therefore positive developments (e.g. Marine Conservation Society).

However, there appears to be still some need for technological development and some zootechnical issues have not yet been completely resolved for an optimal management of recirculation systems. Contributions received highlight the need for innovation in managing and monitoring recycling processes, efficient water treatment (marine and fresh water), optimised energy use, disease prevention and treatment, addressing growth limits for certain species, paying close attention to the quality of the final product (muscle tone and quality, absence of off-flavour)...

Moreover, since many recirculation systems use species that support a high farming density (notably to reduce costs per unit produced), several contributors refer to the importance that should be given on the societal acceptability of this approach and on the need to inform consumers ("chicken-cage- like syndrome").

Offshore fish and shell fish farming is often quoted as another technological innovation for aquaculture but there is also a general and common view among contributors that there are many issues that remain to be resolved in the technical, managerial and financial spheres, which makes FEAP qualifying offshore fish farming as "*appearing to*

provide a lot of instant solutions". Similarly, the Aquaculture section of the Irish farmers' association for example considers that "offshore farming in the strictest sense ... while widely promoted, has yet to be proven in terms of safety and welfare of both stocks and farmers, suitability of sites and equipments, and availability of appropriate plankton food for shellfish. Much more research and developments needs to be carried out in this area before it becomes a reality". Environmental NGOs express some more cautious position about possible promises of offshore aquaculture, notably regarding experience of escapes in marine fish farming and the need for technology to be able to cope with worst conditions forecast (while safeguarding farmed species from excessive currents).

Notwithstanding the technological challenge, a number of contributors highlight the financial dimension of engaging into offshore innovation. According to FEAP, it seems probable that major investments could take place in this type of aquaculture, but that these may be limited to the bigger companies active in marine aquaculture. The Federation of Scottish Aquaculture Producers see a major challenge in finding investors that are willing to risk large sums of money on pilot scale ventures that are of sufficient scope to be able to reassure future full scale investment. The Federation of Greek Maricultures is of the view that the size of the Mediterranean fish farming industry seems to lack the critical mass for industry-financed research on the topic. The two latter organisations also refer to the need to address legal and regulatory challenges associated with off-shore aquaculture (e.g. licensing).

There are therefore numerous common views that technological innovation should be encouraged through efficient **EU cooperation in research and investments**. Some contributors recall also that, if offshore aquaculture is to be developed, equipments and boats will have to be modified for such sites and complementary inshore sites for harvesting or over-wintering of stocks will be required. Possibilities of linking with other industries (renewable energy for example) where aquaculture can take advantage of structures that have the potential to alleviate stress on containments are mentioned. Promoting recirculation aquaculture systems by subsidising energy costs is also an option put forward by some contributors (Finnish Fish Farmers' association).

It is worth noting that several contributors (from various categories of stakeholders) also consider important to mention that, if Europe is a world leader in technology, there must however not always be a presumption that aquaculture production needs to be high-tech. The positive role of extensive aquaculture is highlighted, and traditional aquaculture should be able to continue and to benefit from support. The existence of new technology should not wipe out existing ones. Further development of current production systems (increase in size and production level) is seen by several as a way to significantly contribute to overall production.

6.2. Spatial planning

13. What are the main obstacles to access to marine or fresh water space for aquaculture activities? Would you consider that there is a need for public decision maker to set aside specific locations dedicated to the development of aquaculture?

14. How could marine/maritime spatial planning be developed to provide appropriate conditions for the sustainable growth of aquaculture sectors in coastal and offshore waters?

Obtaining access to farming depends on the procedures to get an approval of licences to operate. In numerous contributions, there is quite an overlap of concerns and views between the two questions above and those related to the links between aquaculture development and environment related issues. Good governance related issues and the current "low" status of aquaculture as a stakeholder in marine and freshwater policies appear also at the heart of this debate. There are unanimous voices for a full stakeholder involvement in any such process.

A number of producers consider that current policies and legal frameworks are unsuited to the sector's needs, specifically at Member State, regional or at local level, which impedes the issuing of licences and/or other control procedures and leads to an effective blocking of aquaculture development.

Very frequent concerns refer to:

- Bureaucratic delays in procedures, costs of registration, and uncertainty of the outcome in absence of specific [supportive] legislation (can imply years of effort and many different authorisations to obtain the necessary licences to operate).
- Licence validity periods are too short which does not stimulate investment, but creates uncertainty and confusion for the producer and investor.
- Differing interpretation of European legislation at national level, combined with a frequently reported tendency for local authorities and organisations to be more radical (under the 'precautionary principle'). In this context some fish or shellfish producers even consider that the overall challenge in some Member States is not to get new licences to develop aquaculture, but first to succeed in having the old ones renewed.

Review of the processes is urgently called for by the sector if development is to occur. Clear and simplified procedures, with established time limits for decision, for obtaining aquaculture operating licences should be provided in each Member State. Licences should also be accorded for reasonable periods of time with clear conditions for renewal in order to bring about longer term investments. These conditions are seen by the sector as symptomatic that it remains poorly understood and reflecting its low status as a stakeholder in freshwater and maritime activities. The need for better communication is often reiterated, with the EU - or the European Commission- being seen an important player in raising the profile of aquaculture as an equal right user of water and land space.

Some contributors put forward benefits of some forms of identifying and mapping of most suitable sites for aquaculture production. Support for spatial planning comes from most quarters and relates to their wish to see aquaculture and its economic dimension and environmental protection treated on an equal footing. However, as far as the possible need for public decision makers **to set aside specific locations dedicated** to the development of aquaculture, there are rather different views among contributors, even within a given category of the main stakeholders, thus reflecting probably different levels of difficulty already faced by operators in terms of access to space and licensing.

As an illustration, the Danish aquaculture organisation considers that it *"is imperative that specific locations are dedicated to aquaculture, otherwise the local authorities will apply the "NIMBY (Not In My Back Yard) principle"*. The need for designation of specific aquaculture sites –including supporting the existing ones- is also seen as necessary by the French Aquaculture Association, which considers that such planning

should also have legal force, and they insist that this is only possible if there is a real political will. The EAS board is of the view that reserved specific locations are probably crucial for the sustainability of shellfish sector as well as for artisanal finfish production in riverside and coastal zones. The Greek producers report that their central administration has decided to move towards the creation of designated aquaculture zones, or Areas of Organised aquaculture development, in response to the need for better control, collective managements within a flexible business environment, but also with respect to natural resources. The Dutch department of fisheries, recognising inconsistent legislation at different government levels, considers that the establishment of specific locations for aquaculture development could prevent the damaging of vulnerable ecosystems.

Other stakeholders have more mitigated views. COPA-COGECA does not consider it useful in every case to designate areas potentially suitable for aquaculture. Conditions and requirements as well as insight into site-specific needs may change over time (due to environmental change, for example, or new species entering the aquaculture scene). It could be helpful to have dedicated areas for aquaculture where it is easier to get approval to establish a farm and receive subsidies, but it would be counterproductive if that would also mean excluding aquaculture in other areas. The Irish producers also recognised there are differing opinions on giving specific zones to specific sectors (uncertainty involved in specialisation and expertise on those who may draw up the zones, need to cope with possible increasing demand in the future, unforeseen environmental impact on the industry, possible impacts on the rights to explore new areas or apply for new areas of production, or simply to continue to operate in exiting areas if not selected...). Some contributors from the scientific community would also see a need to examine each individual case (e.g. SINTEF). Austrian producers do not see the need for reserved aquaculture sites in rural areas, neither do the Slovakian authorities (although recognising that access to aquaculture is limited because of a great number and space of protected areas).

Public bodies or similar, although supportive of some general principles, such as participation processes, often appear to have more of a precautionary stance regarding dedicated allocation of space to aquaculture. There are nevertheless a few more proactive views, such as for example the Fisheries and Aquaculture Strategic Group that advises the Welsh assembly which supports the creation a public body in charge of setting aside specific location for aquaculture.

More broadly, sharing space between different and competing users is often referred to by contributors in relation to the initiative for a Maritime Policy, which is seen as a positive stimulus to marine spatial planning development. The position expressed in the corresponding report of the European Parliament that states *'within the context of an integrated coastal zone management (ICZM) approach, clearly defined areas where fish farms may be clustered should be promoted and that this should be linked to a simplified regulatory regime encouraging entrepreneurship and sustainability'* has been quoted and supported by both FEAP and the EAS board.

Numerous contributions make references to ICZM and the development, use and application of spatial planning procedures are seen as contributing to the resolution of conflicts for space and support the overall recognition of fish farming as a key stakeholder in the maritime sector. Several contributors refer to the usefulness of a mapping exercise, for a clear identification -by Member States- of potential, available and sustainable sites for coastal and offshore aquaculture, and the possible development

of guidelines for optimising site locations for different sectors within the Aquaculture industry. For some also, flexibility among planners is needed to allow fish farms to consolidate on fewer but larger sites to maintain production on a competitive scale (British Trout Association). The Federation of Greek Maricultures is of the view that there is an urgent need for an EU directive or Regulation for marine spatial planning and the designation by MS of areas for aquaculture development, while the Irish producers indicate that IE has already a system very close to terrestrial based planning, but the deficiencies in the system have not come from the legal text but rather from the interpretation of scale, lack of knowledge on carrying capacity, non-implementation of biomass limits... The Norwegian Ministry of Fisheries indicates that spatial planning and management is the main tool in coastal management, and its implementation relies on local authorities. They also indicate that there is a need for science based knowledge of environmental impact of farms on a local scale. However, the central authorities (regional office of the Directorate of Fisheries) may raise objections if sufficient areas for aquaculture are not set aside by the municipality.

The scientific community appears generally supportive of spatial planning initiatives, but highlight also the need for research to develop methodologies for comprehensive and multidimensional approaches. Some NGOs (MCS) also express their support of the principle, subject to strategic environmental impact assessment. They consider that it will increase certainty for industry as government licensing bodies will abide by the Marine Plan unless significant impacts revealed by environmental impact assessments.

7. PROVIDING SUPPORT FOR SUSTAINABILITY

15. How can we ensure that EFF implementation will contribute to sustainable aquaculture growth in the EU?

16. Are there already some lessons to be drawn from the preparation of your National Strategic Plan and Operational Programme regarding aquaculture?

There is generally very little input on the questions related to the European Fisheries Fund (EFF). Some concerns (producers from UK, IE, FI) have been expressed regarding the uncertainty of the outcome of National Strategic Plans and Operational Programmes under elaboration, the insufficient allocation of money compared to previous structural funds or the too- restrictive measures of the new EFF Regulation. Other producers insist on the need for a national dynamic process and a general political, with a better coordination between national authorities and industry (e.g. French and Greek associations). However, the Danish aquaculture association expresses its satisfaction on the collaboration with national authorities and the general consensus about industry development, which they consider will appear important in relation to local decision making.

As far as contributions from national authorities are concerned, the Ministry of Agriculture of the Slovak Republic indicates that the preparation of their national programme allowed them to note that there was an increased interest in building of new production capacity, but considering that they had not enough money for such action, they intend to focus their efforts into existing farming capacity. The Dutch authorities (Department of Fisheries) are of the view that the involvement of the stakeholders has

been an effective way for the identification of measures and objectives that are the most promising.

8. RESEARCH: A POWERFUL DEVELOPMENT TOOL

17. How can research policy be set in a strategic context to enhance its benefits, specifically for European aquaculture and/or European technology and know-how?

18. How can the transfer of research results be optimised so as to maximise the benefit to European business?

19. Which cross-cutting areas in marine research would you consider most important for aquaculture?

There is a clear common view among contributors to see research as a fundamental element to sustainable development of Aquaculture in Europe, although views vary on the facets of sustainability to be more developed. The views on (marine) research for aquaculture are often focused or referring to the conclusions provided in several workshops and seminars made in recent months, such as the "Aberdeen Declaration" of June 2007 for example", as well as in relation to the development of the Maritime Policy. Several contributors consider it important to recall that the high profile given at EU level to Maritimes issues should not leave freshwater aquaculture out of European RTD efforts.

In practice, it is difficult to identify only a few themes that would be seen as most important for aquaculture as the need for further research –being specific or crosscutting– has been raised for all issues covered under the previous questions, such as for example:

- New technologies (materials and management systems offshore aquaculture, marine biotechnology
- (alternate feed)
- Environmental issues, efficient and optimal use of aquatic resource, Climate change effects
- Health monitoring and maintenance, improved hatchery performance for the production of marine juveniles (reduced malformations, better growth), alternate feeds
- Spatial planning and modelling for improved ICZM, potential for integrated aquaculture activities.

Several contributors insist therefore on the fact that the research policy should reflect the overall strategy or that it should be directed by objectives. Providing a specific research

policy for European aquaculture would have visible benefits but would need to be better adapted to the needs (immediate, medium and long-term) of the sector if it is to assist its sustainable development. In parallel to this approach, support work on basic research (e.g. lifecycle, basic biology) and wider issues (for example, on environmental interactions, effects of climate change...) need to be continued. Some also see the use of foresight studies, combined with established European and national aquaculture strategies, as a mean to help to give a clearer focus on sectoral priorities. Nonetheless, the industry will need to accommodate how it can provide financial support for such research work.

While supportive of the need for research, some stakeholders express concerns regarding the present state of research. For example, the Federation of Greek Maricultures is of the view that there is an apparent lack of strategic guidance and support in the research field. The Danish Aquaculture Organisation expresses some rising concern that even though the EU is investing heavily in R&D, production is stagnating. The House of Dutch Provinces even states that in an open economy, it seems inevitable that supporting know-how and innovation will spill over to non-EU Member States and "will capitalise only there", and considers therefore crucial the need for a good picture on the focus points and chances in Europe beforehand. A number of stakeholders also express concerns regarding the bureaucratic procedures for EU RTD projects, which represent a major limiting factor for joining in.

Quite a number of contributors also indicate that European aquaculture research remains dispersed with duplication of effort, particularly between the National Programmes. Some would see benefits in the creation of a central database for future aquaculture research or in a regular appraisal by relevant stakeholders – including industry representatives of RTD progress, based on definite benchmarks to measure progress.

A closer involvement of economic operators in the definition of research priorities at Community level also appears as a frequent request from the sector. The importance of the development of a Technology Platform for European Aquaculture –EATP- has been mentioned several times in this regard, as it should allow providing a strong industry-led view on its future development and research requirements.

Finally, an improvement in RTD transfer is a central concern of the producers (and a number of researchers). However, the willingness to publish and transfer results differs depending partially on the objectives of the research and the owner of the intellectual property or of the competitive advantage gained. A structured effort to optimise the dissemination and availability of information, and training should help bridging the gap that exists between the research and professional sectors. Positive experiences are often used as examples⁴ to support numerous proposals in this regard, such as:

- The assistance of strong professional associations of inter-professional organisations with personnel who are responsible for RTD actions for efficient communication and transfer to the industry
- The development of accessible RTD project summaries, explaining why the RTD work is done, how it can benefit the sector and debating progress and/ or direction (in conferences, regional workshops)

⁴ such as 'PROFET Policy' or the WAVE projects (see www.profetpolicy.info or www.waveproject.com)

- The need for improved networking between research institutes and European business, and improved training in new technologies.