Deliverable D6.1

RECOMMENDATIONS FOR ORGANIC AQUACULTURE REGULATION

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SUMMARY

One of the main hallmarks of the organic farming is the holistic view, where organic production practices consider all impacts the production might have on the environment, the farmed animals and the society, that means to emphasize the importance of the whole and the interdependence of its parts.

Likewise, the OrAqua project is based on a holistic approach to the European regulation, the organic principles, the scientific knowledge, the stakeholder's opinion, considered as whole. Consequently, the recommendations result by the integration of a chain of project processes.

The outcome from WPs 2, 3, 4 and 5 have been used to support the SWOT (strength, weakness, opportunities, threats) analysis concerning some key aspects of the organic aquaculture, in view of the formulation of the recommendations. The SWOT analysis has been carried out for a selection of the key issues of the organic aquaculture, which are grouped into four thematic areas, as in the following table

SWOT Analysis	
Thematic areas	**Key issues**
Production systems	1. Simultaneous production 2. Exceptional production rules allowing the introduction of non-organic juveniles 3. Lay down detailed rules for the organic rearing of life stages between hatching and weaning 4. Recirculation Aquaculture Systems (RAS)
Environmental impacts	1. Impact assessment supported by a Life Cycle Assessment (LCA) 2. Support the use of biodegradable or recyclable material
Feed requirements	1. Fish meal and fish oil derived from non-organic aquaculture trimmings 2. Essential amino acids produced through fermentation 3. Exceptional production rules allowing the use of non-organic feed
Fish health, welfare, veterinary treatments and biosecurity	1. Setting oxygen threshold limits for best husbandry practices 2. Setting stocking density threshold limits for best husbandry practices 3. Allowing the use of oxygen beyond predefined critical periods 4. Setting threshold limits for the transport duration

The 13 key issues analysed by SWOT were selected among those considered potentially more problematic or controversial from both the i) review of the scientific knowledge on production issues (challenges and gaps) and socio-economic issues in organic aquaculture carried out in WPs 2 and 3; ii) the large debate currently ongoing among stakeholders.

To focus the discussion, 37 recommendations have been grouped into 5 thematic areas: i) The institutional framework & societal expectations, which includes 7 recommendations; ii) Production systems, which includes 12 recommendations; iii) Environmental impacts, which includes 2

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recommendations; iv) Feed requirements, which includes 7 recommendations; v) Fish health, welfare, veterinary treatments and biosecurity, which includes 9 recommendations.

It should also be noted that some recommendations, although included in one thematic area, are actually interconnected with other thematic areas. Furthermore, in order to reflect the complexity of the production and socio-economic issues in the organic aquaculture, some recommendations are expressed according to multiple options, each of which supported by pros and cons. Finally, it should be noted that not all of the recommendations require revisions of the Regulation, some are intended to support and validate solutions already provided by the Regulation or suggest support actions for the sector development.

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1. BACKGROUND AND INTRODUCTION TO THE RECOMMENDATIONS

According to the DoW, the objective of the OrAqua project is "*to generate robust science based **recommendations** for potential updates of the EC regulation as regards aquaculture of fish species, molluscs, crustaceans and seaweed, based on comprehensive reviewing, research and assessment, in addition to integrating feedback from key stakeholders through a participatory action research approach*".

The following sources of information have been taken into consideration in order to outline such recommendations, which reflect the holistic perspective of the project:

a) A synthesis of key issues, related to the current regulation on organic aquaculture, challenges and research gaps identified in WP2 "Review of production related issues" and WP3 "Review of socio-economic issues".
b) The feedback from the 1st stakeholder event held in Istanbul on 11th – 12th October 2014, the 2nd stakeholder event held in Rotterdam on 19th – 20th October 2015 and the 3rd stakeholder event held in Venice on 21st – 23rd June 2016.
c) The Deliverables D4.1 "Extracted and integrated/synthesized information from WP2 and WP3" and D4.3 "Communication material for 2nd stakeholder event"
d) The results and interpretations of the Multi Criteria Decision Analysis (MCDA) survey carried out among stakeholders in October 2015.
e) The Aquaculture Reports delivered by the Expert Group for Technical Advice on Organic Production – EGTOP (https://ec.europa.eu/agriculture/organic/eu-policy/expert-advice_en).
f) The organic aquaculture rules provided by the most relevant international standards (cfr. Deliverable D6.2 "Technical background behind the recommendations").

One of the main hallmarks of the organic farming is the holistic view, where organic production practices consider all impacts the production might have on the environment, the farmed animals and the society, that means to emphasize the importance of the whole and the interdependence of its parts.

Likewise, the OrAqua project is based on a holistic approach to the European regulation, the organic principles, the scientific knowledge and the stakeholder's opinion considered as a whole, rather than separated parts only. Consequently, the recommendations rarely result from either purely science or only stakeholder's opinion but, somewhat, by integrating a chain of processes of the project. In addition, because conclusions based on science or specific stakeholder's view might be, in the current situation, practically and economically unrealistic, our commitment was to address this drawback making the recommendations relevant for the industry, as well as for the consumers.

A thorough review of the scientific knowledge on production issues (challenges and gaps) in organic aquaculture is reported into Deliverables **D2.1 "Production issues in organic Aquaculture"** and **D2.2 "Knowledge gaps"**. The thematic areas that have been considered in the two deliverables are i) Feed requirements; ii) Welfare, health, veterinary treatments and biosecurity; iii) Production systems; iv) Environmental impacts.

A thorough review of the scientific knowledge on socio-economic issues in organic aquaculture is reported into Deliverables **D3.1 "Consumer aspects: Report on consumer aspects related to European organic aquaculture"**, **D3.2 "Farm economics and competitiveness of organic aquaculture"** and **D3.3 "The institutional framework for organic aquaculture – Critical development constraints and the potential for improvement"**.

All the above mentioned deliverables also report a comprehensive list of the scientific literature consulted.

The feedback from the three stakeholder events is reported into the Deliverable **D5.3 "Conclusions**

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and actions post stakeholders events". The deliverable includes transcripts of all outputs produced at each event, as well as action lists and conclusions at the closing of each of the three Stakeholder events.

The results and interpretations of the Multi Criteria Decision Analysis (MCDA) survey are reported in **Deliverable D4.4 "Results and interpretations of MCDA"**. The aim of the survey was to assess multi-stakeholders knowledge, experience and perception on key issues for the economic development of organic aquaculture. Participants to the survey were requested to answer anonymously a questionnaire with a number of closed questions concerning the following eighteen thematic areas: 1) Institutional framework; 2) Consumer perception; 3) Environmental interactions; 4) Fish health and welfare; 5) Control provision; 6) Production rules; 7) Legislative framework; 8) Production systems; 9) Product quality; 10) Product ecological quality; 11) Energy use; 12) Recycling; 13) Environmental impact; 14) Quality of water; 15) Quality of feed; 16) Quality of the rearing environment; 17) Physiological condition; 18) Husbandry practices.

To facilitate the follow up of the whole process, five executive dossiers have been prepared on the main technical background behind the recommendations: i) Breeding practices and origin of organic aquaculture animals; ii) Production systems; iii) Feed for fish and crustaceans; iv) Welfare, disease prevention and veterinary treatment; v) Specific rules for mollusc and algae. In each dossier it is also provided a list of the organic aquaculture rules extracted by the most relevant international organic standards. The six executive dossiers are reported in the Deliverable **D6.2 "Technical background behind the recommendations"**. Ethical considerations have been addressed in the Deliverable **D2.1 "Production issues in organic Aquaculture"**.

The outcome from WPs 2, 3, 4 and 5 have been used to support the SWOT (strength, weakness, opportunities, threats) analysis concerning some key aspects of the organic aquaculture, in view of the formulation of the recommendations. The results of the SWOT analysis are reported in a following paragraph of the present deliverable.

To focus the discussion, the recommendations have been grouped into five thematic areas: i) The institutional framework & societal expectations; ii) Production systems, iii) Environmental impacts; iv) Feed requirements; v) Fish health, welfare, veterinary treatments and biosecurity. It should also be noted that some recommendations, although included in one thematic area, are actually interconnected with other thematic areas. Furthermore, in order to reflect the complexity of the production and socio-economic issues in the organic aquaculture, some recommendations are expressed according to multiple options, each of which supported by pros and cons. Finally, it should be noted, that not all of the recommendations require revisions of the Regulation, but are intended to support and validate solutions already provided by the Regulation, or suggest support actions for the sector development.

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2. STRENGTH, WEAKNESS, OPPORTUNITIES, THREATS (SWOT) ANALYSIS

2.1. Introduction

The SWOT analysis approach has been selected, among other possible techniques, because most of the available information are qualitative, but also because the possible replacement of existing rules would require to account for a multidisciplinary approach (i.e. technical, environmental, social, as well as economic).

SWOT analysis is a structured analysis tool that is widely used in strategy formulation, taking into account internal (strengths and weaknesses) and external (opportunities and threats) factors. The external factors may include economic matters, technological change, legislation, and socio-cultural changes, as well as changes in the marketplace or in competitive positions. The SWOT model can be used in any decision-making process to ensure that the implemented strategy is appropriate to the situation described in the analysis.

In our case, SWOT model has been used to assess whether changes are possible in the European Regulation on organic aquaculture and to identify recommendations that maximise the potential of strengths and opportunities of specific rules, while minimising the impact of possible weaknesses and threats.

The SWOT Analysis was performed following a usual step process, as below outlined:

- **First step** - Characterization of the context and collation of the information necessary to drive the analysis according to the five identified thematic areas (input from WP2, WP3, WP4 and WP5);
- **Second step** - Identification of the alternatives potentially enabling the replacement of the existing rules on production methods, procedures and materials;
- **Third step** - Analysis of the external factors and identification of opportunities and threats in relation to the potential alternatives;
- **Fourth step** - Classifying/selecting internal factors that can maximise the strengths, while minimising the impact of weaknesses.

The SWOT analysis has been carried out for a selection of the key issues of the organic aquaculture, which are grouped into four thematic areas, as in the following table.

SWOT Analysis	
Thematic areas	**Key issues**
Production systems	1. Simultaneous production 2. Exceptional production rules allowing the introduction of non-organic juveniles 3. Lay down detailed rules for the organic rearing of life stages between hatching and weaning 4. Recirculation Aquaculture Systems (RAS)
Environmental impacts	1. Impact assessment supported by a Life Cycle Assessment (LCA) 2. Support the use of biodegradable or recyclable material
Feed requirements	1. Fish meal and fish oil derived from non-organic aquaculture trimmings 2. Essential amino acids produced through fermentation 3. Exceptional production rules allowing the use of

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	non-organic feed
Fish health, welfare, veterinary treatments and biosecurity	1. Setting oxygen threshold limits for best husbandry practices 2. Setting stocking density threshold limits for best husbandry practices 3. Allowing the use of oxygen beyond predefined critical periods 4. Setting threshold limits for the transport duration

The 13 key issues analysed by SWOT were selected among those considered potentially more problematic or controversial from both the i) review of the scientific knowledge on production issues (challenges and gaps) and socio-economic issues in organic aquaculture carried out in WPs 2 and 3; ii) the large debate currently ongoing among stakeholders.

In order to place the SWOT analysis in the regulatory context, each of the four thematic areas is introduced by the references to the relevant articles of the organic aquaculture Regulations.

2.2. Production systems

The organic production system, in the Commission Regulation (EC) 834/2007, is considered according to a holistic vision of the processes, that encompasses technical, economic and social aspects.

Simultaneous production of organic and non-organic livestock is allowed, under specific conditions, when a different species is involved. While, for the organic aquaculture, the simultaneous production of organic and non-organic animals of the same species is allowed when different production phases and different handling periods of the aquaculture animals are involved [art. 25(c)(1-2) Reg. (EC) n°889/2008].

As a general rule, the organic aquaculture shall be based on the rearing of young stock originating from organic brood stock and organic holdings [art. 15(a)(i) Reg. (EC) n°834/2007]. However, when organic aquaculture juvenile animals are not available, with a time-limited derogation, non-organic aquaculture juveniles may be brought into a holding. At least the latter two thirds of the duration of the production cycle shall be managed under organic management. Specifically, the maximum percentage of non-organic aquaculture juveniles introduced to the farm have been subject to a phasing out until December 31, 2016 [Reg. (EU) n° 2016/673].

For feeding larval stages of fish it was allowed to use non-organic phyto and zooplankton [Reg. (EU) n° 1358/2014]. While with reference to the life stages between hatching and weaning more detailed rules (e.g. on stocking density and rearing systems) were not adopted.

Closed recirculation aquaculture animal production facilities (i.e. RAS) are prohibited, with the exception of hatcheries and nurseries or for the production of species used for organic feed organisms [art. 25(g)(1) Reg. (EC) n°889/2008].

Artificial heating or cooling of water shall only be permitted in hatcheries and nurseries. Natural borehole water may be used to heat or cool water at all stages of production [art. 25(g)(4) Reg. (EC) n°889/2008].

The use of oxygen is only permitted, in specific exceptional cases, for uses linked to animal health requirements and critical periods of production or transport [art. 25(h)(4) Reg. (EC) n°889/2008].

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Simultaneous production (same species)	
STRENGTHS	• Allows farms with high production capacity to convert or remain in the organic system • Allows operators to try organic production, build up knowledge and experience and expand organic production when appropriate
WEAKNESSES	• Increases the risk of mixing organic and conventional individuals • Make difficult to check that it does not occur changes between conventional and organic productions
OPPORTUNITIES	• Promotes a flexible and efficient use of the production factors • Make easier to adapt the production to the market requirements
THREATS	• Might be considered a risk for the integrity of the organic principles

Exceptional production rules allowing the introduction of non-organic juveniles [Reg. CE n°834/2007 art. 22 (b)]	
STRENGTH	• Allow to ensure that organic production can be maintained when live animals are not available on the market in organic form
WEAKNESS	• Can be seen as a disincentive to bring the whole production cycle under organic management • Can be seen as a disincentive to progress with organic breeding programs aimed at selecting more adapted strains to organic farming conditions
OPPORTUNITIES	• Would facilitate the conversion to organic of farmers who do not manage the whole production cycle and rely upon the external supply of juveniles • Allow to overcome the problem of restrictions on the movement of live animals (Directive 2006/88/EC on animal health), which might occur in some cases • It would be a stabilizing factor for the market
THREATS	• Might be considered a risk for the integrity of the organic principles

Lay down detailed rules for the organic rearing of life stages between hatching and weaning (lower eggs/larvae density)	
STRENGTHS	• Is in line with the organic farming principles • Significant improvement of the fish morphological quality (e.g. lower percentage of developmental abnormalities) • Behaviour closer to wild fish individuals
WEAKNESSES	• Appropriate production methods are difficult to be validated for each species • Specific skills are needed • More space is needed for the production processes • The conversion requires significant fixed capitals and operating costs
OPPORTUNITIES	• Would meet the favour of consumers • Is in line with the organic principles about fish living conditions more close to natural

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THREATS	• Might either stop the organic production or bringing to reconsider the conversion opportunities

Recirculation Aquaculture Systems (RAS) (for on-growing stage)	
STRENGTHS	• Allow a lower water consumption • Allow more stable farming conditions and water quality
WEAKNESSES	• Energy consuming • Use of pure oxygen • "High" stocking density • In case of disease, risk of boosting prevalence
OPPORTUNITIES	• Recycling of water • Recycling/collection of waste nutrients • Prevent escapes • Minimize the environmental impact
THREATS	• Disconnected by the natural environment • Might endanger the integrity of the organic principles

2.3. Environmental impacts

Organic production is an overall system of farm management and food production that combines best environmental practices, a high level of biodiversity, the preservation of natural resources, the application of high animal welfare standards and a production method in line with the preference of certain consumers for products produced using natural substances and processes. The organic production method thus plays a dual societal role, where it on the one hand provides for a specific market responding to a consumer demand for organic products, and on the other hand delivers public goods contributing to the protection of the environment and animal welfare, as well as to rural development [Council Regulation (EC) n° 834/2007].

As it is stated above, the "best environmental practices" are considered among the pillars of the organic regulation. The specific rules with reference to the environmental issues are, instead, reported in the Regulation (EC) n° 889/2008:

- An environmental assessment proportionate to the production unit shall be required for all new operations applying for organic production and producing more than 20 tonnes of aquaculture products per year to ascertain the conditions of the production unit and its immediate environment and likely effects of its operation … the content of the environmental assessment shall be based on Annex IV to Council Directive 85/337/EEC [art. 6b (3)].
- Aquaculture and seaweed business operators shall by preference use renewable energy sources and re-cycle materials and shall draw up as part of the sustainable management plan a waste reduction schedule to be put in place at the commencement of operations. Where possible, the use of residual heat shall be limited to energy from renewable sources [art. 6b (5)].

Impact assessment supported by a Life Cycle Assessment (LCA).	
STRENGTHS	• LCA is an ISO-standardized analytical framework for evaluating the environmental impacts of products or processes

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WEAKNESSES	• Lack of defined criteria and reference points for determining what is an environmental sustainable aquaculture
OPPORTUNITIES	• Measuring, understanding and improving gas (GHG) emissions, or carbon footprint would improve long-term environmental and economic sustainability
THREATS	• Might either stop the organic production or bringing to reconsider the conversion opportunities due to the burden of administrative procedures

Support the use of biodegradable or recyclable material	
STRENGTHS	• Is in line with the organic farming principles • Is in line with the concept of sustainable aquaculture • Is the most effective way to reduce waste
WEAKNESSES	• Might result in an additional increase of production costs
OPPORTUNITIES	• Would contribute to improve overall long-term environmental and economic sustainability, besides the aquaculture sector
THREATS	• No threat envisaged

2.4. Feed requirements

According to the Council Regulation (EC) n° 834/2007, art. 15 (1)(d), the following rules shall apply to aquaculture, with regard to feed for fish and crustaceans: … animals shall be fed with feed that meets the animal's nutritional requirements at the various stages of its development.

Considering the feeding issues analysed below, the relevant implementing rules are:

- Feed for carnivorous aquaculture animals shall be sourced with the following priorities:
  (a) organic feed products of aquaculture origin;
  (b) fish meal and fish oil from organic aquaculture trimmings;
  (c) fish meal and fish oil and ingredients of fish origin derived from trimmings of fish already caught for human consumption in sustainable fisheries;
  (d) organic feed materials of plant or animal origin;
  (e) feed products derived from whole fish caught in fisheries certified as sustainable under a scheme recognised by the competent authority in line with the principles laid down in Regulation (EU) No 1380/2013 of the European Parliament and of the Council [Regulation (EC) n° 889/2008, art. 25k (1)].
- Histidine produced through fermentation may be used in the feed ration for salmonid fish when the feed sources listed in paragraph 1 do not provide a sufficient amount of histidine to meet the dietary needs of the fish and prevent the formation of cataracts [Regulation (EC) n° 889/2008, art. 25k (5)].
- Exceptional production rules related to catastrophic circumstances in accordance with article 22 (2)(f) of Regulation (EC) n° 834/2007.

  …

  In the case of high mortality of aquaculture animals caused by circumstances listed in Article 57(1)(a) to (d) of Regulation (EU) No 508/2014 of the European Parliament and of the Council, the renewal or reconstitution of the aquaculture stock with non-organic aquaculture animals, when organically reared animals are not available and provided that at least the latter two thirds of the duration of the production cycle are managed under organic management [Regulation (EC) n° 889/2008, art. 47f].

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Fish meal and fish oil derived from non-organic aquaculture trimmings	
STRENGTHS	• Does not affect wild fish populations
WEAKNESSES	• Non organic feed materials • Risk of antibiotic contamination
OPPORTUNITIES	• Allows greater flexibility in preparing diets when other more appropriate protein sources are deficient or absent from the market
THREATS	• Might be considered a risk for the integrity of the organic principles

Essential amino acids produced through fermentation	
STRENGTHS	• Allows to optimize the dietary amino acid profile of feed • Does not affect wild fish populations
WEAKNESSES	• According to the organic principles, animals should cover their need for amino acids primarily through the feed • Can be seen as a disincentive to progress with research programs on alternative (organic) protein meal (e.g. fly larvae, earthworms) • Can be seen as a disincentive to overcome legal barriers for the use of earthworms and insects as protein feed
OPPORTUNITIES	• Allows replacement of high quality fish meal • Meets fish welfare requirements
THREATS	• Might be considered a risk for the integrity of the organic principles

Exceptional production rules allowing the use of non-organic feed [Reg. CE n°834/2007 art. 22 (2)(b)]	
STRENGTHS	• Allows to optimize the feed efficiency and availability • Allows to ensure that organic production can be maintained when feed is not available on the market in organic form
WEAKNESSES	• Can be seen as a disincentive to manage the whole production cycle under organic management • Can be seen as a disincentive to progress with research programs to document the feed safety of alternative (organic) protein meal (e.g. fly larvae, earthworms) • Can be seen as a disincentive to overcome legal barriers for the use of earthworms and insects as protein feed
OPPORTUNITIES	• Would facilitate the conversion to organic of farmers who do not manage the whole production cycle and rely upon the external supply of juveniles • It would be a stabilizing factor for the market
THREATS	• Might be considered a risk for the integrity of the organic principles

2.5. Fish health, welfare, veterinary treatments and biosecurity

Organic stock farming should respect high animal welfare standards and meet animals' species-specific behavioural needs while animal-health management should be based on disease prevention. In this respect, particular attention should be paid to housing conditions, husbandry practices and stocking densities. Moreover, the choice of breeds should take into account of their capacity to adapt

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to local conditions. The implementing rules for livestock production and aquaculture production should at least ensure compliance with the provisions of the European Convention for the Protection of Animals kept for Farming purposes and the subsequent recommendations by its standing committee [Council Regulation (EC) n° 834/2007].

Considering the welfare issues analysed below, the relevant implementing rules are:
Stocking density and husbandry practices are set out in Annex XIIIa by species or group of species. In considering the effects of stocking density and husbandry practices on the welfare of farmed fish, the condition of the fish (such as fin damage, other injuries, growth rate, behaviour expressed and overall health) and the water quality shall be monitored [Regulation (EC) n° 889/2008, art. 25f (2)].

The use of oxygen is only permitted for uses linked to animal health requirements and critical periods of production or transport, in the following cases:
(a) exceptional cases of temperature rise or drop in atmospheric pressure or accidental pollution,
(b) occasional stock management procedures such as sampling and sorting,
(c) in order to assure the survival of the farm stock.
Documentary evidence shall be maintained [Regulation (EC) n° 889/2008, art. 25h (4)].

Live fish shall be transported in suitable tanks with clean water which meets their physiological needs in terms of temperature and dissolved oxygen [Regulation (EC) n° 889/2008, art. 32a (1)].

Precautions shall be taken to reduce stress. During transport, the density shall not reach a level which is detrimental to the species [Regulation (EC) n° 889/2008, art. 32a (3)].

Setting oxygen threshold limits for best husbandry practices	
STRENGTHS	• Ensuring that oxygen levels do not fall below settled threshold limits is a priority, among the husbandry practices, to ensure fish welfare
WEAKNESSES	• It is relatively difficult to check that the operator has complied, continuously, with the established threshold limits • The use and the modulation of the oxygen supply is not allowed in organic aquaculture, except in specified cases
OPPORTUNITIES	• No opportunities envisaged
THREATS	• No threats envisaged

Setting stocking density threshold limits for best husbandry practices	
STRENGTHS	• Limiting the stocking density is considered by most consumers an essential condition for organic aquaculture
WEAKNESSES	• Stocking density by itself is considered an indirect indicator of fish welfare
OPPORTUNITIES	• It is relatively easy to check that the operator has complied, continuously, with the established threshold limits
THREATS	• No threat envisaged

Allowing the use of oxygen beyond predefined critical periods	
STRENGTHS	• Allows to meet physiological requirement of fish
WEAKNESSES	• It is far from a natural condition and is not conform to the overall principle of the restriction of the use of external inputs in organic farming

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OPPORTUNITIES	• It can expand the operational range of intensive fish husbandry
THREATS	• It might represent a factor endangering the integrity of the organic principles, thus jeopardizing the consumer perception of the organic aquaculture

Setting threshold limits for the transport duration	
STRENGTHS	• Optimising the transport duration is a relevant measure to minimize fish stress.
WEAKNESSES	• Limiting the transportation distances will reduce the possibility to move fish from farm to farm (especially relevant for juveniles) • Limiting the transport duration by itself is not sufficient to ensure the minimization of the fish stress, because it should be combined with suitable stocking density and oxygen levels • Optimal duration should be determined species by species
OPPORTUNITIES	• No opportunities envisaged
THREATS	• No threats envisaged

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3. RECOMMENDATIONS

3.1. The institutional framework & societal expectations

3.1.1. Background

Organic aquaculture was regulated at EU level in 2009 after a thorough process spanning several years to streamline a number of different organic standards and national certification schemes in Europe. A common European regulation that created basic standards was highly welcomed, but also brought up many deeply problematic issues which are still not resolved.

The EU Member States are not allowed to apply stricter national regulation (specifically for the organic sector) than the rules set out in the EU organic regulation, but they are allowed to develop and apply national regulation in fields not (yet) covered by the EU organic regulation. Private national or international organic standards can be applied in the EU Member States, besides the EU organic regulation. As a minimum, the private organic standards shall fulfil the EU organic regulation but, contrary to the national regulations, the private standards may apply extra, as well as stricter rules than the EU organic regulation, also within fields that the EU organic regulation already covers. This means that organic aquaculture farmers may need to be certified not only according to the EU organic regulation but also to one or more private organic standards, depending on the market requirements, which in turn represents an increase of costs.

It is worth to mention that the current status of the EU Organic Regulation is an ongoing process of review, which was started by the Commission in late 2011 with a proposal for a new organic regulation that, following the recently implemented Lisbon Treaty rules, needs to be agreed by the so-called Trilogue (Parliament, Council and Commission).

The labelling of organic products became mandatory in July 2010. The main objective of the European logo (Euro leaf) is “to make organic products easier to be identified by the consumers. Furthermore it gives a visual identity to the organic farming sector and thus contributes to ensure overall coherence and a proper functioning of the internal market in this field”. The majority of EU consumers are, however, unaware of the organic logo. They are also unsure about the concept of organic fish farming due its overlap with private standards and several available concepts, such as sustainable, ecological, environmental friendly, etc. This is partly a consequence of the Euro-leaf not been promoted sufficiently, thus it has to compete with other eco-labels with more targeted communication strategies. Consumers also show ambivalent impressions about the placement of organic fish between wild fish and farmed fish.

The certification and control system in the European regulation on organic farming, including organic aquaculture, is quite complicated and implementation differs between Member States, which may apply one of the following three types of certification systems: a) private approved inspection bodies; b) designated public inspection authority(ies); c) mixed system between the two. This complex certification and control system may have had a negative impact on the free exchange of organic products in Europe. Furthermore, the related accreditation and certification costs may be quite expensive, especially where the market requires certification according to one or more private standards in addition to the EU organic regulation certification.

Organic imports from third countries represent an important part of organic products consumed in most EU member states. This is true also for organic aquaculture products. The import regime has undergone several changes over time. Currently, the following two options are provided by the regulation to import organic products from third countries to EU:

1. The EU Regulation on Organic Agriculture is applied in the third country exactly as in the EU member states, i.e. the products are “compliant” with the European Regulations. The

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Commission will establish a list of recognised "compliant" control bodies authorised to carry out inspections and issue certificates in third countries. But, this option has not yet been implemented by the EU Commission.

2. The production standards and control measures in the third country are "equivalent" to the European Regulations. In this case, the EU has established a list of recognised third countries and a list of recognised control body issuing the certificate.

However, following the on-going process of revision of the EU organic regulation the imports system could undergo further modifications, which implies the persistence of a situation of uncertainty on the exchange of organic products.

Price is one of the major barriers for increased consumption of organic fish. Cost prices for organic aquaculture production can rise by about 20% to 50%, depending on species and production region. Generally, the feed costs are responsible for the largest contribution to the higher cost price of organic production, followed by the costs for juveniles (if available) and the costs for the fixed assets. A cost analysis of the supply chain showed, however, that the consumer prices are influenced not only by the costs of organic fish production on farm level, but also by the margins for processing and retailing.

Retailers throughout Europe could play a pivotal role in the development of the market for organic aquaculture products. To what extent the retailer chains are willing to foster organic aquaculture differs significantly among countries and groups. As long as the European organic aquaculture market will not exceed a critical threshold, other standards, which are better known or have lower costs, will continue to be serious competitors of the organic aquaculture.

3.1.2. Recommendations

I. The organic aquaculture should be considered as a food production method in line with the preference of certain consumers for products produced using natural substances and processes. The organic aquaculture thus should play a dual societal role: on one hand it provides for a specific market, responding to a consumer demand for organic products, and on the other hand it delivers public goods, contributing to the protection of environment and animal welfare.

II. Establishing and/or reinforcing European and National support actions to programs for developing organic aquaculture is important to facilitate for organic production and marketing.

III. A targeted communication strategy to ensure an increasing consumer awareness, familiarity and knowledge on the organic aquaculture product qualities should be part of the support actions, in order to develop and maintain consumer confidence in organic products.

IV. A further development of the risk based inspection systems, by supporting a weighted approach to the risk of occurrence of non-compliances, in relation to the impact severity on the market and on consumer trust, would be highly recommendable.

V. A further harmonization of terms and definitions used in the EU organic regulation, as well as types of non-compliances and appropriate sanctions to be given at different levels of non-compliances, would enhance the transparency and the strengthening of the organic system.

VI. Collection of relevant statistics, exchange of information and knowledge regarding organic aquaculture production, should be promoted in order to reach a good understanding of the functioning of the regulation and hence identify successes and decide on policies to promote organic production.

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VII. Situations of uncertainty or questionable interpretation, regarding production rules and control provisions, which may create a lack of trust and investments, should be kept to a minimum and resolved in the shortest possible time.

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3.2. Production systems

3.2.1. Background

According to the Commission Regulation (EC) 834/2007, art. 11, a holding may be split up into clearly separated units or aquaculture production sites which are not all managed under organic production. As regards animals, different species shall be involved. As regards aquaculture the same species may be involved, provided that there is adequate separation between the production sites. This chance, granted only to aquaculture, has been much debated among stakeholders, who were very concerned about the possible repeal or modification of this opportunity. The justification for this alarm lies mainly in the considerable length of the production cycle and in the high average dimension of the aquaculture farms, which would not allow a full conversion without bearing excessive production and market risks.

According to the Commission Regulation (EC) n° 889/2008, for on-growing purposes and when organic aquaculture juvenile animals are not available non-organic aquaculture juveniles may be brought into a holding. At least the latter two thirds of the duration of the production cycle shall be managed under organic management. However, the maximum percentage of non-organic aquaculture juveniles introduced to the farm has been subject to a phasing out until December 31, 2016 [Reg. (EU) n° 2016/673]. The phasing out of non-organic aquaculture juveniles has generated alarm among organic aquaculture farmers, moreover it was judged inopportune by the International Federation of Organic Agriculture Movements (IFOAM) and by the Federation of European Aquaculture Producers (FEAP) (cfr. Deliverable D6.3 Policy Implementation Plan), and has also raised the perplexities of some national authorities. The alarm and the perplexities are motivated primarily by the scarcity and/or absence of organic juveniles, as well as by the absence of an institutional procedure to ascertain the availability and amount of organic juveniles of the different species. Actually, it is not clear why there are so few hatcheries permanently converted to organic production, since it does not appear to be significant barriers to the acquisition of organic certification. Indeed, the Commission Regulation (EC) No 889/2008 seems to overlook specific organic rules for managing the early life stages of fish, apart from some issues related to the preparation of weaning feeds, particularly for marine species. Some further insight about this topic are reported in the Executive Dossier “Breeding practices and origin of organic aquaculture animals” (D6.2).

As stated above the Commission Regulation (EC) No 889/2008 seems to overlook specific organic rules for managing the early life stages of fish, which was considered a shortcoming by some national authorities and by IFOAM. If it is deemed appropriate to overcome these gaps, then the recommendations outlined by the Expert Group for Technical advice on Organic Production (EGTOP) are to be considered a reasonable solution (cfr. Final Report on Aquaculture - Part B). It is worth noting that, in this case, the problem of shortage and/or lack of juveniles would see a further exacerbation.

According to the Commission Regulation (EC) n° 889/2008, art. 25g, closed recirculation aquaculture animal production facilities are prohibited, with the exception of hatcheries and nurseries or for the production of species used for organic feed organisms. Even this issue has been widely-debated between stakeholders, up to register an irreparable division within the CODEX Committee meeting held in Ottawa in May 2016. Compliance with this rule is considered a non-derogable principle, especially in Europe. However, an alternative strategy may be envisaged in the “re-use of water” which, to some extent, combines the advantages of both flow through systems and recirculation aquaculture systems (RAS), without compromising organic principles (cfr. Executive Dossier Production systems).

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3.2.2. Recommendations

I. The rearing of organic and non-organic fish, of the same species, in the same production units should continue to be allowed, even though separation criteria might be further detailed in the Regulation.

II. The ban on using hormones is an important principle of organic farming, in order to maintain consumer confidence in organic products.

III. A database should be established in each country for recording information on the availability of eggs and juveniles produced under organic management. The database might be centralized or might be managed by the competent authority of each Member State or by a body designated for this purpose by the competent authority.

IV. Operators must use the database if the species they require is listed in such database. Exceptional permissions to use non-organic juveniles should be granted by the competent authority of each Member State when organic aquaculture juvenile are not listed in the database. In this case, at least the latter two thirds of the duration of the production cycle shall be managed under organic management.
Pros. *No farmers will be forced to give up the organic production, taking on significant economic and reputational damages.*
Cons. *There is a risk of slowing down the process towards establishment of a suitable number of aquaculture farms producing juveniles under organic management.*

V. The promotion of specific breeding programs for organic aquaculture would be highly recommendable for the purpose of a more efficient selection of key traits, such as growth, feed conversion and disease resistance, which allow to obtain family lines more adapted to organic aquaculture conditions. This, in turn, would also enhance the actual applicability of the organic principle for which the whole production cycle should be run under organic management.

VI. The life stage between hatching and weaning should take place, preferably, in “mesocosm” or “large volume rearing” that means low intensity systems more close to nature, with the initial eggs/larvae density lower than in the intensive systems (Technical details can be find in the Executive Dossier Breeding practices and origin of organic aquaculture animals).
Pros. *A shortcoming in the EU Regulation will be overcome.*
Cons. *The problem of shortage and/or lack of juveniles might be further exacerbated.*

VII. Systems fully in line with the organic principles are “polyculture”, where two or more species, usually from different trophic levels, are reared together. A further system, which is based on the same concept, is the so called Integrated Multi-Trophic Aquaculture (IMTA), where fish farming is carried out in combination with molluscs and/or seaweed and/or other invertebrates.

VIII. According to the organic principles, production shall be based on the appropriate design and management of biological processes based on ecological systems using natural resources, which are internal to the system. Therefore, closed recirculation aquaculture animal production facilities should continue to be prohibited, with the exception of hatcheries and nurseries or for the production of species used for organic feed organisms.

IX. However, due to the limitations of water resources, the reuse of water is a desirable ecological practice in organic aquaculture and a responsible use of resources. The re-use of water is an alternative strategy which, to some extent, combines the advantages of both flow

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through systems and RAS, without compromising organic principles. Such re-use of water means a kind of non-intensive recirculation, in out-door systems.

X. Artificial heating or cooling of water shall continue to be permitted only in hatcheries and nurseries.

XI. The use of oxygen shall continue to be permitted only in specific exceptional cases, for animal health requirements and critical periods of production or transport. Under no circumstances will it be used to support higher stocking densities than those allowed by the natural environment.

XII. In the organic aquaculture, the production cycle cannot take place entirely in indoor facilities. The on-growing phase should take place in outdoor facilities.

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3.3. Environmental impacts

3.3.1. Background

The rationale behind organic food production is to minimise the impact of the production on the environment. The global food sector is currently responsible for around 30% of the world's energy consumption and contributes to more than 20% of the global greenhouse gas emissions. However, in recent years there is an increasing interest for developing models, metrics and tools to measure environmental impact. The main purpose of environmental indicators is to summarise the complexity of our environment, providing a manageable amount of meaningful information, which would allow decision-makers to take actions in view of a more sustainable food production.

The Commission Regulation (EC) n° 889/2008, in order to reduce the impact of the organic farms on the surrounding environment, for all new operations, require an environmental assessment proportionate to the production unit, which is based on Annex IV to Council Directive 85/337/EEC. Furthermore, the operators shall provide a sustainable management plan proportionate to the production unit for aquaculture and seaweed harvesting. The plan shall be updated annually and shall detail the environmental effects of the operation, the environmental monitoring to be undertaken, and list measures to be taken to minimise negative impacts on the surrounding aquatic and terrestrial environments, including, where applicable, nutrient discharge into the environment per production cycle or per annum. Environmental assessment and sustainable management plan are considered an effective way to minimize the environmental impacts. Whereas, the obligation to perform a periodic LCA would result in excessive bureaucracy and economic burden. What, however, should be strengthened are the quality checks on these documents, as well as the competences of the staff of the control bodies.

3.3.2. Recommendations

I. The provisions set out in the Regulation n°889/2008, art. 6b(5), about renewable energy sources, re-cycle materials and waste reduction schedule should be reinforced. In addition, specific rules on the use of biodegradable materials and sustainable packaging should be introduced in the regulation.

II. In order to achieve the objective of reducing the impact of the organic farms on the surrounding environment, it is relevant to identify suitable diets in which the protein component is less dependent on trimmings.

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3.4. Feed requirements

3.4.1. Background

According to Commission Regulation (EC) n° 889/2008, feeding regimes shall be designed with the following priorities: a) animal health; b) high product quality, including the nutritional composition which shall ensure high quality of the final edible product; c) low environmental impact.

It is a fact that fish meal of high quality provides a balanced amount of all essential amino acids, minerals, phospholipids and fatty acids in the normal diet of fish, and hence secure high utilization by the fish and minimum discharge of nutrients to the environment.

The art. 25K of the EU Regulation n° 889/2008 states that fish meal and fish oil from trimmings should be prioritized as ingredient for feed for aquaculture animals. However, sourcing fish meal and fish oil from trimmings might conflict with national environmental legislations, because of the higher phosphorus concentrations and the lower content of protein in comparison with high quality fish meal. Furthermore, replacing fish meal in diets for salmonids and marine species is not straightforward due to their unique contents of protein, excellent amino acid profile, high nutrient digestibility, high palatability, adequate amounts of micronutrients, as well as general lack of anti-nutrients. Moreover, compared to salmonids, protein requirements of sea bass and sea bream are higher, reflecting their highly carnivorous nature.

Indeed, high replacement by plant proteins is challenging due to problems related to the anti-nutrient factors, altered patterns of amino acid uptake and impairment of immune competence. High replacement ratios would require that anti-nutrients factors are efficiently removed from alternative plant protein ingredients and that the dietary amino acid profile is optimised, for example, by adding free amino acids. However, it is also important to keep focus on human health related to consuming (organic) aquaculture products, including high content of long chain omega-3 fatty acids (EPA and DHA), currently sourced from fish oil.

There are several other potential feed ingredients, such as microbial organisms (bacteria, fungi, microalgae), terrestrial animal by-products (PAP, blood meal), wild-harvested and/or cultured annelid worms, insect larvae/pupae, gastropods (e.g. golden apple snail). A special aspect of some of these products is that they can be produced with different kinds of waste as raw material, and thus contribute to recycling of valuable nutrients.

Although, over the last decade, a number of studies on the replacement of fish meal with other sources of protein in the diet of fish have emerged and the results are encouraging, it is still necessary to intensify efforts in research and experimentation to overcome technical drawbacks and legal barriers for the use of alternative protein feed.

For further insight, see the Executive Dossier Feed for fish and crustaceans.

3.4.2. Recommendations

I. In the larval rearing of organic juveniles, conventional phytoplankton and zooplankton may be used as feed, until better alternatives have been developed.

II. The items listed in the art. 25K of the EU Regulation n° 889/08 should not be intended as an order of priority but as a list of priorities.

III. The need for protein and lipids in the diet of fish and shrimps depends on their life stages: the early life stages are much more demanding in protein and lipids. Therefore, the limits introduced by the EU Regulation n° 889/08 to the amount of proteins and lipids should be considered appropriate only for the grow-out stage.

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IV. Histidine produced through fermentation may be used in the feed ration for salmonid fish when other feed sources do not provide a sufficient amount of histidine to meet the dietary needs of the fish and prevent the formation of cataracts.

V. Essential amino acids produced through fermentation may be used in the feed ration for carnivorous fish when other feed sources do not fulfil the qualitative dietary needs or are not available. Operators shall keep documentary evidence of the need to use amino acids.

VI. In relation to the point V above, and to overcome shortcoming related to feed for weaning marine species, the art. 22 (2)(b) of the Reg. CE n° 834/2007 might be activated.

VII. Research and experimentation about alternative sources of protein and lipids for organic aquaculture feed should be promoted and prioritized.

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3.5. Fish health, welfare, veterinary treatments and biosecurity

3.5.1. Background

Among public and governments, there is an increasing interest in the welfare of farmed fish. In addition, among farmers, there is growing awareness that good welfare equates to increased success of production activities. Indeed, from a practical point of view, production efficiency, quality and quantity are often coupled with good welfare.

According to Commission Regulation (EC) N° 889/2008, the husbandry environment of the aquaculture animals shall be designed in such a way that, in accordance with their species specific needs, the aquaculture animals shall be kept in water of good quality with sufficient oxygen levels; shall be kept in temperature and light conditions in accordance with the requirements of the species and having regard to the geographic location. Furthermore, in considering the effects of stocking density on the welfare of farmed fish, the condition of the fish (such as fin damage, other injuries, growth rate, behaviour expressed and overall health) and the water quality shall be monitored.

Rearing density in aquaculture has raised preoccupation with respect to welfare, due to public concern about the welfare of farmed fish. Indeed, rearing density encompasses a complex web of interacting factors, such as water quality, social interactions, fish to fish interaction and fish to housing interaction that can have an effect on many aspects of welfare. Therefore, a combination of welfare indices (e.g. behavioural and water quality monitoring) would be a better way to ensure fish welfare in aquaculture than monitoring just one index.

The stocking density is a parameter that can be documented and controlled. However, it is considered only an indirect indicator of fish welfare. Therefore, the compliance with stocking density threshold values in combination with the relevant water quality parameter, e.g. oxygen and carbon dioxide concentrations would make the fish welfare conditions more reliable in the rearing environment (cfr. Executive Dossier Welfare, disease prevention and veterinary treatment).

In case of fish transport from farm to farm, in order to minimize the stress condition, threshold values should be established for the oxygen and carbon dioxide concentration. The optimal duration of transport, between the change of water, should be further investigated, species by species.

In recent years experimental evidence and studies of probiotics and herbal medicine is increasing, and the first results seem to confirm their effectiveness in the prevention and management of diseases affecting aquatic animal breeding. The use of these substances is permitted in accordance with article 25(t) of Regulation 889/2008, but does not describe in what way they are to be administered and whether they are authorized. Therefore, it might be appropriate to make a list of such microorganisms and plants, which can be used in the composition of the feed, for example, as shown in the register of animal feed additives of the Annex to Regulation 2003/1831 (extracts and microorganisms).

Plants and plant bio-actives might be proposed in aquaculture primarily as feed additives or immuno-stimulants, rather than therapeutics, because the registration of herbal remedies to be used in this field is a time-consuming process and implies higher economic costs.

The extracts of several plants have been tested to prove their effectiveness against diseases, particularly if they are effective against bacteria, such as Aeromonas sp., Vibrio sp., other microorganisms, viruses, fungi and parasites. The main plants tested are: Solanum trilobatum, Andrographis pani culata, Psoralea corylifolia, Astragalus membranaceus, Portulaca oleracea, Sophora flavescens, Zingiber officinale, Allium sativum, Origanum vulgare, Azadirachta indica, marine algae, Rhodophyceae, Achyranthes aspera, Angelica sinensis, Cynodon dactylon, Echinacea purpurea, Massa medicated, Punica granatum, Solanum nigrum, Whitania somnifera, Zataria multiflora.

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The most tested probiotics which have given the best results in the trials were microalgae (Tetraselmis), yeasts (Debaryomyces, Phaffia, Saccharomyces), Gram-positive bacteria (Bacillus, Lactococcus, Micrococcus, Carnobacterium, Enterococcus, Pediococcus, Lactobacillus, Streptococcus, Weissella) and Gram-negative bacteria (Aeromonas, Alteromonas, Pseudomonas, Vibrio).

3.5.2. Recommendations

I. Stocking density, oxygen concentration, and husbandry practices are set out in Annex XIIIa, of the Commission Regulation (EC) No 889/2008, by species or group of species. In considering the effects of stocking density and husbandry practices on the welfare of farmed fish, the condition of the fish (such as fin damage, other injuries, growth rate, behaviour expressed and overall health) and the water quality shall be monitored.

II. Precautions shall be taken to reduce the fish stress during transport. Stoking density, concentrations of oxygen and CO_2 during the transport should be detailed in the regulation.

III. Threshold limits of oxygen concentration should be set out in Annex XIIIa as follows: marine fish above 80% saturation; salmonids above 70% saturation; carp above 50% saturation.

IV. Threshold limits of oxygen and carbon dioxide concentration, during transport, should be set out in Annex XIIIa as follows: all species in the range 100-130% O_2 saturation; marine fish less than 10 mg/l CO_2; salmonids less than 8 mg/l CO_2.

V. Because the use of oxygen, in organic aquaculture, is permitted only in specific exceptional cases, for animal health requirements and critical periods of production or transport, stocking density should rely only on the water quality, an appropriate flow rate and the aeration provided by mechanical aerators, under the condition that they are, preferably, powered by renewable energy sources.

VI. Plants and plant bio-actives might be proposed in aquaculture primarily as feed additives or immuno-stimulants. It would be appropriate to make a list of such microorganisms and plants, which are authorized and can be used in the composition of the feed.

VII. The development of non-antibiotic and environmentally friendly agents is one of the key factors for health management in organic aquaculture. As natural products, probiotics have much potential to increase the efficiency and sustainability of aquaculture production. Therefore, comprehensive research to fully characterize the intestinal microbiota of prominent fish species, mechanisms of action of probiotics and their effects on the intestinal ecosystem, immunity, fish health and performance holds great potential.

VIII. However, when despite the measures for preventing diseases a health problem arises, chemically synthesised allopathic veterinary medicinal, including antibiotics, may be used under strict conditions. In such case, allopathic treatments are limited to two courses of treatment per year. In the case of a production cycle of less than a year the limit of one allopathic treatment is applied.

IX. Good hygiene practices and farm management prevent the onset of diseases. There is currently no European guidelines on biosecurity in animal husbandry, but some are set at national level for certain species. It would be appropriate to recognize biosecurity measures at European level.

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