integrate

Integrate Aquaculture: an eco-innovative solution to foster sustainability in the Atlantic Area

Guiding expert knowledge towards identifying best-practice in IMTA in the European Atlantic Area. Examples from land-based IMTA in southern Spain and Portugal

CTAQUA training material part two

Interreg Atlantic Area
European Regional Development Fund

EUROPEAN UNION

November 2019

1. Introduction

In the first part of CTAQUA's course on land-based Integrated Multi-trophic Aquaculture (IMTA) systems, and specifically focused on earthen pond systems…

Following the presentation of the systems themselves, in this second part of the course, we will present a methodology used to reach the following goals:

1. Definition of Best practices (BP) in IMTA

a. Identification of theoretical concepts

b. Prioritising the theoretical concepts

2. Bottle necks for the development of BP in IMTA

a. Identification of bottle necks

b. Prioritising the bottle necks

3. Priority areas for the development of BP in IMTA

a. Identification of priority areas

b. Prioritising priority areas

Interreg Atlantic Area European Regional Development Fund
EUROPEAN UNION
integrate

2. Learning objectives

01 Understanding the bottle necks of each of the four roundtable themes

02 Understanding the priority areas identified with each of the four themes

03 Understanding best practice in IMTA in southern Spain

04 Understanding the methodological approach applied

Interreg Atlantic Area
European Regional Development Fund
EUROPEAN UNION
integrate

3. Rationale

In order to foster cooperation in the Atlantic Area and promote the industrial transition towards Integrated Multi-Trophic Aquaculture (IMTA), it is essential to understand the knowns and unknowns of IMTA in each participating country. Based on a desk-based study presenting the current State-of-the-Art, it is essential to test this theoretical framework against expert knowledge from a broad range of sectors and disciplines, in order to develop the concept of best practice for IMTA in each Atlantic Area country. In a subsequent step, the results obtained will be synthesized into best practice of IMTA in the Atlantic Area as a whole.

4. Methodology

Within the INTEGRATE Project, each participating Atlantic Area country hosted four or five expert roundtables to discuss the following aspects of IMTA: technical, social, environmental and economic (and legislative).

Key experts were selected based on the sector that they represent, including industry, academia, and administration, in order to obtain all points of view on the specific aspects during each roundtable.

In CTAQUA's case, we applied an adaptation of the Blue Slip method, developed by Dale Clawson and Rolf Smith in the innovation office of the Air Force of the United States. This technique guides participants in creative, yet structured brainstorming with the aim of obtaining focused results in a limited amount of time.

Interreg Atlantic Area
European Regional Development Fund
EUROPEAN UNION
integrate

4. Methodology continued

In the first roundtable, this involved individual responses followed by group discussions. In the proceeding three roundtables, we optimised this approach by starting with small groups of 2 or 3 participants, as opposed to individual responses. In this latter case, creativity among the participants is stimulated, conclusions are focussed, thereby optimising time and effort invested in the exercise. Furthermore, the participants were asked to prioritise/score their responses from 1: low priority to 5: high priority.

The groups were given a sheet of paper with 1 question per group. The groups were then given 8 minutes to discuss among themselves and additional 2 minutes to write down their group reply before passing the sheet of paper to the group on their right. This continued until all questions had been answered by all groups.

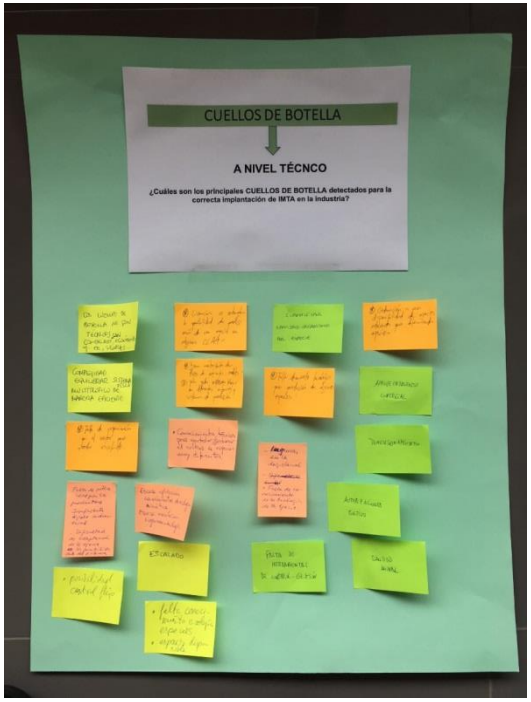
Following this exercise, the answers were collected in a PowerPoint slide and presented to the whole group for general discussion and main conclusions were agreed on.

ROUNDTABLE: TECHNICAL ASPECTS

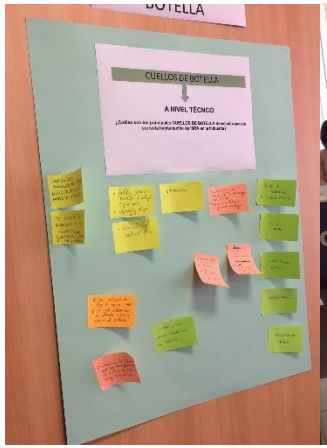
March 22nd 2018

Participants: three researchers from the public sector, including academia, government institutes and administration; four participants from the private sector, including industry and business organizations; and three participants from CTAQUA

ROUNDTABLE: TECHNICAL ASPECTS



In this roundtable, the participants were given post-its to write down their single responses, which were then posted on one large sheet of paper per question. During the ensuing group discussions, the answers were consolidated in a PowePoint slide and main conclusions reached.



Interreg Atlantic Area
European Regional Development Fund
EUROPEAN UNION
integrate

ROUNDTABLE: TECHNICAL ASPECTS
Results

1. Definition of Best practices (BP) in IMTA

(a) Identification of theoretical concepts

1 SPECIES AND TROPHIC LEVELS

- Species selection
- 2 or more aquaculture species from different trophic levels
- Autochthonous species
- Commercial species with economical value
- Low trophic level species (primary producers)
- Flow and nutrient incorporation by trophic levels (=2?)
- Good representation of the different trophic levels
- Trophic level and facilities sizes
- Similar ecological requirements
- Adequate species players/mix/combination (not polyculture)
- Production plan staggered and integrated by species
- Good adaptation
- Good ratio of each component

2 NUTRIENT INPUT/OUTPUT FLOWS

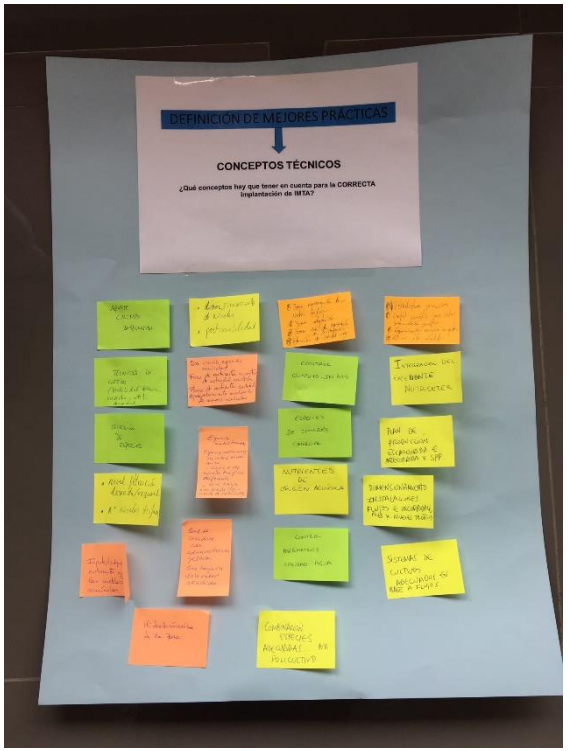
- Nutrient fluctuation from aquaculture activity
- Controlled nutrient flow
- Graded use of aquaculture inputs
- Different sources of nutrients
- Monitoring of outputs/inputs
- Nutrients from aquaculture sources
- Physico-chemical monitoring of the water quality
- Inputs/outputs of allochthonous nutrients
- Hydrodynamic of the site
- Flow and absorption by trophic level
- Integrated absorption of the nutrients excess
- Adequate culture system based on nutrient flow

Interreg Atlantic Area
European Regional Development Fund
EUROPEAN UNION
integrate

ROUNDTABLE: TECHNICAL EXPERTS ASPECTS
Results

1. Definition of Best practices (BP) in IMTA

(a) Identification of theoretical concepts



3 AQUACULTURE TECNIQUES
- Estimation of the biomass
- Technical viability, harvesting, density
- Manageable
- Coordinated with administrative sectors
- Desirable/required filtration level

4 QUALITY
- Contribution to the environmental quality
- To have a clear added value
- Maximise the added value
- Genetic control to avoid genetic contamination

Interreg Atlantic Area
European Regional Development Fund
EUROPEAN UNION
integrate

ROUNDTABLE: TECHNICAL ASPECTS
Results

2. Bottle necks for the development of BP in IMTA

(a) Identification of bottle necks

1 LACK OF KNOWLEDGE

- In ecology and biology of the aquatic species
- In animal health and welfare
- Technical knowledge to manage and monitor multi-trophic aquaculture species/systems
- Lack of experience in the sector to address the scale

2 LACK OF TECHNOLOGY

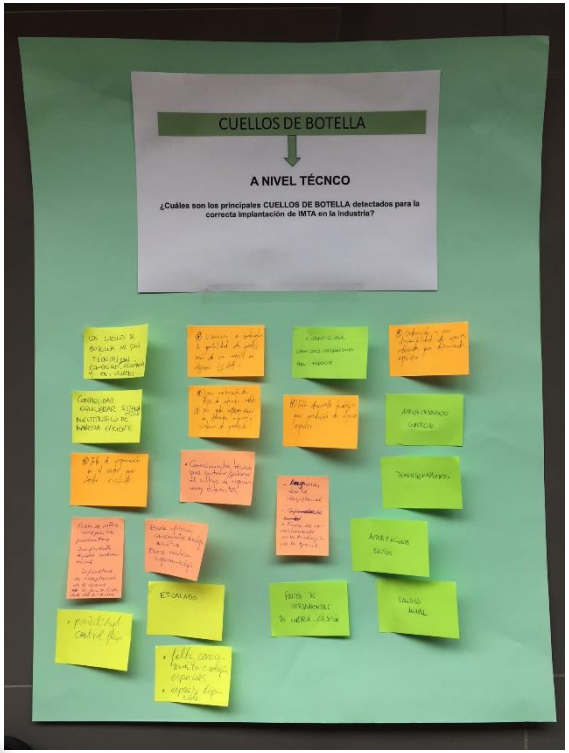
- Lack of tools for monitoring and managing
- Monitoring flow possibilities
- Good flow monitoring of nutrient
- Lack of development for the production of some species
- Quantify the number by species
- Difficulties in adaptation for some species in the system
- Modelling to work in different environments and production systems
- Poor link in between engineering and ecology
- Complexity of balancing multi-trophic physical systems efficiently
- Dimensions or scales

Interreg Atlantic Area
European Regional Development Fund
EUROPEAN UNION
integrate

ROUNDTABLE: TECHNICAL ASPECTS
Results

2. Bottle necks for the development of BP in IMTA

(a) Identification of bottle necks



3 ADMINISTRATIVE ISSUES

- Cultivation authorizations
- Management: low availability of adequate locations for certain species
- Gaps in legislation
- Licenses do not contemplate the possibility of producing more than one species in some Autonomic Communities

4 OTHERS

- Commercial exploitation
- Lack of interest by the farmers
- Insufficient industrial sector
- General consensus that main bottlenecks are not technical, but rather commercial, economic and social

ROUNDTABLE: TECHNICAL ASPECTS
Results

3. Priority areas for the development of BP in IMTA

(a) Identification of priority areas

1 RESEARCH
- Macroalgae cultivation in industrial scale
- Improvement of applied scientific knowledge
- Impact of nutrients on primary producers
- Improve technical knowledge of how to the species
- Research on the aquatic species involved
- Research on final/processed products (value of the biomass)
- Improving animal health through feed

2 TECHNOLOGY
- Systems definition
- Tools for system management and monitoring
- Improve control of water quality and diseases
- Development of new species (production technology)
- Adequate species selection
- Improve productive cycles by species
- Define relationships between trophic levels
- Transfer production techniques to the industry

3 STRATEGY AND MARKET
- Green, eco-labels
- Marketing strategy (consumers)
- Work for the value perception of IMTA products in the market (promote added value)
- Awareness raising of the advantages of IMTA: product quality, environmental mitigation

Interreg Atlantic Area
European Regional Development Fund
EUROPEAN UNION
integrate

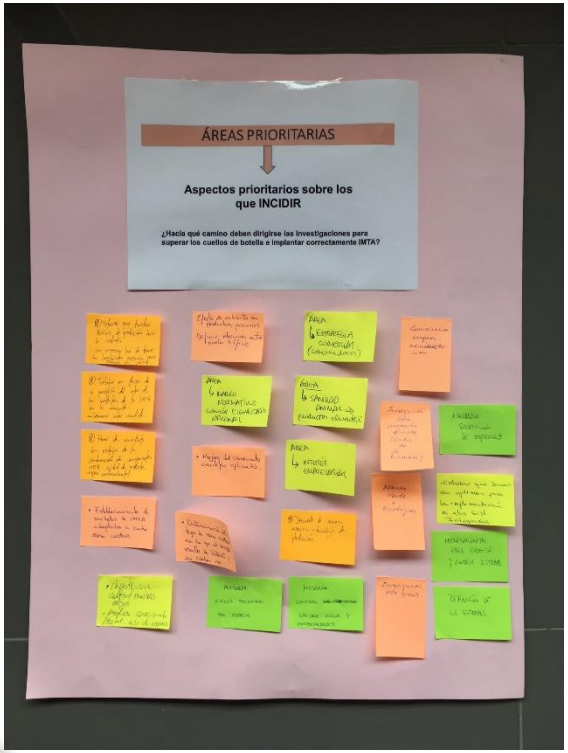
ROUNDTABLE: TECHNICAL ASPECTS
Results

3. Priority areas for the development of BP in IMTA

(a) Identification of priority areas

4 IDEAL AREAS
- Establishment of IMTA models adapted to each coastal zone
- Study which areas and scales are optimal for the implementation of these integrated systems

5 ADMINISTRATIVE ISSUES
- Lack of interest in the industry from administration
- Lack communication between industry and administration
- Lack of standardised national framework
- Lack of necessary tools available to companies to work in IMTA



ROUNDTABLE: TECHNICAL ASPECTS

Conclusions

Best practice in IMTA:

- Rationale needed for adequate representation and scaling of the different trophic levels; e.g. how much surface is required for seaweed cultivation in in IMTA system
- Correct design of flows that allows a control and a level of filtration required
- Importance of species selection in order to provide added value

Main bottlenecks to implementation:

- lack of scientific knowledge; i.e. of the biology and ecology of certain species
- Lack of technical knowledge and of tools for the control and management of IMTA activities
- Administrative issues need to be further clarified

ROUNDTABLE: TECHNICAL ASPECTS

Conclusions

Priority areas:

- Improvement of scientific and technical knowledge in IMTA through investment in research at both the biological level of the species and the technical level, i.e. through development of tools to improve the management and control of the system; modelling of IMTA according to its different areas of application. Adequate modelling will allow the implementation of an integration of different companies that specialise in the production of each of the components of the same IMTA production (fish, molluscs, algae, benthic crops, etc.). In order to achieve this, improvement of the current knowledge of the IMTA-ecosystem interactions is necessary.
- Improvement of marketing and communication strategies
- Liaison with the administrative level and development of suitable administrative tools

ROUNDTABLE: SOCIAL ASPECTS

March 25th 2019

Participants: four participants from public administration; four participants from the private sector; and three participants from CTAQUA

Interreg Atlantic Area
European Regional Development Fund
EUROPEAN UNION
integrate

ROUNDTABLE: SOCIAL ASPECTS
Results

1. How can we capitalize on the benefits of IMTA? (i.e. market acceptability, ecolabels / certification, etc.)

- Corporate social responsibility
- Awareness through the dissemination of the benefits of IMTA (training centres and universities, consumer information, campaigns from the administration, media including social networks)
- Marketing or "Communication" of the benefits
- Generation of employment
- Reduction of environmental taxes and others
- Priority access to concessions and authorizations and / or the possible reduction of administrative procedures
- Priority in the processing of subsidies for specific support for this type of aquaculture.
- Carbon sequestration and impacts on the carbon footprint, although more studies are needed to measure this removal
- Creation of an ecolabel that differentiates IMTA from conventional aquaculture.

ROUNDTABLE: SOCIAL ASPECTS
Results

2. To what extent can legislation support or obstruct the development of good practices in IMTA?

A SUPPORT

- Direct financial and compensatory aid or tax reductions, also environmental
- Differential support or prioritization of aquaculture initiatives following IMTA principles as long as good practices are demonstrated, as well as the objectives
- Prioritization of IMTA best practice in all existing sectorial regulatory frameworks
- The Andalusian model as an example: in order to promote it in Decree 58/2017, of April 18, which regulates marine aquaculture in Andalusia, this type of aquaculture is already contemplated (specific definition and zoning), as well as in the European Maritime and Fisheries Fund (EMFF)
- Delimiting areas suitable for cultivation integrated with other coastal practices according to the principles of Marine Spatial Planning
- Limiting pollution that reaches culture areas - legislation associated with agricultural and livestock practices

B OBSTRUCTION

- Further studies required to better define the benefits
- Pilot actions must be carried out to learn about technical measures to be applied and promote R & D & I
- Further studies of the impacts on human and environmental health required
- Clear determination and communication of Maximum Contaminant Levels (MCLs) in the water and contents in the cultivated species
- Limit IMTA to local species, avoiding the introduction of exotic or invasive species and their pathogens

ROUNDTABLE: SOCIAL ASPECTS
Results

3. What should be taken into account when defining good practices in IMTA systems?

- Integration with the landscape and the environment
- Creation of high quality jobs
- Promotion of new economic activities
- Obtaining healthy and safe products with high quality organoleptic values
- Promote local economy and rely less on imports
- Improvement of aquaculture products
- Activity open to society through visits, demonstrations, tastings, etc.
- Compatible or synergistic with other activities (tourism, gastronomy, crafts, etc.)
- Economically profitable
- Process strictly controlled at both technical level and cultivated species
- Adaptable and / or compatible with the diverse and broad existing regulations (product quality, food safety, animal welfare, environmental management, sustainability and social responsibility)

Interreg Atlantic Area
European Regional Development Fund
EUROPEAN UNION
integrate

ROUNDTABLE: SOCIAL ASPECTS
Results

4. Can adequate communication of the environmental benefits of IMTA result in an increase in the consumption of products derived from these methods?

- Yes, although a real involvement of the stakeholders from relevant sectors would be necessary for the message to reach the consumer (controlled and "harmless" products, respectful of the environment, etc.)
- Although it is a cost intensive and complex process, it may be useful to develop an ecolabel for products from IMTA systems or seek alliances with owners of existing certification schemes

Interreg Atlantic Area
European Regional Development Fund
EUROPEAN UNION
integrate

ROUNDTABLE: SOCIAL ASPECTS

Conclusions

Implementation and development of an economic activity such as aquaculture will have a series of direct and indirect implications on the marine and social environment, thus rendering it a costly and complex process.

During this roundtable, although the magnitude and scope that this type of aquaculture could have on society was shown, the most relevant aspects that could promote or hinder the correct development of IMTA in Spain have been detected, structured and defined.

Three clear pillars have been defined on which acceptance of IMTA would depend, i.e. legislation, which would require greater progress in technical and economic knowledge of this type of aquaculture, food safety and security, employment and acceptance by the end consumer.

Interreg Atlantic Area
European Regional Development Fund
EUROPEAN UNION
integrate

ROUNDTABLE: SOCIAL ASPECTS

Conclusions

Although it is true that at a technical and economic profitability level we need to gather more experience in IMTA practices in order to promote a wider scale industrial implementation, for the promotion of IMTA products among consumers, as well as guarantee of an extensive control of the process, the use of new or already existing certification standards have been proposed as a suitable option.

According to the progress made to date in the framework of the project, for the specific case of Spain, Integrated Multi-Trophic Aquaculture is presented as a complex production method *per se*, which covers and intertwines such a variety of aspects to be taken into account (social, environmental, technical, economic and regulatory), that it is necessary to first see it as a whole and then to be able to disentangle and regroup all the aspects or conclusions obtained from the different points of view of the different experts who have participated in these roundtables.

ROUNDTABLE: ENVIRONMENTAL ASPECTS

March 27th 2019

Participants: Four participants from the public sector, including administration and academia; One participant from the private sector; Three participants from CTAQUA

ROUNDTABLE: ENVIRONMENTAL ASPECTS
Results

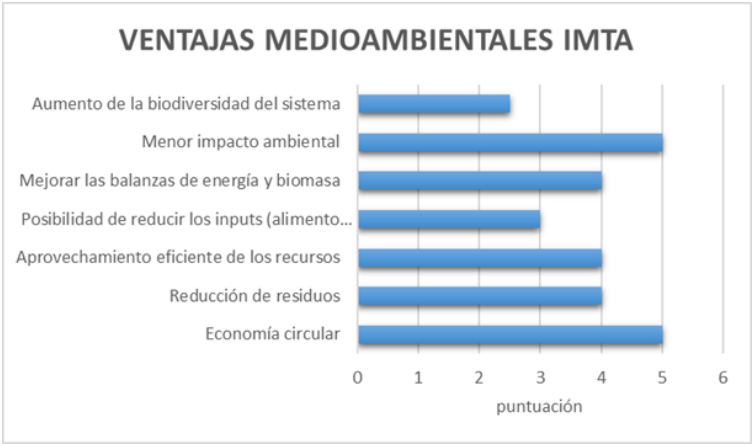
1. From an environmental point of view, what would be the main advantages or disadvantages of an IMTA culture?

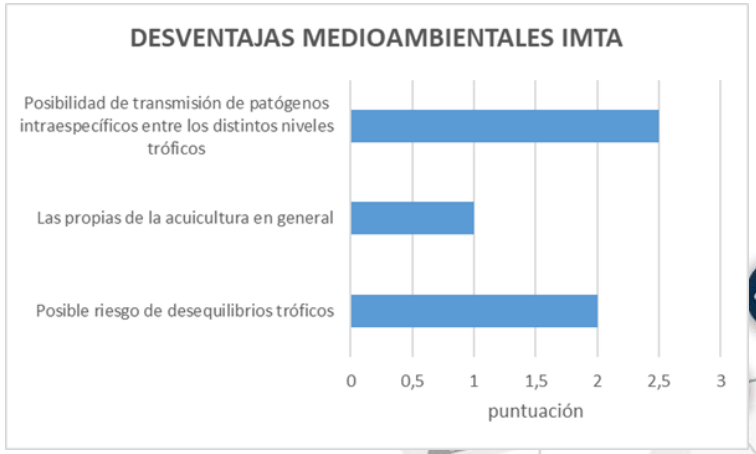
A Advantages

- Circular economy and lower environmental impact (5 points)
- Improvement of the energy and biomass balance, efficient use of resources and waste reduction (4 points)
- Increase in the biodiversity of the system and the possibility of reducing external food and water inputs (3 points)

B Disadvantages

- Possibility of transmission of intraspecific pathogens between different trophic levels (2.5 points)
- Possibility of risk of trophic imbalances (2 points)
- Those of aquaculture in general (1 point)

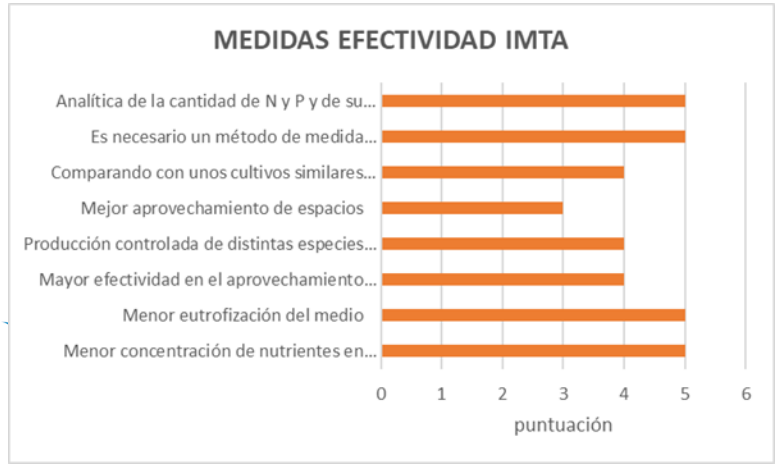




ROUNDTABLE: ENVIRONMENTAL ASPECTS
Results

2. How would you justify or measure the effectiveness or not of an IMTA crop?

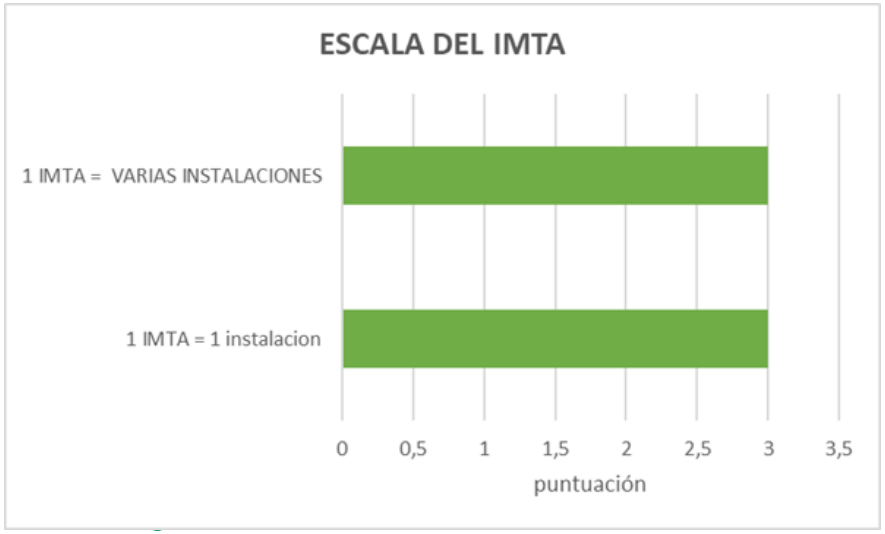
- Measurement and analysis of the amount of N and P and its origin in the cultivated organisms of the different trophic levels, and, therefore, of the concentration of nutrients to demonstrate the lower eutrophication of the environment. This measure must be carried out in a comprehensive manner, the performance of specific measures would not be sufficient (5 points).
- Greater effectiveness in the use of water, food and energy; controlled production of different species and trophic scales; and comparison with similar crops that are not part of IMTA (4 points).
- Better use of spaces, i.e. spatial planning (3 points).



ROUNDTABLE: ENVIRONMENTAL ASPECTS
Results

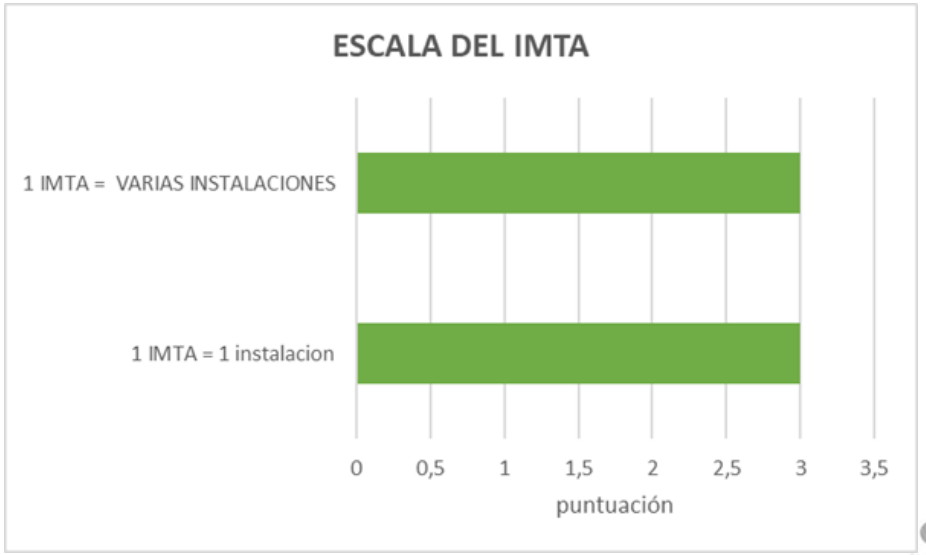
3. A) SCALE: From an environmental point of view, would an IMTA system be more effective if the same company or facility were to produce all trophic levels or should several facilities contribute to the cultivation? Why?

- In principle, this would not influence effectiveness, as long as the design is adequate.



ROUNDTABLE: ENVIRONMENTAL ASPECTS
Results

3. A) SCALE/DIMENSION: From an environmental point of view, would an IMTA system be more effective if the same company (or facility) were to produce all trophic levels or should different companies (or facilities) contribute? Why?

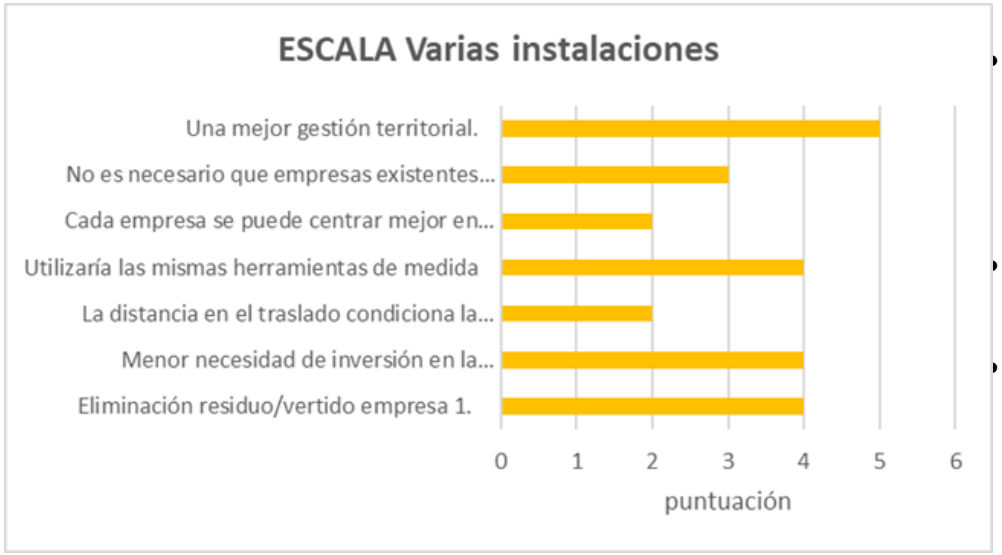


- In principle, this would not influence effectiveness, as long as the design is adequate.

Interreg Atlantic Area European Regional Development Fund EUROPEAN UNION
integrate

ROUNDTABLE: ENVIRONMENTAL ASPECTS
Results

3. B) SCALE/DIMENSION: In the second case (different companies/facilities), how would you justify or measure the advantages of IMTA?

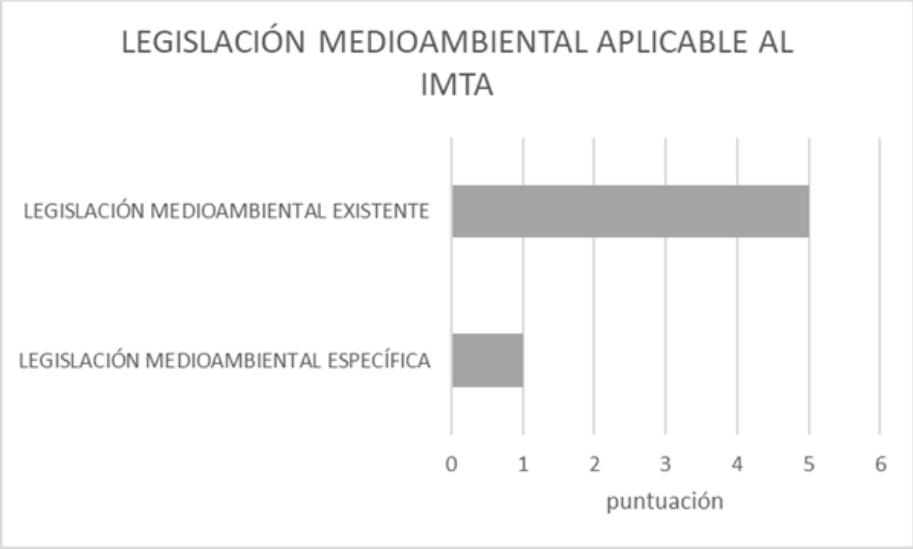


- Waste / discharge removal from the facility or company 1, decrease of waste and possibility of increased profitability for company 2. Use of the same measurement tools (4 points).
- Existing companies do not need to convert to IMTA companies (3 points).
- Each company can specialise in one type of culture. More efficient but less profitable because of transportation of the products (2 points).

Interreg Atlantic Area
European Regional Development Fund
EUROPEAN UNION
integrate

ROUNDTABLE: ENVIRONMENTAL ASPECTS
Results

4. LEGISLATION: Would you create a specific environmental legislation for IMTA or incorporate it into the existing one? Why? Advantages and disadvantages.



- Better adapt it or incorporate it into existing regulatory frameworks (5/6).
- Development of specific regulations for this type of aquaculture would be very complex

ROUNDTABLE: ENVIRONMENTAL ASPECTS

Conclusions

In order to demonstrate sustainability, it is necessary obtain greater control over the effectiveness of this type of cultivation, as well as better knowledge and communication of its potential benefits for the environment.

In order to achieve this, it would be necessary to further progress in the technical development of this type of aquaculture, which is still in its infancy in Spain. There is no evidence for the time being of facilities that perform this type of cultivation recognized as IMTA on an industrial scale, which renders it difficult to draw further conclusions on the environmental benefits of this type of activity.

In this regard, it is necessary to study this type of aquaculture and to encourage it from all possible levels, since there is great hope for aquaculture as a productive activity in Spain.

Interreg Atlantic Area
European Regional Development Fund
EUROPEAN UNION
integrate

ROUNDTABLE: ECONOMIC ASPECTS

June 12th 2019

Participants: One participant from the public sector; five participants from the private sector; Three participants from CTAQUA

Interreg Atlantic Area
European Regional Development Fund
EUROPEAN UNION
integrate

ROUNDTABLE: ECONOMIC ASPECTS
Results

1. From your experience, do you think that this type of aquaculture can be profitable?

YES, BUT WITH SOME LIMITATIONS, SUCH AS:

Economic-financial analysis (direct and indirect benefits)
Feasibility models
Production costs
Dimension
Production volume of the total crop of each species
Commercial viability (existence of a specific market)

2. In your view, what would be the most appropriate business model or models for this type of aquaculture? Why?

- The most important model would be the **diversification** of the economic activity to complete the activity and the search for markets that value products from IMTA systems, although taking into account the limitations due to the business size or the natural space in which this type of installation is usually located.

Interreg Atlantic Area
European Regional Development Fund
EUROPEAN UNION
integrate

ROUNDTABLE: ECONOMIC ASPECTS
Results

3. Possible commercial advantages and possible opportunities

- The main **advantage** lies in product diversification and the differential value of the product in terms of quality, with its own dedicated market niche or through trademarks.
- However, cost saving and transfer to prices and the scale of production would have to be taken into account in order to extend production of seasonal products.

4. Strategies at the economic level for the promotion of this type of activity and / or consumption of these products

- Investment in marketing (Market access, promotion and testing to promote knowledge and consumption).
- Search for local markets
- Environmental education of the activity: public awareness raising, promotion of visits to production plants, TV / documentary programmes, definition of strategies by the different levels of administration, companies, etc.

Interreg Atlantic Area
European Regional Development Fund
EUROPEAN UNION
integrate

ROUNDTABLE: ECONOMIC ASPECTS
Results

5. a) Most relevant positive aspects with possible impact on the economy of the population; b) Possible negative aspects

Positive aspects:

- Promotion of a circular economy
- Climate mitigation (requires further evidence)
- Safeguarding of the aquaculture trade
- Biodiversity conservation
- Pollution reduction

6. How could the introduction of IMTA be accelerated?

- **With public recognition** towards the IMTA activity taking into account its environmentally friendly characteristics (for example, through the simplification of some of the administrative procedures that are required to start this type of activity)

7. Other economic aspects to consider for the promotion of IMTA in Spain

- Strategy to increase product value; for example, gain access to existing markets in northern Europe

Interreg Atlantic Area European Regional Development Fund EUROPEAN UNION

integrate

ROUNDTABLE: ECONOMIC ASPECTS

Conclusions

It is essential that the development of an IMTA system, as a productive activity, be profitable for the company involved.

However, the enormous weight and inherent value of this type of practices that seek not only economic benefit, but also environmental sustainability, means that this should not be understood as any other aquaculture activity.

In this sense, there are numerous strategies that could or should be taken into account to guarantee that the product obtained has a greater value compared to production through other more conventional techniques.

Interreg Atlantic Area
European Regional Development Fund
EUROPEAN UNION
integrate

ROUNDTABLE: ECONOMIC ASPECTS

Conclusions continued

It is also very important that the production method is communicated to the general public in order to allow the consumer to decide whether products from IMTA systems should be available on a broader scale.

This is the only way to achieve not only an increased awareness of the importance of using this type of cultivation method, but also to attract potential investors who would promote this type of economic activity.

Finally, we must not forget the influence that the administrative level has; therefore, communicating the benefits of IMTA to all stakeholders is essential.

Interreg Atlantic Area
European Regional Development Fund
EUROPEAN UNION
integrate

General conclusions

- The input provided by experts from the relevant sectors highlights clear bottlenecks and priorities regarding the need for a comprehensive definition of IMTA and the development of best practice in the European Atlantic Area and beyond.
- The Blue slip method and our adaptation guides participants in creative yet structured brainstorming to obtain answers to pre-defined questions.
- Starting discussions in smaller groups is a good starting point for reaching consensus in larger group discussing and obtaining focused responses.
- Therefore, this method is a relatively simple time- and cost-effective approach to help us define bottlenecks, priorities, best practice for IMTA development in your country of interest.

integrate

Integrate Aquaculture: an eco-innovative solution to foster sustainability in the Atlantic Area

THANK YOU

Contact information:

www.integrate-imta.eu

Follow us

Interreg Atlantic Area
European Regional Development Fund

EUROPEAN UNION