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Organic aqua-farming: a gateway to sustainable aquaculture

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Introduction

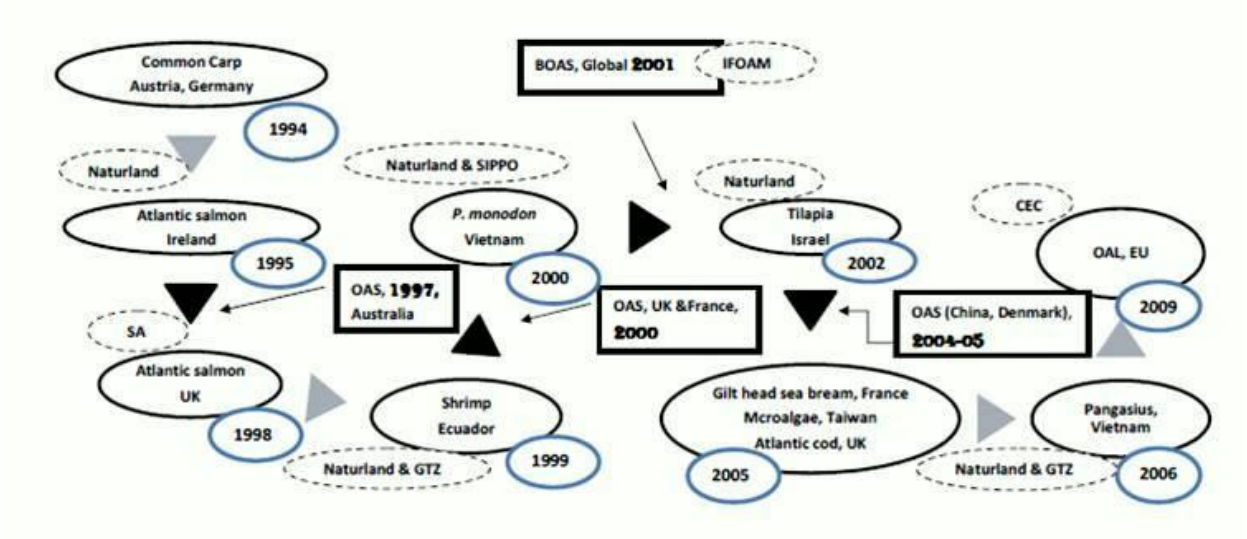
The global aquaculture production accounts to more than 50 million tonnes. The capture fishery production is about 95 million tonnes, of which fish for human consumption accounts for about 60 million tonnes. This means that about 45% of the consumed fish is produced by aquaculture. FAO estimates that the demand for farmed fish will increase by a further 40 million tonnes by the year 2030. The aquaculture is growing more rapidly than any other animal food-producing sectors due to increasing demand and a concurrent decline in the capture fisheries. Intensification of aquaculture causes adverse effects not only at the farm level but also on the health of the aquatic environment and ecosystem. Sustainable aquaculture is the need of the hour to accomplish the goal of sustainable development in the fisheries sector. Organic aquaculture is one of the several approaches that can be used to meet the objectives of sustainable aquaculture. New approaches like organic aquaculture will support the sector's ability to provide an alternative to unsustainable practices of fisheries and aquaculture worldwide.

Organic farming is an ecological production management system that promotes and enhances biodiversity, bio-cycles and soil biological activities. It is based on minimal use of off farm inputs and on management practices that restore, maintain and enhance ecological harmony. "Fish that are produced under natural conditions in accordance with the principles of organic aquaculture without any use of preservatives and additives and without any genetic modifications, that are fed feed produced from natural raw materials, that are certified by a qualified institution are defined as "organic fish" (Yesim *et al*., 2010)

Importance of organic aquaculture

Organic aquaculture has become more important as consumers have become more conscious about environment, sustainability and harmful impacts of intensive and unsustainable aquaculture. Organic aquaculture aims to provide fish and fishery products that are ecologically, economically and socially viable. From various experiments, it is obvious that, the diversity at the levels of species, ecosystem, management and culture system in aquaculture demands enormous efforts to utilize the immense potential of organic aquaculture.

History of organic aquaculture



OAS- Organic Aquaculture Standards, **BOAS**- Basic Organic Aquaculture Standards, **UK**- United Kingdom, **OAL**- Organic Aquaculture Legislation, **EU**- European Union, **SA**- Soil Association, **GTZ**-German Organization for Technical Cooperation, **SIPPO**- Swiss Import Promotion Programme, **CEC**- Commission of the European Communities
Source: **Bergleiter *et al.*, 2009**

Fig 1. Schematic representation of history of organic aquaculture in the world

In 2000, IFOAM (International Federation of Organic Agriculture Movements), the world's umbrella organization for organic agriculture, published first draft of basic standards for organic aquaculture, which became fully accepted basic standards five years later. IFOAM subsequently entered into this field of activities following developments undertaken by some of its affiliated certification bodies and formed the IFOAM Aquaculture Group in 2003. The introduction of detailed production rules for organic aquaculture as part of the EU organic

regulation in 2009 has now opened the door to a broader development of organic farmed seafood in European Union markets and elsewhere. Total organic aquaculture production reached about 53,500 tons in 2009, accounting for about 0.1 percent of aquaculture production worldwide (Prein *et al*., 2010).

Principles of Organic Aquaculture

- Absence of GMOs (genetically modified organisms) in stocks and presence of vegetable feed ingredients (e.g. soy beans).
- Limitation of stocking density- considering ecological capacity of site and species-specific behaviour of animals (e.g. Shrimps: 15 PL/ m^3)
- Use of only vegetal feed and fertilizer from certified organic agriculture which promote recycling of nutrients instead of intensive input
- No use of synthetic pesticides and herbicides in order to maintain natural diversity on the farm area
- Restriction on energy consumption (e.g. aeration); to facilitate de-intensification of operations and lowering of input.
- Preference must be given to natural medicines, and absence of prophylactic use of antibiotics and chemotherapeutics.
- Intensive monitoring of environmental impact, protection of surrounding ecosystem and integration of natural plant communities in farm management focussing on the waste management.
- Processing should be according to organic principles and the final products should be certified as organic.

Steps to organic aquaculture certification

1. **Exchange of information**

The first step towards certification is the exchange of information. This provides detailed information about technical and formal aspects of certification. A basic questionnaire survey is conducted in this step.

2. **Pre-evaluation visit**

The purpose of the visit is to get an impression of the situation on site and to discuss the steps towards conversion with all parties involved, setting up the conversion plan. Moreover, the pre-evaluation visit is supposed to assist the farm/organization in preparing for the oncoming inspection.

3. **Inspection**

Before the inspection is scheduled, cost estimation will be issued by the inspection body. Following the inspection, the inspector will issue the inspection report to certificate agency for listing and evaluating the findings**.**

4. **Contracts**

Assuming a positive decision by the certification committee, a contractual partnership between a farm and the standard setting organization can be established.

5. Certification

The inspection report, together with further data and information, is forwarded to the Certification Committee. The committee's decision is communicated to the farm by the certification letter, containing also the conditions that to which the certification is subjected to. It also decides on the annual renewal of certification.

Table 1. Standard setting organizations in the world

Code	Standards
BFA	Biological Farmers of Australia
BIO GRO	New Zealand Organic Standards
BIO SUISSE	Association of the Swiss Organic Agriculture Organizations
CAN/OGB	Canadian National Standards Board
COABC	Certified Organic Associations of British Columbia
CODEX ALIMENTARIUS	Codex Alimentarius Commission
COG	Canadian Organic Growers

DEBIO	Norway
EU REGULATION	1804/99
IFOAM	International Federation of Organic Agricultural Movements
NASAA	The National Association for Sustainable Agriculture Australia Ltd
NATURLAND	Naturland e.V. Germany

Production prospectus

At the global level, organic aquaculture contributed an estimated 46.1 billion US$ in 2007. There were 0.4 million hectares of certified organic aquaculture area in 2008 and 32.2 million hectares were dedicated to organic farming. The organic production in 2007 was 0.1% of total aquaculture production. The market for organic aquaculture shows strong growth in Europe, especially France, Germany and the UK. The top five producing countries are UK, Ireland, Hungary, Greece and France. Most of the global certified organic aquaculture farms (123 of the 225) operate in Europe and are responsible for 50,000 tonnes in 2008 which is nearly half of global production. Organic salmon is the top species in the organic farming (European Commission Fisheries, 2010).

Table 2: Organically managed area for aquaculture in different counties

Country	Organically managed area [ha]
Bangladesh	**2000**
China	**415000**
Ecuador	**6382**
Indonesia	**1317**
Thailand	**33**
Total	**424732**

Source: Willer *et al.*, 2008

The database about the organic aquaculture production from world in 2001 shows (Fig 2) that the finfish contributed bulk of the production (98%) while the brackish water organic aquaculture was contributed by fin fishes and shell fishes with 35.2% and 56.25 respectively. The organically farmed products in the marine waters were mainly constituted by mollusks

(46.6%) and aquatic plants (44.4%) respectively. The contribution from fin fish and shellfish was negligible in the marine waters.

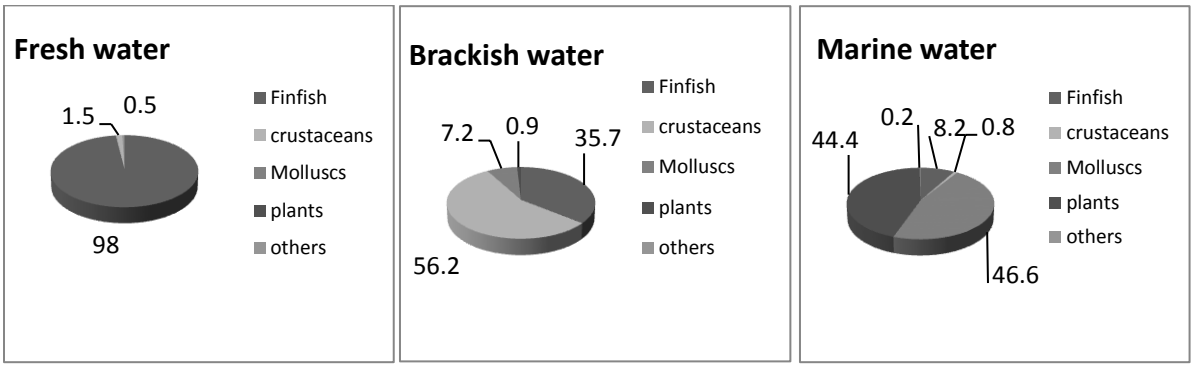


Fig 2. Database on global organic aquaculture production in 2001 (source: FAO, 2001)

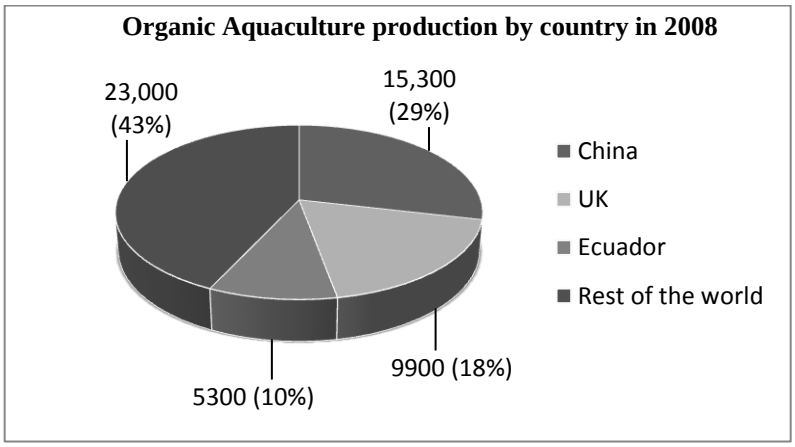


Fig 3 Organic Aquaculture production in 2008

Important farmed organic fishery products in the world

- Black tiger shrimp, Black shrimp: Vietnam , Bangladesh, India
- White shrimp: Ecuador, Peru
- Freshwater shrimp: USA, Bangladesh
- Tilapia :China, Israel, Brazil, Honduras
- *Pangasius* catfish (*basa*): Vietnam
- Carps : Israel, East and Southern Europe
- Trout and sea bream: Eastern, Western and Southern Europe
- Cod : Norway
- Atlantic salmon: U.K., Ireland, Chile

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Advantages of organic aquaculture

- Consideration for the environment is possible by means of monitoring programs to measure the impacts and to strengthen the government regulations. Thus it will help in reducing the environmental footprint.
- Feed Management is ensured through monitoring as well as adequate feed supply, thereby minimizing the stress to the organism. Moreover, the managed environment reduces disease problems and would help to maintain a healthy water condition.
- Healthy and tasty products generated from organic farming without any synthetic chemicals would create a sound and safe environment for consumers.
- The encouragement of the use of local resources and services inclusive of a safe, healthy and sustainable working environment for employees will promote the organic aquaculture to meet consumer needs and to foster sustainable aquaculture.
- Value added products- For instance, *Deutsche* is claimed to be the first fish finger entirely produced by organic means from *Pangasius* fish in Vietnam where breeding is made from organically grown ingredients. The product carries the certification of *Naturland*

Disadvantages of organic aquaculture

- Strict farming regulations
- Low yield and low income compared to the intensive farming practices
- Narrow market
- Limited services for organic aquaculture
- Complex procedures for implementing rules, and strict regulations
- The cost of production and premium prize will keep away farmers and consumers

Steps to be taken for a organic aquaculture in India

1) Evaluate the potential and promote certification of traditional culture farms as organic aquaculture producers. Reduce the costs of certification to make them accessible to small farmers, without diluting standards.

2) Acceptance of the draft Indian Organic Aquaculture Standards by Indian Government and develop domestic market for organic aquaculture products.

3) Increase awareness of farmers as well as the consumers with regard to potential of organic aquaculture and organic farming technologies developed in India through appropriate extension services.

4) Complete economic analysis of organic aqua -farming and the premium price available to be undertaken for each species. Encourage and develop the domestic market for organic products.

5) Evaluate the bottlenecks for getting organically certified inputs and develop mechanism to attain this. Promote research on organic agronomic practices, bio-control of diseases and pests, biofertilizers, etc.

Challenges and Future Prospects

A variety of species produced in aquatic systems and vast difference in cultural requirements for fin fishes, shellfishes, mollusks, and aquatic plants add to the complexity of defining organics for this sector. For the organic aquaculture sector to successfully co-exist with other food production sectors, it will have to effectively source its own organic feed and nutrient resources. Most of the concerns at the farming level will be on

- Difficulty in sourcing and certifying organic juveniles
- 35-40% higher feed cost for the farming
- Time and cost of the certification process
- A higher risk of diseases, and uncertain benefits.
- Whether a product derived from wild caught animals can be certified
- Levels of fish meal or fish oil is that can be used within certified organic feeds

Aquatic species, both animal and plant; ecological situation and locations; and various production systems, both marine and freshwater; are now under scrutiny in order to determine adaptability to organic production systems. The anticipation about the production and handling requirements of organic standards has initiated research and development efforts in some new directions in the sector.

A great deal of research needs to be done into a number of aspects of organic aquaculture. There are various methods and techniques in aquaculture which are advocating the organic aquaculture. Most important systems are Integrated Multi Trophic Aquaculture (IMTA) and aquaponics. Widely used species include shrimps, salmon and Atlantic Cod. There are several ongoing scientific projects on various aspects of organic farming such as, availability of traditional protein sources for feed manufacture, its effects on growth and digestibility, influence of organic vegetables on the health and welfare of farmed fish, and optimizing the production technologies (e.g. Danish ORAQUA Project).

Increased level of fish production through aquaculture in a sustainable way is the need of the hour. The boost in the global aquaculture production about 64 million tonnes is mostly attained through in an intensive, unsustainable way. The safety of the consumer and the sustainability in farmed fishery products can only be achieved through the modern innovative approaches especially, the organic aquaculture disregarding the challenges.

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