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ORGANIC AQUACULTURE:
WAY TO SUSTAINABLE PRODUCTION

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ABSTRACT

"Organic" in the context of food production cannotes standards and certification - a verifiable claim for the production process and production practices - as well as more elusive characteristics such as consumer expectation for food quality and safety and general environmental, social and economic benefits for farmers and for society. The variety of species produced in aquacultural systems and vast differences in cultural requirements for finfish, shellfish, molluscs and aquatic plants add to the complaxity of defining this sector. Some species and some production systems may prove quite difficult to adapt to a traditional "organic" system. Today, organic aquaculture production takes place primarily in europe, where certified organic salmon, carp and trout are grown and sold. Certified organic mussels, tiger shrimp, white shrimp and tilapia also are cultured in such diverse places as Vietnam, Peru, Equador, Chile, Newzealand and Israel. Standards and certification procedures are set by just a few certification agencies. Universal acceptance of any standards does not currently exist. The key to the continued growth and development of organic aquaculture lies in resolving a number of issues that currently stand in the way of instituting internationally accepted certification standards.

Keywords: Organic aquaculture, Aquaculture, Certification, Índia

INTRODUCTION

The declining fishery harvests, wild fish food-safety issues, environmental concerns, increased fish consumption, and the increasing market share of organic foods have combined to focus attention on "organic aquaculture." Consumer demand may well drive the organic production of finfish, shellfish, and other aquatic species into the mainstream during the next decade. Organic aquaculture has attracted the attention of researchers from several academic disciplines as well as that of environmental advocates and entrepreneurial innovators. A small number of "certified" and non-certified organic fish and microalgae products have made it to the retail market place. While the regulatory specifics still need to be addressed, this new organic market niche has significant potential for growth in the future.

What is Organic Farming?

Organic farming is a farming practice and process which is environment friendly and healthy, in harmony with nature and which does not use harmful synthetic chemicals.

The importance of organic farming is being recognised in the developed countries all over the world. Organic farming is generally growing food crops by using natural products without use of synthetic chemicals. Fruits, vegetables and other products so grown are perceived as more healthy and more valuable. Thus the organic farm produce realises higher prices in the export market.

UNITED STATES DEPARTMENT OF AGRICULTURE DEFINED ORGANIC AGRICULTURE AS

Organic farming is a production system which avoids or largely excludes the use of synthetically compounded fertilizers, pesticides, growth regulators and live stock feed additives. To the maximum extent feasible, organic farming system rely on crop rotations, crop residues, animal manures, legumes, green manures, off -farm organic wastes, mechanical cultivation , mineral -bearing rocks, and aspects of biological pest control to maintain soil productivity and tilth, to supply plant nutrients and to control insects, weeds and other pests.

ORGANIC FARMING IN INDIA

The all India Federation of Organic Farming (AIFOF) accepts the standards document of the International Federation of organic Agriculture Movement (IFOAM, 1981) which gives the following description.

1. To work as much as possible within a closed system, and to draw upon local resources.
2. To maintain the long-term fertility of soils.
3. To avoid all forms of pollution that may result from agricultural techniques.
4. To produce the use of foodstuff of high nutritional quality and sufficient quantity.
5. To reduce the use of fossil energy in agricultural practice to a minimum.
6. To give livestock conditions of life that conforms to their physiological needs and to humitarian principles.
7. To make it possible for agricultural producers to earn a living through their work and develop their potentialities as human beings.

To which AIFOF has added the following:

1. To use and develop appropriate technology based on an understanding of biological systems.
2. To use decentralized systems for processing, distributing and marketing of products.

3. To create a system this is aesthetically pleasing to both those within and outside the system.
4. To maintain and preserve wildlife and their habitats

ORGANIC AQUACULTURE

Organic aquaculture is the farming of aquatic animals like shrimp, fishes, bivalves etc and aquatic plants without using antibiotics, chemicals, and fertilizers by preserving the ecosystem and biodiversity.

Organic aquaculture practices would help in raising aquatic products in a human manner i.e. sustainable and pollution free. Organic feed optimizes the health of the animal and to reduce in reliance on drugs, including antibiotics.

Traditional organic farming systems "rely on ecologically based practices, such as cultural and biological pest management, and virtually exclude the use of synthetic chemicals in crop production and prohibit the use of antibiotics and hormones in livestock production." Sustainability, environmental stewardship, and holistic, integrated approaches to production are hallmarks of organic systems. Standards for organic cropping and terrestrial livestock husbandry practices have existed for decades.

Interpreting practices and standards developed for terrestrial species into practices and standards relevant to aquatic species, both animal and plant, remains a major challenge for organic aquaculture. How can aquatic operations comply with the requirements for an organic system plan, for obtaining acceptable stock, for implementing health care monitoring and management, for maintaining prescribed "living conditions," for development and acceptance of allowed and prohibited substances lists, for organic feed requirements, for controlled post-harvest processing, for nutrient management, and for required animal identification and record-keeping. Within the aquaculture there are also huge differences between the species themselves. For instances rearing of mussels is vastly different from rearing fish and crustaceans. Further, sea weeds and algal cultivation methods are totally different. Hence there are more specific standards under each norm that organic farmers must follow to raise the yield. The standards are group or species specific, so, it will be possible to meet the diverse requirement of different aquaculture species within these standards as many claim that modern aquaculture practices (best management practices) are already organic in principle, but do not meet the strict legal interpretation of the standards. The main principle of organic aquaculture standards include:

- Absence of GMOs(genetically modified organisms) in stocks and feed prime material : focusing on vegetable feed ingredients (e.g. soy beans) and feed additives derived from bio-technology, as well as on transgenic, triploid and all-female stock
- Limitation of stocking density: considering ecological capacity of site and species-specific behavior of animals e.g. shrimps: 15 PL/ m3, resp. maximum 800kg/ha per production cycle.

- Origin of vegetal feed and fertilizer from certified organic agriculture, no artificial feed ingredients and networking of organic operations.
- Criteria for fishmeal sources; in general, decreased protein and fishmeal content of diet: permitted are trimmings of fish processed for human consumption or by-catches; no dedicated fishmeal harvesting operations e.g. shrimps: maximum 20% fishmeal/ -oil and maximum 25% total protein.
- No use of inorganic fertilizer: recycling of nutrients instead of intensive inputs.
- No use of synthetic pesticides and herbicides: maintaining natural diversity on the farm area
- Restriction on energy consumption (e.g. regarding aeration) as a general trend; de-intensification of operations, lowering of input.
- Preference for natural medicines, no prophylactic use of antibiotics and chemotherapeutics, no use of such substances in invertebrate aquaculture or live feed culture or live feed culture.
- Intensive monitoring of environmental impact, protection of surrounding ecosystems and integration of natural plant communities in farm management, focusing on the effluents of farms and the design of pond farms.
- Processing according to organic principle basic requirement for a final product to be certified as organic.

Conversion to Organic Aquaculture

Conversion to organic aquaculture is a process of developing farming practices that encourage and maintain a viable and sustainable aquatic ecosystem. The time between the start of organic management and certification of the production is known as the conversion period. Aquaculture production methods can vary widely according to biology of the organisms, technology used, geographical conditions, ownership structure, time span, etc. These aspects should be considered when the length of conversion is specified. The minimum conversion period set for the aquaculture production system is two years.

ORGANIC CERTIFICATION AND STANDARDS

Certified "Organic" assures that products were produced and/or processed under conditions required by National Standards and/or International standards for Organic Production. Standards are guidelines for the management of the whole production process, including post-harvest and sometimes social aspects. Standards can also serve as information for the consumer. Standards should be based on scientific knowledge or at least not in opposition to it. Organic Aquaculture Standard have been developed and many are still in draft form. These include Switzerland's Bio-Suisse, Austria's Bioernte, Germany's Naturland, UK's Soil Association, New-Zealand's Bio Grow, Sweden's KRAV and Europe-Gap Aqua-Gap.

The FAO's food standards body, the "Codex Alimentarius Commission" has finalized organic crop, live stock, processing, labelling, inspection and certifications guidelines.

The International Federation of Organic Agricultural movement (IFOAM) is a global umbrella body for organic food and farming. IFOAM's goals are the worldwide adoption of ecologically, socially and economically sound systems that are based on the Principles of Organic Agriculture. IFOAM's Organic Guarantee System (OGS) is designed to facilitate the development of organic standards and third-party certification. IFOAM Certification bodies are accredited by the International Organic Accredation Service Inc. (IOAS) on the contract base.

Global Organic Aquaculture Production and Markets

The numbers of certified organic aquaculture operations (including the production of micro algae) amount to 240 in 29 different countries in 2009. Most of the operations are located in Europe. However, it has to be considered that these are often small scale carp or trout farms with less than one hectare pond surface, typically run on a part time basis. In China, 72 operations have received organic certification under the national Chinese regulation.

In Europe, the lead product in organic aquaculture is Atlantic Salmon, followed by the Mediterranean species Seabass and Seabream, freshwater salmonids (Rainbow and Brown Trout, and charr species), and carp. In Latin America, there is a strong dominance of organic western white shrimp operations in Ecuador, Peru and Brazil. Most common in China is carp production in polyculture, i.e. in combination with crabs, shrimps or other local species; but there are also certified operations producing turtles or sea cucumbers. In other Asian countries, there is an increasing organic production of Black Tiger Shrimp (e.g. Bangladesh, India, Thailand, and Vietnam), Pangasius catfish (e.g. Vietnam) and micro-algae (e.g. India). Figure: Global organic aquaculture production 2009

Total organic aquaculture production reached about 53,500 tons in 2009, accounting for about 0.1 percent of aquaculture production worldwide. Further, production increases are foreseen, both through organic aquaculture producers expanding existing production and through new aquaculture producers entering the organic aquaculture business. With a growing supply side, the stage is set for market expansion. In the last five years market development has been slow because of a limited number of reliable organic seafood suppliers. This situation is changing right now for major products like salmon and shrimps. Assuming that 70 percent of organic aquaculture production is sold under an organic label, the total market value might have reached •230 million at the distributor level in 2009. According to experts, the global market value will increase annually by 40 to 60 percent in the next three years, eventually surpassing a total value of •500 million in 2011. The lion's share of market growth, however, is occurring among a limited number of countries (including France, Germany, Switzerland and the United Kingdom), market regions and fish species (including Atlantic salmon and shrimps). In Asia too, the market is evolving, though changes are harder to keep track of. China seems to be experiencing a strong

organic fish production, but fish products labelled organic are not readily visible in stores, and market data are not available. Except in a few countries, the market for organic seafood is still in its infancy with all the associated problems of high costs, low sales volumes, little or no competition, and the need to invest in marketing and create consumer awareness of products. The introduction of organic aquaculture production rules in the European Union is expected to support further market growth in Europe.

CURRENT STATUS OF ORGANIC AQUACULTURE IN INDIA

Compared to organic agriculture, organic aquaculture is far behind in the organic niche of the country. The brackish water area available in India for shrimp farming includes the existing traditional prawn filtration fields also, which are located in West Bengal (46100 ha) and Kerala (10700 ha). These vast filtration areas are actually paddy fields, belonging to several entrepreneurs, who do salt resistance paddy cultivation by themselves and later auction the area, after paddy cultivation for doing the seasonal traditional prawn filtration, when the water become saline in nature due to inundation . The traditional type of prawn filtration system is highly environment-friendly as they use no antibiotics, chemicals, etc and hence the paddy fields can easily be adopted for organic aquaculture. Organic products have become very popular now a days due to rise in health and environmental awareness, concerns on food safety and there is a growing demand in developed countries, especially; US, EU, etc. All the big super markets, Coop (Switzerland), Aimare (Austria), and Bristall Bay (USA) are searching for organic product supply throughout the world. India is one of the richest in terms of shrimps and fish resources in the world. Organic aquaculture ensures that the farming activity is in harmony with the nature, with due care for the good health and welfare of the cultured organisms.

The Indian Organic Aquaculture Project was first initiated in January 2007 in the maritime States of Andhra Pradesh and Kerala with technical consultancy from M/s Blueyou. Certification is mandatory for selling organic products across the world and Naturland of Germany has been chosen as the certifying agency and Indocert in Kerala is the inspection body for the project. Farmers, hatcheries, feed mill and processors are motivated for organic conversion to produce organic products for exporting from India.

MPEDA proposed to implement organic aquaculture in India by availing the consultancy and technical collaboration from the Swiss Import Promotion Programme (SIPPO), Zurich, Switzerland. In this context, MPEDA has signed a MoU with SIPPO in January, 2007 at Chennai during INDAQUA 2007 to launch the programme. MPEDA conducted earlier three workshops exclusively for Organic aquaculture; one each in the States of Kerala, West Bengal and Andhra Pradesh in association with INFOFISH and Naturland, where technical sessions were held by the concerned technical officials, to create awareness among the entrepreneurs about organic farming.

The proposal submitted by MPEDA to the Ministry of Commerce & Industry, Govt of India, envisages the implementation of organic aquaculture project for brackish water

shrimp Penaeus monodon (tiger shrimp) and the fresh water giant prawn, Macrobrachium rosenbergii (scampi), in the States of Kerala, West Bengal and Andhra Pradesh, initially. SIPPO will extend technical assistance through its consultant, Blueyou by conducting a few training programmes followed by demonstration for organic tiger shrimp and scampi cultures in Kerala and Andhra Pradesh. Capacity building in organic aquaculture for MPEDA technical officials will be a key component by making use of the expertise to be acquired during the programme. At later stage MPEDA will implement the programme in West Bengal under the supervision of the SIPPO technicians.

Organic Scampi Aquaculture in Andhra Pradesh

The National Centre for sustainable Aquaculture (NaCSA) and India Organic Aquaculture Project (IOAP), MPEDA took up organic fresh water prawn (M. Rosenbergii) farming in two societies of West Godavari District of Andhra Pradesh. A total of 27 farmers, from Sri Venkateswara Aqua Farmers Welfare Society, Matsyapuri and Sri Sainadha Aqua Farmers welfare Society, Velivela were involved in the project covering 31 ha area. As the organic concept is new to the farmers, a series of awareness meetings with the society members and officials of MPEDA/NaCSA were organised. In two of such meetings the consultant for the project Mr. Mathias Krebs from Blueyou, Germany also took part.

Societies were managed by a Managing Committee and an internal control system (ICS). The ICS was developed by societies to implement Organic Internal Standards prepared in consultation with farmers by the project team consisting of IOAP and NaCSA officials along with the consultant for the project and other stakeholders involved in the organic project were trained in the internal control system at M/s Indocert, Aluva, Kerala during the training workshop in 2008. With the help of knowledge acquired from training, farmer societies prepared internal control system along with NaCSA.

Once the project started the supply of critical organic inputs like seed and feed was taken up by IOAP. The key stake holders included the hatchery, feed mill, farmer society and processing plant. Prior to the beginning of farm operations the hatchery and feed mill were certified by Naturland for implementing organic standards. Later the two societies applied to Naturland for Organic Cluster Certification in the prescribed format through IOAP.

Coordination meetings among the society farmers were conducted regularly to coordinate all the activities of organic project. All decisions on the crop activity was reviewed during the meetings and it was properly recorded in society minutes book. Farmers willing to join the IOAP approached the ICS team stating their willingness. Then field officer of ICS team visited the ponds and based on the assessment of the farmer's entrance form screened by the ICS coordinator. The basic criteria to be eligible for organic certification are:

- Should be a member of the cluster/society.
- Should abide internal standards of the cluster/society.
- Willing to convert the whole farm into organic production.
- 50% of farm should be covered with vegetation.
- No track record of chemical, antibiotic or pesticide usage in the farm.
- Water source should be free of pollutants and chemicals.
- All the inputs used in the farm should meet internal standards.

Organic Certified Seed

Organic scampi seeds were procured from Naturland Organic Certified Prawn Hatchery M/s Rosen Fisheries, Thrissur, Kerala. As a general practice for scampi farming, seeds were stocked in nurseries. Practices show a better result of 80% survival in nursery. After 45 days of nursing period juveniles were shifted to the grow out with 1.5 PL/m2 stocking density. Organic nursery feed was used during the nursery phase. Overall survival rate in the nurseries was 62%.

Organic Certified Feed

Societies purchased organic feed from organic certified feed company, M/s Waterbase limited directly without any middlemen/dealers. Through this process society farmers were able to purchase the feed at factory price without any additional cost. Feed procured by the society in bulk was distributed to the farmers from society's central store. It was distributed to the individual farmers based upon their requirement, after verification of the IOAP dairy. Every day feed consumption was monitored by the society coordinator. A total of 18.4 tonnes of organic feed was used by these two Societies.

Farm Management

The water source was from irrigation water supply canal from Godavari River Delta which met the organic standards. Water quality and growth rates were monitored regularly by the ICS team.

All the farm management data including farm entrance form, IOAP dairy, bill copies were kept in the society office. These data were maintained by the farmers and monitored by society coordinators in both the societies.

Harvest

Scampi ponds were harvested partially as is the common practice. The inaugural harvest was conducted in January, 2009. Harvests within the society were coordinated, to give maximum possible quantities for the processor. Harvested prawns were chill killed immediately

and there was no pre processing at farm site. Prawns were sold head on along with, claws. Average survival rate was 49.6% from PL stage. A total of 12.6 tonnes of organic scampi was produced from these societies and processed by M/s Jagadeesh Marine Exports (Table 1). Average FCR was 1.46. The crop outcomes are summarised in Table 2.

Table 1. Crop summary report of Organic project in AP during 2008-09

Item	Value
Total Area under Organic Aquaculture Project	30.85 ha
Total no. of juveniles stocked by societies	427,350
Total feed utilised by societies	18,400 kg
Total production	12,557 kg
Average production	407 Kg/ha
FCR	1.46

Table 2. Crop outcome.

	Area	Farmers	Total production
Sri Venkateswara Aqua Farmers Welfare Society, Matsyapuri	10.26 ha	10	3,964 kg
Sri Sainadha Aqua Farmers Welfare Society, Velivela	20.89 ha	17	8,593 kg
Total	**31.15 ha**	**27**	**12,557 kg**

Marketing

M/s Jagadeesh Marine Exports, Bhimavaram which is a Naturland certified processor was the natural choice for marketing of organic prawn. The prices for the organic prawn were fixed well before the beginning of the crop. Based on a mutually agreed price structure, an agreement had been signed between Jagadeesh Marine Exports and both of society representatives for the quantities of organic prawn to be supplied and its final price.

Organic prawn farmers are happy with the overall outcome of the crop. There were no disease incidents, growth was good and farmers could make decent profits. As a result 88.62 ha of new scampi farming potential areas are being identified and assessed for feasibility to implement the organic project.

First Organic Scampi Farms in Kerala

Scientific shrimp farming continues to arouse controversies over environmental and social impacts as well as food safety issues. Disease outbreaks in shrimp farms, especially white spot syndrome virus (WSSV), have cost Indian shrimp farms four to five billion rupees a year.

Marine Products Export Development Authority (MPEDA), mindful of environmental concerns, has implemented an India Organic Aquaculture Project (IOAP) in collaboration with the Swiss Import Promotion Program (SIPPO) with organic scampi.

The initial Kerala scampi farms, owned by four individuals, were inspected by INDOCERT, the national agency for certifying organics, and have been provided with certification of registration from Naturland. The different components of the project such as organic hatchery, feed mill, farm and processor exports have to abide by guidelines and specifications established by global standards. The stocked scampi seeds in the nursery were fed with the organic scampi feed of starter grade--produced and supplied by The Waterbase Ltd., Nellore, Andhra Pradesh--for a period of 45 days and later transferred to grow-out ponds, where grower and finisher grades of organic scampi feed were given.

Rosen Fisheries Hatchery was chosen for the production of organic seeds and it has produced 11.50 lakh organic scampi seeds so far of this, 3.4 lakh seeds were supplied to four farmers in Kerala and the remaining to the farmers in Andhra Pradesh. Two other hatcheries, Queens hatchery and St John Bosco hatchery had been later selected for organic seed production of which Queens hatchery has commenced production of organic scampi seeds The first scampi harvests took place last November in Kuttanad, Kerala, where 340,000 seeds were stocked in 20 hectares of freshwater ponds last spring.

Four scampi farms besides the backwaters of Kerala with a water spread of 20 hectares have been stocked with organic scampi seeds. Farming operations have been successful and the world's first organic scampi harvest has undertaken in the Alappuzha district in Kerala. The four farmers, Dinesh Kumar, Joseph Korah, Achamma Kurian and Justin Thomas, have produced at least 1,000 to 1,500 kg of the giant freshwater prawn from each farm. The prize of each kilogram is expected to be Rs.350 to Rs.500.

CONCLUSION

Many organic aquaculture issues still need to be resolved. Steps should be taken to encourage and enhance the biological cycles with respect to nutrients management and to retain the integrity of the organic product from farmer to consumer and conversion requirement for moving conventional aquaculture system into organic system. For the answer to this question NGOs academia, government and organic sector have to work closely following the necessary guidelines. With continue emphasis on worldwide, aquaculture will emerge as the most environmentally friendly and efficient form of agriculture and as an partner in sustainable development.

REFERENCES

Albert, G.J. TACON and Deborah J. Brister, (2002). Current standards and future prospect chapter 6. Organic agriculture. Environment and food Security, edited by Nadia EL- Hage Scialbband Caroline Hattam. Environment and Natural Resources. Series. 4. Roma. Italy: Food and agricultural Organization (FAO) of United Nations. (NAL call Number : QED. E68 no. 4).

An update on organic scampi aquaculture in Andhra Pradesh In: sustainable aquaculture, Aquaculture Asia Magazine Volume XV No. 1, January-March 2010 pp 14-17

Bergleiter. S. (2003) "organic aquaculture: completing the first decades." 7th IFAOM international conferenceon trade in organic product: 2003 Mainsreaming organic trade: new frontier. Opportunities and responsibilities. Nov 6-8. Bangkok Thailand.

Brussels (2005) organic aquaculture in the European Union. Current status and prospects for the future, www.globe-fish org.

FAO and WHO (2001) guidelines for the production, processing, labeling and marketing of organically produce food.s (GL 32-1999: REV. 1-2001) http: www fao.org.organic doc glorgunicfial

IFOAM Basic Standards for Organic Production and Processing, Section 10, by International Federation of Organic Agriculture Movements (IFOAM). 2000.

Manoj, V. R and Vasudevan, N. (2009) Functional Options for Sustainable Shrimp Aquaculture in India. Reviews in Fisheries Science, vol. 17: 3, 336-346. http://dx.doi.org/10.1080/10641260802715072

Nathaan Pelletier (2003). Applying organic principles to aquaculture system: understanding proposed organic certification standards for farmed salmond and market trends, http.www.certifiedorganic be. Carabtoa service aquaculture- standards.html.

National organic programm scope. National organic standard board. Policy development committee (2004). http:/ www.ams. Usda.gov/nosb/meeting books/oct2004/NOPS cope9_04.pdf

Tarlochan Singh. (2006). Sector of production and marketing of organic aquaculture. Product natural and library enaca. Org certifiatin publications experts workshop 19-20 INFOFISH%20%MALAYSIA.pdf (FC FAO INFOFISH SIPPO ORGANIC AQUACULTURE PROJECT.