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Recent Trends in Applied Zoology

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Chapter -32

Organic Aquaculture- the Sustainable Practice toward aquaculture development and Ecofriendly approaches

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Abstract:

For the adverse effects on the environment and fish welfare, aquaculture is condemned. One way to address these problems and create a feasible path for the future expansion of the aquaculture business is to promote sustainable production methods. In response to the negative consequences of contemporary industrialized agriculture in the 20th century, organic farming (OF) emerged. The contamination of specific environmental elements, a decline in soil fertility, a reduction in plant health and immunity, a loss of biodiversity, and a degradation in food quality harmful to human health are only a few of the negative effects brought on by the use of agrochemicals. Another factor in the emergence of this problem was the aggressive animal business, which led to animal cruelty, growing drug usage, inadequate nourishment, and shorter life spans for animals. Organic farming (Šrtek& Urban, 2008). Due to its advantages for the environment, safety worries about aquaculture products, rising fish consumption, and expanding market share of organic goods, organic aquaculture has become more popular. Organic farming requires careful soil and environmental management, resource cycling, a range of farm component integrations, and management of nutrients and other resources. The creation and implementation of support systems for legitimate agricultural producers who make environmentally friendly products, as well as the establishment of a national system of legal regulations for this kind of activity, are necessary to ensure the long-term growth of organic aquaculture. Aquaculture has lagged behind agriculture in terms of output because organic aquaculture standards and regulations have only recently become widely adopted a wide range of products that can be labeled as organic.

Keywords: - Organic Aquaculture, Organic farming, Aquaculture market

Introduction: -

The rich source of animal proteins were obtained from various fishes hence aquaculture take spotlight for resource development which increse horizones of aquatic inhabitants. Rural aquaculture farmers in villages of countries towards development connect with aquaculture to serve their families. Boyd claims that in addition to these, fish and non-fish organisms are produced for domestic and international markets all over the world, accounting for about 36% of total fishery production globally and growing at a rate of 10% per year since 1990. While catch fisheries have decreased or stagnated over the past 10 years, aquaculture is the alternative supply for the growing demand for aquatic products. The most common species in aquaculture are molluscs, crustaceans, finfish, and algae (Duncan, 2003).

For its negative consequences on the environment and fish welfare, aquaculture is criticised. One way to address these problems and create a feasible path for the future expansion of the aquaculture business is to promote sustainable production methods. In response to the negative consequences of contemporary industrialised agriculture in the 20th century, organic farming (OF) emerged. The contamination of specific environmental elements, a decline in soil fertility, a reduction in plant health and immunity, a loss of biodiversity, and a degradation in food quality harmful to human health are only a few of the negative effects brought on by the use of agrochemicals. Another factor in the emergence of this problem was the aggressive animal business, which led to animal cruelty, growing drug usage, inadequate nourishment, and shorter life spans for animals. (srtek & Urban, 2008) Organic farming.Due to its advantages for the environment, safety worries about aquaculture products, rising fish consumption, and expanding market share of organic goods, organic aquaculture has become more popular.

The demand for organic products is rising globally at the same time. As more consumers of aquatic products are concerned about the environment and interested in consuming healthful organic food produced by producers who lead respectable lives, the market for organic aquaculture products is growing.

Chemicals in Aquaculture: -

The treatment of sick animals and, the enhancement of water quality in cultural facilities, are the core objectives of the use of chemicals. As aquaculture becomes more intensive in India, particularly in the production of marine shrimp, chemical use has risen in recent years. Fertilizers and liming agents are the chemicals that are frequently utilized in aquaculture. The majority of liming ingredients are composed of lime and agricultural limestone. The most common chemical fertilizers are superphosphate, triple superphosphate, and urea, while other chemicals are occasionally used. Aquaculture also uses a variety of other

chemicals, including anesthetics, oxidants, coagulants, osmoregulators, algicides, herbicides, fish toxicants, therapeutics, disinfectants, and hormones.

Lime	soil and water treatment
• Mahua oil cake (4-6% saponin). • Tea seed cake (10-15% saponin) • Derris root • Ca $(OH)_2$+ $(NH_4)_2SO_4$	Piscicides
• Urea • sulphate • ammonium nitrate	Nitrogenous fertilizers
• single superphosphate • Triple superphosphate	Phosphate fertilizers
• Disodium Ethylene Diamine Tetraacetate (EDTA)	Used to improve water quality
• Zeolite	Soil reformer
• Chlorine • Iodine • Formalin (37-40% Solution) • Benzalkonium Chloride (BKC) • Sodium hypochlorite (5.25%) • Calcium hypochlorite (HTH 65%) • Teaseed (7% saponin) • Calcium oxide	Disinfectants

Harmful effect of chemicals in aquaculture: -

Aquaculture chemicals have the potential to contaminate freshwater sources. Some chemicals could be harmful to farm workers, or they might explode or catch fire. According to Boyd and McNevin (2014), additional chemical residues could taint aquaculture products and cast doubt on the food's safety. Pesticides can enter the body through the mouth, nose, or skin. The potential health effect is influenced by the type of pesticide, the amount of exposure, the manner of exposure, and the individual health status (such as nutritional deficiencies and skin condition, for example). In the body of a human or an animal, pesticides may be metabolised, eliminated, stored, or bioaccumulated in body fat.

Chemical pesticides have been associated with a variety of detrimental health effects, such as effects on the skin, gastrointestinal system, There are many chemical pesticides available today, and multinational agrochemical corporations, who largely regulate the world

food supply, use novel chemical substances with pesticide qualities and enhance biotechnology techniques, departing from conventional agricultural practises. Furthermore, widespread chemical pesticide use, which has been linked to adverse effects on human health, wildlife, and the environment, is the foundation of present agricultural methods.

Principle of organic farming: -

Organic aquaculture is a result of the organic agriculture movement. The environmental issues that extensive aquaculture encounters have led to the development of organic fish farming, an ecosystem-based management strategy. However, the process of switching from conventional to organic aquaculture is complex, challenging, and expensive. The development of organic aquaculture can be enhanced by developing standardised organic aquaculture standards. The conversion of aquaculture to organic practises offers a number of favourable environmental consequences. However, organic farming yields are considerably lower than those of modern aquaculture, which will diminish its contribution to global food security.

Because catch fisheries production has been static and hasn't kept up with the rising demand for fish and shellfish from a growing global population, food yield from aquaculture needs to expand. still another Aquaculture is associated with a number of environmental limits, therefore growth in fish output will encounter a variety of environmental problems. The environmental impact of aquaculture can be lessened by employing more organic aquaculture techniques.

Organic farming requires careful soil and environmental management, resource cycling, a range of farm component integrations, and management of nutrients and other resources.Some of the more conventional techniques used in organic farming instead of synthetic agricultural inputs like fertiliser and insecticides include crop rotation, green manure, compost manure, and other cultural practises to manage illnesses and control pests (Warra & Prasad, 2020).Organic farming attempts to provide wholesome food while conserving the natural life cycle's processes. A good example of this is ecological land management, which attempts to keep animal life, the environment, and food crops in balance. Animals should be raised humanely without the use of artificial fertilisers, synthetic chemicals, growth hormones, antibiotics, or genetically modified animals.

Organic aquaculture is created using sustainable ecological and environmental practises. Global environmental awareness has grown over time, and more people than ever are purchasing organic goods. Producing disease-free, naturally healthy seafood without the use of antibiotics, hormones, pesticides, etc. is one of the main principles of organic aquaculture, which also aims to protect the environment from all potentially hazardous influences. People's

concern for their health and the environment is increasing demand for organic products on the global market. Since organic aquaculture reduces consumers' overall exposure to harmful chemicals and antibiotics, it essentially protects their health. It is a well-known method for ecologically friendly and sustainable product production.

The traditional methods of organic farming "rely on ecologically based practises, such as cultural and biological pest management, and essentially restrict the use of synthetic chemicals in crop production, as well as prohibit the use of antibiotics and hormones in livestock production." Sustainability, environmental stewardship, and comprehensive, integrated industrial processes are characteristics of organic systems. For many years, there have been rules for raising animals on land and producing organic food. The certification requirements for state and federal organic rules have lately been expanded to include standards.

Key points of Organic Aquaculture: -

Restrictions on stocking density taking into account the ecological capability of the site and animal behaviour peculiar to each species (Shrimps: 15 PL/ m3, max. 800kg/ha per production cycle). Absence of genetically modified organisms (GMOs) in stocks and feed prime material with a focus on biotechnologically produced feed additives and vegetable feed ingredients (such as soy beans), as well as transgenic, triploid, and all-female stock

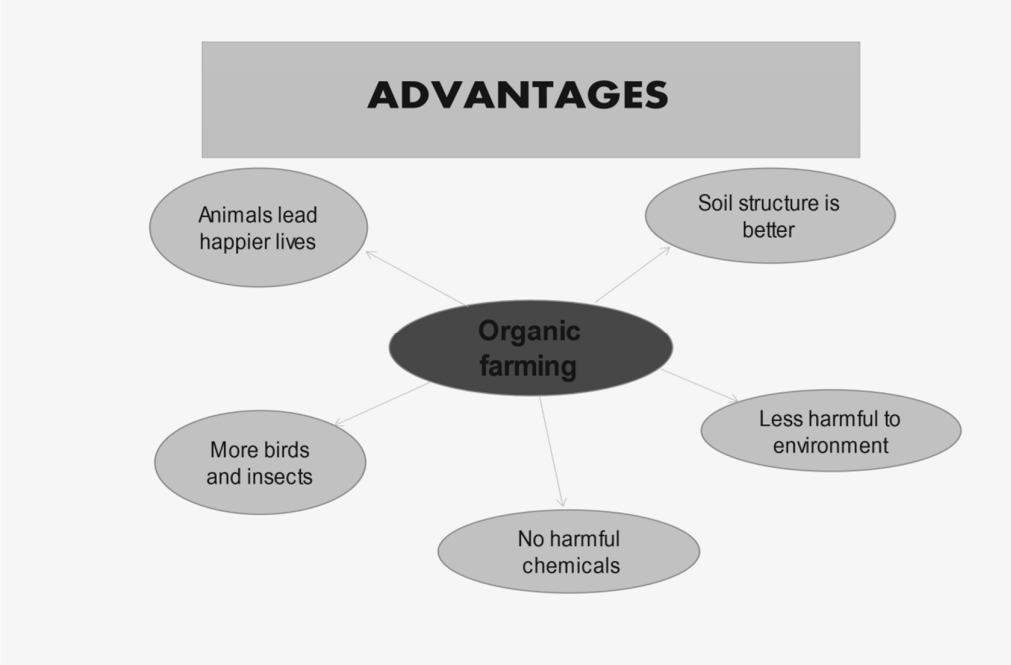
- No artificial feed components; origin of vegetal feed and fertiliser from certified organic farm.
- Networking of organic processes is a fundamental tenet of organic production. Fish trimmings that have been processed for human use or by-catch are generally authorised as sources of fishmeal with lower protein and fishmeal content of diets; no dedicated fishmeal harvesting facilities are allowed (Shrimps: maximum of 20% fishmeal/oil and maximum of 25% total protein).
- No use of inorganic fertilisers basic principle of organic production: recycling of nutrients instead of intensive input
- No use of synthetic pesticides and herbicides basic principle of organic production: 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

- Intensive monitoring of environmental impact, protection of surrounding ecosystems and integration of natural plant communities in farm management focussing on the effluents of farms and the design of pond farms
- Processing according to organic principles basic requirement for a final product to be certified as organic.

Current Status of Organic aquaculture: -

The main EU producers of organic aquaculture are Ireland (salmon and mussel), Italy (mussel and finfish), France (oyster, mussel, and trout), the Netherlands (mussel), Spain (mussel and sturgeon), Germany, Denmark and Bulgaria (mussel).

According to Eurostat data, the organic surface area in EU 27 reached 14,7 million hectares in 2020: an increase of 55,6% from 2012 to 2020. The most important organic areas are located in France (2.517.478 ha in 2020, +144% from 2012 to 2020), in Spain (2.437.891 ha, +39% since 2012), Italy (2.095.364 ha, +79% since 2012) and Germany (1.590.962 ha, +66% since 2012).



Altogether, the above-mentioned four MS represent 59% of the EU 27 organic surface area. The progression is observed in almost all MS to different extents (from +15% in Czechia up to +240% in Croatia), with the exception of Poland where organic surface has reduced by 22% over the 2012-2020 period.

According to the Research Institute of Organic Agriculture (FIBL) 8 and the International Federation of Organic Agriculture Movements (IFOAM), the value at the retail stage in 2020 was estimated at EUR 44,8 billion at EU 27 level (+15,1% compared to 2019). From 2000 to 2020, the value of the organic market increased by 707% in the EU. The EU is the second largest market for organic food globally, after the United States (EUR 49,5 billion).

Mussel is the main species, with 41.936 tonnes certified organic in 2020 (10% of the EU mussel production). Main MS are the Netherlands, Italy, Germany, Denmark, France and Spain with production above 3.000 tonnes each. The production is particularly high in Denmark (organic accounts for 73% of the national production), Ireland (34%) and Germany (29%). - Salmon is the second main species with 12.870 tonnes. It is only produced in Ireland. The EU production has decreased since Brexit, as the UK is an important producer. - Trout is the third species with 4.590 tonnes, France accounts for half of the production (with 2.346 tonnes), followed by Spain (917 tonnes) and Denmark (642 tonnes). The share of organic trout production in the EU is 2%. Since 2015, the EU production of organic farmed trout has decreased due to a strong reduction in Denmark and to a lesser extent in France and Italy. - Carp is the fourth species with 3.562 tonnes (4% of the EU production), main MS are Hungary, Romania and Lithuania. The production in 2020 is two times lower than in 2015. - Oyster accounts for 3% of the EU production (3.228 tonnes of organic oyster), organic production is almost exclusively located in France. The production increased since 2015. - Other species are European seabass/gilthead seabream, with 2.750 tonnes (1,5% of EU production). The main MS is Greece with 57% of the EU production.

Labeling of Organic Fish Products: -

A market-based tool called labelling seeks to provide consumers with only the information they need to make decisions about how they will view, assess, and purchase a product. Consumers can influence their purchase decisions if they are aware of, comprehend, and like labels. For products whose quality cannot be easily assessed by consumers, labels are essential. Labels so often serve as a quality indicator for consumers. Labels are also required to list product characteristics, such as special production methods that consumers cannot see or examine for themselves. These qualities are referred to as credibility traits. Credibility characteristics can be converted into search cues by using labels. However, the criteria must be valid and live up to consumer expectations.

National Programme for Organic Production (NPOP): -

the European Union (EU) has mandated that all organic aquaculture products imported into its member countries adhere to EU Standards Since July 2009, Therefore, framing national standards as equivalent to EU standards would be a more practical option. In this regard, the National Programme for Organic Production (NPOP) of the Government of India is finalising the National Standards for Organic Aquaculture after consulting with various organisations.

Certification organisations from the commercial sector are primarily responsible for defining the organic criteria for aquaculture goods. The increased cost of certification, however, seems to be one of the main obstacles keeping farmers from starting the programmes' development right once. In this regard, the National Standards for Organic Aquaculture Products in India are being developed by the Agricultural and Processed Food Products Export Development Authority (APEDA).

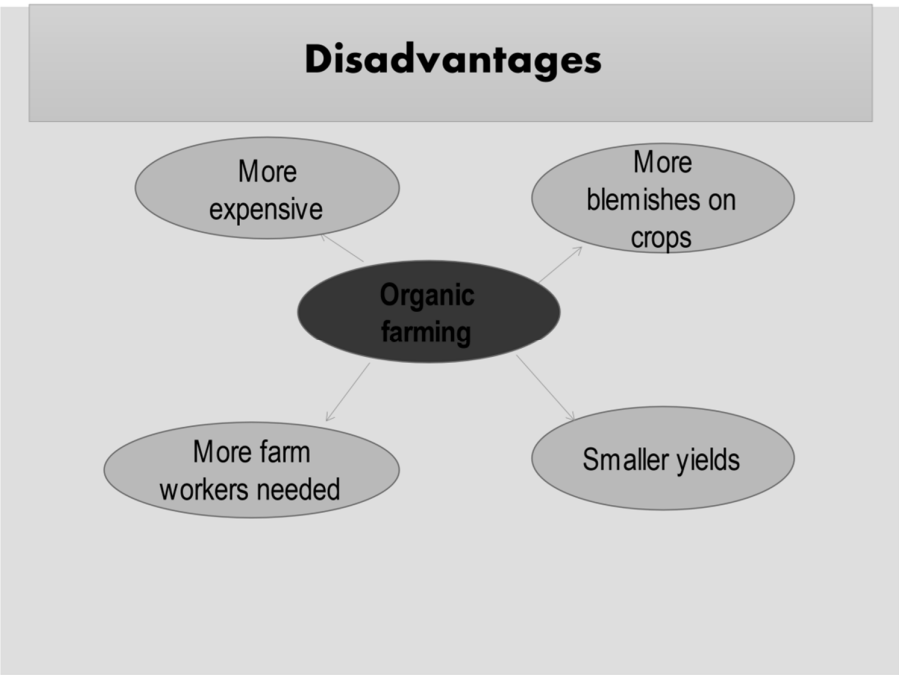
INDOCERT (Indian organic certification): -

The National Programme for Organic Production (NPOP) of the Government of India has accredited INDOCERT (Indian Organic Certification), an Indian certification body, to conduct inspections and grant certificates for organic production systems. In addition to providing certification for export markets based on USDA guidelines, INDOCERT also offers certification for the domestic market (United States Department of Agriculture).

Future Prospect: -

The establishment of a national system of legal regulations for this kind of activity, as well as the creation and implementation of support systems for legitimate agricultural producers who make environmentally friendly goods, are required to ensure the sustainable development of organic aquaculture. Since there have only lately been accepted standards and requirements for organic aquaculture, aquaculture has lagged behind agriculture in terms of the quantity and variety of goods that can be certified as organic.

Enhancing the coordination between production and the market by developing a suitable structure to support continuous development is the major challenge in organic aquaculture. Organic feeds, fish nutrition, customer needs, food safety, environmental issues, and trade issues are among the study's main objectives. The quality of the flesh of fish raised organically is likely to differ from fish raised conventionally due to changes in feeds and nutrition, which has a significant impact on consumer choice (Mente et al., 2011).



Prohibited List of Aquaculture Inputs

- All synthetic weedicides, piscicides, pesticides and insecticides
- Chemical fertilizers
- Wild seeds and seeds from GMO's and their derivatives
- Synthetic hormones
- Processing chemicals such as Ethylene oxide, Methyl bromide, Aluminium phosphide, Hexachlorocyclohexane (HCH) Lindane, Pyrethrum extract and Sulphite

List of Prohibited Antibiotics and Pharma logically Active Substances for Aquaculture

1. Chloramphenicol 2. Nitrofurans including Furazolidone, Nitrofurazone, Furaltadone, Nitrofurantoin, Furylfuramide, Nifuratel, Nifursoxime, Nifurprazine and all their derivatives 3. Nemoycin 4. Nalidixic Acid 5. Sulphamethoxazole 6. Aristolochiaspp and preparations thereof 7. Chloroform 8. Cholrpromazine 9. Colchicine 10. Dapsone 11. Dimetridazole 12. Metronidazole 13. Ronidazole 14. Ipronidazole 15. Other nitroimidazoles 16. Clenbuterol 17. Diethylstilbestrol (DES) 18.Sulfonamide(ex.sulfadimethoxine), sulfabromomethazine and sulfaethoxyrpyidazine 19. Floroquinolones 20. Glycopeptides