

## IMPORTANCE OF SUSTAINABLE AQUACULTURE AND ITS PRACTICES

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In the recent context of food production on the Earth, aquaculture stands as a sunrise sector. According to FAO, aquaculture is the commercial production practice of aquatic organisms like fishes, molluscs, crustaceans, and aquatic plants. Over the last few decades, the fisheries and aquaculture sector have seen a dramatic change in its dynamics with an overall expansion of production capacity, trade business, and food consumption. Although the capture fisheries showing a little stagnation trend for few decades, the aquaculture sector is booming. Emerging aquaculture production systems have a significant potential to curb the global food security problems and to meet human nutritional needs with improved environmental performance.

Aquaculture sector comprising of a wide range of culture practices of various species starting from finfishes, crustaceans, seaweeds, molluscs, and other aquatic organisms. Because of this aquaculture sector is opening up the windows of opportunities for urban as well as rural areas in their socio-economic developments.

But as the aquaculture industry expanding, the sector is also facing some problems like environmental degradation, water scarcity, limited availability of land for aquaculture, high input costs etc. So, sustainability in the aquaculture sector is the need of the hours.

### **What is Sustainable Development?**

Although living resources are self-renewable, the focus needs to be on sustainability before resource utilization. Sustainable development focuses on the management and conservation of natural resources and the orientation of technological and institutional changes in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations. Such sustainable development (in agriculture, forestry, fisheries sectors) conserves land, water, plant, and animal resources are

environmentally non-degrading, technically appropriate, economically viable, and socially acceptable. (code of conduct, FAO,1995).

### **What is Sustainable Aquaculture?**

Sustainable aquaculture can be defined as the aquaculture practice which focuses on environmental, economic, and social sustainability to improve capacity building and utilize land effectively for the aquaculture sector.

❖ *Environmental sustainability-*

Aquaculture practice should be eco-friendly. It should not impose any significant disruption to biodiversity.

❖ *Economic sustainability-*

The aquaculture practice should be profitable with good long-term prospects.

❖ *Social sustainability-*

Aquaculture practice must be socially responsible and contribute to the wellbeing of the local community.

### **Key Challenges Faced by Aquaculture Sector**

With the passage of time aquaculture sector also facing some problems, which are included as follows,

- ❖ According to FAO, there are nearly 870 million people out of 7.1 billion world population are suffering from malnutrition.
- ❖ By 2050 the food consumption will have expected to increase from 2400 kcal/day to 3000 kcal/day.
- ❖ Share of calories derived from cereals is declining in India.
- ❖ There will be around 70 million undernourished people in India by 2050.
- ❖ Over the years, there is shrinkage of freshwater resources.
- ❖ Unavoidable intensification of aquaculture leading to environmental pollution, unprecedented disease occurrence, and causing a heavy loss in the end.
- ❖ Input costs for aquaculture are rapidly increasing.

## Potential of Sustainable Aquaculture

To address these key challenges faced by aquaculture sector. The future perspective of this sector will rely on the importance towards the capacity to deal with global challenges due to social and economic pressure on natural resources and aquatic ecosystems, including environmental degradation, water scarcity, population explosion, food scarcity, global hunger etc.

Sustainable aquaculture can be emerged as rays of hope to deal with these challenges in the present as well as near future also. The role of fisheries and aquaculture is inevitable in food security and to livelihood of millions of people. It also a helping hand for millions of people as;

- ❖ A creator of employment.
- ❖ Supplier of nutritious food.
- ❖ Generator of income and economic growth.

In addition to that, a global opinion of scientists is that aquaculture is a very efficient producer of high value proteins essential for human health and wellbeing in terms of its resource utilization like space, food, energy, and water. Modern sustainable approach of aquaculture produces less waste and lower carbon-nitrogen footprints than agriculture production sector. So there is a need for sustainable development in aquaculture, which has the potential to address the challenges aquaculture facing today.

## Different Approaches for Making Aquaculture Sustainable

### 1. Focus on environmental impacts –

- ✓ Development of suitable technology for environmentally feasible aquaculture practice.
- ✓ Mitigation strategies for environmental pollution through microbial, Nanotechnology, practicing holistic methods like multi-trophic and organic aquaculture.

### 2. Use of renewable energy sources-

- ✓ The use of renewable energy in aquaculture can be a boon as it is cost effective, environmentally friendly, and carbon neutral technology.

- ✓ There is a wide variety of renewable energy techniques entering into aquaculture industry, such as wind-powered water pumps and solar-powered water heating systems etc.
- ✓ Investigating in these technologies reduces the long-term operating costs and reducing environmental implications.

### **3. Reduce dependency on fishmeal as feed ingredient-**

- ✓ As feed cost in aquaculture is skyrocketing due to the increased demand for fishmeal which also causing overexploitation of capture fisheries.
- ✓ Shifting of dependency over animal-based feed ingredients to plant-based can be served as a way for sustainable practice.
- ✓ Research on waste to wealth as a feed ingredient also should be promoted.

### **4. Promotion of sustainable aquaculture-**

- ✓ Rewarding sustainable farming practices in aquaculture through government policies can be done.
- ✓ Subsidy on input costs for sustainable aquaculture farmers should be done.
- ✓ Awareness and encouragement for sustainable aquaculture can be practiced.

### **5. Practice of sustainable organic aquaculture**

- ✓ Organic aquaculture is based on the use of organic inputs in aquaculture.
- ✓ No use of inorganic fertilizer, pesticides, antibiotics.
- ✓ It produces healthy fish which is completely devoid of any pesticide, antibiotic residues.
- ✓ Many organic aquaculture issues still needed to be resolved; steps should be taken to encourage and enhance organic aquaculture as sustainable practice of aquaculture.

### **6. Investment on new sustainable technologies**

#### **A. Aquaponics**

- ✓ Aquaponics is an integration of aquaculture and hydroponics techniques to produce both fish and plants in the same system.

- ✓ The system has high sustainable potential, such as less water requirements, minimum environmental impacts, and organic food production.
- ✓ It has potential to produce value added products like fish and a high yield variety of vegetables with less labor and land, less chemical use, and not much water usage.
- ✓ It can also be adapted to diverse and changing conditions.

#### **B. Integrated multi-trophic aquaculture systems(IMTA)**

- ✓ IMTA is based on the principle of polyculture and wastes utilization from the system by culture species.
- ✓ In the system, the particulate wastes materials are absorbed by filter feeder bivalves, while water-soluble wastes materials absorbed by algae.
- ✓ Along with the culture of fish and crustaceans, bivalves, algae, seaweeds can be cultured, which also maximizes profit margin.

#### **C. In-pond raceways(IPR)**

- ✓ IPR is like cage culture techniques but can be applicable to almost any water bodies which have the advantage of controlled
- ✓ water movement. This improves water quality and provides scope for more stocking density.
- ✓ IPR is more sustainable than cages, raceways, and intensive open pond culture.
- ✓ But still, further research is needed about the waste disposal of solid and liquid wastes.

#### **D. Re-circulatory aquaculture system(RAS)**

- ✓ RAS is based on the principle of water conservation and reduced waste discharge.
- ✓ It consists of a culture chamber, settling chamber, and biological filter. The water flows from the culture chamber to the settling chamber and then the biological chamber, which filters the water for reuse in the culture system.
- ✓ It has the potential for culturing in high stocking density, which maximizes the profit.
- ✓ RAS system conserves the water and reduces pollution.

- ✓ Fewer biological risks such as disease issues relative to farming in the natural environment.
- ✓ Lower environmental compliances.
- ✓ It has the ability to control the cultural environment, which improves FCR and reduces need for chemicals and drug use.
- ✓ Thus RAS can be an efficient, useful tool for sustainable aquaculture.

#### **E. Bio-floc technology(BFT)**

- ✓ BFT technique is based on in situ remediations by which heterotrophic microbes culture is enhanced by C: N ration and constant aeration.
- ✓ Generates a floc-like structure that is nothing but aggregates of various living and dead microbes, which provide a good nutritional value for culture organisms.
- ✓ BFT reduces feed conversion ratio (FCR) and decreases feed costs.
- ✓ This natural productivity plays an important role in recycling nutrients and maintaining the water quality.
- ✓ It conserves water, utilizes waste, and reduces pollution.
- ✓ Less investment as compared to other.
- ✓ The BFT is much more sustainability potential than any other cultural system

#### **Conclusion**

Aquaculture sector will face an immense challenge ahead. But with the industry growing and evolving simultaneously, the goal of feeding the world in a sustainable manner becomes an achievable goal. For that, sustainable aquaculture practice can be the best possible option available. Also, for this, it needs more investment into sustainable aquaculture, which has an immense potential to deliver healthy, sustainable food to meet the rapidly growing demand.

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