

AQUACULTURE FOR SUSTAINABLE DEVELOPMENT

BASED ON UN SDG (SUSTAINABLE DEVELOPMENT GOALS) 2030

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UN SDGs - Sustainable Development Goals

Aquaculture, globally is a dynamic and high growth industry with well established traditional practices. Its genesis dates back to almost 8,000 years in China, and involves water based cultivation - breeding, raising, and harvesting fish, shrimps, etc., including certain specific nutrient-rich marine aquatic plants, seaweeds and specialized algae like spirulina.

Traditional knowledge and systems rely on well-established belief patterns and knowledge. Aquaculture Industry traditionally relies on pond based breeding of fish & other aquatic species for human benefits.

But, in the 21st Century, full of innovations, a whole gamut of amelioration and improvements call for asking questions like 'What if?' and 'Why not?' and "How to do it better?" etc. Also, the operations must be aligned progressively to the excellent

UN SDGs - Sustainable Development Goals, which are a call for action by all countries in various spheres, to promote prosperity and human welfare and simultaneously protecting the planet.

In order to align and achieve the SDGs, it is imperative to continually improve the operations, processes, yield and benefits and cognize

the cardinal aspects affected by aquaculture operations and the effects thereof.

SUSTAINABLE ECONOMIC EFFECTS

Aquaculture industry employs a range of artisanal workers across the value chain – locally, nationally and internationally, from breeding, processing, storage and shipment or exports or retail, etc. It thus provides both macro-economic and micro-economic benefits to a wide spectrum of staff involved in the aquaculture process and thus increases the number of possible jobs in the market. It provides both new versatile food products for a market and creates ample job opportunities as labor is required to maintain the ponds, production, processing, etc.

Sustainable aquaculture would require sustainable economic practices. This would entail the use of human and material resources to create long-term sustainable values by optimal use, reduce wastage and adopt measures for re-use and recycling of resources.

It would also entail ameliorations in the innovative uses of storage, packaging, transportation, etc. to reduce the overall carbon footprint and safeguard against climate change. As a paradigm, energy efficient electric vehicles with zero carbon footprint can be used for local transportation needs and warehousing of produce etc. Another paradigm is the use of reusable plastic packaging.

Aquaculture would thus be a robust and viable business proposition for small and marginal farmers even in the rural segments, with good long term prospects via efficient aquaculture health management and disease control and improving the net yield and profits, thus ensuring sustainable aquaculture economics in the long term.

Thus, these sustainable practices in aquaculture operations contribute to UN Sustainability goals - UN SDG 2 (Sustainable Development Goal 2 - Zero Hunger), and UN SDG 8 (Sustainable Development Goal 8- Promote Sustained, Inclusive and Sustainable Economic growth), as part of the UN 2030 Agenda for Global Sustainable Development!

Apart from the main Economic benefits of the Sustainable Aquaculture operations, one must also focus on its

- ★ Sustainable Environmental Effects
- ★ Sustainable Social Effects
- ★ Sustainable Health and Safety effects.

SUSTAINABLE ENVIRONMENTAL EFFECTS

Aquaculture by itself helps in positive Environmental Sustainability results, in that it causes humans to depend less on the Oceans for food and thus save the Oceans and rivers from destruction on a long-term.

Aquaculture operations indubitably leave a large environmental footprint. As a Paradigm, a large volume of water from a captive source is cardinal aspect for breeding Fish and other Aquatic species. And high density of Fish produce lot of bio-waste, and such waste can contaminate the water. They can even potentially deplete the Oxygen content in water and produce algal blooms in the ponds.

Additionally, Aquaculture Farmers use a range of antibiotics to control this, which further causes exacerbation in effluent build-up and thus contributes to Environmental hazard around ponds and surrounding land, during Rains, floods and surface run-offs.

Sustainable Environmental practices in Aquaculture would entail risk mitigation of environmental hazard and disruptions to the ecosystem. It would also entail preservation of biodiversity and avoidance of significant level of pollution impact.

As a simple paradigm, we can use Modern Technology for this purpose. Android Apps developed to plan, manage & control their Aquaculture Operations. These can also be specially designed and used to provide Weather and Market information on a variety of specific parameters. Bio-Sensors based on IoT (Internet of Things) and AI (Artificial Intelligence) are now available, which can be used very effectively in ponds for Data capture, analyses and monitoring. The Data Analytics from such devices on Hand held digital Devices, Laptops and Mobile Apps, would help in implementing Just-in-time remedial measures and adjustments to monitor and improve any adverse Pond situations like Water

Alkalinity/ Acidity, Temperature, bio-oxygen levels, etc, to maintain a Positive Environment and Healthy and Safe eco- system in the Fish Pond.

Another innovative paradigm, one innovative way to solve water pollution in ponds, is to breed SHELLFISH, alongside other Finfishes. This is known as POLYCULTURE, or Integrated Multi-Trophic Aquaculture (IMTA). The shellfishes are known to easily survive by sponging off on uneaten fish feed, excess nutrients in water and even fish waste. Thus effluent buildup in water is minimized resulting in Environmental sustainability.

Another innovation is that Fish ponds can be built on robust concrete stilts to safeguard against Pond ecological disturbances during Heavy rains, floods, etc

Additionally, there can be innovative mechanisms like Reduce, Recycle and reuse of waste water, using optimum water flow and good ambient water quality maintenance by e-sensors, establishing mini-water treatment plants near the ponds, managing the effluents and controlling water quality also contribute to sustainable practice

Thus, these Sustainable practices in Aquaculture operations contribute to UN Sustainability goals - UN SDG 6 (Ensure availability and sustainable management of water for all), UN SDG 7 (Affordable and Clean Energy), UN SDG 13 (Affirmative Climate Action), and UN SDG 14 (Life below Water), as part of the UN 2030 Agenda for Global Sustainable Development !

SUSTAINABLE SOCIAL EFFECTS

Aquaculture is considered as one of the best ways to help feed billions of people in the future society. Hence, Aquaculture operations must be socially responsible and contribute to the overall well-being of society and growth and enhancement of the happiness of Local community

Seafood cultivation and production aspects make significant social and economic contributions in coastal and rural communities, where economic opportunities can be limited, and helps provide means of sustenance and contributes to poverty alleviation.

As a paradigm, aquaculture operations must be aimed to produce high protein food. The production of spirulina algae is an excellent way to increase long-term sustainability, as it has immense benefits and potential for both animal nutrition and human nutrition.

This results in an affirmative and positive impact on the nutrition and health development aspects of local populations, especially in the developing nations worldwide.

Also Training of Local unemployed and Rural youth can be initiated to bring them to artisanal level of competence . For this purpose , many modern technical aids can be employed.

As a paradigm, Digital Courseware including Mobile Courseware can be developed to Train and educate and ameliorate the cognizance of Frontline workers and technicians and Supervisors in the Farms and Ponds . Interesting and interactive content related to Aquaculture Best Practices and Safe practices in Fish Health & Nutrition, etc can be produced . Assessment by the Trainers can be undertaken via simple Quizzes that can be incorporated to help keep track of the learning curve and motivate the Learners , along with suitable rewards.

Interactive web applications based on Videos with an easy-to-navigate interface will help low-literate Aquaculture farmers and local artisans and workers on any device.

Also effective community involvement via Information dissemination, periodic Publications, news alerts ,in juxtaposition with ensuring the artisanal workers safety aspects , ensuring fair labor practices along with practices of equitable compensation, would ensure good Social Sustainability.

Also, social involvement of various stakeholders via Aquaculture Groups, clubs and Community hubs can be initiated, systematically organized and evolved over time. in juxtaposition with developing and expanding international cooperation and capacity-building support programs.

All these aforesaid aspects can greatly help in creating jobs, training artisans, youth, entrepreneurs, etc for the job requirements and also re- skilling and up-skilling them in modern Aquaculture sustainable processes.

Thus, these Sustainable practices in Aquaculture operations contribute to UN 2030 Sustainability goals - UN SDG 8 (Promote sustained, inclusive and sustainable economic growth, full and productive employment),

UN SDG 11 (Sustainable Communities), UN SDG 12 (Responsible Consumption an Production), and UN SDG 17 (Partnerships for the Goals), as part of the UN 2030 Agenda for Global Sustainable Development !

SUSTAINABLE HEATH AND SAFETY EFFECTS

Aquaculture operations produce products which have a great deal of trade value as food commodities in markets – both Nationally and globally. Hence the Quality, Health and Safety aspects of the Food produce is of cardinal importance. Equally important is the sustainability of the Fishes in the pond ecosystem, Thus, Fish Survivability, Feed efficiency, and Product yield is a major aspect which requires adoption of sustainable breeding and management practices.

As a paradigm, Prebiotics and Postbiotics are innovation in improving Fish health, disease prevention measures and enhancement of fish immunity to diseases. This will also greatly help in Aquaculture Health Management and disease control and thereby improving the Net yield and Profits, thus ensuring Safe and Healthy and Sustainable Aquaculture in the long term.

Technology aids like Bio-sensors can monitor ambient temperature of water, pH levels etc to protect Fish Health and Safety aspects.

Thus, these Sustainable practices in Aquaculture operations contribute to UN 2030 Sustainability goals - UN SDG 9 (Industry, Innovation and Infrastructure), UN SDG 11 (Sustainable Communities), UN SDG 14 (Caring for Life Below Water),and UN SDG 17 (Partnerships for the Goals), as part of the UN 2030 Agenda for Global Sustainable Development !

In this way Sustainable Aquaculture practices, based on the aforesaid paradigms, in juxtaposition with scientific and innovative applications to Aquaculture Farming processes, will ensure great Prosperity, Environmentally Friendly, Safe and Healthy Ponds , along with its heightened and vastly ameliorated , attendant Social and Economic Benefits – in consonance with UN Sustainability Goals!