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ADVANCED AQUACULTURE PRACTISES

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ADVANCED AQUACULTURE PRACTISES

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INTRODUCTION

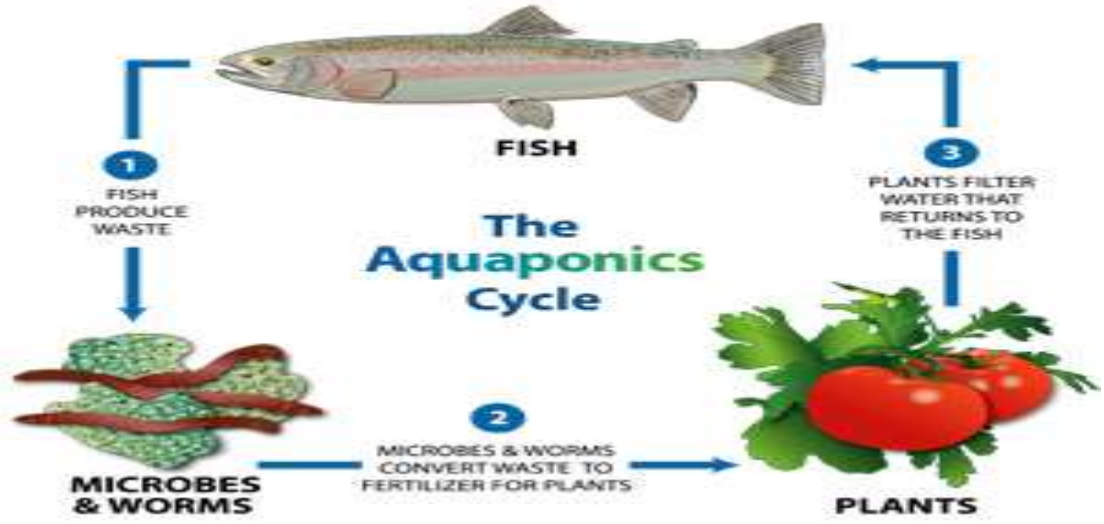
The world's appetite for fish is steadily growing. Finfish and shellfish currently make up one-sixth of the animal protein people consume globally. As the global wild fish catch peaked in the 1990s, aquaculture—or fish farming—has grown rapidly to meet world fish demand, more than doubling production between 2000 and 2012. New research shows that aquaculture production will need to more than double again between now and 2050 to meet the demands of a growing population. WRI partnered with World Fish, the World Bank, INRA, and Kasetsart University to explore this question. Our new paper, Improving Productivity and Environmental Performance of Aquaculture, examines aquaculture's environmental footprint today and explores various scenarios of aquaculture growth to 2050. It uncovers several strategies that can lessen aquaculture's environmental impacts while also ensuring that fish farming provides employment and nutritious food to millions more people. The aquaculture industry has greatly improved performance over the past 20 years, producing more farmed fish per unit of land and water, lowering the share of fishmeal and fish oil in many aquaculture feeds, and largely stopping mangrove conversion.

However, doubling aquaculture production without further increasing the industry's efficiency could lead to a doubling of environmental impacts. And unless the aquaculture industry is able to boost productivity, the limited availability of land, water, and feed may constrain its growth. Advanced aquaculture practises includes various systems:

- Aquaponics
- Cluster Farming
- IMTA
- PAS
- Polyculture
- System 80:20
- BFT
- Cage
- RAS

AQUAPONICS

Aquaponics is the combination of aquaculture and hydroponics. In aquaponics, you grow fish and plants together in one integrated, soilless system. The fish waste provides a food source for the plants and the plants provide a natural filter for the water the fish live in. Aquaponics produces safe, fresh, organic fish and vegetables. When aquaponics is combined with a controlled environment greenhouse, premium quality crops can be grown on a year-round basis, anywhere in the world. Aquaponics can be used to sustainably raise fresh fish and vegetables for a family, to feed a village or to generate a profit in a commercial farming venture.



ADVANTANGES

1-Significant reduction in the usage of water (compared to traditional soil methods of growing plants) as all water is recycled through the system and it is not necessary to discard or change any water (under normal conditions).
2-Growth of plants is significantly faster than traditional methods using soil.
3-Aquaponics grown vegetables are bigger and healthier then when grown in soil.
4-There is no need to use artificial fertilizer to feed the plants.
5-There is no need to dispose of fish waste or provide an artificial filtration system.
6-Significant reduction in land is required to grow the same crops as traditional soil methods.

CLUSTER FARMING

Cluster is a group of farmers whose shrimp ponds are situated in a specified geographical locality; commonly all ponds are dependent on the same water source.

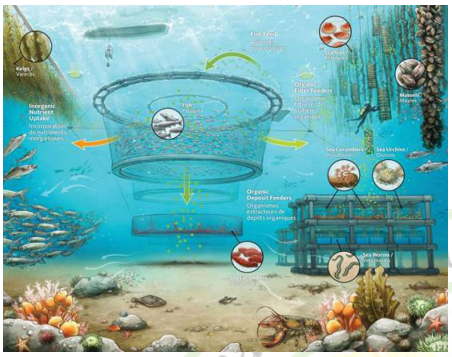
Cluster farming having the following salient features:

- Each Cluster contains - 20 to 50 Farmers
- Small scale farmers
- Use common water supply channel.
- All farmers are registered under Costal Aquaculture Authority
- Also got cluster certification from MPEDA
- The cluster farmers should elect their own governing board
- 7 members such as 1.President, 2.Secretary, 3.Treasurer and 4 committee members
- The Cluster society should prepare their rules and regulations (Bylaw)
- Registration number from state govt.
- Should not use any banned chemicals and Antibiotics
- Cluster people should maintain all records and documents for the traceability
- Society accounts are audited by MPEDA

INTEGRATED MULTI-TROPIC AQUACULTURE (IMTA)

Integrated multi trophic aquaculture provides the by-products including waste from an aquatic species as inputs (fertilizers, food) for another. Different species is cultured in the same pond to maintain the water quality. The wastes from fish utilized by shell fishes and they convert organic into inorganic nutrients. These inorganic nutrients used by sea weed for photosynthesis. The

main aim of this system is to achieve the environmental sustainability(use waste of one animal as a fertilizer or feed of other animals.



Species used in IMTA are :
1-shrimp + shellfish
2-fish + shrimp + seaweed
3-shrimp +shellfish (mussel) +seaweed

Selection of species:
1- based on feeding habits
2-economic value
3-market demand

The major difference of IMTA with Aquaponics or PAS is the function or role of animal in the culture system.

ADVANTAGES

1-Reduce the environmental impacts
2-Gives the sustainable production.
3- More sustainable and profitable system .
4- No need of supplement feed .
5-Biologically well balanced system.
6-Production of different species at one culture.

PARTITIONED AQUACULTURE SYSTEMS (PAS)

The main principle of PAS is water from raceways is flow into the algal culture channels. The flow water is maintanined by aerator in algal unit the waste from water is removed and it is used as nutrient for their growth. Then the purified water is again circulated into the raceway unit. The component of PAS are fish raceway unit, paddle wheel aerator and algal channel.

ADVANTAGES:

- Fish waste can be recycled
- Increased carrying capacity of fish by high primary production and o2 by algae
- It can increased yield 4-5 times
- Release of nutrient rich water to the environment is reduced.
- Yield the high value fish and algal species
- Additional aeration is not required
- Use of fertilizers is reduced
- Low input of water

POLY CULTURE

Polyculture in aquaculture is the association of fish species of different food habits for the effective use of available fish foods in the pond, where wastes produced by one species may be inputs for other species. Polyculture is the main fish culture system in Asia, the continent generating over 90% of the world aquaculture production. There are research pertaining to the combination of intensive aquaculture system with the extensive polyculture system. This is due to the maximization of the organic matter in the discharge water of the intensive culture unit. This polyculture unit will thrive on the organic matter of the intensive unit there by acting as a biofilter for the organic matter rich discharge water making the water free from the organic matter.

ADVANTAGES:

1- Reduce the environmental impacts
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SYSTEM 80:20

The 80:20 system provides higher yields and higher profit than monoculture promoting in India Indonesia and philiphines by American soyabean association international marketing and chines extention service. The 80:20 pond fish culture system combines intensive production of one high-value species such as catfishes, tilapia with a service species" such as the filter feeding silver carp which helps to clean the water and the carnivorous mandarin fish (Siniperca chuatsi) which controls wild fish and other Competitors. Eighty percent of the harvest weight comes from the pellet-fed target species and the other 20 percent comes from the filter feeding service species. Such systems are widely thought to be more environmentally sustainable, however, economic incentives are driving intensification and specialisation, resulting in changes to such traditional systems, with likely loss of environmental services.

BIO – FLOCS TECHNOLOGY

Suspended growth in ponds consists of phytoplankton, bacteria, aggregates of living and dead particulate organic matter and grazers of the bacteria. If carbon and nitrogen are well balanced in the solution, ammonium in addition to organic nitrogenous waste will be converted into bacterial biomass. By adding carbohydrates to the pond, bacterial growth is stimulated and nitrogen uptake through the production of microbial proteins take place. This promoted nitrogen uptake by bacterial growth decrease the ammonium concentration more rapidly than nitrification.

In natural environments, microorganisms tend to form amorphous aggregates. We can conclude that the biological flocs can be considered as a kind of fast growing microbial mixed culture in which the waste – nitrogen is recycled to young cells, which subsequently are grazed by the fish. Uptake of the bio – flocs by fish depends most probably on the fish species and feeding traits, fish size, floc size and floc density. With respect to feeding, this technique operates at neutral cost, because it upgrades starch to protein. Moreover, one does not need to invest in an external water treatment systems.

RECIRCULATORY AQUACULTURE SYSTEMS

Recirculatory system are usually characterized by minimal connection with the ambient environment and the original water source. These system have minimal exchange of water during a production cycle. Some water is discharged and replaced each day in most recirculating tank system. Regular maintenance of accumulated solids and water quality is maintained by pumping the culture water through filtration and aeration.

The increased focus on RAS for fish production is due to:

i. Limitations in freshwater resources especially during dry periods of the growing season.
ii. Problems associated to inlet water quality as most water bodies have relatively soft water (low calcium) requiring liming or silicate to increase alkalinity.
iii. Need for uv irradiation/ozone treatment for disinfection purposes;
iv. Need for stripping off high levels of CO_2 (ground water).
v. The advantages of constant, optimized temperature conditions offered in ras in contrast to open systems.