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Integrated Fish Farming

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Agriculture is known for its multifunctional ties of providing employment, livelihood, food, nutritional and ecological securities .Today the economy is based on mainly in the field of agriculture and software development in the area of Information Technology. For achieving rapid progress in rural area, our strategy must focus on; conserving natural resources, enhancing efficient of resource use, increasing productivity and profitability and improving quality and competitiveness through reduced unit cost of production.

Integrated plant nutrients and protection systems of crop, livestock and aquaculture production are being updated for various agro-ecologies. Water is emerging as international challenge and its most efficient management as well as recycling has been given high priority in the plan of formulation. Recycling of crop residue as well as agricultural by products inclusion of nitrogen fixing legumes in rotation, bio fertilizers, vermicultre, agro forestry, nutrient solubilizing micro-organisms, efficient nutrient up taking plant varieties etc. are being strategies in the research mandate. Improved efficiency farm machinery energy, agro-input and resource conservation technologies of minimum tillage are being researched to minimize the cost of production.

Integrated Fish Farming is one of the best examples of mixed farming. This type of farming practices in different forms mostly in the East and South East Asian countries is one of the important ecological balanced sustainable technologies. The technology involves a combination of fish polyculture integrated with crop or livestock production. On farm waste recycling, an important component of Integrated fish farming, is high advantageous to the farmers as it improves the economy of production and decrease the adverse environmental impact of farming. Integrated fish farming serves as a model of sustainable food production by following certain principles:

- The waste products of one biological system serve as nutrients for a second biological system.

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- The integration of fish and plants results in a polyculture that increases diversity and yields multiple products.
- Water is re-used through biological filtration and recirculation.
- Local food production provides access to healthy foods and enhances the local economy.

In certain areas, paddy fields remain flooded with water for a period of 3-8 months in a year, during which some growth of fish is easily possible. Hence, fish is cultivated in paddy field to give sustainable additional supply to the farmer. This practice is common in Italy, Japan, Malaysia, several African countries and to some extent in India various techniques are employed for fish culture in paddy fields depending upon the climate local conditions, species of fish available and the variety of paddy cultivated. The cultivation of paddy is the primary purpose of farmer; hence fish culture is to be adapted to the schedule of paddy cultivation. Species that are suitable for culture in paddy fields must be able to thrive in shallow water. They should be able to tolerate relatively higher temperature and turbidity. Certain carps, murrels and tilapia are suitable for culture in paddy fields. Fish culture is beneficial to the paddy also to some extent. Fish perform tillage; destroy weed and insect that cause damage to the paddy plants, thus increasing paddy production.

In India, experiments conducted on fish culture in paddy fields in W.Bengal have shown that the survival rate of *Labeo, Catlaand Mrigal* ranges from 34-40%, and the species show more rapid growth in paddy fields than in ponds. Fields that are left flooded for a long or short period after harvesting can be easily utilize for fish culture.

The wetland area which is generally waste land can be used as integrated fish farming with *Euraleferox* culture in same pond / tank (*Euraleferox* is commonly known as "Makhana" is an aquatic plant's fruit having very high nutritive value and are cultivated in northern India and some other Asian country) .This type of mixed culture will offer greater efficiency in resource utilization, will reduce risk by diversifying crop and will provide additional food and income. This system will be of special significance as it will improve the socio-economic status of weaker rural fisher community.

Fish culture in ***Euraleferox*** ponds can be grouped as:-

- secondary crop of fish after a *Euraleferox* corp.
- along with the *Euraleferox* during the period of cultivation; and

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- continuous fish culture, transferring the fish to specially prepared ponds or channels during the harvesting period of *Euraleferox.*`

The various stages of *Euraleferox* cultivation in ponds and tanks considerably alter as well as disrupt the ecological conditions of the water body. The planktonic productivity of such ponds remains very meager due to shaded surface imparted by *Euraleferox* leaves which mostly cover the entire surface of the pond. So that the air-breathing fishes, by virtue of the presence of accessory respiratory organs can thrive well in such adverse, low- oxygen environmental conditions. It is a common view that the air- breathing fishes in such ecologically disrupted ecosystem are probably made for each other by nature itself. These fishes are well known for their high protein, high iron, high calcium and low fat content and easy digestibility and such, suitable for all people.

There are various species of air- breathing fishes most ideally suited for stocking in *Euraleferox* ponds. These are generally carnivorous in nature and in culture operation they adopt themselves excellently to supplementary feeding with dried trash fish, oil cake and rice bran. Among these fishes *Clariasbatrachus* and *Heteropneustesfossilis* are known to be feeding gastropods, insects, micro crustaceans, and other larvae. *Anabas testudineus* is generally a micro plankton feeder in younger stages and takes to insectivorous habit in later stages.

Euraleferox cum fish culture has certain advantage and disadvantage. The main **advantages are** :-

- the most economical utilization of pond or wetland area, since the same pond would be used for the production of both *Euraleferox* and fish.
- Utilization of limited extra labour to take care of fish, since both *Euraleferox* and fish may be taken care at the same time.
- The quantity of supplemental of fish feeds, if it all given, will be comparatively less compared to feed given to the fish in general pond culture and the unused feed in pond *Euraleferox* increases the fertility of the pond by acting as organic manure.
- Fish eat harmful organisms, such as insect larvae and some other water insects, fresh water mollusks. The *Euraleferox* yield would increase due to reduced insect pest pressure and increased organic fertilization.

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- The movement of fish would result in better aeration of the water and greater tillering of the *Euraleferox* crop.

The **disadvantages** of the Euraleferox cum fish culture are:-

- If the fish are introduced to early, they may damage the young *Euraleferox* plants.
- The huge sprawling leaves of *Euraleferox* plant keep the water surface shaded from May to August. During this period sun-light will not penetrate inside the water surface due to which the grazing chain gets disrupted. As a result of this the dissolved oxygen content of water gets depleted which makes the environment unfavorable.

Another example of mixed farming is prawn culture in combination with fish, like major carps. There is no competition for food or space, as carps are non predatory. The faecal matter of fish might serve as an additional source of food for prawns, which are detritus feeder or scavengers. For extensive pond culture, fertilization of the pond and artificial feeding play a significant role. Rice bran, broken rice, ground nut oil cake, fish meal, worms and meat are used as artificial food.

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  - ✓ conservation of water resources and plant nutrients
  - ✓ intensive production of fish protein
  - ✓ reduced operating costs relative to either system in isolation.
- Reciprocating biofilters provide uniform distribution of nutrient-laden water within the filtration medium during the flood cycle, and improved aeration from atmospheric exchange during each dewatering with benefits to both nitrifying bacteria and plant roots.
- Dissolved and suspended organic materials accumulate rapidly in aquaculture systems and must be removed for efficient fish production.
- Aqueous nitrate concentrations in re-circulating aquaculture can be adequately regulated when fish and crop production are linked via reciprocating biofilters.
- Research to determine the optimum ratio of fish pond to biofilter volume on fish growth rate and water quality found that stocking density of fish and plants can vary depending on desired goal. The component ratios of the system may be manipulated to favor fish or crop production according to local market trends or dietary needs. Fish stocking density and feeding rates are adjusted to optimize water quality as influenced by plant growth rate.

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- Thus by applying modern method for integrated fish farming on large scale by the people living in the wetland region will definitely play an important role in the rural economy.

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