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Integrated Fish Farming (IFF); A Practical and Sustainable Aquaculture Production System

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Introduction

The definition of integrated farming is the progressive linking of two or more farming operations or systems. Integrated fish farming is a term used when fish become a key commodity in this system (IFF). In order to raise nutritional standards, the IFF is regarded as an alternate form of land use and livelihood that is mostly used in south-East Asian countries, including India. India generates a lot of plant and animal wastes because it is an agricultural based nation, according to data, between 322 and 1000 million metric tons annually. Country also has the biggest number of cattle, along with sheep, goats, pigs, chickens, and other livestock

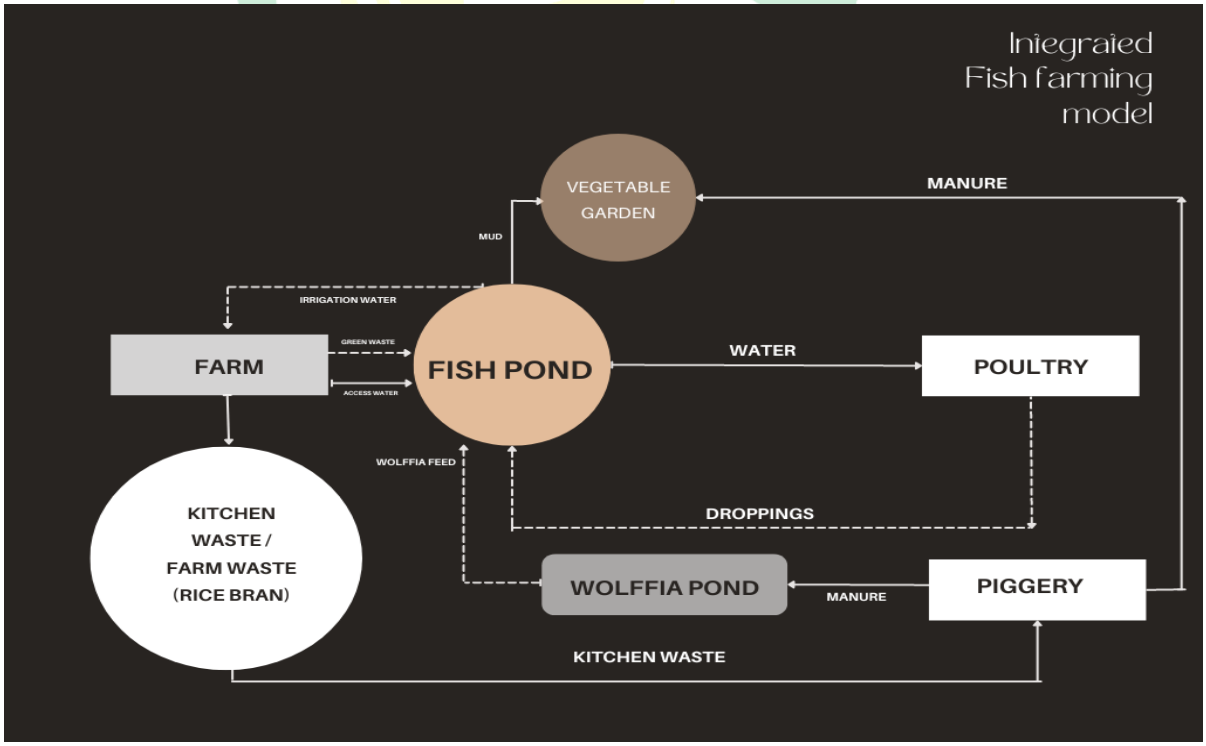

Figure1. Integrated Fish Farming Model

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. Numerous other agricultural products, such as those produced from the mushroom, sericulture, and apiculture industries, as well as biomaterials containing nutrients that may be recycled in fish farming, contribute enormous amounts of organic matter for aquaculture. All of the parts of the system get the benefit from this combination. Fish, who either directly or indirectly consume animal and agricultural waste as food, are typically the largest winners. Integrative farming has been viewed as a cost-efficient and successful way of environmental management since it recycles wastes.

Types of Integrated Fish Farming:

1. **Paddy-Cum-Fish Culture:**

   A small population of fish always manages to penetrate the submerged waterways since rice fields remain buried in water for three to eight months out of the year. This probably led to the intentional stocking and fishing of fish. In fallow rice fields, it has

long been customary in India to employ "gamcha or dhoti" to capture fish and prawns.

Advantages of paddy-field aquaculture:

Aquaculture on rice fields increases farmer income. In areas where fish and rice are the primary staples, paddy-field aquaculture gives the locals an important source of sustenance. Since paddy and fish may be grown simultaneously or alternately in the same water mass, it requires only a little amount of additional input in the form of additional costs, particularly for labour and administration. It provides farmers and agricultural workers with off-season employment. Fish aquaculture and paddy cultivation coexist peacefully. Fish farming promotes higher paddy output by effectively controlling undesirable weeds, mollusks, hazardous insects, and their larval stages.

The following factors are typically considered to choose the fish for paddy-cum-fish culture:

1. Fish capable of surviving in the shallow waters needed for paddy fields.
2. Fish that can endure high temperatures.
3. Fishes that can endure in low-dissolved-oxygen situations, such as those found in rice fields, particularly in tropical areas.
4. Fish having a somewhat high tolerance for turbidity.

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5. Because the time spent cultivating the fish is so brief, it's crucial to select fish with quick growth rates so they may reach a size that is appropriate for sale in these brief months.
6. Fish that can survive in captivity and don't frequently swarm outside the farmed area.
7. Fishes including *Mugil parsia*, *Mystus gulio*, *Haplochromis mellandi* (a mollusc-eating fish), *Puntius* species, *Channa* species, prawns, and shrimp are cultivated in these waters in India. Only a few experimental studies in India have demonstrated the viability of using Indian carps in such integrated farming.

2. Duck-Cum-Fish Farming:

Although duck and fish farming have been practiced for a very long time and their compatibility has long been acknowledged, the interaction and benefits of the pairing have only just come to light. Practical methods for raising ducks in fish ponds have been developed internationally during the past 10 years. Since it considerably increases the quantity of fish and duck protein generated per square foot, a combination culture like this one is undoubtedly very advantageous. Duck and fish farming are now regarded to work well together because, on the one hand, the cost of duck feed may be reduced and, on the other, duck faeces can be used to fertilize ponds at a low cost, which encourages the growth of fish food species.

Therefore, ducks can be considered "living manuring instruments." The excretions of ducks contain a range of elements, including 25% organic and 20% inorganic compounds, as well as carbon, nitrogen, phosphorus, potassium, calcium, and other elements. Ducks also help to release nutrients by agitating the pond's shorelines. Additionally, ducks eat a variety of organisms, such as weeds, snails, unwanted harmful insects and their larvae (some of which are vectors of fish pathogenic organisms), tadpoles, frogs, and water-borne disease-causing organisms that infect humans; their eradication is one of the key elements of farm management).

3. Fish-Cum-Poultry Farming:

Fish ponds benefit greatly from the use of chicken manure as a fertilizer, hence integrated fish and poultry farming is frequently used. Chicken dung has a nitrogen content of 2%, phosphoric acid of 1.25 percent, and potash of 0.7 percent. Due to the low expense of

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feeding each individual bird, poultry farming and fish farming are popular investments for poor farmers.

To breed fish, the ponds are stocked with fingerling Catla, silver, Common Carp, Murrel, Tilapia, enormous Freshwater Prawns, etc. Fish stocking density and poultry stocking density, as well as the period of culture, are related. A one hectare pond can produce 600 kg of massive freshwater prawns (Macrobrachium rosenbergii), 1500 silver carp, and 250 culling birds after receiving 5000 of the species and being farmed for four months.

Catla, Common, Silver, and Grass carp fingerlings may be released in ponds at a density of 5000–6000 fingerlings per hectare for cultivation over the course of a year. After a year of producing fish and poultry together, quantities of fish of over 3,900 kg per acre, 42,000 eggs, and 200 culled birds are frequently possible.

4. Fish-Cum-Pig Culture:

Pig "dung" is used to condition the soil and provide the nutrients required to fertilize the pond water when pigs and fish are kept together. Fish-cum-pig culture is commonly used in China, where pigs are seen as "affordable fertilizer factories."About 70% of pig dung may be used as fish food. Enzymes that keep working long after the food has been contaminated with faeces and passed through the pig's alimentary canal. These undigested substances provide common carp and tilapia with a direct supply of sustenance. In tropical fish ponds used to cultivate fish, weeds are a serious problem. Such a plant is valued as a valuable source of pig food. Polyculture is widely utilized in this style of integrated farming since so many different kinds of food may be produced in the pond. Herbivorous and omnivorous fish are raised for food, mostly common and Chinese carps, but also less frequently catfish (Pangasius), Indian carps, and Tilapia. Due of the ponds' high production, fairly high stocking rates—60,000 fingerlings of different species, each weighing 20–30 grams—are routinely released.

Production:

Fish and pigs are raised for various lengths of time. However, cultures that continue for six months are also practiced. It typically lasts for around a year. The overall economics of rearing pigs and fish together are determined by the local circumstances. However, after they weigh between 90 and 100 kg, the pigs are frequently sold. The annual fish production per acre normally varies from 2 to 18 tones.

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5. Cattle - Fish Integrated Farming System

Integrated cow and fish farming is the greatest method for ensuring fish output in little ponds (0.1 hectare). The fish crop is raised using this technique on pond embankments or other appropriate farming settings. Some processes must be followed, much like in an integrated pig-fish farming system. In the pond, chemical fertilization is not required. The cow should be brought to the shed around two months before the pond is filled with fish seed. While cow faecal matter is guided to a soak hole, it is allowed to fall into the pond's water. However, cow dung is initially strewn all over the pond before it is filled with fish seed. Other than the green grain required for grass carp, no more feed is supplied to the pond.

Production:

3500 kg per hectare of fish, 24 000 litres of milk with 10 calves per hectare could be achieved through this integration.

Constraints of IFF:

The fact that aqua farms in Asian countries are still managed conventionally, without careful planning, the use of cutting-edge management approaches, and a significant dependence on the farmers' own experience, limits IFF. Due to disease outbreaks, a lack of operating capital, intermediaries, low pricing, and the absence of extension services, lack of knowledge and competence may cause losses for farmers. A fair price for the marketing of agricultural products is not assured.

Conclusion:

Integrating fish culture with crops, cattle, and other livestock can boost the income of a farmer with a small landholding. These techniques help to increase productivity while costing little additional money. It is projected that IFF methods would spread quickly in favourable agroclimatic regions of the country since they are reliant on environmentally beneficial practises, give larger returns, and promote sustainable production levels of fish and other bio-resources.

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