



Integrated Fish Farming

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INTRODUCTION

Integrated fish farming systems refer to the production, integrated management and comprehensive use of aquaculture, agriculture and livestock, with an emphasis on aquaculture. Asia has a long and rich history of integrated fish farming. Written records from the first and second centuries B.C. documented the integration of aquatic plant cultivation and fish farming. From the ninth century, records showed fish farming in the paddy field. From the fourteenth to sixteenth centuries, there were records of rotation of fish and grass culture; and by the 1620s, the mulberry-dike fishpond, the integration of fish and livestock farming and complex systems of multiple enterprises integrated with fish farming were developed. Integrated fish farming is the methods by which fish is cultured along with paddy, piggery, poultry or any livestock, or flower culture.

Fish- Cum-Paddy Culture

In areas where paddy fields remain water for 3 to 8 months in a year, paddy cum fish culture can provide an additional supply of fish crop. The culture of fish in fields, which remain flooded even after the paddy is harvested, might also serve as an off-shore occupation for farmers. In recent years, however, with the advent of high yielding varieties of paddy, the use of insecticide, pesticide, weedicide and fungicide, many of which even in minute quantities are highly toxic to aquatic life, has become widely prevalent. Fish culture, therefore, is no more compatible with paddy farming wherever the latest high yielding varieties of paddy are cultivated. Paddy-cum-fish culture is an old practice in several countries as Japan, Malaysia, Italy, China and India. In some north eastern states of India it is practiced to an appreciable extent. As paddy fields remain flooded with water for several months, fish can be grown there at low cost in addition to rice.

Over 80 million ha of land produce the world supply of rice, and in favorable situations at the end of the season, paddy-cum fish culture yields 300 Kg. or more of fish per ha for an inundation period of 3 to 8 months. The species of fish commonly reared in the paddy cum fish culture are carps.

Methodology for rice field preparation

Site selection:

The site selection for paddy cum fish culture is low lying area where water flows easily and available at any time in needs. The soil of the paddy field is fertile organic manure and has highly water retaining capacity.

S.No.	Parameters	Rang
1	Sand	85.71 - 96.62 (%)
2	Silt	3.12 - 11.69 (%)
3	Clay	0.26 - 2.86 (%)
4	pH	5.00 - 5.70
5	Organic Carbon (%)	1.15 - 2.54 (%)
6	Organic Matter	8.24
7	Soil Colour	Light Brown, Blackish
8	Total Nitrogen	0.22 – 2.54 (%)
9	Texture Class	Loamy Soil, Sand
10	Available Phosphorous	2.90 – 4.50mg/100gm

Physicochemical characteristics of soil

Preparation of paddy plots

Bundh construction: The plots selected for paddy cum fish culture are normally prepared in the month of February by raising their embankment all along the plots. The paddy fields are suitable for fish culture at the areas because of strong bundh, which prevent leakage of water to retain water upto desired depth and also guarded the escape of cultivated fishes during the floods. The dykes should be built strong enough to make up the height due to geographical and topographic location of the paddy field. The bamboo screen mating done at the base of the bundh for its support.

Dressing of paddy field: After the completion of bundh construction the base of paddy fields are leveled with the help of spade and local made wooden plates. Manual weeding is done during the month of February followed by construction of irrigation channel for easy passage, storage and draining of water. There are 2-3 channels constructed at the middle of paddy field for water management. That channel divides the paddy field perpendicular and horizontally bisect at a point. It is important to note that almost all paddy field have one or two inlets and more outlets. The

former serve as entry of water required for the field and the later as outlets, one which remains at the bottom side of the dykes is meant for draining out the water for harvesting paddy crops and fishes. The remaining outlet constructed at the middle height of the dykes is meant for maintaining desirable water depth. Once the dressing work is over, the paddy field is ready for transplantation of rice seedling and fish seed stocking. However, the stocking of fish seed is done after 10-15 days of transplantation of rice seedling from its nursery bed.

Management of water supply

The farmers of the areas have sound knowledge of trapping water for paddy field. They construct barricades using wooden/bamboo poles across the stream, rivulets etc. to divert water to irrigational channel for the paddy fields. The irrigational channel varies from 0.5 to 2 meters in wide.

Source of fish seed

The main source of seed is from progressive fish farmers who normally produce adequate size of fish seeds by rearing in small size ponds for a period of about 1-2 months and sell it to the farmers who grow them directly in paddy fields and farms ponds.

Organic fertilization of paddy fields

The plots utilized for rice-cum-fish culture is mainly based on organic fertilization with a varieties of animal excreta such as poultry dropping, pig excreta, cow dung and waste of plants such as rice husks, waste product of local beer and ashes from household burnt and remains of burnt straws after the harvest is over and compost fertilizer like decomposed straws, weeds and rice stalks etc.

Stocking of fish seeds

Before releasing of fish seed to paddy field the paddy transplantation from rice seed beds to main paddy fields is done in the month of April, and there after paddy is left for two weeks for strengthening of paddy roots, the fish seed @ 2500 nos. /ha area is released. The fish rearing period varied from 3-6 months and the paddy rearing period is 5-7 months.

Harvesting

Gears use for harvesting fishes is simple bamboo made basket called cane/bamboo. The fish culture for the period of 3-4 months in rice field, a production of 200-300 Kgs/ha achieved and while fish grown for the period of 5-6 months; 400-500Kgs/ha yield has been reported in the same season. Methodology used for harvesting used for harvesting, first the water is drained through outlet pipe, and thus allowing fishes and water accumulated in mid channel of paddy field, there by the fishes are caught with the help of tasting puda, hand picking etc. and then stocking in large plastic bucket in live condition. After completion of fish harvesting the paddy harvesting followed. Normally paddy harvesting is made last part of Sept. & Oct. The paddy production range from 3500-4500 Kg/ha from the same plot of land.

Marketing

Fish harvested from the paddy field are marketed at the local market a live or fresh condition because of high market demand, live fish sold @ Rs. 120/- per Kg and fresh fish @ 100/- per Kg. during the lean season, the market price fluctuates. Marginal fish farmer sell their produce in fish market or in the

paddy field itself. During the peak season, the fish production from these paddy fields also reaches in the capital markets.

Horticulture-cum-fish farming

The horticulture-cum-fish farming system includes the culture of fruits, vegetables and flowers on the embankment of the pond. The fruits and vegetables contain various nutritive elements and the Indian Council of Medical Research has recommended 85g of fruits and 300g of vegetables to consume daily. For horticulture crop production the inner and outer dykes of the pond and adjoining areas are used. The selection of plant is the main criteria for the success of this system. The plant should be dwarf, seasonal, evergreen, remunerative and less shady. The fruit crops which can be used are Mango, Banana, Papaya, Coconut, Lime etc. and the vegetables like Brinjal, Tomato, Cucumber, Gourds, Chilli, Carrot, Radish, Turnip, Spinach, Peas, Cabbage, Cauliflower, Ladies finger can be grown according to their season throughout the year. The flower plantation on the embankment is also useful. We can use the plants like Rose, Jasmine, Gladiolus, Marigold and Chrysanthemum etc. which provides additional income to the farmer and beauty to the farm. This system provides 20-25% more return in comparison to aquaculture alone.

The Agri-based fish farmin

It includes the mushroom fish system, sericulture-fish system, fodder crop integration etc. Pond bundhs may also be used for growing pulses and oil seed crops. Aquatic cash crop like Makhana (*Euryale ferox*) and Singhara (*Trapa spp*) integration can also be done along with air-breathing or carnivorous fishes.

Fish farming along with Duckery or Poultry

Fish can be cultured along with livestock. The system is advantageous because duck feeds miscellaneous items from water like insects, crustaceans, molluscs which are not economical. The duck droplling is used as foods as well as fertilizers of ponds. The dabbling of duck in pond water in search of feeds release the nutrients from soil as well as

it mixes the oxygen to the water which enhances the biological productivity and consequent increase of fish growth. The duck does not need any elaborate house and most of the time they prefer to live in water. Improve stocks of ducks like– India Runners, are used in poly culture system. 200 – 300 ducks are culture along with fish which can make sufficient amount of fertilizer to the pond water. The culture can yield from one ha area – 3,500- 4000kg of fish, 18,000 eggs and 500kg of duck meat in one year.

Fish cum Pig Farming

Fish farming with pig rearing is also cost effective and extra source of income to

the fish farmers. Four types of pigs are used in that case in India of which Hampshire and Land Race are mostly cultured. They are prolific breeders and attain slaughter house maturity (60 - 70kg) within 6 months and give 6-8 piglets. Fish attains marketable size in a year during which two crops of pigs can be reared. Pig manure is also rich with all nutrients found in cow dung. Fully grown pigs can void 500-600kg manure in a year. For one ha farm, 30 - 40 pigs are sufficient to for adequate fertilisation. The yield is about 6000 - 7000kg fish/ha/yr. with 3,600 – 5000kg of pig meat from poly-culture system.