

INTEGRATED FISH-CUM-LIVESTOCK FARMING SYSTEMS (LPM-610)



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Integrated Fish-cum-Livestock Farming Systems

- ▶ Due to progressive shrinking of land holding to obtain maximum output, adoption of integrated farming system with livestock and fish become very popular in wetland and water shed areas of the country.
- ▶ The by-product utilization of one sub-system e.g. excreta of livestock becomes an input to a second sub-system i.e. in fish culture.
- ▶ To avoid environmental problems with animal excreta apart from manure production, the animal excreta could be efficiently utilized as feed for fish and the end product is valuable animal protein.

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- ▶ States like West Bengal, Orissa, Bihar, Jharkhand, Andhra Pradesh, Assam and North Eastern states; the demand for fish and fish products along with meat and animal products are very high.
 - ▶ To meet the demand and supply, the integration with fish and livestock is very promising and could bring a significant profitability from a unit area particularly for small holding farmers.
 - ▶ Most of the small holder farmers cannot afford the concentrate feed requirements of the fishes in intensive fish farming.
 - ▶ Hence, the integrated fish farming with livestock and utilization of livestock excreta could meet demand by growing fish food organism i.e. plankton in the pond or water bodies along with direct feeding of animal waste.



Advantages of Integrated Fish-cum-Livestock Farming systems:

- Efficiency in resource utilization.
 - Efficient utilization of wastes from livestock farming.
 - Reduction in risks by diversified farming.
 - Recycling of wastes/ by-products of one farming system as input for another system.
 - Efficient utilization of available farming space for maximum production.
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- Additional source of food and income.
 - Reduction in additional cost for supplementary feeding & fertilization.
 - Generates more avenues for employment and reduces the input and increases output and economic efficiency.
 - Enough potential for rural livelihood & socio-economic status.
 - Provides meat, milk and eggs in addition to fish.

Basic principles for integrated fish-cum-livestock farming:

- Full utilization of livestock farm wastes and conversion of waste in to valuable fish protein.
- The spilled over feed or feed derived from livestock manure may be utilized as direct feed or the manure from livestock helps in production of planktons which form the feed for fishes in the pond.
- Optimal stocking density with desired fish species, optimum utilization of manure and lime also play an important role for successful production of fish.
- Excess manuring with livestock excreta may cause poor water quality and may lead to depletion of dissolved oxygen in water causing mortality to fishes.
- The livestock-fish farming may be extensive, intensive or semi-intensive system depending upon the availability of resources and capital.

Fish species for integrated fish-cum-livestock farming:

- The most suitable species of fishes are those fishes that can filter and feed on phytoplankton, zooplankton and bacteria from water.
- The objective of integrated livestock-cum-fish farming is to produce maximum plankton in water through manuring which is rich in protein and a natural feed for fishes.
- The species of fishes which are consumed by the people and are efficient utilizer of phyto and zooplankton and also with macrophytic feeding nature are excellent for integrated livestock fish culture.
- Depending on the feeding nature, the fishes are divided into three categories viz. Surface feeder, Column feeder and Bottom feeder.

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- In integrated system of fish farming both indigenous and exotic species are recommended.
 - Indigenous species like **Catla** (*Catla catla*) are zooplankton feeder and exotic species **Silver carp** (*Hypophthalmichthys molitrix*) which are phytoplankton consumer are best example of surface feeder.
 - **Rohu** (*Labeo rohita*) an indigenous species is omnivorous in nature and column feeder.
 - The indigenous species **Mrigal** (*Cirrhinus mrigala*), **Kalabasu** (*Labeo calbasu*) are detritivorous and **common carp** (*Cyprinus carpio*) an exotic species which are detritivorous/ omnivorous in nature are bottom feeder.
 - Exotic species like **Grass carp** (*Ctenopharyngodon idella*) are herbivorous cover surface, column and marginal area of feeding zone.

Popular integrated fish-cum-livestock farming systems

- Integrated fish-cum-poultry farming system
- Integrated fish-cum-duck farming system
- Integrated fish-cum-pig farming system
- Integrated fish-cum-sheep/goat farming system
- Integrated fish-cum-cattle/buffaloes farming system

Integrated Fish-cum-Poultry Farming System

- Integrated fish farming with poultry is generally cultured as the poultry manure is a very efficient fertilizer for fish ponds.
- The poultry droppings comprises 2% nitrogen, 1.25% phosphoric acid and 0.75% potash.
- The low feeding cost per individual bird makes poultry farming along with fish, a common investment for poor farmers.

Advantages of integrated fish-cum-poultry farming:

- Maximisation of resources since two economic activities take place on the same area which leads to increase in productivity per unit area.
- Diversification of economic activity is achieved and invariably results in more income.
- Reduces the risk involved in farm operations since it acts as a buffer in a situation where one part of the system fails.
- Leads to a more efficient use of biological and chemical energy on the farm. Poultry manure fertilizes the pond provides substrate for bacterial growth, enhances growth of aquatic flora (e.g. Phytoplankton and zooplankton and fish feeds directly on them and the aquatic flora.

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- Leads to better use of farm labour since the amount of labour required is lower compared to that needed for running of poultry and fish culture separately.

Disadvantages of integrated fish-cum-poultry farming:

- Chicks require to be examined periodically and diseased one should be isolated, otherwise they will destroy the entire stock.
- Sufficient time should be given from one stocking of chicks to the next for renovation of the house and disinfecting it.
- Fish growth is not maximised since the fish is either not fed at all or isn't fed adequately. Fish growth is considerably less as fish production with artificial feed.

Stocking Density of Fish

- Fish polyculture is preferred over monoculture because in polyculture, varieties of fish with different food preferences can exploit different fish food resources in the ponds.
- Monoculture results in ineffective utilization of several levels of the ponds natural food chain and is more suitable for intensive fish culture.
- The application of poultry manure in the pond provides a nutrient base for growth of phytoplankton, particularly nano-plankton which helps in intense zooplankton development.
- The zooplankton has an additional food source in the form of bacteria which thrive on the organic fraction of the added poultry dung.

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- It indicates the need for stocking phytoplanktophagous and zoo planktophagous fishes in the pond.
 - In addition to phytoplankton and zooplankton, there is a high production of detritus at the pond bottom, which provides the substrate for colonization of micro-organisms.
 - Another addition will be macro-vegetation feeder grass carp, which, in the absence of macrophytes, can be fed on green cattle fodder grown on the pond embankments.
 - The semi digested excreta of grass carps forms the food of bottom feeders.
 - For exploitation of the above food resources, polyculture of three Indian major carps and three exotic carps is taken up in fish-cum-poultry ponds.

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- The pond is stocked after the pond water gets properly detoxified.
 - The stocking rates vary from 8000 - 8500 fingerlings/ha and a species ratio of 40% surface feeders, 20% of column feeders, 30% bottom feeders and 10-20 % weedy feeders are preferred for high fish yields.
 - Mixed culture of only Indian major carps can be taken up with a species ratio of 40% surface, 30% column and 30% bottom feeders.
 - In northern and north-western states, the ponds should be stocked in the month of March and harvested in the month of October-November to avoid winter stress affecting the growth of fishes.
 - In the south, coastal and north-eastern states, the ponds should be stocked in June-September months and harvested after rearing the fish for 12 months due to mild winter.

Management of pond

- The pond should be water retentive and not to be situated in flood prone area.
- There should be constant water supply throughout the year.
- Seasonal ponds, which can retain 8 to 9 month water. also considered for integrated farming system.
- At least there should be 1.0 m of water and ideal is 1.5-3.0 m.
- Soil pH should be within the range of 6.5 to 7.5. If the soil pH is not up to the desired level, the pH may be corrected by application of lime.

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- The quantity of lime is 2000 kg/ ha for 4.0 to 5.0 pH, 1200 kg for 5.1 to 6.0, 1000 kg for 6.1 to 6.5 (mild acidic), 400 kg for 6.6 to 7.0 (more or less neutral) and 200 kg/ ha for pH 7.1 to 7.5, which is mildly alkaline.
 - Lime helps in maintaining pH, kills and decomposes parasites.
 - The lime should be applied in 3 to 4 split doses. The basal dose of lime in per hectare of water bodies is 1200 kg.
 - The pond should be regularly cleaned from aquatic plants which prevents sunlight penetration and oxygen circulation in water as well as shelter fish predators.
 - The weeding can be done by manually, mechanically, biologically, chemically or by increasing the water depth in the pond.

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- To kill predatory fishes, Mahua cake may be applied at the rate of 2500 kg/ ha of water bodies.
 - By repeated netting unwanted fishes may also be removed.
 - The ammonia, tea seed cake and bleaching powder also can be applied to remove enemy fishes.
 - Broiler or layer bird can be raised in the integrated fish-cum-poultry farming system. Dual purpose poultry birds like Vanaraja can be use.
 - For one hectare fish pond, 500-600 birds and on an average 60 kg poultry manure is required per day.

Use of poultry litter as manure

- The fully built up deep litter removed from the poultry farm is added to fish pond as manure.

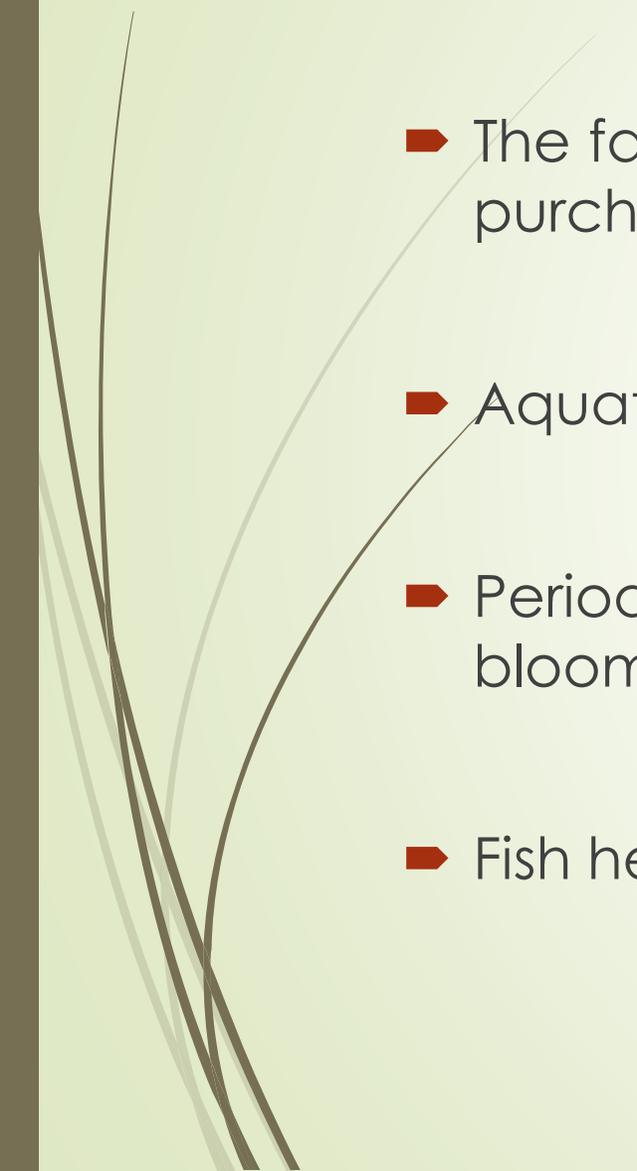
Two methods are adopted in recycling the poultry manure for fish farming:

1. The poultry droppings from the poultry farms is collected, stored it in suitable places and is applied in the ponds at regular instalments.

- Applied to the pond at the rate of 50 Kg/ha/day every morning after sunrise.
- The application of litter is differed on the days when algal bloom appears in the pond. This method of manurial application is controlled.

2. Constructing the poultry housing structure partially covering the fish tank and directly recycling the dropping for fish culture:

- Direct recycling and excess manure cause decomposition and depletion of oxygen leading to fish mortality.
- It has been estimated that one ton of deep litter fertilizer is produced by 30-40 birds in a year.
- As such 500 birds with 450 kg as total live weight may produce wet manure of about 25 Kg/day, which is adequate for a hectare of water area under polyculture.
- The fully built up deep litter contain 3% nitrogen, 2% phosphate and 2% potash.

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- The built up deep litter is also available in large poultry farms.
 - The farmers who do not have the facilities for keeping poultry birds can purchase poultry litter and apply it in their farms.
 - Aquatic weeds are provided for the grass carp.
 - Periodical netting is done to check the growth of fish. If the algal blooms are found, those should be controlled in the ponds.
 - Fish health should be checked and treat the diseased fishes.

Poultry husbandry practices:

- The egg and chicken production in poultry rearing depends upon multifarious factors such as breed, variety and strain of birds, good housing arrangement, balanced feeding, proper health care

A. Housing of birds:

- In integrated fish-cum-poultry farming the birds are kept under intensive system with complete confinement.
- The deep litter system is preferred over the cage system due to higher manurial values of the built up deep litter.
- In deep litter system 250 birds are kept and the floor is covered with litter up to a depth of about 6 inches.

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- The birds are then kept over litter and a space of about 0.3 - 0.4 sq. m. per bird is provided.
 - The litter is regularly stirred for aeration and lime used to keep it dry and hygienic.
 - In 2 month's time, it becomes deep litter and in about 10 months time, becomes fully built-up litter and used as fertilizer in fish pond.
 - The fowls which are proven for their ability to produce more and large eggs in layers or rapid body weight gains in broilers are selected along with fish.
 - The poultry birds under deep litter system should be fed regularly with balanced feed according to their age.

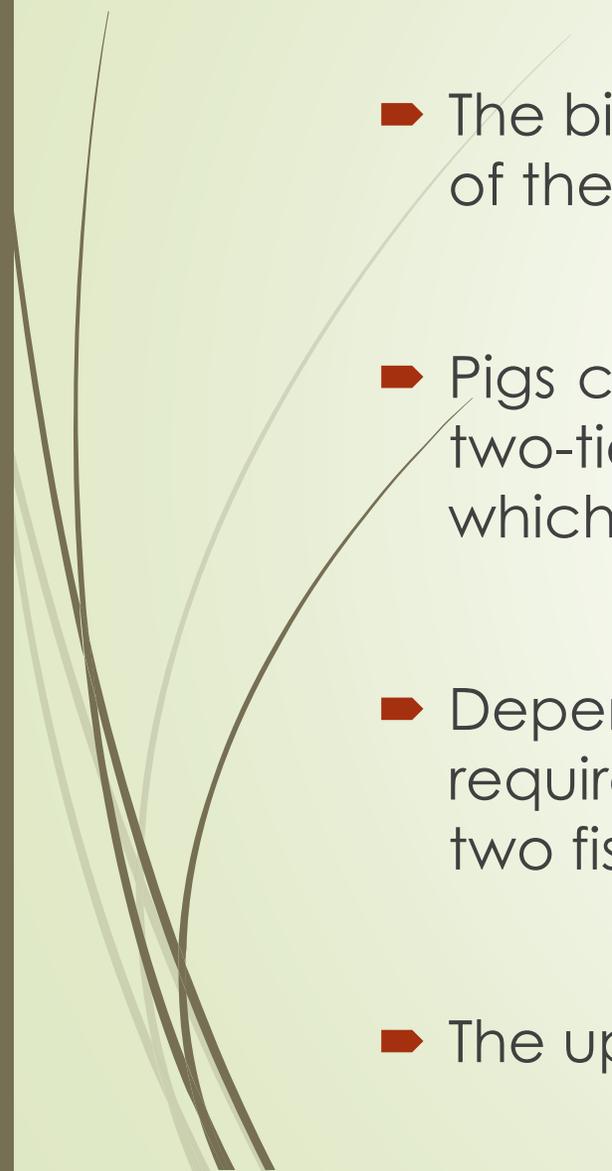
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- Grower mash is provided to the birds during the age of 9-20 weeks at a rate of 50-70 gm/bird/day and layer mash is provided to the birds above 20 weeks at a rate of 80-120 gm/bird/day.
 - The feed is provided to the birds in feed hoppers to avoid wastage and keeping the house in proper hygienic conditions.

B. Egg laying:

- Each pen of laying birds is provided with nest boxes for laying eggs.
- One nest should be provided for 5-6 birds.
- Egg production commences at the age of 20 weeks and each bird lays about 200 eggs/yr.
- The birds are usually kept as layers up to the age of 18 months.

C. Harvesting:

- Some fish attain marketable size within a few months.
- Keeping in view the size of the fish, prevailing rate and demand of the fish in the local markets, partial harvesting of table size fish is done.
- After harvesting partially, the pond should be restocked with the same species and the same number of fingerlings depending upon the availability of the fish seed.
- Final harvesting is done after 12 months of rearing.
- Fish yield ranging from 3500-4000 Kg/ha/yr and 2000-2600 Kg/ha/yr are generally obtained with 6 species and 3 species stocking; respectively.

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- Eggs are collected daily in the morning and evening and every bird lays about 200 eggs/year.
 - The birds are sold after 18 months of rearing as the egg laying capacity of these birds decreases after that period.
 - Pigs can be used along with fish and poultry in integrated culture in a two-tier system. Chick droppings form direct food source for the pigs, which finally fertilize the fish pond.
 - Depending on the size of the fish ponds and their manure requirements, such a system can either be built on the bund dividing two fish ponds or on the dry-side of the bund.
 - The upper panel is occupied by chicks and the lower by pigs.



THANKS

