

management through liming @ 250-300 kg/ha/year at suitable intervals, Except basal manure there is no need to apply inorganic and organic manure from the outside during the culture period.

1. Repairing the side slopes and maintain its slop based on the type of soil i.e. Clayey Soil (1.5:1), Loamy Soil (2:1), Sandy soil (3:1).

2. Sun drying of bottom at least 15-20 days till develops cracks.

Species Combination: The fingerlings should be stocked as following ratio –a) In lower altitudes (Upto 2500 feet msl) with warm temperature: 2 Catla : 2 Rohu : 1.5 Mrigal : 2 Silver carp : 1 Grass carp : 1.5 Common carp. b) In medium altitudes (upto 3500 feet msl): 2 Catla : 1 Rohu : 1 Mrigal : 3 Silver carp : 1 Grass carp : 2 Common carp. c) In higher altitudes (above 3500 feet and below 4500 feet msl): 4 Silver carp : 2.5 Grass carp : 3.5 Common carp.

Stocking Density: 2400 fingerlings/Acre is suitable for stocking with 1 m water depth of and rearing period about 8-10 months. 1. If possible carried over seeds should be introduced into the pond. 2. April-May is the best time and stocking should done 30 days after ducks are introduced in pond.

Fish feed: No supplementary feeding is required. But for grass carp adequate amount of grasses, banana leaf and other aquatic plants should be provided.

Fish growth monitoring: 1. Netting should be done at least once in a month and fish growth as well as health should be

monitored. 2. Generally Silver Carp attains a weight of 1.0 kg within 6-7 months in this system.

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DUCK CUM FISH FARMING



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Advantages: Fish utilizes the feed spilled (10-20% feed/day/duck is wasted) by ducks and eat their droppings directly. 1. Ducks increase the pond productivity by releasing the nutrients from the pond bottom soil, keep the water body clean & increase dissolved oxygen through dabbling the pond bottom mud. 2. Duck get 50-75% of their feed requirement from the pond in the form of aquatic weeds, insects, mollusks, etc. 3. Duck dropping contains 81% water, 0.91% N and 0.38% K. Duck dropping act as a good fertilizer which helps in producing fish feed i.e. phytoplankton & zooplankton. Duck act as a self manuring machine which helps in saving the expenditure involved in labour in applying manure in the pond.

Construction of duck house : Duck house can be constructed in 2 ways - **Moving house:** 1. Floating duck house is constructed using mobile oil barrels or tyres of heavy vehicles as float. There is a hole in the floor of the house and this hole is used to fall the droppings into the pond water. Because of floating the house from one place to another, which helps in manuring the pond uniformly. **Fixed house:** 1. Duck house should be made on the pond dyke with the help of locally available material such as bamboo cane, thatches etc. 2. Ducks are kept in duck house providing about 0.3-0.5 m²/bird. 3. The height of the house should be around 2.5 m. 4. The duck house should be well ventilated for air circulation and exposed to direct sunlight and periphery of the pond should be fenced for protection of ducks. 5. A small bamboo bridge is constructed to the duck house for feeding

the ducks as well as for collecting eggs and duck from the house. Another bridge is constructed from the duck house to the pond surface for helping the ducks ascend or descend to pond water. If duck goes out of the fish farms then the whole principle of the integration will be failed.

Selection of duck for farming : 1. Breeds found to be suitable are - Sylhet, Nageswari, Indian Runner, Khaki Campbell, Chera Chameli etc. but Khaki Campbell crossed with local pati variety is the best. **Numbers of duck to be farmed:** 1. 240-300 birds of 5-6 months age (at 1:5 male female ratio) for 1 ha water area are introduced into the duck house after 1 month of stocking the pond with fish seed. 2. Ducklings are not allowed the free range in the pond water till the cultured fish attain a fingerling size or 10-15 cm in length.

Feeding management: 1. A mixture of any standard balanced poultry feed along with good quality rice bran @ 1:2 by weight can be fed to the ducks @ 100 gm/ day/ duck in 2 times. 2. Duck also consume tadpoles, juvenile of frogs, dragon fly larvae and Lemna, Wolfia, Azolla etc. 3. As protein content in natural food organisms of the ponds consumed by duck is high. So, gives more eggs in comparison to duck which are not allowed in fishponds. 4. Duck should not be fed with mouldy feed, feeds kept for prolong time, feed contain ground nut oil cake & maize as they are having the chance of producing aflatoxin poison. 5. Ducks should be fed with chopped green vegetables. 6. Feed the ducks with manganese sulphate @ 10

mg/ kg feed and also with Vit.- A (Elvitone or Vimarel, etc.) along with drinking water gives encouraging result.

Egg laying management: 1. Each duck lay about 90-100 no. of eggs per year when they become 7 months old. For laying eggs, some nest made of bamboo/ wood/ tin is provided in the duck house by keeping some straw or hay inside the nest. 2. After the duck become 18 months old as egg laying capacity is reduced, they are sale out and a new stock of ducklings are introduced into the duck house.

Health care: 1. Ducks should be vaccinated against all viral diseases & all transmissible diseases like duck cholera, duck hepatitis, duck virus, keel disease etc. 2. Disease infected duck can easily be identified by a farmer by careful looking to them, listening to sound produced by ducks, observing the reduction in daily feed intake and also duck becomes listless, less bright eyes, watery discharge comes out from the eyes and the nostrils. 3. Sneezing and coughing sound from the duck house is warning tone for the coming disease. 4. Isolate the disease infected duck from the groups and should not be allowed to go into the fish pond.

Fish husbandry: 1. Rectangular ponds of 2.5 - 3.5 bighas (0.4 hectare) with 2 meters depth are generally considered good.

Dewatering is done in case of perennial pond. **1. Control of Aquatic weed & weed fish:** If complete dewatering is not possible then unwanted aquatic weeds & fishes should be removed by drag netting or by application of Mohua oil cake @ 800-1000 Kg/Acre. 1. Water quality

Species Combination:

| Altitude(ft) | C | R | M | SC | GC | CC |
|--------------|----|----|----|----|----|----|
| 0- 2500 | 20 | 20 | 15 | 20 | 10 | 15 |
| 2500-3500 | 20 | 10 | 10 | 30 | 10 | 20 |
| 3500-4500 | - | - | - | 40 | 25 | 35 |

~ **Stocking Density:** 2400 fingerlings/Acre is suitable for stocking with 1 m water depth of and rearing period about 8-10 months. If possible carried over seeds should be introduced into the pond. Aril-May is the best time for releasing fish seeds.

~ **Fish feed:** No supplementary feeding is required in case of fish pig integrated farming system. Pig excreta contains about 60% undigested feed which are consumed by fish. But for grass carp adequate amount of grasses, banana leaf and other aquatic plants should be provided.

~ **Fish growth monitoring :** Netting should be done at least once in a month and fish growth as well as health should be monitored. In general it is seen that Silver Carp attains a weight of 1.0 kg within 6-7 months in this system. Some fishes of this size can be harvested and equal number and same species of fingerlings harvested, can be restocked. In addition to this, during netting the pond bottom get disturbed which results in mixings of bottom nutrients with pond water leading to enhancement of productivity.

~ **Production :** Using this integration technology from a 1000m² water area pond yearly 300-400 kg of fish & 350-400 kg of pig can be produced. At an interval of 3-4 years the pond should be dewatered and the bottom mud should be removed. This mud serves as excellent organic manure for horticultural crops.

PRECAUTIONS

~ Stocking density of fingerlings and number of pigs in direct integration should not be more than required. Application of excreta in pond should be stopped immediately for the time being in case of occurrence of algal bloom, rainy weather, and galloping of fishes on the pond surface.

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INTEGRATED FISH PIG FARMING



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INTEGRATED FISH PIG FARMING

Integrated pig- fish farming is a highly profitable fish culture system, where pigs are reared adjacent to the fish ponds (indirect system) and pig waste is manually applied to the pond daily at a predetermined dose or on the pond embankment (direct system) from where pig urine, excreta and spilled pig feeds are directly introduced into the pond water.

♣ **CONSTRUCTION OF PIG HOUSE** : The pig house can be constructed by using locally available materials such as bamboo and thatch, but the floor must be roughly cemented. The pig sty should be well ventilated with feeding & drinking troughs (30 cm/ pig). The floor space requirement 1- 1.5 m²/pig. The height of the sty should be in between 1.7- 2.0 m. Height of the concrete wall should be in between 1.0- 1.2 m and over this wall, iron netting (for ventilation) is done to a height of 0.5- 1.0 m. An enclosed run is attached to the pig sty towards the pond, so that the pigs get enough air, sunlight, exercise and dunging space. The floor & the run is cemented with drainage facility to a soak pit (storing the pig sty wastes) which have the built in shutter facility and connected to pond with a drainage pipe. But in indirect system, the floor of the pig sty is connected to a soak pit where the wastes are carried away to the fish pond as and when needed in required quantity. There should be a door in between the sty and the open run, so that during night time pigs can be locked in the house.

During night the iron netting of the sty should be covered by a black P.V.C. sheet or with a black cloth, so that the pigs can get sleep peacefully. The thatched roof is most preferred over the tin or asbestos roof as it helps in maintaining the temperature in the pig sty.

↪ **Selection of pigs** : Commonly **White Yorkshire, Landrace, Hampshire and Saddle back** are used but **Hampshire variety is mostly preferred** as it grows up to 60- 110 kg in 6 month, produce 6- 12 piglets & attain its 1st maturity within 6-8 months.

↪ **Number of pigs** : 3-4 weaned piglets (2-3 months old) / 1000 m² / 6 months.

↪ **Pig feed** : Pigs are fed with balanced feed- pig mash @ 1.4-1.5 kg/ pig/ day & divided into 3 equal installments. To overcome any mineral deficiency, pig are fed with 'Sod' (30 X 30 cm bed of grass with all its root intact and interlocked soil) is provided once a week.

↪ **Health management of pigs** : Pigs are susceptible to diseases like- swine fever, swine plague, swine pox and may be infested with parasites like- round worm, tape worm, liver fluke, etc. Maintenance of hygienic and healthy condition in the pig sties keeps the pigs away from danger from diseases. The pig sties and appliances used should be disinfected at least once in a week using disinfectant like- potash or lime. Time to time the pig should be fed with worm controlling drugs & vaccinated for all viral diseases.

FISH HUSBANDRY:

↪ **Selection of Pond** : Rectangular ponds of 2.5 – 3.5 bighas (0.4 hectare) are generally considered good for fish culture. In case of larger ponds, the pig excreta should not be allowed to fall in one spot, instead it should be dropped in 2-3 spots. Water height of 2 meters is generally considered good.

↪ Dewatering is done in case of perennial pond.

↪ Control of Aquatic weed and weed fish: If complete dewatering is not possible then unwanted aquatic weeds & fishes should be removed by drag netting or by application of Mohua oil cake @ 800-1000 Kg/Acre.

↪ Repairing the side slopes & maintain its slop based on the type of soil i.e. Clayey Soil (1.5:1), Loamy Soil (2:1), Sandy soil (3:1)

↪ Sun drying of bottom at least 15-20 days till it develops cracks.

↪ Liming: Generally for a 1000 m² water spread area pond 40kg of quick lime should be applied annually (400 kg/ha/year). 1/3 rd of this should be applied initially and the remaining should be applied on monthly basis dividing into 11 equal installments.

↪ Fertilizer/ Manure application: Since Pig excreta act as excellent manure, so need not to apply extra manure. After cleaning the pig sty, the excreta and unused feed are released into the pond. After about 2 weeks of excreta application, natural fish food organisms develop spontaneously in the pond water.

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PADDY CUM FISH CULTURE



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PADDY CUM FISH CULTURE

Advantages –

- ◆ Higher productivity.
- ◆ Reduction in fish production cost.
- ◆ The culture of fish in paddy fields generally benefits rice cultivation, as a result of better aeration of water and greater tilling due to the movement of fish. The excreta of fish increase the fertility of soil.
- ◆ Fish also feed on harmful pest, weeds and insect larva, which are harmful for paddy.
- ◆ Two crops of fish are raised along with a single crop of paddy within a period of 3-4 months.
- ◆ A reliable source of protein for farmers and their families, as availability of wild fish are decreasing.
- ◆ Locally available inputs like poultry dropping, pig excreta, cow dung, rice husks, ashes from household stoves, decomposed straw, weeds and stalks etc can be used in paddy cum fish culture.

Site selection : The site should be regular supply of irrigated water and the rainfall is fairly high.

- ◆ Paddy field with uniform contour is suitable for paddy cultivation.
- ◆ The water from stream irrigated and rain fed plots trickles down from higher altitude plot to lower plot creating a flow through system within the plot.

Preparation of Paddy plot -

- ◆ A single trench (used for water management, spaces for fishes, shelter for fishes during sunny days) is excavated either along the edge or along the middle of plot having a width of 45-60 Cm and a depth of 60-70 Cm depending on the volume of water to be retained and density of fish sock to be cultured.
- ◆ The trench have 2 outlets (one is for overflow and other is for draining of water) and 1 inlet with bamboo screen.

- ◆ Levelling of field done with great care to maintain the equal distribution of water throughout the field.

- ◆ The excavated earth of the trench is utilized for raising the height of the embankment (prevent leakage of water, help retain water to desire depth, prevent escape of cultivated fishes during flood, cultivation of millets / vegetables) of the paddy plot sufficiently for holding nearly 80 cm water depth and made ready by April – May.

- ◆ Having prepared the plot local deepwater variety of paddy i.e. **Neghuri Bao, Padmapani, Kekowa, Panikokowa, Rupohi, Maguri, Tora Bao** is sown by transplantation method with onset of monsoon during May.

Stocking of Seed :

- ◆ After 14-20 days of transplanting and raising the water level up to 30-40 Cm stocked the common Carp @ 6000-7000 no / ha of fry (2-3 Cm size).
- ◆ Fish can be reared from April to Sept when paddy grown in the field and Nov to Feb after harvesting of paddy.
- ◆ The level of water is gradually raised with the growth of the fishes.
- ◆ Constantly monitor the water level during monsoon to ensure swept away of fishes.
- ◆ No pesticides and supplementary feed is used only *Azolla and Lemna are allowed to grow there as nitrogen fixer.*

Harvesting :

- ◆ The fishes are harvested after a period of 3 months by blocking the main irrigation channel and lowering the water level.
- ◆ The fishes congregate at the outlet of the channel are either scooped with the bamboo gears or handpicked.
- ◆ The fish production varies from 300-400 Kg/ha while the paddy crop is allowed to grow for another 30-40 days and harvested with a production ranging from 2000-2200 Kg/ha.