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PRODUCTION TECHNOLOGY FOR COMPOSITE FISH CULTURE IN TRIPURA

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PRODUCTION TECHNOLOGY FOR COMPOSITE FISH CULTURE IN TRIPURA

Fish is the most important source of protein for the people of Tripura as almost 100% people are fish eaters. Fish culture is very popular in this state. There is a huge demand of fish here and the most popular aquaculture practice is the pond culture.

Harvest from a composite fish culture pond

The state of Tripura is blessed with 23748 ha of water bodies and more than 60% are used for aquaculture purpose.

Pond culture is very common in all the districts of Tripura. Composite fish culture and integrated aquaculture are very common. These fishponds are very productive both in eco-physiological and faunistic point of view.

Most of the farmers have a pond area of less than one hectare for fish culture and are unable to go for any supplementary feeding. Average productivity estimated as 1859 kg/ha. Preliminary experiments conducted in the Institute showed that the timely application of the fertiliser and/ or restricted supplementary feeding will improve the total production.

Proud display of his produce

The major constraints in the success of aquaculture are as follows : -

1. Most of the farmers are not practicing the proper fertiliser application, species combination and required stocking density.
2. No proper feeding strategies.
3. Low primary and secondary production due to poor management.
4. Fish disease due to poor environmental management Hence it is pertinent to find out the suitable management practices like ideal species combinations, fertiliser application, stocking density under different fertiliser application trials and integration practices.

SITE SELECTION

In Tripura most of the lunga lands are ideal for pond construction. Soil here is highly acidic but fertile and water-holding capacity is very low in most of the area. Irrigation wells or ponds/ water harvesting structures with concrete/ cement/ tarfel/ polythene lining in Tilla land also can be used for fish culture.

A typical lunga converted to a fish pond

POND PREPARATION

Preparation of ponds should start at least in the month of February and should complete before monsoon. The topography is very ideal for construction of ponds. If we block a lunga in between a pair of tillas we can have a pond. In some cases there is no need for excavation. In most of the cases at least 1-2m excavation is required. February-March is the ideal time for excavation work. The bund should be at least 1.5m wide and 50cm above the highest water level. Hybrid napier grass or guenea grass are ideal

to plant on the bund to give extra strength to the bund and these are very ideal for feeding the grass carp. In most of the case a drainage system (a pipe 50cm below the bund level) is required to remove excess water during monsoon. The mouth of the pipe should be covered with a piece of net to avoid escape of fingerlings during overflow. It is ideal to keep 2-5% slope in the bottom opposite to the drainage pipe/bund. Avoid sharp slope on bunds and the boundaries.

Weeds and submerged objects should be removed with hands and repeated netting will take care of the weed fishes or last year stock. The liming followed by fertilizer application is the important part of the pond management. Water level should be in between 1.2 and 2.2m. The ideal depth for ponds is 75cm in shallow end and 2.2 in the middle.

PRACTICES

Generally composite fish culture is practiced in Tripura. The next common practice is the integration with pigs or ducks. Ponds bigger than 0.1 ha area are ideal for integrated farming. Shallow ponds can be used for nursery purpose for growing fry up to advance fingerlings. Since there is a continuous demand for fingerlings and breeding is possible in almost all months, this has become a popular quick income earning practice. Common carp should be avoided in shallow ponds because of its digging habit. Breeding ponds should be deep up to 2m. An ideal small fish farm should have a brood stock pond, a rearing pond and a nursery pond.

A small scale integrated farm with ducks

Composite fish culture is the most common practice here. Recently few farmers are doing the multiple stocking and harvesting as a way for easy higher income. For monoculture Tilapia is the best. An experiment using Tilapia *(Oreochromis spp.),* Moka *(Amblypharyngodon mola)* and Kanla *(Notopters notopterus)* was found promising. In all these cases regular harvesting should be there using nets with different mesh size.

Tilapia *(Oreochromis sp.)*

Moka *(Amblypharyngodon mola)*

Kanla *(Notopters notopterus)*

SPECIES SELECTION AND STOCKING

Ideal stocking density: 10000 fingerlings/ha. Most suitable species combination is *Catla catla, Labeo rohita, Cirrhina mrigala, Ctenopharyngodon idella, Cyprinus carpio* in the ratio 2:1: 1: 2:1. If we are planning for artificial feeding at least in the three winter months, the ideal stocking density is 10000 fingerlings/ha. The fingerlings of Catla *(Catla catla)*, Rohu *(Labeo rohita)*, Mrigal *(Cirrhina mrigala)*, Grass Carp *(Ctenopharyngodon idella)*, and Common Carp *(Cyprinus carpio)* with size ranges from 3-7gm were stocked. The stocking was done in the month of June and harvesting was in April.

Catla *(Catla catla)*

Rohu *(Labeo rohita)*

Mrigal *(Cirrhina mrigala)*

Grass carp *(Ctenopharyngodon idella)*

Common carp *(Cyprinus carpio)*

Avoid a combination of catla *(Catla catla)* with silver carp *(Hypopthalmichthys molitrix)* and or with big head carp *(Aristichthys nobilis)* since they compete for food. A higher stocking of mrigal and common carp is also not ideal due to same reason. A dip treatment using common salt 3% will help to remove external parasites.

Silver carp *(Hypopthalmichthys molitrix)*

Big head carp *(Aristichthys nobilis)*

LIME REQUIREMENT

FAO recommendations of the lime requirement for correcting the soil pH in water were found ideal for Tripura situations also.

For new ponds a basal dose of 500 kg/ha of good quality lime is essential and quarterly 100 kg/ha each should be supplemented as heaps in the margins or the interface between land and water. From second year onwards it should be basal 250 kg/ha. quarterly installment of 50kg/ha. for the rest of the period. If we are using normal agriculture lime the quantities should be doubled.

Table 1. Lime required in kg/ha to change the pH of the various pond soils.

Soil Type	Existing pH	Desired pH	Lime Requirement (kg/ha)
Clay loam	5	6	1000
	5.5	6.5	900
Loam	5	6	800
	5.5	6.5	800
Fine sandy loam	5	6	500
	5.5	6.5	500
Sandy loam	5	6	400
	5.5	6.5	400

FERTILISER APPLICATION

A combination of organic and inorganic fertilisers found ideal. Pigsty or bird house can be in the side of the pond or above the pond and the washing can be directed towards the pond. If we are planning to stock more livestock, then it is advisable to keep the excreta outside the pond and add as per the requirement given in the table below. Cow dung requirement to fertilise the pond is 13000 kg/ha, pig dung is 11500kg/ha. and the poultry litter is 7000kg/ha. It is ideal to add 1000kg/ha. of cow dung as a basal dose and 500kg/ha. in post winter season for poultry cum fish culture otherwise it is observed that there is a reduction in plankton diversity and this will reflect in the final production. Inorganic fertiliser NPK in the ratio 4:4:1 is required in the following rate as 50kg/ha as a basal dose and 30kg/ha

monthly. In integrated pond with ducks the ratio of NPK should be 1:4:2 because poultry litter contain uric acid, which is equivalent to urea in ponds. Fertilisers should be added in maximum possible split ways to ensure a constant productivity throughout the culture period.

Table 2. Seasonal requirement of organic manure (kg/ha)*

	Monsoon♣ (June - August)	Post Monsoon (Sept. - Nov.)	Winter (Dec. - Feb.)	Pre Monsoon (March - May)	Total
Cow dung	6000	4000	3000	2000	15000
Pig dung	5000	3000	2000	2000	12000
Poultry manure	4000	2000	1000	1500	8500

*This data is for the ponds where the lowest water level will be >1.2m.

♣ including the basal dose.

If the water level will be below 1.2m a reduction in the fertiliser application is essential as per the depth of water in order to avoid algal blooms. If we are adding excess of plant matter into the water for increasing fertility as in the case of integration with Agriculture/horticulture/agro forestry, the acidity of water will be increased. So we should double the lime application in such cases.

Incase of algal blooms stop all sources of fertilizers for at least two weeks. The ideal well fertilised water should be light green in colour and transparent up to 20cm.

FEEDING

Adopting restricted feeding during winter months can significantly increase production. A mixture of groundnut oil cake and rice bran in the 1:1 ratio was found ideal. If groundnut oil cake is not available we can use mustard oil cake. The best method is to mix

the ingredient and tie it in loose gunny bags and hang it in different areas of the ponds. A mixture of MOC and rice bran 1:1 ratio 50kg/day for five days in a week and should start from November up to March. Maximum production obtained was 5650kg/ha. with a combination of organic and inorganic fertilisers with restricted feeding during winter months.

GROWTH AND PERFORMANCE

Grass carp, *(Ctenopharyngodon idella)*, showed the highest growth rate followed by Catla *(Catla catla)*, Mrigal *(Cirrhina mrigala)*, Rohu *(Labeo rohita)* and the Common carp *(Cyprinus carpio)* the least. Integrated farming with pig gave a production of 4800 kg./ha. and with duck 3810kg/ha and with agri-horti system 2850kg/ha. 40 pigs /500 ducks /8ha.of catchments with normal Agri - horticulture system with medium cropping intensity is ideal to fertilize 1ha of pond.

Bamboo poles >1000 numbers/ hectare is essential to have a better growth of peryphyton in the submerged parts and it will add to the protection since poaching is a regular phenomena in this region. Zooplankton biomass and species diversity was highest in ponds treated with both organic and inorganic fertilisers. Calanoid copepods dominated in quantity and Rotifers showed highest species diversity. Total 38 species of zooplanktons were collected and identified from the culture ponds.

DISEASE MANAGEMENT

Disease management should start at the time of pond preparation itself. Remove all the old stocks and if possible drain out the pond and apply lime and allow it to dry just after the winter. The incidence of the disease will be there mainly when there is a deterioration of the water quality. Select only active and healthy fingerlings in the recommended ratio and intensity.

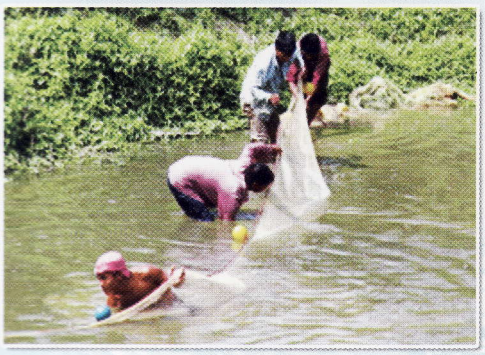
pH of the fish pond should be always in the optimum range.

Avoid over crowding of fishes and if the population is above 10,000 fish/ha immediately harvest 25% of the stock. In the beginning of the monsoon avoid direct run off water to fall in fish ponds. It may carry lot of silt which make the water turbid and pH will be generally drop towards the acidic side. If the turbidity condition persists, apply lime at the rate of 100kg/ha through the margins of the pond. In extreme cases especially during the winter months when water level is low and if there is a plankton bloom or deterioration of water quality or oxygen depletion or incidence of any disease, potassium permanganate can be applied @1kg/ha. In case of incidence of Epizootic Ulcerative Syndrome, CIFAX can be applied as per the recommended doses. Apply an extra dose of lime (100 kg/ha) as a prophylaxis in post winter season (February-March).

Avoid snail populations in the fish ponds because snails act as intermediate host for a major group of fish parasites. Avoid migratory birds and water birds visiting the fish ponds. They can carry infections from other ponds. Nets and other farm implements should be washed and kept in dry condition. If an infection is noted in a fish pond avoid using the same net and other implements in other pods. Always wash body and cloths before entering into another pond. Avoid overdose of fertilizers and always use fertilizers and lime in split doses. Remove and dispose the dead fishes from the pond as early as possible.

HARVESTING AND MARKETING

Periodic harvesting can be done with the use of cast nets or gill nets of different mesh size. Drag net of different mesh size is the ideal net for final harvesting. For harvesting the fingerlings drag nets of smaller mesh size is required. Fingerling should be harvested in early hours or in the evening and can be kept in a fine mesh happa



in clean and well aerated water for next day's sale.Fishes can be transported live in big containers with aeration can give better price for the farmer. Fingerlings can be treated in 0.1% Potassium permanganate solution and while transporting in fresh water add pinch of table salt in the water. This will increase the survival and check for the spread of external parasites.

ECONOMICS

Model economic analyses showed that the pig cum fish culture (Net profit Rs. 18,500/0.1ha pond area /year) is the most profitable practice followed by duck cum fish culture (Net profit Rs. 14,750/0.1ha pond area /year) and normal composite fish culture Rs. 10,200 /0.1ha pond area /year) Initial investment also followed the same pattern.

SOME NATIVE FISHES IN COMPOSITE FISH CULTURE

There is good demand for smaller native fishes which are not popular and not promoted generally in composite fish culture practices in this region. There is some unutilized or under utilized niche still exist in the composite fish culture system. By utilizing this vacant niche we tried some smaller local fishes along with the common species which are already there in the system. These fishes have high consumer demand and often get a price Rs. 100 to 120 per kg. *Amblypharyngodon mola* (mola: - slender barb), *Notopterus notopterus* (razor fish/knife fish/ kanla) can be incorporated into the culture system without much changes in the growth pattern of carps.

There need not be any change in the stocking ratio, stocking density and feeding pattern. Only 5-10% of more organic fertilizer is required in case of *A. mola*. The barbs like *Puntius conchonius* (Rosy barb/ Putti) and *Puntius sophore* (Swamp barb/ Putti) were not found suitable for this type of culture. *P. conchonius*

failed to breed in the pond conditions. *P. sophore* could reproduce in pond condition but an effective/ significant population of next generation was not found. Rather it acted as a store house of various species of parasites including three species of monogenetic trematode and five species of Myxosporidian parasites. The result showed significant increase (5.6 to 9.4%) in the total fish production without affecting the performance of the other species. *A. mola* fetched the highest price per kg of the fish (Rs.120). Due to the self recruiting nature the second year of auto stocking the over crowding of *A. mola* was observed. So periodical harvesting (once in three months) is necessary to have better production of carps and better total output. *N. notopterus* can be harvested annually leaving 10-20 fishes for next year socking.

Use of stunted fishes for better fish production

Fingerlings can be stocked in heavy stocking density of 1,00,000/ha for one year. These are called yearlings and can be cultured in the normal composite fish culture to have good marketable sized fishes in one year period. Normally Rohu does not show a faster growth in first year but it shows a sort of compensatory growth in the second year even without stunting. Hence it is always advantageous to keep stunted rohu in composite fish culture. All carps responded to stunting and showed a compensatory growth in experimental ponds. Grass carp and catla can easily grow beyond 2kgs after stunting. Rohu usually grows 1-1.5 kg in a year after stunting. In a fish farm one fish pond of 0.1 ha area can be dedicated for the production of stunted fishes. It is always better to use separate ponds for stunting of each species. If there is a problem for space, all the fishes can be stunted in same pond without changing the stocking ratio. Another advantage for stunting is that stocking can be done in the early monsoon itself.

High stocking of mrigal and stunting of mrigal with rohu in a higher stocking can cause incidence of white spot disease. Water quality management including proper liming is very much essential in stunting ponds. Restricted feeding is also essential with god quality rice bran and oil cake to have better production of yearlings.

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