

Composite Fish Culture

Introduction

Fish is the cheapest and most easily digestible animal protein and was obtained from natural sources from time immemorial for consumption by human beings. However, due to over exploitation and pollution, the availability of fish in natural waters have declined considerably forcing scientists to adopt various methods to increase its production. Fish farming in controlled or under artificial conditions has become the easier way of increasing the fish production and its availability for consumption. Farmers can easily take up fish culture in village ponds, tanks or any new water body and can improve their financial position substantially. It also creates gainful employment for skilled and unskilled youths. The technology developed for fish culture in which more than one type of compatible fishes are cultured simultaneous is the most advanced and popular in the country. This technology is known as Composite Fish Culture. This technology enables to get maximum fish production from a pond or a tank through utilization of available fish food organisms in all the natural niches, supplemented by artificial feeding. Any perennial fresh water pond/tank retaining water depth of 2 metres can be used for fish culture purpose. However, the minimum level should not fall below one metre. Even seasonal ponds can also be utilised for short duration fish culture.

1.1. Fish species involved in composite fish culture

Depending on the compatibility and type of feeding habits of the fishes, the following types of fishes of Indian as well as Exotic varieties have been identified and recommended for culture in the composite fish culture technology:

Species Feeding habit Feeding zone

Indian Major Carp

Catla	Zoo plankton feeder	Surface feeder
Rohu	Omnivorous	Column feeder
Mrigal	Detritivorous	Bottom feeder

Exotic carps

Silver carp	Phytoplankton feeder	Surface feeder
Grass carp	Herbivorous	Surface, column and marginal areas
Common carp	Detritivorous/Omnivorous	Bottom feeder

- 2. Potential :** The area under tanks and ponds available for warm fresh water aquaculture is estimated to be 2.41 million ha. In addition 0.131 million ha of swamps, beels, etc. and low lying water logged area not good for agriculture as also any land where there is copious water supply can be converted for fish farming. Out of the total inland fish production of 4.7 lakh tonnes around 80% is contributed by the culture sector. The average productivity from ponds at present is to the tune of 2500 kg/ha/year. This shows the tremendous scope for fish culture in the country. Only 15 % of the of the potential area of tanks and ponds available is developed so far, showing immense possibilities for horizontal expansion of composite fish culture.
- 3. Technical Parameters :** Technical parameters of composite fish culture has been enclosed as Annexure E - I which includes site selection, items of development, pre and post stocking operations, stocking density, fertilisation, feeding etc.
- 4. Margin:**
The margin money may be considered @ 5,10 & 15% for small, medium and large farmer respectively and 25% for companies and partnership firms.
- 5. Subsidy**
Subsidy is available for various items like renovation/ repair of ponds, construction of new ponds, first year inputs etc. under a centrally sponsored subsidy scheme implemented by majority of the State Governments through FFDA's for different categories of farmers and also from National Fisheries Development Board (NFDB) details of which may be obtained from concerned Fisheries Departments or from the website of NFDB [www. nfdb.ap.nic.in](http://www.nfdb.ap.nic.in) respectively.
- 6. Eligible Borrowers**
The following category of borrowers are eligible to avail credit.
 - a) An Individual.
 - b) A company.
 - c) A Partnership firm.
 - d) A co-operative society.
 - e) A group of fish farmers.

Training in fish farming is being provided by the FFDA's to the eligible borrowers and it is essential that the borrower has prior knowledge of fish farming before availment of bank loan.

7. Financial Outlay

The details of Capital Cost and Recurring Cost have been indicated in Annexure - II. As per Annexure E - II the capital cost for excavation of 1 Ha pond works out to be Rs1.065 lakh /- and the recurring cost as Rs 1.113 lakh /-. However, the cost is indicative and actual assessment of the cost parameters have to be done while submitting the project to the bank.

8. Financial Analysis:

The scheme is financially viable and the financial parameters are as follows

- i). NPW @ 15% Rs: 4.005 lakh
- ii). BCR @ 15% 1.54 : 1
- iii). IRR above 50%

The details of the financial viability viz; Cash flow , IRR BCR are given in Annexure E- III.

9. Repayment

Repayment of bank loan is possible in 8 years in equated annual instalments with a moratorium on repayment of principal for the first year . A tentative repayment schedule is given in Annexure E -IV

10. Rate of interest

Interest rate to be charged to the ultimate borrowers would be as indicated by bank/RBI/NABARD from time to time depending on quantum of loan amount and the agency providing the loan

11. Security

Security from the ultimate beneficiaries may be obtained as per the guidelines of RBI issued from time to time.

12. Rate of Refinance

NABARD provides refinance assistance for fish culture to Commercial banks, Cooperative banks and Regional Rural Banks. The rate of refinance is fixed by NABARD from time to time.

Annexure E- I

Technical Parameters

Technical parameters that needs to be considered for Composite Fish Culture project are as follows :

1. Selection of Pond

The main criteria to be kept in mind while selecting the pond is that the soil should be water retentive, adequate supply of water is assured and that the pond is not in a flood prone area. Derelict, semi derelict or swampy ponds can be renovated for fish culture by dewatering, desilting, repair of the embankments and provision of inlet and outlet. The pond may be owned by the individual or taken on lease in which case the lease period should be more or coterminous with the repayment period. The eligible items of pond development are as follows:

- i) Desilting of existing ponds
- ii) Deepening of shallow ponds.
- iii) Excavation of new ponds.
- iv) Impoundment of marginal areas of water bodies.
- v) Construction / repairs of embankments.
- vi) Construction of Inlets / Outlets.
- vii) Any other item like civil structures, watchmen sheds, pump sets water supply arrangements / electricity supply arrangements etc. depending on requirements of the project based on its size etc.

2. Pond Management

Pond Management plays a very important role in fish farming before and after the stocking of fish seed. Various measures that are required to be undertaken in pre and post stocking practices are tabulated below:

a) Prestocking:

In case of new ponds, pre stocking operations starts with liming and filling of the pond with water. However, the first step for existing pond requiring development deals with clearing the pond of unwanted weeds and fishes either by manual, mechanical or chemical means. Different methods are employed for this.

i) Removal of weeds by Manual/Mechanical or through Chemical means.

ii) Removal of unwanted and predatory fishes and other animals by repeated netting or using mahua oil cake @ 2500 kg/ha metre or by sun drying the pond bed.

iii) **Liming** - The soils/ tanks which are acidic in nature are less productive than alkaline ponds. Lime is used to bring the pH to the desired level. In addition lime also has the following effects -

- a) Increases the pH.
- b) Acts as buffer and avoids fluctuations of pH.
- c) It increases the resistance of soil to parasites.
- d) Its toxic effect kills the parasites; and
- e) It hastens organic decomposition.

The normal doses of the lime desired ranges from 200 to 250 Kg/ha. However, the actual dose has to be calculated based on pH of the soil and water as follows :

Soil pH	Lime (kg/ha)
4.5-5.0	2,000
5.1-6.5	1,000
6.6-7.5	500
7.6-8.5	200
8.6-9.5	Nil

The pond is required to be filled with rain water or water from other sources after liming in case it is a new pond.

iv) Fertilisation/ Manuring

Fertilisation of the pond is an important means for intensifying fish culture by increasing the natural productivity of the pond. The fertilisation schedule has to be prepared after studying the quality of the pond soil. A combination of both Organic and Inorganic fertilisers may be used for best results. The fertiliser programme has to be suitably modified depending on the growth of the fish, available food reserve in the pond, physico chemical conditions of the pond and climatic conditions.

a) Organic	:	Organic manure to be applied after a gap of 3 days from the date of liming.
b) Inorganic	:	Cowdung @ 5000 kg/ha or any other organic manure in equivalent manurial value Inorganic fertilisation to be undertaken after 15 days of organic manuring. Requirement of nitrogenous and phosphate fertilisers would vary as per the nature of the soil fertility indicated below. However any one of the nitrogen and phosphate fertilisers could be used as per given rate.

Inorganic Fertiliser Application (kg/ha/month)

Soil fertility status	Ammonium sulphate	Urea
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1. Nitrogen (mg/100 g soil)	70	30
i) High (51-75)	90	40
ii) Medium (26-50)	140	60
iii) Low (upto 25)		
2. Phosphorus (mg/100 gm soil)	Single super phosphate	Triple super Phosphate
i) High (7-12)	40	15
ii) Medium (4-6)	50	20
iii) Low (upto 3)	70	30

B) STOCKING

The pond will be ready for stocking after 15 days of application of fertilisers. Fish fingerlings of 50- 100 gm size (approx) should be used for stocking @ 5000 nos. per hectare. However, if fingerlings of smaller size are used, suitable allowance may be made accounting for mortality. The present model envisages stocking of advanced fingerlings and rearing for 10-12 months. Depending on availability of seed and market condition, stocking can be of 3, 4 or 6 species combination in the following ratio.

Species combination (ratio)

Species	3-species	4-species	6-species
Catla	4.0	3.0	1.5
Rohu	3.0	3.0	2.0
Mrigal	3.0	2.0	1.5
Silver Carp	-	-	1.5
Grass Carp	-	-	1.5
Common Carp	-	2.0	2.0

Since the market demand for Indian major carps are very good especially that of Catla and Rohu, the model is prepared based on the stocking of Indian major carps alone in the stocking density mentioned above.

C. POST STOCKING:

a) Supplementary feeding

Fishes need much more food than what is available naturally in the pond. Fishes can be fed with a mixture of rice bran and oilcakes in the ratio 4:1. Due to the high cost of Groundnut Oil Cake (GOC) farmers have tried using alternate sources like Cotton seed oil cake which is comparatively cheaper than GOC. GOC and cotton seed oil cake can be mixed in equal proportions and fed to the fish and is reported to give almost the same growth rate as that of GOC. The feed should be placed on a feeding tray or in feeding bags and lowered to the pond bottom or it can be dispersed at the corners of the pond. After some time the fishes will get used to this type of feeding and aggregate at the same place at particular time for regular feeding thereby reducing the feed losses. The recommended feeding rate is 5 - 6 % of the body weight upto 500gm size of fish and then reduce to 3.5% of body weight from 500-1000gm size . The feeding is supplementary in nature.

b) Manuring

- i) Organic manuring may be done in monthly instalments @ 1000 kg/ha.
- ii) Inorganic fertilisation may be done at monthly intervals alternating with organic manuring. However, the monthly rate of fertilisation will depend on pond productivity and the growth of the fishes. It should be ensured that excess fertilisation does not take place which may result in eutrophication.

c) Harvesting:

Harvesting is generally done at the end of 1 st year, when the fishes attain average weight of 800 gm to 1.25 kg. With Proper management a production of 4 to 5 tons/ha can be obtained in a year. Harvesting is done by partial dewatering and repeated netting. In some cases complete dewatering of ponds is resorted to. Some farmers resort to partial harvesting also depending on the season and demand for fish.

3) Vertical expansion of fish culture:

A number of measures are now being employed by the entrepreneurs to increase the per hectare production of fish. Important measures adopted are stocking of advanced fingerlings / yearlings by stunning the growth of fish seed during first year, heavy stocking and multiple harvesting after the fishes attain a size of 500 gms., multiple stocking and multiple harvesting, use of aerators, integrated fish farming with animal husbandry activities like dairy, poultry, piggery or

duckery to get daily organic manuring to the pond thus increasing its fertility. It is possible to increase the per hectare production of fish to 7 to 10 tonnes per ha per year by employing different methods as indicated above.

Annexure E- II

Indicative cost of composite fish culture

A	Capital Cost				Amount Rs
S.No	Particulars	Units	Quantum	Rate (Rs.)	Total
1	Site clearance		LS	3000	3000
2	Construction of pond including digging, bund construction and compaction and consolidation	Hrs	40	1200	48,000
3	Diesel Pump Set	3 HP	1	30000	30,000
4	Inlet/outlet sluices			L/S	5,000
5	Store Room/rest room	Sq ft	80	150	12,000
6	Nets and other implements			L/S	5,000
7	Miscellaneous			L/S	3,500
	Total "A"				106,500
B	Operational cost for one crop (one year)				
1	Drying, desilting and ploughing	LS	LS	LS	3000
2	Lime	Kgs	500	5.00	2,500
3	Single Super Phosphate	Kgs	250	5.00	1,250
4	Urea	Kg	125	5.00	625

3. NPV Costs	7.444								
4. NPV Benefits	11.449								
5. NPV	+4.005								
6. BCR	1.54:1								
D. IRR	>50 %								

Annexure E- IV

Repayment Schedule

Total financial Outlay	-	Rs 2.189 lakh
Margin (15%)	-	Rs 0.328 lakh
Rate of interest	-	12%
Bank Loan	-	Rs 1.860 lakh

Year	Net Income	Interest	Principal	Total outgo	Bank loan O/S	Net Surplus	DSCR
1	0.876	0.223	0.000	0.223	1.860	0.653	3.925
2	0.876	0.223	0.265	0.488	1.595	0.388	1.795
3	0.876	0.191	0.265	0.456	1.330	0.420	1.920
4	0.876	0.160	0.265	0.425	1.065	0.452	2.063
5	0.876	0.128	0.265	0.393	0.800	0.483	2.230
6	0.876	0.096	0.265	0.361	0.535	0.515	2.427
7	0.876	0.064	0.265	0.329	0.270	0.547	2.661
8	0.876	0.032	0.270	0.302	0.000	0.574	2.896

Repayment 8 years with one year grace on payment of principal

Source: <http://nabard.org/modelbankprojects/fisheries.asp#>

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