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. 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:

2. Potential

The area under tanks and ponds available for warm fresh water aquaculture is estimated to be 2.41 million ha. In addition 1.31 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 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 – I which includes site selection, items of development, pre and post stocking operations, stocking density, fertilisation, feeding etc.

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

4.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 respectively.

5. 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.

6. Financial Outlay

The details of Capital Cost and Recurring Cost have been indicated in Annexure - II. However, the cost is indicative and actual assessment of the cost parameters have to be done keeping in view the site conditions, while submitting the project to the bank.

7.Financial Analysis

The scheme is financially viable and the financial parameters viz; Cash flow , IRR BCR are given in Annexure - III.

8. Repayment

Repayment of bank loan is possible in 8 years with 1 year moratorium.(Annexure IV)

9. Margin Money / Rate of interest / security

As per RBI guidelines.

10. Refinance

NABARD provides refinance assistance for fish culture to Scheduled Commercial banks, Cooperative banks, Primary Urban Cooperative Banks, and Regional Rural Banks.

Annexure - I

Technical Parameters

Technical parameters that needs to be considered for Composite Fish Culture

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. Construction of new ponds in ideal sites is recommended keeping in view the above parameters.

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:

2.1 Pre-stocking

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. Cow dung @ 5000 kg/ha or any other organic manure in equivalent manurial value.
b) Inorganic	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.

v) Inorganic Fertiliser Application (kg/ha/month)

Soil fertility status	Ammonium sulphate	Urea
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	**Single super phosphate**	**Triple super Phosphate**
(mg/100 gm soil)		
i) High (7-12)	40	15
ii) Medium (4-6)	50	20
iii) Low (upto 3)	70	30

2.2 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.

2.3 POST STOCKING

2.3.1 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 Ground nut 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.

2.3.2 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.

2.3.3 Harvesting

Harvesting is generally done at the end of 1st 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.

2.4. 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 - II

Indicative cost of composite fish culture – 1Ha area

A	**Capital Cost**				Amount Rs
S.No	**Particulars**	**Units**	**Quantum**	**Rate (Rs.)**	**Total**
1	Site clearance		LS	7000	7000
2	Construction of pond including digging, bund construction and compaction and consolidation (using earth moving equipments)	Hrs	40	1500	60,000
3	Diesel Pump Set	3 HP	1	30000	30,000
4	Inlet/outlet sluices		L/S	8000	8,000
5	Store Room/rest room	Sq ft	150	300	45,000
6	Nets and other implements		L/S	12000	12,000
7	Miscellaneous		L/S	6000	6,000
	Total "A"				**1,68,000**
B	**Operational cost for one crop (one year)**				
1	Drying, desilting and plouging	LS	LS	LS	6000
2	Lime	Kgs	500	7	3,500
3	Single Super Phosphate	Kgs	250	7	1,750
4	Urea	Kg	125	7	875
5	Raw Cow Dung	Tons	10	800	8,000
6	Fish Seed Catla (2000), Rohu(1500) and Mrigal (1500)@Rs 5 each	Nos	5,000	5	25,000
7	Fish Feed	Kg	6,000	14	84,000
9	Harvesting charges per kg		4000	1.5	6,000
10	Miscellaneous	LS	LS		5,000
	Total "B"				**1,40,125**
	Total A +B				**3,08,125**

Capital Cost	Rs lakh	1.68
Recurring Cost	Rs lakh	1.40
Total Cost	Rs lakh	3.08

C. Production and Income

1	Survival	%	85%
2	Avg size at harvest	Kg	1.1
3	Total Production	Kg	4675
4	Farm gate sale price	Rs/Kg	55
5	Gross Income		2.57

Annexure - III

Financial analysis, IRR, BCR (Rs in lakh)

A. Cost	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
1. Fixed Costs -	1.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2. Recurring Costs	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
Total Cost	3.08	1.40	1.40	1.40	1.40	1.40	1.40	1.40
1. Income from sale of fish	1.29	2.57	2.57	2.57	2.57	2.57	2.57	2.57
2. Net Income	-1.80	1.17	1.17	1.17	1.17	1.17	1.17	1.17
3. NPV Costs	7.75							
4. NPV Benefits	10.42							
5. NPV	2.67							
6. BCR	1.34							
D. IRR	63%							

Annexure - IV

Repayment Schedule Rs lakh

Total financial Outlay	3.08
Margin (15%)	0.46
Rate of interest (per annum)	12%
Bank Loan	2.62

Year	Net Income	Interest	Principal	Total outgo	Bank loan	Net Surplus	DSCR
					O/S		
1	1.17	0.31	0	0.31	2.62	0.86	3.72
2	1.17	0.31	0.32	0.63	2.30	0.54	1.84
3	1.17	0.28	0.32	0.60	1.98	0.57	1.96
4	1.17	0.24	0.32	0.56	1.66	0.61	2.10
5	1.17	0.20	0.4	0.60	1.26	0.57	1.95
6	1.17	0.15	0.4	0.55	0.86	0.62	2.12
7	1.17	0.10	0.5	0.60	0.36	0.57	1.94
8	1.17	0.04	0.36	0.40	0.00	0.77	2.91

DISCLAIMER

The views expressed in this model project are advisory in nature. NABARD assume no financial liability to anyone using the report for any purpose. The actual cost and returns of projects will have to be taken on a case by case basis considering the specific requirements of projects.