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 2.85 million ha. In addition 0.78 million ha of swamps, beels, etc. and low lying water logged area not good for agriculture as also any agriculture land can be converted for fish farming. Out of the total inland fish production around 60% is contributed by the culture sector. The average productivity from ponds at present is to the tune of 2160 kg/ha/year. This shows the tremendous scope for fish culture in the country. The area of 4.56 lakh ha brought under scientific fish culture by 1997-98 is only 16% of the potential area of tanks and ponds available for development 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.

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 Pond Development, 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, details of which may be obtained from concerned Fisheries Departments.

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 the capital cost for excavation of 1 Ha pond works out to be Rs 1,75,000/- and the recurring cost as Rs 26,000/-. However, the cost is indicative and actual assessment of the cost parameters have to be done while submitting the project to the bank.

8. Repayment

Repayment of bank loan is possible in 6-8 years in equated annual instalments with moratorium on repayment of principal for the first year.

9. Financial Analysis:

As per financial analysis shown in annexure the scheme is financially viable. The financial parameters are as follows

i). NPW @ 15% Rs: 101106

ii). BCR @ 15% 1.51 : 1

iii). IRR 25%

10. 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.

11. 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.

12. Security

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

Annexure - 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 pondis 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, semiderelict or swampy ponds can be renovated for fish cultureby 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 huts, 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, prestocking 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 fisheseither 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 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 :

Fertilisation of the pond is an important means of 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 b) Inorganic	: :	Organic manure to be applied after a gap of 3 days from the date of liming. 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
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 10 cm 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.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

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 bran and oilcake in equal quantities daily. The feed should be placed on a bamboo tray and lowered to the pond bottom or it can be sprayed at the corners. After some time the fishes will get used to this type of feeding and aggregate at the same place at particular time.The recommended feeding rate is as under:

Culture period	**Quantity per day in kgs.**
I quarter	1.5 to 3
II quarter	3 to 6
III quarter	6 to 9
IV quarter	9 to 12
Total (for the year)	1,655 to 2,700

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.

D) Harvesting:

Harvesting is generally done at the end of 1 st year, when the fishes attain average weight of 750 gms to 1.25 kg. A production of 4 to 5 tons/ha can be obtained in a year. However, for the purpose of working out economics' a production level of 3 tons/ha/year may be considered. Harvesting is done by partial dewatering and repeated netting. In

some cases complete dewatering of ponds is resorted to.

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 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 Unit Cost and Income for 1 Ha pond requiring 1 meter excavation

Item	**New ponds Excavation upto 1 metre depth**
A.Capital cost:	150000
1.Excavation 10,000 m3@Rs.15/m3	20000
2.Construction of inlet/outlet (L.S.)	5000
3.Equipments & Gears (L.S.)	175000
4.Total	

B. Recurring cost:	2500
1.Lime 500 kg @ Rs. 5/kg	2000
2.Fingerlings 5000 Nos.@ Rs. 400/1000 Nos.	4500
3.Organic manure(cowdung) 15 tonnes	1650
@Rs.300/ton	825
4.Urea 330 kg@Rs.5/kg	8100
5.Triple Super Phosphate165 kg@Rs.5 per kg	4050
6.Mustard oil cake1350 kg@Rs.6/kg	960
7.Rice Bran: 1350 kg@ Rs.3/kg	2415
8. Insurance cost@4% of Seed and Fertilizers	27000
9. Miscellaneous including Harvesting, Marketing expenses and Watch and Ward etc.	
C. Income :	3000 Kg
1. Production (From second year onwards)	Rs 30/-
2. Sale Price (per Kg)	Rs 90,000/-
3. Total Income	

ANNEXURE- III

Statement showing Financial Analysis for Composite Fish culture in New Ponds(Indicative)

(Amt in Rs)

A. Cost	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
1. Fixed Costs	175,000	-						
2. Recurring Costs	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000
Total	202,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000
B.Benefits								

1. Income from sale of fish	-	90,000	90,000	90,000	90,000	90,000	90,000	90,000
2. Net Income	-202,000	63,000	63,000	63,000	63,000	63,000	63,000	63,000
3. NPV Costs	273,332							
4. NPV Benefits	374,438							
5. NPV	101,106							
6. BCR	1.51:1							
D. IRR	25 %							

Source: http://nabard.org/modelbankprojects/fisheries.asp