Tilapia Culture

Introduction :

Fish is the cheapest and most easily digestible animal protein and was obtained from natural sources from time immemorial for consumption. 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.

India ranks second after China among the top Aquaculture producers of the world, however, aquaculture in India is mostly restricted to carp farming and to some extent *Pangassius* farming. Though tilapia is the second most farmed fish in world, India does not farm Tilapia to that extent commercially . *Oreochromis mossambicus* was the first tilapia to be introduced in India during 1952 and due to the prolific breeding quickly gained the reputation of being a pest. Over population in reservoirs resulted in stunted growth and low price.

Tilapia has been considered as the Food Fish of the 21st century and is popularly known as aquatic chicken. The world aquaculture production of tilapia is 4.0 million tonnes with an estimated value of around $ 3 billion. FAO reports indicate that the Global Tilapia production is expected to reach 7.3million tons by 2030. In countries like China , Egypt, Phillippines, Brazil, Thailand and Bangladesh Tilapia contributed substantially to the Food Security Programmes. Therefore, it was felt at the national level that Tilapia would be one of the candidate species which could be cultured to address the food security in general and cheap protein requirement of the growing population in particular. MPEDA has given a major thrust to Tilapia farming in India.

The National committee on Introduction of Exotic aquatic species in Indian waters approved the import of *Oreochromis niloticus* and the guidelines for import of Tilapia has been reframed in 2006. Farmer friendly guidelines for responsible farming of Tilapia was implemented during December 2011,wherein respective State Governments have been empowered with Monitoring , Controlling and Surveillance (MCS) of hatchery/ Farming (Nursery as well as Grow out) facility . Biosecurity and licensing are the key aspects in the guidelines issued by Ministry of Agriculture, GoI. It is mandatory for the State Governments to issue license to farms and registration. The culture of only All male tilapia or hybrid is only permitted in India so as to avoid/ arrest prolific breeding during culture period.

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 suitable for agriculture as also any agriculture land can be converted into ponds for fish farming. Tilapia occupies lower level food chain which makes the culture economical and eco friendly. Monosex culture of Tilapia is advantageous as they grow fast and uniformity in size is generally obtained in a culture pond. The genetically Improved Farmed Tilapia (GIFT) has enhanced the culture as well as market potential as it is scientifically proved to be superior than fresh water carps and would be an ideal candidate for fish culture in India. Moreover GIFT Tilapia has high export potential to US, African countries as also Japan . Domestic demand also need to be tapped due to easiness to fillet the fish.

3. Technical Parameters : Technical parameters of Tilapia culture includes site selection, pond development, pre and post stocking operations, stocking, fertilization , feeding, harvest and post harvest operations which is given in Annexure I

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/NFDB 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.

f) Producer Groups / companies

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 so that the activity can be pursued with skill and generate income to pay back the loan and earn profit.

Farmers who intend to take up Tilapia culture shall apply to the State Fisheries Departments in the prescribed Proforma given in the Guidelines for responsible faring of Tilapia in India and the details can be obtained from *www. dahd.nic.in*

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 3.69 lakh and the recurring cost as Rs 5.02 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. 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 17.85 lakh

ii). BCR @ 15% - 1.31 :1

iii). IRR - above 50%

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.

Technical Aspects of Tilapia Culture - Annexure I

Advantages of Tilapia Culture

- Fast growing
- High demand in local market
- Prefer all kind of supplementary feeds
- Can be profitably cultured in seasonal ponds
- Can be cultured at high stocking densities
- High disease resistance ability
- Can be cultured in saline water (salinity 12 – 15 ppt)
- Three crops are possible in perennial ponds
- Growing export potential due to the easiness to fillet the fish

Technical parameters that needs to be considered for Tilapia Culture are as follows :

1. Selection of Pond: Any perennial fresh water pond/tank retaining water depth of 1.5 - 2 metres can be used for fish culture purpose. However, the minimum level should not fall below one metre so as to maintain and sustain the standing crop. Even seasonal ponds which can retain 1 - 1.25 m water can also be utilised for short duration Tilapia culture.

The main criteria to be kept in mind while selecting the ponds 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/huts, water supply arrangements / electricity supply arrangements etc. depending on requirements of the project based on its size etc.

Bio Security

The approval for farming of tilapia shall be accorded only to those ponds/farms which could maintain biosecurity of the farm to ensure no escape of the biological material from the farm to the water source or to any other source even in situations like flooding. Therefore, there should be a standard design specifying the minimum requirement of bund height water management systems and other biosecurity measures which are necessary for farming. Outlet water from culture ponds must be screened and treated before released into drains/canals/rivers during culture practice or subsequent to harvesting in order to prevent escape of eggs into natural water bodies (b) Provision of Bird scaring device/fencing is mandatory, (c) Bund height should be high enough to avoid fish escape and (d) sluice gates must be provided with appropriate mesh size to prevent escape of fish/eggs/fry

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 given below

A) 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 fish 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 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 (up to 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 (up to 3)	70	30

B) Stocking

The pond will be ready for stocking after 15 days of application of fertilisers.

B.1 Nursery Rearing

Improved tilapia fry can be procured from the approved hatcheries conforming to protocols specified in the guidelines for establishment of Tilapia hatcheries and should be reared in nursery ponds for at least one month before releasing into the grow out ponds . The nursery rearing can be done in nylon meshed hapas suspended in the grow out ponds. 50 - 75 fry may be reared in one sq m. Feeding can be done using small floating pellets and the feeding can be reduced from 30% -20% of the body weight as the fish grows and moved into the grow out pond. Special feeds are available in the market. The feed should be made available to the fry at least 3 - 4 times a day based on the demand for feed to get good survival and growth. The hapa should be cleaned to facilitate water flow.

Grow out rearing

The fry thus reared for one month can be released into the grow out pond with a stocking density of 3-5 Nos /sqm for better growth and survival.

C) Post Stocking:

a) Supplementary feeding:

Fish need much more food than what is available naturally in the pond. Fish can be fed with artificial feed and floating pelleted feed and is generally preferred as it gives better growth, less deterioration of water quality and good survival. A commercial feed with FCR 1.25 to 1.5 is ideally preferred.

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) Monitoring / Sample checking

Periodical monitoring of the stock to be done for disease incidence and growth. Records for day to day management of the pond to be kept for inspection of the State Government Officials.

d) Harvesting:

Harvesting is generally done at the end of 6 months, when the fishes attain average weight of 500 gm in 5-6 months. A production of 8 - 10 tons/ha can be obtained in one crop of 6 months. Harvesting is done by partial dewatering and repeated netting. In some cases complete dewatering of ponds is also resorted to. The fish thus harvested can be iced and sold. The fish farmers are resorting to even selling of live fishes so as to fetch better returns. Partial culling depending on the market demand is also being tried out.

Economics of Tilapia culture 1 Ha Model

A	Capital Cost				Amount Rs
S.No	Particulars	Units	Quantum	Rate (Rs.)	Total
1	Site clearance		LS	4000	4000
2	Construction of pond including digging, bund construction and compaction and consolidation	Hrs	50	1500	75000
3	Diesel Pump Set	5HP	1	60000	60000
4	Inlet/outlet sluices			LS	10000
5	Store Room/ Office Room	Sq ft	400	300	120000
6	Bio security			LS	75000
7	Miscellaneous items nets and implements			LS	25000
	Total "A"				**369000**
B	**Operational cost for one crop (6 months)**				
1	Drying, desilting ,plouging and watering	LS	LS	LS	10000
2	Lime	Kgs	500	5	2500
3	Single Super Phosphate	Kgs	250	5	1250
4	Urea	Kgs	125	5	625
5	Poultry Litter/cowdung	Tons	5	1000	5000
6	Fish seed	Nos	25000	3	75000
7	Fish feed	Kgs	13125	28	367500
8	Watch and ward, feeding	6	1	3500	21000
9	Harvesting charges per kg		9375	1	9375
10	Miscellaneous	LS	LS		10000
	Total "B"				**502250**
	Total A +B				**871250**
C	**Production Norms:**				
1	Stocking		25000 seed		
2	Survival(%)	75	18750		
3	Average weight at harvest (gms)	500	9375		
4	Total production (Kg)	9375			
5	Farm gate price (Rs.)	75			
6	Number of Crops per annum	2			
7	Income during 1st year	703125			
8	For 2 crops from II yr onwards	1406250			

Financial analysis of Tilapia culture 1 Ha Model (Amt in Rs lakh)

Year	**1**	**2 - 8 years**
Capital Cost	3.69	0
Recurring Cost	5.02	10.05
Total Cost	8.71	10.05
Gross Benefit	7.03	14.06
Net Benefit	-1.68	4.02
Present Worth of Costs @ 15%	56.53	
Present Worth of Benefit @ 15% DF	74.38	
Net Present Worth (PW Benefit - PW Cost)	17.85	
Benefit Cost Ratio (PW of Benefit / PW of Costs)	1.31 :1	
Internal Rate of Return	> 50%	

Repayment schedule - Tilapia culture 1 Ha Model

Total financial outlay	8.71
Margin	1.31
Bank Loan	7.4
Rate of Interest	12%

Year	**Net Income**	**Interest**	**Principal**	**Total outgo**	**Bank loan o/s**	**Net surplus**	**DSCR**
1	2.00	0.89	0.00	0.89	7.41		2.25
2	4.00	0.89	1.23	2.12	6.17	1.88	1.88
3	4.00	0.74	1.24	1.98	4.93	2.02	2.02
4	4.00	0.59	1.24	1.83	3.69	2.17	2.18
5	4.00	0.44	1.24	1.68	2.45	2.32	2.38
6	4.00	0.29	1.24	1.54	1.21	2.46	2.61
7	4.00	0.14	1.24	1.39	0.00	2.61	2.89

Repayment 7 years with one year grace