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Innovation in Aquaculture: Replacement of bottom dweller fish by fresh water prawn

Vinayak V. Parab & Dilip V. Nakhwa

Department of Zoology, The Institute of Science, Mumbai

Abstract

The giant fresh water prawn *Macrobracium rosenbergii* and *M.malcomsonii* are the two important fresh water prawn species which has similar demand in the international and domestic market as that of the marine shrimp. The main innovation is the replacement of the bottom dweller fish by fresh water prawn. Among the few promising species available in the country for diversification from carp culture, fresh water prawn forms the most important one due to its very high market value, consumer's preference and export potential. Culture of prawns along with fishes in a pond system is called polyculture. *Macrobrachium rosenbergii* is commercially known as "Scampi" the largest of prawn. In natural system, it attains a size of 30-35 cm with 400-450 gms weight. It grows well in almost all fresh water and low saline water bodies such as lakes, rivers, swamps, irrigation ditches, canals, ponds and small dams. *Macrobrachium malcomsonii* is popularly known as Indian River Prawn or Godavari River Prawn. Average total length is 250 mm. It is distributed in South Indian rivers which drain in Bay of Bengal, and Chilka lake. *Macrobrachium rosenbergii* (Scampi) is preferred for culture because it is fast growth compared to other prawns, Hardy in Nature, Low protein requirement (in feed), suitable for polyculture. Year round breeding is possible with peak in monsoon season (ensures availability of seed) and consumer preference and demand in export market. Even though site conditions and environmental factors being ideal for prawn culture, its importance is yet to be demonstrated and popularized. Keeping in mind the availability of vast potential areas for fresh water prawn culture, even 10% of its utilization on scientific lines can earn daily bread for millions of people. It is possible to obtain 93.33% higher profit just by replacing bottom dweller fish like mrigal and common carp by fresh water prawns in existing carp culture system. The internal rate of return of the scheme is more than 98.08% with (BCR) Benefit Cost Ratio 1:1.22. Whereas, in composite fish culture, IRR is 81.61% and BCR is 1: 1.2. Thus, this innovation is economically viable and bankable as well.

Key words : Giant fresh water prawn, *Macrobracium rosenbergii*,Scampi, polyculture, IRR

Introduction

The state of Assam is also full of wetlands, derelict water bodies and ponds and tanks with rich fish biodiversity. Fish is an integral part in the diet of the people of Assam. Pond production systems in all the states of India are becoming increasingly reliant on external resources (feed, fertilizers) to supplement or stimulate autochthonous food production for pond fish. In most pond production systems, only about 15–30% of nutrient inputs are converted into harvestable products, the remainder being lost to the sediments, effluent water and the atmosphere (Acosta-Nassar et al., 1994; Gross et al., 2000). Improving the conversion of nutrients into

harvestable products, through adoption of periphyton-based production into existing pond systems, is one solution worth exploring.

The main innovation is the replacement of the bottom dweller fish by fresh water prawn. Among the few promising species available in the country for diversification from carp culture, fresh water prawn forms the most important one due to its very high market value, consumer's preference and export potential. Some of the promising species in this group includes giant freshwater prawn(*M. rosenbergii and M. malcolmsonii)*. The hatchery technologies of these species are also developed, standardised and tested with an average survival of 60% from Zoea to Post Larva. Traditional farming of these species has been in vogue for long time in the country, relying on reverine seed collections and trapping of natural seed in ponds and enclosures. **Innovation :** Bottom dweller fish such as Common carp, Mrigal do not fetch good market price to the fish farmer. Tiltation of the soil by common carp leads to erosion of embankment. Replacement of bottom dweller fish by fresh water prawn. Prawns have good consumer demand than the fish like Common carp and Mrigal. Only composite fish culture is not bankable proposal.

Male and female *Macrobrachium rosenbergii* (scampi)

Polyculture :

Culture of prawns along with fishes in a pond system is called polyculture**.** In polyculture system, the fishes are selected in such a way that they are compatible. The system is practiced based on the principle that the food items available in the water body is fully utilized and wastes are minimized. Here the production per unit area is maximized under good management practices. Moreover, with the development of artificial seed production technology, scientific culture of prawn has taken a great leap. These prawns form excellent component species for polyculture with Indian major carps. Till date about 40 seed production units established in Andhra Pradesh, West Bengal, Tamilnadu and Kerala producing about 200 million seeds per annum. Polyculture of M.rosenbergii with fishes are reported from different states of our country.

Polyculture with freshwater prawns is practised along with carp species viz., catla, rohu, silvercarp and grass carp which are used for composite fish culture. In composite fish culture, six carp varities viz., catla, rohu, mrigal, common carp, silver carp and grass carp are reared in one pond.

Indian Major Carps

a ; Catla, b: Rohu, C: Mrigal

Catla and silver carp are surface feeders; rohu, and grass carp are middle feeders; mrigal and common carp are bottom feeders. In polyculture, in order to avoid competition in space and food in the bottom area, the bottom feeding fishes such as mrigal and common carp are not allowed. Introduction of catla, silvercarp and rohu has been shown to control plankton population and to maintain good water quality. The grass carp feeds on the grasses available on the lower region of pond thus avoiding decomposition of plants. Introduction of silver carp has added advantages Silver carp is very sensitive and serves as an indicator species to understand any unwanted biological, physical and chemical processes undergoing in the pond water. Hence, it is possible to rectify the defects of the water system by the movements of the silvercarp, so that mortality of prawns can be avoided. Cultrable fresh water prawn species for polyculture with fresh water prawn: (1) *Macrobrachium rosenbergii* (2) M. *malcomson*i and (3) M.*choprii.* Macrobrachium rosenbergii : Commercially known as "Scampi" is the largest of prawn and is one of the most important species from the point of view of fresh water aquaculture. In natural system, it attains a size of 30-35 cm with 400-450 gms weight thus being the largest prawn available for culture. It grows well in almost all fresh water and low saline water bodies susch as lakes, reivers, swamps, irrigation ditches, canals, ponds and small dams. *Macrobrachium malcomsonii* : It is popularly known as Indian River Prawn or Godavari River Prawn. Average total length is 250

mm. It is distributed in South Indian rivers which drain in Bay of Bengal, and Chilka lake. *Macrobrachium choprii* : The average length is 200 mm. It is distributed in River Ganga and its tributaries in Eastern U.P., Bihar and Brahmaputra in Assam. However, these 3 species, *Macrobrachium rosenbergii* (Scampi) is preferred for culture for the following reasons due to 1) Fast growth compared to other prawns 2) Hardy in Nature 3) Low protein requirement (in feed) 4) Suitable for polyculture (can be reared with other fin fishes 5) Ability to grow in fresh water and low saline water 6) Year round breeding is possible with peak in monsoon season (ensures availability of seed) 7) Consumer preference and demand in export market.

Materials and Methods:

Project area:

The proposed project area is under Hahara and Tetelia Gaon Panchyat of Dimaria Development Block, Kamrup District. It covers the villages of Bagibari, Hahara, Mitani, Nij hahara and Nij Bagibari. The total family of these villages are approximately 1000 nos and most of their livelihood is agriculture. A total of 450 family members having existing tanks for pisciculture and their mode of farming is in traditional farming. Most of the farmers are small and marginal. Specific problem is the non availability of prawn seed. All the banks operating in the scheme area including Commercial Banks, Cooperatives and RRBs have shown interest in development of this culture method with bank finance.

In association with personnel of Department of Fisheries, Assam and NGO**,** surveyed the target area for pre stocking management viz., site selection with the soil and water parameters, source of water to assess the durability of water viz, seasonal or perennial and preparation of pond for culture. Pre stocking, stocking post stocking management and marketing also conducted.

Pre stocking management: Preparation of Pond

For preparation of pond the further procedure has been strictly adhered: In order to achieve optimum fish production, following steps are adopted: a) Aquatic and nuisance weeds, uncontrolled algal growth and predatory local fishes are removed from the pond by dewatering the pond by manual labors, application of chemical weedicides like 2, 4 – D, spray/oil-soap emulsion and allowed the pond bottom to dry till cracks develop at the bottom, plough the bottom and refill the pond with fresh water. Mahua Oil Cake (M.O.C.) in fine powder @ 2,500 kg/hectare water spread area (W.S.A.) was applied before 20 days of fish seed stocking to avoid poisonous effect

on fish seed. b) Lime is applied in the pond depending upon the pH of the water as per following table. Acidic soil and water are not favorable for fish growth.

pH	Amount of Lime to be applied Kg/ha. W.S.A.
4.5 to 5.0	2,000
5.0 to 6.5	1,000
6.5 to 7.5	500
7.5 to 8.5	200
8.5 to 9.5	Not required

Benefits of application of lime shown: i) Lime provides alkaline medium to the water which is good for fish growth. ii) It regulates pH of the water. iii) It promotes bacterial break down of organic matter in the water. iv) It helps fertilizer to work efficiently. v) Lime helps in killing parasites present in the water. vi) It supplies Calcium to fish for bone formation. Application of lime of entire dose of lime is split into monthly doses Lime and preferably broadcasted on the water surface. In addition to the lime, application of inorganic fertilizers viz, Nitrogen and Phosphate also applied. c) To augment the biological productivity of the pond for natural growth of fish food (zooplanktons and phytoplanktons), ponds are supplied with organic and inorganic fertilizers as shown below till the crop is harvested.

Kg/ha W.S.A.

Application at monthly intervals	Cattle Dung	Ammonium Sulphate	Super Phosphate
1st Dose	5,000*	75	50
2nd Dose onwards	2,000	75	50
Total (12 months)	27,000	900	600

(* Need not be applied if M.O.C. is applied initially)

These are applied by spreading over the water surface. These doses may however be regulated depending upon the population of Zooplanktons and Phytoplanktons in the water which are judged by examining the water colour. Green colour of the water was most ideal. Light green indicates poor population of zooplanktons and phytoplanktons, dark green indicates more growth of zooplanktons and phytoplanktons and increasing level of water pollution, which may lead to oxygen deficiency in the water. Both the colours i.e. light green/dark green are found not favorable for fish culture. The application of organic and inorganic fertilizers are therefore,

regulated as per requirements. Prior to stocking, the pond water was tested for water quality parameters such as pH, DO, alkalinity etc. and necessary corrective steps are taken.

Seed stocking management: Till now there is no hatchery for production of fresh water prawn seed in Assam. But it can be transported easily from Kolkata through air as the distance from Guwahti airport to the project area is about 50 km, there will be no problem to carry seed from Kolkata to the project area. The ideal age group of seed was found to be PL 7-10 (Post Larvae 7 - 10 days old). The seed are brought from reputed hatcheries. While stocking the seed the utmost care was taken viz., the healthy seed should be light brown in colour (not so transparent) and is very active. The larvae should have clear shells without dirt and will accept feed quickly; seed should be transported from hatchery to the ponds within 24 hours. If the travel time is beyond 24 hours, repacking is necessary. For packing the PLs, water of the same pond should be used. It is better to bring down the temperature, of water to 22-25^{0}C by using ice. This reduces moulting and mortality. For small distances of 1-2 hours, they can be transported in open tanks, with aeration. For longer journey they should be transported in oxygenated bags. Counting of larvae was done by Random sampling method. Larvae are concentrated in a cloth with small quantity of water and are measured using 5 ml. or 10 ml. spoon. Normally 5 ml. of PL 7 without water may contain 500-800 nos. 5-10 ml. can be packed in a 20 liters container for 15-20 hours journey. The utmost care was taken that the farmer/entrepreneur should satisfy himself about the quantity and quality of seed, at the hatchery site itself. On bringing the seeds to the pond they are acclimatized to the pond water. After opening the bag, some pond water put into the containers and the polyethylene bags floated in the pond for 10-15 minutes as also late evening was found to the ideal time for release of seed in the pond. On preparing the pond with lying of hideouts the pond was stocked with post larva or Juveniles of giant fresh water prawns (Macrobrachium rosenbergii) stocked at the rate of 10,000 - 30,000/ha and the carp species viz., catla, silver carp, rohu and grass carp stocked at the rate of 2,500, 1,000, 1,500 and 1,000/ha respectively. The methodology applied has been summarized as shown below:

C.7A Capital Cost

1. Reclamation of the existing water bodies :

i) Excavation :Not required as having low lying area
ii).Dewatering : By hiring one pump for 12 hrs(Rs.32per /let/hr for fuel+Rs.35 /hr as rental for 5 hp pump+Rs.8 for opertor/hr)
iii).Weed eradication: Will be done by engaging non skilled 3 labourers for 3 days @ Rs.75 per day.

iv).Removal of predators: Will be done by netting with the help of 2 labourers for 3days @Rs.75 per day

Input Requirement

I ***Lime*** : 50 kg @ 500 Kg/ Ha will be used to make the water body conducive for rearing operation.
ii **Cow dung** : 1000 kg @10000 kg/ha will be used as manure for the necessary zooplankton production.
iii **Single superphosphate**:50 kg of SSP@500 kg/ha necessary for phytoplankton growth.
iv **Urea** :35 kg @350 kg/ha basically required for primary productivity.
v **Fish seed (10cm & above)**: 500 No@5000/ha.
vi **Prawn seed**:1000 No.@10000 No/ha stocking desity.
vii ***Feed*** :
A. ***Fish feed* @2% body weight** : 1000kg Rice bran & Mustard Oil Cake @50% ratio
B ***Pellated Prawn feed*** @FCR 1:1.5 : 105 kg
viii ***Labour***
A Watch & ward: Will be taken care of by fish farmer himself.
B Harvesting : Could be done by engaging 2 labourers in one day
ix Marketing : Will be taken care of by fish farmer himself.
x Insurance of asset and farmer : Not available presently.
xi Prophylactics measures : Required for disease control

Rearing period: One year.

Result:

C.7D Techno-Economic feasibility vis-a-vis Financial Analysis

Unit size : 0.1WSA
Crop/cycles : 1
Stocking density:
Fish seed (10cm & above):500 No@5000/ha.
Prawn seed :1000 No.@10000 No/ha

Rearing period
Fish :One year per crop
Prawn : ***Eight months per crop***.
Survival rate:90 %
Production
Fish : 250 kg
Prawn :70 kg
Total yield :320 kg

Cash flow and Economic analysis

The economic analysis as also details of income and expenditure from the unit is given in the annexure II. The summary is as under:

N P W at 15% DF : 14764

B C R at 15% DF : 1:1.2
I R R : 98.08 %

The net surplus works out to Rs. 35,000 from second year onwards on a conservative scale

The internal rate of return of the scheme is more than 98.08% with (BCR) Benefit Cost Ratio 1: 1.22. Thus, the scheme is economically viable and bankable as well. (The repayment schedule indicates that the principal amount of bank loan with interest can be repaid in one year.)

The ready marketing size of 70-80 gm is obtained over a culture period of 8 to 10 months under the tropical climate. The fresh water prawn during the culture period of 6 to 7 months attained 50 to 60 gms as an individual weight gain with an average survival of 60 %. In this regard actual survival rate much more higher but complete harvesting was not possible in the present circumstances as dewatering is the main problem in rural areas which hampers the complete harvesting but to depend only on cast netting. The farmer therefore harvested fish about 1000 kg and prawn about 100 kg per acre.

Total project outlay taking into consideration the operating cost of one cycle in the first year works out to Rs. 20680. Operating cost of one cycle in the first year at Rs. 16800 in the first year has been envisaged in the project. It is assumed that beneficiary will be able to get 50%, 75% and 100% fish yield during first, second year and third year respectively. The gross income from sale of 250 kg fish @ Rs.60 per kg and from sale of 70kg prawn @ Rs.200 works out to Rs.29000 from second year onwards on a conservative scale. The internal rate of return of the scheme is more than 98.08 % with (BCR) Benefit Cost Ratio at 15% will be 1.

As such, the scheme is technically feasible and economically viable.

The repayment schedule indicates that the interest and the principal amount of bank loan can be repaid in two years with first year as grace period.

A detailed economics of the said bankable model is given in Annexure

N.B. The items and cost indicated under the model are indicative and not exhaustive. While preparing projects for financial assistance, the costs have to be assessed taking into account actual field conditions.

The Financial analysis of both Composite pisciculture and Polyculture with fresh water prawn is as follows:

	Composite pisciculture	Polyculture with fresh water prawn	Percentage increase
Capital cost	2000	2000	
Operational cost of one crop	13580	18680	37.55 %
Total Project Outlay	15580	20680	
Fish Production	250 kg.	250 kg	
Prawn production	NIl	70 kg	
Income from sale of produce (Rs)	15000	29000	93.33%
N P W at 15% DF	412	14764	
B C R at 15% DF	1.00 :1	1.22 :1	
I R R	81.61 %	98.08%	

Discussion:

Benefits of application of lime shown**:** i) Lime provides alkaline medium to the water which is good for fish growth. ii) It regulates pH of the water. iii) It promotes bacterial break down of organic matter in the water. iv) It helps fertilizer to work efficiently. v) Lime helps in killing parasites present in the water. vi) It supplies Calcium to fish for bone formation. Application of lime of entire dose of lime is split into monthly doses Lime and preferably broadcasted on the water surface.

In addition to the lime, application of inorganic fertilizers viz, Nitrogen and Phosphate also applied. The application of exogenous nitrogenous and phosphorus fertilizer helps in stimulating autotrophic food production in fish pond and thereby helps in enhancing primary productivity of fish pond. This helps production of phytoplankton and in turn production of zooplankton and other secondary consumers of the food chain. As nitrogen and phosphorus are limiting nutrients, it has to be added exogenously from outside source. Most of the phytoplankton uptakes nitrogen nutrients mostly in the form of inorganic form and phosphorus in the form of orthophosphate form and maintains Redfield Ratio, it is important to maintain the sustained amount of exogenous nitrogenous and phosphorus fertilizer application throughout the culture period to ensure growth of culture of both carps as also prawns. Post larvae can directly stock into the pond if it has been prepared properly. Otherwise, they can be kept in nursery tank, for one month to become Juveniles and after that they can be released into culture ponds. In nursery ponds PLs can be stocked @ 1,000 numbers per m^2. Artificial feed and aeration must be provided in the nursery pond. The survival rate from PL to Juveniles is normally 80%.

The newly excavated fish ponds in the area are found to be undertaking scientific fish culture activity successfully. Average size of the fish pond is 3.8 x 50 m. Most of the farmers are undertaking integrated fish culture along with the local verity of ducks and horticulture on the embankments. However, majority of farmers were not aware about the polyculture with freshwater prawn for replacement of bottom dweller fishes in the existing ponds gives the remunerated economical benefit.

Innovation involved in the project

Even though site conditions and environmental factors being ideal for prawn culture in Assam, its importance is yet to be demonstrated and popularized in the state. Keeping in mind the availability of vast potential areas for fresh water prawn culture in the state, even 10% of its utilization on scientific lines can earn daily bread for millions of people. The bottom dweller fish such as Common carp, Mrigal do not fetch good market price to the fish farmer. Moreover, Tiltation of the soil by common carp leads to erosion of embankment. The distance from Guwahti airport to the project area is about 50 km, there will be no problem to carry seed from Kolkata to the project area. Prawns have good consumer demand than the fish like Common carp and Mrigal. All the above three fresh water prawn species are amenable to extensive, semi-intensive as well as intensive culture. However, considering the vast potential areas available in Assam for culture, and with a view to ensure long sustaining yield, better economics and eco-friendly practice, it is advisable to adopt extensive or improved extensive farming system. Poly-culture with compatible species of carps and fresh water prawns will facilitate better utilization of pond resources and also control excessive growth of algae and zooplankton. The Grass Carp, Silver carp, Catla and Rohu can be used for poly culture with scampi. However, bottom feedrs like the Mrigal and the Common Carp are not advisable for poly-culture with scampi as they are competitors for food and space.

Economic value of prawn culture is very high due to: i) They take natural feed (Plankton) available in pond water and also accept artificial feed. ii) Seed is available in plenty in rivers. Also artificial seed production is possible through hatcheries. iii) They are hardy in nature and tolerate wide fluctuations in water quality. iv) Being an export commodity, prawns enjoy a good commercial status. v) Cost of production per unit is less than 50% of the selling price, which ensures 100% profit over investment.

Summary of economic estimation for 0.1 ha unit area

	Proposed	Recommended
Capital cost	2,000	2,000
Operational cost for one year	18,500	18,680
Unit cost	20,500	20,680
Farmers' contribution@10%	2,050	2068 say 2,000
Loan component	18,450	18680 say 18,700
Repayment period	Two years with first year as grace period	Two years with first year as grace period
Rate of Interest	12 %	12 %
Yield		
Fish	250 kg	250 kg
Prawn	70 kg	70 kg
Total yield	320 kg	320 kg
N P W at 15% DF	13,461	14,764
B C R at 15% DF	1 : 1.2	1 : 22
I R R	84.33%	98.08

(N.B.: Rate of interest is indicative. However, the rates of interest are subject to change from time to time as per directives/instructions issued by RBI.)The disbursement of loan may be made in installments after inspection in each phase.

The summary of the same along with other general lending terms is given below:

4.2 Techno-Economic feasibility vis-a-vis Financial Analysis

Unit size : 0.1WSA

Crop/cycles : 1
(Rearing period:
Fish : One year per crop
Prawn : Eight months per crop).

Stocking density
Fish seed : 500 Nos. of 10cms & above size @ 5000 per ha per crop
Prawn seed : 1000 No. PL 7-10 (Post Larvae 7 - 10 days old) @ 10000 per ha per crop

Rearing period : 10 months per crop

Survival rate : 90 %

Production of Fish : 250 kg per crop
Production of Prawn : 70 kg per crop

4.3 A detailed economics of the said bankable model is given below:

	Replacement of bottom dweller fish by fresh water prawn					
	Average size of pond 0.10 ha (1000 smt)					
Sl	Item					
A	**Capital Cost**	Quantity	Unit	Cost (Rs.) per unit	Cost	
	Preparation of tank					
1	Cost of reclamation					
a	Cost of excavation for 1000 m3 for 1 m excavation less 20% i.e. for 800 m3	800	Cum	45	Not required	
b	Weed eradication by 3 labours(non skilled)	3	Day	75	675	
c	Removal of predators by netting by 2 labours(non skilled)	3	Day	75	450	
d	Dewatering by one pump for 12 hrs(Rs.32per /let/hr for fuel+Rs.35 /hr as rental for 5 hp pump+Rs.8 for operator/hr)	12	Hour	75	900	
	Total Capital Cost				2025	
				Say	***2000***	
B	**Operational cost one crop**					
1	Lime	50	Kg	12	600	
2	Cow dung	1000	Kg	0.25	250	
3	Single super phosphate	50	Kg	6	300	
4	Urea	35	Kg	8	280	
5	**Fish seed (nos.) 10cms & above**	**500**	**No.**	**3**	**1500**	
6	Prawn seed PL 7-10 (Post Larvae 7 - 10 days old)	1000	No	3	3000	
7	Fish feed @ 2% body weight for 10 months					
i	Rice bran	500	Kg	8	4000	1200
ii	MOC	500	Kg	12	6000	
8	Pelleted prawn feed(including transportation)@ FCR 1:1.5	105	Kg	20	2100	
9	Miscellaneous Expenditure including insurance of asset and farmer			Not available	0	
10	Watch & ward	Self			0	
11	Harvesting by 2 labours	1	Day	75	150	
12	Prophylactic measures	L.S.			500	
	Operational Cost for one crop				***18680***	
C	Total Cost /Total Financial Outlay (Capital cost + Operational cost)				20680	
D	Farmer's contribution @10% of the Total cost	10%	20680		2068	
				say	2000	
E	Loan Amount				18680	
				say	18700	
F	Yield/income					
	Fish	250	Kg	60	15000	

	Prawn	70	Kg	200		14000	
G	Gross Income					29000	
H	Assumption:						
1	The farmers shall be advised to undertake culture with a species ratio of Catla, Rohu and Prawn in 34:52:14.						
2	NGO should arrange supply of prawn seed PL 45 days from Kolkata in due consultation of DOF.						
3	NFO should furnish the list of prawn seed suppliers from Kolkata.						
I	***Repayment Schedule***						
	Bank loan	18700	2244	20944	11600	2	
	Repayment schedule	Two year with first year as grace period					
INCOME EXPENDITURE STATEMENT AND REPAYMENT							
	Particulars		***Years***				
			I	II	III		
1.	Gross Income		14500	21750	29000		
			50%	75%	100%		
2	Gross expenditure		20680	18680	18680		
3	Gross Surplus : (1 -2)		-6180	3070	10320		
4	Add recurring cost capitalized for term loan		18680	18680	18680		
5	Amount available for repayment (3+4)		12500		29000		
6	Less AEI (12%)C.R.F : 0711780		13296	13296	13296		
7	Net surplus (5 - 6)		25796	35046	42296		
	Years	**1**	**2**	**3**	**4**	**5**	
	Capital Cost	2000	0	0	0	0	
	Recurring cost	18680	18680	18680	18680	18680	
	Total Cost	20680	18680	18680	18680	18680	
	Benefit	14500	21750	29000	29000	29000	
	Gross surplus	-4180	3070	10320	10320	10320	
	PWC	64357					
	PWB	79122					
	NPW@15	14764					
	BCR at 15 %	1.22					
	IRR	98.08%					

	Traditional pisciculture in average size of pond 0.10 ha (1000 m^2)					
Sl	Item					
A	**Capital Cost**	Quantity	Unit	Cost (Rs.) per unit	Cost	
	Preparation of tank					
1	Cost of reclamation					
a	Cost of excavation for 1000 m3 for 1 m excavation less 20% i.e. for 800 m3	800	Cum	45	Not required	
b	Weed eradication by 3 labours(non skilled)	3	day	75	675	
c	Removal of predators by netting by 2 labours (non skilled)	3	day	75	450	

d	Dewatering by one pump for 12 hrs(Rs.32per /let/hr for fuel+Rs.35 /hr as rental for 5 hp pump+Rs.8 for operator/hr)	12	hour	75	900	
	Total Capital Cost				2025	
				Say	***2000***	
B	**Operational cost one crop**					
1	Lime	50	Kg	12	600	
2	Cow dung	1000	Kg	0.25	250	
3	Single super phosphate	50	kg	6	300	
4	Urea	35	kg	8	280	
5	Fish seed (nos.) 10cms & above	500	No.	3	1500	
6	Fish feed @ 2% body weight for 10 months					
i	Rice bran	500	Kg	8	4000	1200
ii	MOC	500	Kg	12	6000	
9	Miscellaneous Expenditure including insurance of asset and farmer	Not available			0	
10	Watch & ward	Self			0	
11	Harvesting by 2 labours	1	day	75	150	
12	Prophylactic measures	L.S.			500	
	Operational Cost for one crop				***13580***	
C	**Total Cost /Total Financial Outlay (Capital cost + Operational cost)**				**15580**	
D	**Farmer's contribution @10% of the Total cost**	**10%**	**15580**		**1558**	
E	**Loan Amount**				**14022**	
				say	**14000**	
F	**Yield/income**					
	Fish	**250**	Kg	**60**	**15000**	
	Repayment Schedule					
	Bank loan	14000	1680	15680	6000	3
	Repayment schedule	Three years with first year as grace period				

INCOME EXPENDITURE STATEMENT AND REPAYMENT						
	Particulars		***Years***			
			I	II	III	
1.	Gross Income		15000	15000	15000	
2.	Gross expenditure		15580	13580	13580	
3.	Gross Surplus : (1 -2)		-580	1420	1420	
4.	Add recurring cost capitalized for term loan		13580	13580	13580	
5.	Amount available for repayment (3+4)		13000	15000	15000	
6.	Less AEI (12%)C.R.F : 0711780		9965	9965	9965	
7.	Net surplus (5 - 6)		22965	24965	24965	

	Years	1	2	3	4	5
	Capital Cost	2000	0	0	0	0
	Recurring cost	13580	13580	13580	13580	13580
	Total Cost	15580	13580	13580	13580	13580
	Benefit	12000	15000	15000	15000	15000
		80%	100%	100%	100%	100%
	Gross surplus	-1580	1420	1420	1420	1420
	PWC	47261				
	PWB	47674				
	NPW@15	412				
	BCR at 15 %	1.008				
	IRR	81.61%				

Conclusion / Recommendations

It is possible to obtain 93.33% higher profit just by replacing bottom dweller fish like mrigal and common carp by fresh water prawns in existing carp culture system. In polyculture, in order to avoid competition in space and food in the bottom area, the bottom feeding fishes such as mrigal and common carp are not allowed. During our earlier visit to the fish ponds established with the bank finance in Tetalia, Mitani, Maloibari and Bagibori villages in the Dimoria block, it was found that Dimoria block can be developed as **Fisheries Model Block on cluster approach**. Considering the vast potential areas available in Assam for culture and with a view to ensure long sustaining yield, better economics and eco-friendly practice, it is advisable to adopt extensive polyculture with freshwater prawn farming system. Cost of production per unit is less than 50% of the selling price, which ensures 100% profit over investment.

Till date only composite fish culture in Assam is in vogue, but nobody is undertaking polyculture of carps with fresh water prawn due to the irregular availability of seed as also non establishment of organized body for prawn seed collection in Assam. Hence, this project will be a very good beginning for scientific polyculture with fresh water prawn.

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