

Culture technology, management and economics of giant freshwater prawn *Macrobrachium rosenbergii*

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Keywords:

Macrobrachium Rosenbergtii
Freshwater Prawn
Culture Technology
Economics
Management Practices.

Abstract

The giant freshwater prawn, *Macrobrachium rosenbergii* is the largest prawn known in the world. It is also known as Scampi. Its farming is gaining popularity all over the world. It is the most preferred species for culture because it has fast growth rate, better meat quality, resistance to disease, omnivorous feeding habit, compatibility for polyculture with Indian and Chinese carps, adaptation to varying environmental conditions, easy breeding and good demand in domestic and international markets (Gupta 2006; New 1995, 2005).

Culture of prawn can be carried out in earthen ponds, cement cisterns, in pens or in cages. However, most of the operations are being carried out in earthen ponds. It can be reared in mono-culture or polyculture with carps. The standard practices of scampi farming include site selection, pond construction, water source and quality, management practices, etc.

Selection of Site

The selected site should have the following major qualities: Supply of good quality, pollution free freshwater; Soil having a pH of more than 6.5 and good water retention capacity; and Warm climate for nearly 8 months (Temperature - > 25 °C)

Construction of Pond

Ponds should have an inlet and an outlet; Pond bottom should have a gradient slope towards the outlet; Pond bunds should have a suitable slope (1 :2); Pond size - 0.2 -< 1.0 ha (0.2-0.5 ha); Depth - 2 m, Shape - Rectangular; and Soil - Clay loam, sandy loam.

Water Source and Quality

A permanent source of water is must before planning freshwater prawn farming. It includes tube well water, canal water, water from nearby river/reservoir/lake, etc. Water used for culture should be free from toxic chemicals and pollutants. The optimum range of few most important water quality parameters for freshwater prawn culture are salinity (freshwater/ <5 ppt), temperature (28-32 °C), pH (7.0-8.5), total hardness (50-100 mg/l), dissolved oxygen (>5ppm).

Quality of Seed

Selecting the best quality seed for stocking is one of the most important tasks in scampi culture. The PL brought to the farm need to be acclimatized to the pond water. In any case, the PL should be acclimatized to the temperature as well as pH of the pond water. Many farmers consider only the former by simply floating the seed bags in the pond before releasing the seeds. The water in the seed bag and the pond water should be gradually mixed to avoid pH shock to the PL.

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Nursery Rearing

The PL are stocked, in small nursery ponds at high densities and reared for 1.0 to 1.5 months. The common practice is to stock nursery ponds at 2.0-2.5 lakh PL/ha. The PL should be fed a pellet diet or other suitable diet for at least 3 to 4 times a day (Gupta et al 2007). Zooplankton are an important food source for prawns, especially during the first few weeks after stocking. The nursery reared PL grow to juveniles and weigh about 3-5 g depending on the stocking density employed and management practice. These juveniles are used for stocking in grow-out ponds.

Pond Management

The important management practices needed includes pond preparation, feeding, water quality measurement, prawn sampling and finally harvesting.

i) Pond preparation: The steps involved in pond preparation includes, eradication of predators and competitors, application of lime and application of fertilizers (organic and inorganic). Bleaching powder and urea @ 300 and 100 kg/ha respectively can be applied to kill all predatory species in the pond. For this first urea and after six hours bleaching powder has to be applied. Stocking of prawn seed can be done two weeks after eradication of pests and predators.

Lime is applied @200-600 kg/ha depending on the

Table 1: Different fish species combinations for poly-culture of freshwater prawn

Fish species	Three species Combination (per ha)	Four species Combination (per ha)	Six species Combination (per ha)
Catla	2000	2000	1000
Silver carp			1500
Rohu	3000	3000	2000
Grass carp			1000
Mrigal	2000	1000	750
Common carp		1000	750
Total	7000	7000	7000

Food and Feeding

Pellet diets containing 35% crude protein are preferred for feeding freshwater prawn (Gupta et al 2011). Feed should be spread evenly along the peripheral area of pond. Feeding should be done during late evening and early morning as per the daily

Table 2: Daily feed requirement of freshwater prawn

Prawn wt. (g)	%age of body wt. feed daily
<1	<20
2-5	15
5-10	10
10-30	5
>30	2

soil pH. The lime used should be agricultural lime (CaCO₃) or dolomite (CaMg CO₃). The lime should be spread over the whole pond bottom and up to the top of the dyke. Lime helps to correct the pH and disinfects the pond bottom (Gupta et al. 2007). Lime is also a source of calcium, which is very important for exoskeleton formation of prawns. Cow dung @ 500 kg/ha and urea @ 10-30 kg/ha and super phosphate @ 20-60 kg/ha may be applied to initiate a plankton bloom. After the initial fertilization water can be filled up to the desired level (4-5 feet).

Provision of Hide Out

It is desirable to provide hideouts and more surfaces for clinging. Cut branches of trees, nylon screen, earthen/ plastic pipes etc. can be used as hideouts.

Stocking

Prior to stocking the pond water quality should be tested and necessary correction should be made. Care should be taken to acclimatise the post larvae to the temperature of the pond by floating the transport bags in the ponds for 20 min. Early morning and late evening are considered ideal period for stocking the seed. For semi-intensive culture a stocking rate of 5-7/m² is desirable. In poly-culture stocking density of prawn is reduced to 50% i.e. @ 25000/ha and compatible carp species such catla, rohu, silver carp and grass carp are also stocked @7000/ha (Table 1).

feed requirement (Table 2). Monthly sampling should be done to know the average body weight of prawn to adjust the feed quantity.

Water Quality Management

Daily monitoring of critical water quality parameters such as dissolved oxygen, pH, and temperature is essential to prevent any loss of stock due to poor water quality. Dissolved oxygen should be monitored during early morning. On cloudy days and rainy days depletion of oxygen may occur during daytime also. Phytoplankton bloom and

decaying waste material are the main reasons for dissolved oxygen depletion usually seen in prawn ponds. When the oxygen level in pond water is critically low then oxygens come to the surface along the periphery of the pond. Immediate remedial actions such as water exchange or operation of pond aerators should be taken to avoid mortality of stock. Application of probiotics may be undertaken for water quality maintenance (Gupta et al. 2016).

Stock Monitoring

Growth of the animal is assessed by regular monthly sampling with cast nets or small mesh seine nets. The growth rate and survival of a population of prawn depends on many factors including density, predation, feed and temperature.

Health Management

Health management measures are given below:

- » Maintaining a good rearing practice, avoid high density stocking and over feeding
- » Provide hideouts to increase the total surface area of the pond and to reduce cannibalism
- » Pelleted feed with 35% protein content is must for better production
- » Regularly check feeding tray to ensure consumption of the feed
- » Drying out the ponds between production cycles so that the beds can be re-oxidized
- » Exchange water regularly which induces

moulting

- » Water quality should be tested to determine the DO; pH and ammonia levels and necessary corrections should be made
- » Periodic harvesting is always preferred to reduce the heterogeneous growth pattern
- » Protozoan parasites, bacteria and fungi cause diseases. Loss of appendages, brown or black coloration of the exoskeleton, etc. can be seen in disease affected prawns. They may not accept feed.
- » If disease symptoms are noted water should be replaced

Harvesting, Processing, Marketing and Economics

Growth of the animal is assessed by regular monthly sampling with cast nets or small mesh seine nets. The growth rate and survival of a population of prawn depends on many factors including density, predation, feed and temperature. Because of the heterogeneous growth pattern of freshwater prawn, individual weight is highly variable for prawns of the same age. Periodic harvesting is always preferred.

After four months bigger size prawns (>30g) can be removed by using a seine net of suitable mesh size. Selective harvesting should continue once every 3-4 weeks for another 3-4 months and finally the pond may be harvested by complete draining. An average survival of 60% can be expected from a properly prepared pond, stocked with quality seed, fed with quality feed and monitored regularly to maintain optimum water quality. The average

a) Economics of Monoculture of giant freshwater prawn

S. No	Item	Amount (in Rs.)
I.	Expenditure	
A.	Variable Cost	
1.	Pond lease value (area: 1 ha)	10,000
2.	Prawn seed @ 60,000/ha @Rs. 1000/1000 Nos. with transportation cost	60,000
3.	Fertilizers and lime	6,000
4.	Supplementary feed (pellet form @ 3 t/crop @ Rs. 30/kg)	90,000
5.	Wages (One @ Rs. 3000/month for 9 months)	27,000
6.	Electricity and fuel	3,000
7.	Harvesting charges	5,000
8.	Miscellaneous expenditure	3,000
	<i>Sub-Total</i>	2,04,000
B.	Total Cost	
1.	Variable cost	2,04,000
2.	Interest on variable cost (@ 15% per annum for 6 months)	15,300
	<i>Grand Total</i>	2,19,300
II.	Gross Income	
	Sale of big size prawn (@ Rs. 450/kg for 700 kg)	3,15,000
	Sale of small size prawn (@ Rs. 350/kg for 300 kg)	1,05,000
	<i>Grand Total</i>	4,20,000
III.	Net Income (Gross income - Total cost) (420000 - 219300)	2,00,700

b) Economics of Polyculture of giant freshwater prawn with carps

S. No.	Item	Amount (in Rs.)
I.	Expenditure	
A.	Variable Cost	
1.	Pond lease value (area: 1 ha)	10,000
2.	Fish seed [7000 no./ha (@Rs. 300/1000 nos.)] = Rs. 2100/- Prawn seed [25,000/ha (@Rs. 1000/1000 nos.)] = Rs. 25000/-	27,100
3.	Fertilizers and lime	6,000
4.	Supplementary feed (pellet form @ 3 t/crop @ Rs. 25/kg)	75,000
5.	Wages (One @ Rs. 3000/month for 10 months)	30,000
6.	Electricity and fuel	3,500
7.	Harvesting charges	5,000
8.	Miscellaneous expenditure	3,000
	<i>Sub-Total</i>	1,59,600
B.	Total Cost	
1.	Variable cost	1,59,600
2.	Interest on variable cost (@ 15% per annum for 10 months)	19,950
	<i>Grand Total</i>	1,79,550
II.	Gross Income	
	Sale of prawn (@ Rs. 350/kg for 500 kg)	1,75,000
	Sale of fish (@ Rs. 60/kg for 2500 kg)	1,50,000
	<i>Grand Total</i>	3,25,000
III.	Net Income (Gross income - Total cost) (325000 - 179550)	1,45,450

expected body weight of prawns after 6-7 months of culture is about 40-60 g. Yield may range from 1-1.5 tonnes/ha/6-7 months. Scampi has got excellent international market.

It is exported mainly to Europe as a luxury item served in elite restaurants. The tail weight percentage is less (about 50%) than that for marine shrimp. This is also lesser for males than that for females, and also decreases with prawn size. Also there is a high rate (5%) of hanging meat. Dipping prawns in iced water ('kill chilling') prior to blanching at 65°C for 15-20 seconds, before icing and transport to market significantly improves quality. Beheading and intensive washing decreases initial microbial load and improves post storage quality.

The market rate for 1 kg of freshwater prawn is about Rs. 500-700, depending on number per kilogram. Lesser the number greater will be the cost.

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