



# Economic Considerations, Management and Marketing Strategies of Carp Polyculture System Under SSMH Technique for Improving Yield and Profitability

## KEYWORDS

Carp polyculture, SSMH technique, IMCs, economics, management, marketing, yield, profitability, CIFRI.

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**ABSTRACT** Indian aquaculture is mainly carp based where the three Indian major carps (IMC), viz. catla, rohu and mrigal are grown together under polyculture system. Single stocking multiple harvesting (SSMH) is a recent and emerging technique in freshwater aquaculture industry of India, with a huge future potential. Seven months (Oct to May) on-farm management, economics and marketing of 3 species IMC polyculture were supervised and carefully monitored in a rural fish farm of Arang district of Chhattisgarh. The standard "Single Stocking Multiple Harvesting (SSMH)" culture package developed by CIFRI was followed in the selected ponds. The realised economic, management and marketing considerations at farm level are discussed below which were adopted on hit and trial basis to successfully improve fish yield and profitability of the culture operation. The profit or net income from fish culture in a unit area (Y) is mainly affected by level of Production (Q), Cost of production and marketing (C), Price received (P). This relationship can be expressed by—  $(Y = Q.P - C)$ . Hence major means of increasing profits are increase in yield or production, reduction in cost and increase in sale price. Annual profit of Rs. 21250.00 was realised in each 0.30 ha pond with a return to variable cost of about 53.66%. Efficient marketing system may play an important role in maximizing the return. Cost of production of per kg fish came out to be around Rs. 32.53.

## 1. INTRODUCTION

The fisheries sector of India has been playing a vital role in the Indian economic development by virtue of its potential contribution to employment generation, income augmentation, addressing food and nutritional security concern and foreign earnings. This sector contributes 1.10% to the national GDP and 5.3% of the agricultural GDP. Besides providing livelihood security to more than 14 million people, the sector has been one of the major foreign exchange earners, with revenue reaching Rs. 10048 crore i.e.- 18% of the total agricultural export (ICAR, 2011). Therefore, the primary interest is now directed towards establishing viable industries for the purpose of domestic consumption, employment opportunities, income generation, export or a combination of these objectives. These development objectives can not be achieved if a minimum income and profitability are not attained by the producers (Srivastava and Ahmed, 2008). Indian aquaculture is mainly carp based where the three Indian major carps (IMC), viz. catla, rohu and mrigal are grown together under polyculture system or along with the three exotic carps, viz. silver carp, grass carp and common carp, as the six species composite fish culture systems (ICAR, 2011). These six species are selected considering their compatibility for habitat and food preference to utilize the entire ecological niches of the culture system. Catla and silver carp are surface feeders showing preference for zoo- and phytoplankton respectively. Mrigal and common carps are omnivorous bottom feeders. Rohu is a common feeder and grass carp shows preference for aquatic vegetation (Pillay and Kutty, 2005). Single stocking multiple harvesting (SSMH) is an emerging technique in freshwater aquaculture industry of India, with a huge future potential (Dutta and Tamuli, 2006).

## 2. MATERIALS AND METHODS

Seven months (October 2012 to May 2013) on-farm management, economics and marketing of 3 species IMC polyculture were supervised and carefully monitored in a rural fish farm of Arang district (21°12'03.95"N 81°58'39.65"E), Chhattisgarh. Four ponds of 0.3 ha area each and having 1.5-2.0 m depth, stocked with 3 species of IMCs were carefully managed and monitored from stocking till marketing. Data of financial transactions were maintained in a ledger book and

the management steps were noted in a log book. Marketing strategies were drafted based on the market experience. The standard "Single Stocking Multiple Harvesting (SSMH)" culture package developed by CIFRI (CIFRI, 2000) was followed in the selected ponds. The realised economic, management and marketing considerations at farm level are discussed below which were adopted on hit and trial basis to successfully improve fish yield and profitability of the culture operation at last.

## 3. RESULT AND DISCUSSION

The profit or net income from fish culture in a unit area (Y) is mainly affected by Production (Q), Cost of production and marketing (C), Price received (P). This relationship can be expressed by—  $(Y = Q.P - C)$ . Hence major means of increasing profits are increase in yield or production, reduction in cost and increase in sale price (Ahmed and Roy, 2009).

### 3.1. Means to increase fish production.

Increasing stocking density, survival rate and growth rate are the basic means of increasing production.

#### 3.1.1. Increasing stocking density

A fish pond can support only a certain quantity of fish because of its limited space and natural food. This limit has been called the "maximum standing crop". The stocking rate and hence maximum standing crop of a fish pond can be increased by the following ways. The same concept has been agreed upon by Varghese and Sharma (2009).

##### 3.1.1.1. Fertilization

Recommended doses of fertilizers should be applied @257 kg Urea/ha; 220 kg Single super phosphate/ha and 11200 kg Cow dung/ha, totally. 30% of the total dose should be applied initially during pond preparation and the rest 70% of the total dose should be provided in seven equal monthly splits. Besides, monthly liming @220 kg/ha is to be done in the culture ponds.

##### 3.1.1.2. Supplementary feeding

Recommended doses of feed should be applied @2% of the total weight of fish stocked initially, which can be increased to @3% of the total weight of fish in pond at later stages.

### 3.1.1.3. Stock manipulation

**Multiple size stocking:** The carrying capacity of a pond for different age group and size is considerably greater than its capacity for any age group and size alone. The single stocking and continuous harvesting method gives the farmer a constant income and a higher average price. Fingerlings of various sizes obtained from various sources were gradually stocked in the pond @5200 fingerlings/ha in 40:30:30 (catla: rohu: mrigal) percent ratio.

### 3.1.1.4. Aeration

It helps in increasing dissolved oxygen of water and hence fishes can be stocked at a higher stocking rate when aeration is provided to a pond.

## 3.2. Means to increase survival and growth rate

Survival and growth rate can be increased through the following ways, also given by Roy *et. al.* (2008).

### 3.2.1. Pond management

It involves correct stocking rate, right kind and amount of feed/ fertilizer, proper water quality, eradication of predatory and weed fishes, control of aquatic weeds, prevent disease and parasites.

### 3.2.2. Genetic improvement

It may involve selective breeding and hybridization.

## 3.3. Means to reduce the cost of fish production and marketing

Production and marketing cost can be minimized through the following ways. Similar management steps proved viable for Dutta and Tamuli (2006).

### 3.3.1. Reducing the cost of construction

It is possible through proper site selection, construction of comparatively larger pond. Larger the pond size the greater the efficiency of land and water utilization and lower the construction cost. Only required depth of pond should be maintained.

### 3.3.2. Reducing the cost of feed and fertilizer

Only required amount of feed and fertilizer should be supplied. Locally available feed or byproducts should be provided. Improvement in food conversion ratio should be prioritized. Use of domestic and farmyard manure can reduce the cost of feed and fertilizer instead of inorganic fertilizer. Adopting integrated fish farming can also prove beneficial.

### 3.3.3. Reducing the cost of seed

Good quality fish seed should be obtained at a reasonable price from known and reliable source. Government intervention can prevent monopoly operation by fish seed dealers as a means of providing certified and quality seed to the farmers at reasonable price.

### 3.3.4. Reducing the cost of labour

Efficient management and use of skilled labour should be done along with a multi tasking and practical work schedule. Two sets of labour can be hired in the farm viz. - permanent and temporary or contractual.

### 3.3.5. Reducing the cost of water

An adequate supply of good quality water in the vicinity of the farm should be assured. Gravity driven inlet canals can also be drawn into a common reservoir pond in the farm from where water can be circulated to culture ponds by small pumps.

### 3.3.6. Low interest rate

The risk and uncertainty involved in fish culture make the financial institutions more reluctant to sanction loan for which more interest rate may be charged which ultimately increase the cost of production. Introduction of insurance can reduce the risk.

Availability of credit at reasonable interest rate is a key element that determines the intensification and expansion of production.

## 3.3.7. Reducing marketing cost

Marketing cost include preservation, processing, storage, transportation, etc. Government support is necessary for improved transportation (e.g. insulated van), storage, ice plant, etc. Formation of co-operative societies or associations can reduce the cost.

## 3.4. Means to increase farm sale prices

In a competitive market, the price level is determined by the supply and demand for fish. The price received by farmers can be increased by following methods as agreed upon by Srivastava and Ahmed (2008).

### 3.4.1. Improvement in quality of fish

Fresh fish fetch more prices in the market. Low quality, spoilage and waste reduce the price. Fish quality can be improved by careful handling during harvesting, transportation and/or proper preservation.

### 3.4.2. Seasonality of demand

The price of fish is usually fluctuating seasonally as a result of variation in the demand and supply. The demand for and price of fish are usually high during the off fishing season and local social customs. This advantage may be taken.

### 3.4.3. Co-operative marketing

The small scale fish farmers are usually in a weak bargaining position and often received very low price. The situation may be improved through collective bargaining by fish farmers associations or co-operatives.

## 3.5. Marketing Management For Increasing Return From Fish Production

Both production and marketing technology are essential for reinforcing each other for the development of fisheries. If marketing technology fails to keep pace with the production technology, the former would tend to impede the growth of other. Due to adoption of more scientific technologies in fish production, increased labour use, increasing population trend, changing food habits, improving purchasing power; appropriate marketing technology and price policy assume crucial importance (Srivastava and Ahmed, 2008).

In the absence of an appropriate marketing technology, the producers failed to convert the production activities to profitable opportunities for which the scarce production resources in the nation have been under utilized or misused. Increase in fish production in the absence of proper marketing will not satisfy the interest of fish producers. Efficient marketing system may play an important role in maximizing the return.

Marketing of fish and fishery products is of great concern due to diversity of species, choice of consumers, perishability, seasonal changes in demand, ignorance regarding marketing among fish producers, etc. Therefore, market intermediaries enjoy a lions' share. Modern fish marketing aims to achieve consumer satisfaction and provide remunerative price to producers. In order to translate this concept it is necessary to understand the characteristics of fish consumer, their values and beliefs, their socio-economic characteristics, their purchasing behaviour, consumption pattern and their attitudes towards increasing consumption of fish as well as the fish production system (Ahmed and Roy, 2009).

For getting remunerative price fish farmers should know some characteristics of scientific fish marketing to protect the interest of producers and consumers. Some important features of modern fish marketing are mentioned below for benefit of the farmer.

- i. Fresh fish should be tried to sell after proper cleaning

(make free from dirt, mud, impurities, etc.).

- ii. Fishes should be sold after grading. Grading, standardization and separation leads to a better market price.
- iii. Fish farmers should plan their harvest in such a way that their produce should be marketed in high price (e.g. festivals, occasions, etc.).
- iv. Sound and sufficient cold storage facility and provision of refrigerated van.
- v. Introduction of co-operative fish marketing can reduce the possibility of cheating by middleman and transportation cost for small farmers.

### 3.6. Economic analysis

Economic analysis is essential to evaluate the viability of investment, determine efficiency of resource allocation, improve the existing management practices, and assess market potential. Economic analysis of semi intensive Indian major carp polyculture in each 0.30 ha area pond following the package of practice developed by CIFRI practiced in the farm is given below (Table 1):-

**Table 1: Economics of the culture operation (in each 0.30 ha pond)**

A. Fixed capital cost				
S. No.	Item	Actual cost (Rs)	Economic life (Yr.)	Annual Depreciation (Rs)
1.	Earth work for pond construction	100000.00	25	4000.00
2.	Interest on annual capital cost (10%)	—	—	400
Total : 4400.00				
B. Recurring expenditure				
S. No.	Item	Quantity	Rate (Rs)	Cost (Rs)
1.	Agricultural lime	602 kg	5.00	3010.00
2.	Cow dung	3360 kg	2.00	6720.00

3.	Urea	77 kg	5.00	385.00
4.	Single super phosphate	66 kg	5.00	330.00
5.	Fingerlings	1540 nos.	1.50	2310.00
6.	Supplementary feed:			
	Rice bran	570 kg	4.00	2280.00
	Mustard oilcake	570 kg	5.00	2850.00
	Vitamin, medicine, etc			500.00
7.	Labour cost	1 no.		12000.00
8.	Harvesting cost			1000.00
9.	Miscellaneous expenditure			615.00
Total : 32000.00				
	Interest (10% on total)			3200.00
Total recurring cost: 35200.00				

**C. Total annual investment = Rs. 4400.00 + Rs. 35200.00 = Rs. 39600.00**

**D. Annual return:** Fish (harvested) 1217 kg sold @ Rs. 50.00 per kg = **Rs. 60850.00**

**E. Annual profit = Rs. 60850 - Rs. 39600.00 = Rs. 21250.00**  
(in each 0.30 ha pond)

**F. Profit to turn over or return to variable cost = 53.66%**

**G. Cost of production per kg of fish = Rs. 32.53**

### Acknowledgement

I am deeply grateful and highly obliged to Mr. G. Chandrakar, assistant professor, department of entomology, college of agriculture, IGKV, Raipur (C.G.) for his full support, constant enthusiasm and encouragement to pursue this qualitative study in his fish farm. I owe my tribute to Prof. Dr. S.R. Gaur and Prof. Dr. M.S. Chari department of fisheries, IGKV for guiding me through this study along with their valuable intellectual inputs and evaluation.

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