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Original Article

Economics of Fish Production at Kalna and Its Adjacent Areas, Burdwan District, West Bengal, India

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Abstract

Culture of fish involves various processes like preparation and management of pond, liming, removal of weeds and weedivorous fish, nurturing the desirable species in a scientific manner and harvesting the fish. Profitability depends upon proper management of all the operations involved in the fish cultural activities. It also depends on factors like productivity, cost of production, and market price of the product. Minimization of cost and maximization of productivity help to improve the profitability. This paper highlights the production, productivity and profitability of fisheries in and around Burdwan based on the results of a primary survey conducted among the selected fishermen household units (Samudragarh (23°34'N and 88°32'E); Dhatrigram (23°27'N and 88°31'E) and Kalna (23°22'N and 88°34'E).

Keywords: Fish Culture; Production; Profitability Analysis; Burdwan; West Bengal; India.

Introduction

According to 2011 census, India's population increases 181 million people from 1.03 billion in 2001 to 1.21 billion in 2011. It is expected that India will become the most populous country in the world by 2030 overtaking China creating food scarcity and huge amount of unemployment. West Bengal is the fourth populous state in India after Uttar Pradesh, Maharashtra and Bihar. As per census 2011 estimates, the state has population of 9.13 crore accounting for 7.55 percent of India's population. Burdwan is a key district in West Bengal from the human resource growth perspective. As per 2011 census, the district has a population of around 77.24 lakhs, making it the third most populations in the state. The district has a relatively high proportion of urban population, accounting for 39.87 percent of total population. Burdwan's population density at 1100 persons per sq km is marginally higher than state average of 1029 persons per sq km. The adult gender ratio in the district has increased from 922 females per 1000 males in 2001 to 943 females per 1000 males in 2011. Around 33.40 percent of total district population comprised of reserved categories. Burdwan has a literacy rate of 77.15 percent (Ramsundar, 2011).

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Plant proteins are deficient in certain essential amino acids notably methionine, tryptophan and lysine which are essential for healthy growth while, animal proteins are rich in these amino acids and are therefore described as first class or good quality protein (Adeniyi et al., 2012; Dalhatu and Ala, 2010). Fish is an important source of high quality protein, providing about 16% of the animal protein consumed by the world's population (FAO, 1997). Asides from being a source of protein for livestock, fish plays an important role medicinally as it replenishes the human body with vitamins A and D; calcium, phosphorus and lysine; sulphur and amino acids (Ohen & Abang, 2007). Fish allows for protein improved nutrition, in that it has a higher biological value in terms of high protein retention in the body

(Anthonio & Akinwumi, 1991), higher protein assimilation as compared to other protein sources, low cholesterol content and one of the safest sources of animal protein. World aquaculture output has increased substantially, from less than 1 m t of annual production in 1950 to 63.6 m t in 2011, increasing at three times the rate of world meat production (2.7% from poultry and livestock together) in the same period (FAO, 2012). About 68% of total population spends their livelihood from agriculture and per capita income is very low. Fisheries can play important role in this aspect. Realizing its importance during the fifth-five year plan the Government of India introduced beneficiary-oriented programme in the form of a pilot project entitled 'Fish Farmers Development Agency' (FFDA) to provide self employment, financial, technical and extension support to fish farming in rural areas. In 1974-75 this programme was further extended under World Bank Assisted, Inland fisheries project to cover about 200 districts of various states in India. The nutritional requirement is particularly crucial in a developing country like India where malnutrition and starvation are the major problems faced by millions of rural dwellers.

In India, about 14 million people are employed in fisheries sector either directly or indirectly (NCAP, 2008). It contributes about 1.5% to total GDP (Gross Domestic Product) and about 5.2% to the agricultural GDP. India witnessed an impressive growth in inland fisheries and the past ten years has witnessed both horizontal and vertical expansion, with total inland fish production increasing from 2.84 mt in 2000– 01 to 4.86 mt in 2009-10, an increase of over 70% (Indiastat, 2011).

Fish is one of the most favorite food items of Bengali. Out of the total net area under effective pisciculture 1, 43,336.66 ha in West Bengal, the district Burdwan covers 23,313 ha net area under effective pisciculture (Table 1). Pisciculture is a key allied activity in the district with a workforce of over 1.4 lakhs involved in these activities. Large number of tanks and ponds are stocked every year with fry and fingerlings not following scientific methods. Use of scientific methods in fish culture and proper management of fish culture activities offer immense scope for improvement the productivity and profitability.

Fish production depends upon various factors, such as pond preparation, control of weeds, control of predator, liming, proper stocking, monitoring of physicochemical parameters, use of manure, supplementary feeding, netting, stock manipulation, harvesting. The following factors are considered at the time of selecting ponds for cultivation: suitable shape of the pond, assured supply of adequate quantity of water, quality of soil and water of the pond, road connection for transportation of fish, pond location must be free from social problems such as poaching, malicious damage etc.

This paper highlights the production, productivity and profitability of fisheries based on the results of a primary survey conducted among the selected fishermen household units (Samudragarh (23°34'N and 88°32'E); Dhatrigram (23°27'N and 88°31'E) and Kalna (23°22'N and 88°34'E) in the district Burdwan.

Table 1: Pisciculture Scenario

State/ District	Net Area Available (ha.)	Net area under effective pisciculture (ha.)	Number of people employed
West Bengal[s]	5,93,512.4	1,43,336.66	21,63,062
Burdwan[d]	31,181	23,313	1,43,950

Materials and Methods

Primary data have been collected through administering questionnaires among 240 selected fishermen household units of 12 villages (20 units from each village). However, analysis has been made according to analysis method adapted by Dandapat and Islam, 2009; considering 200 questionnaires as 40 questionnaires have been rejected due to incomplete responses. We also collected the data of fish collected by fishermen.

Data were collected for a period of two years (2013-2014 & 2014-2015). Collected data have been tabulated and analyzed using simple statistical analysis t test.

Results

During the period of survey, we have noticed six species of cultivable carps namely Major carps (Rohu-*Labeo rohita*, Catla- *Catla catla*, Mrigel- *Cirrhinus mrigala*), Exotic Carp (Grass carp-*Ctenopharyngodon idella*, Silver Carp- *Hypophtahlmichthys molitrix*, Common Carp-*Cyprinus carpio*). Besides this we also noticed varieties of fishes out of which most dominant

and prevalent fish species are *Puntius ticto* and *Channa punctatus* which are of economic importance and high protein content.

At the time of survey we have also noticed that in composite fish culture stocking density were maintained (Table 2).

Profitability Analysis

Culture of fishes involves important cost elements:

i. Annual Non- Recurring Costs (Rent of Ponds, Cost of preparation and maintenance of pond).

ii. Recurring costs (cost of weed clearance, fish eradication, labor cost, cost of organic/inorganic manure, cost of seeds of fishes/ fry, cost of harvesting, cost of netting (insect removal), transport cost

iii. Other costs such as depreciation on loan, interest on loan etc.

Also Profitability Depends on Three Stages of Fish Production

i. Raising of fry from Nursery Pond

ii. Raising of fingerling from Rearing Pond

iii. Raising of Table Size Fish From culture

The fishermen were interviewed to know their cost structure relating to above three stages of fish culture. The figures have been derived on the basis of their responses, because most of the fishermen usually do not maintain systematic account. Information on sale price has been obtained from wholesale market and average price has been taken into consideration. The

Table 2: Stocking density observed in composite fish culture

Species of fish	% composition
Major Carps	
Rohu	25
Catla	10
Mrigel	10
Exotic Carps	
Grass Carp	10
Silver Carp	25
Common Carp	20

Table 3: Profitability of Raising Fry from Nursery Pond

A. Annual Non-Recurring Cost	Annual Cost (Rs.)
Annual Rent of pond (1 bigha/0.133 hectare)	12000
Pond Preparation and maintenance	5000
Total	**17000**
B. Recurring Cost	
Labour charges	7000
Weed clearance	1000
Insect Removal (netting)	750
Organic manure	2000
Cost of fish seed (4 lakhs pieces)	8000
Transport	2500
Cost of feed	5000
Harvesting	4000
Depreciation of net	500
Total	**30,750**
Total cost (A+B)	**47,750**
C. Income	
Income from sale of 200000 fry at Rs. 450/- per 1000 pieces [Expected Fry Production at an average rate of survival of 50% of 4 lakhs pieces]	90,000
D. Net Profit [C-(A+B)]	**42,250**

Table 4: Profitability of Raising Fingerling from Rearing Pond

A. Annual Non-Recurring Cost	Annual Cost (Rs.)
Annual Rent of pond (1 bigha/0.133 hectare)	14,000
Pond Preparation and maintenance	6000
Total	**20,000**

B. Recurring Cost	
Labour charges	9000
Weed clearance	1200
Insect Removal (netting)	1000
Organic manure	2400
Cost of fry (15000 pieces)	10000
Transport	2500
Cost of feed	8000
Harvesting	5000
Depreciation of net and contingency	500
Total	**39,600**
Total cost (A+B)	**59,600**
C. Income	
Income from sale of 10500 fry at Rs. 9,000/- per 1000 pieces [Expected Fry Production at an average rate of survival of 70% of 15000 pieces]	94,500
D. Net Profit [C-(A+B)]	**34,900**

Table 5: Profitability of Raising of Table size fish from Composite Culture Pond

A. Annual Non-Recurring Cost	**Annual Cost (Rs.)**
Annual Rent of pond (1 bigha/0.133 hectare)	14,000
Pond Preparation and maintenance (MOC + Earth filling)	7,000
Total	**21,000**
B. Recurring Cost	
Labour charges	9000
Organic manure	2500
Cost of fingerling (1500 pieces)	22500
Transport	2500
Cost of supplementary feeding	5000
Harvesting	5000
Depreciation of handi and contingency	600
Total	**47,100**
Total cost (A+B)	**68,100**
C. Income	
Income from sale of 450 kg fish at Rs. 250/- per kg [Expected Fish Production at an average rate of survival of 90% of 1500 pieces and an average size of 2 kg]	1,12,500
D. Net Profit [C-(A+B)]	**44,400**

Table 6: Total Income, Expenditure and Savings of Fishermen Household units

	Rs
Net Profit per bigha from Nursery pond (Table 3)	42,250
Net Profit per bigha from Rearing pond (Table 4)	34,900
Net Profit per bigha from Composite Culture pond (Table 5)	44,400
Total Profit from three bigha	**1,21,550**
Average Income per household unit Per Annum (on the basis of average pond holding of three bigha)	1,21,550
Average household expenditure (8000/- per month × 12 months= 96000)	96,000
Savings per household unit per annum	**25,550**

cost structure and profitability of three different stages of production have been shown in Table 3, 4 and 5. Total Income, Expenditure and Savings of Fishermen Household units is presented in Table 6.

From the survey of 200 fishermen household units, it has been found that average pond holding per household unit is three bigha and average household expenditure Rs 8000/- p.m. Therefore, the average surplus per household unit is only Rs 25,550/- p.a. and Rs 2129.17/- p.m.

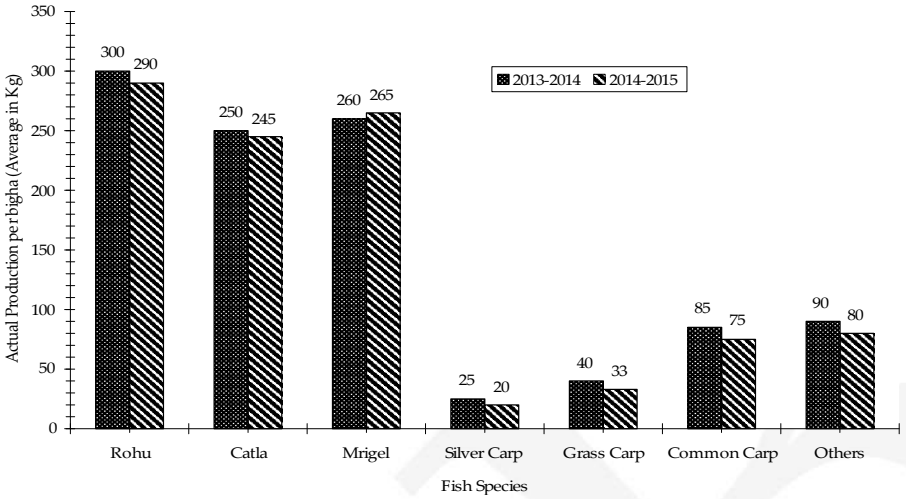

Fig. 1: Average production of fish

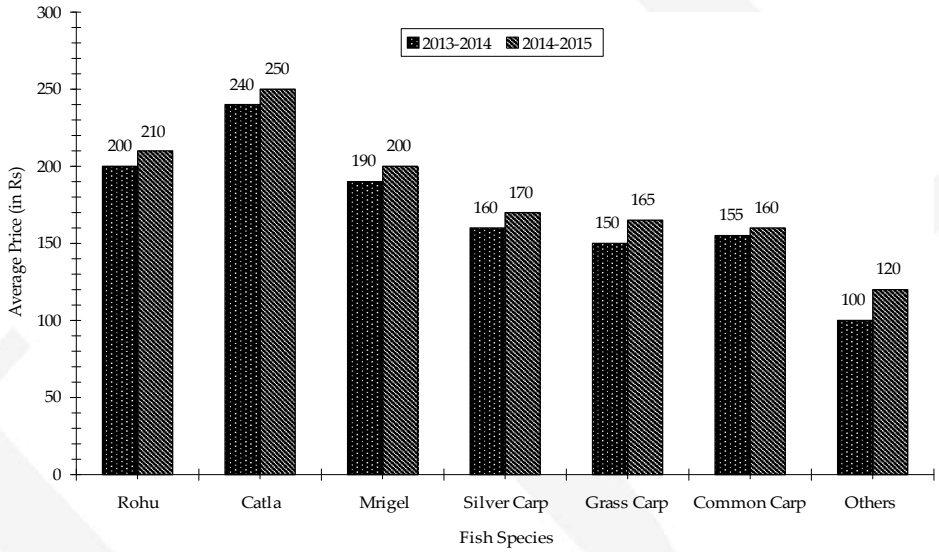

Fig. 2: Average annual selling price of fish (Rs. per Kg)

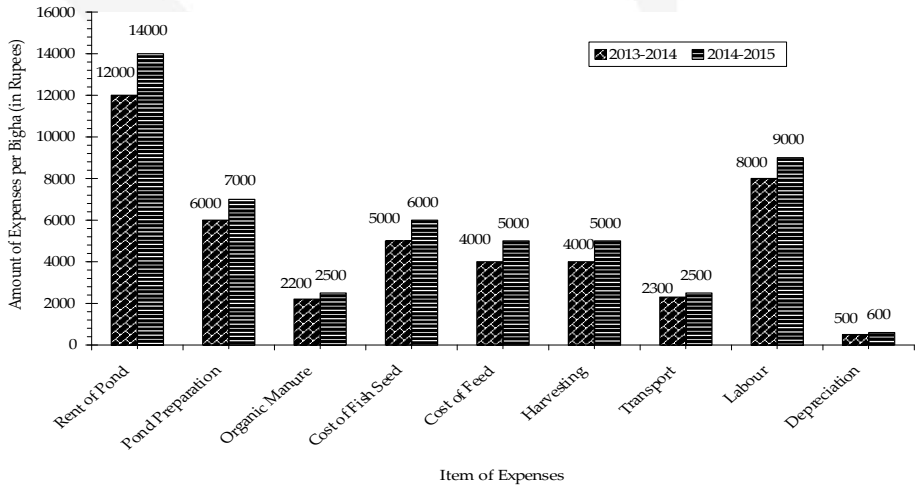

Fig. 3: Average Expenditure for Fish Cultivation

Statistical Analysis

In order to analyze the survey results and to examine relationship, if any, among average production of fish, average selling price and average expenditure of fish cultivation data were collected.

Student t test has been applied to find out the relationship among average production of fish (Figure 1), average selling price of fish (Figure 2) and average expenditure of fish cultivation (Figure 3).

Hypothesis:

H_0: There is no significant difference between:

i. The average production between two years

ii. The average selling price of fish for two years

iii. The average expenditure of fish cultivation for two years

H_A: Difference is Significant in the above Cases

In case of average production of fish, the calculated value of t (2.965) is greater than the tabulated value (2.45) at 5% level of significance. Therefore, H_0 cannot be accepted. So it can be said that the average production of fish for two years have been significantly different.

In case of average selling price, the calculated t value (6.358) is greater than the tabulated value (2.45) at 5% level of significance. Therefore, H_0 cannot be accepted. So it can be said that the average selling price of fish for two years have been significantly different.

In case of average expenditure for fish cultivation the calculated value of t (4.343) is less than the tabulated value (2.31) at 5% level of significance. Therefore, H_0 in this case is accepted.

So, it can be said that the average expenditure of fish cultivation in two years have not been significantly different.

Discussions

A serious lacuna in the country is availability of economics of respective species culture data. For any business planning or growth analysis, current or the latest data is necessary and unfortunately an organized/authentic data assessment system does not exist. In addition, business planning and market assessment would not be effective on old data because of the rapidly changing aquaculture scenario. In the recent years, The Indian economy, inflation rate has been increased gradually and cost of ingredients and fertilizer are also increased. This intern affected the cost of production or profit in fish culture practices. But, we have very limited economic information is available for carp seed rearing and farming. Therefore, we have conducted the survey on economics of seed rearing and farming of carps with reference to basic input. This was done for economic efficiency with combination of technical and allocative efficiencies.

The monthly and annual income of fishermen household units is very poor. They have not adequate fund for fish cultivation and so they have to lend money from Mahajans, who lend them money at very high rate of interest. Higher rate of interest, and lower price for fish production bound the fishermen to commit suicide or to live in debt traps of Mahajans.

5. Suggestions to improve production, productivity and profitability of fisheries

1. A well coordinated and collective effort made to develop fish-cooperatives for all-around development of production of fish.
2. Water areas above one acre may be incorporated under control of cooperative society.
3. Scientific techniques must be adapted in order to increase production.
4. Regional Offices of different National Institutes of Fisheries should be set up.
5. Fishermen must be encouraged to establish aqua club that may facilitate developing awareness about fisheries.
6. Knowledge about different fish disease is necessary to farmers.
7. Proper storage and processing facilities is must.
8. Fish farming in the area is dominated by males; females should be encouraged to participate in fish farming as a means of augmenting their income.
9. Unemployed youths in the study area should be trained in fish farming production methods and given loans to engage in fish farming business which is a very profitable enterprise in the area with high rate of return per capital invested.

Conclusions

Based on the results of these experiments, it can be concluded that though the fish seed rearing and farming is profitable, the margins are very narrow. Since the input costs and labor costs are increasing significantly, one must know the availability resources, capital and the projected profit before starting of the fish farming activity.

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