Key Factors Influencing Annual Income from Commercial Fish Farming and Efficiency of Different Fish Marketing Channels of Assam: Insight from Biswanath District

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Abstract **- Since the time immemorial the human evolution has been witnessed to take place at the closest proximity of the water sources, to fulfil their basic needs of water and food. With time this reliance on the water resources has paved the way to use them as the way to earn means of support for the humans in addition to the fulfilment of the basic needs of food. Fishes have gained its status as the most important source of human nutrients. Sea and river fishes are the major food source of the ever increasing human population of the world. Various earlier works have already established the fact that with the right techniques and vision, fish farming can turn into a very noble and profitable venture. Being blessed with tropical climatic condition fishing seems to be one of the age-old practices in the state of Assam. Despite of the huge potentiality in fish farming with available ample water resources, the contribution of fishery sector to the State Gross Domestic Product (SGDP) of Assam is still very nominal. This present work is an effort to get some deeper insight about the fish farming activity in the newly created Biswanath district of Assam, with the objective to pinpoint different factors effecting the outcome, measured in terms income earned, of some selected commercial fish farming units of the study area. In addition to this a detailed analysis of efficiency level of various marketing and distribution channels of these fish farming units is also tried to investigate.**

Keyword: **fish farming, net income, cost, profitable venture, marketing and distribution channels.**

I. INTRODUCTION

Owing to the rapid population growth accompanied by a large numbers of malnourished people all over the globe, especially in developing countries like India, meeting the demand for food commodities becomes a major worldwide matter of concern among the policy makers. The same holds goods in Assam also. In such a dismal situation regarding job market of the state, a handful of people from the population has come forward and invested their time and energy in what is known as fish farming. Of late fish farming has become a desirable job among many of the educated unemployed youths and of Assam, due to its wide range of possibilities. With the right techniques and vision, fish farming can turn into a very noble and profitable venture (Goswami, 2001).

Fish farming includes the practice of both fisheries and hatcheries. Fisheries refer to the rearing, raising and harvesting of fish in tanks, ponds or any other artificial water enclosures for commercial purpose. On the other hand hatchery is the practice for artificial breeding, hatching and rearing of fish spawns. These fish spawns are later raised and harvested in fishery tanks or ponds.

Being blessed with tropical climatic condition fishing seems to be one of the commonest practices in Assam from time immemorial. However with the changing consumption pattern, emerging market forces and technological developments, fishery sector of the state is undergoing a transformation. The modern fish farming now becomes a culture practice in artificial water bodies like ponds or tanks rather than the capture practice from natural water bodies like rivers or *beels*. This shifting pattern in fish farming also opens up a new window of opportunity to build a robust platform for entrepreneurship development which is yet to be popularised among the rural youths (Das, 2006).

Contrasting to the heavy potential, the available data on fishery of the state does not reflect an upbeat picture for us. The contribution of fishery sector to the State Gross Domestic Product (SGDP) is very nominal and it is around 3.0 percent. Despite of having vast water resources suitable for fish farming in Assam, with an area of 4.77 lakh hectares, the fish production is showing a sluggish growth. In 1991-92 total fish production was estimated to be 130,000 tonnes from all the sources while domestic demand was 234,000 tonnes. Though the figure is increased to around 2.94 lakh Metric Tonnes in 2015-16, which was 4.0 percent higher than 2014-15, it is still insufficient to meet the domestic demand which currently stands for 3.36 lakh metric tonnes (Economic Survey of Assam, 2016-17). This demand-supply gape is partially bridged by importing fish from outside states of India, in most of the cases from Andhra Pradesh. Here poses another prospect regarding profitable fish farming of domestic/local fishes.

Newly announced Biswanath district, which was until 2015 an integral part of undivided Sonitpur district, is of a great historical relevance. It is situated between the giant Brahmaputra and high hills of Arunachal Pradesh and consists of two sub-divisions, namely Biswnath and Gohpur. This region is an ideal basin for fish farming due to abundance of water bodies, both natural and man- made, all along the district. In fact Biswanath is the sixteenth highest fish producing district in Assam whereas Nagaon occupies the top position (Department of Fishery, Assam, 2015-16). Suitable geographic condition and a readymade market are fostering the fish farming practice in the district and many youths, regardless of caste and creed, are engaged in various fish farming activities as a fully-fledged profession.

In spite of possessing such stupendous potential regarding fishery culture, a systematic study is yet to be conducted in this region. Moreover though a few studies has been conducted upon various aspects of fish farming in Assam, analysis of various factors affecting annual income from fish farming seems to be very meagre. This paper tries to investigate different factors affecting annual income earned from fish farming of the study area. Further a detailed analysis of efficiency level of various marketing and distribution channels of produced fish is also put into the study.

II. REVIEW OF LITERATURE

2.1Variable Cost and Firm's Profitability

Production of anything involves cost, which is the amount spent during the production process. Total cost of production is primarily divided into fixed cost and variable cost. Fixed costs are those which are incurred even if no production takes place. The firm has to bear a certain amount of expenditure even when it does not produce a single unit of output. On other hand variable costs are those which keep on changing with the varying level of production (Koutsoyiannis, 1979).

The shape of the average variable cost curve is U-shaped. It is so happens because during the initial stage of production the firms experiences increasing return to scale and therefore cost of per unit of output tends to decline and achieve a minimum point. Or in other words during the very begging of production the productivity of the inputs remains on very high note, which pulls down the per unit cost of production. Once this minimum limit is reached, the input productivity starts falling and the firm will confront diminishing return to scale, which will raise the cost of producing per unit of output and the average variable cost curve will be upward one (Salavator, 2003).

A diagrammatic representation of various average cost curves will show that the shape of the average cost curve is also U-shaped like the average variable cost curve. However the average cost curve reaches its minimum point slightly after than that of the average variable cost curve. It is due to the fact that average cost also consists of average fixed cost, which keeps on falling with every increase in production and ultimately forms a rectangular hyperbola (Ahuja, 2016).

2.2 Cost and Fish Farming

Cost of production is the most important factor understanding the profitability of an aquaculture enterprise. The profitability of fish culture basically depends on cost of production and market price of the produce along with the yield. Higher profitability can be achieved by better biological and technological management of the ponds (Rao, 1996).

The size, shape and depth of the pond and the clearing work required also affect the cost of construction. Generally larger the pond size greater the efficiency of land and water utilisation and lower the construction cost. On the other hand smaller the size of the pond greater the convenience of pond management and lower the earth work maintenance (Tang, 1979).

Goswami (2001) found various elements of fixed cost and variable cost regarding fish farming. According to him fixed cost includes expenditure made on purchase of land and construction of fish ponds, interest on fixed capital, depreciation on machinery and insurance amount paid to the insurance agencies. On the other hand variable cost consist of expenditure made on labour, fertiliser, lime, electricity, marketing expenses, repairing of the fish tanks, spawn, etc.

2.3 Aspect of Fish Marketing

The importance of aquaculture in rural development is situational. The feasibility of aquaculture development efforts depends on local marketing condition and marketability, which in turn depends on consumers' preference and social attributes. Unless the fish can be marketed at a reasonable price farmers are unlikely to invest in fish farming.

According to Kulkarni and Srivastav (1985) the marketing systems for fish are explained in terms of use flows, physical flows, channel flows and fish farmers share in the ultimate price paid by the consumers.

Srivastav (1992) found that there are various intermediaries and fish flows take place through various combinations of intermediaries like pre-harvest contractor, contractor cum wholesaler cum retailer, co-operative society, commission agent, commission agent cum wholesaler, wholesaler, wholesaler cum retailer, worker cum retailer, worker cum vendor, retailer, etc.

In Indian fish markets, fishes are generally sold through the auction system. The producer or the fish farmers have to supply their marketed surplus to the auctioneers, who also perform the role wholesaler and commission agent. These auctioneers then open the auction for retailers. Those retailers who pay the highest bid price to the auctioneers can purchase the fishes and sell them to the customers (Rao, 1973).

The market efficiency of various marketing flows or channels depends primarily on the sale value and marketing cost of a

particular amount of fish. Higher the sale value more efficient will be the market flow or channel from the view point of seller (Smith, 1981).

2.4 Investment on Fixed Assets and Working Capital and Firm's Profitability

Uche (2012) conducted a study based on a sample four companies in the Nigerian brewery sector over an eleven year period from 1999 to 2009. The result of this study showed that the level of investment in fixed assets does not strongly and significantly impact on the level of reported profit of breweries in Nigeria.

Tajudeen (2014) had conducted the study on thirteen Commercial banks of Nigeria with the duration of 12 years (from the year 2000 to 2012) to examine the relationship between investment in fixed assets and banks' profitability. The result of this study had showed that investment in fixed assets has significant positive relationship to the performance of the sampled banks which implies that for every increase in net profit through years 2000 to 2012 resulted from an increase of 5.35% of investment in Building, 1.14% in information communication, 7.79% in machinery, 8.06% in leasehold, 6.07% in land and increase of 9.32% in fixture and fitting. The researchers had concluded that Investments in fixed assets have strong and statistical positive impact on the profitability of banking sector in Nigeria.

Industrial differences in profitability are not strongly related to industrial differences in the fixed capital ratios. The more profitable groups show a slight tendency toward having low ratios of fixed capital assets to sales, but no significant rank correlation is evident for the ratio of fixed capital to total assets. Such results are to be expected: A high turnover of fixed capital would be indicative of a relatively high level of profitability, other things being equal; on the other hand, there is little reason why profitable industries, compared with unprofitable groups, should have relatively smaller or larger investments in fixed than in current assets, despite the fact that they can afford larger investments in improved machinery and equipment. The reason for this is that the profitable industries also have larger investments in cash and marketable securities as well as in inventories and receivables, with the result that there is little difference between the fixed capital/total assets ratio among industries of varying profitability. When compared with sales, the fixed capital assets of most major industrial groups increase with size sharply and, on the whole, consistently (Chudson, 1937).

Dong at. el. (2012) tried to investigate whether fixed asset investments enhance (or damage) the performance of firms. The data used in this study were collected from the China Stock Market and Accounting Research Database (CSMAR), which is based on annual reports and employed by several recent researchers. The study sample consists of companies listed on the Shanghai and Shenzhen stock exchanges throughout the years 2003 to 2007. The result showed that a higher proportion of fixed asset investments is associated with a lower level of Jensen's alpha, which suggests that CRE (Corporate Real Estate) and other types of FAH (Fixed assets/total assets) may not enhance firm performance in the stock market after adjusting for risk.

Okelue (2012) revealed that the focal variable Ratio of Selling and General Administrative Expenses designed to capture the effect of a company's operating expenses on profitability is statistically positive and impacts on profitability of the brewery firms in Nigeria. Cost of sale is the major variable that has significant positive relationship with the profitability of the brewery firms in Nigeria. Cost of sale is therefore an important factor to be considered in enhancing or boosting the performance of Breweries in Nigeria. It is therefore necessary that the internal components of cost of sale such as material cost, labour cost and factory overhead should be reduced to the barest minimum.

III. ANALYTICAL FRAMEWORK

3.1 Objectives of the Study

The present study is driven by the following two basic objectives.

1. To investigate the marginal impact of various factors like age, education, experience, land holding, fixed cost, variable cost and training facility on the annual income of the sample fish farmers of the study area.
2. To analysis the efficiency of various marketing channels exists in the fish market of the study area.

3.2 Materials and Methods

3.2.1 Coverage

The present study is strictly confined to the newly announced Biswanth district of Assam. Since fish farming is a major element of agri allied activities and fisheries are generally located in rural areas, the researchers are apparently interested in those rural areas of both Gohpur and Biswanath sub-division of the district where fish farming is thought to have genuine potential

3.2.2 Data Collection and Sampling Design

The study is an outcome of primary data collected from the sample fish farmers of both the subdivisions of Biswanath district. Bearing the fact in mind that there is no provision of registration of fisheries causing a unknown population of fish farmers, the researchers are prompted to follow the "snow ball sampling method" while interrogating the respondents. Time constraints and lack of adequate transport facilities in the rural areas where fish farming has heavy potential compelled the researchers to limit their sample fisheries only to twenty.

Point to be noticed that only privately owned commercial fisheriesare purposively selected and public or community controlled are omitted from the study.

3.2.3 Line of Analysis

The paper is a descriptive and analytical one.

For fulfilling the first objective we are using a "multiple linear regression model" with gross annual income of the fish farmers as dependent variable and age, education, experience, land holding, fixed cost, variable cost and training facility as independent variables. Coefficients of various explanatory variables are being used to explain the marginal effect each of these variables on annual income from fish farming.

In the study area two major market channels were observed.

1. Fish farmers→ auctioneer/commission agent→ Retailers→ Customers.
2. Fish farmers→ Customers.

To check market efficiency of each of these channels, we are going to use the following formula.

Marketing efficiency = (total sales value of the produce/ total marketing cost) – 1.

Higher the ratio, higher will be the marketing efficiency and vice versa.

Fixed cost is calculated by summing up the cost of purchasing land for fishery and cost of constructing fish tank. On the other hand variable cost is the aggregate of cost on spawn, feed, lime, fertilisers, repairing of the fish tanks, commission paid to the marketing agents or marketing cost, medicine and wages paid to labourers.

IV. FINDINGS OF THE STUDY

4.1 Factors Affecting Annual Income from Fish Farming

Productivity of a firm or revenue earned by a firm is determined by different factors. In case of fish farming gross annual income is influenced by various factors like age of the fish farmers, education of the fish farmers, experience of the fish farmers, fixed cost and variable cost incurred by the fish farmers, provision of training facility, etc. In this section we will try to analyse the marginal impact of these individual factors on annual income earned from fish farming.

There are various techniques available for studying the marginal impact of one independent or explanatory variable on the depending variable keeping the impact of other independent or explanatory variables remaining constant. The convenience issue prompted the researchers to use the "multiple regression model" to analyse the marginal impact of each of these variables on annual income of the sample fish farmers of the study area.

The estimated model:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \beta_6 X_{6i} + \partial D_i + U_i, \quad i = 1, 2, 3 \ldots n$$

Where

Dependent variable:

Y_i= Gross annual income from fish farming for the i^{th} fish farmer.

Independent variable:

X_{1i} = Age of the i^{th} fish farmer in years

X_{2i} = Education of the i^{th} fish farmer in terms of years of schooling.

X_{3i} = Experience in fish farming of the i^{th} fish farmer in terms of years.

X_{4i} = Land holding under fish farming of the i^{th} fish farmer in terms of bigha.

X_{5i} = Fixed cost incurred by the i^{th} fish farmer in terms of rupees.

X_{6i} = Variable cost incurred by the i^{th} fish farmer for the current year in terms of rupees.

D_i= Whether the i^{th} fish farmer is acquainted with any kind of training facility or not (Dummy variable)

1 = Yes.

0 = Otherwise.

$\mathbf{U_i}$ = Error term, where $U_i \sim N(0, \sigma^2)$.

Co-efficient:

β_0 = Intercept or constant term.

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ and ∂ are the co-efficient of various independent variables which examines the marginal impacts of these independent variables on the dependent variable.

It is important to note that among the explanatory variables age, education, experience, land holding, fixed cost and variable cost are ratio scale variable and training facility is the nominal variable, which is coded as dummy variable.

Estimation of the model:

During the procedure we have used software package STATA to estimate the regression model. After putting the sample data according to the above mentioned multiple regression model we have obtained the result as shown in the following table.

TABLE I: ESTIMATION OF THE MODEL

Dependent variable: Gross annual income from fish farming (in Rs.)		
Method: Ordinary Least Square		
Sample: 20		
Degree of freedom: 19		
	Estimated co-efficient	t-statistics
Constant	384.78**	2.40
Age (in years)	-11.88**	-2.96
Education (in years)	-3.37	-0.43
Experience (in years)	25.27**	2.30
Land holding (in acres)	-0.84	-0.23

Fixed cost (in Rs.)	0.37**	2.03
Variable cost (in Rs.)	0.99**	2.30
Training facility	57.33	1.09
R^2	0.8807	
F-Statistics	12.65	

*,** and *** *denotes significance level of 1%, 5% and 10% respectively.*

Explanation and interpretation of the results:

The results obtained from the above table have shown that among the explanatory factors experience, fixed cost and variable cost have positive effect on the gross annual income from fish farming, while the others have negative impact.

Moreover it is seen than among the explanatory variables age, experience, fixed cost and variable cost are significant at 5% significance level, which indicates that each of their coefficient is statistically different from zero. Therefore in case of age, experience, fixed cost and variable cost, we can reject the null hypothesis. On the other hand, variables like education, land holding and training facility are insignificant at all.

Various coefficients of the significant variables can be interpreted as follows.

Every increase in age in terms of years reduces the income by Rs. 11.88. Therefore we can say that young fish farmers are more capable of earning income than their elder counterparts. This may be due to existence of better ability to devote more time and effort in fish farming among the young fish farmers.

Experience is another important factor determining annual income earned from fish farming. It is seen that increase in experience by one year raises income by Rs. 25.27 every year. It is simply because of better management ability with more experience.

Every rupee increase in fixed cost, which is primarily incurred on purchasing land and constructing fish tanks, raises income by Rs. 0.37.

On the other hand every rupee increase in variable cost raises income nearly by exact one rupee. Therefore rate of increase in variable cost and annual income is the same.

4.2. Market Channels and their Efficiency

4.2.1Existence of Different Marketing Channels

Marketable surplus any final produce is distributed among the customers through various market/distribution channels. Some of the producers sell the produce with help of intermediaries while some others rely on the tactic of direct selling.

The researchers found two major market/distribution channels of produced fish in the study area. They are as follows:

1. Fish farmers→ auctioneer/commission agent→ Retailers→ Customers.
2. Fish farmers→ Customers.

It was found that fifteen out of the twenty sample fish farmers in the study area follow the first market channel, where fishes are first auctioned by the auctioneers/commission agents/wholesaler and then sold by the retailers, who purchase the fishes from the auction market at a stipulated bid price.

In this market channel the marketing cost incurred by the fish farmers is higher than the second channel as they have to pay a certain rate of commission to the auctioneer along with the transportation cost and the loading expenditure. Generally those fish farmers who usually harvest higher quantity of fish tend to adopt this marketing channel. The field survey reveals that the average sale value of fish of each fish farmer following this market channel is Rs. 4, 60, 667 and average marketing cost of the same is Rs. 18,500.

The remaining five sample fish farmers follow the second channel where the producers supply the products directly to the customers. Since no additional cost has to be borne by the fish farmers other than transportation cost and loading expenditure, the marketing cost is definitely less than that of the first channel. This channel is usually followed by those fishermen who harvest small amount of fish compared to those who follow the first marketing channel. The average sale value of fish of these farmers is Rs. 1, 84, 000 and average marketing cost of the same is Rs. 4,500.

4.2.2 Market Efficiency

Now marketing efficiency, from the producers' perspective, of both the market channels can be computed from the following formula.

Marketing efficiency = (total sales value of the produce/ total marketing cost) – 1

Using the above formula we found that the marketing efficiency of the first channel is 23.90 and that of the second channel is 39.89. Since a higher ratio indicated higher marketing efficiency, the second market in the study area is more efficient than the first one. This is bound to happen because if the producers sell their produce directly to the customers, they will receive the entire amount ultimate price paid by the customers, while if produce is sold through intermediaries, a certain portion of the ultimate price has to be paid to agents.

However that does not necessarily deny the relevance of the first marketing channel. Directing selling of fish is possible only when the marketable fish of small quantity. If the harvest is large and so the marketable surplus, fish farmers are left with no option other relying on the commission agents or wholesalers or auctioneers.

Different market channels, fish farmers following these market channels, sales value of their produced fish, their marketing cost and efficiency of these different market channels are demonstrated in the following table:

TABLE II: MARKET EFFICIENCY

Marketing channel	No. of sample fish farmers following the market channel	Total sales value of the market channel (in Rs.)	Total marketing cost of the market channel (in Rs.)	Market efficiency
1	15	4,60,667	18,500	23.90
2	5	1,84,000	4,500	39.89

V. CONCLUSION

Since service sector is confined to a very small fraction of the total work force, the menace of unemployment only seems to put the economy of Assam in to a deep ruination in near future. Therefore we must explore alternative sources of livelihood which are feasible according to our locally available resources. Since Assam is a state which heavily depends upon agriculture, we have enough scope in shaping the economy through various agri-allied activities as a source of income and employment generation.

It is the high time for the authorities to provide adequate physical and financial support to the youths who are willing to engage in fish farming as full scale profession. Provision of training facilities to the stakeholders should be the prime priority. Proper training enables the fish farmers to manage cost incurred during aqua culture more efficiently and an efficient management of cost will yield more return in turn.

Regarding fish marketing, such a business environment should be created that the fish farmers can handle marketing of their produce on their own, rather than depending on the intermediaries. It will help not only the fishery owners to achieve major part of the final price paid by the ultimate customers, but also the customers by supplying the produces at lower price.

As one of these agri-allied activities, entrepreneurial fish farming has its immense potentiality to stand at the forefront of the development process of the region. What we need is a positive attitude and well-designed plans equipped with up to date R&D facilities and government support regarding fishery practice.

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