



An Economic Study on Shrimp Production and Value Chain System in Khulna District of Bangladesh

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Authors' contributions

This work was carried out in collaboration among all authors. Author NIT designed the study, performed the statistical analysis and wrote the first and final draft of the manuscript. Author MSI wrote the protocol and managed the analyses of the study. Authors MAI, RS, SI and MNA managed the analyses of the study and literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Shrimp farming and related activities contribute significantly to the national economy of Bangladesh. Per hectare half yearly average yield of shrimp was 350 kg and its money value was Tk. 1, 07,900. Variable cost is 61.29% and fixed cost is 38.71% of the total cost (Tk. 92,190). Among the various variable cost items of shrimp production, maximum cost Tk. 20,000 was found on human labor which was about 35.40% and Tk. 14,770 was found on feed which was about 26.14% of the total variable cost. Again among the various fixed cost items of shrimp production, maximum cost (Tk. 24,375) was found on human labor which was about 68.30% of the total fixed cost. Net returns were estimated at Tk. 1, 49,710 and benefit-cost ratio of shrimp farming was 2.62 which indicates that shrimp production is profitable business for the shrimp farmers. The value chain system continues by the active involvement of farmer, faria, aratdar, bepari, retailer, consumers.

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1. INTRODUCTION

Shrimp is one of the most delicious and nutritious food in the world. The demand for shrimp is increasing day by day. In Bangladesh aquaculture sector has expanded rapidly all over the country [1]. More than about 15.6 million people of the country are directly and indirectly involved in this sector [2,3]. During the last three decades not only shrimp farming area but also production has tremendously increased. In the year 2015–16, total production of shrimp was 239798 tons from 275509 hectares of water bodies. A total of 75338 tons of fish were exported from Bangladesh in the year 2015–016 while shrimp was 40726 tons [4]. Only shrimp contribute 61% of total fish export earnings which was Tk.4283 million in 2014-2015 [5],[4].

There are two production zones for shrimp in Bangladesh, the southern region and the Chittagong region. The southern region contributes about 70% of the total shrimp production (55,513 mt) of Bangladesh [6]. The rest of the production is mostly concentrated in the coastal region in Chittagong and Cox's Bazaar. The total land under shrimp production in the southern region is estimated to be 183,000 ha. This is about 75% of the total land under shrimp and prawn production in the region [7]. Within the southern region, Satkhira, Bagerhat and Khulna are the major production hubs.

Economic value chain analysis describes the range of activities required to bring a product to the final consumer and, in the case of international products, the extent to which intermediaries/agents gain from participating in the chain [8].

A study conducted on new technologies for measuring profitability of shrimp farming and found that the farmers gained significantly higher net returns when practicing improved shrimp farming systems as compared to traditional farms. Successful shrimp farming depends on its good management and improved system at various culture practices. [9]

Bangladesh acquires a remarkable amount of foreign exchange every year by exporting shrimp. Due to increase in demand and high price of shrimp both in domestic and export market, Bangladesh has a great potentiality to gain huge foreign exchange by exporting shrimp.

Considering the importance shrimp production and distribution it was needed to study on shrimp production and marketing of shrimp farming. Thus, the present study was conducted to examine the Profitability of shrimp production, identify the marketing channels and value chain of shrimp farming and constraints of Shrimp Farming in Bangladesh.

2. METHODOLOGY

The study was conducted in Shibbari and Boyra at Paikgacha Upazila under Khulna district. Random sampling technique was followed for selecting sample. Total 60 shrimp farmers (small 20, medium 25 and large 15) and 30 intermediaries (10 Depot owners + 10 Aratder + 10 Retailer) were selected for the study.

The data and information were collected from the sample farmers from January to March, 2013 through direct interviews with the selected respondents using a structured survey questionnaire. For collecting the supplementary data the researcher visited the area several times. FGD was conducted to have detailed information from the stakeholders involved in value chain system of shrimp marketed.

Total return per farm represented the average price of the main product and it's by products. The net return (NR) analysis considered fixed costs (which include costs for land use, depreciation, etc). So net return per farm was calculated by deducting all costs (variable costs and fixed costs) from total return (i.e. $NR=TR-TC$). Here, TC means the cost incurred during this period either as to meet the increased cost of farming or living or to invest in other farm. For measuring the farm income, a simple mathematical expression of the relationship between the total return and total cost on the set of variable inputs can be presented as:

$$TR = P \cdot Q$$

Where,

TR = Total return measured in terms of Tk.; P = Prevailing market price measured in terms of Tk.; and Q = Quantity of product produced per farm; and the total cost was estimated as follows;

$$\text{Total cost (TC)} = \text{Total variable cost (TVC)} + \text{Total fixed cost (TFC)}$$

Marketing margin (MM), and marketing cost (MC) are usually used to estimate the profitability of intermediaries involved in fish marketing. Total marketing margin is the difference between the price received by the producer and the price paid by consumer. Marketing margin is the price for adding activities and functions performed by intermediaries [10].

$$\text{Marketing Margin (MM)} = \text{Sales price (SP)} - \text{Purchase price (PP)}$$

$$\text{Marketing profit (MP)} = \text{Marketing Margin (MM)} - \text{Marketing cost (MC)}$$

$$\text{Value addition} = \text{Selling price} - \text{purchase price}$$

3. RESULTS AND DISCUSSION

3.1 Cost and Returns of Shrimp Production

Shrimp production requires a large number of inputs like human labour, shrimp fry, manure, feeds, lime, fertilizer, land use/lease cost, construction of water supplying canal, guard shed and housing cost, electricity and interest on operating cost. Fixed costs included land use cost and interest on operating capital of shrimp production. It is observed that the total per hectare variable cost for shrimp farming was Tk. 56,500. Per hectare per half yearly average fixed cost for shrimp farming was Tk. 35,690.

From Table 1 variable cost is 61.29% and fixed cost is 38.71% of the total cost (Tk. 92,190). Among the various variable cost items of shrimp production, maximum cost Tk. 20,000 was found on human labor which was about 35.40 percent and Tk. 14,770 was found on feed which was about 26.14 percent of the total variable cost (Table 1). Again among the various fixed cost items of shrimp production, maximum cost (Tk. 24,375) was found on human labor which was about 68.30 percent of the total fixed cost.

3.2 Gross Returns

Gross return is the pecuniary value of total product. In the study areas, per hectare half yearly average yield of shrimp was 350 kg and its money value was Tk. 1, 07,900. Shrimp has a different grading system. Most

shrimp are graded on the basis of size (weight). Here grading is based on number of pieces forming one kg. For calculating easily three types of grading system was followed.

- In “A-grade”, 12-15 numbers of shrimp is required to make 1kg weight.
- In “B-grade”, 20-30 numbers of shrimp is required to make 1kg weight.
- In “C-grade”, 30⁺ numbers of shrimp is required to make 1kg weight.

Apart from this, few species of shrimps and fishes, as indicated above, were also grown in shrimp farms. They are known as fin fish included pershey, tilapia, vetki, horina, ruhi, tangra, chali. Per hectare average yield of fin fish was 250 kg and its money value was Tk. 37,500. Therefore, the gross return for half yearly shrimp farming was Tk. 2, 41,900 (Table 2).

3.3 Net Returns

To evaluate the profitability of shrimp production, net return analysis is an important aspect. Table 2 shows that net returns were estimated at Tk. 1, 49,710 which indicates that shrimp production is profitable business for the shrimp farmers.

3.4 Gross Margin

Gross margin was calculated by deducting total variable costs from gross return on account of the enterprise. Gross margin of shrimp were at Tk. 1, 85,400 which is shown in Table 3.

3.5 Benefit-cost Ratio (Undiscounted)

Benefit-cost ratio was calculated by dividing gross return by gross cost. It implies return per taka invested. It is evident from the study that the benefit-cost ratio of shrimp farming was 2.62 implying Tk. 2.62 would be earned by investing every Tk. 1.00 for shrimp production. So the shrimp production is profitable for farmers.

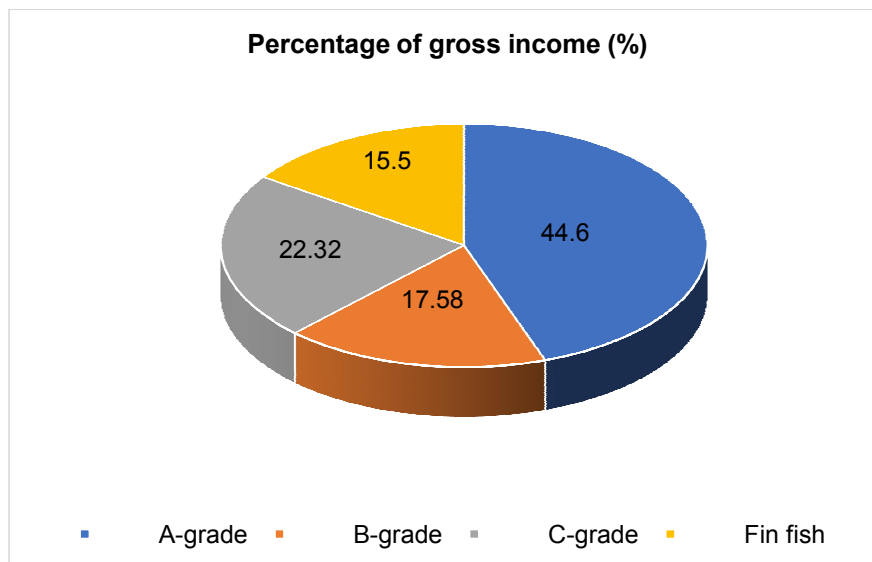
3.6 Involvement of Stakeholder in Shrimp Value Chain System

Shrimp industry plays an important role in value chain in Bangladesh. Shrimp is the second largest exporting industry followed by garment industry in Bangladesh. Various agents are involved in the shrimp industry from production to final consumption stage as well as the exporting

Table 1. Per hectare cost of shrimp farming

Cost items		Cost (Tk.)	Percent of total (%)
Variable cost	Human labor	20,000	35.40
	Shrimp fry	12,400	21.95
	Lime	1,350	2.39
	Urea	660	1.17
	TSP	1,890	3.35
	Manure (cowdung)	630	1.12
	Feed cost	14,770	26.14
	Medicine	1,000	1.76
	Cost of harvesting	1,800	3.18
	Miscellaneous cost	2,000	3.54
Total variable cost (TVC)		56,500	100
Fixed cost	Land use cost/ Lease value	24,375	68.30
	Construction of water supplying canal, guard shed and housing cost canal, guard shed and housing cost	2,950	8.27
	Canal digging and dyke reconstruction cost	1,650	4.62
	Interest on operating capital	6,215	17.41
	Miscellaneous	500	1.40
Total fixed costs (TFC)		35,690	100
Total cost (TVC+TFC)		92,190	

Source: Field survey, 2013

**Fig. 1. Percentage of gross income (%)**

of international markets. Domestic value chains for marketing involve four intermediaries (shrimp farmer, aratdar, retailers and consumer) for local market and five intermediaries (shrimp farmers, aratdar, paiker, retailer and consumers) for distant markets. The involved intermediaries are at most six, namely, shrimp farmer, aratdar, bepari, account holder, processing plant and

overseas consumer. The specific objectives of this chapter is to identify different intermediaries' involvement, marketing system, marketing channels and their roles in shrimp marketing, to Determine the extent of value addition in terms of relevant costs in successive stages; and to determine marketing margins and profitability of the cultured shrimp intermediaries.

3.7 Marketing System of Shrimp

such as buying and selling, transportation, grading, storing, weighing, financing, market information and pricing, value addition etc.

Table 3. Gross margin and gross return for shrimp farming

Items	Amount (Tk./ha)
Gross returns (GR)	2,41,900
Total variable costs (TVC)	56,500
Gross margin (GM)	1,85,400
Total fixed costs (TFC)	35,690
Total costs (TC)	92,190
Net returns (NR)	1,49,710
BCR (undiscounted)	2.62

Source: Field survey, 2013

3.8 Value Addition

Shrimp farmers sold 70% of their shrimp to farias and that of 30% to beparis via aratdars. On the other hand, farias purchased 100% shrimp from shrimp farmers and they sold 86% to depot owners via depot employees. Bepari purchased

In the study areas, the whole marketing of shrimp has been broken down into various functions entire shrimp (100%) from faria via aratdar and sold 57% to depots via depot employees, 21% of inter district aratdar agent via aratdar and rest 14% retailers. Usually the consumers purchased 100% of shrimp from the retailers in the study areas.

3.9 Marketing Channels of Cultured Shrimp

Flow Chart 1 show the distribution of shrimp produced in the study areas. Along with supplier, depot and processing plant owners and exporting agencies are involved and play key role in exporting shrimp.

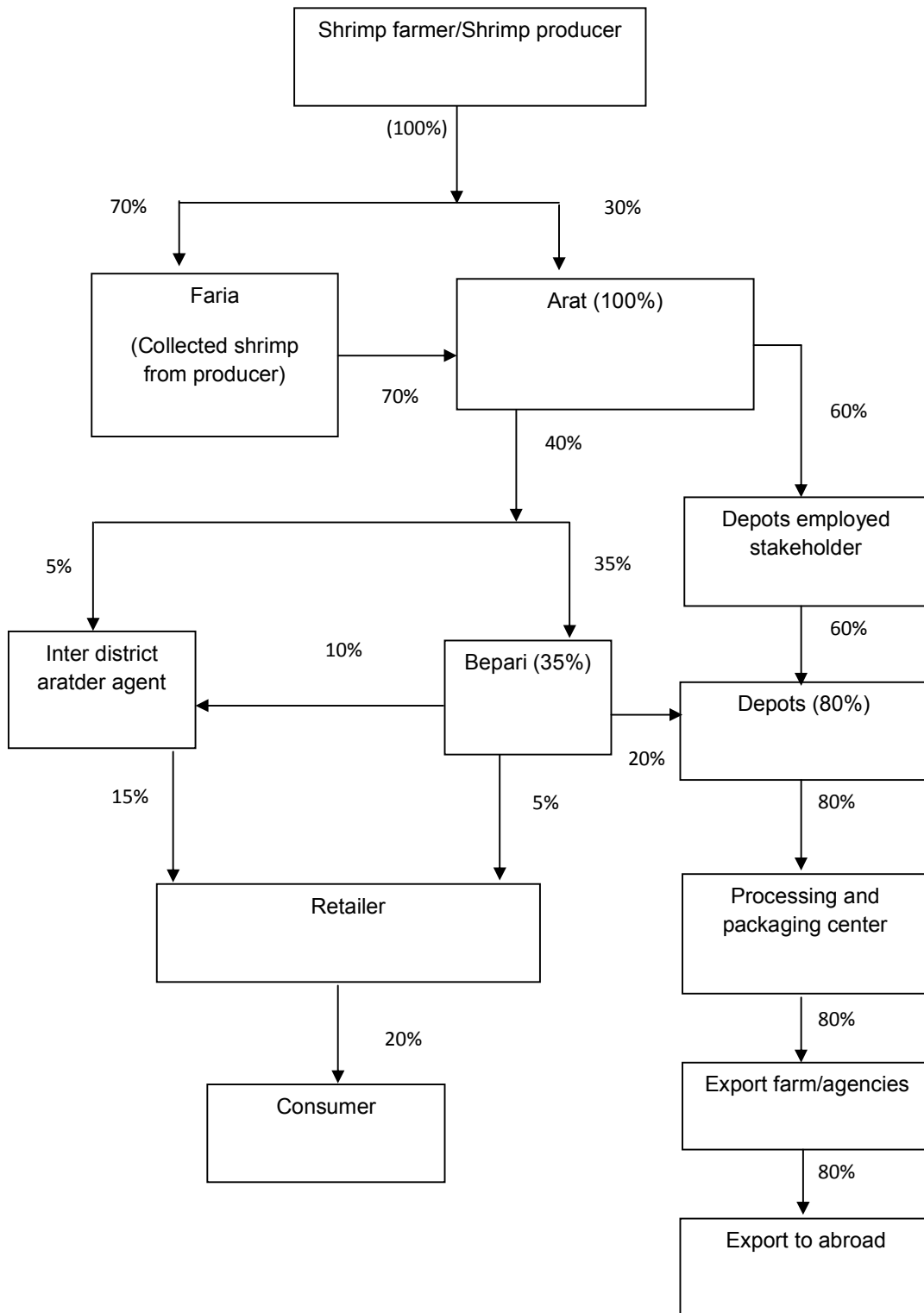
3.10 Marketing Margin and Profitability of Cultured Shrimp

Marketing margins as well as marketing profit both were relatively higher in consumer market followed by primary and secondary markets where beparies and aratdars are involved (Table 4).

Table 4. Marketing margin and profitability of shrimp in domestic market

Particulars of marketing	Captured shrimp (frozen) (Tk./Kg)	Captured shrimp (dry) (Tk./Kg)
Primary market		
Purchase price (PP)	180.83	285.69
Marketing cost (MC)	8.84	17.65
Sales price (SP)	202.53	319.97
Marketing margin (MM=SP-PP)	21.70	34.28
Marketing profit (MP=MM-MC)	12.86	16.63
Secondary market		
Purchase price(PP)	202.53	319.97
Marketing cost (MC)	9.97	11.09
Sales price (SP)	228.86	355.17
Marketing margin (MM=SP-PP)	26.33	35.20
Marketing profit (MP=MM-MC)	16.36	24.11
Consumer market		
Purchase price (PP)	228.86	355.17
Marketing cost (MC)	12.27	16.75
Sales price (SP)	256.33	401.34
Marketing margin (MM=SP-PP)	27.46	46.17
Marketing profit (MP=MM-MC)	15.19	29.42
Total marketing margin and profit		
Total marketing margin	75.49	115.65
Total marketing profit	44.41	70.16

Source: Field survey, 2013



Flow Chart 1. Marketing and value chain system of shrimp [11]

Table 5. Problems and constraints faced by shrimp farmers

Problem and constraints	No. of respondent (60)	Percent (%)
Natural problems		
Natural vulnerabilities	25	41.67
Virus attack	22	36.67
Technical problems		
Scarcity of shrimp's fry	40	66.67
High cost of shrimp food	48	80.00
Insufficient water in dry season	15	25.00
Lack of scientific knowledge	43	71.67
Lack of extension services	20	33.33
Economic problems		
Lack of institutional credit	37	61.67
Low price of outputs	48	80.00
Marketing problems		
Lack of marketing facilities	31	51.67
Fluctuation of market price	20	33.33
Lack of cold storage and processing facilities	25	41.67
Political problems		
Tips and donation	18	30.00
Social problems		
Lack of security	15	25.00

Source: Field survey, 2013

3.11 Problem and Constraints of Shrimp Farming

The problems and constraints faced by shrimp farmers were identified according to opinions given by them. There are number of reasons why cultivators are forced to give away or divert their cultivation of shrimp. The problems and constraints reported by the farmers were grouped in to different categories.

4. CONCLUSIONS

This study tried to find out the financial profitability of shrimp farming in coastal area of Bangladesh. Financial profitability was measured from different point of view. Benefit-cost ratio of shrimp farming was found 2.62 which indicates that shrimp production is profitable business for the shrimp farmers. A large numbers value chain activity involve in shrimp industry from production stage to consumption stage. When shrimp moves through value chains, every intermediary adds some extra costs with the purchase price as part of their involvement or profit. All agents of marketing channels gain more financial benefits than the producers of shrimp.

5. POLICY IMPLICATION

Scientific method of cultivation should be introduced in shrimp farming to increase the

production. Availability of shrimp's fry and inputs with suitable price, credit facilities should be ensured for the shrimp farmer's. Training and extension information on improved gher management system should be provided to the producers to cope with the climate change.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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