An economic study on shrimp production and value chain system in selected areas of Khulna district

Abstract:
Per hectare half yearly average yield of shrimp was 350 kg and its money value was Tk. 1, 07,900. Variable cost is 61.62% and fixed cost is 38.38% of the total cost (Tk. 91,690). 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 69.10 percent of the total fixed cost. Net returns were estimated at Tk. 1, 50,210.00 which indicates that shrimp production is profitable business for the shrimp farmers.
Keywords: Shrimp, profitability, Value chain

Introduction: Shrimp is one of the most delicious and nutritious food in the world. The demand for shrimp is increasing day by day. Fish and fish products account for about 4.91 percent of GDP and 5.71 percent of total export earnings. Bangladesh earned amounted Tk 4,703.95 crore by exporting fish and fisheries products during 2011-12 [1] of which frozen shrimp and other fish shared more than 80% of the total exports of the fishery products [1].

Fisheries sector earns huge foreign exchange by exporting frozen shrimp and other fish and fisheries products to the USA, UK, Japan, France, Hong Kong, Singapore, the Kingdom of Saudi Arabia, Sudan and other countries. Export assistance for frozen shrimp and other fishes has been enhanced from current level of 10% to 12.5% under the stimulus package declared recently [2].

About 75% of the world production of farmed shrimp comes from Asian countries; the two leading nations being China and Thailand closely followed by Vietnam, Indonesia, and India.

The other 25% are produced in the western hemisphere, where Latin American countries (Brazil, Ecuador, and Mexico) dominate. In terms of export, Thailand is by far the leading nation, with a market share of more than 30%, followed by China, Indonesia, and India, accounting each for about 10%. Other major export nations are Vietnam, Bangladesh, and Ecuador.

Shrimp farming has proved it is highly profitable business and providing substantial higher incomes for the farmers. The income from shrimp cultivation is five or six times higher than the income from other agricultural cultivation. Due to the high potential short-term economic benefits of shrimp farming and increased saline water intrusion in the field, many small-scale farmers have been encouraged to agriculture to aquaculture. There are apparent conflicts between subsistence agriculture and shrimp cultivation and conflicts over land rights and access to resources. More than 70% of shrimp are produced in Khulna, Satkhira and Bagerhat region and only 30% comes from Cox's Bazar and other regions. Present study will generate the baseline information on socio demographic profile of shrimp farmers, level of input use and its pricing, cost and returns, value chain analysis, involvement of stakeholder in value chain, consequences and problems associated with shrimp farming. The study was carried out to document the socio-demographic profile of shrimp farmer, examine the profitability of shrimp production, analyses the value chain and suggest policy recommendation to shrimp farming in Bangladesh.

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 + 10Aratder + 10 Retailer) were selected for the study.

Table: Study design and distribution of sample shrimp farmer

Categories of shrimp farmer (Based on size on holding)	**Distribution of farmer**		**Total**
	Shibbari	**Boyra**	
Small	10	10	20
Medium	15	10	25
Large	5	10	15
All farmer			60

Note: Small farmer holding size 1 ha (2.49 acre) of land, medium farmer holding size 1-3 ha (2.50- 7.49 acre) of land and large farmer holding size more than 3 ha (7.50^{+} acre) of land.

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.

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:

$$TR = P * Q$$

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;

$$TC = TVC + TFC$$

Where, TC = Total cost (Tk. /farm); TVC= Total variable cost (Tk. /farm); and TFC = Total fixed cost (Tk. /farm).

NR has been estimated as follows

$$NR = TR - TC$$

The returns were classified into gross return, net return and return on the basis of full cost and cash cost.

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 [3].

MM has been estimated as follows

$$MM = SP - PP$$

Where, MM = Marketing Margin (TK. /Kg); SP = Sales price (TK. /Kg); and PP = Purchase price (TK. /Kg).

MP has been estimated as follows

MP = MM- MC

Where, MP = Marketing profit (TK. /Kg); MM=Marketing Margin (TK. /Kg); and MC = Marketing cost (TK. /Kg).

Value add: Selling price – purchase price

RESULTS AND DISCUSSIONS

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. 35,190.

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	69.10
	Construction of water supplying canal, guard shed and housing cost canal, guard shed and housing cost	2,950	8.38
	Canal digging and dyke reconstruction cost	1,650	4.69
	Interest on operating capital	6,215	16.24
	Miscellaneous	500	1.42

Total fixed costs (TFC)	**35,190**	**100**
Total cost (TVC+TFC)	**91,690**	

Source: Field survey, 2013.

From Table 1 variable cost is 61.62% and fixed cost is 38.38% of the total cost (Tk. 91,690). 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 fxed cost items of shrimp production, maximum cost (Tk. 24,375) was found on human labor which was about 69.10 percent of the total fixed cost.

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).

Table 2: Per hectare financial return of half yearly shrimp farming

Items	Yield (kg/ha)	Price (Tk. /kg)	Gross income	Percentage of gross income (%)
Gross return				
shrimp				
A-grade	130	830	1,07,900	44.60
B-grade	85	500	42,500	17.58
C-grade	135	400	54,000	22.32
Fin fish	250	150	37,500	15.50
Gross return	-	-	**2,41,900**	**100**

Total cost (TVC+TFC)	-	-	91,690	-
Net return	-	-	**1,50,210**	-

Source: Field survey, 2013.

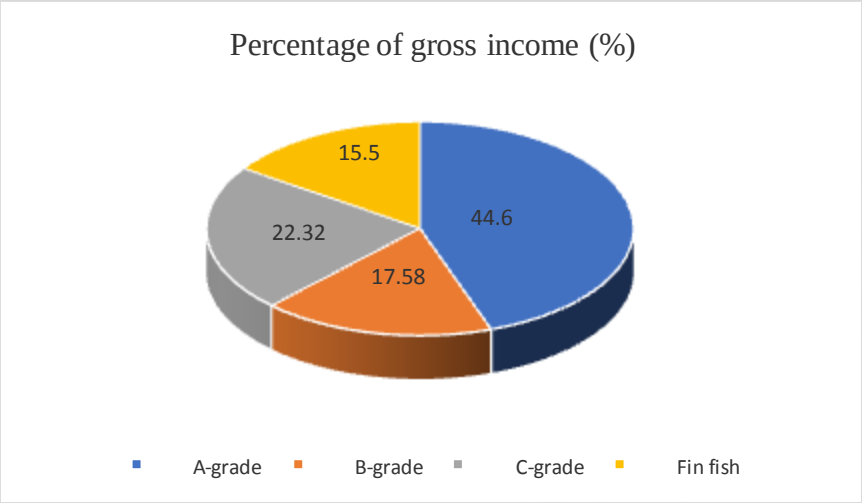


Fig : Percentage of gross income (%)

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, 50,210.00 which indicates that shrimp production is profitable business for the shrimp farmers.

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)	35,190
Total costs (TC)	91,690
Net returns (NR)	1,50,210
BCR (undiscounted)	1.61

Source: Field survey, 2013.

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.

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 1.61 implying Tk. 1.61 would be earned by investing every Tk. 1.00 for shrimp production. So the shrimp production is profitable for farmers.

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 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.

Marketing System of Shrimp: In the study areas, the whole marketing of shrimp has been broken down into various functions such as buying and selling, transportation, grading, storing, weighing, financing, market information and pricing, value addition etc.

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 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 (Table 4).

Table 4: Percent of culture shrimp transacted by value chain actors

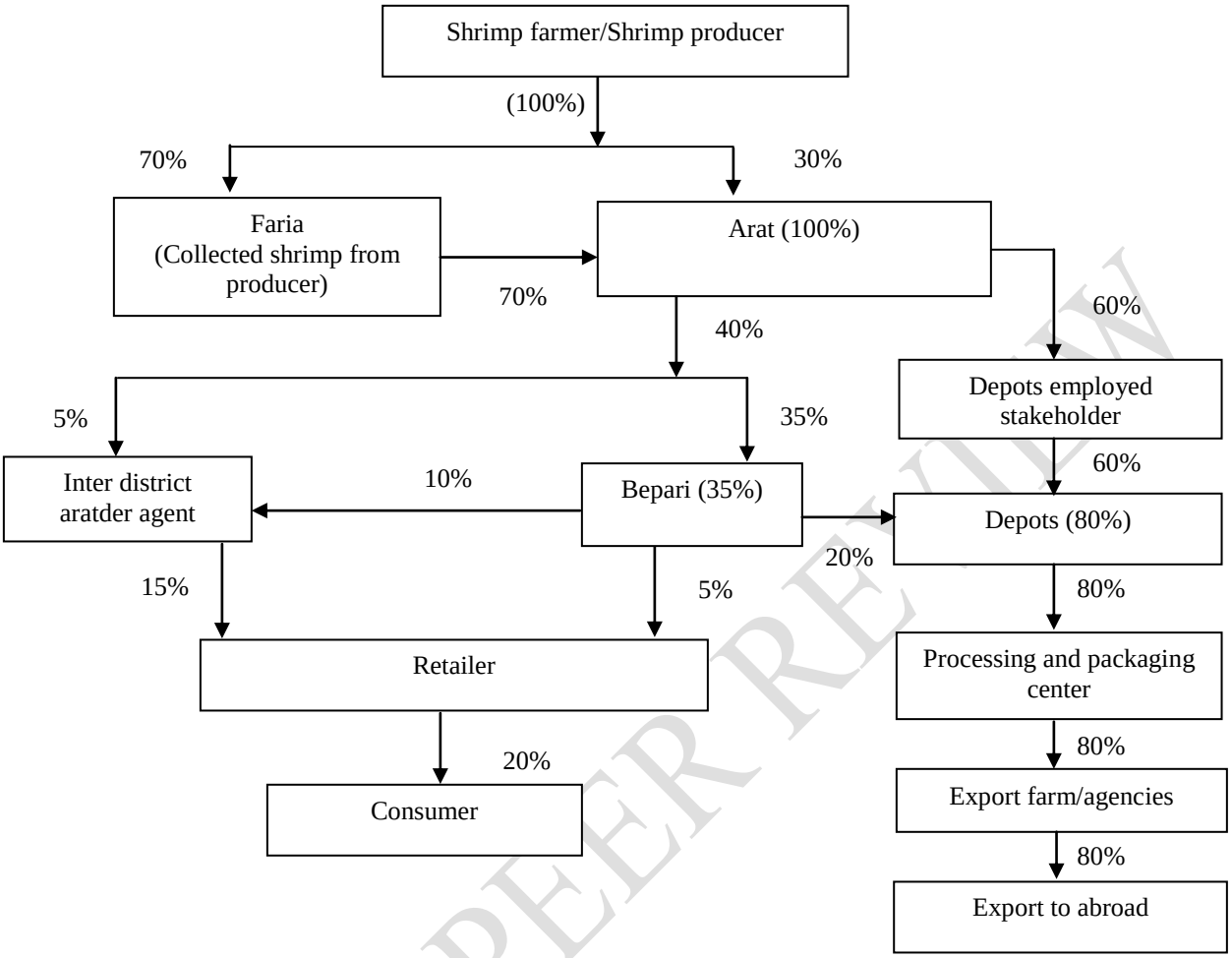
	Purchase from (%)	**Sold to (%)**

Value chain actor	Shrimp farmer (domestic market)	Faria via aratdar	Bepari via aratdar	Inter district aratdar agent	Depots owner	Retailer	Faria	Bepari via aratdar	Inter district aratdar agent via aratdar	Depots via Depot employee	Export farm/processing plant	Retailer	Consumer	Export to abroad
Shrimp farmer	-	-	-	-	-	-	70	30	-	-	-	-	-	-
Faria	100	-	-	-	-	-	-	7	7	86	-	-	-	-
Aratdar	**Aratdars negotiate between buyers and sellers of fish and help them at their own business premises on receipt of Aratdari commission.**													
Bepari	-	100	-	-	-	-	-	-	29	57	-	14	-	-
Inter district aratdar agent	-	33	67	-	-	-	-	-	-	-	-	100	-	-
Depots	-	75	25	-	-	-	-	-	-	-	100	-	-	-
Export farm	-	-	-	-	100	-	-	-	-	-	-	-	-	100
Retailer	-	-	-				-	-	-	-	-	-	100	-
Consumer	-	-	-	-		-		-	-	-	-	-	-	-

Source: Field survey, 2013.

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.



Flow Chart 1: Marketing and value chain system of shrimp

Shrimp Marketing and its Relevant Cost

In the present study, estimated cost per kg of shrimp for faria, aratder, beparies, inter-district aratdar agent and retailers was Tk. 5.07(13%), 1.91(5%), 10.17(27%), 8.19(22%) and 5.43(14%) respectively (Table 5).

Table 5: Total marketing cost of stakeholders and intermediaries involved in shrimp marketing (Tk. /Kg) in domestic market

Cost items	Shrimp farmer	Faria	Aratdar	Bepari	Int.-district aratdar agent	Retailer	Total	% of total
Transportation, loading and unloading	1.40	1.76	0.00	3.37	3.70	1.71	11.94	32.30
Baskets	0.28	0.14	0.06	1.13	0.00	0.45	2.04	5.53
Icing	0.00	0.00	0.00	1.41	0.00	0.89	2.30	6.21
Wage and salaries	0.00	0.18	0.63	0.19	0.43	0.00	1.43	3.88
Aratdar's commission	2.63	2.30	0.00	2.64	2.30	0.00	9.87	26.70
House rent	0.00	0.00	0.15	0.03	0.01	0.62	0.81	2.19
Security	0.00	0.00	0.01	0.00	0.00	0.06	0.06	0.17
Electricity	0.00	0.00	0.12	0.00	0.15	0.15	0.42	1.12
Telephone bill	0.12	0.11	0.14	0.17	0.09	0.34	0.97	2.63
Personal expenses	0.15	0.12	0.19	0.23	0.18	0.51	1.38	3.72
Tips and donation	0.14	0.21	0.12	0.18	0.19	0.15	0.99	2.67
Wastage	0.15	0.00	0.00	0.00	0.58	0.00	0.74	1.99
Others	1.33	0.25	0.50	0.82	0.56	0.56	4.02	10.88
Total	6.19 (16)	5.07 (13)	1.91 (5)	10.17 (27)	8.19 (22)	5.43 (14)	36.97 (100)	100.0

Source: Field survey, 2013.

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 6).

Table 6: 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.

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.

Table: 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.

Conclusion

Shrimp farming is highly profitable. If modern inputs and production technology can be made available to farmers in time, yield and production may be increased which can help the farmers to increase income and improve livelihood conditions. This sector has been geared to export oriented expansion which has resulted in huge export earnings at the national level and large number of employment generation in the coastal areas of Bangladesh. Shrimp industry plays an important role in value chain in Bangladesh. 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. Shrimp as an exportable item seems to have brought some improvement in the value chain. Since commercial shrimp farmers are relatively well-off farmers, they are not dependent much on others for credit, inputs, and farming and marketing decisions. And by virtue of their richness, they remain aware of the market price. Even though the farmers bear the all production risks, they did not get the profit like other agents of the marketing channels of shrimp industry of Bangladesh. All agents of marketing channels gain more financial benefits than the producers of shrimp.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

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