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ECONOMICS OF SILK PRODUCTION AS AN ALTERNATIVE SOURCE OF INCOME IN THE RURAL AREAS OF BOGRA DISTRICT

B B Siddiq[1], M Mannaf*[2], J U Ahmed[2] and M S Alamgir[3]

[1]Exim Bank, Mymensingh, Bangladesh
[2]Department of Agricultural Economics and Policy, Sylhet Agricultural University, Sylhet-3100, Bangladesh
[3]Department of Agricultural Finance and Banking, Sylhet Agricultural University, Sylhet-3100, Bangladesh

Abstract

The study was conducted to elucidate the profitability of silk production. Six adjacent villages of Dhunatupazila of Bogra District were selected purposively for this study. A total of 60 sample farmers were selected randomly of which 35 were small, 19 were medium and another 6 were large farmers. Both tabular and statistical techniques were used in the study. A large number of labourers were employed in the sericulture activities. Cocoon production per 100 Disease free laying (DFL) employed about 11 man-days for producing cocoon and 100 percent of the labourers were female. Gross return of small, medium and large group of farmers were calculated at Tk. 3712, 4537.5 and 5467, respectively per 100 DFL. Total costs of cocoon production for the same three categories of farmers were estimated Tk. 1831, 1972 and 2318, respectively per 100 DFL and their corresponding gross margins were Tk. 2781, 3555.5 and 4229, respectively per 100 DFL. Net returns of cocoon production were calculated at Tk. 1881, 2565.5 and 3145 for small, medium and large farmers, respectively per 100 DFL and the corresponding undiscounted Benefit Cost Ratio (BCR) came out to be 2.03, 2.30, and 2.35, respectively. Net return of all farmers was Tk. 2530.16 per 100 DFL and BCR was 2.31 which showed that cocoon production is profitable in the study areas.

Keywords: Silk production, livelihood, income generation, benefit cost analysis, and profitability.

Introduction

Since ages, silk and silk fabrics have attracted mankind and have found their place among the most valued and elegant human fabrics. Sericulture is both an art and science of raising silkworms for silk production. Sericulture, the art and science of growing silkworm, food plants, rearing silkworms and production of silk is basically an agro-industry. It is divided into two sectors namely farm and industry. The farm sector involves growing silkworm's food plants, rearing silkworm to produce cocoons and producing eggs. Reeling, twisting, dyeing, printing, finishing, knitting and felting form the industry sector (Chakravorty *et al.,* 2010). Sericulture provides gainful employment, economic development and improvement in the quality of life to the people in rural area (Chauhan, 2002) and therefore, it plays an important role in anti-poverty programme and prevents migration of rural people to urban area in search of employment. Hence developing nations like Bangladesh can take up sericulture to provide employment to the people in rural area.

Silk production is a very complicated process. Silk is made by silkworm (cocoon), the caterpillar of the flightless silk moth, whose only food is fresh mulberry leaf. Silkworms are hatched from eggs and end their existence by encasing themselves in cocoons from which they emerge as silk moths. The female moths then lay eggs to recommence the cycle. Silk yarn ('raw silk') is obtained by killing the silk pupae in their cocoons, boiling the cocoons to loosen the yarn, and then reeling off the yarn. The yarn is then treated in several ways for making it ready for use in the loom to produce silk textiles.

Silk is a natural protein fiber obtained from the cocoons of the silk moths, *Bombyx mori.* The silk worm species generally complete their life cycle within 30 - 35 days from mating of moths to reeling of silk cocoons (Banglapedia, 2011). The silk worms feed exclusively on the leaves of the different varieties of the mulberry plant

***Corresponding author:** **M Mannaf,** Department of Agricultural Economics and Policy, Faculty of Agricultural Economics and Business Studies, Sylhet Agricultural University, Sylhet-3100, Bangladesh. Email: maksuda_mannaf@yahoo.com*

(*Morusalba).* Therefore, mulberry production is an important part of silk worm rearing. The young silkworms are placed in bamboo trays and fed mulberry leaves through four growth stages. When the silkworms are ready to spin they must be placed on bundles of twigs or special bamboo trays to spin their cocoons. When they are fully spun they are boiled in water. The boiling water kills the worms inside the cocoons and makes it possible to unwind them. A number of cocoon filaments are drawn together and pulled from the cocoon. Then, the filaments are reeled and made ready for dyeing. Finally the weave must be prepared and the silk can be weaved into garments.

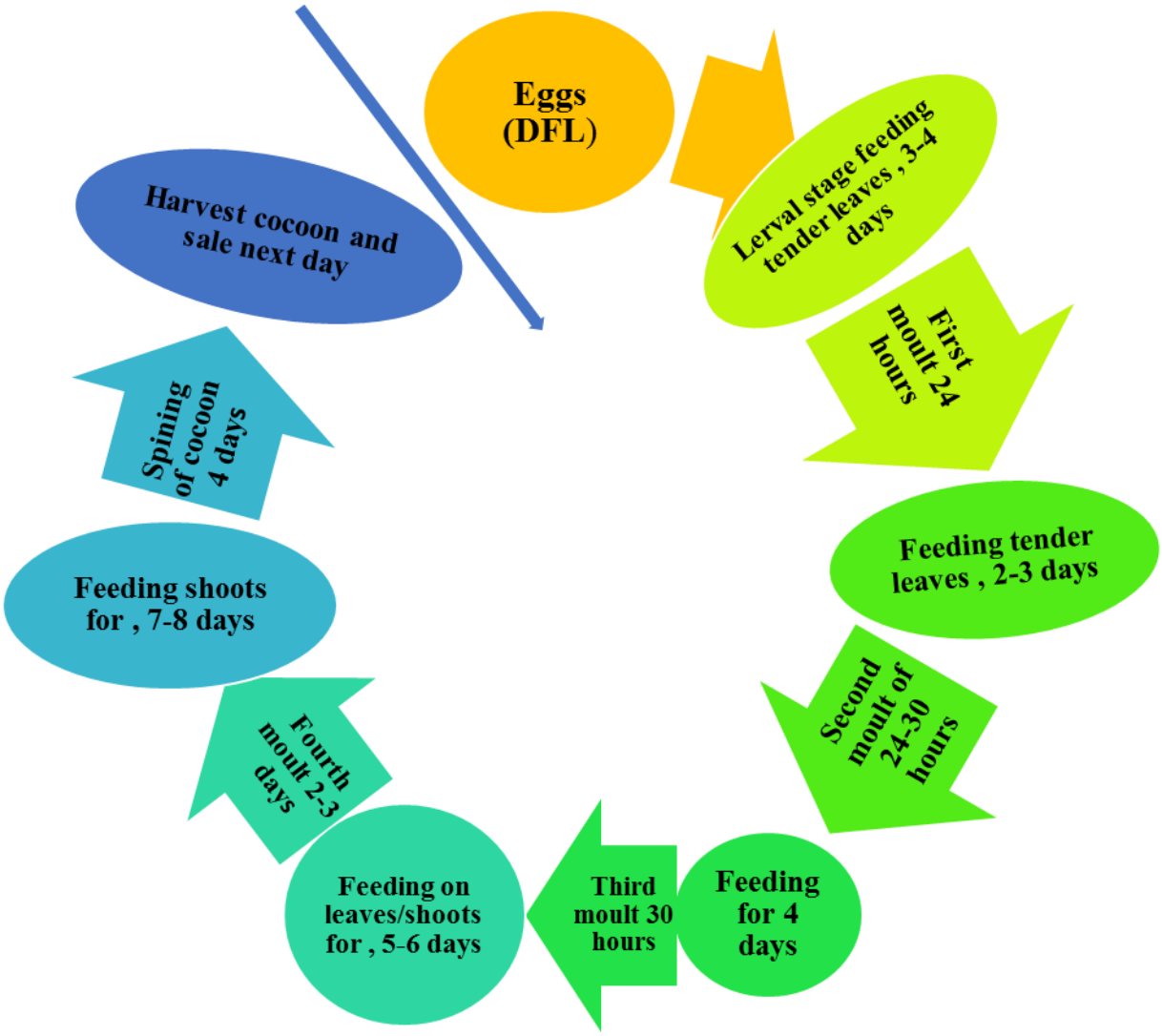

Fig. 1. Silk Worm (Cocoon) Rearing Cycle in Farm Sheds.

In Bangladesh, almost all silkworms are reared on large bamboo trays in village huts. Silkworm rearing is very labour intensive, especially towards the end of the season when thousands of silkworms are voracious. A silk season (bond) lasts up to 30 days, depending on the temperature.

In Bangladesh, there are four to five silk seasons a year (Khan, 2012). The major ones are *Chaitra* (spring), *Jaishtha* (summer), and *Agrahayon* (autumn). The dyeing, weaving and printing of silk is done in small rural workshops as well as in mechanized urban factories. The market for Bangladesh silk is largely domestic. The demand for silk far outstrips domestic supply, and silk textiles are imported, legally and illegally, mainly from India (Khan, 2012). Silk has long played an important role in the lifestyles of the Bengali upper classes men and women. For example, a silk *Sari* is more than a beautiful garment. It is a symbol of opulence, sophisticated taste, traditional femininity, and

cultural authenticity. Some people believe that the evocative expression *Shonar Bangla* (Golden Bengal) originated from the golden colour of the Bengal silk yarn.

Bangladesh has a long history in silk production because of its agro-climatic advantages, but this industry failed to realize its full potential because of Government's interventionist policies resulting in distorted production and marketing incentives in rearing and reeling activities which discouraged local private enterprise to modernize (Banglapedia, 2009). In 1857 the production of silk only in Rajshahi district was 186 tones. Subsequently the industry declined due to frequent epidemic of diseases, competition for land generated by increased price of food grains and failure to introduce new technology. On the eve of the partition of India in 1947, Bangladesh silk industry was on the verge of extinction, producing just 50 kg of silk from a few villages in Rajshahi district (Jones, 2009). After independence, the Government of Bangladesh together with a number of local and foreign non-government voluntary organizations tried to rehabilitate the silk industry which helped to increase production up to 32 tons in 1974. But domestic demand for raw silk is estimated at around 200 tones, which is mainly supplemented by importing of Chinese silk.

There is a possibility of earning foreign currency by exporting silk and silk goods. In our country, the larger portion of land is not properly utilized for want of proper maintenance. But at present situation most of these lands can be used by planting mulberry plants. Leaves can be harvested 4 - 5 times in a year. Plants may survive for 20 - 25 years. Waste products e.g. larval excreta, leaves reduce can be used as a farms manures. Besides these, killed pupae or larvae can be used as poultry feeds. Moreover, after death, the plants can be used as fuel, and excess leaves can be used as fodder (Faruk, 2005). So it can be said without any hesitation that sericulture plays an important, bright and significant role for the economic development.

However, different studies have been conducted on silk production such as: Mattigatti *et al*. (2000) studied the price spread in silk industry in India, Mosfiqur (2008) investigated the production and marketing of silk in selected areas of Bangladesh, Roy and Sain (2005) conducted cost benefit analysis of mulberry cultivation (up to cocoon production) in West Bengal, India, Faruk (2010) investigated the impact of sericulture marketing on income and employment generation and Mac Donald (2007) identified the opportunities, potentials and possibilities for promotion, production, processing and trading of raw and processed silk Mulberry/tasar in Madhya Pradesh, as a natural resource based rural livelihood enterprise. However, there are very few studies that may help to determine the potential of silk production to improve the socioeconomic conditions of farm households. To minimize the research gap, this study was designed to generate valuable information on socioeconomic aspects of farmers involved in raw silk production as an alternative source of income. Therefore, this research will highlight the advances of sericulture with the objectives of creating a changed perception on the economic returns from silk production, to make sericulture more vibrant and sustainable. The specific research objectives set for the study were as follows: i) To find out the socioeconomic conditions of the silk producing households; ii) To determine the cost structure and profitability of silk production, and iii) To identify the problems and constraints in silk production.

Materials and Methods

Although silk is produced in many districts of Bangladesh, Bogra district was selected for this study purposively. Keeping in view the objectives of the study as well as time and resource constraints and on the basis of higher concentration of silk production, Mathpara, Matikora, Ghukrapara, Hashkhali village under Dhunot upazila of Bogra district were purposively selected for the study. A total of 60 farmers were selected using stratified random sampling technique for data collection. Selected respondents were classified in small, medium and large according to their production size. However, the farmers who produced below 60 kg cocoon in a production period were considered as the small farmers, who produced 60 - 120 kg cocoon in a production period were considered as the medium farmers and who produced above 120 kg cocoon in a production period were considered as the large farmers. Table 1 shows the distribution of samples.

The data were collected from the silk producers through field survey. It may be noted here that production of silk possesses some cycle (silkworm rearing, reeling, drying, weaving, etc.) and all of these could not be considered in this study because of both time and resource constraints. Keeping this view in mind, only the cocoon production cycle is being considered in this study. Descriptive statistics (i.e., sum, average, percentages, ratios, etc.) were

employed to achieve the objectives. Profitability of silk production from the view point of individual farmers was measured in terms of gross return, gross margin, net return and benefit cost ratio.

Table1. Distribution of respondents according to village.

Name of village	No. of respondents				% of total
	Small farm	Medium farm	Large farm	Total	
Mathpara	6	5	1	12	20
Matikora	6	2	0	8	13.33
Shitolabil	3	1	2	6	10
Anarpur,	8	6	1	15	25
Ghukrapara,	8	2	0	10	16.67
Niktipota	4	3	2	9	15
Total	35	19	6	60	100

Gross return: Gross Return was calculated by multiplying the total volume of output of an enterprise by the average price in the harvesting period (Dillon and Hardaker, 1993). The following equation was used to calculate gross return-

$$GR_i = \sum_{i=1}^{n} QmiPmi + \sum_{i=1}^{n} QbiPbi$$

Where,

GR_i = Gross return from i^{th} Product (Tk. /100 DFL);
Q_{mi} = Quantity of the i^{th} product (kg/100 DFL);
P_{mi} = Average price of thei^{th} product (Tk. / kg);
Q_{bi}= Quantity of the $i^{th}$by-product (kg/100 DFL);
P_{bi}= Average price of the i^{th} by-product (Tk. / kg);
i = 1, 2, 3.....n (number of inputs)

Gross margin: Gross margin calculation was done to have an estimate of the difference between total return and variable costs. The following equation used to assess gross margin -

$$GM = TR - VC$$

Where,

GM = Gross Margin
TR = Total Return, and
VC = Variable Cost

Net return: Net return was calculated by deducting all costs (variable and fixed) from gross return. To determine the net return of silk production, the following equation was used in the present study

$$\Pi = \Sigma P_m Q_m - \Sigma (P_{xi} X_i) - TFC \text{ (Awal } et\ al.\text{, 2007)}$$

Where,

Π = Net return (Tk. /100 DFL);
P_m = Per unit price of produce (Tk. / kg);
Q_m = Quantity of the production per 100 DFL (kg);
P_{xi}= Per unit price of i^{th} inputs (Tk.);
X_i = Quantity of the i^{th} inputs per 100 DFL (kg);
TFC = Total fixed cost (Tk.);
i = 1, 2, 3,...,n (number of inputs).

Results and Discussion

Socioeconomic Attributes of the Silk Producers

Age of the cocoon producers: The age structure of the sample farmers was explained by classifying into four age groups: (i) up to 20.00 years, (ii) 20.01 - 30.00 years, (iii) 30.01 - 40.00 years, and (iv) above 40.00 years. Table 5.2

reveals the age distribution of the respondents. It showed that about 31.43 percent of small farmers, 31.58 percent of medium farmers and 16.67 percent of large farmers fell into up to 20.00 years of age group. About 40 percent of small farmers, 31.58 percent of medium farmers and no large farmer were between 20.01 - 30 years of age group. About 14.29 percent of small farmers, 21.05 percent of medium farmers and 50 percent of large farmer were between 30.01 - 40.00 years of age group. About 14.29 percent of small farmers, 15.79 percent of medium farmers and 33.33 percent large farmer were above 40 years of age group.

Table 2. Distribution of cocoon producers according to age limit.

Age category (Years)	Small		Medium		Large		Total	
	No.	%	No.	%	No.	%	No.	%
Up to 20.00	11	31.43	6	31.58	1	16.67	18	30
20.01-30.00	14	40	6	31.58	0	0	20	33.33
30.01-40.00	5	14.29	4	21.05	3	50	12	20
Above 40.00	5	14.29	3	15.79	2	33.33	10	16.67
Total	35	100	19	100	6	100	60	100

Family Composition:

Most of the rural families are joint families and hence family size was large compare to urban families. Family size was explained by classifying the families into three groups: small (1- 5), medium (6 - 8), and large families consisting of more than 8 members. About 31.43 percent of small farmers, 31.58 percent of medium farmers and no large farmer were under small family size. About 40, 31.58 and 16.67 percent of small, medium and large farmers were under medium family size, respectively. About 14.29 percent of small farmers, 21.05 percent of medium farmers and 50 percent of large farmer were under large family size. For all farm catagory 31.66 percent families of silk producers were small, 48.33 percent were medium and those of 20.00 percent were large families.

Table 3. Distributions of cocoon producers according to family size.

Categories according to family size	Small farm		Medium farm		Large farm		Total	
	No.	%	No.	%	No.	%	No.	%
Small family (1- 5)	11	31.43	6	31.58	0	0	19	31.66
Medium family (6 - 8)	14	40	6	31.58	1	16.67	29	48.33
Large family (above 8)	5	14.29	4	21.05	3	50	12	20.00
Total	35	100	19	100	6	100	60	100

Distribution of Cocoon producers according to experience

The Cocoon producers were classified in to four groups according to their year of experience of producing Cocoon i.e. (i) below 3 years, (ii) 3 to 8 years, (iii) 8 to 12 years and (iv) 12 years above. Cocoon producers in case of experience were found the highest of 38.33 percent in 5 - 10 years category. A few numbers of farmers found above 15 years' experience as estimated 6.67 percent in the study areas.

Table 4. Distribution of Cocoon producers according to experience.

Experience category (Years)	Small		Medium		Large		Total	
	No.	%	No.	%	No.	%	No.	%
Below 3	15	42.86	3	15.78	0	0	18	30
3 - 8	13	37.14	9	47.36	1	16.67	23	38.33
8 - 12	7	20.0	6	31.58	2	33.33	15	25
Above 12	0	0	1	5.26	3	50.00	4	6.67
Total	35	100	19	100	6	100	60	100

Educational status of cocoon producers: Education may be defined as the ability of an individual to read and write or formal education received. To examine the educational status of cocoon producers, the educational status of the sample farmers was divided into four categories. It can be seen from the Table that about 40, 26.32 and 16.67

percent of small, medium and large farmers were illiterate. About 45.71, 31.58 and 16.67 percent of small medium and large farmers were able to put signature. About 8.57, 21.05 and 50.00 percent of small medium and large farmers had primary level of education. About 5.75, 15.79 and 16.67 percent of small medium and large farmers were studied up to secondary level. Only 5.26 percent of medium farmers studied above the secondary level.

Table 5. Educational status of cocoon producers.

Level of education	Small		Medium		Large		Total	
	No	%	No	%	No	%	No	%
Illiterate	14	40	5	26.32	1	16.67	20	33.33
Ability to sign	16	45.71	6	31.58	1	16.67	23	38.33
Primary	3	8.57	4	21.05	3	50.00	10	16.67
Secondary	2	5.75	3	15.79	1	16.67	6	10
Above secondary	0	0	1	5.26	0	00	1	1.67
Total	35	100	19	100	6	100	60	100

Occupational status of cocoon producers: The work in which a man engaged more or less throughout the year is known as the occupation of that person. Selected farmers of the study areas were engaged in various occupations along with silk production. It was showed that agriculture was the main occupation of the cocoon producers. Some were also engaged in small trading and services. About 85.71, 57.89 and 50.00 percent of small, medium and large farmers were engaged in agriculture, respectively.

Table 6. Occupational status of cocoon producers.

Occupation	Small		Medium		Large		Total	
	No.	%	No.	%	No.	%	No.	%
Crop production	17	48.57	4	21.05	2	33.33	23	38.33
Vegetable production	6	17.14	3	15.79	1	16.67	10	16.67
Animal rearing	7	20.0	4	21.05	0	0	11	18.33
Small business	1	2.85	3	15.79	2	33.33	6	10
Job	0	0	2	10.53	1	16.67	3	5
Labor sale	4	11.42	3	15.79	0	0	7	11.67
Total	35	100	19	100	6	100	60	100

Cost structure and profitability of silk production: For agricultural production, cost of inputs is an important element. In subsistence farming, farmers' decision about production of crops is mainly influenced by their cost of inputs. Both home supplied and/or purchased inputs were used by the farmers in the study areas. Farmers had to pay cash for the purchased inputs like chondroki, dala, insecticides/pesticides etc. It was, in fact, very easy and straight forward to calculate the costs of these items. On the other hand, no cash payment was actually made for home supplied inputs. Family labour costs, for example, were estimated by applying the opportunity cost principle. Opportunity of an item is defined as an income, which an input is capable of earning in an alternative employment in or outside the farm (Ferdausi, 2011). The costs of home supplied inputs were estimated at the existing market price in the area during the study period or the prices at which the farmers bought the inputs. For the convenience of analysis, the costs items were classified into two categories: variable cost and fixed cost.

Costs of silk production

Variable costs: Variable costs are those costs which incurred for using the variable inputs in a particular production process. These costs, however, vary with the level of production. In silk production, various input costs like material cost, egg cost, insecticide cost normally regarded as variable expenses (Dillon and Hardaker, 1993), cost of Chondroki, cost of Dala and cost of other materials are also considered as variable costs.

Cost of Dala: Dala, a bamboo made tray, is used to feed the silkworm. Total costs of dala per 100 DFL for Cocoon production were estimated at Tk. 160, 200 and 240 for small medium and large farmers, respectively.

Table 7. Cost of dala per 100 dfl for producing cocoon.

Categories of farmers	Total quantity/100 DFL(No.)	Total cost (Tk./100 DFL)
Small farmers	4	160
Medium farmers	5	200
Large farmers	6	240
All farmers	5	200

Cost of chondroki: Chondrokis a special type of bamboo tray on which the cocoons are spun. In the study area, Chondroki cost per 100 DFL for small, medium and large farmers were Tk. 500, 500 and Tk. 700, respectively.

Table 8. Chondroki cost for producing cocoon (Per 100 DFL).

Categories of farmers	Total quantity/100 DFL (No.)	Total cost (Tk./100 DFL)
Small farmers	5	500
Medium farmers	5	500
Large farmers	7	700
All farmers	5.67	567

Other material cost: Other material cost was also an important cost item which included the cost of net, kerosene oil, polo powder, bleaching powder, dhup and egg purchasing. The kerosene oil cost per 100 DFL of producing Cocoon were Tk. 91, 98 and 104 for small, medium and large farmers, respectively. The polo powder costs per 100 DFL of producing Cocoon were Tk. 16, 18 and 20 for small, medium and large farmers, respectively. Cost of bleaching powder per 100 DFL of producing Cocoon were Tk. 18, 20 and 21 for small, medium and large farmers, respectively. Costs of dhup per 100 DFL of producing Cocoon were Tk. 30, 30 and 35 for small, medium and large farmers, respectively.

Table 9. Other material cost of producing cocoon.

Items	Small farmer	Medium farmers	Large farmers	All farmers
Net	16	16	18	18
Kerosene oil	91	98	104	97.67
Polo powder	16	18	20	18
Bleaching powder	18	20	21	19.67
Dhup	30	30	35	31.67
Egg	100	100	100	100

Fixed costs: Fixed costs are those costs which do not change in magnitude as the amount of output changes and are incurred even when production not undertaken. Fixed costs included land use costs, interest on operating capital, repairing and depreciation, costs of tools and equipment, etc. For the production of silk very small amount of costs were incurred for using tools and equipment as a result, these costs were ignored because calculation of depreciation for these equipment were difficult and complex. Thus, only the family labour cost was considered as fixed cost for silk production.

Cost of human labour: Human labour was the most important and largely used input for producing cocoon. There were two types of labour: family labour and hired labour. Family labour included the operator himself plus other male and female members of his family and hired labour included casually and/or the permanently hired labour. The cost of family labour was determined by applying principle of opportunity cost. The cost of hired labour was calculated as the actual wage paid by the farmer's without meal.

The labour was measured in man-day units, which usually consisted of 8 hours. Human labour, particularly owned female labours, was required for different operation like care for intercultural operation in leaf production, rearing of silk worm, insecticide application, harvesting and carrying, drying, storing, etc. In the study area, the average wage rate of silk producers' was Tk. 90 per man-day.

Table 10. Labour cost of producing cocoon per 100 DFL.

Categories of farmers	No of labour 100 DFL^{-1}	Total cost (Tk. 100 DFL^{-1})
Small farmers	10	900
Medium farmers	11	990
Large farmers	12	1080
All farmers	11	990

The use of human labour for producing silk was 10, 11 and 12 man-days of family labour for small, medium and large silk producers, respectively for 100 DFL. Their total costs were Tk. 900, 990 and 1080 for small, medium and large farmers, respectively per 100 DFL.

Gross return: Gross returns of cocoon production per 100 DFL were calculated by multiplying the total amount of produces by farm gate price. Per 100 DFL yields of cocoon were 32, 37.5 and 43 kg for small, medium and large group of farmers, respectively and their respective values were calculated at Tk. 3712, 4537.5 and 5467, respectively. The average yield of cocoon 100 DFL^{-1} was 37.5 kg and its respective value was calculated at Tk. 4572.17. It may be noted here that the price of Cocoon was reported to be Tk. 116, 121 and 127 kg^{-1} for small, medium and large group of farmers, respectively.

Gross margin: Gross margin is the gross cost over the variable cost. Gross margin is obtained by deducting total variable cost from gross return. Per 100 DFL gross margins were estimated at Tk. 2781, 3555.5 and 4229 for small, medium and farmers, respectively. However, average per 100 DFL gross margin of producing Cocoon was calculated at Tk. 3520.17 for all groups of farmers.

Table 11. Cost of Cocoon production per100 DFL.

Items of costs	Small farmers			Medium farmers			Large farmers		
	Total quantity/100 DFL	Per unit price (Tk.)	Costs (Tk./100 DFL)	Total quantity/100 DFL	Per unit price (Tk.)	Costs (Tk./100 DFL)	Total quantity/100 DFL	Per unit price (Tk.)	Costs (Tk./100 DFL)
A. Variable Costs									
Chondroki	5	100	500	5	100	500	7	100	700
Dala	4	40	160	5	40	200	6	40	240
Net			16			16			18
Pesticides									
Kerosene oil	1.75 kg	52 kg^{-1}	91	1.88 kg	52 kg^{-1}	98	2 kg	52 kg^{-1}	104
Polo powder	0.40 kg	40 kg^{-1}	16	0.45 kg	40 kg^{-1}	18	0.50 kg	40 kg^{-1}	20
Bleaching powder	0.60 kg	30 kg^{-1}	18	0.65 kg	30 kg^{-1}	20	0.70 kg	30 kg^{-1}	21
Dhup			30			30			35
Egg	100	1	100	100	1	100	100	1	100
Total variable cost	-	-	**931**	-	-	**982**	-	-	**1238**
B. Fixed Costs									
Family labour	10 Man-days	90/Man-day	900	11 Man-days	90/Man-day	990	12 Man-days	90/Man-day	1080
Total fixed cost			**900**			**990**			**1080**
C.Total Cost (A+B)			**1831**			**1972**			**2318**

Net return: Net returns per 100 DFL were calculated at Tk. 1881, 2565.5 and 3145, respectively, for small, medium and large farmers and its average net return per 100 DFL was Tk. 2530.16. The result presented in the table indicates that Cocoon is a profitable crop but there is a difference in profitability among different farm groups. It can be seen that the large farmers were making the highest amount of profit while the medium farmers were earning the lowest amount of profit from their Cocoon production.

Benefit cost ratio (Undiscounted): Benefit cost ratio (BCR) is a relative measure, which is used to compare benefit per unit of cost. In this study, BCR of Cocoon was calculated as a ratio of gross return and gross cost. Benefit cost ratio were estimated at 2.03, 2.30, and 2.35 for small, medium and large farmers, respectively. However, on an average per 100 DFL benefit cost ratio of producing Cocoon was calculated at 2.31 for all farmers.

Table 12. Per 100 DFL yield, gross return, gross margin, and net return and BCR of Cocoon production.

(Unit/100 DFL)

Particulars	Small farmers	Medium farmers	Large farmers	All farmers
Yield (kg)	32	37.5	43	37.5
Gross return (Tk.)	3712	4537.5	5467	4572.17
Total variable cost (Tk.)	931	982	1238	1052
Total Fixed cost (Tk.)	900	990	1080	990
Total cost (Tk.)	1831	1972	2318	2042
Gross margin (Tk.)	2781	3555.5	4229	3520.17
Net return (Tk.)	1881	2565.5	3149	2530.16
BCR (undiscounted)	2.03	2.30	2.35	2.24

Problems and constraints in silk production: The problems and constraints faced by the farmers were identified according to opinions given by them. For the sake of analytical convenience the problems and constraints were classified into three general groups:

a) Economic and technical problem

It was observed that farmers faced some economic and technical problems and constraints relating to the production of silk. Following are the major economic and technical problems faced by the farmers in cocoon production.

Problems in plantation: One of the basic supply constraints facing silk production in Bangladesh is the absence of HYV mulberry plants all over the country. Leaf productivity is nearly 5 percent higher for HYV plants compared to local variety. Leaf production is also adversely affected by improper practices, non-use of fertilizer, and lack of irrigation facilities. Labour use for plant maintenance has been found to be very low and pruning practice and fencing have been observed to be much less than the prescribed level. Irrigation is one of the critical missing inputs.

Problem in rearing: It is a very difficult process to rear the silk worms. This is because the worms are very sensitive to their environment e.g. high temperatures, moist, light and pollution. Apparently the use of pesticides by cocoon producers has been an increasingly important constraint for silk producers in the study area. Several producers reported that their rearing process had been disturbed by polluting pesticides from neighbors, either directly or through the mulberry leaves. Another huge problem in this process was that many of the worms die at the later stage of the rearing process. In fact the producers experienced that up to 60 % of the worms in a batch die. The reason for this high mortality rate of the worms is unknown for the producers. Furthermore, the rearing process depends on lot of equipment such as baskets for worms, net covering to avoid contamination from flies, etc. It showed that lack of equipment was a limitation for the production. In the study area rearers used low yielding local "*nistari"* variety of silkworm. It was observed that cocoon yield of this traditional variety is about 25 kg per 100 DFL while that of improved variety is about 40 - 50 kg.

Problem in processing of the yarn: The reeling process does not seem to be a problematic process for the producers, in this sub-process no constraints were mentioned by the producers. NGOs in the study area have provided training that has introduced new knowledge among the silk producers especially concerning the use of natural dyes. The producers want to use natural dyes because of the higher market demand for this kind of product, but unfortunately natural dyes were difficult to use. It takes more time than dyeing with chemical dyes and it can be

difficult to get precisely the colour the buyer ordered. Compared to the chemical dye which colours the silk right away, the silk has to be dyed several times with the natural dye before the desired colour was obtained.

Shortage of capital or institutional credit: Production of cocoon and silk need proper management and special care and therefore, cocoon and silk producers should have sufficient money to maintain it. As they did not have a lot of money, they often failed to maintain it. Some cocoon producers borrowed money from non-institutional sources but they think that it was not wise to take loan from these sources because of higher interest rate. The results showed that about 90 percent respondents of cocoon producers reported about this problem.

Lack of proper training and management: Production of cocoon is a sensitive function. Whole procedure of cocoon production needs proper management. In Bangladesh, training on management to the cocoon producer is absent. Lack of training was a problem for 75 percent of cocoon producers.

Non-availability of disease free egg: Production of good quality cocoon largely depends on fine quality eggs. Non-availability of improved eggs was another limiting factor in producing cocoon in the study area. Quality of silk also depends on the quality of cocoon used. Quality cocoon was not available also in the study areas. About 80 percent of cocoon producers reported about this problem.

Lack of scientific knowledge of farming: Although modern agricultural technologies have been in use in the study area, a large number of farmers do not have no adequate knowledge of right doses and methods of using inputs and technologies of producing cocoon. In the study areas, 58 percent silk producers were encountered this problem.

b) Marketing problem

According to the respondents' opinion, one serious problem of cocoon production was the marketing problem. There were some problems relating to the marketing of silk which is highlighted below:

High price of inputs: Most of the farmers in Bangladesh are marginal and small farmers. A very few farmers are large. Non availability of inputs like disease free egg, insecticides and human labor etc. at fair price was a problem in the way of producing silk. During the production period price of some inputs tend to rise due to their scarcity. The farmers therefore do not use the recommended dose of inputs in silk production. As a result, desired yield was not obtained. It appeared that 69 percent cocoon producers reported that they had to purchase some inputs at a high price during the production period.

Low market price of output: Low price of cocoon discouraged the producers to produce cocoon in the study area. Sometimes the price does not cover the cost. They could not get reasonable return from their products. This problem was faced by 80 percent of cocoon producers.

Deferred payment: Generally, cocoon producers sell their products on credit and payment is made after six or seven days. In some cases, they received the payment even after more than a month. About 89 percent of cocoon producers reported about deferred payment.

Spoilage and damage: Cocoon is soft and sensitive silk product item. When it is transported and stored using gunny bags, a significant quantity of cocoon becomes wasted in the marketing process. About 55 percent of cocoon producers faced this problem.

Price fluctuation and low price: High price fluctuation of cocoon created uncertainty in the market. Low price was also another limiting factor. When low price prevailed in the market, the cocoon producers had to sell their products at lower price. As a result, they sometimes had to incur loss. About 82 percent of cocoon producers faced this problem.

Lack of market facilities: Lack of marketing facilities was another marketing problem. Marketing facilities constitute proper information about demand and supply and the feature of the product. It also requires proper knowledge of the buyers and sellers and communication and transportation systems of the study areas. More marketing facilities are needed for efficient operation of market functions. Lack of marketing facilities was mentioned as a problem by 45 percent of cocoon producers in the study areas.

c) Social Problem

It was found that farmers were facing some social problems in producing silk. These are discussed below.

Table 13. Problems and constraints of producing cocoon.

Problems and constraints	Silk producers	
a) Economic and technical problems	No.	Percent
Problems in plantation	43	71
Problem in rearing	35	58
Problem in processing of the yarn	41	68
Shortage of capital or institutional credit	54	90
Lack of proper training and management	45	75
Non-availability of disease free egg	48	80
High price of egg	36	60
Lack of scientific knowledge of farming	35	58
b) Marketing problem		
High price of inputs	41	69
Low market price of output	48	80
Deferred payment	53	89
Spoilage and damage	33	55
Price fluctuation and low price	49	82
Lack of market facilities	27	45
Social problems		
Health problems	34	56
Damage caused by insects	32	53

Health problem: Workers involved in Sericulture activities suffered from coughs, gastrointestinal pains, ulcers, throat infections, thinning nails, dry skin, and hand and eye burning. The colures and materials used in dyeing and tracing emit strong smells, affecting their eyes, throats, nose, hands, and possibly internal functions. Primary treatment in the form of ointment for burns and cuts is provided by different NGOs. Tracing chemicals burns hands and eyes and stains fingers and nails. Using thinner for tracing also causes finger disease. Workers could not use gloves during tracing because the gloves melt from the kerosene and zinc oxide. Workers were not observed to use gloves for mixing dyes either. They washed chemicals off their hands with normal soap. Some respondents mentioned that new employees suffer more than older ones in the washing section, as old workers have become habituated to the chemicals. Some respondents mentioned that women are shifted from task to task so that their exposure to harmful chemicals is lessened. About 56 percent growers reported this is one of the most important problems.

Damage caused by insects: The producers of silk were also affected by the problem of attack of pests and diseases. Pests and diseases reduced cocoon production and increased cost of production. About 53 percent growers reported that this was one of the most serious problems.

Since silk production is a relatively new in Bangladesh but its production is profitable. It was observed that the large farmers earned higher profit compared to small and medium farmers. Due to the differences in price received by the large farmers for the better quality product they earn highest amount of profit. Furthermore, silk production is labour intensive activity; it would help create employment opportunities. Incentives to produce more skill will create additional employment opportunities for the labours. So, it is necessary to make the farmers aware about efficient use of resources. After production of silk, total household income of rural people increased significantly which enabled them to spend more on the basic items such as food, education, clothing, health care and housing compared to before. It indicates that livelihood and standard of living of silk farmers to some extent improved. If modern inputs and production technology could be made available to the farmers in time, yield and production of silk may be increased which can help the farmers to increase income and improve their livelihood conditions.

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