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An economic analysis of production and marketing of silk in Bhagalpur district of Bihar

Abhishek Arya and Dr. Ramchandra

Abstract

The present study entitled “An Economic analysis of production and marketing of Silk in Bhagalpur district of BIHAR” was undertaken to know cost and returns, marketing efficiency, producer share in consumer rupee and problems in production and marketing of silk. The study has been undertaken in Bhagalpur district of Bihar.

“An Economic analysis of production and marketing of Silk in Bhagalpur district of Bihar” Silk is a highly priced agricultural commodity which accounts for about 0.2 per cent of the total world quantity of textile fiber. Among all the textile fibers silk occupies the top place for the qualities of softness, luster, dye-ability, durability and elegance.

Keywords: Marketing channel, marketing cost, margin

Introduction

Silk is regarded as the “Queen of textiles”. Silk is a highly priced agricultural commodity which accounts for about 0.2 per cent of the total world population of textile fibre. Silk is a natural fibre secreted by the larvae of silkworms. The silkworm secretes a fibrous covering during its last larval period for undergoing a prolonged period of rest due to its instinctive habit. The man has exploited this humble beginning of an organism for his material benefit and to such an extent that many silk industries now entirely depend on it. Among all the textile fibres silk occupies the top place for the qualities of softness, lustre, dye-ability, durability and elegance.

Historically, China discovered the silk more than 4000 years ago. The Chinese silk is world famous and the original home of silk was in the Shangtung province in China. Silk has been mentioned as “Changlangshu” in Rig Veda and this clearly suggest that silk has Chinese origin. The “Silk Road” which is famous as the world’s longest highway, is stretched from Eastern China to the Mediterranean Sea, was named after this important commodity.

The word “Sericulture” is derived from the Greek word “Sericos” meaning “Silk” and the English word “Culture” meaning “Rearing”. The art of silk production is called “Sericulture” that comprises cultivation of mulberry, silkworm rearing and post cocoon activities leading to production of silk yarn or raw silk. Sericulture or silk the word “Sericulture” is derived from the Greek word “Sericos” meanin “Silk” and the English word “Culture” meaning “Rearing”. The art of silk production is called “Sericulture” that comprises cultivation of mulberry, silkworm rearing and post cleading to production of silk yarn or raw silk. Sericulture or silk Production has a long and colorful history unknown to most people. For centuries the West knew very little about silk and the people who made it. Pliny, the Roman historian, wrote in his Natural History in 70 BC as “Silk was obtained by removing the down from the leaves with the help of water”.

For more than two thousand years the Chinese kept the secret of silk among themselves. It was the most zealously guarded secret in history. It is said that around 2640 B.C. the groves of mulberry trees in the imperial garden were destroyed by the little worms due to which the legendary emperor Huang-ti asked his bride, Hsi-Ling- Shih (Lei-Tsu) to study the little worms. The young empress gathered some of the cocoons in her hand and took them into the palace to see what they were made up of. Hsi-Ling-Shih called a bowl of hot water and dropped a cocoon in the steaming water. To her amazement, a magical cobweb like tangle separated itself from the cocoon. Hsi- Ling-Shih picked up the gauzy mass and found that one slender thread was unwinding itself almost without end from the cocoon. Thus, Hsi-Ling-Shih had discovered silk.

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Hsi-Ling-Shih was so pleased with the soft, fine thread that she wove a ceremonial robe for the emperor out of the cocoon threads. Hsi-Ling-Shih was honoured for her work with the name “Seine-Than” or “The Goddess of Silk Worms”.

The silk glands of the silkworm secreted a proteinaceous fibre which forms silk threads. Two types of proteins, viz., fibroin, the actual silk fibre and sericin, the gummy material which coats the filament through the spinneret of the mouth part of the silk moth larva make the silk-fibre. The cocoon, which is a silken-case makes by the worm, in order to protect itself from natural calamities and enemies and undergoes metamorphosis to become adult.

Silk may be defined as “Yarn reeled from the cocoons spun by the caterpillars of silk producing insects”. It is the only thread that can be woven directly into fabric. A one kilometre long silk thread would weigh only a quarter of gram. To get one kilogram (2.2 pounds) of silk, 1500 silkworms is fed with 250 kilograms of mulberry leaves. The durability, draping qualities and dye-ability of silk is of great extent. Silk is regarded as the perennial queen of textiles as no other fabric can match it in lustre and elegance.

Silk producing organisms

Silk is a fibrous protein secreted by the insect silkworm which belongs to the Order Lepidoptera, Super-family Bombycidae and Family Saturniidae. Only few species are commercially exploited from nearly 400-500 known species which can produce silk. There are four kinds of commercially importance silk in the world i.e., mulberry, tasar, eri and muga. India has a unique distinction in the field of sericulture as it is the only country producing all the four varieties of silk. The silk produced in all countries falls in two major groups:

- Mulberry silk
- Non-mulberry silk

A. Mulberry silk

Mulberry silk has been entirely domesticated since more than 4000 years. The Mulberry silk is produced by mulberry silkworm called “*Bombyx mori*” and this type of silk dominates the field of sericulture in various aspects like quantity and quality of production. Mulberry silk contributes 95 percent of the world’s silk production.

The mulberry silkworm, *Bombyx mori* are fed on mulberry leaves to produce the mulberry raw-silk out of the cocoon after subjecting to complicated processes called reeling and spinning. Mulberry sericulture is also known as Moriculture. Other insects which are considered to be the ancestors of *Bombyx mori* are also associated with the mulberry silk production viz., *Bombyx mandarina*, found in Japan, Manchuria etc. and *Theophila huttoni*, *Theophila religiosa*, distributed in wild conditions of Bihar, Sikkim and Himachal Pradesh.

B. Non-mulberry silk

Under this type, there are three types of silk. They are:

- Tasar silk
- Eri silk
- Muga silk

C. Tasar silk

Tasar silk is the product from the secretion of *Antheraea mylitta* and *Antheraea proylei*, commonly known as the

tropical and temperature tasar silkworms, respectively. Tasar (Tussah) is copperish coloured silk and does not possess the lustre of mulberry silk.

China is the largest producer of tasar silk in the world followed by India. While China produces only temperate tasar silk, India has got distinction in producing both tropical.

Materials and Method

Selection of district

Out of 38 districts present in the state Bihar has been selected purposively for present study due to major amount of silk production in total state silk production. The knowledge of study tracks for helpful for reliable information for silk.

Selection of Respondent

Classification of the respondents

The respondents were divided into three main groups viz. silkworm rearer, reeler and weaver based on the activities performed by them. Silkworm rearers were associated with silkworm rearing and production of cocoons. Reelers were involved in purchase of cocoons and production of yarn from them; while weavers were engaged in production of silk and silk products. 32 silkworm rearers, 18 reelers and 30 weavers were again categorized based on cocoon production, yarn production and income, respectively.

Distribution of silkworm rearers

Thirty-two (32) silkworm rearers were divided into three sub-groups based on yearly cocoon production as mentioned below.

Table 1: Distribution of silkworm rearers (n = 32)

Sl. No.	Groups	Cocoon production (kg/yr)	Frequency	Percentage
1	I	< 75	11	34.37
2	II	75-150	15	46.88
3	III	>150	6	18.75
	Total		32	100

Distribution of reelers

Eighteen (18) reelers were divided into three sub-groups based on yarn production per year as mentioned below.

Table 2: Distribution of reelers (n = 18)

Sl. No.	Groups	Yarn production (kg/yr)	Frequency	Percentage
1	I	< 20	4	22.22
2	II	20-30	5	27.78
3	III	>30	9	50.00
	Total		18	100

Distribution of weavers

Based on annual income thirty (30) weavers were divided into three sub-groups as mentioned below.

Table 3: Distribution of weavers (n = 30)

Sl. No.	Groups	Income (Rs./yr)	Frequency	Percentage
1	I	< 50,000	11	36.67
2	II	50,000-1,00,000	6	20.00
3	III	> 1,00,000	13	43.33
	Total		30	100

Methods and analytical tools used for data analysis

Data collected from the respondents during the study period were edited, scored, systematically tabulated and analyzed using the following statistical tools and techniques.

Percentage analysis

Frequencies and percentages were used to interpret the data pertaining to personnel and socio-economic characteristics of the respondents.

Functional analysis

Various statistical tools were used for analysis of the data collected during the study period which are as follows.

Compound Growth Rate (CGR)

The compound growth rate was worked out by using exponential potential function of the form

$$Y = ab^t$$

$$\ln y = \ln a + b \ln t$$

$$\text{CGR} = \text{Anti log} (b - 1) \times 100$$

Where,

y = Dependent variable

a = Intercept

b = Regression coefficient

t = Time in years

Cost of marketing (Singh and Toppo, 2010)

The total cost incurred on marketing, in cash or in kind, by the silkworm rearer and various intermediaries involved in the sale and purchase of silk till the commodity reaches the ultimate consumer was computed as follows.

$$\text{Where, } C = C_f + C_{m1} + C_{m2} + C_{m3} + C_{mn}$$

C = Total cost of marketing of silk

C_f = Cost paid by the silkworm rearer, from the time the produce leaves the production place till sale

C_{mn} = Cost incurred by the nth middleman in the marketing process of silk

Producer's price (Singh and Toppo, 2010) [14]

This is the net price received by the silkworm rearer at the time of first sale. This is equal to the wholesale price at the primary assembly centre, minus the charges borne by the silkworm rearer in selling of cocoon. If P_n is the wholesale price in the primary assembling market and C_f is the marketing costs incurred by the silkworm rearer, the producer's price (P_f) is

$$P_f = P_n - C_f$$

Marketing margins of middleman (Balaji et al., 2010) [4]

This is the difference between the total payments (cost + purchase price) and receipts (sale price) of the middleman (the agency). The following measures were used.

Absolute margin of middleman (A_{mi}) = P_{ri} - (P_{pi} + C_{mi})

$$\frac{P_{ri} - (P_{pi} + C_{mi})}{P_{ri}} \times 100$$

Where,

P_{ri} = Total value of receipts per unit of produce (sale price)

P_{pi} = Purchase value of goods per unit of produce (purchase price)

C_{mi} = Cost incurred in marketing per unit. The margin thus calculated includes the profit of the middleman and the returns.

Producer's share in consumer's rupee

It is the price received by the silkworm rearer expressed as a percentage of the retail price i.e. the price paid by the consumer. Producer's share in consumer's rupee (P_s) was calculated by using the following formula (Acharya and Agarwal, 2005).

$$P_s = \frac{P_f}{P_c} \times 100$$

Where,

P_f = price of the produce received by silkworm rearer P_c = price of the produce paid by the consumer

Marketing efficiency

Marketing efficiency was calculated using both Shepherd Index (1972) and Acharya's modified marketing efficiency (Acharya and Agarwal, 1999) [1] which is as follows.

Conventional method:

$$\text{Index of marketing efficiency (E)} = O / I$$

Where,

O = value added by the marketing system

I = cost of market intermediaries

Shepherd's Index (1972)

$$\text{Marketing Efficiency (ME)} = V / I - 1$$

Where,

V = value of goods sold or price paid by the consumers I = total cost + margin of market intermediaries

Acharya's modified marketing efficiency (MME)

$$\text{MME} = \text{FP} / (\text{MC} + \text{MM})$$

Where,

FP = price received by silkworm rearer

MC = marketing costs

MM = marketing margin

Garrett ranking method

This statistical technique was used to evaluate the problems faced by the silkworm rearers, reelers and weavers in production and marketing of silk and silk products. The orders of merit given by the respondents were converted into ranks by using the following formula (Garrett and Woodsworth, 1969).

$$\text{Percentage position} = \frac{100 (R_{ij} - 0.5)}{N_j}$$

Where,

R_{ij} = Rank given for ith item jth individual

N_j = Number of items ranked by jth individual

Result and Discussion

Silk marketing channels and their price spreads

Marketing channel is referred as the path through which the product passes from the producer to the ultimate consumer. A marketing channel is a useful tool for management, and is crucial to creating an effective and well-planned marketing strategy. Marketing channels used for selling cocoon, yarn and silk products were identified during the study and all the channels are discussed in this sub-section.

Marketing channels identified in cocoon marketing

A total of three marketing channels viz. channel I (Silkworm rearer – Customer i.e., reeler), channel II (Silkworm rearer – Research Extension Center – Customer i.e., reeler) and channel III (Silkworm rearer – Retailer – Customer i.e., reeler) were identified for marketing of cocoons in the study areas. Out of the three channels channel II was found to be the most dominant channel through which 100 per cent mulberry and 88.46 per cent oak tasar silkworm rearers sold their cocoons. A total of

66.62 and 75.63 per cent produced mulberry and oak tasar cocoons, respectively were sold through this channel. Eri Research Extension Center Fatehpur (REC), Fatehpur has been providing financial, technical and managerial support to the people associated with silkworm rearing and other silk related activities and hence they are bound to sale most of their produce to REC. Cocoon producers also need not to worry for the market in presence of REC.

Marketing channels identified in cocoon marketing

Table 4: Marketing channels identified in cocoon marketing

Sl. No.	Channels	No. of producers sold through the channel		Quantity of cocoon (kg)	
		Mulberry	Oak Tasar	Mulberry	Oak Tasar
1	I (Silkworm rearer – Customer i.e. reeler)	4 (66.67)	13 (50.00)	312 (23.72)	427 (18.10)
2	II (Silkworm rearer – REC – Customer i.e., reeler)	6 (100.00)	23 (88.46)	876 (66.62)	1784 (75.63)
3	III (Silkworm rearer – Retailer – Customer i.e., reeler)	2 (33.33)	7 (26.92)	127 (9.66)	148 (6.27)
	Total	6 (100)	26 (100)	1315 (100)	2359 (100)

Figures in parentheses indicate percentage to the column total Silkworm rearers (cocoon producers) also sold 23.72 and 18.10 per cent of mulberry and oak tasar produce, respectively through channel I, which was the direct channel attached with the final customers. It was observed that less than 10 per cent of mulberry and oak tasar cocoons were sold through channel III where retailer was available as market intermediary between the producer and final consumer.

Marketing costs and marketing margin in Channel I of cocoon marketing (Silkworm rearer – Customer i.e., reeler)

Marketing costs and marketing margin in Channel I (Silkworm rearer – Customer i.e., reeler) are exhibited in

Table 3.14. The net prices received per kg of cocoon by the mulberry and oak tasar silkworm rearers were Rs. 482.83 and Rs. 283.13, respectively. The rearers spent money as marketing costs for labour charges, packaging, purchase of bamboo baskets and plastic sheets. The final selling prices of mulberry and oak tasar cocoons were Rs. 500.00 and Rs. 300.00 per kg, respectively. The producer's prices on consumer's rupee (96.57 and 94.38 per cent for mulberry and oak tasar rearers, respectively) were quite high as no middleman was involved in this channel.

Marketing costs and margin in Channel I of cocoon marketing

Table 5: Marketing costs and margin in Channel I of cocoon marketing

Particulars	Mulberry		Oak Tasar	
	Amount (Rs/kg of cocoon)	% In consumer price	Amount (Rs/kg of cocoon)	% In consumer price
Net price received by the silkworm rearer	482.83	96.57	283.13	94.38
Labour cost	8.81	1.76	8.35	2.78
Packaging	0.15	0.03	0.14	0.05
Bamboo baskets	0.86	0.17	0.86	0.29
Plastic sheet for drying	7.35	1.47	7.52	2.50
Total marketing costs of the silkworm rearer	17.17	3.43	16.87	5.62
Rearer's selling price to customer i.e., reeler	500.00	100	300.00	100
Total marketing costs	17.17	3.43	16.87	5.62
Total marketing margin	-	-	-	-

Marketing costs and marketing margin in Channel II of cocoon marketing (Silkworm rearer – REC – Customer i.e., reeler)

Marketing costs and marketing margin in Channel II (Silkworm rearer – REC – Customer i.e., reeler) are portrayed in Table 3.15. The net price received per kg of cocoon by mulberry silkworm rearers was Rs. 380.78, which was 84.62 per cent of consumer's rupee. The rearers spent Rs. 10.86, Rs. 0.15, Rs. 0.86 and Rs. 7.35 for labour charges, packaging, purchase of bamboo baskets and plastic sheets, respectively for 1 kg of cocoon which accounted for total marketing costs of Rs. 19.22. Silkworm rearers sold cocoon to the REC at Rs. 400.00 per kg. Total marketing costs incurred and marketing margin cornered by the RSRS were Rs. 22.89 and Rs. 27.11, respectively, which were 5.09 and 6.02 per cent of the consumer's rupee. Final selling price of REC to the reeler was

Rs. 450.00 per kg of cocoon. Total marketing costs and margin of mulberry cocoon marketing in channel II were Rs. 42.11 and Rs. 27.11, respectively.

On the other hand, net price received per kg of cocoon by oak tasar silkworm rearers was Rs. 231.47, which was 79.82 per cent of consumer's rupee. The rearers spent Rs. 10.01, Rs. 0.14, Rs. 0.86 and Rs. 7.52 for labour charges, packaging, purchase of bamboo baskets and plastic sheets, respectively for 1 kg of cocoon which accounted for total marketing costs of Rs. 18.53. The marketing costs incurred by the oak tasar silkworm rearer was less in comparison to mulberry as handling of oak tasar was little bit easy and hence labour charge reduced slightly. Silkworm rearers sold cocoon to the REC at Rs. 250.00 per kg. Total marketing costs incurred and marketing

margin cornered by the REC were Rs. 22.00 and Rs. 18.00, respectively, which were 7.59 and 6.21 per cent of the consumer's rupee. Final selling price of REC to the reeler was Rs. 290.00 per kg of cocoon. Total marketing costs and margin of oak tasar cocoon marketing in channel II were Rs. 40.53 and Rs. 18.00, respectively.

It is interesting to note down that final prices paid by the reelers in purchase of 1 kg of mulberry and oak tasar cocoon were less in comparison to channel I. This is mainly because of the involvement of REC in the whole marketing process of cocoons.

Lakshmanan and Mallikarjuna (2006) reported that the cost of

cocoon production per kg of cocoon increased from Rs. 70.43 during 1993-94 to Rs. 79.29 in 2005-06, which is due to the escalation of input prices in their study areas. The average cocoon price increased from Rs. 81.12 to Rs. 105.53, which was not satisfactory for the

silkworm rearers of the state. They also suggested to introduce Minimum Support Price for commercial cocoon producers to increase both profitability and productivity in the region.

Marketing costs and margin in Channel II of cocoon marketing

Table 6: Marketing costs and margin in Channel II of cocoon marketing

Particulars	Mulberry		Oak Tasar	
	Amount (Rs/kg of cocoon)	% In consumer price	Amount (Rs /kg of cocoon)	% In consumer price
Net price received by the silkworm rearer	380.78	84.62	231.47	79.82
Labour cost	10.86	2.41	10.01	3.45
Packaging	0.15	0.03	0.14	0.05
Bamboo baskets	0.86	0.19	0.86	0.29
Plastic sheet for drying	7.35	1.63	7.52	2.59
Total marketing costs of the silkworm rearer	19.22	4.27	18.53	6.38
Silkworm rearer's selling price to REC	400.00	88.89	250.00	86.21
Transportation	8.02	1.78	7.65	2.64
Plastic sheet for drying	6.85	1.52	6.82	2.35
Gunny/ plastic bags	0.14	0.03	0.14	0.05
Bamboo baskets	0.65	0.14	0.65	0.22
Labour cost	7.23	1.61	6.74	2.32
Total marketing costs of REC	22.89	5.09	22.00	7.59
Total marketing margin of REC	27.11	6.02	18.00	6.21
REC's selling price to customer i.e., reeler	450.00	100	290.00	100
Total marketing costs	42.11	9.36	40.53	13.97
Total marketing margin	27.11	6.02	18.00	6.21

Marketing costs and marketing margin in Channel III of cocoon marketing (Silkworm rearer – Retailer – Customer i.e., reeler)

Marketing costs and marketing margin in Channel III (Silkworm rearer – Retailer –Customer i.e., reeler) are depicted in Table 3.16. The net price received per kg of cocoon by mulberry silkworm rearers was Rs. 432.83, which was 86.57 per cent of consumer's rupee. The rearers spent Rs. 8.81, Rs. 0.15, Rs. 0.86 and Rs. 7.35 for labour charges, packaging, purchase of bamboo baskets and plastic sheets, respectively for 1 kg of cocoon which accounted for total marketing costs of Rs. 17.17. Silkworm rearers sold cocoon to the retailers at Rs. 450.00 per kg. Total marketing costs incurred and marketing margin cornered by the retailers were Rs. 16.86 and Rs. 33.14, respectively, which were 3.37 and 6.63 per cent of the consumer's rupee. Final selling price of retailer to the reeler was Rs. 500.00 per kg of cocoon. Total marketing costs and margin of mulberry cocoon marketing in channel III were Rs. 34.03 and Rs. 33.14, respectively.

On the other hand, net price received per kg of cocoon by oak tasar silkworm rearers was Rs. 253.13, which was 84.38 per cent of consumer's rupee. The rearers spent Rs. 8.35, Rs. 0.14, Rs. 0.86 and Rs. 7.52 for labour charges, packaging, purchase of bamboo baskets and plastic

sheets, respectively for 1 kg of cocoon which accounted for total marketing costs of Rs. 16.87. The marketing costs incurred by the oak tasar silkworm rearer was less in comparison to mulberry as handling of oak tasar was little bit easy and hence labour charge reduced slightly. Silkworm rearers sold cocoon to the retailers at Rs. 270.00 per kg. Total marketing costs incurred and marketing margin cornered by the retailers were Rs. 16.25 and Rs. 13.75, respectively, which were 5.42 and 4.58 per cent of the consumer's rupee. Final selling price of retailer to the reeler was Rs. 300.00 per kg of cocoon. Total marketing costs and margin of oak tasar cocoon marketing in channel III were Rs. 33.12 and Rs. 13.75, respectively.

Like channel I, final selling prices per kg of mulberry and oak tasar cocoons were Rs. 500.00 and Rs. 300.00, respectively in channel III too. But producer's price on consumer's rupee in channel III was less as extra marketing costs and margin were associated with the retailers.

Marketing costs and margin in Channel III of cocoon marketing

Table 7: Marketing costs and margin in Channel III of cocoon marketing

Particulars	Mulberry		Oak Tasar	
	Amount (Rs/kg of cocoon)	% In consumer price	Amount (Rs/kg of cocoon)	% In consumer price
Net price received by the silkworm rearer	432.83	86.57	253.13	84.38
Labour cost	8.81	1.76	8.35	2.78
Packaging	0.15	0.03	0.14	0.05
Bamboo baskets	0.86	0.17	0.86	0.29
Plastic sheet for drying	7.35	1.47	7.52	2.51
Total marketing costs of the silkworm rearer	17.17	3.43	16.87	5.62
Silkworm rearer's selling price to retailer	450.00	90.00	270.00	90.00
Transportation	9.01	1.80	8.74	2.91
Gunny/ plastic bags	0.62	0.12	0.62	0.21
Storage	7.23	1.45	6.89	2.30
Total marketing costs of retailer	16.86	3.37	16.25	5.42
Total marketing margin of retailer	33.14	6.63	13.75	4.58
Retailer's selling price to customer i.e., reeler	500.00	100	300.00	100
Total marketing costs	34.03	6.81	33.12	11.04
Total marketing margin	33.14	6.63	13.75	4.58

Conclusions

Involvement of market intermediaries in silk and silk products marketing in Bhagalpur is less, as presently most of the people engaged in sericulture in the state have directly or indirectly received assistance from the REC and hence, they try to abide by the rules and regulations set by the REC. Bhagalpur is presently the largest oak tasar producing district in the Bihar. The price of mulberry cocoons (Rs. 450-500/kg) is higher than the tasar cocoons (Rs. 300/kg). 6-8 kg mulberry and 18 kg tasar cocoons are required to produce 1 kg quality yarn. Phanek, dupatta and shirting pieces are the most preferred silk items produced in the state. In case of both cocoon and yarn marketing, direct channels are found to be the most efficient marketing channels. But interesting, silkworm rearers and reelers use direct channels as the second preferred channels for selling of the produce. Sericulture is a profitable venture and people engaged either in silkworm rearing or reeling or weaving can earn lots of profit and can improvise their standard of living within short period of time.

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