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Value Chain Analysis of Cocoons, Constraints faced by women in Production and Marketing of Mulberry Silk in Chikkaballapur District of Karnataka, India

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The present study was carried out in Chikkaballapur district of Karnataka to assess the marketing costs, value chain of cocoons and constraints faced by women in production and marketing of mulberry silk in the year 2021. The study adopted multistage random sampling for the selection of farmers and intermediaries, 90 and 50 respectively. The marketing costs are calculated for one quintal of cocoons among the stratified farmers. The marketing cost incurred was estimated to be

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Rs 980.78, amongst which the largest share was observed higher for marketing fee accounted 40.89 per cent, followed by packing material accounting 20.72 per cent. The producer's share in consumer's rupee was accounted to 34.28 per cent. The process of cocoons, the marketing costs and margins shown that the silk weavers purchased coloured weft from the silk twisters which accounts highest share of 42 per cent of the total cost of consumer's price. The major constraints faced by women in mulberry cultivation was water scarcity etc. Constraints encountered in cocoon production was mainly pest and disease of mulberry silkworms. Constraints encountered in marketing of mulberry silk cocoons majorly was high price fluctuations in the market followed by the absence of quality based pricing. The constraints faced by reelers in mulberry silk production are high investment cost and high price fluctuations was observed in marketing of silk.

Keywords: Value chain; cocoons; marketing costs and margins; price spread; raw silk; constraints.

1. INTRODUCTION

Sericulture is the rearing of silkworms for cocoon production to get the silk yarn or raw silk. It includes various activities like growing of mulberry leaves, rearing of silkworms, silk reeling from cocoons, weaving of silk yarn, and produce the silk fabric from it [1].

Sericulture is the oldest small scale sustainable agribusiness practice in rural regions. It is a labour intensive and women friendly sector, traditionally engaging individual households. It offers job opportunities for young men and women in rural communities. It is extremely competitive and capital intensive enterprise and it is widely practiced all over India in rural and semi-urban areas [2,3,4].

Asia's largest silk cocoon market is situated in Ramanagara, Karnataka. The Department of Sericulture has developed cocoon markets to make it easier for both cocoon producers and silk reelers to get their cocoons at competitive and fair prices, such a kind of controlled transaction, cocoon marketing system exists in Karnataka. The cocoons were brought by the silkworm rearers or cocoon producers to these markets and transacted as separate lots and treated in an open auction and e-auction systems. Electronic weighing machines and computers are built in the markets to introduce transparency in transactions [5].

Silk reeling is the process, extraction of silk filament from cocoons through a sequence of raw silk reeling operations. Silk reeling is currently carried out by different types of reeling devices: charaka, cottage basin, multi-end based, filature *etc.* The silk cocoons are used as the raw materials for raw silk production. The economics and quality of silk yarn production depend on raw material quality i.e., commercial characteristics of cocoons like shell quality, race, shape, size, reliability, and filament denier length. Processing parameters like stifling method, reeling method, device used for reeling etc [6,7,8].

Women form a significant workforce in the sericulture industry. Sericulture is a significant small scale agro-industry provides jobs for farm women and men. Women constitute 60% of the sericulture workforce [9]. The researchers have shown that women in sericulture industries are involved in mulberry cultivation, silkworm rearing, cocoon production, post-harvest practices of cocoons, and decision making. Mulberry planting, manuring, irrigation, weeding, mulberry leaf picking, mulberry leaf transportation and leaf storage, women frequently involved in these sericulture operations. They are also involved in leaf-cutting, feeding, worm spacing, bed cleaning, mounting, cocoon harvesting, and disinfectant during silkworm rearing, and women were also involved in post-harvesting activities of cocoons like silk reeling, silk spinning, silk twisting, silk weaving etc., Some are still involved in decision-making [7,10,11,12,13]. So the study aim is to analyse the problems faced by women in these activities involved in production and marketing of mulberry silk.

Therefore, the current study was undertaken to examine the various aspects of the sericulture industry. This study focused majorly on marketing channels, marketing cost of cocoons incurred by farmers and constraints faced by women in the production and marketing process.

2. METHODOLOGY

2.1 Study Area and Sampling Framework

The study was carried out in Chikkaballapur district of Karnataka during 2021. The multistage sampling technique is adopted. In the first stage

Chikkaballapur district was purposively selected for the study. In the second stage two taluks or blocks are selected i.e., Shidlaghatta and Chintamani because which is having the highest mulberry silk cocoon production. Under the Sidlaghatta and Chintamani blocks, six villages were selected for the study. From each village 15 mulberry growing and silk cocoon producing farmers were selected randomly and from selected blocks, 35 silk reelers are selected randomly who are using the cottage basin reeling technique. five respondents from each twisters, weavers and consumers were selected. Thus total sample size of the study constituted was 140 respondents.

2.2 Analytical Tools

2.2.1 Marketing cost: It is sum of all the costs like weighing, loading and unloading charges, commission etc. which were paid by the farmers and the market functionaries per 100 Kgs.

2.2.2 Marketing margins: The marketing margin is the gap between the price paid and price received by a single marketing agency, including a retail outlet, or any kind of marketing agency, such as retailers or wholesalers in the marketing network.

2.2.3 Price spread (PS): is the difference between the price paid by final consumers and the price received by producer.

$$PS = \frac{(\text{Consumer price} - \text{Net price of producer})}{\text{Consumers price}} \times 100$$

2.2.4 Garrett's ranking technique

The problems in mulberry leaves production, cocoon production, marketing, mulberry raw silk and marketing of silk yarn were identified in the study area by using Garrett's ranking technique. Garrett ranking is a method for ranking a group of items or factors according to their priority as observed by the sample respondents. Garrett and Woodworth's (1977) formula was used to transform the respondents' order of merit into scores.

$$\textbf{Per cent position} = \frac{100\,(Rij - 0.5)}{N_j}$$

Where R_{ij} = Rank given for the i^{th} variable by j^{th} respondents

N_j = Number of variables ranked by j^{th} respondents

By using Garret's table, per cent position estimated was transformed into score. The scores of various responders were then summed for each factor, and the mean score was obtained. The most important problem was determined by the variable with the greatest mean score. As a result, the average score for each problems was ranked by placing them in decreasing order.

3. RESULTS AND DISCUSSION

3.1 Marketing Channels for Mulberry Silk Cocoons

The mulberry silk cocoons are harvested after mounting of silkworms and they are marketed as soon as possible before the silkworm moths emerge out and delay in marketing of the cocoon results in weight reduction of cocoons. So, this is very crucial stage that must be handled carefully thus not results a loss.

Various routes of output process from producers to final consumers are referred to as marketing channels. Producers can sell their cocoons at the nearest government cocoon markets. The scientific procedures have been used to determine an appropriate floor price in the cocoon markets, and the selling price is determined in an e-auction mode. Silk reelers purchase the cocoon from the producer and used it as raw material for raw silk or yarn production. Marketing channel for mulberry silk cocoon have identified in the study area and are presented below.

Channel: Producer → Government cocoon market →Reelers→ Twisters→ Weavers → Consumers

As per the results, the producers sell their cocoons through government cocoon markets in the study area. The Government cocoon market acts as a commission agent for both producers and reelers, levying an 1% of the market fee on the sale value of cocoon.

3.2 Marketing Costs of the Cocoons

Marketing costs are the summation of all the expenses such as packing material costs, loading and unloading charges of output, transportation costs, market fee or commission and so on. The marketing costs on handling mulberry silk cocoons incurred by the producer has been shown in Table 1. The mulberry silk cocoons were often packed in gunny bags with weights of

around 50 Kgs. The producers graded and sorted high-quality cocoon and low-quality cocoon during cocoon harvesting based on their commercial features like shell quality, cocoon shape and size of the cocoon. Finally, mulberry silk cocoons are filled in gunny bags for marketing. In current study, the total marketing cost of selling 100 Kgs of mulberry silk cocoon in the research area was worked out.

The Table 1, displayed that at overall level, marketing cost incurred was estimated to be Rs 980.78, amongst which largest share of cost was observed highest in marketing fee amounted to Rs 401.11(40.89%), followed by packing material amounted to Rs. 203.31 (20.72%) and cost on transportation incurring Rs.199.97 (20.38%) and so on. The marketing cost incurred by various categories of farmers i.e., marginal, small and medium farmers were amounted for Rs.1109.72, Rs.966.98 and 882.14, respectively. It may be point out that the higher marketing cost was incurred by marginal farmers compared to other categories of farmers. The reason behind this scenario was that the marginal farmers would deal with lesser quantity of cocoons compared to medium farmers incurring higher cost on packing material and transportation was observed. Similarly, [3,14] was reported on par results with my findings.

3.3 Value Chain Analysis of Cocoons

Marketing costs linked with distribution channel have always been a source of concern because increasing marketing costs results in inefficient marketing system, which impacts on both producers and consumers. The marketing margin is the gap between the price paid and price received by intermediaries in the marketing network [3,14,15].

The producer's share in consumer's rupee was accounted to 34.28 %. The marketing costs incurred in selling of cocoons incurred by sample farmers amounted to be Rs. 980.76 (0.83 %) of the consumer's price. Producers sale price to the government cocoon market amounted to Rs. 40,111.17 (34.28 %) per 100 Kgs of the cocoon. The government cocoon market collects levy @ 1% market fee from both seller and buyers of mulberry silk cocoons and producers was sold cocoons to silk reelers at Rs. 40,512.28 (34.62 %) per 100 Kgs of the mulberry silk cocoon. Then the silk reelers incurred processing or reeling cost amounting to Rs. 41,822.25 (35.74%) and silk reelers benefited with a margin of Rs. 3047.75 by selling the reeled silk. One quintal of cocoons yields about 12.82 Kg of raw silk [16-17].

The twisters purchase the raw silk amounting to Rs. 44,870.00 (38.35%) of the consumer's price. The costs incurred by twister to process silk yarn to weft which are used in weaving was amounted to Rs. 47,100.00 and twisters benefited with a margin of Rs. 2235.00 and during silk twisting, a loss of 1.02 Kg of raw silk was observed after processing of 12.82 Kgs of raw silk, this was due to the enhanced fineness of raw silk with the process of twisting. After silk twisting, silk degumming is necessary operation to increase the quality of silk, shine, the texture and colour of the silk.

Table 1. Marketing costs of cocoons incurred by sample farmers (Unit: Rs/100 Kgs)

Sl. No	Items	Marginal farmers	Small farmers	Medium farmers	Overall
1	Packing material	228.96 (20.63)	195.83 (20.25)	190.86 (21.63)	203.31 (20.72)
2	Transportation charges for output	258.48 (23.29)	197.98 (20.47)	149.45 (16.94)	199.97 (20.38)
3	Loading and unloading charges	64.46 (5.80)	52.18 (5.39)	50.63 (5.73)	55.13 (5.62)
4	Market fee @ 1%	401.12 (36.14)	403.69 (41.74)	397.65 (45.07)	401.11 (40.89)
5	Miscellaneous expenses	156.68 (14.11)	117.28 (12.12)	94.31 (10.69)	121.22 (12.35)
	Total	1109.72 (100)	966.98 (100)	882.14 (100)	980.78 (100)

Note: Figures in the bracket indicate the percentage value to the total

Table 2. Marketing costs of cocoon, margin and price spread (Rs/100 Kg)

Sl. No	Particular	Amount	%
1	**Producers cost incurred**		
	a) Packing material	203.31	0.17
	b) Loading and unloading	199.97	0.17
	c) Transportation	55.13	0.04
	d) Market fee (1%)	401.11	0.34
	e) Miscellaneous	121.22	0.10
	Total cost	980.76	0.83
	Producers margin	39,130.41	33.44
	Producers sale price	40,111.17	34.28
2	**Government cocoon market purchase price**	40,111.17	34.28
	Market commission (1%)	401.11	0.34
	The Government cocoon market sale price	40,512.28	34.62
3	**Reelers purchase price**	40,512.28	34.62
	Costs incurred on reeling of yarn or raw silk		
	a) Labour costs	1060.00	0.90
	b) Packing material	200.00	0.17
	c) Transportation cost	50.00	0.04
	Total cost	41,822.20	35.74
	Reelers margin	3047.75	2.60
	Reelers sale price	44,870	38.35
4	**Twisters purchase price**	44,870	38.35
	Costs incurred on silk yarn into the coloured weft		
	a) Labour cost	2000.00	1.70
	b) Chemical cost	150.00	0.12
	c) Packing material	30.00	0.02
	d) Transportation cost	50.00	0.04
	Total costs	47,100.00	40.25
	Twisters margin	2235.00	1.91
	Twister sale price	49,335.00	42.16
5	**Weavers purchase price**	49,335.00	42.16
	Costs incurred to convert weft into sarees		
	a) Labour costs	18,000.00	15.38
	b) Packing material cost	150.00	0.12
	Total costs	67,485.00	57.67
	Weavers margin	49,515.00	42.32
	Weavers sarees sales price	1,17,000.00	100
	Consumers sarees purchase price (18 sarees)	1,17,000.00	100

Table 3. Constraints faced by women in mulberry cultivation

Sl. No	Particulars	Garrets score	Rank
1	Water scarcity	75.22	I
2	Discriminatory wage rates	68.45	II
3	Lack of labour during planting mulberry	63.16	III
4	Less access to new technology	54.01	IV
5	Lack of planting materials	51.12	V
6	Less access of extension participation	48.05	VI
7	Less of credit facility	45.52	VII
8	Limited participation in decision making	39.11	VIII
9	Lack of inputs availability	27.88	IX
10	Transportation problem for mulberry leaves	27.44	X

After twisting, dyeing carried out by the twisters and resulted 8.97 Kg coloured weft from 11.80 kg of twisted silk weft. Weavers purchased coloured weft from the silk twisters which costs Rs. 49,335.00 (42.16%) of the total cost of consumer's price. The purchased colour weft,

saree processing and marketing cost were amounted Rs. 67,485.00. The silk weavers benefited with Rs. 49,515.00. Weavers required weft quantity to weave the sarees would be based on design of the sarees. Normally it requires 400-450 grams to weave one saree and even the cost of silk saree is proportionate with the design. Weavers could weave 17 to 18 sarees from 100 Kg mulberry silk cocoons and the consumer's purchase price of sarees accounted to Rs. 1,17,000.00 and price spread was observed to be Rs. 76,888.83 (65.72%). Similarly, [6,8,7] reported on par results with my findings.

3.4 Constraints Faced Women in the Production and Marketing Process

In the current section, an attempt for analysing the various problems/ constraints encountered by both women and men sericulturists were examined. A survey conducted resulted the opinions of the farmer respondents and reelers in the study area.

3.4.1 Constraints faced by women in mulberry cultivation

The major constraints ascribed by women and men comprising the Garrett mean score and the rank was depicted in the Table 3. It is evident from the table that the water scarcity was a key and predominant problem faced by mulberry cultivators with a Garret's score of 75.22, followed by discriminatory wage rates with Garret's score 68.45, lack of labour during planting of mulberry saplings with Garret's score 63.16 and so on.

3.4.2 Constraints faced by women in mulberry silk cocoon production

From the Table 4, it was noticed among the problems faced in production of mulberry silk cocoon, major constraint faced by both women and men farmers was pest and disease of mulberry silkworms with 74.61 Garret's score, second and foremost problem was improper disinfectant with a score of 55.94, followed by shortage and high wage rates of labour with 54.07 Garret's score, difficulty in obtaining Disease Free Layings (DFLs) with 53.63 Garret's score and so on.

3.4.3 Constraints faced by women in the marketing of mulberry silk cocoon

It is observed from the Table 5, that the marketing of mulberry silk cocoon problems, higher price fluctuations was the first and foremost problem faced by both women and men sericulture growers with a Garret's score of 71.92, second foremost problem was absence of quality based pricing with 65.13 Garret's score, followed by lack of financial awareness with 56.56 Garret's score and so on.

Table 4. Constraints faced by women in mulberry silk cocoon production

Sl. No	Particulars	Garrets score	Rank
1	Pests and diseases of silkworms	74.61	I
2	Improper disinfection	55.94	II
3	Shortage and high wage rates of labour	54.07	III
4	Difficulty in obtaining DFLs.	53.63	IV
5	Lack of technical guidance	52.86	V
6	Lack of training needs	51.13	VI
7	Lack of support by family members	49.02	VII
8	Discriminatory wage rates	42.48	VIII
9	Non-availability of good quality mulberry leaves.	38.73	IX
10	Water problem & high temperature during summer	27.52	X

Table 5. Problems faced by women in the marketing of mulberry silk cocoon

Sl. No	Particulars	Garrets score	Rank
1	High price fluctuation in the market	71.92	I
2	Absence of quality based pricing	65.13	II
3	Lack of financial awareness	56.56	III
4	Non-availability of market information	49.12	IV
5	Transportation problem	48.37	V
6	Less access to market and low income earning from cocoons	47.21	VI
7	Less reelers participation in market	36.01	VII
8	Lack of storage facility	25.65	VIII

Table 6. Constraints faced by reelers in mulberry raw silk production

Sl. No	Particulars	Garrets score	Rank
1	High investment costs	74.74	I
2	Women drudgery problems in reeling	67.20	II
3	Less access to new technology	61.54	III
4	Less access to extension participation	51.77	IV
5	Less access to credit	51.65	V
6	Lack of technical guidance	34.22	VI
7	Lack of skilled labours	33.51	VII
8	Limited financial decision making	25.45	VIII

Table 7. Constraints faced by reelers in the marketing of mulberry raw silk

Sl. No	Particulars	Garrets score	Rank
1	High price fluctuations	83.15	I
2	Less access to marketing	79.01	II
3	Non-profitable prices	59.89	III
4	Inadequate marketing facility	15.06	IV
5	Transportation problem	14.88	V

3.4.4 Constraints faced by reelers in mulberry raw silk production

It was noticed from the Table 6 that the high investment costs with 74.74 Garret's score was identified as first rank, second major problem was women drudgery problems in reeling with 67.20 Garrets score, followed by less access to new technology with 61.54 Garret's score, and so on.

3.4.5 Constraints faced in the marketing of mulberry raw silk

It was depicted from the Table 7 that, constraints faced by reelers in the marketing of mulberry raw silk was majorly high price fluctuations of silk yarn with 83.15 Garret's score, followed by the less access to marketing with 79.01 Garret's score, non-profitable prices with 59.01 Garret's score and so on.

4. CONCLUSION

The present study of marketing costs incurred in marketing of cocoons, process of cocoons and constraints in production and marketing of mulberry silk revealed some meaningful results which are marketing cost incurred by various categories of farmers i.e., for overall, was amounted to Rs. 980.78, and Rs.1109.72, Rs.966.98 and 882.14, for marginal, small and medium category farmers, respectively. Producers share in consumer's rupee was estimated to be 34.28 per cent, and the silk weavers getting highest share (42.16 per cent) of the total cost of consumer's price and further price spread was 65.72 per cent to the consumer's rupee. The major constraints faced by women in mulberry cultivation was water scarcity, etc. Constraints encountered in cocoon production was mainly pest and disease of mulberry silkworms. Constraints encountered in marketing of mulberry silk cocoons majorly was high price fluctuations in the market followed by the absence of quality based pricing. The constraints faced by reelers in mulberry silk production are high investment cost and high price fluctuations was observed in marketing of silk.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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