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Cost and returns of mulberry and cocoon production in Chikkaballapura and Kolar districts

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Abstract
The present study was conducted to study the cost and returns of mulberry and cocoon production in Chikkaballapura and Kolar districts which was purely based on the primary data collected in year 2020-21 from the sericulture farmers and intermediaries. A random sampling procedure was adopted for selection of talukas, villages and sample farmers. In Chikkaballapura district two talukas were selected with 50 farmers and 10 intermediaries from each markets, in Kolar district two talukas were selected with 50 farmers and 10 intermediaries were selected from each markets. In case of cost and returns comparison was done with traditional and improved method in mulberry cultivation and cocoon production. The cost of mulberry cultivation was found to be ₹23,882.18 in traditional method, ₹21,481.54 in improved method in Chikkaballapura district and ₹23,890.34 in traditional method ₹21,266.26 in improved method in Kolar district. The cost of cocoon production was found to be ₹34,207.87 in traditional method, ₹33,348.13 in improved method in Chikkaballapura district and ₹36,203.13 in traditional method, ₹33,758.71 in improved method in Kolar district. The role of silk cocoons concentration is very much important in production but the prices of cocoons are fluctuated. So there is a necessity to subsidize the silkworm rearing weavers. Price fluctuation is the major constraint faced by the farmers of sericulture in cocoon markets. So that the government should take care the proper regulation and dissemination of market information and there by stabilize the market price.

Keywords: cost and returns, mulberry, cocoon production, market information

Introduction
The art and science of breeding silkworms for the production of cocoons and silk is known as sericulture. Silk has been known as the "Queen of Textiles" for centuries and no other natural fibre can compare to its shine and elegance with unsurpassed grandeur, natural sheen and intrinsic affinity for colours, great absorbency, light weight, soft touch and excellent durability.

The production of raw silk and silk fabrics are limited to only few countries in the world. China occupies the first place with the production of 53,359 metric tonnes (58.07%) and India holds second position with the production of 33,770 metric tonnes (36.75%), other countries such as Uzbekistan 2,037 metric tonnes (2.21%), Vietnam 795 metric tonnes (0.86%), Thailand 700 metric tonnes (0.76%), Brazil 480 metric tonnes (0.52%), North Korea 370 metric tonnes (0.40%), Iran 270 metric tonnes (0.29%) and Bangladesh, Turkey, Japan, Bulgaria, Madagascar, Indonesia, Philippines, Tunisia, Egypt, South Korea, Syria (0.10%) also contribute to global silk production. The total area under mulberry plantation in India was increasing over a year in 2019-20, total area of mulberry was accounted for 2,35,001.00 hectares and total mulberry silk cocoon production in India was estimated to be 1,85,143.00 metric tonnes. Mulberry silk cocoon was divided into bivoltine cocoons and cross breed cocoons which was measured to the tune of 46,295.00 metric tonnes and 1,38,848.00 metric tonnes, respectively (Anonymous 2020).

Sericulture has been practiced in Karnataka for around 250 years. It was created by King Tippu Sultan, who required high-value, low-volume goods in exchange for guns and ammunition in Europe. The monarchs who succeeded him in Mysore continued to support this enterprise with royal patronage. Because of the favorable environment, governmental assistance and planning, plus the farmer's traditional expertise, Karnataka now ranks first in sericulture. Because sericulture is a state issue, the government of Karnataka developed extensive programmes, such as the Karnataka sericulture project with World Bank funding to promote the state's sericulture sector. The goal was to grow the industry's manufacturing base while also providing a solid infrastructure.

The total area under mulberry plantation in Karnataka during 2019-20, was accounted for 1,05,076.00 hectares of which Chikkaballapura has the highest area 20,666.00 hectares (19.00%) followed by Kolar (18.66%), Ramanagara (18.05%), Mandya (15.66%) and Bengaluru rural district (6.69%) etc., Total mulberry silk cocoon production was formed 79,008.81 metric tonnes, of which highest share was accounted for by Mandya district 21,213.51 metric tonnes (26.84%), followed by Ramanagara shared to 19,492.61 metric tonnes (24.67%), Chikkaballapura was the third-largest producer of mulberry silk cocoon in Karnataka which showed to 12,269.41 metric tonnes (15.52%) and Kolar (12.73%) and so on (Anonymous 2020).

Research Methodology

This study is purely based on primary data regarding the cost and returns of mulberry and cocoon production in selected villages of Shidlaghatta taluka, Chinthamani taluka, Kolar taluka and Srinivasapur talukas. The primary data were collected through personal interview method with the help of well structured and pre- tested schedule in the year 2020-21 from sericulture farmers and intermediaries. The farmers were selected by random sampling method. From each district 2 talukas were selected, from each taluka 5 villages were selected and from each village 5 farmers were selected and 10 market intermediaries were selected from each markets. Thus, the total sample size is 140.

Descriptive analysis

Information on the details of different items of expenditure involved in the cultivation of mulberry like labour used for different cultural operations (per acre), the wages, cost of inputs like farm yard manure (FYM), fertilizers etc, were collected. Cost and returns were worked out on per acre basis for comparison across two sample groups. The data were compared and contrasted with the aid of averages, percentages etc., to obtain meaningful results.

Garrett Ranking Technique

For carrying out this analysis, the mulberry growing, cocoon rearing farmers and intermediaries were asked to mention the most important problems in production and marketing of mulberry silk cocoons by using simple ranking methods. The ranks given by them were quantified using Garrett Ranking Technique using the formula.

Position= 100 (R_{ij} – 0.05/ N_j)

Where, R_{ij} – rank given for i^{th} item by j^{th} individual
N_j- Number of items ranked by j^{th} individual

The per cent position of each rank then converted into scores referring to the table given by Garrett and Woods word (1969). For each factor, the scores of individual respondents were added together and divided by the total number of respondents for whom scores were added. These mean scores for the entire factor were arranged in descending order, ranks were given and most important factors were identified.

Results and Discussion

Cost of Mulberry cultivation

The returns in mulberry cultivation through mulberry leaves, stalks etc. were either assumed or imputed ones in nature. The leaf was not sold but used by the producer himself in cocoon production and the by-products were wholly used by the farm families themselves. Considerable cost was involved for acquiring various resources and also for the maintenance of the mulberry crop. Table1 presents information on the cost incurred in mulberry under two broad heads namely, variable cost and fixed cost on per acre basis. In Chikkaballapura district, the total cost incurred on mulberry cultivation was ₹23,882.18 and ₹21,481.54 in traditional and improved method respectively. Similarly, in Kolar district, the total cost incurred on mulberry cultivation was ₹23,890.34 and ₹21,266.26 in traditional and improved method respectively.

In all the cases, out of total variable cost incurred, cost on human labour accounted to be highest because the sericulture activities like harvesting the mulberry, weeding, chapping of mulberry leaves etc. these activities are only done by the human labour which cannot be compensate with other operations and followed by machine labour, bullock labour and fertilizers. While in case of fixed cost, the depreciation cost accounted to be highest followed by interest on fixed capital and land revenue. The findings were in conformity with Swamy Naika (2017).

Returns from mulberry cultivation

The returns from mulberry cultivation through mulberry shoots were considered. This was because here mulberry leafs and stalks were not sold separately but it used to sell entire mulberry shoot by the producer. The results revealed that the farmers produced mulberry leaves are primarily used for silkworm rearing. Hence, it was difficult to estimate the returns from mulberry cultivation by the producers. From table 2 it was observed that the respondents produced the mulberry cultivation especially for the selling purpose only however, the main product of mulberry cultivation was mulberry shoot. In case of Chikkaballapura district under the traditional method the mulberry shoots quantity is 6,126 kg per acre which were sold at ₹7 per kg, hence the total value was ₹42,882. Whereas under improved method the mulberry shoots quantity was 8,250 kgs per acre which were sold at ₹7 per kg, hence the total value was ₹57,750.

Similarly in case of Kolar district, under the traditional method the mulberry shoots quantity was 6,009 kgs per acre which were sold at ₹ 6.7 per kg, hence the total value was ₹40,260.3. Similarly under improved method the mulberry shoots quantity was 7,819 kgs per acre which were sold at ₹6.7 per kg, hence the total value was ₹52,387.3. It showed that improved method is better than the traditional method because in case of improved method the number of mulberry shoots more compared to traditional method and total output was more in improved method than the traditional method. The similar results are in line with study Susikaran (2020) [6].

Cost of cocoon production

The results revealed in the table 3 the analysis of different cost of cocoon production under two broad heads, namely, variable cost and fixed cost. In Chikkaballapura district, the total cost incurred on cocoon production was ₹34,207.87 and ₹33,348.13 in traditional and improved method respectively. Similarly, in Kolar district, the total cost incurred on cocoon production was ₹36,203.13 and ₹33,758.71 in traditional and improved method respectively. In all the cases, out of total variable cost incurred, cost of mulberry leaves per 100 DFLs accounted to be highest followed human labour, chawki worms, interest on working capital and marketing cost. The cost of human labour is more because the labours required

during the feeding of mulberry leaves to the larvae, harvesting of cocoons from chandrikes etc. while, in case of fixed cost, depreciation cost of rearing room and equipment accounted to be highest followed by interest on fixed capital. The findings were in conformity with Swamy Naika (2017).

Returns from cocoon production

The returns in cocoon production were partly in the form of cash returns which had accrued from the sale of main product and partly in the form of imputed returns on by-products which were entirely used by the farm households themselves. The main product namely cocoons were sorted after harvest into good quality cocoons and substandard cocoons, the later consisting of flimsy, stained and double cocoons together known as "waste" or "jalligoodu". The proportion of substandard cocoons generally increased with the extent of disease in a crop and was minimal in a healthy crop. The results on per acre gross and net returns from cocoon production for 100 DFLs in case of traditional and improved methods in both Chikkaballapura and Kolar districts are presented in table 4. The main returns consisted of cocoon yield (both of good and low quality) and by product composed of crop waste which was used as crop waste/ fodder.

The results indicates that in Chikkaballapura district under traditional method the cocoon yield of 86 kg per acre per 100 DFLs rearing as main product. Whereas in improved method the cocoon yield of 97 kg per acre per 100 DFLs rearing as main product. The gross and net returns in traditional method were ₹35,430 and ₹1,222.13 and in improved method were ₹38,710 and ₹5,361.87. The B.C ratio under traditional method is 1.035 and 1.160 under improved method. Similarly in Kolar district under traditional method the cocoon yield of 94 kg per acre per 100 DFLs rearing as main product. Whereas in improved method the cocoon yield of 98 kg per acre per 100 DFLs rearing as main product. The gross and net returns in traditional method were ₹37,610 and ₹1,406.87 and in improved method were ₹38,335 and ₹4,576.29. The B:C ratio under traditional method was 1.03 and 1.13 under improved method. From the above information it indicated that improved method was superior or better than the traditional method because the yield was more in improved method than the traditional method. The results are in line with the study Subrata Trivedi and Kunal Sarkar (2015).

Marketing cost incurred by silkworm rearing farmers

The results revealed from the table 5 indicates that the total marketing cost per 100 kg of cocoons by the farmers of Chikkaballapura was ₹500, where as Kolar was ₹457. The significant item of cost across the farmers was transport charges and packaging material in the total marketing cost incurred by farmers. The table revealed that the marketing cost incurred by the farmers in Chikkaballapura were higher than Kolar because they had incurred more cost on packaging material and transportation charges since those cost were high for them. In the markets, producers had to pay different marketing charges such as market fee, loading and unloading charges. These findings were in conformity with Roopa (2014).

Marketing cost, margins and price spread under channel

In the study area, only one marketing channel was identified.

Channel I = Producer Wholesaler-cum-reeler

The marketing of cocoons started at producer level and ended at wholesaler-cum- reeler, level then onwards reeling and value addition was taken place. Therefore, from the point of farmers the final stage of marketing of cocoons was wholesaler-cum-reeler. Only one channel was found in the study area. The sale of cocoons was done in government commercial cocoon market, where the producer directly sold to wholesaler-cum-reeler, so there was no price spread issue and final consumer was the reeler who purchased the cocoons for reeling. The results revealed from the table 6 indicated that the marketing efficiency was more in Chikkaballapura district than the Kolar district. The results are similar with the study Soundarya (2019).

Problems faced in mulberry cultivation

The result represented in table 7 that, in both Chikkaballapura and Kolar districts indicated the problems in mulberry cultivation faced by the sericulture farmers was scarcity of labour, as majority of farmers are mainly dependent on agriculture and allied activities and it ranked first in the order followed by lack of knowledge about soil nutrition, improper utilization of water resources, scarcity of water. There are still another six problems listed in the table among them non-awareness about disease management which ranked as the least in the order with garret mean of 43.74. The similar findings were observed in the study Roopa and Murthy (2014).

Problems faced on cocoon production

Table 8 indicated that, in both Chikkaballapura and Kolar districts the majority of the farmers felt that the incidence of pests and diseases was the major constraints in case of cocoon production with garret mean 54.95. Among the pests, incidence of uzi fly was more in Chikkaballapura and Kolar districts. The reduction in cocoon yield was mainly due to incidence of pests and diseases of silkworm. Followed by lack of scarcity, lack of technical guidance, temperature fluctuations. Among the other problems listed in the table, difficulty in obtaining quality DFLs ranked as least constraints with garret mean of 43.21. The results are in line with findings of the study Bindu (2018).

Problems faced in cocoon marketing

The result represented in table 9 that, in both Chikkaballapura and Kolar districts indicated that the majority of the problem in cocoon market was high price fluctuations in market with garret mean 54.68, here the prices varies from produce to produce and time to time and it was ranked as the first in order. Followed by delay in payments was another major constraint due to technical issues during e-payments and some illiterate farmers were not much aware of this new procedure. There were still another seven problems listed in the table among them inadequate market facilities was ranked as least in order in the table. The findings were in conformity with Chandan *et al.* (2015).

Problems faced by reelers

Table 10 indicated that, in both Chikkaballapura and Kolar districts the majority of the problems faced by reelers were labour scarcity with highest garret mean of 21.57 and ranked first in order in the table. This was because, the farmers were mainly dependent on agriculture and allied activities reelers were facing problems with the labour. Followed by highest equipment cost, price fluctuations, water scarcity. Among the other problems listed in the table, non-availability of market

information was ranked as least constraint with garret mean of 18.22. The similar findings were observed in the study Elumalail *et al.* (2019) [2].

Table 1: Cost of mulberry cultivation (Per acre)

Sl. No	Name of the operations	Chikkaballapura(n=50)				Kolar(n=50)			
		Traditional method	Percen tage	Improved method	Percen tage	Traditional method	Percen tage	Improved method	Percen tage
A	**Variable cost**								
1	Human labour	10,500	43.96	8,700	40.49	10,401	43.53	8,400	39.49
2	Bullock labour	2,400	10.04	2,400	11.17	2,400	10.04	2,400	11.28
3	Machine labour	3,000	12.56	3,700	17.22	3,000	12.55	3,700	17.39
4	FYM(tonnes)	600	2.51	800	3.72	600	2.51	800	3.76
5	**Fertilizers**								
	a. Urea	536	2.24	268	1.24	536	2.24	268	1.26
	b. DAP	1,800	7.53	1,200	5.58	1,800	7.53	1,200	5.64
	c. MOP	1,600	6.69	800	3.72	1,600	6.69	800	3.76
6	Irrigation	382	1.59	382	1.77	382	1.59	382	1.79
7	Growth regulators	556	2.32	572	2.66	543	2.27	568	2.10
8	Interest on working capital @ 7%	1,496.18	6.26	1,317.54	6.13	1,488.34	6.22	1,296.26	2.67
	Total variable cost	22,870.18	95.76	20,139.54	93.75	22,750.34	95.22	19,814.26	93.17
B	**Fixed cost**								
1	Land revenue	20	0.08	20	0.09	20	0.08	20	0.09
2	Depreciation	900	3.76	1200	5.58	1000	4.18	1300	6.11
3	Interest on fixed working capital@10%	92	0.38	122	0.56	120	0.50	132	0.62
	Total fixed cost	1012	4.23	1342	6.24	1140	4.77	1452	6.82
	Total cost (A+B)	23,882.18	100	21,481.54	100	23,890.34	100	21,266.26	100

Table 2: Returns from mulberry cultivation (Per acre)

Sl.No	Particulars	Unit	Chikkaballapura (50)		Kolar (50)	
			Traditional method	Improved method	Traditional method	Improved method
a.	Mulberry shoots	Kg	6,126	8,250	6,009	7,819
b.	Price	Rs/kg	7.00	7.00	6.7	6.7
c.	Total value	Rs	42,882	57,750	40,260.3	52,387.3

Table 3: Cost of cocoon production (₹/100 DFLs)

Sl. No	Name of the operations	Chikkaballapura(n=50)				Kolar(n=50)			
		Traditional method	Percen tage	Improved method	Percen tage	Traditional method	Percen tage	Improved method	Percen tage
A	**Variable cost**								
1	Chawki worms	2500	7.30	2500	7.49	2500	6.90	2500	7.40
2	Human labour	8100	23.67	7200	21.59	8400	23.20	7500	22.21
3	Disinfectants								
	a) Bed disinfectants	300	0.87	252	0.75	320	0.88	264	0.78
	b) Lime dust	275	0.80	253	0.75	270	0.74	260	0.77
	c) Bleaching powder	129	0.37	119	0.35	130	0.35	121	0.35
4	Paraffin paper	240	0.70	235	0.70	242	0.66	236	0.69
5	News paper/ Brown paper	152	0.44	120	0.35	155	0.42	115	0.34
6	cost of mulberry leaves	17000	49.69	16780	50.31	17240	47.62	16900	50.06
7	Marketing cost	500	1.46	500	1.49	457	1.26	457	1.35
8	Interest on working capital @ 7%	2043.72	5.97	1957.13	5.86	2174.13	6.00	1984.71	5.87
9	Sub total	29196.00	85.34	27,959	83.83	31,059	85.79	28353	83.98
	Total variable cost	31,239.72	91.32	29,916.13	89.70	33,233.13	91.79	30337.71	89.86
B	**Fixed cost**								
1	Depreciation of rearing room and equipment	2698.32	7.88	3120	9.35	2700	7.45	3110	9.21
2	Interest on fixed capital @ 10%	269.83	0.78	312	0.93	270	0.74	311	0.92
	Total fixed cost	2,968.15	8.67	3,432.00	10.29	2,970	8.20	3421	10.13
	Total cost (A+B)	34,207.87	100	33,348.13	100	36,203.13	100	33,758.71	100

Table 4: Returns from cocoon production (₹ /100 DFLs)

Sl. No	Item	Price/ unit	Chikkaballapura				Price/ unit	Kolar			
			Traditional method		Improved method			Traditional method		Improved method	
			Quantity	Value	Quantity	Value		Quantity	Value	Quantity	Value
Output											
1.	**Main product**										
	a. Cocoon yield (kg)	380	86	32,680	97	36,860	365	94	34,310	98	35,770
	b. Low quality cocoon yield (kg.)	125	16	2,000	10	1,250	125	18	2,250	15	1,875
2.	**By product**										
	a. Mulberry Crop waste/fodder Rs(quintal)	150	5	750	4	600	150	7	1,050	4.6	690
	Total			35,430		38,710			37,610		38,335
Returns											
	Gross returns			35,430		38,710			37,610		38,335
	Total costs			34,207.7		33,348.13			36,203.13		33,758.71
	Net returns			1,222.13		5,361.87			1,406.87		4,576.29
	B:C Ratio			1.035		1.160			1.03		1.13

Table 5: Marketing cost incurred by silkworm rearing farmers (Rs/100 DFLs)

Sl. No	Particulars	Chikkaballapura		Kolar	
		Cost	Percentage	Cost	Percentage
1.	Packing charges	90	18.00	90	19.69
2.	Transport charges	100	20.00	80	17.50
3.	Loading and unloading charges	70	14.00	52	11.37
4.	Market fee	97	19.40	98	21.44
5.	Miscellaneous charges	143	28.60	137	29.97
	Total	500	100.00	457	100.00

Table 6: Marketing cost, margins and price spread under channel (Rs/ kg)

Sl. No	Particulars	Chikkaballapura	Kolar
1.	Producer's sales price	380	365
2.	Marketing cost	5.15	4.66
3.	Net price received by the producer	374.85	360.34
4.	Consumer's price	380	365
5.	Marketing margin	0.00	0.00
6.	Price spread	0.00	0.00
7.	Producer's share in consumer's rupee (percent)	98.72	98.64
8.	Marketing efficiency	77.32	73.79

Table 7: Problems faced in mulberry cultivation (n=100)

Sl. No	Particulars	Mean	Rank
1.	Scarcity of labour	60.51	I
2.	Lack of knowledge about soil nutrition	56.99	II
3.	Improper utilization of water resource	56.01	III
4.	Scarcity of water	55.71	IV
5.	Lack of labour during planting of mulberry	54.53	V
6.	Non adoption the recommended doses of fertilizer	53.39	VI
7.	Non availability of quality mulberry leaves	50.77	VII
8.	Non availability of inputs in time for mulberry cultivation	48.22	VIII
9.	Non availability of vehicles for mulberry transportation	46.00	IX
10.	Non awareness about disease management	43.74	X

Table 8: Problems faced on cocoon production (n=100)

Sl. No	Particulars	Mean	Ranks
1.	Pest and disease incidence	54.95	I
2.	Labour scarcity	52.82	II
3.	Lack of technical guidance	52.13	III
4.	Temperature fluctuations	51.91	IV
5.	Lack of basic amenities like stands, nets, montages etc	50.99	V
6.	Non availability of good quality mulberry leaves	48.09	VI
7.	High cost of silkworm rearing equipment's	45.45	VII
8.	Improper disinfection	44.49	VIII
9.	Difficulty in obtaining quality DFLs	43.21	IX

Table 9: Problems faced in cocoon marketing(n=100)

Sl. No	Particulars	Mean	Rank
1.	High price fluctuations in market	54.68	I
2.	Delay in payments	52.20	II
3.	Malpractices followed in markets	52.18	III
4.	Lack of transportation facility	51.48	IV
5.	Non availability of market information	50.88	V
6.	Lack of storage facility	49.8	VI
7.	Absence of quality based pricing	48.19	VII
8.	Transportation problems	47.64	VIII
9.	Inadequate market facilities	45.67	IX

Table 10: Problems faced by reelers (n=40)

Sl. No	Particulars	Mean	Ranks
1.	Labour scarcity	21.57	I
2.	Highest equipment cost	20.29	II
3.	Price fluctuations	19.70	III
4.	Water scarcity	19.43	IV
5.	Absence of quality cocoons	19.28	V
6.	Electricity problem	19.06	VI
7.	Inadequate storage facility	18.88	VII
8.	Transportation	18.52	VIII
9.	Non availability of market information	18.22	IX

Conclusion

The cost and returns of mulberry and cocoon production in Chikkaballapura and Kolar districts showed that the improved method was superior or better than the traditional method because the yield was more in improved method than the traditional method in both cost of mulberry cultivation and also in cocoon production. Price fluctuation is the major constraint faced by the farmers of sericulture in cocoon markets. So that the government should take care the proper regulation and dissemination of market information and there by stabilize the market price.

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