International Journal of Bio-resource and Stress Management https://pphouse.org/ijbsm.php

Crossref

IJBSM November 2022, 13(11):1148-1156 Print ISSN 0976-3988 Online ISSN 0976-4038 **Article** AR3226b

Research Article *Social Science*

DOI: HTTPS://DOI.ORG/10.23910/1.2022.3226b

An Economic Analysis of Mulberry and Cocoon Production in North Eastern Karnataka

Anil Kumar G. N.[1], Mohith Kumar G. V.[2], Vijaya N. L.[3], Reddy B. S.[4] and Venkataravana Nayaka G. V.[5]

[1]Dept. of Agricultural Economics, College of Agriculture, UAS, Raichur, Karnataka (584 104), India
[2]Dept. of Agricultural Engineering, College of Sericulture, Chintamani, Karnataka (563 125), India
[3]Dept. of Commerce, GFGC, Hebbal, Bangalore, Karnataka (560 024), India
[4]Dept. of Agricultural Economics, UAS, Raichur, Karnataka (584 104), India
[5]Dept. of Agronomy, College of Sericulture, Chintamani, Karnataka (563 125), India

Open Access

Corresponding gvmohith.471@gmail.com

0000-0001-5312-7193

ABSTRACT

The present study is an attempt to assess the silkworm cocoon production and its profitability in North Eastern Karnataka region, India through structured survey during June–September, 2018. The multistage random sampling technique was adopted in designing sampling frame. In the first stage, three districts namely Ballari, Kalaburagi and Raichur districts were selected based on the highest area under mulberry crop. In the second stage two taluks were selected based on the potentiality and highest area under mulberry crop. In the third stage, 10 farmers from selected taluks of the districts were selected randomly in view of spread out of sericulture farmers in different villages. Total sample size of sericulture farmers were 60 respondents. However, 15 market intermediaries representing 5 respondents each from the selected districts constituting village trader and reeler's were chosen randomly and interviewed personally to elicit required information with the help of well-structured and pre-tested schedule. The human labour usage in establishment of mulberry garden was highest in Kalaburagi (53.25 mandays) compared to Raichur (50.30 mandays) and Ballari (46.80 mandays). The variable cost incurred by sericulture farmers was more than 81% of the total cost of cultivation of mulberry. However, the expenditure on human labour (35.97%) was the major constituent of the total cost. The net returns realised by silk cocoon producing farmers was ₹ 55,819 300 DFL^{-1}. The extent of net returns realised was highest in Kalaburagi (₹ 58,708 300 DFL^{-1}) district compared to Raichur (₹ 54,726) and Ballari (₹ 54,025) districts.

KEYWORDS: Sericulture, mulberry, silk cocoon, production cost, returns

***Citation* (VANCOUVER):** Kumar et al., An Economic Analysis of Mulberry and Cocoon Production in North Eastern Karnataka. *International Journal of Bio-resource and Stress Management,* 2022; 13(11), 1148-1156. HTTPS://DOI.ORG/10.23910/1.2022.3226b.

Data Availability Statement: Legal restrictions are imposed on the public sharing of raw data. However, authors have full right to transfer or share the data in raw form upon request subject to either meeting the conditions of the original consents and the original research study. Further, access of data needs to meet whether the user complies with the ethical and legal obligations as data controllers to allow for secondary use of the data outside of the original study.

Funding: The research was conducted with the kind and supports from Institute.

Conflict of interests: The authors have declared that no conflict of interest exists.

RECEIVED on 10th August 2022 RECEIVED in revised form on 20th October 2022 ACCEPTED in final form on 05th November 2022 PUBLISHED on 16th November 2022

1. INTRODUCTION

India is mainly an agriculture-based country with more than 50% of its population dependent on agriculture for their livelihood. Further, about 70% of the people live in rural areas and more than 40% of the rural population still lives below the poverty line mainly due to, the small sized holdings owned by a large proportion of farmer's in the absence of alternative sources of income and employment. Small holders are able to realize only a part of the production potential due to physical, technological and institutional constraints. In order to control migration of rural poor to urban places, Government of India has been encouraging regular income and employment oriented farming approaches, one such potential farming enterprise is sericulture (CSB report, 2017). Sericulture is a cottage industry and one of the most labour intensive sectors in Indian economy combining both agriculture and industry (Suresh, 2017).

India has the unique distinction of being the only country producing all the five known commercial silks, namely, mulberry, tropical tasar, oak tasar, eri and muga. China leads the world with silk production of 1,42,000 mt or 79.99% of the produce. India is the second largest producer of silk in the world and has 17.97% share in global raw silk production (Anonymous, 2018). Some studies were taken to find out the economic prospects of chawki mulberry garden at the farmer's levelin various other parts of India (Viswanathan et al., 2003; Das et al., 2006; Lakshmanan, 2007; Mallikarjuna et al., 2008; Reddy et al., 2010; Mote, et al., 2014; Dewangan, 2017; Rai and Dwivedi, 2017). Mulberry sericulture is practiced mainly in 5 states namely, Karnataka (42.24%), Andhra Pradesh (30.71%), West Bengal (11.67%), Tamil Nadu (8.99%) and Jammu and Kashmir (4.43%), which collectively account for about 98% of the total mulberry silk production in the country (Qadri et al., 2011; Hosali and Murthy, 2015). The women participation in sericulture ranges between 55 and 60%. Due to the significance in the economy, the year 1994 was observed as "the year of women in sericulture" (Rai and Dwivedi, 2017)

Sericulture is one of the important enterprise undertaken by farmers in Karnataka, it is practiced in 19,868 villages and provides direct employment and livelihood to more than 11 lakh persons in the state engaged in different sericultural activities like mulberry cultivation, silkworm rearing, silk reeling, twisting, dyeing and weaving. The area under mulberry in Karnataka during 2017–18 accounted for 98,135 ha with production of 66,833 t of silk cocoons. Further, more than 1.26 lakh families are depending on sericulture and more than 7430 reeling families converts the cocoons in to silk yarn is 9571 mt (Vishakanta, 2018; Savithri et al., 2013). In North Eastern Karnataka Region the people are migrating towards urban areas for employment. There is a lot of unemployment; poverty and failure of crops have been observed in this region. Since sericulture is the labour intensive enterprise which can provide maximum (1000 mandays acre^{-1} annum^{-1}) employment from the point of cultivation of mulberry to final silk weaving stage (Mote et al., 2014; Choudhari et al., 2020). Based on the highest area under mulberry cultivation three districts namely, Ballari, Raichur and Kalaburagi districts were selected for the study (Muniraju, 2017; Mithilasri and Uma, 2018). The collected data were analyzed by simple tabular method, averages and percentages along with the frequencies computed for work out the cost and returns of chawki mulberry leaf production (Hiriyanna et al., 2002; Lakshmanan et al., 2000, Lakshmanan and Geetha Devi, 2005, Srinivasa et al., 2008; Balasaraswathi et al., 2010; Manjunatha et al., 2017).

2. MATERIALS AND METHODS

The study was conducted during *kharif* (June–September, 2018) in North-Eastern Karnataka, (between 15° 00' North and 18° 30' North latitudes and between 75° 00' East and 78° 30' East longitude) which constitutes six districts namely Bidar, Kalaburagi, Yadgir, Raichur, Ballari and Koppal. Out of these six districts, three districts namely Ballari, Kalaburagi and Raichur districts were selected for the study based on the highest area under mulberry crop. The multistage random sampling technique was adopted in designing sampling frame for the study. In the first stage, three districts namely Ballari, Kalaburagi and Raichur districts were selected based on the highest area under mulberry crop in North Eastern Karnataka region. Similarly, in the second stage two taluks were selected based on the potentiality and highest area under mulberry crop in the concerned district. In the third stage, 10 farmers from selected taluks of the districts were selected randomly in view of spread out of sericulture farmers in different villages. Further, while selecting the villages in the selected taluks for identifying the potentiality as well as concentration of sericulture farmers, experiences of the Sericulture Officers at district taluk^{-1} level along with those of market intermediaries were taken by consultation. Thus, total sample size of sericulture farmers was 60 respondents. However, 15 market intermediaries representing 5 respondents each from the selected districts constituting village trader and reeler's were chosen randomly and interviewed personally to elicit required information with the help of well-structured and pre-tested schedule. Thus, the total sample of 75 respondents constituting 60 farmers and 15 market intermediaries were chosen for the study

2.1. Tabular analysis

The data collected were presented in tabular form to

facilitate easy comparisons. The investment pattern, procurement cost, inventory proprietorship, labour usage, production and marketing constraints faced by the producers and market intermediaries, etc., were collected from sample respondents and presented in tabular form. The collected data were summarized with the help of statistical tools like averages and% to obtain meaningful inferences.

3. RESULTS AND DISCUSSION

3.1. Establishment cost of mulberry garden

Mulberry is a perennial crop, once it is established and maintained properly will provide yield up to 15 years. Since mulberry is a labour intensive crop, it generates income throughout the year and provides employment to the people. So it is important to analyse economics of mulberry crop, an attempt has been made to analyse cost of establishment of mulberry garden, use of different inputs, annual labour requirement, cost of cultivation, returns from mulberry crop, etc., For the purpose of drawing meaningful inferences, the cost of production of mulberry leaves are divided in two broad categories viz., the establishment costs and the production costs.

The establishment costs are those costs which are incurred on materials during establishment of a mulberry garden in the first year. The information on the physical inputs including labour requirement and the corresponding money values for the establishment of mulberry garden during the reference year is furnished in Table 1. The cost of establishment of mulberry garden across the districts in study area indicated that cost on human labour was ₹13165

Table 1: Establishment cost of mulberry garden (acre^{-1})

S I . No	Items	Unit	Ballari		Kalaburagi		Raichur		Overall	
			Quan-tity	Value (₹)	Quan-tity	Value (₹)	Quan-tity	Value (₹)	Quan-tity	Value (₹)
A. Variable cost										
1.	Cuttings saplings^{-1}	No.	5454	12434 (24.79)	5702	9546 (18.40)	5515	12871 (24.42)	5557	11617 (22.52)
2.	FYM	T	3	1982 (3.95)	4	2736 (5.27)	3	2112 (4.01)	3	2277 (4.41)
3.	Fertilizers	kg	105	2046 (4.08)	114	3324 (6.41)	117	3200 (6.07)	112	2857 (5.54)
4.	Transportation of saplings	₹	-	702 (1.40)	-	580 (1.12)	-	570 (1.08)	-	617 (1.20)
5.	Weedicides	L	0.65	354 (0.71)	0.54	294 (0.57)	0.67	365 (0.69)	0.62	338 (0.66)
6.	Growth regulators	L	0.82	563 (1.12)	0.85	552 (1.06)	0.57	374 (0.71)	0.75	496 (0.96)
7.	Irrigation		-	4709 (9.39)	-	4607 (8.88)	-	4393 (8.33)	-	4569 (8.86)
8.	Human labour	MD	46.80	12519 (24.95)	53.25	14111 (27.20)	50.20	12890 (24.46)	50.08	13165 (25.53))
9.	Bullock labour	BP	5.40	7209 (14.37)	6.10	8235 (15.87)	5.95	8300 (15.75)	5.81	7915 (15.35)
10.	Machine labour	h	1.00	450 (0.90)	1.20	540 (1.04)	1.00	450 (0.85)	1.06	480 (0.93)
11.	Miscellaneous	₹	-	387 (0.77)	-	364 (0.70)	-	370 (0.70)	-	374 (0.73)
12.	Interest on working capital @7% p.a	₹	-	3035 (6.05)	-	3142 (6.06)	-	3213 (6.10)	-	3129 (6.07)
	Sub-total (A)	₹	-	46390 (92.47)	-	48031 (92.58)	-	49108 (93.17)	-	47834 (92.74)

Table 1: Continue...

S I. No	Items	Unit	Ballari		Kalaburagi		Raichur		Overall	
			Quantity	Value (₹)	Quantity	Value (₹)	Quantity	Value (₹)	Quantity	Value (₹)
B. Fixed cost										
1.	Rental value of land	₹	-	3500 (6.98)	-	3567 (6.88)	-	3333 (6.32)	-	3467 (6.72)
2.	Land revenue	₹	-	30 (0.06)	-	30 (0.06)	-	30 (0.06)	-	30 (0.06)
3.	Interest on fixed capital @ 7% p.a	₹	-	247 (0.49)	-	252 (0.49)	-	235 (0.45)	-	245 (0.48)
	Sub-total (B)	₹	-	3777 (7.53)	-	3849 (7.42)	-	3598 (6.83)	-	3742 (7.26)
C.	Total cost (A+B)	₹	-	50167 (100)	-	51880 (100)	-	52706 (100)	-	51576 (100)

Note: Decimal values are rounded up to its nearest value; Establishment cost is for 4 months; Figures in parenthesis indicate percentage to the respective total

(25.53%) acre^{-1} this shows that establishment of mulberry garden was labour intensive. However, the availability of labour especially during establishment was major concerned and availability was inadequate as perceived by the farmers during their opinion survey. Therefore, in order to reduce the cost on establishment of mulberry, there is immediate need to develop the labour saving devices such as improved tools for planting, use of weedicides, shoot harvester, etc. Next to human labour the other major cost was planting materials amounting of ₹ 11617 (22.52%) followed by cost on bullock labour which amounted to ₹ 7915 (15.35%), irrigation ₹ 4569 (8.86%), fertilizers ₹ 2857 (5.54%), cost on farm yard manure (4.41%), growth regulators and weedicides (1.62%), transportation of saplings (1.20%) and machine labour (0.93%). Thus, the acre^{-1} total cost of establishment of mulberry garden worked out to be ₹ 51,576. The rental value of land formed major component (6.72%) of establishment cost among the fixed costs. Similar findings were reported by Balasaraswathi et al. (2010).

3.2. Labour use pattern in establishment of mulberry garden

Proper establishment of mulberry garden for optimum bio-mass production is most critical for obtaining higher returns from sericulture enterprise. Sericulture is a labour intensive and the efficient use of labour determines the success of the enterprise. The operation wise human labour requirement along with bullock and machine powers gives clear picture of the labour cost in establishment of mulberry garden. The details of labour use pattern are presented in Table 2. The labour use pattern by the sample farmers across the districts showed that on an average the total human labour required for the establishment of mulberry garden was 50.09 mandays while bullock labour and machine power requirement was 5.80 pair days and 1.06 machine hours respectively. Among the different items weeding operation utilized maximum labour (23.61%) followed by planting of mulberry cuttings (19.76%), application of farm yard manure (14.63%) and fertilizers (14.29%), irrigation (10.18%) and transportation of saplings (7.90%), spraying and intercultivation (5.19%) and cuttings of plant material (4.41%). The findings of the study are in line with study conducted by Lakshmanan and Geetha Devi (2007). The estimated labour utilization pattern of mulberry garden establishment clearly indicated that human labour, bullock pairs and machine hours used to the maximum extent. The maximum number of labours used for weeding operation mainly due to sensitivity of mulberry crop to weeds during early stage of garden establishment and also 3–4 times weeding operations were taken up by farmers in subsequent period because of longer gestation period of mulberry crop. The cleaned mulberry garden with frequent weeding will also help to boost the growth of mulberry bio-mass resultant production of quality leaves with higher yield.

3.3. Costs and returns of mulberry cultivation

Higher amount of cost is involved for purchase of various resources for the maintenance of the mulberry garden. The estimation of cost incurred on mulberry cultivation were discussed under two broad category namely, variable costs and fixed costs on acre^{-1} basis. The different items of costs aspercentage of their respective totals provided the relative importance of each cost. Hencepercentage are also worked out and presented in Table 3. On an average, farmers incurred a total cost of cultivation of ₹ 22,324 acre^{-1}, of which variable cost accounted for more than 80.16%. Among the variable costs expenditure on human labour (₹ 7944) constituted 35.59% of total cost of cultivation followed by expenditure on irrigation (15.35%), fertilizers

Table 2: Operation wise labour use pattern in establishment of mulberry garden (acre^{-1})

S I . No.	Particulars	Ballari			Kalaburagi			Raichur			Overall		
		HL	BL	ML	HL	BL	ML	HL	BL	ML	HL	BL	ML
1.	Ploughing	-	2.95 (54.62)	1.00 (100)	-	2.95 (48.36)	1.20 (100)	-	3.00 (50.42)	1.00 (100)	-	2.96 (51.03	1.06 (100)
2.	Harrow-ing	-	1.10 (20.37)	-	-	1.55 (25.40)	-	-	1.45 (24.36)	-	-	1.36 (23.44)	-
3.	Cutting of plant material	2.10 (4.48)	-	-	2.55 (4.78)	-	-	2.00 (3.98)	-	-	2.21 (4.41)	-	-
4.	Transpor-tation of cuttings saplings^{-1}	3.60 (7.69)	-	-	4.40 (8.26)	-	-	3.90 (7.75)	-	-	3.96 (7.90)	-	-
5.	Applica-tion of FYM	6.55 (13.99)	-	-	7.10 (13.33)	-	-	8.35 (16.60)	-	-	7.33 (14.63)	-	-
6.	Opening of ridges and fur-rows	-	1.35 (25.00)	-	-	1.60 (26.22)	-	-	1.50 (25.21)	-	-	1.48 (25.51)	-
7.	Planting	9.60 (20.51)	-	-	10.40 (19.53)	-	-	9.70 (19.28)	-	-	9.90 (19.76)	-	-
8.	Fertilizer applica-tion	6.20 (13.24)	-	-	8.15 (15.30)	-	-	7.15 (14.21)	-	-	7.16 (14.29)	-	-
9.	Irrigation	5.20 (11.11)	-	-	5.10 (9.57)	-	-	5.00 (9.94)	-	-	5.10 (10.18)	-	-
10.	Weeding	10.95 (23.39)	-	-	13.05 (24.50)	-	-	11.50 (22.86)	-	-	11.83 (23.61)	-	-
11.	Spraying and inter cultivation	2.60 (5.55)	-	-	2.50 (4.69)	-	-	2.70 (5.36)	-	-	2.60 (5.19)	-`	-
Total		46.80	5.40	1.00	53.25	6.10	1.20	50.30	5.95	1.00	50.09	5.80	1.06

Note: Figures in parenthesis indicate percentage to the respective total; HL: Human labour (MD), BL: Bullock labour (PD), ML: Machine labour (h)

(11.27%), bullock labour (7.62%), farm yard manure (4.05%) and growth regulators (1.05%). The rental value of land formed major component (11.65%) of the total cost of cultivation among the fixed costs. The apportioned establishment cost (5.78%) was the second important items of fixed costs. Similar pattern of cost structure was observed in all the selected districts of NEK region. However, the total cost of cultivation in Kalaburagi (₹ 23,112 acre^{-1}) district was found to be relatively higher than Ballari (₹ 22,042 acre^{-1}) and Raichur(₹ 21,817 acre^{-1}) districts as well as overall (₹ 22,324 acre^{-1}) average. Kumaresan et al. (2010) and Purushotham and Rama mohan Rao (2009) were found similar findings in their study. Munikrishnappa et al. (2009) in their study on economics of sericulture in drought prone region of Andhra Pradesh obtained total cost of mulberry leaf production of ₹ 24,752.

The gross returns of mulberry leaves were also estimated through imputed value because of majority of the farmers did not sold mulberry leaves to other mulberry cultivating farmers. However, some of the mulberry cultivating farmers purchased leaves as and when necessity arises and those prices were taken in to consideration for estimating returns from mulberry leaves. The prevailing price of the mulberry leaves in Kalaburagi, Raichur and Ballari districts were

Table 3: Costs and returns under mulberry cultivation

SI. No.	Particulars	(₹ rearing^{-1} acre^{-1})			
		Ballari	Kalaburagi	Raichur	Overall
A.	Variable cost				
1.	Human labour	7921 (35.94)	8281 (35.83)	7629 (34.97)	7944 (35.59)
2.	Bullock labour	1495 (6.78)	1739 (7.52)	1869 (8.57)	1701 (7.62)
3.	FYM	906 (4.11)	981 (4.24)	825 (3.78)	904 (4.05)
4.	Fertilizers	2406 (10.92)	2612 (11.30)	2526 (11.58)	2515 (11.27)
5.	Irrigation	3532 (16.02)	3455 (14.95)	3295 (15.10)	3427 (15.35)
6.	Growth regulators	220(1.00)	299 (1.29)	184 (0.84)	234 (1.05)
7.	Interest on working capital @ 7%	1154 (5.24)	1216 (5.26)	1142 (5.23)	1171 (5.25)
	Sub-total (A)	17634 (80.00)	18583 (80.40)	17470 (80.40)	17896 (80.16)
B.	Fixed cost				
1.	Land revenue	89 (0.40)	90 (0.39)	89 (0.41)	89 (0.40)
2.	Depreciation	234 (1.06)	256 (1.11)	242 (1.11)	244 (1.09)
3.	Rental value of land	2625 (11.91)	2675 (11.57)	2500 (11.46)	2600 (11.65)
4.	Interest on fixed capital @ 7%	206 (0.93)	211 (0.91)	198 (0.91)	205 (0.92)
5.	Apportioned establish-ment cost	1254 (5.69)	1297 (5.61)	1318 (6.04)	1290 (5.78)
	Sub-total (B)	4408 (20.00)	4529 (19.60)	4347 (19.92)	4428 (19.84)
C.	Total cost (A+B)	22042 (100)	23112 (100)	21817 (100)	22324 (100)
D.	Returns				
1.	Main product	41440	44220	41762	42474
2.	By product	902	1275	1121	1099
3.	Gross returns	42342	45495	42883	43573
4.	Net returns	20300	22383	21066	21250

Note: Decimal values are rounded up to its nearest value; Figures in parenthesis indicatepercentage to respective total

6.60, 6.50 and 6.40 kg^{-1} respectively. The overall average net returns obtained by mulberry cultivators amounted to ₹ 21,250 acre^{-1} with gross returns of ₹ 43,573 acre^{-1}. However, farmers of Kalaburagi (₹ 45,495 acre^{-1}) district realized higher amount of gross returns compared to Raichur (₹ 42,883 acre^{-1}) and Ballari (₹ 42,342 acre^{-1}) districts. Similarly, net returns obtained by Kalaburagi (₹ 22,383 acre^{-1}) were relatively high compared to Raichur (₹ 21,066 acre^{-1}) and Ballari (₹ 20,300 acre^{-1}) districts.

3.4. Cost of silkworm cocoon production

A perusal of Table 4 revealed that the cost structure in silkworm cocoon production was found to be similar to that of mulberry presented in the earlier section. However, farmers of Raichur (₹ 79,910 300DFL^{-1}) district incurred marginally higher cost on silkworm cocoon production compared to Kalaburagi (₹ 76,520 300DFL^{-1}) and Ballari (₹ 75,395 300DFL^{-1}) districts.The overall average cost of silkworm cocoon production amounted to ₹ 77,277 rearing^{-1} of which ₹ 70994 (91.87%) was incurred on variable costs. Out of the total cost of silkworm rearing, the expenditure on mulberry leaves (54.96%) formed the major component followed by cost on human labour (10.93%). The expenditure on Disease Free Layings (DFLs) (8.84%), marketing expenses (6.68%), disinfectants (2.40%), paraffin paper (1.05%), etc. were the other important variable costs while depreciation cost of equipment (7.60%) formed major cost among fixed costs. It is worth noting that the similar pattern of cost structure was observed in all the selected study districts.

However, the total cost of silkworm production in Raichur (79,910 300 DFL^{-1}) was found to be marginally higher than that of Kalaburagi (₹ 76,520 300 DFL^{-1}) and Ballari (₹ 75,395 300 DFL^{-1}) district farmers. Similar pattern of cost structure of variable cost distribution was observed

Table 4: Cost of silkworm cocoon production

SI. No.	Item	(₹ 300 DFL^{-1})			
		Ballari	Kalaburagi	Raichur	Overall
A.	Variable cost				
1.	DFLs	6930 (9.19)	6825 (8.92)	6735 (8.43)	6830 (8.84)
2.	Transportation cost of chawki worms	525 (0.70)	510 (0.67)	493 (1.62)	509 (0.66)
3.	Human labour	8352 (11.08)	8305 (10.85)	8695 (10.88)	8451 (10.93)
4.	Disinfectants				
	a. Bed disinfectants	161 (0.21)	192 (0.25)	171 (0.21)	175 (0.23)
	b. Lime dust	1100 (1.46)	1400 (1.83)	1627 (2.04)	1376 (1.78)
	c. Bleaching powder	248 (0.33)	231 (0.30)	438 (0.55)	306 (0.39)
5.	Paraffin paper	750 (0.99)	830 (1.08)	860 (1.08)	813 (1.05)
6.	Waste paper	232 (0.31)	220 (0.29)	267 (0.33)	240 (0.31)
7.	Mulberry leaves	41440 (54.96)	41762 (54.58)	44220 (55.34)	42474 (54.96)
8.	Marketing cost	5080 (6.74)	5358 (7.00)	5053 (6.32)	5165 (6.68)
9.	Interest on working capital @ 7%	4545 (6.03)	4603 (6.01)	4817 (6.03)	4655 (6.02)
	Sub total	69363 (92.00)	70236 (91.79)	73376 (91.82)	70994 (91.87)
B.	Fixed cost				
1.	Depreciation	5637 (7.48)	5873 (7.67)	6107 (7.64)	5872 (7.60)
2.	Interest on fixed capital @ 7%	395 (0.52)	411 (0.54)	427 (0.53)	411 (0.53)
	Sub total	6032 (8.00)	6284 (8.21)	6534 (8.18)	6283 (8.13)
C.	Total cost (A+B)	75395 (100)	76520 (100)	79910 (100)	77277 (100)

Note: Decimal values are rounded up to its nearest value; Figures in parenthesis indicate percentage to the total

in all the selected districts. The cost on mulberry leaves and human labour have shared a major component of the total cost incurred by the farmers on cocoon production. This is in confirmation with results reported by Rao et al. (2001) and also Srinivasa et al. (2001). Marketing costs accounted as the fourth largest operational cost owing to long distance travelled by farmers to sale their produce in Ramanagara market. The remaining cost was distributed for disinfectants, transportation cost of DFLs and purchase of paraffin and newspapers, etc. The comparison of acre^{-1} cost incurred on silkworm cocoon production across the districts indicated that the magnitude of costs and their proportions for most inputs remained same. However, imputed cost of mulberry leaves and human labour were relatively high in Raichur (₹ 44220 and ₹ 8695) compared to Kalaburagi (₹ 41762 and ₹ 8305) and Ballari (₹ 41440 and ₹ 8352) districts.

3.5. Returns from silkworm cocoon production

A perusal of Table 5 revealed that the overall average yield obtained by farmers was 252.46 kg 300 DFLs^{-1}. The yield was obtained in the form of good quality cocoon and jelly (second grade) cocoon. Whereas, by-product consists of manure and crop waste.It could be seen from the table that on an average, farmers of Kalaburagi district realised relatively higher cocoon yield (254 kg 300 DFL^{-1}) rearing^{-1} compared to farmers of Raichur (238 kg 300 DFL^{-1}) and Ballari (232 kg 300 DFL^{-1}). The findings of the study are contrary to the results reported by Chandrappa et al. (2001) in his study on comparative economics of mulberry silkworm cocoon production - shoot vs. shelf rearing method, wherein cocoon yield reported was 52.10 kg for 100 DFLs in shoot feeding method of rearing. Similarly, Rao et al. (2001) reported the average yield obtained by the farmers of Chittoor and Eluru was 42.99 and 38.50 kg 100 DFL^{-1}respectively and Gururaj et al. (2007) who also reported a yield of 52.22 kg 100 DFL^{-1}.

The overall average net returns obtained by silkworm cocoon producing farmers amounted to ₹ 55819 300 DFL^{-1} with gross returns of ₹ 133094. However, farmers of Kalaburagi (₹ 58708) district obtained relatively higher net returns as

Table 5: Returns from silkworm cocoon production (Returns in ₹ 300 DFL^{-1})

Sl. No.	Item	Unit	Ballari			Kalaburagi			Raichur			Overall		
			Quantity	Price	Value	Quantity	Price	Value	Quantity	Price	Value	Quantity	Price	Value
1. Gross return														
a.	Cocoon yield	kg	232	537	124602	254	512	130175	238	545	129750	241.51	535	128176
b.	Jelly cocoon	kg	11	94	1064	11	91	975	11	95	1032	10.95	93	1024
c.	Crop waste	kg	900	138	1238	800	138	1080	800	140	1073	813	139	1131
d.	Manure	t	3	810	2515	4	830	2997	3	812	2777	3.36	817	2763
	Sub total	₹	-	-	129420	-	-	135228	-	-	134636	-	-	133094
2.	Total costs	₹	-	-	75395	-	-	76520	-	-	79910	-	-	77277
3.	Net returns	₹	-	-	54025	-	-	58708	-	-	54726	-	-	55819
4.	Returns ₹-1 of investment	-	-	-	1.71	-	-	1.76	-	-	1.68	-	-	1.72

Note: Decimal values are rounded up to its nearest value; 1 US$= INR 72.09 (avg. value of September, 2018)

compared to the farmers of Raichur (₹ 54726) and Ballari (₹ 54025) districts. As a result, returns ₹ $^{-1}$ of investment was high in case of Kalaburagi district (₹ 1.76) compared to Ballari (₹ 1.71) and Raichur (₹ 1.68) districts.

4. CONCLUSION

The acre^{-1} total investment required for establishment of mulberry garden was ₹ 44,150. The human labour usage in establishment of mulberry garden was highest in Kalaburagi (53.25 mandays) compared to other districts. Expenditure on mulberry leaves (54.96%) was the major constituent of total variable cost. The net returns realized by silk cocoon producing farmers was ₹ 55,819 300 DFL^{-1}. The extent of net returns realized was highest in Kalaburagi (₹ 58,708 300 DFL^{-1}) compared to Raichur (₹ 54,726) and Ballaari (₹ 54,025) districts.

5. ACKNOWLEDGEMENT

Author(s) acknowledge the supports from institutes involved

6. REFERENCES

Anonymous, 2018. Annual Report, 2017-18. Department of Sericulture, Government of Karnataka, Bangalore, India, 45-49.

Anonymous. 2017. Central Silk Board annual report, Ministry of Textiles, Govt. of. India.

Balasaraswathi, S.S., Lakshmanan, A., Mani, A., Shanthi, A.M., Qadri, S.M.H., 2010. An economic analysis of cocoon production in Theni district of Tamil Nadu. Indian Journal of Sericulture 49(1), 81-85.

Chandrappa, D., Umesh, K.B., Nageshchandra, B.K., 2001. Comparative economics of mulberry cocoon production- Shoot vs. shelf rearing method. Mysore Journal of Agricultural Sciences 35(3), 265-269.

Choudhari , S.D., Perke, D.S., Jadhav, D.S., 2020. Economics of mulberry leaves production in Parbhani district. International Journal of Current Microbiology and Applied Sciences 11, 787-793.

Das, P.K., Bhigesha, K., Rajanna, L., Hiriyanna, S.B., Dandin, 2006. Validation of package of practices of exclusive Chawki mulberry garden for commercial chawki rearing and economics. Indian Journal of Sericulture 45(1), 30-34.

Dewangan, S.K., 2017. Role of women in sericulture, observation of two tribal block of Raigarh district, Chhattisgarh, India. Journal of Emerging Technologies and Innovative Research 4(12), 524-529.

Gururaj, R., Magadum, S.B., Dandin, S.B., 2007. Sericulture at Kodagapura: A case study. Indian Silk 46(2), 20-21.

Hiriyanna, T.P., Swamy, P., Kumaresan, N.B., Vijayaprakash, 2002. Comparative economics of bivoltine hybrids with multihybrid cocoon production. Indian Journal of Sericulture 41(1), 38–41.

Hosali, R., Murthy, C., 2015. To analyse the cost of mulberry and cocoon production in Haveri district. International Journal of Commerce and Business Management 8(1), 58–63.

Kumaresan, P., Jaishankar, Qadri, S.M.H., 2010. Impact of urbanization on sericulture development in Karnataka. Journal of Rural Development 29(2), 113–123.

Lakshmanan, S., Geetha Devi, R.G., 2005. Studies on economics of sericulture under dry farming condition in Chamarajanagar District of Karnataka. Indian Journal of Sericulture 44(2), 183–185.

Lakshmanan, S., Geetha Devi, R.G., 2007. Employment opportunities in sericulture. Indian Silk 46(7), 18–20.

Lakshmanan, S., Geetha Devi, R.G., Suma, N., 2000. Studies on economics of bivoltine versus cross-breed cocoon production in K.R. Nagar taluk of Mysore district. Indian Journal of Sericulture 39(2), 149–151.

Mallikarjuna, B., Lakshmanan, S., Munikrishnappa, H.M., and Geetha Devi, R.G., 2008. Comparative study of a few agricultural crops in Mandya- An economics analysis. Indian Journal of Sericulture 47(1), 118–121.

Manisha, P., Shinde, H.P., Bagde, A.S., 2021. Economic analysis of silk cocoon production in Maharashtra. The Pharma Innovation Journal 10(11), 534–538.

Manjunatha, N., Wilson, W., Kispotta, Ashoka, J., 2017. An economic analysis of silkworm cocoon production: A case study in Kolar district of Karnataka, Agricultural Science Digest 37(2), 141–144.

Mithilasri , M., Uma, K., 2018. Cost of chawki mulberry leaf production - a study in Tamil Nadu, India. Trends in Biosciences 11(22), 3089–3093.

Mote, T.S., Sanase, S.L., 2014. Statistical trend analysis of global production, export and imports scenario of Raw silk. International journal of Statistika and Mathematika 10(2), 31–35.

Munikrishnappa, H.M., Lakshmanan, S., Geethadevi, R.G., Mallikarjuna, B., 2009. A study on economics of sericulture in drought prone region of Andhra Pradesh. Indian Journal of Sericulture 48(2), 201–203.

Muniraju, E., 2017, Directory of Sericulture Technologies. KSSR&DI Publication. No. 91, 1028.

Purushotham, S., Rama Mohan Rao, P., 2009. Economics of sericulture in Ananthapur district of Andra Pradesh. Agricultural Science Digest 29(2), 120–122.

Qadri, S.M.H., Kumaresan, P., Nirmal Kumar, S., 2011. Future vision on sericulture. In: Proceedings of Golden Jubilee National Conference on Sericulture Innovations: Before and Beyond. CSR&TI, Mysore, January 28–29.

Rao, M.V., Kumaresan, P., Prakash, N.B.V., 2001. Comparative economics of cocoon production in coastal area and traditional area of Andhra Pradesh. Indian Journal of Sericulture 40(2), 147–150.

Rai, S., Dwivedi, R.K., 2017. Forecasting area, production and productivity of mulberry silk in India. International Journal of Science and Research 6(3), 556–563.

Reddy, P.S., Reddy, B.K., Raju, S.C., 2010. A comparative study on economics of mulberry with other commercial crops of Andhra Pradesh. Agricultural Science Digest 30(1), 37–41.

Savithri, G., Sujathamma, P., Neeraja, N., 2013. Indian sericulture industry for sustainable rural economy. International Journal of Economics and Business Research 3(2), 73–78.

Srinivasa, G., Sarangi, R.N., Geetha, G.S., Geethadevi, R.G., Prakash, N.B.V., 2001. Cropping patterns and income levels of sericulturists in Mandya district, Karnataka – A comparative study. Indian Journal of Sericulture 40(2), 119–126.

Suresh, 2017. Economic analysis of resource uses efficiency in sericulture. Indian Journal of Sericulture 47(1), 29–33.

Vishakanta, 2018. An economic analysis of area, production and productivity of sericulture in India and Karnataka. International Journal of Research in Applied Science & Engineering Technology 45(6), 3266–3272.

Viswanathan, K.U., Jayaram, B., Reddy, C.V., 2003. Sericulture in Kolar and Tumkur districts of Karnataka (An Ex- post Evaluation study). National Bank for Agriculture and rural development Regional office, angalore, India, 39–53.