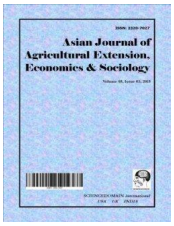

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Comparative Costs and Returns of Mulberry and Cocoon Production under Rainfed and Irrigated Conditions - An Economic Analysis

M. Raju[1] and B. Sannappa[1*]

[1]Department of Studies in Sericulture Science, University of Mysore, Manasagangotri, Mysuru – 570 006, India.

Authors' contributions

This work was carried out in collaboration between both authors. The lead author MR designed the study, managed the literature searches, wrote the methodology and wrote the first draft of the manuscript. Author BS supervised the data collection, managed the analyses of the study and fine-tuned the manuscript. Both authors read and approved the final manuscript.

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ABSTRACT

A study has been undertaken to work out the costs involved and returns generated in mulberry and cocoon production among the farmers of rainfed and irrigated conditions in Chamarajanagar district of Karnataka state, India. In mulberry production, costs (fixed and variable) involved in the production of mulberry was lower with rainfed farmers over irrigated farmers with lesser among small farmers over medium and big farmers. The unit cost of mulberry production was lower under the irrigated condition as compared to the rainfed condition being lower among big farmers over medium and small farmers. However, gross returns, net returns and B:C ratio were more under irrigated condition over rainfed condition with higher being among big farmers over medium and small farmers. In cocoon production, the total cost of cocoon production was lower with rainfed farmers as compared to irrigated farmers with lesser among small farmers category over medium and big farmers category. The unit cost of cocoon production was lower under irrigated farmers over rainfed farmers with least being among medium farmers over big and small

**Corresponding author: E-mail: drbsannappa@gmail.com;*

farmers. Grass returns, net returns and B:C ratio were more under the irrigated condition when compared to rainfed condition with better returns among big farmers over medium and small farmers.

Keywords: Costs; returns; mulberry; cocoon; rainfed farmers; irrigated farmers.

1. INTRODUCTION

Sericulture is an agro-based industry which involves multi-disciplinary programmes like cultivation of food plants, silkworm rearing and cocoon production and silk reeling. It is a labour intensive rural industry assumes the importance of its own, particularly in India where employment opportunities have to be created especially in the rural areas to provide gainful employment to the underemployed, the unemployed and the landless persons. The inherent economics of sericulture and its capacity to give quick returns have brought a change in the values.

Indian sericulture industry falls under Mahatma Gandhi's classification of a technology based on "production by masses and not by production methods" thus; sericulture is both a way of life and a means to the security of livelihood in well over 50 thousand villages in the country. It is this form of industry that is most relevant to our current socio-economic conditions. The investment needs are low. The industry can substitute for knowledge and labour for capital. It provides an opportunity for unskilled to become skilled.

Sericulture in India has turned out to be a highly remunerative enterprise with minimum capital base and yielding reasonably good returns *vis-a-vis* other enterprises. It is one of the stable enterprises which provide a regular flow of returns in the tropical states like Karnataka, Tamil Nadu, Andhra Pradesh, Maharashtra and Kerala of the country throughout the year. Sericulture effectively transfers urban wealth to rural producers. It provides not only periodical return within a short period of time, but also assures potential family employment opportunities around the year.

Karnataka enjoys the lion's share (45%) in producing mulberry raw silk in India [1]. The sericulture industry has seen its glorious past way back in 18th century when Tippu Sultan, the powerful ruler of the erstwhile State of Mysore, initiated a number of developmental measures. Considering the socio-economic and ecological backdrop of the Karnataka state, sericulture is conceived to be an excellent economic support to the farmers especially those having marginal and medium level land holdings. It provides gainful employment and periodical income besides bringing significant change both in social and economic spheres of the rural and semi-urban areas and avoiding the migration of rural force to urban areas.

Even though sericulture is considered to be one of the important agricultural activities, the measurement of economic returns and the relative contribution of various inputs in the cocoon production system under rainfed and irrigated conditions play a major role in determining the cost of cocoon production. The pace of adoption of an innovation and consequent diffusion on a large scale is an essential feature of sericultural development. The adoption of innovations at an accelerated pace by a large number of farmers is essentially a social process conditioned by a variety of factors within and outside the social system concerned.

Sericulture is a remunerative crop for all categories of farmers with short gestation period and quick returns. The economics of sericulture depends on utilization and management of various resources and inputs. Sericulture uplifts and ameliorates the economic conditions of farmers by way of diversifying the farming system, high-income generation at frequent intervals and providing off-farm employment opportunities [2]. In this backdrop, a study has been taken up to work out the economics of mulberry and cocoon production among the rainfed and irrigated farmers in Chamarajanagar district of Karnataka state, India.

2. METHODOLOGY

The investigation has been conducted in Chamarajanagar district of Karnataka, State, India. Karnataka state has 70,958 ha of mulberry of which the crop occupies 1,103.97 ha in Chamarajanagar district. The district has four taluks with a total geographical area of 5,69,901 ha. It is located in the southern tip of Karnataka state and lies between the North latitude 11^{o} 40' and 12^{o} 06' and East longitude 76^{o} 24' and 77^{o}

46'. The district chiefly comprises red sandy loam soil, in addition to having black cotton soil in some pockets. The district receives an average annual rainfall of 791 mm. Altogether, 2821 farmers are practising sericulture both under rainfed and irrigated conditions in as many as 254 sericultural villages (Department of Sericulture, Govt. of Karnataka).

The district was purposively selected for the study as it has both rainfed (187.47 ha) and irrigated (916.50 ha) mulberry. However, Chamarajanagar and Gundlupet taluks have both irrigated and rainfed areas, while Kollegal and Yelandur taluks posses only irrigated areas.

A total of 240 farmers, 120 each under rainfed (Chamarajanagar and Gundlupet taluks) and irrigated (Kollegal and Yelandur taluks) conditions comprising 60 farmers in each taluk were considered for the study. The selection of villages and number of farmers interviewed for the collection of data in each taluk depends on the mulberry area and number of farmers practising sericulture. The study was formulated based on the preliminary field survey and in consultation with Technical Staff of the State Department of Sericulture in different taluks of the Chamarajanagar district.

The information pertaining mulberry and cocoon yields among the farmers of the rainfed and irrigated conditions was collected through formal discussion using an interview schedule. Further, both under rainfed and irrigated conditions, classifications of respondents were categorized into three groups namely big, medium and small land holding based on mulberry holding size as mentioned in Table 1.

2.1 Costs and Returns of Mulberry and Cocoon Production

The costs-return analysis was worked out separately for mulberry (Rs./acre/year) and cocoon (Rs. 100 DFLs) both under rainfed and irrigated conditions among three categories of farmers namely small, medium and big farmers. For the purpose of collecting primary data, a structured schedule was used [3].

2.2 Cost of Mulberry Production

Mulberry is a perennial crop and once it is established properly during the first six months, it will start yielding in the second year and lasts for 15 to 20 years without a significant reduction in yield. Based on the variety and plantation system practised, the cost of mulberry cultivation was worked out. The cost of cultivation includes establishment cost (fixed cost) and maintenance cost (variable cost).

2.3 Establishment Cost of the Mulberry Garden

The apportioned cost of the establishment was calculated by dividing the total establishment cost by the average lifespan of the mulberry variety possessed by the respondent. The establishment cost includes the cost of land preparation, cost of inputs like seed materials, manures and fertilizers and human power utilized in plantation, inter-cultivation and irrigation to the first harvest from the date of planting.

2.4 Maintenance Cost of the Mulberry Garden

The maintenance cost includes the cost of the bullock, machine and human power utilized for ploughing and intercultural operations, cost of manure and fertilizers, cost of irrigation, revenue and cost of leaf harvest from the first harvest to the last crop of the year under reference.

Interest on working capital: The interest rate was calculated at the rate of 8% per annum on the actual amount incurred.

Interest on fixed capital: The interest rate was calculated at the rate of 8% per annum on the actual amount incurred for the establishment of the mulberry garden for 6 months period.

Table 1. Size of mulberry land holding under rainfed and irrigated conditions

Category	Rainfed condition		Irrigated condition	
	Area under mulberry (Acres)	No. of farmers	Area under mulberry (Acres)	No. of farmers
Small farmers	< 0.79	08	<0.83	12
Medium farmers	0.80 to 1.61	91	0.84 to 1.94	75
Big farmers	>1.62	21	>1.95	33

2.5 Cost of Silkworm Cocoon Production

Rearing of silkworm requires certain specific pre-requisites like separate rearing house, rearing appliances and inputs *viz*., disinfectants, silkworm seed, etc. Most of the farmers in the study area owned a separate rearing house and Kolar Gold was the popular silkworm breeds reared. Many chawki rearing centres were established in the study area almost all farmers were buying chawki reared larvae. Shoot rearing method of rearing was found dominating and the mountages used includes the traditional bamboo chandrike, the plastic collapsible mountage commonly known as "Netrika" and the Japanese rotary card board mountages. Considering these facts the cost of cocoon production was estimated. The fixed cost and variable cost involved in silkworm rearing were assessed as explained below.

Fixed costs: The fixed cost was calculated on the all the items used for rearing based on the depreciation cost of the material.

Depreciation cost: Depreciation cost for the rearing house, equipment and machines used by an individual farmer were calculated separately as follows.

$$\text{Annual depreciation} = \frac{\text{Purchase/construction value}}{\text{The expected life span of the asset(s)}}$$

The average life span of the asset that was reported by the respondent was considered for computing the depreciation value.

Interest on fixed capital: The interest rate was calculated at the rate of 8% per annum on the actual value of the assets after deducting the depreciation cost for the year.

Operational costs: This includes the recurring or variable costs of different items used in silkworm rearing are the cost of chawki worms, mulberry leaf, human labour, mountages, disinfection, miscellaneous charges, marketing charges, etc.

Interest on the working capital: The interest rate was calculated at the rate of 8% per annum on the actual cost incurred by the respondents.

Returns from cocoon production: The income realized by the sale of cocoons at the cocoon market by the respondents and other by-products accounted for the returns were valued at the prevailing market rate.

Net income realized from cocoon production: The gross income includes the value of cocoons transacted at the prevailing market rate, plus the value of by-products. The net income from cocoon production was estimated by deducting the total cost of cocoon production from the gross income.

Benefit: Cost ratio (B:C ratio): It indicates the returns generated for every rupee of investment both in mulberry and cocoon production. It was calculated by adopting the following formula.

$$\text{B:C ratio} = \frac{\text{Gross returns}}{\text{Total cost}}$$

3. RESULTS AND DISCUSSION

The results of the current investigations are tabulated in Tables 2 to 6 and explained along with the works of previous researchers in the following paragraphs:

3.1 Costs and Returns of Mulberry Production

Cost of mulberry production includes two types namely variable and fixed costs and these costs were more under the irrigated condition as compared to the rainfed condition. Among three categories of farmers, variable costs were higher with small farmers (Rs.6,860 and 30,950/acre/year) over medium (Rs.7,930 and 33,250/acre/year) and big farmers (Rs.8,650 and 35,550/acre/year) under rainfed and irrigated conditions, respectively. Similarly, fixed cost *i.e.,* apportioned cost of establishment of the mulberry garden was less among small (Rs.865 and 1,256/acre/year), when compared to medium (Rs.1,056 and 1,502/acre/year) and big farmers (Rs.1,182 and 1,760/acre/year) for rainfed and irrigated conditions, respectively (Table 2 and 3).

The total costs (variable and fixed costs) too were less under rainfed condition (Rs.7,725, 8,986 and 9,832/acre/year) as compared to irrigated condition (Rs.32,306, 34,752 and 37,310/acre/year) among small, medium and big farmers, respectively. However, cost per kilogram of mulberry leaf production was less under irrigated farmers over rainfed farmers. Further, under the irrigated condition, cost per kilogram of leaf production was least among big

farmers (Rs. 1.859) followed by medium (Rs. 1.922) and small farmers (Rs. 1.965). However, under the rainfed condition, small farmers recorded less cost for one kilogram of leaf production (Rs. 2.146) over medium (Rs. 2.276) and gig farmers (Rs. 2.298). In the current results, higher cost of mulberry production under irrigated condition was mainly due to the use of more quantity of inputs as compared to the rainfed condition. However, a decrease in unit cost of leaf production under irrigated condition was due to more quantity of leaf production coupled with more number of crops over rainfed condition (Table 4).

Table 2. Cost of mulberry leaf production under rainfed condition (Unit: Rs./acre/year)

No.	Particulars	Category of farmers		
		Small farmers (n=8)	Medium farmers (n=91)	Big farmers (n=21)
A	**Variable cost**			
1	Intercultural operations in mulberry garden @ 3 man days (MD) & 1 pairs of bullock - 2 times per year @ Rs 150/MD and Rs.300/- per bullock pair.	1,500	1,800	1,800
2	Manure and application charges (2 tons + 2 MD) @ Rs.150.00/MD	1,300	1,700	1,950
3	Fertilizer and application charges (25 kgs 15:15:15) + 1 MD) @ Rs. 22/ kg + Rs.150.00/MD	810	1,180	1,400
4	Leaf harvest (15 MD @ Rs 150/MD)	2,250	2,250	2,250
5	Pruning and cleaning of plants (3 MD @ Rs. 150/MD)	450	450	450
6	Land revenue	50	50	50
7	Miscellaneous	500	500	750
	Total variable cost	**6,860**	**7,930**	**8,650**
B	**Fixed cost**			
8	Apportioned cost of establishment of mulberry garden	865	1,056	1,182
	Total cost	**7,725**	**8,986**	**9,832**

Table 3. Cost of mulberry leaf production under irrigated condition (Unit: Rs./acre/year)

Sl. No.	Particulars	Category of farmers		
		Small farmers (n=12)	Medium farmers (n=75)	Big farmers (n=33)
A	**Variable cost**			
1	Intercultural operations in mulberry garden @ 4 man days (MD) & 1 pairs of bullock - 5 times per year @ Rs 150/MD and Rs.300/- per bullock pair.	4,500	5,250	6,000
2	Manure and application charges (4 tons + 10 MD) @ Rs.150.00/MD	6,500	7,500	8,500
3	Fertilizer and application charges (150 kgs 15:15:15) + 5 man days) @ Rs. 22/ kg + Rs.150.00/MD	4,050	4,600	5,150
4	Irrigation water (Rs.)	2,000	2,000	2,000
5	Irrigation charges (20 MD @ Rs. 150/MD)	3,000	3,000	3,000
6	Shoot harvest (60 MD @ Rs 150/ MD)	9,000	9,000	9,000
7	Pruning and cleaning of plants (5 MD @ Rs. 150/MD)	750	750	750
8	Land revenue	150	150	150
9	Miscellaneous	1,000	1,000	1,000
	Total variable cost	**30,950**	**33,250**	**35,550**
B	**Fixed cost**			
10	Apportioned cost of establishment of mulberry garden	1,256	1,502	1,760
	Total cost	**32,306**	**34,752**	**37,310**

The returns generated from mulberry production were higher under irrigated condition over rainfed condition. Under irrigated condition, among three categories of farmers, gross returns, net returns and B:C ratio were more among big farmers (Rs.71,249/acre/year, Rs.33,939/acre/year and Rs.1.910:1) as compared to medium (Rs.64,294/acre/year and Rs.29,542/acre/year and Rs.1.850:1) and small farmers (Rs.58,358, Rs.26,152/acre/year and Rs.1.812:1), respectively. However, under rainfed condition, gross returns was higher among big farmers (Rs.13,334/acre/year) over medium (Rs.12,347/acre/year) and small farmers (Rs.11,300/acre/year), while net returns higher among small farmers (Rs.3,575/acre/year) when compared to big (Rs.3,502/acre/year) and medium farmers (Rs.3,361/acre/year). Similarly, B:C ratio was more under small farmers (Rs.1.463:1) over medium (Rs.1.374:1) and big farmers (Rs.1.356:1). Better benefits/returns accrued under irrigated condition over rainfed condition were mainly due to higher yield levels and better price for cocoons (Table 4).

The cost of establishment of the mulberry garden in Karnataka was Rs.4,100 and Rs.3,400 per hectare under rainfed and irrigated conditions, respectively [4]. The total cost of cultivation per acre of mulberry in the first year was Rs.4105 with a net return of Rs.5,315 and in the second year, the total cost was Rs.4,307 with a net return of Rs.7,398 [5]. Cost of establishment of mulberry garden per hectare in T.S. Hally, Jagamohanahaly and Sugutur Villages in Kolar district of Karnataka were Rs.3,268.80, Rs.3500.05 and Rs. 3524.65, respectively [6]. The total cost of establishment of one hectare of the mulberry garden under an irrigated condition in Jamakandi taluk of Bijapur district was Rs.2,111.17 [7].

The farmers spent an amount of Rs.2,251.99 for the establishment of one acre of the mulberry garden under rainfed condition. The maintenance cost of one acre of the mulberry garden was Rs.596.77, the cost of production of one kg of the mulberry leaf was Rs.0.85 and net income earned was Rs.617.84 [8]. The average cost of establishment of one acre of dry land mulberry for the large farmers was Rs. 3,125.00 [9].

Table 4. Returns from mulberry leaf production under rainfed and irrigated conditions (Unit: Rs./acre/year)

Rainfed (n=120)						
Category of farmers	**Leaf yield (kg)**	**Cost of leaf production**		**Returns generated (Rs.)**		
		Total cost (Rs.)	**Cost/kg of leaf (Rs.)**	***Gross returns (Rs.)**	**Net returns (Rs.)**	**B:C Ratio**
Small farmers (n=8)	3,600	7,725	2.146	11,300	3,575	1.463 : 1
Medium farmers (n=91)	3,949	8,986	2.276	12,347	3,361	1.374 : 1
Big farmers (n=21)	4,278	9,832	2.298	13,334	3,502	1.356 : 1
Irrigated (n=120)						
Category of farmers	**Leaf yield (kg)**	**Cost of leaf production**		**Returns generated (Rs.)**		
		Total cost (Rs.)	**Cost/kg of leaf (Rs.)**	****Gross returns (Rs.)**	**Net returns (Rs.)**	**B:C Ratio**
Small farmers (n=12)	16,388	32,206	1.965	58,358	26,152	1.812 : 1
Medium farmers (n=75)	18,084	34,752	1.922	64,294	29,542	1.850 : 1
Big farmers (n=33)	20,071	37,310	1.859	71,249	33,939	1.910 : 1

** Price of leaf @ Rs.3/kg; value of by-products = Rs. 500/-*
***Price of leaf @ Rs.3.5/kg; value of by-products = Rs. 1000/-*

Table 5. Cost of cocoon production under rainfed and irrigated conditions (Unit: Rs./100 DFLs)

Rainfed (n=120)				
Sl. no.	**Particulars**	**Category of farmers**		
		Small farmers (n=8)	**Medium farmers (n=91)**	**Big farmers (n=21)**
	Variable cost			
1	Chawki worms	2,500	2,500	2,500
2	Leaf	2,070	2,052	2,025
3	Disinfectants	100	200	200
4	Labour (@ 24 MD/100 DFLs) @ Rs 150	3,000	3,000	3,000
5	Transportation and marketing	200	200	250
6	Other costs	100	100	200
	Total	**7,970**	**8,052**	**8,175**
	Fixed cost			
6	Depreciation on building and equipment	400	500	700
	Total cost	**8,370**	**8,552**	**8,875**
Irrigated (n=120)				
Sl. no.	**Particulars**	**Category of farmers**		
		Small farmers (n=12)	**Medium farmers (n=75)**	**Big farmers (n=33)**
	Variable cost			
1	Chawki worms	2,500	2,500	2,500
2	Leaf	2,007	1,899	1,818
3	Disinfectants	250	300	400
4	Labour (@ 24 MD/100 DFLs) @ Rs 150	3,600	3,600	3,600
5	Transportation and marketing	200	200	250
6	Other costs	100	300	500
	Total	**8,657**	**8,799**	**9,068**
	Fixed cost			
6	Depreciation on building and equipment	650	700	1,100
	Total cost	**9,307**	**9,499**	**10,068**

An average of Rs.1.52, 1.28, 1.16 and 1.09 was incurred in producing one kg of mulberry leaf Salem and Dharmapuri districts of Tamil Nadu for holding size groups I (0.01-0.50 ha), II (0.51-1.00 ha), III (1.01-1.50 ha) and IV (>1.50 ha), respectively [10]. Cost of mulberry garden maintenance was more in irrigated areas compared to rainfed areas because of frequent intercultural operations, more input usage and involvement of more labour [11].

The total cost of mulberry leaf production per acre was worked out to be Rs.14157.40/year [12]. The maintenance cost of one acre of the mulberry garden was worked out to be Rs.8,030 and Rs. 7,912 in Kolar and Tumkur districts, respectively [13].

The cost of establishment of one acre of the mulberry garden was Rs.5,492.12 [14]. The revenue obtained from sericulture is fairly higher with continuous income throughout the year. The advantages and high profitability nature of sericulture can be made known to the farmers through extension programmes [15].

3.2 Costs and Returns of Cocoon Production

The total cost of production of cocoons for the rearing of 100 DFLs of silkworms among different categories of farmers (small, medium and big) could exhibit variations under rainfed and irrigated conditions. Total costs (variable and fixed) was relatively lower under rainfed condition being less among small farmers (Rs. 8,370) over medium (Rs. 8,552) and big farmers (Rs. 8,875) as against irrigated condition (Rs. 9,307, 9,499 and 10,068), respectively. The variations existed between rainfed and irrigated conditions with respect to the cost of cocoon production were marginal with higher being under irrigated farmers over rainfed farmers (Table 5).

Table 6. Returns from cocoon production under rainfed and irrigated conditions (Unit: Rs./100 DFLs)

Rainfed (n=120)							
Category of farmers	**Cocoon yield (kg)**	**Cost of cocoon production**		**Returns generated (Rs.)**			
		Total cost (Rs.)	**Cost / kg of cocoons (Rs.)**	**Price of cocoons /kg**	***Gross returns (Rs.)**	**Net returns (Rs.)**	**B:C Ratio**
Small farmers (n=8)	44.25	8,370	189.15	273.75	12,719	4,349	1.520 : 1
Medium farmers (n=91)	45.96	8,552	186.07	292.44	14,113	5,561	1.650 : 1
Big farmers (n=21)	47.00	8,875	188.83	319.05	15,745	6,870	1.774 : 1
Irrigated (n=120)							
Category of farmers	**Cocoon yield (kg)**	**Cost of cocoon production**		**Returns generated (Rs.)**			
		Total cost (Rs.)	**Cost / kg of cocoons (Rs.)**	**Price of cocoons /kg**	***Gross returns (Rs.)**	**Net returns (Rs.)**	**B:C Ratio**
Small farmers (n=12)	50.97	9,307	182.60	330.83	17,706	8,399	1.902 : 1
Medium farmers (n=75)	53.42	9,499	177.82	356.00	19,968	10,469	2.102 : 1
Big farmers (n=33)	55.93	10,068	180.01	381.82	22,423	12,355	2.227 : 1

**Includes value of by-products @ 5%*

Cost for one kilogram of cocoon production was least under irrigated condition over rainfed condition and among the three categories of farmers, medium category farmers registered less cost (Rs. 177.82 and 186.07) as compared to big (Rs. 180.01 and 188.83) and small farmers (Rs. 182.60 and 189.15) under irrigated and rainfed conditions, respectively. On the other hand, returns generated from cocoons fetches a higher price for irrigated farmers over rainfed farmers. Gross returns, net returns and B:C ratio were more under irrigated condition among big farmers (Rs. 22,423/100 DFLs, Rs. 12,355/100 DFLs and 2.227:1) when compared to rainfed condition (Rs. 15,745/100 DFLs, Rs. 6,870/100 DFLs and 1.774:1) over medium and small farmers, respectively. The benefits obtained by the irrigated farmers were better when compared to rainfed farmers were mainly due to higher yield per unit quantity of DFLs and also higher price of cocoons (Table 6).

The estimated per hectare total cost, gross and net returns were Rs.28,725, Rs.55,200 and Rs.26,275, respectively for cocoon production under irrigated condition. Under the rainfed condition, per hectare cocoon production cost was Rs. 12,110 and the net profit was Rs. 5,390 [4]. The current results are comparable with the findings of previous researcher [16], where the returns accrued were comparatively lower among sericulturists who are having a land area of 0.5 to 1 acre in the rainfed region than other classes. But in the irrigated region, the sericulturists having a land area of 1.00 to 2.00 acres and above 2.00 acres were able to derive much higher returns.

The gross and net return from silk cocoon production in Jamakandi taluk of Bijapur district was Rs.88,961.96 and Rs.52,680.16 per hectare per annum, respectively [7]. The average cocoon yield per acre of the rainfed mulberry garden was 79 kg and net income realized was Rs.6,400 in

Mysore and H.D. Kote taluks [17]. The farmers of Chamarajanagar invested Rs.64.34 for producing 1 kg of cocoons, the return was Rs.73.34 and C:B ratio worked was 1:1.14 [18].

The net return per acre per year from cocoon production was Rs.31,289.19 in holding size I, Rs.29,663.85 in holding size II and Rs.27,710.23 in holding size III. Further, farmers with holding size I had accrued higher returns than holding size II and III and concluded that farmers having 0.5 acres or less of the mulberry garden (mostly marginal farmers) could obtain more benefit from sericulture [19].

The cost declined with the increase in the size of the farms (marginal, small, medium and big). The cost incurred ranged from Rs 12,000.37 per hectare in the case of marginal farms to Rs. 10,763.62 per hectare in the case of big farmers. The net income between marginal farmers and big farmers ranged between Rs.13,779.63 and Rs.9,073.43 [20].

The gross returns from silk cocoon production were Rs.88961.96 with a net return of Rs.52680.16 per hectare of the mulberry garden [21]. In Salem and Dharmapuri districts of Tamil Nadu, an average cost of cocoon production per kg was worked out to be Rs. 79.46, 64.24, 63.73 and 54.31 for holding size groups I (0.01-0.50 ha), II (0.51-1.00 ha), III (1.01-1.50 ha) and IV (>1.50 ha), respectively. The investment per rupee indicates that farmers with the largest holdings (size IV) had the highest returns [10].

A comparative study of cocoon production in a coastal area with a traditional area of Andhra Pradesh revealed that the C:B ratio was 1:1.70 and 1:1.19, respectively [22]. The cost of production of cocoons per 100 DFLs was Rs. 4901.12 with a B: C ratio of 1:1.54. The cost of production of one kg of the cocoon was estimated at Rs. 81.68 [23].

The cost of cocoon production in Kolar district was Rs.6,987.10/100 DFLs and the gross and net returns were Rs.8,251.96 and Rs.1,264.86/100 DFLs, respectively [14]. A case study conducted on large-scale farming in Talawadi of Tamil Nadu and Anekal of Karnataka revealed that the production cost of one kg of cocoons was Rs.70 in both places [24]. The cost per kg of cocoon productivity increased from Rs.70.43 during 1993-94 to Rs.79.29 in 1995-96, which was due to the escalation of input prices [25].

Large-scale farmers possessing more than five acres of mulberry incurred a total expenditure of Rs.65,655.35 and Rs.64,167.90/acre/year, respectively in Karnataka and Tamil Nadu towards cocoon production. In case of small/medium scale farmers, the total cost of production was Rs.72,677.93 and Rs.64,537.58/acre/year in Karnataka and Tamil Nadu, respectively. [26].

Gross and net returns were quite high under assured irrigated condition in Karnataka and Tamil Nadu than that of the semi-irrigated condition in Andhra Pradesh. In the absence of minimum support price for cocoon, most of the sample farmers were reported to be scaling down their cocoon production, which calls for framing of suitable developmental policies to increase silk cocoon productivity [27].

Sericulture in the drought-prone condition is not only profitable but also sustainable. The C: B ratio was estimated to be 1:1.52 and this indicator suggests that sericulture is profitable even under drought-prone condition [28]. The majority of the farmers in Malavalli taluk of Mandya district spent moderate amount for cocoon production and obtain fewer net returns and also the majority of the farmers obtain average C:B ratio and only a few of the farmers receive less C:B ratio [29].

4. CONCLUSION

The study concluded that cost and return structure of mulberry and cocoon production varied between rainfed and irrigated conditions among the three categories of farmers (small, medium and big) in Chamarajanagar district of Karnataka state. Less cost of production of leaf and cocoons with higher returns were obtained among big farmers over medium and small groups of farmers under irrigated condition over rainfed condition. Thus the study helps to know ways and means for reduction of costs (fixed and variable) towards the production of mulberry and cocoons for obtaining higher returns for the farming community for the improvement of the socio-economic status of sericulture farmers.

CONSENT

As per international standard or university standard was written participants' consent has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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