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Assessing the Impact of Farm Size on Cocoon Production Efficiency and Profitability in Non-Traditional Districts of Tamil Nadu

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ABSTRACT

The current study aimed to determine the costs and returns associated with producing cocoons for different farmer groups in Tamil Nadu's non-traditional districts, including Coimbatore, Tiruppur, Erode, Dindigul and Theni in the Western Zone. The study's sample size consisted of 45 farmers who owned marginal, small and medium-sized plots of land. These farmers were chosen at random for the study. According to the findings, marginal farmers had to spend Rs. 2, 21,531.20/- for the production of cocoons, whereas they would receive Rs. 7, 27,460.80/- in return for the cocoon waste and raw cocoons. On the other hand, it was discovered that small farmers had to spend Rs. 3, 41,794.89/- for the production of cocoons, while they received returns of Rs. 14, 16,072.40/- from the cocoon and waste. Comparably, the cost of producing cocoons for medium-sized farms was determined to be Rs. 4, 93,193.60/-, while the returns from the cocoon and waste came to Rs. 21, 19,064.96/-. As a result, it can be concluded that medium farmers have a greater benefit-cost ratio—roughly 1:4.3. Therefore, medium farmers faced the highest costs and returns from cocoon production, followed by small and marginal farmers.

Keywords: *Sericulture; Non-traditional districts; Mulberry; Cost to benefit ratio; Economics; Cocoon*

INTRODUCTION

India ranks second globally in terms of silk production. Mulberry accounted for 36,582 MT of the four commercial silks produced in 2022–23, the main factor behind the rise in India's silk output in recent years has been the non-mulberry silk varieties namely Tasar and Eri silks(Bharathi*et al.,* 2024). Mulberry sericulture is mostly practiced in states categorized as traditional and non-traditional sericulture areas in India including Tamil Nadu, Karnataka, Andhra Pradesh, West Bengal and Jammu & Kashmir (Bharathi*et al.,* 2023). Tamil Nadu leads the country in bivoltine silk output (1914 MT), notwithstanding Karnataka's significant contribution to India's total silk production. Nonetheless, there is a 3,000 MT demand for silk (Dasari and Venkataramana, 2023).

The non-traditional districts have a 7,528-ha mulberry area that can supply this need. Sericulture is a significant endeavor that contributes significantly to the creation of rural jobs and as a result, guarantees a minimum sustainable income throughout the year (Susikaran*et al.,* 2019). With the introduction of new production technologies for Bivoltine sericulture, productivity is trending upward (Kiruthika, 2020). To optimize the yield and profit, however several major adjustments must be made to the kind, amount and price of inputs utilized in sericulture (Altman and Farrell, 2022). Finding strategies to boost sericulture profits throughout India is crucial in light of this (Ravindran *et al.,* 1993, Lakshmanan *et al.,* 1996).

One of the founding states of mulberry sericulture in India is Tamil Nadu, which mostly grows the fruit in the western (Coimbatore, Tiruppur, Erode, Dindigul and Theni) and northwestern (Dharmapuri, Krishnagiri, Salem, Namakkal and Permabalur) zones. Thus, it is obvious that there would be a great deal of improvement in sericulture. In these situations, an effort was made to calculate and contrast the economics of producing silk in Tamil Nadu's non-traditional areas while implementing various developed sericulture technologies.

MATERIAL AND METHODS

The study was carried out in the Western Zone of Tamil Nadu, specifically in the non-traditional districts of Coimbatore, Tiruppur, Erode, Dindigul and Theni. The study's sample size consisted of 45 farmers who owned marginal, small and medium-sized plots of land. These farmers were chosen at random for the study. Random sampling was used to choose the farmers. A specially designed questionnaire for data collection was created in cooperation with Sericulture Department officials in order to conduct personnel interviews with farmers. With the aid of a well-structured and tried-and-true schedule covering socioeconomic profile, mulberry area, costs and returns, cocoon production and marketing costs and returns obtained, including value of by-products, the primary data was obtained through direct personal interviews with farmers (Susikaran, 2020).

The study's goal is analyzed using statistical methods like mean and percentages. The cost and return from silkworm raising and moriculture in unit area per year were calculated using a simple cost accounting technique (Soundarya et al., 2022). Farmers who own a separate rearing house were chosen for the study using the basic random selection technique, and the Department of Sericulture, Salem, provided the information needed for the study. To compare the economics of sericulture technology, percentage analyses were performed on the gathered data. Typically, the production of cocoons from silkworm rearingaccounts for the entire cost of production together with the production of mulberries. Furthermore, the benefit-cost ratio for the entire silk production was successful (Bharathi*et al.,* 2022)I.

RESULTS AND DISCUSSION

The current analysis demonstrated that Non-Traditional districts contribute 7,528 ha of the 19,886 ha of mulberry area contributed by Tamil Nadu. For marginal farmers, the total cost of starting a mulberry garden was Rs. 93,166.62/ha. (Table1& Figure1). On the other hand, the annual cost of

producing mulberry leaves was Rs. 76,075.38/ha. The money spent on planting and manuring (Rs. 30862.00 and 15165.00) and labour costs (Rs. 31,480.00 and 33,657.30) contributed significantly more than all other costs—33.78, 33.12, 49.42, and 24.11 per cent—during the establishment of the mulberry garden and leaf production respectively. Through cocoon sales, a gross return value of Rs. 7,27,460.80/ha/year was recorded. The entire cost of cocoon production is Rs. 2,21,531.20/ha/year after deducting the total fixed cost of Rs. 76,075.38/ha/year and the total variable cost of Rs. 1,99,692.00/ha/year (Table 2& Figure 2). With a benefit cost ratio of 1:3.2, the net income generated was Rs. 5,05,929.60/ha/year (Table 3).

For small farmers, the total cost of starting a mulberry orchard was Rs. 1, 94,376.73/ha (Table 4). According to Table 5, the annual cost of producing mulberry leaves was Rs. 1, 50,079.53 per hectare. The cocoon's return value per hectare per year was Rs. 10, 46,111. Similar trends of highest contribution by planting supplies, manuring costs and labour were noted in prior small-scale mulberry cultivation cases. The entire cost of producing cocoons was Rs. 3, 69,961 of which Rs. 28,166.07 was the total fixed cost and Rs. 3, 41,794 was the total variable cost. These expenses added up to Rs. 3, 69,961/ha /year, which was the total cost of producing cocoons. Finally, the benefit-cost ratio was 1:3.8 and the net revenue generated was Rs 10, 46,111.00 /ha/year (Table 6). For medium-sized farmers, the total cost of starting a mulberry orchard was Rs. 2, 94,221.02 per hectare (Table 7). According to Table 8, the annual cost of producing mulberry leaves was recorded at Rs 1, 97,310.85 per hectare. As was previously noted, the cost of labour, manuring and planting supplies accounted for a larger portion of the expenditure than other costs involved in the production of mulberries.

The cocoon's return value was 21, 19,064.96/ha /year. The entire cost of producing cocoons was calculated by adding the recorded total fixed cost of Rs. 38,888.56ha/year and the total variable cost of Rs. 4,54,305.92/ha/year. Thisresults are in accordance with the findings of Raju and Sanappa (2018). This came to a total of Rs. 4,93,193.60/ha/year. With a benefit-cost ratio of 1:4.3, the net revenue generated per hectare per year was Rs 16, 25,872.00 (Table 9). The economics of sericulture in the Karnataka district of Haveri was examined by Roopa Hosali and Murthy (2015), who came to the conclusion that marginal farmers' costs of mulberry cultivation were Rs. 23,278.54 per acre, while small and medium-sized farmers' costs were Rs. 25,116.18/- and 26,358.52/- per acre respectively. Similarly, it was discovered that medium farmers paid Rs. 50,046.54/- per acre for cocoon production while small and marginal farmers paid Rs. 55,036.06/- per acre and Rs. 59,187.20/- per acre respectively. According to Kumaresan *et al.* (2008), large farmers in the Udumalpet area of the Coimbatore district faced higher production costs per kilogram of cocoon than small farmers. This was mostly because the large farmers employed more labour. Dandin *et al.* (2005), Balasarswathi *et al.* (2010), and Beula Priyadarshini and Vijaya Kumari (2017) have also provided reports that are similar. Shukla (2018) stated that in the Udaipur area of Rajasthan, the development of gardens incurred the biggest proportion of costs related to human labour with FYM application. In sericulture,recorded a net return of Rs. 5, 20, 39.32/- and a benefit-cost ratio of 1.49.

In a 2017 study, Manjunatha *et al.* evaluated the profitability of silkworm cocoon production in five taluks in the Kolar district of Karnataka. They discovered that the total cost of rearing 8,000 dfl's annually was Rs. 7, 30,224/- with the production of mulberry leaves accounting for the largest portion of these costs. Since many agricultural inputs are always subject to price fluctuations, Tamil Nadu is one of the pioneer states in India when it comes to mulberry sericulture. The state's mulberry farms are primarily located in the western (Coimbatore, Tiruppur, Erode, Dindigul, and Theni) and northwestern (Dharmapuri, Krishnagiri, Salem, Namakkal, and Permabalur) zones. Some crucial factors that should be taken into account are farmers' lack of appreciation for improved techniques and their poor knowledge of those inputs.

It was also noted that the cost of cultivation went up due to the increased transportation costs associated with mobilizing inputs at different output levels. It was also discovered that the expense of hiring labour to complete numerous tasks related to the rearing of silk worms significantly raises the cost of production. As a result, there would be ample opportunity for mechanizing numerous sericulture procedures. This will make things easier to work with and help cut costs. It might also lessen the issue of a labour shortage. In various sericulture operations, the labour of family women should also be efficiently utilized in order to significantly lower the cost of producing cocoons and raise the net benefit.

CONCLUSION

The study determined the costs and returns associated with producing cocoons for farmers having different size of land holdings in Tamil Nadu's non-traditional districts including Tiruppur, Erode, Coimbatore, Dindigul and Theni in the Western Zone. The current findings clearly show that medium farmers with the maximum benefit-cost ratio had the highest costs and returns associated with cocoon production followed by small and marginal farmers.

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Ethics statement

No specific permits were required for the described field studies because no human or animal subjects were involved in this research.

Consent for publication

All the authors agreed to publish the content.

Competing interests

There were no conflict of interest in the publication of this content

Author contributions

All the authors are equally contributed to research work.

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Table 1: Cost of establishment of mulberry garden by marginal farmers

S. No.	Variables	Units	Physical Quantity	Cost (Rs)	Share of Total Cost (%)
1	Human Labour	Man days	104.00	31480.00	33.78
2	Animal Labour	Pairs	3.80	1573.33	1.68
3	Machine Labour	Hours	4.96	3476.66	3.73
4	Manuring	Tonnes	16.13	15165.00	16.27
5	Planting Material	No's	8817.70	30862.00	33.12
6	Irrigation	-	-	500.00	0.50
7	Chemical Fertilizer	-	-	3932.30	4.22
8	Others (Bio-fertilizers)	-	-	606.66	0.65
9	Plant Protection	-	-	570.67	0.61
10	Miscellaneous cost	-	-	5000.00	5.36

	Total	**93166.62**	**100.00**

Table 2: Cost of mulberry leaf production by marginal farmers

S. No	Variables	Units	Physical Quantity	Cost (Rs)	Share of Total Cost (%)
I	**Variable Cost**				
1	Human Labour	Man days	154.46	33657.30	49.42
2	Machine Labour	Hours	2.50	1750.00	2.56
3	Manuring	Tonnes	17.46	16418.67	24.11
4	Irrigation	-	1100.00	500.00	0.70
5	Chemical Fertilizer	-	-	3946.50	5.79
6	Others (Bio-fertilizers)	-	-	606.64	0.89
7	Plant Protection	-	-	596.00	0.87
8	Int. on working Capital @ 9% p.a	-	-	5622.76	8.25
9	Miscellaneous Cost	-	-	5000.00	7.34
	Total Variable Cost			**68097.87**	**100.00**
II	**Fixed Cost**				
1	Land Tax	-	-	19.26	0.24
2	Apportion cost	-	-	6210.66	77.85
3	Depreciation on Farm Imp. @ 10% p.a	-	-	1000.00	12.53
4	Int. on Fixed Capital @ 12% p.a	-	-	747.59	9.37
Total Fixed Cost				**7977.51**	**99.99**
Total (I+II)				**76075.38**	

NOTE: * indices that total cost of establishment was divided and accounted for 15 years.

Table 3: Cost and return studies of cocoon production by marginal farmers

S.	Variables	Cost (Rs)	Share of Total Cost (%)

No			
I	**Fixed Cost**		
1	Depreciation on Rearing House& equipment	19499.26	89.28
2	Interest on Working Capital @12% p.a	2339.91	10.71
Total Fixed Cost		**21839.17**	**100.00**
II	**Variable Cost**		
1	Human Labour	25760.00	12.96
2	DFLs	48666.70	24.49
3	Disinfectants	4971.33	2.50
4	Other Rearing Essentials	1078.66	0.54
5	Marketing &Transport Charge	29733.33	14.96
6	Miscellaneous Cost	3200.00	1.61
7	Interest on Working Capital @ 9% p.a	10206.60	5.13
8	Costof Mulberry Leaf Production	76075.38	37.78
Total variable Cost		**199692.00**	**100.00**
Total Cost (I+II)		**221531.20**	
III	**Return (Rs)**		
1	Gross Return (Cocoon + By-products)	727460.80	
2	Total Cost of Cocoon Production	221531.20	
3	Net Return	505929.60	
B:C Ratio		**1:3.2**	

Table 4: Cost of establishment of mulberry garden by small farmers

S. No.	Variables	Units	Physical Quantity	Cost (Rs)	Share of Total Cost (%)

1	Human Labour	Man days	186.66	58106.70	29.89
2	Animal Labour	Pairs	10.06	4140.00	2.19
3	Machine Labour	Hours	5.26	3686.66	1.89
4	Manuring	Tonnes	40.53	38507.00	19.81
5	Planting Material	No.	20305.00	71067.00	36.56
6	Irrigation	-	-	500.00	0.25
7	Chemical Fertilizer	-	-	9687.30	4.98
8	Others (Bio-fertilizers)	-	-	1108.77	0.57
9	Plant Protection	-	-	2573.30	1.32
10	Miscellaneous cost	-	-	5000.00	2.57
Total				**194376.73**	**100.03**

Table 5: Cost of mulberry leaf production by small farmers

S. No	Variables	Units	Physical Quantity	Cost (₹)	Share of Total Cost (%)
I	**Variable Cost**				
1	Human Labour	Man days	286.60	64041.30	47.60
2	Machine Labour	Hours	2.50	1750.00	1.30
3	Manuring	Tonnes	40.53	38506.67	28.62
4	Irrigation	-	-	500.00	0.37
5	Chemical Fertilizer	-	-	9687.30	7.20
6	Others (Bio-fertilizers)	-	-	1108.65	0.82
7	Plant Protection	-	-	2573.30	1.91

8	Int. on working Capital @ 9% p.a	-	-	11355.06	8.44
9	Miscellaneous Cost	-	-	5000.00	3.71
Total Variable Cost				**134522.28**	**100.00**
II	**Fixed Cost**				
1	Land Tax	-	-	39.80	0.25
2	Apportion cost	-	-	12958.00	83.29
3	Depreciation on Farm Imp. @ 10% p.a	-	-	1000.00	6.42
4	Int. on Fixed Capital @ 12% p.a	-	-	1559.73	10.02
Total Fixed Cost				**15557.53**	**100.00**
Total (I+II)				**150079.53**	

*Indices that total cost of establishment was divided and accounted for 15 years

Table 6: Cost and return studies of cocoon production by small farmers

S. No	Variables	Cost (Rs)	Share of Total Cost (%)
I	**Fixed Cost**		
1	Depreciation on Rearing House& equipment	24640.00	87.48
2	Interest on Working Capital @12% p.a	3526.07	12.51
Total Fixed Cost		**28166.07**	**100.00**
II	**Variable Cost**		
1	Human Labour	52693.30	15.32
2	DFLs	96966.70	28.20
3	Disinfectants	15039.66	4.37
4	Other Rearing Essentials	2337.66	0.67

5	Transport Charge	5848.33	1.70
6	Miscellaneous Cost	3000.00	0.87
7	Interest on Working Capital @ 9% p.a	15829.71	4.60
8	Cost of Mulberry Leaf Production	150079.53	44.23
Total variable Cost		**341794.89**	**100.00**
Total Cost (I+II)		**369961.00**	
III	**Return (Rs)**		
1	Gross Return (Cocoon + By-products)	1416072.40	
2	Total Cost of Cocoon Production	369961.00	
3	Net Return	1046111.00	
B:C Ratio		**1:3.8**	

Table 7: Cost of establishment of mulberry garden by medium farmers

S. No.	Variables	Units	Physical Quantity	Cost (Rs)	Share of Total Cost (%)
1	Human Labour	Man days	154.20	95142.00	32.33
2	Animal Labour	Pairs	14.80	5976.66	2.03
3	Machine Labour	Hours	13.60	9566.66	3.25
4	Manuring	Tonnes	58.60	55733.00	18.94
5	Planting Material	No.	31024.00	108582.00	36.90
6	Irrigation	-	-	500.00	0.16
7	Chemical Fertilizer	-	-	9904.70	3.36

8	Others (Bio-fertilizers)	-	-	2260.00	9.18
9	Plant Protection	-	-	1556.00	0.76
10	Miscellaneous cost	-	-	5000.00	1.69
Total				**294221.02**	**100.00**

Table 8: Cost of mulberry leaf production by medium farmers

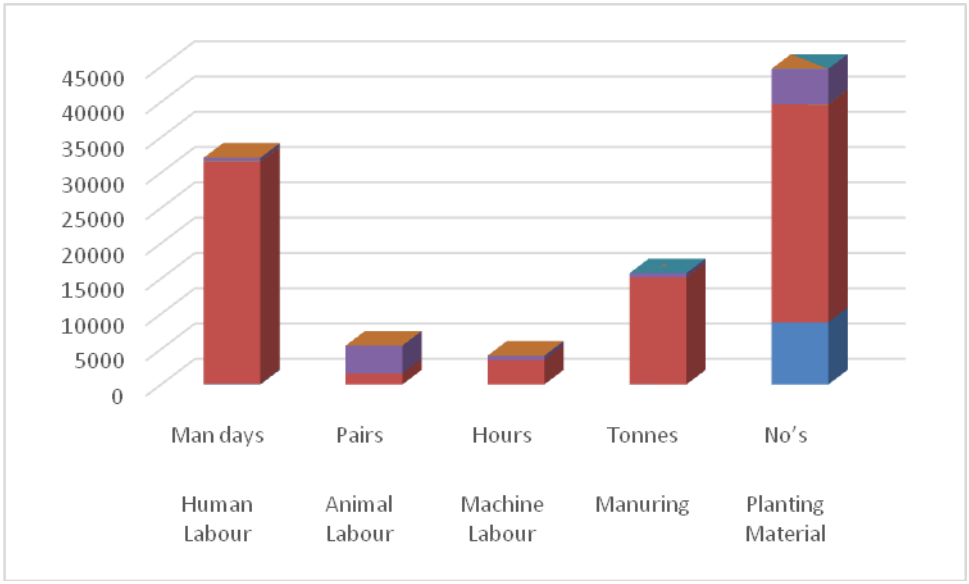
S. No	Variables	Units	Physical Quantity	Cost (Rs)	Share of Total Cost (%)
I	**Variable Cost**				
1	Human Labour	Man days	143.46	82597.30	47.48
2	Machine Labour	Hours	2.50	1750.00	1.00
3	Manuring	Tonnes	58.60	55733.33	32.04
4	Irrigation	-	-	500.00	0.28
5	Chemical Fertilizer	-	-	9904.50	5.69
6	Others (Bio-fertilizers)	-	-	2559.99	1.47
7	Plant Protection	-	-	1556.00	0.89
8	Int. on working Capital @ 9% p.a	-	-	14337.12	8.24
9	Miscellaneous Cost	-	-	5000.00	2.87
Total Variable Cost				**173938.24**	**100.00**
II	**Fixed Cost**				
1	Land Tax	-	-	65.33	0.27
2	Apportion cost	-	-	19614.26	83.91
3	Depreciation on Farm Imp. @ 10% p.a	-	-	1000.00	4.27
4	Int. on Fixed Capital @ 12% p.a	-	-	2693.28	11.52
Total Fixed Cost				**23372.61**	**100.00**
Total (I+II)				**197310.85**	

*Indices that total cost of establishment was divided and accounted for 15 years.

Table 9: Cost and return studies of cocoon production by medium farmers

S. No	Variables	Cost (Rs)	Share of Total Cost (%)
I	**Fixed Cost**		
1	Depreciation on Rearing House& equipment	34721.93	89.28
2	Interest on Working Capital @12% p.a	4166.63	10.71
Total Fixed Cost		**38888.56**	**100.00**
II	**Variable Cost**		
1	Human Labour	38953.30	8.76
2	DFLs	149817.00	33.72
3	Disinfectants	14306.33	3.22
4	Other Rearing Essentials	1632.00	0.36
5	Transport Charge	27866.66	6.27
6	Miscellaneous Cost	3200.00	0.72
7	Interest on Working Capital @ 9% p.a	21219.78	4.76
8	Cost of Mulberry Leaf Production	197310.85	42.15
Total variable Cost		**454305.92**	**100.00**
Total Cost (I+II)		**493193.60**	
III	**Return (Rs)**		
1	Gross Return (Cocoon + By-products)	2119064.96	
2	Total Cost of Cocoon Production	493193.60	
3	Net Return	1625872.00	
B:C Ratio		**1:4.3**	

Fligure 1: Cost of establishment of mulberry garden by marginal farmers



Fligure 2: Cost of mulberry leaf production by marginal farmers