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Performance of Large Scale Farming in Sericulture – An Economic Analysis

P. Kumaresan*, R.G. Geetha Devi*, S. Rajadurai, N.G. Selvaraju† and H. Jayaram***

I

INTRODUCTION

India is the second largest producer of mulberry raw silk, next only to China, accounting more than 15 per cent of the global raw silk production. The total annual production of raw silk in India was 18.76 thousand tonnes, of which mulberry raw silk output aggregated to about 17.31 thousand tonnes during 2006-07. However, the productivity and quality of the silk produced in India is comparatively lower than that of advanced silk producing countries such as China and Japan. Further, the cost of production of the silk is also higher than that in many other countries. One of the major reasons attributable for lower productivity and quality is small-scale operations by the farmers and reelers and the adoption of traditional technologies for the production of cocoons and raw silk.

Sericultural operations are mostly confined to small or medium scale mostly with the mulberry holdings ranging from 0.5 acre to 2 acres in India due to the labour intensive nature and the personal care required for silkworm rearing operations. As the improved technologies evolved by the research institutes of the country have increased the crop stability and considerably reduced the labour dependence for silkworm rearing operations, large-scale or commercial farming has now become economically viable and is becoming popular especially among progressive farmers and educated persons. It is hypothesised that high production and cost efficiency and quality are characteristic of large-scale sericultural farming. In this context, this study has been taken up to examine the performance of large-scale farming in sericulture through the measurement of productivity and economic differences between large and small scale sericulture farming and analyse the sources of such differences.

*Central Sericultural Research and Training Institute, Central Silk Board, Mysore, Karnataka, **Research Extension Centre, Central Silk Board, Madiwala, Kolar District, Karnataka and †Research Extension Centre, Central Silk Board, Udumalpet, Coimbatore District, Tamil Nadu, respectively.

II

METHODOLOGY

The study was carried out in Tamil Nadu, which is one of the largest silk producing states in India. In Tamil Nadu, Coimbatore district was purposively selected for the study, as it is a traditional and major cocoon producing district with a greater number of large-scale farmers practicing sericulture. In the present study, the mulberry farm size of more than or equal to five acres was considered as large-scale sericultural farm. The data were collected from 60 randomly selected large-scale silkworm rearers and 60 small-scale rearers in the study area. Thus, altogether, the total sample size was 120 sericultural farmers.

As the number of large-scale sericulture farms is relatively small and highly scattered in any area, the large-scale silkworm rearers were selected by random sampling method using the list of farmers received from Research Extension Centre of Central Silk Board located at Udumalpet. The small or medium scale silkworm rearers (that is less than 5 acres) located adjacent to the sample large-scale farmers were selected in order to minimise the variations between the two categories of the farmers in terms of rearing practices and agronomical parameters. A pre-tested structured interview schedule was used to collect the required information. The data collected from the sericultural farmers for the study pertain to the year 2005-06.

The collected information were compiled, tabulated and subjected to tabular and percentage analyses. The productivity and economics of sericulture farming were worked out for both the categories of the farmers.

In order to study the input-output relationship in cocoon production, Cobb-Douglas production model was chosen over the linear form based on the goodness of fit. The function employed in the study can be expressed as:

$$Y = aX_1^{b1} X_2^{b2} \ldots X_5^{b5} \mu \qquad \ldots (1)$$

Where

Y = Net income from cocoon production (Rs./acre/year),
X_1 = Cost of farmyard manure (Rs./acre/year),
X_2 = Cost of fertilisers (Rs./acre/year),
X_3 = Cost of labour (Rs./acre/year),
X_4 = Cost of disinfectants (Rs./acre/year),
X_5 = Cost of disease free layings (dfls[1]) (Rs./acre/year),
a = Intercept,
b_is = Regression coefficient of the i-th variable (i = 1 to 5),
μ = Random term independently distributed with zero mean and finite variance.

The parameters of the function 'a' and 'b_is' were estimated separately for both conventional silkworm rearers and large-scale silkworm rearers using ordinary least squares (OLS) technique by converting the functions into log-linear forms. The equations specified for conventional rearers and large-scale silkworm rearers are respectively, as follows:

$$LnY_1 = Ln\ a_1 + b_{11} Ln\ X_{11} + b_{21} Ln\ X_{21} + b_{31} LnX_{31} + b_{41} LnX_{41} + b_{51} LnX_{51} + \mu \quad \text{....(2)}$$
$$LnY_2 = Ln\ a_2 + b_{12} Ln\ X_{12} + b_{22} Ln\ X_{22} + b_{32} LnX_{32} + b_{42} LnX_{42} + b_{52} LnX_{52} + \mu \quad \text{....(3)}$$

Chow's F test (Chow, 1960) was employed to test the homogeneity between the parameters of the above two production functions. Once Chow's 'F' statistics was found significant, it could be inferred that the two functions differed significantly. Then using Bisalaiah's (1977) output decomposition model, different sources of income differences between the two categories of the rearers were estimated.

Taking the differences between equations (2) and (3), adding some terms and subtracting some terms, yield decomposition models can be written for conventional silkworm rearers and large-scale silkworm rearers as follows:

$$Ln\ Y_2 - Ln\ Y_1 = (Ln\ a_2 - Ln\ a_1) + (b_{12} LnX_{12} - b_{11} LnX_{11} + b_{12} Ln\ X_{11} - b_{12} Ln\ X_{11}) + (b_{22} LnX_{22} - b_{21} LnX_{21} + b_{22} LnX_{21} - b_{22} LnX_{21}) + (b_{32} LnX_{32} - b_{31} LnX_{31} + b_{32} LnX_{31} - b_{32} LnX_{31}) + (b_{42} LnX_{42} - b_{41} LnX_{41} + b_{42} LnX_{41} - b_{42} LnX_{41}) + (b_{52} LnX_{52} - b_{51} LnX_{51} + b_{52} LnX_{51} - b_{52} LnX_{51}) + (\mu_3 - \mu_1) \quad \text{.... (4)}$$

Rearranging the terms,

$$Ln\ Y_2 - Ln\ Y_1 = (Ln\ a_2 - Ln\ a_1) + [(b_{12} - b_{11})\ Ln\ X_{11} + (b_{22} - b_{21})\ LnX_{21} + (b_{32} - b_{31})\ LnX_{31} + (b_{42} - b_{41})\ LnX_{41} + (b_{52} - b_{51})\ LnX_{51}] + [b_{12}\ (LnX_{12} - LnX_{11}) + b_{22}\ (LnX_{22} - LnX_{21}) + b_{32}\ (LnX_{32} - LnX_{31}) + b_{42}\ (LnX_{42} - LnX_{41}) + b_{52}\ (LnX_{52} - LnX_{51})] + (\mu_3 - \mu_1) \quad \text{.... (5)}$$

By using the logarithmic rule, the equation (5) can also be written as

$$Ln\ (Y_2/Y_1) = [Ln\ (a_2/a_1)] + [(b_{12} - b_{11})\ LnX_{11} + (b_{22} - b_{21})\ LnX_{21} + (b_{32} - b_{31})\ LnX_{31} + (b_{42} - b_{41})\ LnX_{41} + (b_{52} - b_{51})\ LnX_{51}] + [\{b_{12}\ Ln\ (X_{12}/X_{11})\} + \{b_{22}\ Ln\ (X_{22}/X_{21})\} + \{b_{32} Ln\ (X_{32}/X_{31})\} + \{b_{42} Ln\ (X_{42}/X_{41})\} + \{b_{52} Ln\ (X_{52}/X_{51})\}] + (\mu_3 - \mu_1) \quad \text{.... (6)}$$

The resultant equation (6) decomposes the total difference in cocoon production between two categories of the farmers. On the right hand side of the equation, the first two bracketed expressions, summed up, measure the production gaps attributable to the differences in the management practices. The first bracketed expression on the right hand side is a measure of percentage change in output due to shift in scale parameters of the production function. The second bracketed expression is the sum of the arithmetic changes in output elasticities as a measure of change in output due to shifts in slope parameters (output elasticities) of the production function. The third bracketed expression is a measure of change in output due to changes in input use, given the output elasticities of these inputs under new production technology. The last bracketed expression is related to the difference in error terms.

III

RESULTS AND DISCUSSION

Size of Operation

There are two major distinct activities in sericultural farming. The first one is production of mulberry leaf, which is the sole feed for silkworm and the second one is silkworm rearing, which is an indoor activity. Hence, the size of operations is decided based on mulberry farm holding and the number of disease free layings (dfls) reared per batch. The mulberry farm holding pattern of the sample farmers is given in Table 1. Majority of the sample farmers (76.67 per cent) fell in the category of 5.0 acres to 7.0 acres of mulberry holdings. Though large-scale sericulture farming is picking up in recent years, majority of the large-scale farms are with the mulberry area of around 5 acres considering high labour requirement for silkworm rearing especially during the last instar[2] of silkworm rearing, mounting[3] of silkworm and harvesting of cocoon. Only 4 sample farmers accounting for 6.67 per cent had the mulberry acreage of above 10 acres. The average size of the large-scale sample mulberry holding was 6.05 acres whereas it was 2.19 acres in case of small sized farms.

TABLE 1. MULBERRY HOLDING PATTERN OF LARGE-SCALE AND SMALL-SCALE SAMPLE REARERS

		Large-scale rearers (LSR)		Small-scale rearers (SSR)	
Sl. No (1)	Size of mulberry holdings (2)	No. (3)	Per cent (4)	No. (5)	Per cent (6)
1.	Above 10.0 acres	4	6.67		0.00
2.	7.5 acres - 10.0 acres	10	16.67		0.00
3.	5.0 acres - 7.5 acres	46	76.67		0.00
4.	Less than 5.0 acres	0	0.00	60	100.00
	Total	60	100.00	60	100.00
	Average mulberry holding (acres)	6.05		2.19	

As a commercial activity, one silkworm crop takes normally 35 days from the day of hatching of silkworm eggs to marketing of cocoon and then for cleaning and disinfection of rearing house and appliances. However, the farmers can reduce 8 days of rearing period by purchasing the young aged worms from young age silkworm rearing centres (popularly known as Chawki Rearing Centres in sericulture industry) instead of buying silkworm eggs. Considering the growth of mulberry leaf from the garden, the farmers can rear only 5 crops of silkworm in a year. But by dividing the mulberry garden into two portions and adjusting the pruning schedule of the mulberry plantation, the farmers normally rear 10 crops in a year in such a way to get mulberry leaf for alternate batches from each portion in order to efficiently utilise the infrastructure created for silkworm rearing such as rearing house, rearing and mounting appliances, etc. Thus in the study area, all the sample farmers reared 10 crops of silkworm per year by dividing their mulberry farm into two equal portions.

Around 68.33 per cent of the large-scale silkworm rearers considered for the study brushed 500-750 dfls per crop (Table 2). About 11.67 per cent of the large-scale farmers brushed less than 500 dfls per batch due to insufficient space in rearing house or less mulberry leaf availability. The large farmers brushed at an average of 621 dfls per batch, whereas the small farmers reared 230 dfls per batch.

TABLE 2. BRUSHING PATTERN OF LARGE-SCALE AND SMALL-SCALE SAMPLE REARERS

		LSR		SSR	
Sl. No. (1)	No. of dfls/crop (2)	No. (3)	Per cent (4)	No. (5)	Per cent (6)
1.	Less than 500 dfls	7	11.67	60	100.00
2.	500-750 dfls	41	68.33		
3.	750-1000 dfls	9	15.00		
4.	More than 1000 dfls	3	5.00		
	Total	60	100.00	60	100.00
	No. of crops	10.03		10.17	
	No. of dfls reared/crop	621.25		230.47	

Profitability in Large-Scale Silkworm Rearing

The production and productivity differences in cocoon production per unit area between two categories of farmers are presented in Table 3. The small-scale rearers brushed 1068 dfls/acre/year, which was slightly more than that of the large-scale rearers. In addition, the average cocoon yield obtained per 100 dfls by the small-scale rearers was 64.63 kg against the average yield of 61.92 kg/100 dfls by large scale rearers. Hence, the cocoon production/acre/year of small-scale farmers was about 52.56 kg more than that of their counterparts. This indicates that the small farmers were able to manage the silkworm rearing operations better than the large-scale rearers to obtain better yield and quality, which is reflected in higher cocoon prices realised by the small-scale silkworm rearers.

TABLE 3. PRODUCTIVITY DIFFERENCES IN COCOON PRODUCTION BETWEEN TWO CATEGORIES OF FARMERS

Sl. No. (1)	Items (2)	LSR (3)	SSR (4)
1.	Number of dfls reared/acre/year	1030.07	1068.14
2.	Cocoon yield (kg/100 dfls)	61.92	64.63
3.	Cocoon production (kg/acre/year)	637.80	690.36
4.	Cocoon price (Rs./kg)	145.55	148.88

Table 4 gives the comparative economics of cocoon production under small-scale and large-scale silkworm rearing. The cost of production of cocoon was more for the large farmers (Rs. 100.61/kg of cocoon) than that of their SSR counterparts (Rs. 93.48/kg), as they produced less quantity of cocoon for almost the same expenditure, which may be attributed to management problems in large-scale rearing. When we look into the cost structure of silkworm rearing, the expenditure incurred on labour by the small farmers was comparatively more than that of large-scale rearers. This indicates that the small scale farmers by incurring an expenditure of Rs.17122.71/acre/year on labour used more labour to attend the silkworm rearing activities more intensively as compared to large-scale rearers (Rs.13990.65) to obtain higher yield and better returns. The studies conducted by Hanumappa and Erappa (1985), Lakshmanan *et al.*, (1998) and Kumaresan and Vijaya Prakash (2001) indicated more involvement of family labour and high returns to family labour and management in silkworm rearing. As the cocoons produced in the study area are usually marketed in Karnataka to obtain better price, the transportation and marketing charges were generally high for both the categories of farmers.

TABLE 4. COMPARATIVE ECONOMICS OF COCOON PRODUCTION WITH LARGE-SCALE SILKWORM REARERS AND SMALL-SCALE REARERS

(Rs./acre/year)

Sl. No. (1)	Items (2)	LSR (3)	SSR (4)
1.	Mulberry leaf	26020.42	22445.61
2.	Dfls/young age worm	6773.90	6659.32
3.	Labour	13990.65	17122.71
4.	Disinfectants and materials	5075.39	5324.20
5.	Transportation and marketing	7171.88	7702.67
6.	Depreciation on building and equipments	4250.18	4394.26
7.	Interest on working capital	885.48	888.82
8.	Total cost	64167.90	64537.58
9.	Cost/kg cocoon	100.61	93.48
10.	Revenue from cocoon and by-products	94732.22	104665.52
11.	Net return	30564.32	40127.94
12.	B:C ratio	1.48	1.62

Small-scale silkworm rearers obtained higher revenue by realising Rs.104665.52/acre/year from the sale of cocoon and generation of by-products than that of large-scale rearers (Rs. 94732.22/acre/year), as the small-scale rearers obtained better yield and price compared to the large-scale rearers. The net return earned by the large-scale rearers and small-scale rearers worked out to Rs. 30,564.32 and Rs. 40,127.94/acre/year, respectively. Though, the large-scale rearers did not obtain the revenue comparable to the level of the small-scale rearers, their profit levels were very high with the benefit-cost ratio of 1.48 and was comparable with many other cash crops such as sugarcane, turmeric, cotton, banana, etc. [4]

Production Function Estimates

Decomposition analysis needs values on production function estimates and geometric mean levels of inputs and output. The estimates of the production function are presented in Table 5. The coefficient of multiple determination (R^2) was worked out to 0.768, 0.824 and 0.725 for large-scale rearers, small-scale rearers and pooled data respectively implying that 76.80 per cent, 82.40 per cent and 72.50 per cent of variation in the income from cocoon production could be explained by the variables included in the respective function. This indicated that the selected form of the production function was the best fit.

TABLE 5. PRODUCTION FUNCTION ESTIMATES FOR COCOON PRODUCTION

		Regression coefficient		
Sl. No. (1)	Variables (2)	LSR (N=60) (3)	SSR (N=60) (4)	Pooled (N=120) (5)
1.	Constant	1.493	1.7502	2.7287
2.	Farmyard manure	0.03393	0.04379*	0.03315*
		(0.05965)	(0.0151)	(0.00507)
3.	Fertilisers	0.02678	0.0081	0.000751
		(0.01649)	(0.01097)	(0.00928)
4.	Disinfectants	0.4833*	0.15929*	0.19226*
		(0.1377)	(0.06109)	(0.06471)
5.	Labour	0.0406	-0.1487	0.05086
		(0.1171)	(0.06507)	(0.06507)
6.	Dfls	0.6657**	1.2344**	0.8455**
		(0.1284)	(0.1857)	(0.1037)
	R^2	0.768	0.824	0.725

Note: Figures in parentheses indicate standard error.
* and ** Significant 5 and 1 per cent level, respectively.

The values of the regression coefficient (elasticity of production) were less than one for all the inputs considered in the production function fitted for large-scale farmers. This shows that each input included in the production function followed diminishing marginal productivity. The coefficients of dfls (0.6657) and disinfectants

(0.4833) were positive and statistically significant for large-scale farmers. This implies that one per cent increase in these resources over the geometric mean levels would contribute respective percentage increase in income from cocoon production. Hence, it may be inferred that dfls and disinfectants were the important variables, which significantly influenced the cocoon production with the large-scale farmers. The production coefficient of fertiliser (0.02678), human labour (0.0406) and farmyard manure (0.03393) had positive sign as expected *a priori* but statistically not significant.

In the production function fitted for small-scale rearers, the production elasticity of farmyard manure (0.04379), disinfectants (0.15929) and dfls (1.2344) turned out to be the most important variables governing the cocoon production, as these regression coefficients were positive and statistically significant. The output elasticity of fertiliser was positive but statistically not significant. The regression coefficient of labour was inversely related to cocoon production with the small-scale rearers against the expectation, but the coefficient was statistically not significant. This might be due to the overuse of labour in the silkworm rearing by the small-scale rearers due to more availability of family labour with them.

In the pooled data, the regression coefficient of dfls (0.8455), disinfectants (0.19226) and farmyard manure (0.03315) exerted significant influence on the cocoon production, while the coefficient of fertiliser (0.000751) and labour (0.05086) did not have any significant relationship with the output.

Chow's test was conducted to examine the structural differences between the two categories of the farmers. The results of this analysis indicated that the F value was statistically significant at one per cent level thus, proving that the two production functions defined for cocoon production differed significantly. These differences were due to changes in the slope as well as intercept differences. This result offered the required justification for decomposing the production functions of large-scale farmers and small-scale farmers into its constituent sources that is technological change and changes in the level of inputs.

The geometric mean levels of inputs used for cocoon were estimated independently for large-scale rearers and small-scale rearers and the results are presented in Table 6. It is interesting to note that the large-scale farmers used more inputs such as farmyard manure and fertilisers for mulberry garden compared to the small-scale rearers, but used less quantity of inputs (labour, disinfectants and dfls) than their counterparts in silkworm rearing. The cost intensive inputs such as farmyard manure and fertilisers were used more by the large-scale rearers compared to small-scale farmers due to their better economic conditions. The expenditure on the labour use was significantly higher for the small-scale rearers, because they tend to use more of family labour for the small sized operations. On the other hand, as the large-scale rearers depended more on hired labourers, the use of labour for silkworm operations was optimum.

TABLE 6. GEOMETRIC MEAN LEVELS OF INPUTS USED BY THE SAMPLE FARMERS

Sl. No. (1)	Variables (2)	Mean value LSR (3)	Mean value SSR (4)	Increase/decrease over SSR (5)
1.	Farmyard manure (Rs./acre/year)	6412.42	5716.96	12.16
2.	Fertilisers (Rs./acre/year)	5296.23	3977.17	33.17
3.	Disinfectants (Rs./acre/year)	4634.74	4864.95	-4.73
4.	Labour (Rs./acre/year)	15181.58	22038.85	-31.11
5.	Dfls (Rs./acre/year)	3732.23	3926.38	-4.94

Decomposition Analysis of Cocoon Production

The results of decomposition analysis on the income difference in cocoon production between large-scale rearers and small-scale rearers are presented in Table 7. A slight discrepancy is observed between observed and estimated gains in net income between the two categories of the rearers. This may be attributed to the random term, which among others, accounts for variable management input, which could not be included in the model.

TABLE 7. DIFFERENT SOURCES CONTRIBUTING TO INCOME DIFFERENCE BETWEEN LARGE-SCALE FARMERS AND SMALL-SCALE FARMERS IN COCOON PRODUCTION

Sl. No. (1)	Sources of change (2)	Percentage contribution (3)
A.	Total difference in income	-31.29
B.	Income difference due to management	
1.	Neutral technological change	-25.72
2.	Non-neutral technological change	0.72
	Total income difference due to management	-25.01
C.	Income gap due to input use	
1.	Farmyard manure	0.39
2.	Fertilisers	0.77
3.	Disinfectants	-2.34
4.	Labour	-1.51
5.	Dfls	-3.38
	Total income difference due to input use	-6.08
	Total difference in income	-31.08

The total difference in income from cocoon production between the large-scale silkworm rearers and small-scale rearers was found to be 31.08 per cent. Among the different sources contributing to the income difference, the technology or the management practices contributed maximum (25.01 per cent) to the income gap for the large-scale farmers compared to the small-scale farmers. Among the components of technological change, the contribution of neutral technological change in the income reduction was estimated to be 25.72 per cent in contrast to the positive contribution of 0.72 per cent by the non-neutral technological change to the net income in cocoon production. This indicates the better technique of production adopted by the small-scale farmers resulted in the shift in slope parameters. As evident by the positive contribution of non-technological change, though the large-scale rearers were able to consolidate the technological gain by adjusting to the new requirements of silkworm rearing, the gain was not significant. This implies that by following better techniques of production or management such as adequate and timely feeding for silkworm, maintaining optimum bed space, proper disinfectants, maintenance of temperature, humidity and ventilation, use of proper mounting technique etc., the income levels of the large-scale farmers could be increased to about 25 per cent without incurring additional expenditure on inputs. As the small-scale rearers normally rear silkworm in small or medium sized rearing houses in which adjusting temperature and humidity is comparatively easier. Again, with the availability of family labour, the small farmers could provide timely feed for silkworm and maintain hygiene in the silkworm rearing. Any deviation in rearing practices due to non-availability of labour or work pressure adversely affect the yield performance in silkworm rearing. Hence, the large-scale rearers need some labour saving practice or devices such mulberry shoot harvesting, mounting of silkworm, harvesting of cocoon and cleaning of silkworm bed for timely completion of operations to obtain better yield.

With regard to difference in the level of input use, farmyard manure and fertilisers contributed to a meager income gain in cocoon production to the tune of 0.39 per cent and 0.77 per cent, respectively for the large-scale farmers, whereas the less use of disinfectants, labour and dfls contributed negatively to the profit to the extent of 2.34 per cent, 1.51 per cent and 3.38 per cent, respectively for the large-scale farmers. While the cost intensive mulberry inputs were used effectively by the large farmers for income maximisation, the rearing inputs such as disinfectants and labour were not managed properly by them, which might be due to some technical problems such as timely operations in large-sized rearings and labour related problems. The income loss for the large-scale farmers was 6.08 per cent compared to the small-scale farmers due to the sub-optimal use of inputs in silkworm rearing.

Constraints in Large-Scale Sericultural Farming

Though the large-scale sericultural farming was economically viable, they were not able to obtain the yield levels comparable to the small-scale farmers. Various constraints operating on large scale farming in the field conditions might be partially responsible for this yield gap. Hence, the opinions of large-scale rearers were documented to understand the practical problems faced by them in managing large-scale silkworm rearing (Table 8). Timely availability of adequate labour and increase in wages were the important problems expressed by more than 75 per cent of the farmers. The large-scale rearers expressed the requirement of labour saving machineries or practices especially for shoot harvest, mounting of silkworm and harvest of cocoons from mountages, for which the labour requirement is very high. About 31 per cent of the respondents in Tamil Nadu expressed the problems in marketing of cocoon, as they had to carry their cocoons to Karnataka for getting a fair price. Fluctuations in the cocoon price, crop instability and inadequate technical guidance from the extension workers were the other constraints expressed by the large-scale rearers.

TABLE 8. LARGE-SCALE SILKWORM REARERS' OPINION ABOUT CONSTRAINTS IN LARGE-SCALE SERICULTURAL FARMING

Sl. No. (1)	Constraints (2)	Per cent response (N=60) (3)
1.	Labour problem	75.00
2.	Marketing problems	31.25
3.	Water problem	15.63
4.	Insufficient/fluctuations in cocoon price	9.38
5.	Crop instability	5.00
6.	Inadequate technical guidance	5.00

IV

SUMMARY AND CONCLUSIONS

The objective of the study was to evaluate the economic performance of the large sized sericultural farms. The information for the study was collected from randomly selected 60 large-scale silkworm rearers in Coimbatore district of Tamil Nadu. For comparison purposes, the data were also collected from 60 randomly selected small/medium scale silkworm rearers in the same study area. Though the net profit earned by the large scale farmers was marginally below that of the small-scale farmers, the large scale sericultural farming was highly profitable with the cost benefit ratio of around 1:1.48. This clearly indicates that the large-scale sericultural farming is economically viable and commercially feasible. The higher profitability nature of sericulture can be popularised with the large farmers, educated and unemployed rural youth, rural based entrepreneurs through extension programmes, vocational training and entrepreneurship development programmes to promote sericulture. The corporate houses and private firms, which have adequate capital, professional skills and look for the investment avenues, can be persuaded to participate by having facilitative policies for promoting private investment in sericulture.

The decomposition analysis showed that the technology contributed for about 25 per cent income difference between large-scale farmers and small-scale farmers. This calls for fine-tuning of the existing technologies to suit to the requirements of large-scale silkworm rearing so that the income levels of the large-scale farmers could be increased to the level of small-scale farmers.

The major constraint expressed by the large-scale silkworm rearers was the difficulty in availability of sufficient labour for large-scale sericultural operations especially during the later stages of the silkworm rearing. This calls for devising and popularisation of improved labour saving machineries or practices especially for shoot harvest, mounting of silkworm and harvest of cocoons from mountages, for which the labour requirement is very high.

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NOTES

1. Silkworm seed, which is free from diseases, is called disease free layings (dfls). Each dfl has 400-500 eggs.
2. The silkworm larvae *Bombyx mor*i feed for 23 to 24 days on mulberry leaves and undergo four moults during this period. The final instar, which is after the fourth moult, is the longest eating phase in life cycle of the silkworm and it lasts for 6 to 7 days. The labour requirement would considerably increase during the last instar due to the voracious feeding of the larvae.
3. The activity of transferring of matured silkworm larvae to a suitable frame to provide proper anchor to spin cocoons is called mounting. Mounting is a time bound, quick and labour intensive activity in silkworm rearing. Wrong management, postponement and prolonged mounting result in loss of silk besides production of poor quality cocoons resulting in lower income.
4. In the study conducted on comparative economics of sericulture vis-à-vis major competing crops by Dandin *et al.* (2005), the net profit from sericulture was worked out to Rs. 47476.00/acre/year whereas the net profit of sugarcane and turmeric was Rs. 29625.00 and Rs. 25707.00/acre/year, respectively, in Erode district of Tamil Nadu. The net revenue obtained in turmeric and sugarcane was less than that of the revenue obtained by the large-scale farmers in the present study.

REFERENCES

Bisalaiah, S., (1977), "Decomposition Analysis of Output Change Under New Production Technology in Wheat Farming: Some Implications of Returns on Research Investment", *Indian Journal of Agricultural Economics*, Vol. 32, No.3, July-September, pp.193-201.

Chow, G.C. (1960), "Test of Equality Between Sets of Coefficients in Two Linear Regressions", *Econometrica*, Vol.28, No.2, pp. 591-605.

Dandin, S.B., S.M.H. Qadri, Thirunavukkarasu and Krishnamoorthy (2005), "Comparative Economics of Sericulture with Major Cash Crops in Erode District of Tamil Nadu", *The 20th Congress of the International Sericultural Commission 2005*, December 15-18, 2005 held at Bangalore, pp. 233-236.

Hanumappa, H.G. and S. Erappa (1985), "Economic Issues in Sericulture: Study of Karnataka", *Economic and Political Weekly*, Vol. 20, No. 31, August 3-10, pp.1322-1326.

Kumaresan, P. and N.B. Vijaya Prakash (2001), "Comparative Economics of Sericulture with Competing Crops in Erode District of Tamil Nadu", *Indian Journal of Sericulture*, Vol. 40, No.2, pp.142-146.

Lakshmanan, S., H. Jayaram, R. Ganapathi Rao, B. Mallikarjuna, and R.G. Geetha Devi (1998), "Manpower Utilisation in Mulberry Sericulture: An Empirical Analysis", *Manpower Journal*, Vol.33, No.4, pp. 49-63.