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Economics of Sericulture Technologies – A Study in North Western and Western Zones of Tamil Nadu

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The objective of the study was to find out the economically viable zone for sericulture technology in Tamil Nadu. Costs and returns from north western and western zone were estimated. The study showed that net return from cocoon production for north western zone and western zone were ₹ 270200.41 and ₹ 377153.36 ha/year. The output / input ratio of sericulture were higher than unity for both the zones i.e., 1:2.28 and 1:2.32 for north western zone and western zone. The estimated results showed that farmers of western zone of Tamil Nadu earned more profit than north western zone.

Key words: sericulture, economical zones, Tamil nadu

India has the unique distinction of being the only country in the world which produces all four types of silk, *viz.*, mulberry, tasar, eri and muga. India is the second largest producer of raw silk and the highest consumer of raw silk fabrics in the world. Sericulture is an important agro based rural industry that helps our economy and generates higher income and employment. It is practiced in a wide range of agro-climatic regions of western zone and north western zone of Tamil Nadu. The recent technological advancements have made it possible to practise it on an intensive scale, mainly due to increased profits obtained from it as compared to most of the crops and enterprises. Also, there is wide scope in change of quantity and cost of inputs required for sericulture activities.

In view of this, it is very much imperative to know the sericulture economics and it is highly essential to motivate the growers to take up sericulture and increase their income. Some studies were earlier attempted were made to find out the economic prospects of sericulture at the farmer's level in various parts of Tamil Nadu (Ruchira Shukla *et al*., 2012). Hence, the present study was designed, to find out the cost of establishment of mulberry garden in north western zone and western zone of Tamil Nadu, to find out the cost associated with mulberry leaf production and cocoon production in north western zone and western zone, to work out cost and returns from unit area under mulberry cultivation and silkworm rearing

Materials and Methods

The study was carried out in two major silk producing zones of Tamil Nadu namely, north western zone and western zone. Totally 100 sericulture farmers each from north western and western zone were randomly selected, and the total sample size was 200 farmers. In order to collect the responses, a survey was conducted in the area in consultation with the officials of the Sericulture Department. A specially designed schedule was used as an instrument of data collection in persond interview with farmers. A pre-tested schedule was subjected to collect information on cost incurred for different inputs and return including value of by-products. Simple cost accounting method was employed to outline the cost and return of mulberry leaf production and silkworm rearing per hectare per year. The total cost consisted of fixed and variable cost components. The total cost of garden establishment was divided and accounted for 15 years to arrive at the share of fixed costs per annum using net present value method while calculating cost of mulberry leaf production. Gross returns were calculated using returns from cocoons and by-products (Balasaraswathi *et al*., 2010). The data pertained to the period, 2012-2013.

In the study area, majority of the farmers with separate rearing house were selected by following random sampling method using the list of farmers received from the district sericulture office, the farmers rearing silkworms in the dwelling house located adjacent to the sample farmers possessing the rearing house were selected for the data collection in order to minimize the variations between the two categories of the farmers in terms of rearing practices and agro -climatic conditions (Kumaresan *et al*., 2011). The collected data were compiled, tabulated and subjected to tabular and percentage analyses, in order to assess the economics of sericulture technologies, benefit- cost ratio (BCR) was worked out.

Results and Discussion

North western zone of Tamil Nadu

The cost incurred in mulberry garden in north western zone was analysed and results are presented

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in Table 1. The cost items considered for garden establishment were human labour, animal power, machine power, farm yard manure (FYM), chemical fertilizers, cuttings and saplings, irrigation, land tax, miscellaneous cost and interest on working capital

Table 1. Cost of establishment of mulberry garden in north western zone of Tamil Nadu (N=100)

Variables	Units	Physical quantity	Cost (₹)/ha	Share of total cost (%)
Human labour	man days	88.43	11571.54	19.21
Animal power	hours	21.84	2858.85	4.75
Machine power	hours	17.28	4674.24	7.76
Farm yard manure	tonnes	14.94	7529.76	12.50
Chemical fertilizers	kg	875	10062.50	16.70
Cuttings and saplings		-	12643.50	20.99
Irrigation		-	5800.00	9.63
Miscellaneous cost		-	1090.00	1.81
Land less		-	73.80	0.12
Interest on working capital @7% p.a.		-	3941.30	6.54
Total			60245.50	100.00

computed at the rate of 7 per cent per annum. The primary share (20.99 per cent) of the cost associated with garden establishment was incurred for cuttings and saplings (₹ 12643.50) followed by cost on human labour (₹ 11571.54) and chemical fertilizers (₹ 10062.50).

The details of cost matrix on mulberry leaf production (per ha/year) are presented in Table 2. The total cost consisted of fixed and operational (variable) cost components. The total cost of garden establishment was divided and accounted for 15 years to arrive at the share of fixed cost per annum.

Table 2. Cost (per ha) of mulberry leaf production in north western zone of Tamil Nadu (N=100)

Variables	Units	Physical quantity	Cost ( )	Share of total cost (%)
Operational cost				
Human labour	man days	346.5	51849.78	55.99
Animal power	hours	1.5	300.00	0.32
Farm yard manure	tonnes	16.90	9700.60	10.47
Chemical fertilizers	kg	1050.00	12075.00	13.04
Irrigation		-	7600.00	8.21
Miscellaneous cost		-	1199.00	1.29
Land tax		-	73.80	0.08
Interest on working capital@7% p.a.		-	5795.87	6.26
Operational cost			88594.06	95.66
Fixed cost (share of establishment of mulberry garden per ha/ annum)			4016.36*	4.34
Total (I+II)			92610.42	100.00

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

The total operational cost included human labour, animal labour, FYM, chemical fertilizers, irrigation, land tax, miscellaneous cost and interest on working capital. It was recorded that about 55.99 per cent (₹ 51849.78) of total cost was incurred for human labour in leaf production activities. The higher labour cost incurred was due to the higher wages of labour and shortage of manpower (Ruchira Shukla *et al*., 2012). The cost incurred in chemical fertilizers was 13.04 per cent (₹ 12075.00) of total cost whereas in FYM it was 10.47 per cent (₹ 9700.60) of the total cost.

The cost of labour, chemical fertilizers and FYM put together accounted for about 79.5 per cent of the total production cost. High cost on inputs is due to lack of awareness about inputs and reluctance of farmers in accepting the cost effective improved practices generated by the research institutes (Jayram *et al.*,

Table 3. Cost and return (₹ /ha/year) structure from cocoon production in north western zone of Tamil Nadu (N=100)

Variables	Cost (₹)	Share of total cost (%)
Fixed cost		
Depreciation on rearing house	17218.45	8.16
Depreciation on equipments	16560.25	7.85
Interest on fixed capital@12% p.a.	4053.44	1.92
	37832.14	17.94
Variable cost		
Human labour	29800.00	14.13
Dfls	16169.18	7.67
Disinfectants	14640.00	6.94
Transport charge	6214.00	2.95
Miscellaneous cost	2334.00	1.11
Interest on working capital @ 7% p.a.	11323.73	5.37
Mulberry leaf cost	92610.42	43.91
	173091.33	82.06
	210923.47	100.00
Return (₹)		
Gross return	481123.89	
Total cost	210923.47	
Net return	270200.41	
	1:2.28	

1996). The total operational cost and total fixed cost were ₹ 88594.06 (95.66 %) and ₹ 4016.36 (4.34 %), respectively. Therefore, total cost of mulberry leaf production was ₹ 92610.42.

Depreciation on rearing house and equipments shared about 8.16 (₹ 17218.45) and 7.85 per cent (₹ 16560.25) respectively (Table 3) . Human labour was the major cost component next to mulberry leaf production, which accounted for ₹ 29800.00 whereas mulberry leaf cost accounts ₹ 92610.42 (43.91 %). The total cost of cocoon production was ₹ 210923.47. The estimated gross return was ₹ 481123.89. and the net return of cocoon production was ₹ 270200.41.

It is evident from the Table 4 that the gross income from cocoon (ha/year) and by product was ₹ 465123.89 and ₹ 16000.00 respectively. The average cost of cocoon was ₹ 267.38/ kg. Thus, benefit cost ratio was estimated as 1:2.28 for the cocoon production in north western zone of Tamil Nadu.

Table 4. Summary of major economic parameters in north western zone of Tamil Nadu (N=100)

Parameter	Units	Value
Average area under mulberry	hectare	1.00
Average leaf yield (ha/yr)	kg	27504.57
Cost of leaf (ha/yr)	₹	92610.42
Cost of leaf (per/ kg)	₹	3.37
Average numbers of Dfls brushed (ha/yr)	numbers	2939.85
Average cocoon yield (ha/yr)	kg	1739.56
Average numbers of crops (ha/ yr)	numbers	5
Average cocoon cost (ha/yr)	₹	267.38
Gross income (ha/yr)		
From cocoons (A)		465123.89
From by-products (B)	₹	16000.00
Total (A+B)		481123.89
Average cost of cocoon (per/ kg)	₹	267.38
Benefit cost ratio (B:C ratio)	-	1:2.28

Western zone of Tamil Nadu

The total cost of establishment of mulberry garden of the sample farmers in western zone was ₹ 86976.83/ ha (Table 5). The main cost involved was the cost of cuttings and saplings which accounted for ₹ 21250.24. This was followed by human labour

Table 5. Cost (₹ /ha) of establishment of mulberry garden in western zone of Tamil Nadu (N=100)

Variables	Units	Physical quantity	Cost (₹)	Share of total cost (%)
Human labour	man days	91.76	15415.68	17.72
Animal power	hours	22.50	3825.00	4.40
Machine power	hours	22.40	6731.20	7.74
Farm yard manure	tonnes	17.68	13313.04	15.31
Chemical fertilizers	kg	970.00	11155.00	12.83
Cuttings and saplings			- 21250.24	24.43
Irrigation			- 7600.00	8.74
Miscellaneous			- 1853.00	2.13
Land tax			- 143.60	0.17
Interest on working capital @7% p.a.			- 5690.07	6.54
			- 86976.83	100.00

with a cost of ₹ 15415.68. and farm yard manure with a cost of ₹ 13313.04. The other minor items of expenditures were land tax (₹ 143.60), miscellaneous cost (₹ 1853.00) and animal power (₹ 3825.00).

Among the farmers in western zone of Tamil Nadu, the total cost of mulberry leaf production was ₹ 130692.20 and the highest expenditure was towards labour (₹78041.52) and was 59.71per cent. The second major expenditure was towards the cost of chemical fertilizers and farm yard manure constituted for 10.50 per cent followed by interest on working capital @ 7 per cent per annum which accounted for ₹ 8170.62. The other minor expenditures were land tax (₹ 143.54), animal power (₹ 1037.50) and miscellaneous costs (₹ 1995.95) (Table 6).

Table 6. Cost (₹ per ha) of mulberry leaf production in western zone of Tamil Nadu (N=100)

Variables	Units	Physical quantity	Cost (₹)	Share of total cost (%)
Operational cost				
Human labour	man days	385.2	78041.52	59.71
Animal power	hours	3.8	1037.50	0.79
Farm yard manure	tonnes	18.2	13704.60	10.49
Chemical fertilizers	kg	1200	13800.00	10.50
Irrigation		-	8000.00	6.12
Miscellaneous		-	1995.95	1.53
Land tax		-	143.54	0.11
Interest on working capital@7% p.a.		-	8170.62	6.25
Operational cost			124893.72	95.56
Fixed cost (share of establishment of mulberry garden per ha)			5798.46*	4.44
Total (I+II)			130692.20	100.00

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

The silkworm rearing activities end up with the production of cocoons. This is carried out as an indoor activity unlike mulberry leaf production which is an outdoor activity. The expenditure involved is broadly classified into fixed cost and variable cost. The summation of two costs together form the cost of production of cocoons. The costs of cocoon production per kg and benefit ratio were arrived at subsequently.

The capital investment required on fixed items was taken into account for computation of the fixed cost which is non- recurring in nature. The deprecation cost of the fixed items such as rearing house, equipments and interest on fixed capital @ 12 % per annum. In addition, the variable cost operating on silkworm rearing was human labour, disease free layings (dfls), disinfectants, transport charge, mulberry leaf cost and miscellaneous cost was computed for the purpose.

The major depreciative cost to an extent of 6.97 per cent was the cost of the rearing house which accounted for ₹ 19925.00. This was followed by expenditure on the depreciation on equipments (6.65 %) were ₹ 18998.14 and interest on fixed capital @ 12 % per annum ₹ 4670.78 respectively. Thus, total fixed cost was ₹ 43593.92 (Table 7).

The total variable cost was ₹ 242093.36. It included mulberry leaf production (₹ 130692.18) followed by the labour cost, (₹ 36164.10). The cost of disinfection, dfls, interest on working capital were calculated @ 7 % per annum, transport cost and miscellaneous cost which were ₹ 24834.00, ₹ 23728.80, ₹ 15837.89, ₹ 8180.40 and ₹ 2656.00, thus, total cost of cultivation was ₹ 285687.28

Table 7. Cost and return (₹ /ha/year) structure from cocoon production in western zone of Tamil Nadu (N=100)

Variables	Cost (₹)	Share of total cost (%)
Fixed cost		
Depreciation on rearing house	19925.00	6.97
Depreciation on equipments	18998.14	6.65
Interest on fixed capital @12% p.a.	4670.78	1.63
Total Fixed cost (I)	43593.92	15.26
Variable cost		
Human labour	36164.10	12.66
Dfls	23728.80	8.31
Disinfectants	24834.00	8.69
Transport charge	8180.40	2.86
Miscellaneous	2656.00	0.93
Interest on working capital @ 7% p.a.	15837.89	5.54
Mulberry leaf cost	130692.18	45.75
Total variable cost (II)	242093.36	84.74
Total cost (I+II)	285687.28	100.00
Return		(₹)
Gross return		662840.64
Total cost		285687.28
Net return		377153.36
B:C ratio		1:2.32

expenditures (Table 7). Therefore, the gross return of cocoon production was ₹ 662840.64. The net return was ₹ 377153.36.

Table 8 revealed that the average leaf yield was estimated to be 32079.21 kg/ha/yr with the cost of ₹ 130692.18. The average cocoon yield was found to be 1959.82 kg. Thus, gross income from cocoon and by products was worked out to be ₹ 637040.64 and ₹ 25800.00. Therefore, the cost benefit ratio was found to be 1: 2.32 in western zone of Tamil Nadu.

Table 8. Summary of major economic parameters in western zone of Tamil Nadu (N=100)

Parameter	Units	Value
Average area under mulberry	hectare	1.00
Average leaf yield (ha/yr)	kg	32079.21
Cost of leaf (ha/yr)	₹	130692.18
Cost of leaf (per / kg)	₹	4.07
Average numbers of Dfls brushed (ha/yr)	numbers	2966.10
Average cocoon yield (ha/yr)	kg	1959.82
Average numbers of crops (ha/ yr)	numbers	5
Average cocoon cost (ha/yr)	₹	637040.64
Gross income (ha/yr)		
From cocoons (A)		637040.64
From by-products (B)		25800.00
Total (A+B)	₹	662840.64
Average cost of cocoon (per/ kg)	₹	325.05
Benefit cost ratio (B:C ratio)	-	1:2.32

The study revealed that the total costs of production of mulberry garden in north western zone and western zone were ₹ 210923.47 and ₹ 285687.28 respectively. The total expenditure on human labour in north western zone and western zone were ₹ 11571.54 and ₹ 15415.68 per hectare. The cost of mulberry leaf production in north western zone and western zone per hectare were ₹ 92610.42 and ₹ 130692.20 respectively. The gross income realized ₹ 481123.89 and ₹ 662840.64 per hectare. The total costs of cocoon production per hectare for north western zone and western zone were ₹ 210923.47 and ₹ 285687.28 respectively. The C:B ratio for north western zone was 1:2.28 and western zone was 1:2.32 per hectare respectively.

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