

Is Small-Scale Mulberry Silk-Worm Rearing Profitable? The Experience of Cocoon Growers of Bilaspur, Himachal Pradesh

KESHAV SHARMA¹ AND AMIT KUMAR BASANTARAY^{2*}

Department of Economics, Central University of Himachal Pradesh, Dharamshala,
Himachal Pradesh- 176 215

Received: 09 July, 2020

Accepted: 03 September, 2020

ABSTRACT

The sustainability of the Mulberry silk-worm rearing, an important sub-stage of sericulture, depends upon whether or not cocoon growers earn profit from this practice. The present study focuses on small-scale cocoon growers/mulberry silk-worm rearers to find out the extent of profit or losses of these growers. The answer to this question takes care of the issue of sustainability of small-scale silk-worm rearing practice. The study is based on primary data collected from 60 randomly selected households from Ghumarwin block of district Bilaspur of Himachal Pradesh (HP). Small-scale sample cocoon growers are incurring losses when imputed value of family labour is included in the total cost. Returns over total cost excluding family labour is positive which reveals that practice of small-scale mulberry silk-worm rearing is sustainable when the households are willing to put their own labour.

Keywords: Sericulture, Mulberry silk worm, Sustainability, Cocoon Grower, Small-scale, Family Labour

In the contemporary scenario of continuing decline in the contribution of agriculture and allied sector in total GDP and at the same time more than half of country's labour force engaged in agriculture and allied sector, agriculture based industries in India becomes that much significant. Agro-based industries promote development and reduce poverty (Wilkinson & Rocha, 2009) at the country level. Sericulture is one of the important agro-based activities in India which involves five sub-activities, namely, food-plant cultivation, developing silkworms, rearing of silkworms to produce cocoons, reeling of silk yarn from cocoon, and finally weaving of silk-products. As per International Sericulture Commission, global silk production in the year 2018 stood at 159,648 metric tonnes of which India produced 35,261 metric tonnes which comes to about 22 per cent. India is the second largest producer of raw silk and at the same time it is the World's largest consumer of pure silk. The uniqueness of India's silk industry lies in the fact that it is the only country which produces all the four varieties of silk, namely, Mulberry, Eri, Tasar, and Muga. However, mulberry silk holds the dominant position in India as it accounts for roughly 76 per cent of the country's total silk production. Further, sericulture industry in India provides employment to 7.6 million people which is roughly 1.5 per cent of

country's labour force and the sericulture activity spreads across 51,000 Indian villages. There are around 328,628 handlooms, 45867 power looms and 814616 weavers in India. Therefore, sericulture industry has the potential to absorb labour force of both rural and urban India and the same time can be a source of employment for the weavers who face serious threat due to mechanisation. Sericulture industry has a favorable impact on income and employment generation ((Hanumappa & Erappa, 1985; Lakshmanan, 2012; Lakshmanan & Devi, 2007; Lakshmanan S. & Devi, 2007; Rani, 2007). Sericulture is considered as one the few activities which is a short gestation labour intensive enterprise which promotes inclusive growth and alleviates poverty particularly in rural areas -(Chauhan, 2013). Among all the states in India that produces silk, Himachal Pradesh has great potential due to its varied climatic and topographical conditions. Sericulture is practiced in all the districts of Himachal Pradesh (HP) except Lahaul-Spiti and Kinnaur. The state offers favourable conditions for growth of mulberry trees and therefore silkworm rearing offers a suitable environment for mulberry silk production. Rearing of mulberry silk worm can be an important source of subsidiary income occupation to supplement the income of rural households. Realizing this, during 2007-12, then government of the state implemented Catalytic Development Programme (CDP) of Central Silk Board (CSB) in five districts- Kangra, Mandi, Bilaspur, Hamirpur, and

⁽¹⁾ Department of Economics, Central University of Himachal Pradesh, Dharamshala, Himachal Pradesh,

^{*} Email: amiteco@gmail.com

Una to promote sericulture activities in the state. After roughly 10 years past the introduction of CDP, it is worthwhile to find answer to the question of whether the farmers engaged in silk-worm rearing activity in HP are earning profit or incurring losses. The answer to this question will go a long way in finding out whether or not the sericulture activity is sustainable, for production of silk largely depend on supply of good quality cocoons. Therefore, the objectives of the study are to first understand the different stages of silk-worm rearing activity, and then to examine the economics of mulberry silk-worm rearing. There are, in total, four sections which the entire study has been divided into. The succeeding section presents sampling techniques, data, and methodology used in this study followed by a section that presents the empirical results of the study, and last section concludes the study and gives policy recommendations.

MATERIALS AND METHODS

The study is based on primary data. Out of the 10 districts of HP where sericulture activities are performed, district Bilaspur is selected for our study through lottery method of simple random technique. There are four blocks in district Bilaspur, namely, Sadar Bilaspur, Ghumarwin, Jhanduta, and Shree Naina Devi. Ghumarwin block has been selected purposively for the study as it consists of highest number of farmers who are engaged in mulberry silk-worm rearing among all the blocks. Out of the 49 Panchayats and 281 villages in Ghumarwin block, sericulture activities are conducted in roughly 30 Panchayats and 81 villages. Out of those 30 Panchayats, 5 Panchayats are selected randomly for our purpose. After the selection of Panchayats, households belonging to only those villages where sericulture activities are done were listed in our sample frame and then 60 households were

selected randomly. Primary data have been collected from these 60 households in the month of May, 2019 through a pre-tested schedule. After the stage of data collection, data were processed and filtered before these were analysed using frequencies, percentages, and averages. Discussion of empirical results is presented in the following section. The analyses of data have been done on the basis of two categories of farmers- those who rear only in spring season and those who rear in both spring & autumn seasons.

RESULTS AND DISCUSSION

Majority of sample households (67 per cent to be precise) are from SC category and only 33 per cent are from general category (refer to table-1). Half of the samples are from above the poverty line (APL) category and the rest are having below the poverty line (BPL) card. Among the general category households higher percentage of households are from APL category and higher percentage of SC households are from BPL category. In so far as the types of structure of sample households are concerned, majority of general households were either living in katcha or semi-pucca houses. Only 30 per cent of general households were living in pucca houses. Same was the case with SC households. Half of the SC households were living in semi-pucca houses. One interesting characteristic that was observed is that half of the general households are having MGNREGA card meaning they do not get enough employment days from other sources. Percentage of SC households possessing MGNREGA card were higher (70 per cent) than that of general households. Among all the sample households, percentage of those who possessed job card was significantly higher than those not having the card.

Table 1 Select Socio-economic characteristics of Sample Households (In Percentages)

Social Group	Distribution of Households	Type of Ration Card		Type of Structure			Households having MGNREG A Job card	Households NOT having MGNREGA Job card
		APL	BPL	Katcha	Semi - Pucca	Pucca		
General	33	60	40	30	40	30	50	50
SC	67	45	55	10	50	40	70	30
Total	100 (60)	50	50	17	47	36	63	37

Note: Figures in the parenthesis is the total number of households. APL & BPL stand for above poverty line & below poverty line, respectively. MGNREGA stands for Mahatma Gandhi National Rural Employment Guarantee Scheme.
Source: Primary Survey, 2019

Table-2 presents the gender-wise educational level of all the members of sample households. Among the male members, majority were having secondary level education, and a significant percentage was having higher secondary education. Percentage of males who were either illiterate or having below primary level education was 10 per cent. A very small percentage of males were having diploma, graduate, and post-graduate education. Similar is the case with females. One striking difference that is found in case of females compared to males is that 16 per cent of

females were having primary education. Majority of females were having secondary education. Compared to males, a smaller percentage of females were having higher secondary education. The percentage of females who were either illiterate or having below primary education are similar to those of males. From the above figures, it can be safely concluded that majority of members of the households who are practicing Seri-culture activities are having an education which is below or at higher secondary level.

Table 2 Gender-wise educational level of members of sample households (In Percentages)

Educational Qualification	Gender		Total
	Male	Female	
Not Literate	10	11	11
Below Primary	10	10	10
Primary	1	16	9
Secondary	37	34	35
Higher Secondary	24	16	20
Diploma/Certificate Course	4	1	3
Graduate	7	4	6
Postgraduate and above	6	6	6
Total	100 (71)	100 (70)	100 (141)

Note: Percentage of male & female children is 1 per cent each. In the total column, 100 include percentage includes this 1 per cent. Figures in the parentheses are number of persons.

Source: Primary Survey, 2019

Table 3 contains some important information on mulberry silk-worm rearers. It can be seen that majority of households were persuaded by sericulture cooperative society to start silk-worm rearing. More than half of the sample rearers had started practicing the activity after 2007. That means Catalytic Development Programme (CDP) of Central

Silk Board introduced in five districts of HP, in 2007, to boost sericulture support system has helped in increasing the number of silk-worm rearers/cocoon growers. 40 per cent of sample households were growing cocoons only in spring season and the rest were growing in both spring and autumn season.

Table 3 Year of starting of sericulture activity by Sample households and their season-wise distribution

Who convinced the sample households to start sericulture?	Percentages
Sericulture cooperative society	83
Neighbors	17
When did the Sample households start sericulture?	Percentages
Before 2007	43
On and After 2007	57

Season - wise practice of sericulture, and quantity of silk - worm cultivation

Seasons	Sample households (%)	Seeds (in ounce)	Silk Worms (In Numbers)
Only Spring	40	1.33	59850
Both Spring & Autumn	60	2.39	107550

Note: Month in Spring (March-May) & Autumn (August - October), 1 Ounce contains 45000 Silkworms, and ½ Ounce contains 25000 Silkworms.

Source: Primary Survey, 2019

The infrastructures with which farmers were growing cocoons are shown in Table 4. Majority of farmers were using one room or rooms of their dwelling house to rear cocoons. Only a small percentage of farmers (23 per cent to be precise) were growing cocoons in separate sheds. Under the CDP of central Silk Board, it is the job of Sericulture Development Office (SDO) to provide equipment necessary for cocoon growing to growers of targeted districts. Among all the households surveyed, 73 per cent households received equipment from SDO and

the rest did not get any equipment. Again among those 73 per cent households, the percentage who got full kit and half kit was 47 per cent and 26 per cent, respectively. It is clear that 73 per cent of sample households grew cocoons with kits (either half kit or full kit) provided by SDO. But those households (27 per cent) who did not receive any kit grew cocoons using traditional equipment. The percentage of households who grew cocoons with tin sheets, self-made bed, and ply board bed are 10 per cent, 4 per cent, and 13 per cent, respectively.

Table 4 Infrastructure with which sample households rear silk-worms (In Percentages)

Where did the sample households rear silk -worms?	Percentage of Sample Household
Separate Shed	23
Separate room	77
Did the households receive equipments from sericulture development office for rearing silk -worms?	Percentage of Sample Household
Yes	73
No	27
If yes, what type of equipment's did they receive?	Percentage of Sample Household
Full Kit	47
Half Kit	26
No Kit	27
Percentage of households and their type of equipments used for rearing silk -worms	Percentage of Sample Household
With Kit	73
With Tin Sheets	10
With Self -Made Bed	4
With Ply Board Bed	13

Note: Full Kit (Rearing beds, Bed cleaning nets, Scythe, Chopping knives, Chopping Table/Boards, Rubber, Strips, Spade, Shovel, Shallow pan, Bucket, Black clothes rail, Heater, etc.) & Half Kit (Rearing beds, Scythe, Bed cleaning nets)

Source: Primary Survey, 2019

Table 5 Season-wise number of mulberry trees used by sample households

Average number of mulberry trees		Season		All Households
		Only Spring	Both Spring & Autumn	
Owned	S,46	177	152	162
	Local	18	30	25
	Total	195	183	188
On Rent		9	11	10
Total		204	194	198

Source: Primary Survey, 2019

(October 2020)

Is Small-Scale Mulberry Silk-Worm Rearing Profitable? The Experience of Cocoon Growers

Mulberry silk is considered to be the best quality silk and it is produced from silkworms those are fed mulberry leafs. Therefore, farmers who rear these silk-worms must have mulberry trees. Average number of mulberry trees used by farmers of both types is shown in Table 5. Average number of trees used by farmers who rear only in spring and in both spring & autumn are 204 and 194, respectively. These trees are the main and only source of fodder for the worms. Majority of the trees were owned by the farming households. However, some minimal number of trees was also taken on rent. Majority of the trees are of S,46 variety. There are also local varieties of trees used by farmers. Leaves of local mulberry trees are harder than that of S,46 variety.

Leaves of S,46 are soft and also bigger than the local variety. It is considered that 5 leaves of local variety are equal to 1 leaf of S,46 variety –(Chauhan, 2013). Table-6 contains the data on average quantity of mulberry leafs fed to worms at various stages of a 30-days cycle and the survival rate of worms. Seeds/worms are taken from SDO by farmers and from day-1 onwards feeding of leaf start. The growth of worms goes through different phases. Worms are fed for the first four days and immediately after that they go to sleep. So 5th day and 6th day are the days when they sleep and do not eat leafs. Then again from day 7, leafs are provided to them. After day 11, they again go to sleep. Next sleeping days come on 19th & 20th days.

Table 6 Average quantity of mulberry leafs fed to the silk-worms and their survival rate in different stages of silk-worm rearing

Stages	Days	Quantity of Mulberry leafs fed to worms (In Kgs)		Percentage of Silk - worms surviving	
		Only Spring	Both Spring & Autumn	Only Spring	Both Spring & Autumn
Stage1	Day 1	1.14	1.09	100 (31667)	100 (32778)
	Day 2	1.14	1.09		
	Day 3	1.44	1.39		
	Day 4	1.75	1.93		
Stage 2	Day 7	7.75	6.83	98.92	98.91
	Day8	7.75	6.83	97.81	97.87
	Day9	10.75	9.83	96.92	97.06
	Day10	10.75	9.83		
Stage3	Day11	13.75	12.83		
	Day 14	38.33	37.11		
	Day 15	56.33	55.11	95.06	95.17
	Day 16	73.75	72.83		
Stage 4	Day 17	91.75	90.83		
	Day 18	122.33	121.11		
	Day 21	61.75	60.83	89.15	89.43
	Day 22	90	90		
	Day 23	122.92	181.94		
	Day 24	155.83	152.78		
	Day 25	181.75	180.83		
	Day 26	272.92	271.39		
	Day 27	302.92	301.39	89.15	89.43
	Day 28	151.75	150.83		
	Day 29	122.92	121.39		

Note: Figures in the parentheses are precise number of worms which the farmers started rearing on Day-1
Source: Primary Survey, 2019

In stage 4, worms are continuously fed for 9 days and immediately after that they are sold to SDO. During the sleep days, worms enter into their larval life which ends on day 29. That means they are ready for silk-reeling units after day 29. As we can see from the table, on the first day around 1 kg of leafs are provided to them and then the amount gradually increases. The quantity of leafs significantly increases from stage 3 onwards. In stage 4, quantity of fodder increase continuously till day 27 and as the selling date comes close the amount of fodder is reduced. That is why for both the categories of farmers who cultivate only in spring season and both in spring & autumn season, quantity of leafs fed are get drastically reduced from 302.92 kg and 301.39 kg on day 27, respectively to 122.92 kg and 121.39 kg on day 29, respectively. In so far as survival of silk-worms are concerned, maximum rate of death happens in the last stage. Over a period of 30 days, roughly 11 per cent of worms died for both categories of sample farmers.

Rearing of silk-worm in general and mulberry silk-worm in particular is a labour intensive activity. Labour used for this activity was largely family labour.

Details about number of labour (both male & female) used and imputed value of labour are shown in Table 7. Together both male and female labours work for 6 hours a day for 23 days in the 30 days cycle of silk-worm rearing. The rest 7 days do not involve any labour work as those are sleeping days of cocoons. Usually male members cut branches from mulberry trees and then take out leaves from branches. In the initial days, female members chop leaves and provide them to cocoons. Cleaning work of rearing houses is done by female members. Application of disinfectant is usually performed by male members. The farmers of only spring category, on an average, use 3 male and 2 female members for labour work. Minimum market wage rate prevalent in Himachal Pradesh is Rs 350. Hence the total imputed value of wage for this category of farmers was Rs 8050. The farmers of both spring & autumn category employed more number of male and female members as compared to other category. Total imputed value of labour for this category was Rs 16,100 which was incurred in both the seasons. Total imputed value of labour for all sample households was at Rs 12,075.

Table 7 No. of labour, labour hours used & total labour cost in different seasons

Season	Labour (No.)			No. of hours worked in a day	No. of days	Wages per person (Rs)	Total wages (Rs)
	Male	Female	Total				
Only Spring	3	2	5	6	23	350	8050
Both Spring & Autumn	4	4	8	6	23	350	16100
Average Total	3	3	6	6	23	350	12075

Source: Primary Survey, 2019

Farmers engaged in rearing activities found construction and repairing cost of rearing house as one of the important item under fixed cost. Average life of a rearing house is around 36 years (or 36 seasons) and 35 years (or 35x2=70 seasons) for farmers doing rearing in only spring and both spring and autumn seasons, respectively. Average cost due to rearing house per season is calculated by dividing total cost (construction cost plus repairing cost) by average life of a house. These figures are presented in Table 8. Total cost of constructing and maintaining a rearing house was Rs 95,833 and 114,778 for only spring farmers and both spring & autumn farmers, respectively. The same figure for the overall sample was 107,200. Farmers get subsidy from government

to meet the fixed cost. Spring farmers got a lower subsidy compared to those who rear in both spring and autumn seasons. That is because government wants to promote rearing in both seasons and hence they provide higher subsidies to those who cultivate in both seasons. The percentage of subsidy in total cost for farmers of both spring & autumn season was at 63 per cent compared to 31 per cent in case of farmers/rearers of only spring season, and 51 per cent in case of overall sample households. The average cost per season on rearing house was calculated at Rs 1843 and Rs 610 for farmers of only spring season and both spring & autumn seasons, respectively.

Table 8 Season-wise average cost of building & maintaining a rearing house

Variables	(In Rs)		
	Only Spring	Both Spring & Autumn	All Households
Construction Cost	79167	95333	88867
Repairing Cost	16667	19444	18333
Total cost of Building	95833	114778	107200
Subsidy Amount	29500 (31)	72111 (63)	55067 (51)
Cost -Subsidy	66333	42667	52133
Average Life of Rearing House (No. of Seasons)	36 seasons	70 seasons	33
Cost Per Season	1843	610	1580

Note: Figures in the parentheses is the percentage to total.

Source: Primary Survey, 2019

Table 9 Average Total Cost of Different Inputs Used in Sericulture

Items	Spring (Rs)	%	Spring & Autumn (Rs)		Total (Rs)	%
Own Labour (Imputed value of labour)	8050	52.88	16100	69.84	12075	61.63
Cost of Building & Maintaining a Rearing House per Season	1843	12.10	610	2.64	1580	8.06
Rearing Equipment	3886	25.52	4312	18.70	4141	21.13
Fertilizer	25	0.16	175	0.75	115	0.58
Disinfectant	56	0.36	61	0.26	59	0.30
Seed	60	0.39	123	0.53	98	0.50
Mulberry Rent	850	5.58	1089	4.72	993	5.06
Transportation & Electricity	452	2.96	581	2.52	529	2.7
Total Cost	15222	100	23051	100	19590	100

Source: Primary Survey, 2019

Average cost incurred on different inputs and their share to total cost for both categories of farmers is shown in Table 9. Total cost of silk-worm rearing for only spring farmers was Rs 15,222 and 23,051 for both spring & autumn farmers. The total cost for both spring & autumn farmers were higher than that of only spring farmers, for the former category rear worms two times a year. It is clear from this that both spring & autumn farmers were drawing economies of scale as their total cost was less than 2 times of total cost of only spring farmers. Imputed value of labour is the dominant input in terms of share in total cost for

both categories of farmers. The share of own labour in total cost for only spring & both spring & autumn farmers were 52.88 per cent and 69.84 per cent, respectively. This shows the labour intensive nature of mulberry silk-worm rearing. Share of own labour to total cost in the overall sample households was 61.63 per cent. Next major cost item for both categories of farmers is rearing equipment. It is worth noting here that costs on rearing equipment shown in the table are figures excluding the subsidies that farmers got from government. Since, same equipments were used two times by both spring &

autumn category; its percentage to total cost is lower than that of spring farmers. Rent paid for mulberry trees that are not owned by farmers and costs of transportation & electricity were also significant for both categories of farmers. One significant cost item for spring farmers was rearing house construction & maintenance cost. Its share was 12.1 per cent. However, the share of same item in total cost for both spring & autumn farmers were at 2.64 per cent. This shows that there was a cost advantage of using rearing house/room two items a year. For overall sample households, share of rearing equipments; rearing house; mulberry rent; & transportation & electricity to total cost stood at 21.13 per cent, 8.06 per cent, 5.06 per cent, and 2.7 per cent, respectively.

All the individual cost items have been combined under different major heads and figures are shown in Table 10. All paid out costs are costs incurred on items whose payment was made within the 30 day

period of rearing. Construction and maintenance cost of rearing house after deducting the subsidy amount is treated as fixed cost. Imputed value of family labour are included in this table as this is one of the major input among the all the inputs. It can be seen from the table that paid out costs (or cash payment) constituted 35 per cent, 27.5 per cent, and 30.29 per cent of total cost of rearing mulberry silk-worm for only spring, both spring & autumn, and all sample households, respectively. Paid-out costs and fixed cost together constituted 47.11 per cent, 30.15 per cent, and 38.36 per cent of total cost for only spring, both spring & autumn, and all sample households, respectively. Imputed value of family labour is also a significant cost item in total cost. One thing that is clear from this table is that those farmers who were rearing in both seasons are getting the benefit of economies of scale on all major input heads in general and fixed cost in particular.

Table 10 A2 (Paid Out Cost) + FL (Family Labour) + Fixed Cost (Rear House)

Item	Only Spring (Rs)	%	Both Spring & Autumn (Rs)	%	Total	% (Rs)
A2	5329	15.56	6341	8.41	5935	9.99
A2+ Fixed Cost (FC)	7172 (1843)	47.11	6951 (610)	30.15	7515 (1580)	38.36
A2+ FL	13379	87.9	22441	97	18010	91.9
Total Cost (A2+FL+FC)	15222	100	23051	100	19590	100

Note: Figures in parentheses are fixed costs.

Source: Primary Survey, 2019

Production, productivity, gross returns, and net returns from silk-worm rearing are presented in Table 11. The farmers who were only rearing in spring season, on an average, had produced 9.25 kg of silken cocoons and their productivity is 6.95 kg per ounce of seed. Price of silken cocoons in spring season was Rs 900 thereby giving those farmers a gross return of Rs 8325. It can also be seen that production, productivity, and price of silken cocoons is much lower in autumn season compared to spring season. The farmers who did rearing in both seasons have produced 15.83 kg and gross returns for them was Rs 13575. Returns over all paid-out costs was recorded at Rs 2996 and Rs 7234 for only spring farmers and both spring & autumn seasons, respectively. When fixed cost (construction and repairing costs of rearing house) are added to paid-

out costs then returns over this combined cost of only spring farmers and both spring and autumn seasons farmers declined to Rs 1153 and Rs 6624, respectively. It is clear that farmers of both seasons were getting a significantly higher net return over paid-out and fixed cost compared to single season farmer. However, inclusion of imputed value of family labour to paid out costs made net returns of both categories of farmers negative. Same is the case with net returns over total costs which include all paid out costs, fixed cost, and imputed value of family labour. Therefore, the practice of mulberry silk-worm rearing was resulting in losses to farmers once the true cost family labour is included in cost items. Hence this practice is not sustainable without unpaid family labour.

Table 11 Production, Productivity, and value of silken cocoons

Variables	Only Spring	Both Spring & Autumn		
		Spring	Autumn	Total
Total Production (Kg)	9.25	9.72	6.11	15.83
Average Seed (Ounce)	1.33	1.19	1.19	2.39
Productivity (Kg/Ounce)	6.95	8.16	5.13	6.62
Price/k.g. (Rs)	900	900	790	-
Gross Returns	8325	8748	4827	13575
Returns over A2 (Rs)	2996	-	-	7234
Returns over A2+FC (Rs)	1153	-	-	6624
Returns over A2+FL (Rs)	-5454	-	-	-8866
Returns over A2+FL+FC	-6897	-	-	-9476

Source: Primary Survey, 2019

On the basis of the above analysis, it can now be safely said that, in case of sample households, income from sericulture (in a cycle of 30 days for only spring farmers and in two cycles of 30 days for both spring and autumn farmers) can at most be regarded as supplement income not the main income. Therefore, income of sample households from other sources are analysed and presented in Table 12. In so far as other income sources are concerned, sample households were engaged in dairy activities. They had cows, goats, and buffalo and they usually sold milk and ghee after meeting their domestic consumption. They are also running local shops (grocery shops), some have opened electric appliances shops, and some are engaged in tailoring activity. All these are grouped under non-agricultural activity. In case of some households, there are salaried persons and pensioners. Pensions are received as some members are retired government employees or retired-army persons. Pensions are also due to old age pension, and differently able pensions. Average income from salary and pensions are captured under different heads. Other sources include MGNREGA, driving, domestic help services,

and agricultural labour. Some members from sample households are also working as cobblers, potter man, electric mechanic, and mason and these are included in other sources. Crop cultivation is not included in any sources as mostly household do cultivation for domestic use purposes. They mostly were engaged in very small scale subsistence level cultivation of maize and wheat, and in some cases paddy. It can be seen from Table 12 that average annual income of only spring category, both spring & autumn category, and all households were at Rs 3,23,408, Rs 3,03,742, and Rs 3,11,690, respectively. Major sources of income for only spring category farmers are non-agricultural activity, salary, and other sources. Only 3 per cent of total income had come from sericulture for this category of farmers. Salary and non-agricultural sources were the major sources of income for both spring & autumn category. Only 4 per cent of total income had come from sericulture for this category. In so far as total households are concerned salary, non-agricultural activity, and other sources were the major sources of their annual income.

Table 12 Average Income from all Sources of Sample Households

Income Sources	Only Spring (Rs)	Both Spring & Autumn (Rs)	All Households (Rs)
Sericulture	8325 (3)	13575 (4)	11557 (4)
Non-agricultural activity	107000 (33)	67933 (22)	83560 (27)
Salary	82800 (26)	150267 (49)	123280 (40)
Pension	39700 (12)	32867 (11)	35600 (11)
Other sources	85583 (26)	39100 (13)	57693 (19)
Total	323408 (100)	303742 (100)	311691 (100)

Note: Parentheses values are percentage to their respective column total

Source: Primary Survey, 2019

CONCLUSION & POLICY PRESCRIPTIONS

Based on the above results, we can summarise and conclude the following. Majority of rearers are from SC category. Both APL and BPL category households are engaged in the rearing activity. Most of the members of sample households have education either up to secondary level and or above secondary level. Therefore, it can be said that cocoon growers do not possess higher levels of education. CDP of central silk board has had a positive effect on number of farmers adopting cocoon growing as majority of sample households have started growing cocoons after 2007. However, there still a considerable percentage of households who practice rearing of worms with traditional infrastructure. SDO should make it its aim that all the households get full kit for silk-worm rearing. Construction and repairing of rearing house is the major fixed cost item for farmers. However, farmers who rear in both the seasons experience lower average fixed cost as rearing houses is used two times a year. Therefore, more efforts should be made so that all the households grow cocoons in both seasons. Rearing equipment is another major cost item. However, imputed value of family labour holds the lion's share in total cost. Mulberry silk-worm rearers are earning profit over paid-out costs, over fixed costs, and over both paid-out costs and fixed cost. However, they are incurring losses when imputed value of family labour are considered in the calculation of net returns. Therefore, mulberry silk-worm rearing are not profitable and hence not sustainable but for family labour. Income from silk-worm rearing is at best a supplement to total income of households. This supplement income is also not that significant. Therefore, there is a dire need for focusing on these small scale growers so that they can make the rearing activity as a major source of their secondary income. This can only happen when these rearers are engaged in other sub-activities of sericulture like reeling of silk yarn from cocoon and also in the stage of weaving of silk.

REFERENCES

- Chauhan, S. K., 2013, Documentation and Impact Study of Sericulture Development Programmes in Himachal Pradesh. Research Publication No. 67, of Agricultural Economics Extension Education & Rural Sociology College of Agriculture CSK Himachal Pradesh Agricultural University, Palampur.
- Hanumappa, H. G., and Erappa, S., 1985, Economic Issues in Sericulture: Study of Karnataka. *Economic & Political Weekly*, 20(31): 1322-1324.
- Lakshmanan, S., 2012, Employment of Rural Women in Sericulture-An Empirical Analysis. *Journal of Rural Development*, 31(2): 163-172.
- Lakshmanan, S., and Devi, R. G. G., 2007, Employment Opportunities in Mulberry Sericulture Versus Agricultural Crops- An Empirical Study. *SBI Monthly Review*: 16-19.
- Lakshmanan S., and Devi, R. G. G. D., 2007, Employment Generation in Dry Farming Sericulture in Karnataka- An Empirical Study. *Manpower Journal*, 42(1): 181-198.
- Rani, J. U., 2007, Employment Generation to Women in Drought Prone Areas: A Study With Reference to the Development of Sericulture in Anantapur District of Andhra Pradesh. *Journal of Social Sciences*, 14(3): 249-255.
- Wilkinson, J. and Rocha, R., 2009, Agro-industry Trends, Patterns and Development. In C. A. da Silva, D. Baker, A. W. Shepherd, C. Jenane, & S. Miranda-da-Cruz (Eds.), *Agro-Industries for Development* (pp. 46-91). The Food and Agriculture Organization of the United Nations and The United Nations Industrial Development Organization by arrangement with CAB International.