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Sustainable Rearing of Eri Silkworm (*Samia ricini*) in Bishnupur District of Manipur

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ABSTRACT

Background: The practice of rearing eri silkworm is extensively practice in Bishnupur district of Manipur. The current study aimed to access the input factors for production as well as major constraints faced by the respondents during its production and marketing.

Methods: The present research investigation was carried out during the agricultural year 2020-21 with a total of 120 respondents were selected by following a multi-stage simple random quota sampling technique.

Result: Study reveals that the majority of the female respondents were actively doing Eri-rearing; the total cost of cultivation of Eri-rearing was ` 8,530 per 100 dfls with 90 kgs cocoon produce with gross and net returns *viz*; ` 13,500 and ` 4,970 respectively on semi-medium farm category.

Key words: Constraints, Cost, Eri-rearing, Income, Silkworm.

INTRODUCTION

Almost 65.00 per cent of agricultural households in India depend on agriculture for their livelihood, despite the good numbers of agro-based enterprises *viz*; cotton enterprises, jute enterprises, poultry, diary *etc*; besides sericulture and can be taken up by any poor farmer as a main or subsidiary occupation (Anonymous 2020). Sericulture plays a crucial role in poverty alleviation and is one of the vital sectors in raising the economy of India. It is well known fact that sericulture is a cash crop, which gives returns within 30 days (Siddappaji *et al*., 2014); it's considered as "Queen of Textile", as it is superior as compared to other textile fabrics in terms of its qualities like durability, weight and lustre. The name eri is evolved from the Assamese word 'Era' or Eranda meaning 'castor' which is also the primary food plant of the eri silkworm, *Samia Cynthia ricini*. Eri silk is also called as "poor man's silk". Unlike other varieties, eri cocoons do not have continuous filament and hence are spun (Patil and Savanurmath, 1994).

Samiaricini, eri silkworm belongs to the family Saturniidae, is multivoltine (more than two broods of offspring in a year) and the only completely domesticated silkworm other than *Bombyxmori*; according to the recent findings (based on mulberry sericulture), the efficiency of eri silkworm rearing are affected by various factors, such as: 38.20 per cent by food, 37.00 per cent by climatic condition (temperature, relative humidity, light, air), 18.20 per cent by rearing techniques and 6.60 per cent by race or silkworm stock. (Rahmathulla, 2012). The rearing of eri silkworm may guarantee good profits for the rearers in just 27 to 30 days (Elumalai and Murugesh, 2019).

North Eastern Region holds indomitable positions in the global sericulture to have a climate of tropical to temperate which is essential for rearing all the four varieties of silk *viz;* Mulberry, Oak Tasar, Eri and Muga, providing gainful employment to nearly about 1.80 lakh families. In India, NE India contributed more than 90.00 per cent of eri silk production and about 77.00 per cent of the total non-mulberry raw silk produced in the country (Shuya and Sharma, 2018). Unlike the other competitive enterprises like mulberry and tasar, eri culture also is slowly gaining its recognition and Government is taking the initiatives in developing this sector (Pongener and Sharma, 2018).

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MATERIALS AND METHODS

Bishnupur district of Manipur was selected for the research purpose, out of three blocks, Bishnupur and Moirang both blocks were selected purposively; out of this, 5 (five) villages in view of the availability of eri rearers were selected from each block. Therefore, total of 10 (ten) villages were chosen; out of which 10 respondents were randomly selected from each village making a total number of 120 respondents from the two blocks. Primary data required for the present study were collected personally with the help of pre-tested and pre-schedule plans especially designed for the survey.

Whereas, the secondary data were obtained from Department of Sericulture and various concerned offices, journals, magazines, handbooks and other sources.

Analytical techniques and tools

The cost of cultivation for rearing of eri silkworm was estimated using different methods used in the farm management analysis in terms of variable and fixed cost (Sharma *et al*., 2019).

Cost of production: Cost C_2 + value of by-product/Yield

Total cost = Fixed cost + Variable cost

In order to analyze the income, the following types of farm income were used.

The marketing channel was based on the middlemen involved to transfer goods from the point of production to the point of ultimate consumer. Marketing margin at any stages of marketing was calculated as follows:

$$MM = \frac{CP\text{-}SP}{CP} \times 100$$

Whereas:

MM = Marketing margin.

CP = Consumer price (Rs).

SP = Seller's price (Rs).

Price spread is the difference between the price paid by the buyer and the net amount received by the producer. It is expressed as percentage of consumer's price.

$$PS = \frac{CP - NPP}{CP} \times 100$$

Whereas:

PS =Price Spread.

CP = Consumer price.

NPP = Net Price of Producer.

Similarly, to evaluate the price spread the stake of total marketing cost and margin were estimated. The marketing constraints were calculated using the ranking technique by Garrett's.

$$\text{Per cent position} = \frac{100\ (R_{ij} - 0.50)}{N_j}$$

Whereas:

R_{ij} = Rank given to i^{th} item by the j^{th} individual.

N_j = number of item a ranked by the j^{th} individual (Garett and Woodworth, 1969).

RESULTS AND DISCUSSION

The respondents having area below 1.00 ha were categorized as marginal farm, which consists of 27 households. The respondent having area between 1.01 to 2.00 ha were categorized as small farm, consisting of 41 households. The respondent having area between 2.01 to 4.00 ha were categorized as semi-medium farm, which consists of 32 households. In the semi-medium farmer category, among the total of 32 households 8 respondents (25.00 per cent) were male and 24 respondents (75.00 per cent) were female. The involvement of women in rearing silkworm plays a pivotal role compared to that of male, which is relevant to the study conducted by Sharma *et al*. (2019) in their paper.

Under marginal farmer, 5 respondents (22.73 per cent) fall into the lower age group of 30-38 years of age, 10 respondents (45.45 per cent) under the medium age group (39-59 years) and 7 respondents (31.82 per cent) fall under the higher age group (60 years and above). Under semi-medium 5 respondents (16.67 per cent) fall under the lower age group *i.e*., 30-38 years, while 15 respondents (50.00 per cent) and 10 respondents (33.33 per cent) were under the medium age group of 39-59 years and higher age group of 60 and above years of age respectively. Similar finding were also reported in the line by Singh and Sharma (2020)a.

The educational position of the sample respondents is presented below. It shows the literacy rate of the area under survey and also holds an important function in determining the knowledge and maintaining skills of the rearers of eri silkworm. Under semi-medium farmer, majority of the respondents were illiterate *i.e*., 18 respondents (56.30 per cent), 12 respondents (37.50 per cent) fall under primary level, 1 respondent (3.13 per cent) having high school level of education and 1 respondent (3.13 per cent) having graduate level of education. Similar findings were found by Raju and Sannappa (2018) in their paper majority of the farmers were illiterate.

The figure depicts that under marginal farmers, 5 respondents (23.80 per cent) were of small size family, 8 respondents (38.10 per cent) were of medium size family and 8 respondents (38.10 per cent) fall under the large family size. Small farmers, 8 respondents (15.40 per cent) fall under small family size, 34 respondents (65.40 per cent) were under medium size family and 10 respondents (19.20 per cent) on large family size. Under small farmer, 52 cows (13.70 per cent), 26 pigs (6.80 per cent), 44 ducks (11.60 per cent) and 255 poultry (67.60 per cent) were reared. Under semi-medium farmer, 49 cows (9.40 per cent), 26 pigs (4.90 per cent), 112 ducks (21.40 per cent) and 337 poultry (64.30 per cent) were reared by the sampled farmers Dewangan (2017) where respondents were engaged in rearing different livestock.

This holds an important part in the survey in order to determine the primary and secondary source of income of the sample population. From the figure, it can be seen that under marginal farmer, the primary occupation of 17 respondents (63.00 per cent) was agriculture. 9 respondents (33.33 per cent) took sericulture as their primary occupation followed by service 3.70 per cent (1 respondent). Similar reports were found by Dewangan *et al*. (2011) in their paper which disclosed that more than half of the total respondents adopted sericulture as secondary occupation. Marketing channel is the alternative ways of transferring goods from producer to consumer. The marketing channel of eri cocoon follows only one channel.

Table 1 reveals the marketing channel involves only a single channel of transferring silk cocoon to consumer through the department of sericulture. The total production

of each farm category as per 100 dfls was obtained as 80.50 kgs on marginal farmers, 85.50 kgs on small farmers and 90.05 kgs on semi-medium farmers. Marketing cost was computed by estimating the cost acquired in the process of marketing of cocoon. The cost incurred after harvesting till it reached the consumers generally constituted the marketing cost. Similar finding were also by Singh and Sharma, (2020)a.

Table 2 reveal the total cost incurred for marketing 1 kg of cocoon. For marginal farmers, the marketing cost for 1 kg of cocoon was ` 5.00, for small farmers, the cost incurred was ` 4.50 per kg and for semi-medium farmers, the total cost incurred by the farmer for 1 kg of cocoon was ` 4.00, respectively. Similar finding were also by Singh and Sharma, (2020b). The price spread as per kg of cocoon was obtained to be ` 5.00 on marginal farmer, ` 4.50 on small farmer and ` 4.00 on semi-medium farmer.

Table 1: Marketing channel of eri.

Particulars	Channel	Growers involved
Channel - I	Producer-Department of Sericulture-Consumer	100 (100.00)

(Figures in parentheses indicate percentage to the total).

Table 3 reveals the detailed about the cost incurred as well as return perceived from cocoon production per 100 dfls. The total cost for production of silk cocoon was accounted to be ` 7,950 on marginal, ` 8,240 on small and ` 8,530 on semi-medium farmers, respectively. The break-up of total cost into fixed cost and variable costs indicated that the fixed cost were ` 1,500 (18.90 per cent) on marginal, ` 1,670 (20.30 per cent) on small and ` 1,840 (21.60 per cent) on semi-medium farms, while the variable costs were ` 6,450 (81.10 per cent) on marginal, ` 6,570 (79.70 per cent) on small and ` 6,690 (78.40 per cent) on semi-medium farms, respectively. Among the total cost, the imputed value of human labor bore the highest which amounted to ` 4,500; ` 4,500 and ` 4,500 on marginal, small and semi-medium farms, contributing 69.80 per cent, 68.50 per cent and 67.30 per cent, respectively.

Table 4 reveals that the second major cost factor was cost of castor leaf which accounted ` 1,200, ` 1,250 and ` 1,290 on marginal, small and semi-medium farmers with 18.60 per cent, 19.10 per cent and 19.30 per cent, respectively; which is then followed by marketing cost accounted ` 300 (4.70 per cent) on marginal, ` 320 (4.90 per cent) on small and ` 350 (5.20 per cent) on semi-medium

Table 2: Marketing cost, margin and price spread of eri through channel - I (`/kg).

Particulars	Farm category		
	Marginal	Small	Semi-medium
Producer's selling price	150.00 (100.00)	150.00 (100.00)	150.00 (100.00)
Marketing cost	5.00 (3.34)	4.50 (3.00)	4.00 (2.67)
Net price received by the eri farmers	145.00 (96.66)	145.50 (97.00)	146.00 (97.33)
Marketing margin	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Price paid by the consumer	150.00 (100.00)	150.00 (100.00)	150.00 (100.00)
Price spread	5.00 (3.34)	4.50 (3.00)	4.00 (2.67)
Producer's share in consumer rupee	145.00 (96.66)	145.50 (97.00)	146.00 (97.33)

(Figures in parentheses indicate percentage to the total).

Table 3: Breakup cost of cultivation of eri across various farm categories (`/100 dfls).

Particulars	Farm category			
	Marginal	Small	Semi-medium	Average
Variable cost				
DFLs	200 (3.10)	200 (3.00)	200 (3.00)	200 (3.00)
Leaf	1200 (18.60)	1250 (19.10)	1290 (19.30)	1246.67 (19.00)
Disinfectants	150 (2.30)	180 (2.70)	200 (3.00)	176.67 (2.70)
Imputed value of family labour	4500 (69.80)	4500 (68.50)	4500 (67.30)	4500 (68.50)
Marketing cost	300 (4.70)	320 (4.90)	350 (5.20)	323.33 (4.90)
Miscellaneous	100 (1.50)	120 (1.80)	150 (2.20)	123.33 (1.90)
Total Variable cost (TVC)	6450 (81.10)	6570 (79.70)	6690 (78.40)	6570 (79.70)
Fixed cost				
Depreciation on implements	450 (30.00)	550 (32.90)	650 (35.30)	550 (32.90)
Interest value on fixed capital	350 (23.30)	370 (22.20)	390 (21.20)	370 (22.20)
Rental value on own land	700 (46.70)	750 (44.90)	800 (43.50)	750 (44.90)
Total fixed cost (TFC)	1500 (18.90)	1670 (20.30)	1840 (21.60)	1670 (20.30)
Total cost (A+B)	7950 (100.00)	8240 (100.00)	8530 (100.00)	8240 (100.00)

(Note: Figures in parentheses indicate percentage to the total).

Table 4: Farm profit Measures on Sample farms (`/100 dfls).

Particulars	Farm category			
	Marginal	Small	Semi-medium	Average
Average yield (kg)	80.00	85.00	90.00	85.00
Price of eri (`/kg)	150.00	150.00	150.00	150.00
Cost of production (`/kg)	99.37	96.94	94.77	97.03
T. V.C (`)	6450.00	6570.00	6690.00	6570.00
T.F.C (`)	1500.00	1670.00	1840.00	1670.00
Total Cost (`)	7950.00	8240.00	8530.00	8240.00
Cost A_1 (`)	2400.00	2600.00	2840.00	2613.33
Cost B_1 (`)	3450.00	3720.00	4030.00	3733.33
Cost C_1 (`)	7950.00	8240.00	8530.00	8240.00
Gross returns (`)	12000.00	12750.00	13500.00	12750.00
Net return (`)	4050.00	4510.00	4970.00	4510.00

(Note: Figures in parentheses indicate percentage to the total).

Table 5: Constraints in production and marketing of eri silkworm.

Problems	Per cent position	Average mean score	Garette's rank
Lack of knowledge	5.50	65.68	I
Non-availability of market in the locality	16.60	62.43	II
Lack of organization	27.70	61.22	III
Absence of market information	38.80	55.19	IV
Inadequate transport facility	50.00	50.00	V
Non-availability of capital	61.10	47.40	VI
Problem of storage	72.20	46.52	VII
Non-availability of healthy seeds/dfls	83.30	40.53	VIII
Low marketable surplus	94.40	38.67	IX

farmers. The cost of disease free laying (dfls) amounted to ` 200 (3.10 per cent), ` 200 (3.00 per cent) and ` 200 (3.00 per cent) on marginal small and semi-medium farmers, respectively. The cost incurred on disinfectants accounted to ` 150 (2.30 per cent) on marginal, ` 180 (2.70 per cent) on small and ` 200 (3.00 per cent) on semi-medium farmers, respectively. Other cost components contributed to less than 5 per cent to the overall cost similar study by Singh and Sharma (2012).

Among the fixed cost, the highest cost is borne by rental value on own land accounting ` 700 (46.70 per cent) on marginal farms, ` 750 (44.90 per cent) on small farms and ` 800 (43.50 per cent) on semi-medium farms, which is followed by depreciation on building and equipment cost which accounted to ` 450 (30.0 per cent) on marginal farmer, ` 550 (32.90 per cent) on small farmer and ` 650 (35.30 per cent) on semi-medium farmers. The cost of interest value on fixed capital was ` 350 (23.30 per cent) on marginal farms, ` 370 (22.20 per cent) on small farms and ` 390 (21.20 per cent) on semi-medium farmers. From the above discussion, it indicates that higher costs were incurred on large farmers which were followed by small farmers and the least was incurred on marginal farmers. The above study is pertinent to the research conducted by Roopa (2014).

Table 5 reveals with regards to the constraints faced during production and marketing, lack of knowledge among the growers about training and rearing of cocoon were ranked as I followed by non-availability of market in the locality; as a result the farmers had to supply their final products to the state department directly without the involvement of middlemen. The next constraint which caused problematic to the respondents were lack of organization, so the farmers themselves are involved directly with the people of the department of sericulture leading to the absence of market information which is the next constraint, followed by inadequate transport facility. The next constraint is non-availability of capital facility in the initial stage from any financial institution. Similar studies by Singh and Sharma (2020b). Thus, the last constraint faced in production and marketing of eri silkworm was low marketable surplus, as the entire yield obtained from 100 dfls was directly sold to the traders. Hadimani *et.al* (2019) had mentioned similar results.

CONCLUSION

The majority of the eri-rearers (73.00 per cent) of the women belonging to the middle age group and 51.00 per cent of the sample was illiterate and taking agriculture as their primary source of income. With an average yield 90 kg per 100 dfls with ` 150 per kg; the highest gross income (` 13500) and net income (` 4970) on semi-medium category. The benefit cost ratio for marginal, small and semi-medium farms were 1.50, 1.54 and 1.58, respectively. Among the numerous problems *viz;* lacks of proper

knowledge since majority of them were illiterate, also the non-availability of markets in the local areas *etc*; Therefore the policy to overcome from the constraints / problems faced by the eri rearing respondents:

- Training for the eri-rearing for gaining effective knowledge,
- Establishing regulated block market and effective farmer organization,
- Implement of price policy and establishment of institutional credit facilities,
- Proper storage facilities and transportation facilities,
- Formulation of Strict Laws and Regulation.

Conflict of interest: None.

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