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UNDERUTILISATION OF CAPACITY AND THE PROBLEM OF OPTIMISATION IN ERICULTURE IN ASSAM : AN ECONOMIC ANALYSIS

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ABSTRACT

Ericulture, a major component of sericulture has been a traditional practice of the poor tribal villagers of Assam since times immemorial. It has been a secondary occupation of the womenfolk during their leisure time which adds to their family income to some extent. Moreover, their by-product pupae which is full of protein is a favourite delicacy of the tribals. Though the occupation requires very small amount of investment, the rearers are not utilising it to their full capacity. It is because of the fact that the rearers are highly dependent on wildly grown feed leaves of castor, the primary feed leaf of eri worm. It is observed that even if the rearers cultivate castor, it will undoubtedly raise their costs of production. However, it will certainly help them to raise their level of income and thus their profit even at the present technological set-up. This paper tries to find out the underutilised capacity of ericulture and suggests means to develop this traditional primary occupation of Assam.

Introduction

Ericulture is an agro-based economic activity the end product of which is 'silk'. Out of four sericulture activities, eri occupies the first position in terms of production and generation of employment in Assam, though at all-India level mulberry occupies the first position, followed by ericulture. In Assam, 1,35,237 families were engaged in ericulture (i.e. 69.30 per cent of total sericulture-practising families) and their production of eri cocoon was 700 MT in 2005-06 (Directorate of Sericulture, Government of Assam, 2007).

Ericulture is mostly practised by the poor villagers of tribal communities like Misings, Kacharis, Bodos, Mikirs, Rabhas, Karbis and Garos since times immemorial. It is an occupation of the women during their leisure time. Thus, it has been providing opportunities for additional employment and income to a large section of population for a long time. Besides, these are the activities of low investment and high output. Moreover, its by-product, pupae is a popular dish of the tribal communities. Eri-fabric is called 'poor man's silk' as it is cheaper than muga and mulberry silk (Benchamin and Jolly, 1987). The local weavers prepare a special type of shawl for both males and females for use in the winter season from eri thread. Eri fabric is highly durable and has a specific thermal property, which makes it an alternate fibre to wool. Therefore, it is also called 'poor man's wool'. Erstwhile undivided Assam is known to be the original home of eri and muga silk in the world. Therefore, they are also called Assam Silk (Das, 2008).

In ancient times, along with England eri fabrics had a high demand in Tibet, Bhutan and other neighbouring countries. Of late, eri products like curtains, wall coverings, cushion covers, place mat, upholstery, etc. are being

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exported to the USA, Japan, Israel, Turkey and South Africa by Assam Apex Weavers and Artisans Co-operative Federation Limited (ARTFED) and thus a good amount of foreign exchange is added to government treasury (De and Das, 2007). Though ericulture is practised in almost all the districts of Assam, it is highly concentrated in the districts of Karbi Anglong, North Cachar Hills, North Lakhimpur, Dhemaji, Barpeta, Kokrajhar, Sibsagar and Darrang.

Like other sericulture activities, ericulture can be broadly divided into two parts : ericulture proper and endi-textile industry. 'Ericulture proper' consists of sowing of seed; plantation of host plant (like castor, kesseru, bar kesseru etc.) on which eri worms are fed; maintenance of host plants; plucking of leaves from the planted trees or from wildly grown trees or from Eri Concentration Centres (ECC)[1]; feeding and rearing of pupae up to cocoon stage; while 'endi-textile' comprises spinning of yarn and weaving of fabrics. As most of the rearers are poor, they perform their rearing activities in their dwelling houses. Here spinning and weaving are done at home on a very small scale with simple traditional tools (like *takli, Charkha* in case of spinning and throw shuttle or fly shuttle loom in case of weaving) by a section of eri-worm rearers. All the cocoon rearers are not weavers. A large section of them owing to ignorance and poverty, sell their reared cocoons to the middlemen at a throw away price which means very low income to the eri-rearers cum endi-entrepreneurs. Today, ericulture sector of Assam suffers from a number of economic and non-economic problems.

The present paper attempts to analyse the underutilisation of capacity for the production of eri cocoon of the ericulturist at the present technological set-up in Assam, particularly in the district of Barpeta and to find out the means to make ericulture activity a viable and profitable one.

The following hypotheses have tested in the present study :

1. The eri-rearers of Barpeta district have not tapped the potentiality of the sector in the production of eri cocoon to the maximum extent possible :
2. Profit of the eri-rearers can be enhanced through slight innovation like systematic plantation of eri host plant like castor.

Studies on Ericulture : Till now, no detailed study covering all the aspects of the silk culture (sericulture) especially on ericulture of Assam has been made. The Sericulture and Weaving Department, Government of Assam conducted a survey during 1975-76 in 598 Gaon Panchayats of the plain districts of Assam to assess the position of the silk industry relating to production, employment, etc. The survey report reveals that a majority of population were pursuing silk culture as leisure time occupation[2]. A few studies are there conducted by Dutta (1983, 1988), Choudhury (1984), Shamachary, Laksmipathalah and Jolly (1985), Barthakur (1986) Ratnala, Mallikarjuna and Datta (1990), who tried to analyse the problems, prospects and economic conditions of sericulture sectors. However, most of them stressed on mulberry, mugaculture and related cottage industries except Dookie (1984) and Das (2007) who gave some attention to the analysis of ericulture in India.

Though there are a few studies on sericulture and particularly on ericulture in Assam and other parts of the country, most of them described how people adopted these cultures and who were engaged in such activities. But none of them has determined the excess capacity in ericulture at the present technological set-up. Thus, the present study has proposed to fill this research gap. In this paper, though a small sample of 180 families are considered for the collection of data, it is large enough to successfully show the excess capacity in ericulture and its future prospects.

Methodology

For the purpose of the following analysis, primary data were collected from 180 families chosen by multistage sampling procedure from the district of Barpeta[3], the fourth populous district in Assam with 16.42 lakh population

covering an area of 3245 square kilometres. Out of the total population of the district, 5.70 and 7.48 per cent belong to scheduled castes and scheduled tribes, respectively. The literacy rate is only 56.24 per cent (2001 Census Report). There are 12 Community Development (CD) blocks in the district consisting of 1073 villages. Sericulture is practised in 140 villages, which are mainly concentrated in the CD blocks of Gobardhana, Jalah and Sarukhetry. At the first stage, three CD blocks out of a total of twelve blocks in the district were chosen purposively on the basis of the concentration of ericulture activities. Three villages were chosen from each of the chosen blocks (total nine villages) also purposively depending upon the concentration of such activities. From the nine villages, a total 180 sample families were selected (23, 10 and 17 from Gahia, Agdia and Garartari villages under Sarukhetry block; 14, 21 and 35 from Salbari, Hahchara and Bhuyapara villages under Jalah block and 18, 32 and 10 from Bashbari, Nimua and Khurabari villages under Gobardhana block, respectively) on the basis of the number of families engaged in such activities. From each village, the sample families were chosen by simple random sampling without replacement from all the families practising sericulture. From each family, information regarding number of broods reared, production of cocoons in a year, number of people engaged in this occupation, cost of production of cocoons, selling price of cocoons, family income etc. were collected through a pre-tested questionnaire during June 2005 to July 2006. The collected data are compiled, regrouped and reclassified for the purpose of analysis. Moreover, cost, revenue and profit per kilogram of eri cocoon production with plantation of host plant during 2005-06 were collected from Central Silk Board (North-Eastern Region), Guwahati.

The average number of broods of cocoon harvested by an average sample family is determined. Thereafter, correlation between the annual number of broods reared and the annual family income of the sample households is calculated. Average revenue and cost functions are estimated and also plotted graphically for different level of broods practised by the sample rearing families. From that the profit function is also examined and the profit maximising level of output estimated. Also, the level of output at which average cost would be minimum, is estimated by minimising the best fitted average cost curve with respect to the level of output of eri cocoon. Those are also compared to the existing level of output to see how much expansion is possible and thereby to maximise profit or minimise the average production cost and that indicates the scope for the expansion of the activity at the existing level of technology.

Results and Discussion

Ericulture is multi-voltine. In a year maximum six broods of eri cocoon can be harvested if there is no constraint on the supply of food leaves. But the number of broods of the sample families practising ericulture varies from one to four in a year. An average sample family harvests 2.43 broods of cocoon in a year (Table 1). It is because of shortages of castor leaves which are collected by the rearers from different areas. The correlation between the annual number of broods reared and the annual family income of the sample households during 2005-06 is estimated to be -0.492. Similarly, the correlation between the revenue generated annually from ericulture proper and the annual family income is calculated at -0.283 and both are significant at five per cent level of significance. It indicates that relatively poor families are more interested in practising ericulture than the relatively well-off families in the study area.

The total revenue and total cost generated in the process of production of eri cocoon in the sample families is illustrated in Table 2. It is observed from the Table that 180 sample families generated a total revenue of Rs. 368064.5 from the production of 1267.63 kilogram of eri cocoon (revenue from cocoon and pupae) during 2005-06. A sum of Rs. 19947 was spent by the rearer families in the form of annual depreciation of rearing appliances, cost of seed and cost of

Table 1 : Number of broods per family in the sample households during 2005-06

Block	Village	Household (Number)	Total number of broods	Broods per family	Total income per family (Rs.)
Sarukhetri	Gohia	23	51	2.22	51869.56
	Agdia	10	32	3.20	47700.00
	Garartari	17	37	2.17	51294.11
	Sub-total	50	120	2.40	50840.00
Gobardhana	Bashbari	18	36	2.00	50555.55
	Nimua	32	86	2.68	48500.00
	Khusrabari	10	25	2.5	50800.00
	Sub-total	60	147	2.45	49500.00
Jalah	Salbari	14	34	2.43	160500.00
	Hahchara	21	53	2.53	53000.00
	Bhuyapara	35	83	2.37	56200.00
	Sub-total	70	170	2.43	76100.00
	Grand Total	180	437	2.43	60216.66

Source : Compiled from Field Survey.

transport for the collection of leakes etc. Thus, the rearers together earned a gross profit over the explicit cost of Rs. 348117.5. Gross profit from a kilogram of cocoon production is Rs. 274.62. Of course, this gross profit includes the imputed cost of self-employed labour. Imputed labour cost is much higher than the explicit cost of production of cocoons. Taking into account the wages in similar other activities (existing agricultural wage), a sum of Rs. 185592.5 would be the opportunity cost of family labour used for the purpose. Therefore, total net profit earned by the rearers would be only Rs. 162525. Net profit per kilogram of cocoon production is Rs. 128.21 while gross profit per kilogram is Rs. 274.62. Gross profit as well as net profit per kilogram of cocoon production was the highest in Gahia village within Sarukhetry block with Rs. 313.88 and Rs. 160.48, respectively, while it was the lowest in Agdia village with Rs. 228.61 and Rs. 41.77 within the same block. In the village Agdia, the gap between gross and net profit per kilogram of eri cocoon is much higher due to relatively higher wage rate that these villagers can earn working in agriculture compared to their counterparts in other villages.

An average cost and average revenue in different broods reared by the sample families is illustrated in diagram - 1.

Table 2 : Cost, revenue and profit in eri cocoon production of the sample households during 2005-06

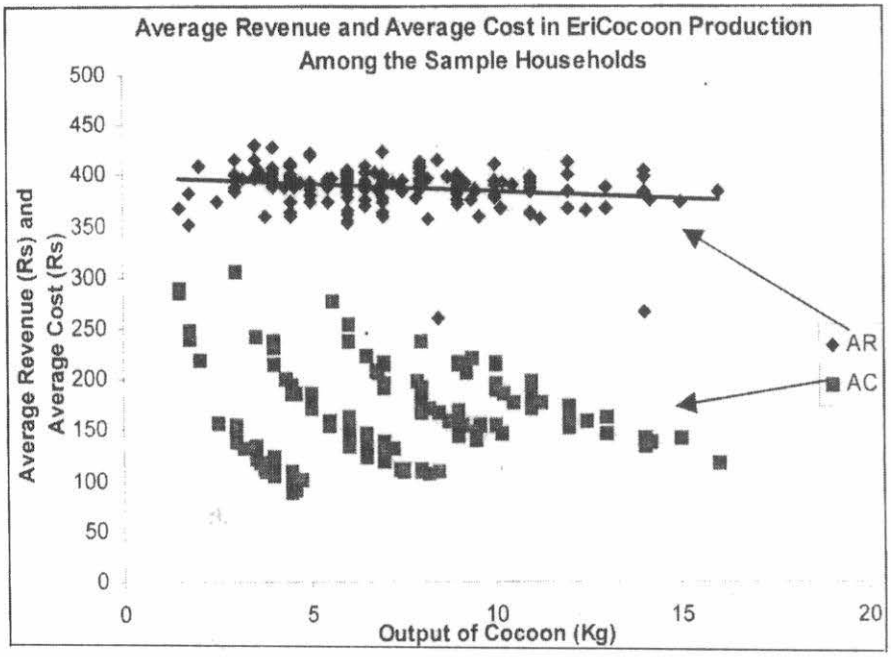
Block	Village	Production of cocoon (Kg.)	Total revenue (Rs.)	Average revenue (Rs.)	Total explicit cost (Rs.)	Gross profit over total explicit cost (Rs.)	Implicit labour cost (Rs.)	Net profit over total cost (Rs.)	Gross profit per kg. (Rs.)	Net profit per kg. (Rs.)
Sarukhetri	Gohia	148.0	49090	331.68	2637	46453	22702.5	23750.5	313.88	160.48
	Agdia	79.0	19690	249.24	1630	18060	14760	3300.00	228.61	41.77
	Garartari	120.6	36446.75	302.22	1985	34461.75	16965	17496.75	285.76	145.08
	Sub-total	347.6	105226.8	302.73	6252	98974.75	54427.5	44547.25	284.74	128.16
Gobardhana	Bashbari	106.73	29812.45	279.33	1495	28317.45	14480	13837.45	265.32	129.65
	Nimua	249.55	77245.5	309.54	4220	73025.5	34680	38345.5	292.63	153.66
	Khusrabari	76.45	20537.5	268.64	1010	19527.5	10479	9048.5	255.43	118.36
	Sub-total	432.73	127595	294.86	6725	120870	59639	61230.95	279.32	141.50
Jalah	Salbari	93.5	25695	274.82	1365	24330	14238	10092	260.22	107.94
	Hahchara	150.5	41282.5	274.31	2100	39182.5	22407	16775.5	260.35	111.47
	Bhuyapara	243.3	68266	280.59	3505	64761	34881	29880	266.18	122.81
	Sub-total	487.3	135243.5	277.54	6970	128273.5	71526	56747.5	263.24	116.45
	Grand Total	1267.63	368064.5	290.36	19947	348117.5	185592.5	162525	274.62	128.21

Source : Compiled from Field Survey.

Notes : (1) Total revenue includes the revenue from cocoon as well as pupae.

(2) Total cost includes expenditure incurred on seed, rearing house, annual appliances cost and transport cost of collection of leaves of feed plant.

Diagram-1



It may be observed from diagram 1 that the average revenue curve is almost a horizontal straight line and there are four distinct layers of average cost curves corresponding to different (one, two, three and four) broods harvested by different sample families. The average revenue curve always lies above the average cost curve across all levels of activities and hence there is substantial positive profit. But it is clear from the diagram that the rate of profit margin is more in case of smaller rearers. However, profitability rises with the level of output of eri cocoon, as the average revenue curve is almost horizontal and average cost curve is downward sloping and convex to the origin and becomes asymptotic after certain level of output and that varies for different sizes of farms. The present performance and the scope of the rearers to enhance their production at the existence level of technology are given below.

Diagram-2

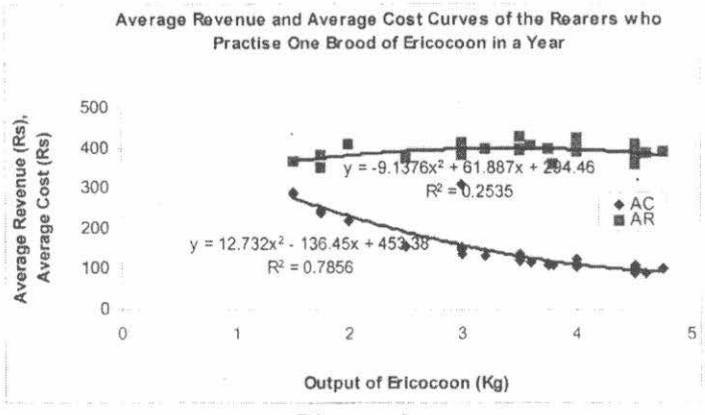


Diagram-3

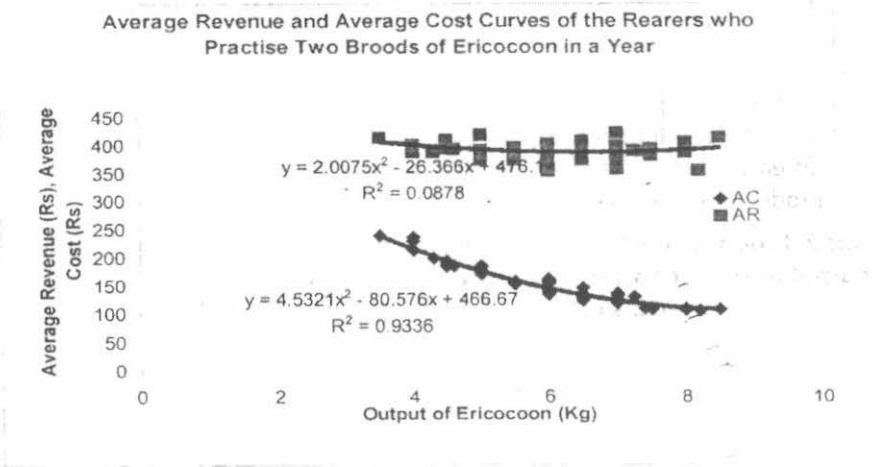


Diagram-4

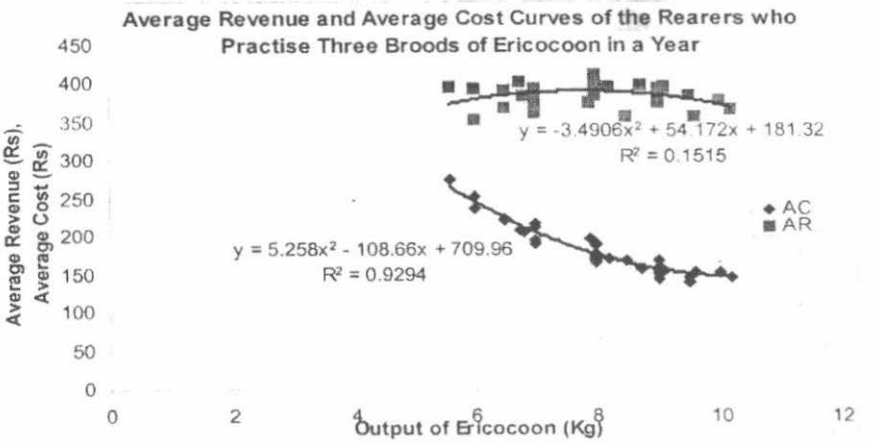
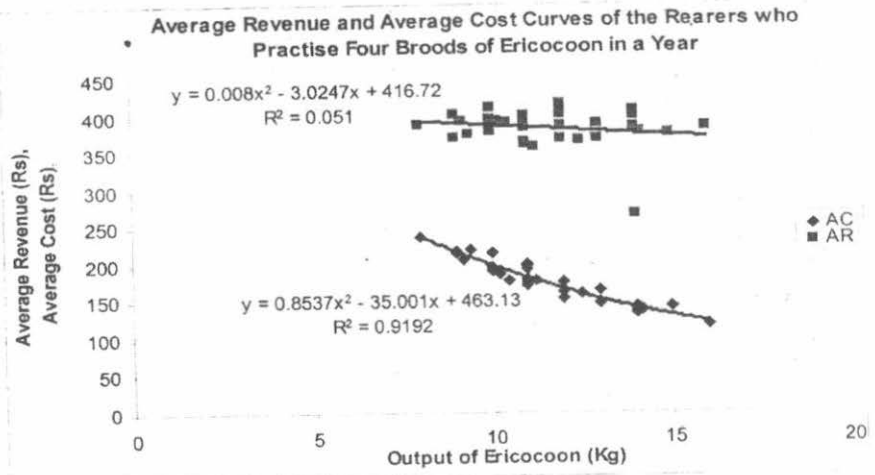


Diagram-5



Diagrams 2 to 5 present the average revenue and average cost functions of different groups of rearers harvesting one to four broods of eri cocoon in a year. The results of Table 3 show that at various levels the rearers produce well below their optimum level of productions. In order to maximise profit, each producer at various levels can increase production on an average from 30 per cent to about 143 per cent in a year at the existing level of technology and even without increasing the number of broods harvested by each of them. Thus, they can increase their level of profit ranging from about 32 per cent to 168 per cent approximately. Those who rear two broods seriously underutilise their capacity.

Table 3 : Brood-wise actual, profit maximising and lowest possible average cost output of eri cocoon and scope of increasing output and profit as obtained from the estimated result by using sample data

No. of broods	Average yearly output of cocoon per family (kg.)	Average yearly profit maximising output of cocoon per family (kg.)	Average yearly output of cocoon per family corresponding to lowest average cost (kg.)	Scope of percentage increase in	
				Output to maximise profit	Yearly total profit
1	3.428	5.615	5.359	63.80	64.56
2	5.920	14.400	8.890	143.80	168.06
3	8.038	10.488	10.330	29.98	31.60
4	11.597	24.460	20.500	110.92	130.01

Source : Compiled from Field Survey.

Note : Output corresponding to lowest average cost and maximum profit is estimated by minimising best-fitted average cost function and maximising the best-fitted profit function as obtained from the sample data.

The underutilisation of capacity is mainly due to the shortage of castor leaves. However, castor leaves may be grown under the initiative of the rearers or may be supplied by others. If the feed leaves are cultivated scientifically as is observed in other districts of Assam and separate rearing house is maintained, then instead of average 2.43 broods, more broods (maximum six) can be harvested. Of course, cost of production (as shown in Table 4) of the extra unit of output will definitely rise by several times because of inclusion of construction of rearing house, rent on land, etc. and thus the average cost curve would shift upward. But with regular supply of feed leaves, production of cocoon as well as pupae also increases which will raise the income of the eri-rearers with better price. It is because of the fact that the traders visit these rich cocoon areas regularly as they can get cocoon in bulk. Hence revenue earned is also found to be much higher if all the pupae are sold at the reasonable price. Thus, total profit will certainly increase if not exactly to the extent estimated here (as shown in Table 4). The rate of profit may also increase if better technology is used to reduce unit cost of production and the activity is carried on a large scale that would generate economies of scale (as seen here an average rearer at each level is producing at the point on the downward falling portion of the average cost curve). Therefore, to meet the shortages of feed leaves, which is the major hurdle of prosperity of ericulture in Assam, systematic plantation of host plant is advocated.

Policy Implications and Conclusions

Deficiency of eri feed plants is one of the important limitations for the growth of ericulture in Assam. The rearers can be encouraged to cultivate feed plants as it is observed that even if castor is cultivated scientifically, there is still sufficient profit in the culture. Moreover, the Government should establish more ECCs and expand the existing ECCs in collaboration with the Department of Social Forestry, and encourage private entrepreneurs to establish ericulture farms. At the same time, indiscriminate cutting down of naturally grown silkworms' food plants should be prevented by strictly enforcing the existing law. Moreover, to meet the shortage of silkworms' food plants and to increase production of cocoons, the state government may acquire wasteland and allot the same to the local silk rearing cooperatives, self-help groups (if any) or individual rearers for the growth of silk production. Extensive plantation of secondary feed plants like Borkesseru, Tapioca etc., can also be encouraged to meet the deficiency of food leaves for eri silkworms during the shortage of castor.

Table 4 : Cost, revenue and profit per kg of eri cocoon production with and without plantation of host plant during 2005-06

	Cost, revenue and profit per kg of cocoon production	*With plantation (Rs.)	Without plantation (Rs.)
Items of Cost	1. Plantation	172.76	00
	2. Fixed Cost	126.60	2.73
	(a) Rearing house	100.00	00
	(b) Appliances Cost	26.60	2.73
	3. Wages	175.00	146.41
	4. Others	32.50	12.85 (Transport Cost)
	Total Cost	506.87	161.99
Revenue	Revenue from Cocoons	280.00	209.26
	Revenue from Pupae	350.00	81.10
	Total Revenue	630.00	290.36
	Net Profit	123.13	128.37

Source : (1) Compiled from Field Survey.

(2) Office of the Directorate, Central Silk Board (North-Eastern Region), Guwahati.

These castor seeds can be used for the production of highly expensive castor oil, which will definitely raise the income of the rearers. Moreover, to eliminate the role of middlemen who exploit the rearers by offering a low price for cocoon, cooperatives, self-help groups, etc. may be formed. This process will raise the bargaining strength of the rearers cum weavers and help them to have reasonable price. Government marketing personnel (Cocoon Marketing Inspectors for cocoon) and agencies like ARTFED; Assam Government Marketing Corporation Limited, North-Eastern Handicrafts and Handloom Development Corporation Limited, Assam Khadi and Village Industries Board, etc. can be reactivated. Finally, cooperation of various sections like government officers, artisans, traders, rearers, weavers, etc. engaged in activities related to ericulture is necessary for the successful growth of the sector.

Notes

1. Eri Concentration Centres are set up by Government of Assam to grow eri feed plants in order to supply leaves regularly to the rearers. At present, there are 94 ECCs in Assam covering 733.49 hectares of land (Directorate of Sericulture, Government of Assam).

2. As there is disguised unemployment in agriculture, the rural people, especially women are engaged in such occupation. Also the male people during the lean agricultural season take part in such activities for raising a part of their family earning.

3. Though contribution to total ericulture output of the State and number of families engaged in ericulture is much larger in Karbi Anlong, North Lakhimpur, North Cachar Hills and Dhimaji district growth rate of number of families engaged in ericulture and area under host plant is the second highest in the district of Barpeta. Moreover, growth of production of cocoon per unit of land is the highest in Barpeta during the last decade.

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