Research Paper

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A Study on Socio-Economic Assessment and Adoption of Scientific Technologies by the Muga Rearers of Assam

Sericulture

KEYWORDS : Muga, Socio-Economic Assessment, Disease Free Layings

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ABSTRACT

The muga culture plays an important role in the socio-economic development of the weaker sections of the rural population in terms of employment generation, but it is not getting the momentum of development due to non-availability quality DFLs, high incidence of disease and pests, non-adoption of modern technologies, prevailing adverse climatic condition etc. The reasons for non-adoption of scientific technologies are lack of awareness and preference to traditional method of rearing of silkworm. The adoption level of technologies depends on methods of transfer of technologies and hence awareness campaign and specific programs focusing on recent technologies and its practical benefits to the Muga rearers of Assam would be beneficial for adoption of such technologies. This paper attempts to assess the socio-economic condition of the muga rearers and level of adoption of improved technologies.

INTRODUCTION

Sericulture is an occupation of low investment and high output source of employment and income, which holds high promise in providing employment especially for rural people and is capable of generating substantial incomes. Sericulture enterprises a long chain industry from food plant cultivation to fabric making where different sections of people are engaged with different skills and involvement pattern. Being rural based labour intensive agro- industry, sericulture is ideally suited for improving the socio-economic condition of the rural people which provides a continuous income throughout the year. Sericulture plays a pivotal role in rural development, which integrates with the farming systems, as it needs low capital and provides year round employment (Hanumappa & Erappa, 1985)**.** India has the monopoly in the world to produce lustrous Golden Muga silk as Muga silkworm is endemic to north east India (Siddiqui *et.al.*, 1998). Muga culture is an age old practice and closely associated with the rich heritage of Assamese culture. The State virtually holds a monopoly in the production of Muga silk (Choudhury P.C, 1959). The muga silk of Assam not only holds an important place in local handloom sector market but has also a great demand in national and international market (Anonymous[2], 2008). The use of Muga silk is quite closely associated with the culture and tradition of Assamese society and occupies a unique position in the socio economic life of Assam. Assam accounts for highest production of non mulberry silk, Muga and Eri and Assam itself contributes 95% of the total Muga raw silk production of the country (Anonymous, 2012), which is the product of a semi-domesticated sericigenous insect *Antheraea assamensis* Westwood belonging to the family Arthropoda. Muga silk worm is polyphagous in nature and feeds mainly on Som (*Persea bombycina* Kost.), and Soalu (*Litsea polyantha* Juss.).

The muga culture plays an important role in the socio-economic development of the weaker sections of the rural population in terms of employment generation mostly in their off-agricultural seasons. Presently 30,000 families are engaged with this culture in Assam and their livelihood comes from it directly or indirectly (Das, P.K. 2000) from this sector. Non-mulberry silk, Eri and Muga in particular has been closely associated with the rituals and traditions of Assam and thus, silk production and its usage has been an important household activity in the state over the years. At present 9400 ha of area is available under Muga food plantation in Assam (Anonymous, 2013). Assam has received the right of Geographical Indication (GI) for muga silk and its products. Muga culture plays a very important role in socioeconomic and culture life of Assamese people, but the present status of Muga culture is not promising due to different factors. The area under Muga host plants reduced considerably due to combined impact of various factors as reported by Phukan & Chowdhury (2006). The present study was undertaken with the objective to assess the socio-economic status of the Muga rearers and level of adoption of improved technologies by the Muga rearers of Assam.

MATERIALS AND METHODS

The Department of Biotechnology, Government of India sponsored a project on Production of Disaese Free Layings (DFLs) and establishment of model muga farm in Assam and The Energy and Resources Institute (TERI), Northeastern Regional Centre has been implementing this project in Assam with the objective to produce was DFLs. As a part of the project objective to understand the problems of Muga sector, a study was undertaken during 2012 and 2013 covering 11 districts of Assam, viz., Dhemaji, Lakhimpur, Sonitpur, Sivsagar, Jorhat, Golaghat, Kamrup (R), Kamrup (M), Goalpara, Kokrajhar and Udalguri. (Figure 1)

An analytical approach based on both primary and secondary data was adopted for the study. Therefore, the data were collected from primary and secondary sources. Random sampling technique was used for collection of primary data from the study areas of the districts and from each district 10 Muga rearers (respondents) were selected randomly for information collection. The present study was carried out in 11 major Muga growing districts of Assam covering 110 farmers during the period from August 2012 to September 2013 (Table 1). A questionnaire was developed incorporating five general questions and 31 specific questions on Muga culture to collect the primary data from the study areas. The questions such as available plantation area, rearing facility, grainage facility, level of adoption of improved technologies, yield etc. were incorporated in the questionnaire taking adequate care in order to gather qualitative and quantitative information. Based on objectives of the study, both open ended as well as closed ended questions were incorporated in the questionnaire. To get an idea about the status of local rearer's, interview method was also adopted. Moreover, formal and informal focused group discussions (FGD) were followed with the key informant (KI) of the area. The secondary data was sourced from different publications (both governmental and non-governmental), research papers, web sites, news papers and journals etc.

Table 1: District wise data collection sites with Coordinates

Sl. No	District	Area/Village	Coordinates/GPS reading
	Dhemaji	Gogamukh	N 27°25'260" E 94°19'113"
		Jiadhal	N 27°28'036" E 94°29'732"
		Nilakh	N 27°36'088" E 94°38'528"
		Gandhia, Machakhowa	N 27°19'257" E 94°30'721"
	Lakhimpur	Jalbhari , Dhakuakhana	N 27°11'352" E 94°22'597"
		Baliani, Ghilamara	N 27°18'386" E 94°23'344"
		Moinapar, Ghilamara	N 27°19'964" E 94°25'285"
		Ghagara,Narayanpur	N 26°58'499" E 93°46'776"
		Maghnowa Narayanpur	N 26°57'729" E 93°48'128"
		Jorhotiagaon Gaon, Dhalpur	N 26°56'217" E 93°47'915"
	Kamrup (R)	Boko	N 25°59'453" E 91°15'227"
		Ratanpur, Chayyagaon	N 26°00'715" E 91°22'636"
	Kamrup (M)	Tetelia	N 26°07'398" E 92°02'289"
		Khetri	N 26°06'205" E 92°07'592"
		Gandhinagar	N 26°07'886" E 92°02'648"
	Goalpara	Agia	N 26°05'568" E 90°33'438"
		Mogho (Baida)	N 26°01'615" E 90°25'249"
		Salpara (Krishnai)	N 26°00'824" E 90°42'407"
		Jira Bakra (Mendipathar)	N 25°57'266" E 90°38'420"
		Bherbari (Mendipathar)	N 25°56'241" E 90°38'332"
	Sonitpur	Dubia Maduonigaon, Gohpur	N 26°54'802" E 93°42'122"
		Kokilagaon, Gohpur	N 26°54'390" E 93°40'580"
		Chengaigaon	N 26°54'211" E 93°37'652"
	Kokrajhar	Borokurshakati, Salekati	N 26°54'386" E 93°40'580"
	Udalguri	Dehantpara, Khairabari	N 26°35'117" E 91°49'135"
		Dindangpara, Khairabari	N 26°34'835" E 91°47'546"
		Kawaimari, Khairabari	N 26°33'175" E 91°47'539"
	Jorhat	Kaliapani Chapori	N 26°51'117" E 94°27'470"
		Hahchora	N 26°50'016" E 94°28'980"
		Bor Ahomgaon	N 26°43'580" E 94°67'45"
		Jogduar	N 26°50'193" E 94°26'328"
	Golaghat	Jonaki Nagar	N 26°31'610" E 93°58'929"
		Bogorijeng	N 26°33'695" E 93°58'200"
		Dekadolakhoria	N 26°314'750" E 93°59'870"
	Sivsagar	Sontolisinga, Gaurisagar	N 26°55'967" E 94°31'620"
		Bolomia, Janji	N 26°51'758" E 94°29'920"

RESULTS AND DISCUSSION

The required information was collected through administering a questionnaire and personal interview of the concern stakeholders and tabulated and analyzed to draw inferences. The results of the study have been summarized below.

Almost 86.36% respondent belong to the male category while only 13.64% are from female category, who are directly involved in muga culture. Although, the women of the rearer's family involved in their family occupation but involvement of women headed household or women of a family in Muga rearing is comparatively low. The majority of the rearer (62.73 %) is in the age group above 35 years followed by 25-35 years (34.55 %) and below 25 years (2.73 %). From the study it is clear that most of the Muga rearers are above 35 years and they have been practicing it for long time and the new generation (age group between 20-30 years) are seems not to be interested to involve themselves in this practice, which might be due to the present day work culture and the patient they have. Among the respondent covered under the study, 42.73% of the respondents belong to ST, 22.73 % SC and 34.55 % belongs to general cast. Most of the respondents (60 %) are under 10th pass, 27.27 % are 10th pass, 7.27 % are illiterate and graduate level rearer are a very few (5.45 %). As the maximum portion of Muga rearers have low level of educational qualification and hence are not aware about the scientific practices and reluctant to adopt modern scientific technologies developed by the scientists. Study also revealed that most of the respondents (70 %) are practicing Muga culture as secondary source of income and only 30 % respondent rear muga as primary source of income.

With regards to cultivation category as per the study result, 20.91 % belongs to adopted seed rearer (ASR) or seed rearer (SR), 40.91 % commercial rearer, 22.73 % seed rearer cum graneur and only 15.56% respondents are purely involved in private grainage operation (Table 2). The study also revealed that only 23.33% regular seed rearers assume the responsibility of meeting the target for production of seed for 40.91 % commercial rearers who solely depend on the seed rearers for commercial seed production. As a result there is a scarcity of seed cocoons for production of quality DFLs for commercial rearing. Moreover it is difficult to identify a rearer as a seed rearer in actual sense because most of them practices seed as well as commercial rearing in their same rearing field. The study result indicated that 58.18 % of the rearers have their own food plantation within 1- 3 acres area, 23.64 % of respondents have 3- 6 acres and only 7.27 % rearers having above 6 acres of food plantation area and remaining 10.91 % respondents are dependent on Village Grazing Reserves (VGRs) for rearing of silkworm. This indicates that most of the Muga rearers are under marginal and small farmers group and 43.64% of them have 200-400 active food plants, 34.55 % have 400-600 and 21.82 % have above 600 active food plants in their plantation area for rearing of silkworm. The rearers mostly used Som plants to rear silkworm (73.64 %) whereas 3.64 % rear muga worm on Soalu plants and remaining 22.73 % used both Som and Soalu as food plants (Table 2) for muga worm rearing purpose. Usually the rearers prefer to rear Chawki worms on Soalu plants and after completing 2nd or 3rd instars worms are transferred to Som plants. In Lakhimpur, Dhemaji, and Sonitpur districts of Assam only Som plants are preferred due to its availability for silkworms rearing but in districts like Kamrup, Udalguri and Kokrajhar both Som and Soalu are used as primary food plants for silkworm rearing. The result shows that majority of the respondents (76.36%) collect seedlings of muga food plants from government nursery or other sources and only 23.64 % produce their seedlings themselves for plantation. As per the study 79.09 % of existing plantations are systematic whereas 20.91 % plantations are scattered plantation without proper spacing and planting geometry. Similar results were also reported in the Assam Agricultural Competitiveness Project

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report (Anonymous[1] , 2008). In the systematic plantation the rearer maintained a spacing of 3 m x 3 m and 4 m x 4 m. Out of the available plantation 11.82 % plantations are 5-10 years old, 41.82 % plantations are 10-15 years old and 46.36% plantations are above 15 years old. At present very few new plantations are coming up, which is a negative sign in the growth and development of the muga sector. Nearly thirty eight (38.18 %) per cent of rearers collect DLFs from government grainage centre, 33.64% rearers collect DFLs from private graneurs and remaining 28.18 % rearers produce muga seed (eggs) by themselves for their own rearing. Most of the private graneurs produced DFLs without giving much attention on scientific approaches with poor infrastructure facilities, which may help in transmitting the Pebrine disease as most of them do not practice mother moth examination method for detection of Pebrine disease. There is a huge gap in production and demand of DFLs mainly due to low production of DFLs at private level and lower production capacity of the Government grainage. Only 39.09 % of the respondents have facilities for conducting grainage operation for production of DFLs and rearing whereas remaining 60.91 % of the respondents do not have facilities for grainage operation. Moreover only 29.09 % respondents followed disinfection procedure for grainage operation and rearing partially or fully and hence under this circumstance it is difficult to assure quality silkworm seeds. As per the findings of the study 54.55 % of the rearer used to rear more than three crops in a year, 14.55 % rear three crops and 30.91% of the respondents used to rear only two crops in a year (Table 2). The study results revealed that almost all the rearers used to rear at least two main commercial crops (*Jethua* and *Kotia*).The study also revealed that majority of the farmers do not utilize their plantations to its fullest potential. The findings of the present result are also supported by the study carried out by Borah and Mech (2001). During the study it was found that most of the rearers do not practice rearing during winter seasons due to scarcity of fresh leaves and long larval duration. About 23.64 % rearers produced 10000-30000 cocoons, 50 % rearers produced 30000- 60000 cocoons and 26.36 % rearers produced more than 60000 cocoons per year (Table 2). It is pertinent from the study that most of the potential rearers can produce 60000 cocoons per year. As per the sample survey among the private graneurs 33.33 % graneurs produce 1000-2000 DFLs, 40.48 % graneurs produce 2000-3000 DFLs and only 26.19 % graneurs produce above 3000 DFLs in commercial crops. It seems that most of the graneurs are having limited production capacity with limited infrastructure and resources. Only 19.05 % of the surveyed private graneurs followed microscopic examination of the mother moth. This could be a reason for crop loss because the Pebrine disease passes through mother moth to next generation i.e. transmission is transoverial. The private graneur supplied DFLs without examination and the eggs produced through this procedure cannot be called as DFL in true sense. Regarding maintenance of food plants, 53.64 % of the respondents apply Farm Yard Manure (FYM) in their plantation. The chemical fertilizer application intensity is very low and 91.82 % respondents do not apply any chemical fertilizer in their plantations and only 8.18 % respondents were found to apply chemical fertilizer in their plantations. The scientists have recommended standard package of practices for growing food plants but very few farmers followed the recommended practices. Success of silkworm rearing depends on sufficient numbers of quality leaves and for that purpose food plants are raised to feed the silkworm but due to non adoption of recommended practices the farmers are getting very less quality leaves to rear the worms. With regard to occurrence of pest and diseases, 32.73 % respondents were found to take control measures to prevent pests and diseases by adopting both traditional and scientific methods. More or less Flacherie disease is available in almost all the rearing fields but reports of occurrence of Pebrine disease was found very low. Although new innovations have been developed by premier research institutes of the region, but only a section of rearer are aware about these innovations and 30.91 % of the respondents are aware about Muga Heal to control Flacherie disease and none of them have ever used Muga Heal for controlling Flacherie disease. Muga Heal is a *Terminalia chebula* based bio-formulation patented by North East Institute of Science and Technology (NEIST), Jorhat to control infectious Flacherie disease which also enhances cocoon quality parameters. Similarly another product developed by CMER&TI, Lahdoigarh, *Lahdoi* used to control *Muscardine* disease and only 20 % respondent know about the product but still not used, 78.18 % respondents are not aware about the use of *Lahdoi* and only 1.82 % respondents were found to use this product on trial basis.

Central Silk Board (CSB) recommends using of box type bamboo mountages in place of traditional *Jali* which is convenient and reusable but only 2.73 % respondents were found to use this mountage on trial basis but not as regular practice, whereas 35.45 % respondents heard about the technique but not used and rest 61.82 % respondents were not aware about the use of this mountages. There is a need for popularizing this method through strong extension approaches for adoption of recent developments among the farmers. Study revealed that only 24.55 % of respondents used or are using rearing net and rest 75.45 % respondents do not use rearing net for silkworm rearing. Uzi fly is a serious silkworm pest causing a considerable damage to the cocoon crop during winter crops. To control uzi fly infestation 35.45 % respondents followed traditional methods, 58.18 % respondents do not take any control measures and 6.36 % respondents practiced biological control measures on trial basis as reported by the respondent during the field study period. CMER&TI, Lahdoigarh developed package of practices for biological control of uzi fly by releasing native parasitoid *Nesolynx thymus* at rearing field but a very less respondents are aware about this method of controlling uzi fly infestation. It was observed that uzi fly infestation in upper Assam is higher than the lower Assam and it is prevailing mainly during winter seasons (*Jarua* and *Chotua* crop) *(*Goswami *et al*., 2003*).*. Muga culture is a family occupation and most of the farmers (80 %) engaged family members for entire operation whereas only 20 % farmers engaged hired labour as per requirement. About 78.18 % of the respondents attended skill development training conducted by state department and CSB. It was found that 29.09 % of the respondents sale their cocoon to the linked farmer and remaining 70.91 % rearers sale their product through middle man. As per result most of the rearers (70.91 %) used to sale cocoons through middle man due to non-availability of controlled cocoon market and sometime they deprived of getting actual price of their product.

Table 2: Specific information on muga culture

Sl. No	Variables	Frequency	Percentage
1	Type of farmer		
	ASR/SR	23	20.91
	Commercial Rearer	45	40.91
	SR cum Graneur	25	22.73
	Private Graneur	17	15.45
	Total	110	
2	Beneficiary of other programme		
	Yes	67	60.91
	No	43	39.09
	Total	110	
3	Total area under Muga food plantation		
	1- 3 acre	64	58.18
	3- 6 acre	26	23.64
	Above 6 acre	8	7.27
	Reared at VGR	12	10.91
	Total	110	

Sl. No	Variables	Frequency	Percentage
4	Total number of active food Plants		
	200 - 400	48	43.64
	400 - 600	38	34.55
	Above 600	24	21.82
	Total	110	
5	Variety of Som Plants		
	Local Variety	89	80.91
	S 3	10	9.09
	S6	11	10.00
	Total	110	
6	Food plants used for rearing		
	Som	81	73.64
	Soalu	4	3.64
	Both*	25	22.73
	Total	110	
7	Source of planting material		
	Own	26	23.64
	Sourced from others	84	76.36
	Total	110	
8	Type of Plantation		
	Systematic	87	79.09
	Sparse	23	20.91
	Total	110	
9	Age of plants		
	5-10 years	13	11.82
	10-15 years	46	41.82
	Above 15 years	51	46.36
	Total	110	
10	Source of Dfls		
	Self	31	28.18
	Govt. grainage	42	38.18
	Private graneurs	37	33.64
	Total	110	
11	Availability of grainage/rearing equipments		
	Sufficient	43	39.09
	Not sufficient	67	60.91
	Total	110	
12	Disinfection procedures followed		
	Yes	32	29.09
	No	78	70.91
	Total	110	
13	Rearing crop per year		
	Twice	34	30.91
	Thrice	16	14.55
	More than thrice	60	54.55
	Total	110	
14	Total Production of cocoon per year		
	10000 – 30000	26	23.64
	30000 – 60000	55	50.00
	More than 60000	29	26.36
	Total	110	

Sl. No	Variables	Frequency	Percentage
15	Total production of DFLs per year**		
	1000 – 2000 gm	14	33.33
	2000 – 3000 gm	17	40.48
	More than 3000 gm	11	26.19
	Total	42	
16	Microscopic examination practiced for moth examination**		
	Yes	8	19.05
	No	34	80.95
	Total	42	
17	Application of FYM in plantations		
	Yes	59	53.64
	No	51	46.36
	Total	110	
18	Application of Chemical fertilizer in plantations		
	Yes	9	8.18
	No	101	91.82
	Total	110	
19	Occurrence of plant disease and pest		
	Yes	110	100
	No	0	0
	Total	110	
20	Control measures taken for plant diseases		
	Yes	36	32.73
	No	74	67.27
	Total	110	
21	Occurrence of silkworm diseases		
	Yes	110	100.00
	No	0	0.00
	Total	110	
22	Control measures taken for Silkworm diseases		
	Yes	22	20.00
	No	88	80.00
	Total	110	
23	Use of *Muga Heal* to control Flacherie disease		
	Yes	0	0.00
	No	34	30.91
	Not heard	76	69.09
	Total	110	
24	Use of *Lahdoi* to control Muscardine disease		
	Yes	2	1.82
	No	22	20.00
	Not heard	86	78.18
	Total	110	
25	Use of box type bamboo mountage		
	Yes	3	2.73
	No	39	35.45
	Not heard	68	61.82
	Total	110	

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Sl. No	Variables	Frequency	Percentage
26	Use of Rearing net		
	Yes	27	24.55
	No	83	75.45
	Total	110	
27	Control of Uzi fly		
	Traditional	39	35.45
	Biological control	7	6.36
	No measure adopt	64	58.18
	Total	110	
28	Experience in Muga culture		
	0-5 years	9	8.18
	5-10 years	23	20.91
	10-15 years	46	41.82
	Above 15 years	32	29.09
	Total	110	
29	Engagement of Labour		
	Family member	88	80.00
	Hired labour	22	20.00
	Total	110	
30	Skill development training attended		
	Yes	86	78.18
	No	24	21.82
	Total	110	
31	Selling of Cocoons		
	Linked Farmer	32	29.09
	Middle Man	78	70.91
	Total	110	

CONCLUSION

Muga culture is an age old industry of Assam but still it is underdeveloped due to several reasons, like-non-availability quality DFLs in time, high incidence of disease and pests, non-adoption of modern technologies developed by the research institute, absence of controlled cocoon market, prevailing adverse climatic condition etc. All the traditional rearers living in the rural areas have high motivational level towards Muga Culture. Sericulture considered as a profitable occupation for rural masses which needs less investment, small land holdings and higher returns within a short period of time but in Muga culture success of crops depends on several factors as it is reared in outdoor condition. In recent times due to adverse climatic conditions and increase in pollution level the productivity is going down year by year. The study has shown that the overall socio-economic condition of Muga rearers of Assam is not satisfactory in present days. The study revealed that the well-educated farmers having good knowledge on the improved Sericulture technologies have somehow adopted the recent technologies. To transfer and increase the adoption level of recent technologies proper extension programme should be followed. The extension strategy should be in such a way that it gives utmost importance to convince the farmers about the benefits of recent improved techniques. Area wise awareness campaign and programs should be implemented focusing the recent technologies and its practical benefits to the Muga rearers of Assam. The reasons for non-adoption of new technologies are lack of awareness and preference to traditional method of rearing of silkworm. The improved technologies those are totally different from traditional practices there the adoption level is very low. From the above findings, it may be concluded that the overall adoption level of improved package of practices is low. Hence, in order to increase the adoption level in those areas, the extension personnel need to identify the educated progressive farmers and motivate them to adopt the new recommended technologies which will increase the adoption level among the rearers of all Muga farmers in long run. Muga culture has been considered as one of the traditional occupations of Assam providing an abundant scope for the betterment of the socio-economic condition of the population. The need of the time is to trace out the problems at field level and take necessary steps to retain the global status of Assam for the Muga silk.

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