Original Research Article

Muga culture practices and its prospects in augmenting income of rural households: An empirical analysis

ABSTRACT:

Muga culture is traditionally practiced in Assam by the rural people. Rearing of Muga silk worm is done in most of the districts of Assam by the villagers as additional source of income. The present study was carried out in Dhemaji district of Assam during 2022. The study tries to examine the different aspects of Muga culture and its significance for the livelihood of local people. The present study finds that mugaculture contributes significantly to the total income of the people. The mugaculture practice in the study area is found to be an avocation that people engage in between other farming activities and people use traditional methods of mugaculture. Income is generated through selling of cocoon, pupae and muga silk threads Moreover, the cost-benefit ratio indicates that mugaculture is a profitable venture of the people.

Keywords: Muga culture, Cocoons yield, rural economy, sustainable livelihood

1. INTRODUCTION:

The state of Assam, situated in North-Eastern part of India has a total area of 78,438 sq. kms and a population of 31.20 million [1] and 70% of its population depend on agriculture and related activities for livelihood directly or indirectly. Assam is one of the major silks producing state where sericulture has been practiced traditionally since time immemorial. The agro-climatic conditions of Assam are suitable for rearing of different varieties of silkworm. The silkworm varieties reared in India are generally categorized into two groups- Mulberry silkworm (host plant- Mulberry) and Non-mulberry silkworm (host plants other than Mulberry). Mulberry silkworm reared in Assam is locally called Nooni silkworm. Among the non-Mulberry silkworm, Muga, Eri and Tasar are usually reared here. But all the four varieties of silkworm are reared commercially in various regions of India for silk production. Based on the amount (in Metric Tonnes) of raw silk production in our country by the different varieties

of silkworm from 2019-2020 (till December, 2019), Mulberry silk accounted for 18080 MT, Tasar silk 1909 MT, Eri silk 6035 MT, Muga silk 227 MT out of the total raw silk production of 26251 MT and Assam alone produced 4494 MT of the total raw silk production **[2]**

The rearing of silkworm and cocoon production to yield silk is basically known as Sericulture. Mugaculture is a specific sericulture activity wherein, Muga silk worms are reared and the ultimate output is the muga silk thread from which fabric is prepared. Muga silkworm (*Antheraea assamensis* Helfer) is endemic to Assam and some neighbouring regions of North-East India including Indo-Burma **[3].** Besides Assam, Muga culture is practiced in various neighbouring states namely Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland and West Bengal **[4].** This practice is also carried out in the states of Gujarat, Himachal Pradesh, Pondicherry, Sikkim, Uttarakhand and Uttar Pradesh and countries like Bangladesh, Indonesia, Northern Myanmar and Sri Lanka **[5].**

Muga silkworm is multivoltine in nature as it is reared for 5-6 generations in a year **[6].** It is a semi-domesticated sericogenous insect belonging to the Saturniidae family of the class Lepidoptera. It is phytophagous and reared on host plants of Lauraceae family **[7] .** Som(*Persea bombycina*) is the primary host plant of Muga silkworm but during unavailability of Som, it also feeds on Soalu(*Litseamonopetala*), Dighloti(*Litsea salicifolia*) and Mejankari(*Litsea citrata*) **[8].** In Assam, different generations of crop are named according to the Assamese calendar as Jarua(season-Winter, month-December to February); Chotua(season-Early Spring,month-March to April); Jethua(season-Spring, month-May to June); Aherua(season-Early Summer, month-June to July); Bhodia(season-Late summer, month-August to September) and Katiya(season-Autumn, month-October to November **[9].** Jethua and Katiya are considered as commercial crops while the other four crops are considered as pre-seed or seed crops **[10].** Muga culture is a complicated process because it completes its life cycle both indoor and outdoor because of its semi-domestic nature [11]**.** It is a wild species showing little genetic variation among populations and surviving harsh climatic conditions but susceptible to various diseases, pests and predators **[12].** Attempts have been made to rear Muga indoors by using various rearing devices **[13] .** Rearing of Muga silkworm indoors up to second instars, then rearing outdoors is beneficial for reducing mortality of worms and for the production of good quality cocoons **[10]. ** Indoor rearing of Muga silkworm is experimentally practiced by several workers to reduce larval mortality outdoors and to combat the various constraints faced in outdoor rearing like pests, predators, diseases, inbreeding depression, abnormal changes of climate etc.

Assam has the GI tag for the aesthetic golden Muga silk. It produces about 95 percentage of the total Muga silk production in the world **[11] .** Among the districts of Assam, Muga culture is practiced chiefly in Dhemaji, Dibrugarh, Goalpara, Golaghat, Lakhimpur, Jorhat, Kamrup, Kokrajhar, Sibsagar, Tinsukia and Udalguri **[14] .** Muga industry in Assam has the utmost potential for income generation and providing employment to the rural people of the state **[9]** . It plays a significant role in socio-economic development of rural population by generating continuous income throughout the year **[10].** The demand for Muga fabric and its products is increasing at a higher rate both in India and abroad. Sericulture is a labor-intensive industry and includes host plant cultivation, silkworm rearing and silk production. Sericulture requires low capital and provides employment throughout the year; thus, play a significant role in improving the socio-economic conditions of the rural people **[15].** It is considered to be a mode of uplifting of rural economy. Envisaging the prospects of Muga industry in Assam, the present work tries to study the role of mugaculture to alleviate rural poverty.

The present study is conducted in Dhemaji district of Assam. Several studies have found that Dhemaji district is one of the few districts that has a wide area under the host plant cultivation, a greater number of families engaged, increased muga cocoon production and has the maximum muga cocoon production per family than all other districts of the state **[9]** . Therefore, the present study is conducted in Dhemaji district of Assam. Dhemaji is situated in the north bank of the river Brahmaputra located between 94°12'18"E and 95°41'32"E longitudes and 27°05'27"N and 27°57'16"N latitudes. It is a floodplain covering an area of 3237 sq. km with a population of 688,077(2011 census). Sericulture is an age-old tradition among different communities of Dhemaji district. The present study aims to explore the contribution of Mugaculture to the household economy of the villagers in the study area and to study the profitability of Mugaculture practice.

2. MATERIALS AND METHODS

The present study is conducted on the Dhemaji district of Assam. Dhemaji district has 5 developmental blocks- Bordoloni, Dhemaji, Machkhowa, Sissiborgaon and Murkongselek. Among the 5 blocks, Dhemaji block was selected for the present study on the basis of preliminary survey. During the preliminary survey it was found that maximum family are involved in Muga culture as compared to other blocks. The selected block has 413 villages. 4 villages were selected at random as study sites from Dhemaji block for sampling, namely; Napam, Gohaingaonalichuk, Khojuachuk and Ghuguha.

Gohaingaonalichuk and Khojuachuk are located within Gohaingaon village. Gohaingaon is a very large village with nearly 1600 households constituting many small villages or localities. Of the households engaged in Muga culture from each of the four villages 20% of the households were selected at random as samples for the present study. Thus, a total sample size of 80 households engaged in Muga culture were selected for the study and accordingly survey was conducted. The present study is based on both primary and secondary data. Secondary data were collected from various published sources. Primary information was obtained through survey with a pre-structured and tested schedule prepared for the purpose. Sites for Muga silkworm rearing were personally investigated through field survey during the various rearing seasons from November,2020 to October,2021. Muga silkworm culture on host plants, various gears and equipment used, silk thread extraction techniques, weaving from the fabric were observed. Information regarding income generation from Muga culture business was acquired through personal interaction with the head of the families and compared with government data as well as literature available. Information on costs incurred in Muga culture, various heads of expenditure, diseases observed in the culture and other inherent cost faced by the rearers in recent years were gathered by interrogating with the rearers and personal interview. Data thus obtained was analysed with the help of existing literature.

Pandey *et al*.,2010 [16] conducted a cost benefit analysis of mugaculture, an avocation of the people in the district of Coochbehar, West Bengal,using cost-benefit ratio. In another similar study a cost benefit analysis taking a one-year crop period **was carried out** in Sengaon Tehsil, Mahaarashtra**[17]** .In an another study carried out in Barpeta district of Assam studied the correlation between high and low income and the income from ericulture activities and also conducted a regression analysis of the income from ericulture on total income**[18].** Ericulture is also a sericulture activity where the eri silk worm is reared and eri silk thread and eri fabric is the final output. In the present study, to analyse the contribution of mugaculture to the household economy a stochastic multiple regression analysis is conducted of the total income of a household with one of the variables as income specifically from mugaculture using SPSS. Again, to study the profitability of mugaculture a cost benefit analysis was conducted. The nature and number of harvest, tools and methods used and whether the people use any modern methods are studied through personal interview.

3.RESULTS AND DISCUSSION

3.1 MUGACULTURE PRACTICES IN THE STUDY AREA:

During the study, both male and female were found involved in the muga culture practice. The mean family size of the respondents was 5 members. Both male and female members of every household are involved in Muga culture right from host plant cultivation to bed preparation for culture and cleaning of culture beds, disease detection and care. Individuals of the family within age group 30 years and above are actively involved in Muga rearing, followed by individuals of age group 20 to 30 years and individuals below 20 years being least involved. Both the males and females of the family get the share of the income from Muga business. The female members of the household after removing the pupae from the cocoons make the silk thread ready by reeling with a traditional tool locally called *Takuri*. The female members also weave varieties of traditional Muga silk clothing and sell them at different prices depending on the type of garment and artwork created on them.

The sample households are engaged in sericulture for additional source of income. Though muga is reared, they also engage in ericulture. Eri is another silk worm which is endemic to Assam and northeast India. A thick fabric having thermal properties is derived from the fiber of Eri silk worm cocoons. These people are primarily engaged in agriculture for livelihood. Almost 20 percent of respondents have government jobs and nearly 5 percent of them own small shops.

Muga culture is conducted thrice a year in the surveyed villages. Jethua, Katiya and Jarua crop is cultured. Growth is fast in Jethua and Katiya crop (1-1.5 months) and slow in Jarua crop(nearly 3 months). Silk yield is highest from Jethua and Katiya crop. Mugaculture and host plant cultivation is conducted by every household on self-owned lands. Muga silkworm is reared in host plants like *Persea bombycina* (Som) and *Litsea monopetala* (Soalu). *P.bombycina* is the primary host plant due to its availability but *L.monopetala* is also utilized where the former is sparse. The rearers use the traditional method of rearing using traditional tools prepared by self. Generally, Som and Soalu are the host plants for Muga culture. Seeds for Muga culture are obtained from high yielding and good quality silk producing varieties. Rearers keep the seeds from their previous culture for the next crop as well as sell to other rearers. 98.5% rearers utilize seeds from their own culture as well as buy seeds from the private sources or rearers from Lakhimpur, Jorhat, Sivasagar districts of Assam and Garo hills of Meghalaya. Only about 1.5% rearers buy seeds from government sericulture farm.

3.2 CONTRIBUTION OF MUGACULTURE TO HOUSEHOLDS:

Data pertaining to income of households from various sources was collected. The sample households' sources of income were mugaculture, farm activities and ericulture. Eri is another silk worm which is reared by the selected households. This is an indoor silk worm culture which feeds primarily on castor leaves, locally called eri and hence the name. Some of the respondents had other sources of income, viz. government jobs or small business (Table: 1) .Income from Mugaculture can be attributed to various sources. Rearers sell some of the cocoons to other weavers of the district or to other places. The price of such cocoons was reported as Rs. 5000 per kg. The muga pupae are edible and form an essential part of the local cuisines. These pupae are also partly sold locally at price Rs. 500-Rs. 700 per kg. The muga thread is sold at Rs. 18,000 per kg. Besides, the rearers weave clothes out of the threads which they sometimes sell. Income from all these sources was calculated and the total income from mugaculture was regressed to the household total income to identify whether mugaculture contributes significantly to the total household income (Table: 1)

Table 1: Block wise average annual household income from various sources (in Rs.)

Household income sources	Napam	Khojuachuk	Gohaingaonalichuk	Ghughuha
Other sources	75000	72000	72000	75000
Mugaculture	83550	98500	96925	152950
Farm activities	12650	11850	10850	11250
Ericulture	3850	3175	3787.5	4325

Source: Primary Investigation

Table 2: Average Muga cocoon production per year and income from Muga culture

Parameter	Napam	Khojuachuk	Gohaingaonalichuk	Ghughuha
Number of cocoons	28900	37600	38250	57825
Income from cocoons (Rs)	18400	21820.00	21300.00	34500.00
Income from Threads, clothes (Rs)	62660.00	73880.00	72800.00	114000.00
Income from Pupae (Rs)	2490.00	2800.00	2825.00	4450.00

Source: Primary Investigation

From the study, it was found that income from Muga culture were more in all the families than the other agricultural sources of income (Table: 1).It may be noted that all do not have other occupational sources except for sericulture and farm income. It was observed that income from selling muga threads and clothes were more than selling cocoons and pupae (Table: 2). Among the four study sites, maximum cocoons were produced in a year by each family (average) of Ghughuha village and income of such families are more than the other three villages. A multiple regression analysis was conducted using SPSS. Prior to the regression the data were also tested to observe for the existence of heteroscedasticity. The regression equation thus, obtained is Y_t=5.912+0.892 X_1+0.169X_2+0.012X_3+0.008X_4+μ, with R square value as 0.978. Besides, the t value of the co-efficient of variable X_2 (income from Mugaculture) is found to be statistically significant. The findings validates the hypothesis that mugaculture contributes significantly to the household economy. The findings are similar to earlier studies in different study area that sericulture practices contributed significantly to the household income.

3.3 ECONOMIC PROSPECTS OF MUGACULTURE:

To study the prospects of mugaculture a cost benefit analysis was conducted in the context of the studied sample. Now, the mugaculture is an avocation practised traditionally by the people in these selected villages. The practice of mugaculture is not new to the region. The main feed of the muga silk worms is gathered and are available in plenty locally. Following available literature, the cost involved in mugaculture is calculated as a sum of establishment cost of host plant garden (prime cost), working capital and maintenance cost (cost A) and imputed cost of labour (cost B). However, taking a crop period of one year as in the context of the present study and considering that the village people have carried out mugaculture practise since many years the prime cost is redundant in the case of the present study. Tools for use in mugaculture practises are made by themselves from locally available resources. Seeds of muga worms are from their own harvest and very seldom they need to buy from government grainage. Again, as an avocation the practise is conducted amidst other farm activities by the people and both male and female members contribute in carrying out the activity.

Table 3: Computation of Cost-Benefit of Muga culture Practise

Items	Amount (in Rs.)
Cost	Rs. 15,500
Gross Return	Rs. 112,981.25
Net Return	Rs. 107,981.25
Cost-Benefit Ratio	6.97
Crop Period	1 year

Source: Primary Investigation

Personal interview and discussions with the sample households was conducted for deriving the amount of cost incurred and returns from mugaculture in the context of the study. Cost A and cost B was observed to be Rs. 15,500.00 annually (Table: 3). The gross return from mugaculture for the sample household during a one-year crop period is Rs. 112,981.25 and the net return is Rs. 107,981.25. The Table:3 shows the cost-benefit of the mugaculture avocation of the people. As evident from the table cost-benefit ratio indicates that mugaculture is promising occupational venture of the people. The findings are similar to studies conducted earlier in different study area.

4. CONCLUSION:

Mugaculture has been practiced traditionally by the people in Dhemaji district of Assam by the traditional methods of sericulture practice. The practice is an avocation that people engage in between other farming activities. All the family members, both men and women, engage themselves in the various activities of the mugaculture practice and the women also get a share of the total income received thereof. The present study finds that mugaculture contributes significantly to the total income of the people. Moreover, the cost-benefit ratio indicates that mugaculture is a profitable venture of the people. Therefore, on the basis of the study, mugaculture can be stated to be a profitable way to augment the economic condition of the rural people. Considering the cost of the activity the study finds that there is immense potential for augmenting the benefits with little effort at enhancing the scope of the activity and engaging modern scientific methods.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that no generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts

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