Factors affecting production of Silk yarn and Cocoon in Assam

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Abstract

The sericulture industry of India has a very high potential of supplying more employment and source of income than what is being currently supplied by the industry. Sericulture is found to be a very important practice of tribal life and practice by around 1.5 lakh tribal people of states like Chhattisgarh, Orissa, Madhya Pradesh, West Bengal, Bihar, Jharkhand, Maharashtra, and Andhra Pradesh. The growth rates of both silk yarn and employment by the sericulture industry in Assam are not continuous and seamless. This study reveals a few years of the negative trend in the case of silk yarn production by the state. Analysis of the production data shows that the trend line of silk production in the state has fluctuation. The production quantity of different types of silk in Assam also has variations. The main aim of this study is to understand the relationship among the number of sericulture villages, the number of the family engaged in sericulture, the area under food plants, number of cocoons and silk yarn produced in Assam. It was found that the increased number of sericulture villages, the number of families engaged in different sericulture, and the area under food plants are not clearly ensuring more cocoon and raw silk production in the state.

Keywords: Sericulture; Silk Yarn; Sericulture family; Sericulture village; Assam

Introduction

The affluent history of sericulture production covers a period of over five millennia. The history of silk production gives shreds of evidence of the supply of job opportunities and economic upliftment. Silk is a protein that is emitted and spun to convert it into a fiber by different arthropods. The sericulture sector is an example of a vital sustainable sector that demands minimal pressure on the ecology and serves for human health and soil conservation if cared with proper supply chain management. As silk is on its own a natural polymer it is biodegradable and has the benefit of being dynamic as plastic. During the 1930's it was found that boiling silk cocoons with sodium carbonate salt emits sericin protein and loose poly fiber filaments, which has various uses. Even though the synthetic fiber revolution was due to a disturbance in the supply of silk from Japan and Italy in the late 1930's and 40's silk fibroin protein still had the benefit of being biodegradable (Altman et al., 2022).The rearing method of the silkworm is known as sericulture. It is a significant economic activity in numerous developing countries across the world. The sole purpose of sericulture is to produce silk fiber. In terms of sericulture production India holds the second position and produces different types of silks like Muga, Tasar, Eri, and Mulberry. In India highest produced silk is Mulberry silk. In addition to the main product, cocoon there are various other economically significant by-products that can be obtained from sericulture. The by-products of sericulture also have been in use to treat different health-related issues. Various counties producing silk through sericulture use pupa after silk reeling because pupa is rich in protein, carbohydrates, vitamins, and fat. Waste products of sericulture like moths, pupae, waste silkworms, and fibers can be used for different purposes. Two important proteins created by silkworms are fibroin and sericin as these two are the main constituents of cocoons. In the textile industry, sericin is manufactured by removing gum from the cocoons (Kumar et al., 2021). Livelihood creation is the major prospect of the sericulture industry. In India, sericulture is mostly rural-based and labor-intensive sector and plays a vital role in socioeconomic development. 75% of the total silk production by the sericulture industry in India is covered by Mulberry silk. The sericulture industry of India supplies livelihood to mostly rural and semi-urban populations (Chanotra et al., 2019). India and china together produce 93% of the world's silk. Though the silk industry of India has seen various highs and lows, it has made recognizable growth in the past 30 years in terms of producing Mulberry silk (Kasi, 2013). In the recent educational policy, GOI has taken initiatives to introduce vocational skill-based subjects at the first-degree level with the help of UGC. Where sericulture is one of the most important subjects with the potential to provide huge employment. The acknowledgment of the significance of the sericulture sector for meeting the current needs of society as well as educational institutions is a crucial matter to be looked into (Hiware, 2019). In Assam, the practice of sericulture is from the immemorial time. Traditionally in the state, three types of silks are produced, are Eri, Mug, and Mulberry silk. In fact, Assam is the largest producer of Muga silk. Even though three are four types of silks are being produced by the sericulture industry of Assam, more importance is given to the production of Eri, Muga, and Mulberry silk. India's 95% and 65% of Muga and Eri production come from Assam (Directorate of sericulture, 2023).

The sericulture industry of Assam is a remarkable source of employment and income for the people of the state, however, the sericulture sector of Assam has huge potential to grow more. Sericulture in Assam contributes one-tenth portion of overall silk production of India and the hugely growing food plants are one of the favorable factors for sericulture in Assam (Das et al,2023). There is a fluctuating trend in terms of the number of sericulture villages, number of people engaged, and area of food plants for sericulture in Assam over the years. The overall production by the sericulture industry of Assam is not stable every year, (Kherkatary, 2017). The number of sericulture villages, number of people engaged, and area of food plants for sericulture is the most associated variables with the production of silk yarn in government reports (Directorate of Economics and Statistics Assam, 2022) . Studying the impact of such variables on the production of silk yarn in Assam will reveal how significant above stated variables are for overall silk production of the state and whether more attention should be given or not.

Sericulture global status

Now sericulture is acknowledged as an Intangible Cultural Heritage by UNESCO. The sericulture industry contains three main activities, which are food tree cultivation, the rearing of silkworms, and silk harvesting. The silkworms live on the leaves of mulberry trees i.e. white mulberry, which is native to China and India. This white mulberry was planted in the USA in the 1600s for the cultivation of silkworms (Altman et al., 2022). In 1607, silk growth in the US started with the finding of the first colony of Virginia and expanded till World War 2. The sericulture industry in the US grew in a very less time. During the time of finding Virginia, the Italian piedmont solely exported silk of £200,000 every year to England. Starting from 1656 to 1669 different acts were laid down by the Virginia Assembly to collect penalties for not planting mulberry trees and supply rewards to uplift silk production. The London society for the encouragement of arts, commerce, and manufactures attempted to cheer up sericulture in America. The first American silk mill was constructed in Mansfield Connecticut in the year 1810 (Klose, 1963). There are 10 million silkworm rearers and 0.5 million related industrial workers in the world. Asia remains to be the top producer of silk with 95%

of the total world's silk production and there are 58 countries found to be practicing sericulture in the world (Dewangan, 2013). The silk industry yields over four megatonnes of silk every year. Sericulture can be practiced at a small level and also at an industrial level. The silk industry is supplying numerous economic benefits over millennia. In Indonesia, the sericulture industry provides livelihoods and a forest ecosystem as sericulture is a non-timber forest product. Solely the distinct benefits of sericulture have not been able to motivate the development of a possible sericulture industry in Indonesia. The silk industry in Indonesia was first introduced with the help of trade during the 10th century and since 1953 the industry has progressed quickly. Silk yarn production in Indonesia reached the top in 1917 when 140 tons of silk yarns were produced. The production centers have their existences in different locations like West Java, South Sulawesi, and Central java (Andadari et al., 2022).

Sericulture in India

Agriculture-based industries play a significant role in the development of the rural Indian economy. The sericulture industry in India can be separated into two parts i.e. farm and industry. Sericulture is found to be a very important practice of tribal life and practice by around 1.5 lakh tribal people of states like Chhattisgarh, Orissa, Madhya Pradesh, West Bengal, Bihar, Jharkhand, Maharashtra, and Andhra Pradesh. Producing tasar silk serves the livelihood of the Indian tribal people (Dewangan, 2013). Women are playing a significant role in the sericulture industry of India. The sericulture sector of India has introduced doors for employment opportunities and helped women to be self-dependent. Sericulture in India also has become a popular topic in the theoretical as well as methodological understanding in the fields like social anthropology and sociology. In India, sericulture is supplying continuous income and employment to society without any discrimination against caste, gender, religion, and creed (Kasi, 2013). The plantation of mulberry plants and rearing of the silkworm in the Karnataka state of India goes back to the 18th century. The Government of Karnataka played a vital role in keeping the sericulture practice going in the state by setting up a special department in 1913-14 to look at the matters related to sericulture and taking steps for encouraging the sericulture industry (Hanumappa et al.,1985).

Sericulture in Assam

The growth rates of both silk yarn and employment by the sericulture industry in Assam are not continuous and seamless. This study reveals a few years of the negative trend in the case of silk yarn production by the state. Analysis of the production data shows that the trend line of silk production in the state has fluctuation. The production quantity of different types of silk in Assam also has variations (Kherkatary, 2017). Sericulture is a notable source of employment and silk waste processing also provides additional indirect employment in the state. Eri is the less expensive silk among the other types and is very commonly worn by Assamese women. According to the statistics, Ericulture is performed by 2, 94,419 farm families in Assam. 47 % of the tribal community of the Dhemaji district of Assam are engaged in rearing Eri and Muga. . Assam is in a very suitable location for producing muga silk because of its favorable climatic conditions and the state is well known for its golden muga silk yarn (Chakravorty et al., 2015). The Jorhat district of Assam plays a recognizable role in producing silk, where sericulture is practiced at a larger scale. In Jorhat, around one thousand families are engaged in producing silk (Hatibaruah, 2022).

There is a limited number of studies have been done on sericulture in the NE region of India and especially in Assam (Kherkatary,2017). Apart from the lack of overall research on the sericulture industry of Assam, there are also very few studies that considered the number of sericulture villages, number of people engaged, and area of food plants for sericulture as their research variable to see their importance in the production of raw silk in Assam. The current study will fill this existing gap in the literature related to the sericulture of Assam. The objective of this research study is to see the relationship among the number of sericulture villages, the number of the family engaged in sericulture, the area under food plants, number of cocoons and silk yarn produced in Assam.

Methodology

This research study is descriptive and based on data published by The NEDfi (North Eastern Development Finance Corporation Ltd) (NEDFi 2021). To understand the relationship among the number of sericulture villages, the number of the family engaged in sericulture, the area under food plant, production of cocoon and silk yarn in Assam, multiple correlation has been applied. To analyse the effect of the number of sericulture villages, the number of the family engaged in sericulture, and the area under food plant on the quantity of silk yarn produced in Assam, multiple regression has been used. Data analyzed for the study relate to a period of five years starting from 2016-17 to 2020-21. Data used for this study are up to dated and uploaded till 2020-21 in the official website of NEDfi data bank, which was the latest data available for the purpose this study. The number of families engaged in sericulture and sericulture villages includes Familes and sericulture villages associated with production Eri, Muga and Mulberry cocoons as well as silk yarn.

In the case of multiple regression analysis, the following model has been used

$$y=\beta_0+x_1+x_2+x_3+\epsilon$$

Here Y= Silk yarn produced in Assam, β_0 = Constant term, x1= Number of sericulture Villages in Assam, x2= Number of the families engaged in sericulture in Assam, x3= Area under food plant, and ϵ = Error term

Results and discussion

The results of correlation and regression analysis of the data obtained and discussion of the results have been shown in categories according to different types of silk. According to the data published by NEDFi,(2021), the number of sericulture villages and families engaged in sericulture over five years is shown in Table 1

Eri Silk

The results of the correlation show that number of sericulture villages has a moderate degree of negative correlation which means that an increase in the number of sericulture villages will lead to a decrease in the total production of Eri silk yarn. The number of families engaged in Eri sericulture have a low degree of positive correlation with the production of Eri silk yarn. The area under the food plant of Eri silk has a very high correlation with the MT production of Eri silk yarn. Hence, there should be more focus on increasing the area under Eri food plants and increasing the capacity of production of cocoons rather than increasing the number of sericulture villages (Table 2).

Muga silk

According to the result of correlation, there is a high degree of positive correlation between the number of cocoons produced and the production of silk yarn, and an increase in the area under Muga food plants will lead to a moderate increase in the number of Muga silk yarn production of the state. An increase in the number of families engaged in Muga sericulture increases the yield of Muga silk by Assam at a moderate rate. There should be less importance given to the increasing number of the family engaged in sericulture as it has a very high negative correlation with Muga silk yarn production (Table 3).

Mulberry silk

The results of the above correlation show that the production of cocoons has a very high positive correlation and families engaged in sericulture (Mulberry) have a high positive correlation with the amount of Mulberry silk yarn produced in the state over the five years. No families engaged in Mulberry silk production also have a very high positive correlation with Mulberry cocoon production. With an increase in the number of families engaged in sericulture (Mulberry), the production of cocoons of Mulberry will increase Assam's Mulberry silk production. In the case of the other two types of silks the number of families engaged in sericulture has a very low capacity to increase the production of silk in Assam (Table 4).

Table 1: Number of sericulture villages and sericulture engaged in sericulture over the period of five years

Sericulture villages	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021
Numbers	9935	8729	8828	8642	8640
Sericulture engaged in sericulture	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021
Numbers	3,19,405	3,06,044	3,01,008	3,09,530	3,31,857

Source: (NEDFi.,2021).

Table 2: Correlation among the variables like the number of sericulture villages, families engaged in sericulture (Eri), Area under Eri food plants, production of Eri cocoon and Eri silk yarn

	Sericulture Villages	Families Engaged in Sericulture (Eri)	Area under food plants (Eri)	Production of Cocoons (Eri)	Production of Silk Yarn (Eri)
Sericulture Villages	1				
Families Engaged in Sericulture (Eri)	0.173904793	1			
Area under food plants (Eri)	-0.540045629	-0.062484341	1		
Production of Cocoons (Eri)	-0.962966409	0.032764351	0.3862534	1	
Production of Silk Yarn (Eri)	-0.682795126	0.380117624	0.09435187	0.841745	1

*Very high correlation

Table 3: Correlation among the variables like the number of sericulture villages, families engaged in sericulture (Muga), Area under Muga food plants, production of Muga cocoon and Muga silk yarn

	Sericulture Villages	Families Engaged in Sericulture (Muga)	Area under food plants (Muga)ha	Production of Cocoons (Muga) in lakhs no	Production of Silk Yarn (Muga) in MT
Sericulture Villages	1				
Families Engaged in Sericulture (Muga)	-0.953316954	1			
Area under food plants (Muga)IN Hect	-0.489712179	0.641244329	1		
Production of Cocoons (Muga) in lakhs no	-0.653345546	0.566799172	0.511548278	1	
Production of Silk Yarn (Muga) in MT	-0.685470358	0.625180902	0.747382904	0.856406357	1

Table 4: Correlation among the variables like number of sericulture villages, families engaged in sericulture (Mulberry), Area under Mulberry food plants, production of Mulberry cocoon and Mulberry silk yarn

	Sericulture Villages	Families Engaged in Sericulture (Mulberry)	Area under food plants (Mulberry) ha	Production of Cocoons (Mulberry) in lakhs	Production of Silk Yarn (Mulberry) in MT
Sericulture Villages	1				
Families Engaged in Sericulture (Mulberry)	0.23847991	1			
Area under food plants (Mulberry) ha	0.437799079	-0.204731558	1		
Production of Cocoons (Mulberry) in lakhs no	-0.09877024	0.939403145	-0.327755701	1	
Production of Silk Yarn (Mulberry) in MT	-0.150745787	0.897560748	-0.24987418	0.959893991	1

*Very high correlation

Table 5: Impact of independent variables on the dependent variable (Total production of silk yarn in Assam)

Regression Statistics	
Multiple R	0.936537
R Square	0.877101
Adjusted R Square	0.508405
Standard Error	638.099
Observations	5

ANOVA					
	df	SS	MS	F	Significance F
Regression	3	2905887	968629.1	2.378929	0.437039
Residual	1	407170.3	407170.3		
Total	4	3313058			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	5765.888	9504.925	0.606621	0.652868	-115006	126537.4	-115006	126537.4
Sericulture Villages	-1.60953	0.686707	-2.34384	0.256728	-10.335	7.115903	-10.335	7.115903
Total Families Engaged in Sericulture	0.044114	0.026612	1.657701	0.345559	-0.29402	0.382246	-0.29402	0.382246
Total Area under food plants in Hect	-0.01671	0.018934	-0.88228	0.539763	-0.25728	0.223874	-0.25728	0.223874

Result of regression model

R square value represents that 87.7% of the dependent variable is explained by the independent variables. The P values of the independent variables are higher than 0.05, which represents that the independent variables have no significant impact on the dependent variable Hence it is clear that increasing sericulture villages, number of the family engaged in sericulture, and total area under food plants have no significant positive impact on the total production of the sericulture industry of Assam. More emphasis should be given to increasing the skills and capacity of the families engaged in sericulture for increasing the rate of silk production in the state. Other factors associated with the sericulture industry of the state should also be more focused on (Table 5).

Conclusion

Assam has huge potential of developing the sericulture industry from its current position. The number of sericulture villages, the number of families engaged in different sericulture, and the area under food plants have been the most popular topics of both Central and State Government reports on sericulture. The findings of the study show that Assam's sericulture industry needs more focus on other matters associated with the industry apart from these factors. The increased number of sericulture villages, the number of families engaged in different sericulture, and the area under food plants are not clearly ensuring more cocoon and raw silk production in the state. Kherkatary., (2017) has mentioned that the upgradation of sericulture practices, new technologies, and introducing training should be more focused by the state government for increasing silk production as well as employment generation by the sericulture industry of Assam. Gogoi et al., (2023) has stated that limited capital, lack of rearing infrastructure, low-quality seed, the existence of middlemen, and non-availability of the spinning machine are significant challenges that lead to low production of silk by the state.

Conflict of interest: There is no conflict of interest

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