Exploring the relationship between raw silk production and employment growth in the Indian sericulture Sector

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Abstract

The paper investigates the relationship between raw silk production and employment growth in India's sericulture sector. It aims to understand how the sericulture industry contributes to employment generation and economic development. The primary aim of this investigation is to explore the extent to which raw silk production influences employment growth in the Indian Sericulture Sector. The study uses data from government sources, including the Ministry of Textiles, the Central Silk Board, and the Center for Industrial and Economic Research. The data covers the period from 2000-01 to 2023-24. The dataset includes annual figures for production and employment. The key variables include raw silk production (measured in metric tons), and employment in sericulture (number of persons). The analysis employs AGR, Standard Deviation, CAGR, Coefficient Variation, Pearson Correlation and Linear Regression analysis techniques to examine the relationship between raw silk production and employment growth. The CAGR of employment in the silk industry is 2.37%, showing a steady but slower annual growth rate than production. The Pearson correlation coefficient between Production and Employment is **0.976**. This numerical value closely approximates the quantity of one, indicating a solid positive linear relationship between Production and Employment. Both (Constant) and Production have p-values (.000), indicating that they are statistically significant at conventional levels (e.g., $p < .05$).

Keywords: Silk Production; Employment; Labour productivity; Sericulture

Introduction

Silk constitutes a commodity of significant worth yet limited quantity, representing a mere 0.2% of the global textile output. The production of silk is perceived as a crucial mechanism for fostering the economic advancement of a nation, given its labour-intensive nature and capacity to yield high levels of revenue through the creation of value-added goods with economic significance. Developing nations heavily depend on silk production to generate employment opportunities, particularly within rural areas, and to acquire foreign currency. Silk is the most graceful fabric in the world. Asia, geographically speaking, serves as the primary hub for silk production worldwide, accounting for more than 95% of the total global output. While the world map depicts over 40 nations engaged in silk production, the majority of this activity is concentrated in China and India, with additional contributions from Japan, Brazil, and Korea. Notably, China stands out as the foremost provider of silk on the global stage (Kanchan & Hebbar, 2024).

It is lightweight, soft, high stability and well-known as the queen of textiles worldwide. The Indian silk industry is the second largest contributor to production worldwide. According to the Central Silk Board, Ministry of Textile, Government of India, silk production increased from 28525 million tonnes during 2015-16 to 35261 million tonnes till 2018-19. The direct impact of silk production on employment will be an increase of 9.12 million persons in 2018-19 as associated with 8.25 million persons in 2015-16 (Annual report 2015-16 and 2018-19, Central Silk Board,Bengaluru,India). In the employment scenario of the Sericulture industry around 9.76 million people in rural and semi-urban areas in India (Official website on Indian Trade portal). Sericulture is a labour-intensive, agro-based industry providing work to the jobless in rural areas facilitating financial progress and enhancing the standard of living of the rural people. It is low investment demanding and remunerative nature of its construction.

The silk industry is an efficient massive foreign exchange earner for the country. The sericulture industrial activities in the rural area approx. 52360 villages are covered. The sericulture industry engagements over seven lakh farmhouse families most in the Indian state Karnataka, Tamilnadu, and Andhra Pradesh and to near range Assam and West Bengal. Only Karnataka produces more than seventy per cent of the country's overall silk production. Sericulture is one of the most industries valuable to agriculturists. Currently 5.6 million people are dependent on the silk industry, out of which 4.7 million are agriculturists. Sericulture offers the chance for rural people to work in the field and to produce good quality top brands. It also helps alleviate poverty and decreases unemployment for the youth and jobless workers in the occupied age group. It is labour labour-intensive industry that promotes workers' standard of living and enhances the local economy. A very low amount of capital is required to establish this type of industry which is the low cost of labour, maintenance costs are almost very down. So we can say new start-ups, mid-sized firms and small businesspersons can set up and start silk production.

The profit worth of cocoon and by-products gathered Rs. 662840.64 and 881123.89 hectare/year in both zones correspondingly. The cost-benefit ratio is reported as 1:2.28 and 1:2.32 for the northwestern and western zones, correspondingly, (Susikaran et al, 2019). Sericulture enhanced to increase seasonal work as additional income for people living in the regions. The results indicate that the production of cocoons in 2000 year compared to the 2019 year will be increased. Monetary factors play a major role in influencing the financial efficiency of production (Ibragimovich & Rasuljonovich, 2020).

Indicates that raw silk production has a growing trend and markets directly influence the average raw silk process. Further, a study found that Tasar silk has higher uncertainty in fabrication and growth rate (Bhat & Choure, 2014). The study found that cocoon production has money-making in the selected areas. The net profit of all agriculturalists is Tk.2530.16 per hundred DFL and the benefit-cost ratio is 2.31. The research concludes that silk production is a gainful substitute source of revenue for agriculturalists in rural areas (Siddiq et al, 2015). Analyzed the growth and variability of silk production in the context of India. The study found the growth rate of silk production in India to be a positive and highly significant overall period of the study. The uncertainty in the export quantity and worth of silk increase in the overall period is positive and found in R square and coefficients (Inge et al, 2022).

The authors found the result that imports of China's raw silk to India reduced significantly. The silk industry's inclusive sales in India improved throughout this study (Mouzam et al, 2016). Sericulture provides the potential for income generation and employment in cocoon production and the sericulture industry. The study suggests that cocoon farming and fabrication can be necessary monetary tools for rural progress (Syamaladevi, 2022). The evaluation underscores the significance of comprehending the variety, nutritional characteristics, and interactions among the Muga silkworm and its food sources for efficient preservation and sustainable silk manufacturing (Devi et al, 2021). The scholarly article is anticipated to encompass statistical information regarding silk output, climate change forecasts, and rural economic metrics to evaluate the consequences of climate change on eri and muga cultivation, as well as its repercussions on rural income and employment in Assam. The overall yield of Eri and

Muga silk is progressively rising despite the adverse climate conditions, demonstrating the resilience of silk production in Assam (Das et al, 2023).

Sericulture activities rooted in agriculture have significantly contributed to creating job opportunities and revenue in the gradually advancing economy of Assam. There has been a notable shift in the relative ranking of each sericulture activity about the creation of employment opportunities, income generation, and level of acceptance among the populace. This study endeavours to conduct a relative investigation of various silk production practices in Assam, specifically focusing on eri, muga, and mulberry related to employment and income generation (De & Das, 2010). The following goals are the focus of the study:

- To study the trend and labour productivity within the sericulture industry in India.
- To investigate the relationship between the production of raw silk and employment in the sericulture sector in India

Materials and Methods

The present research is based on secondary data obtained from government sources, including the Central Silk Board, and the Ministry of Textiles, India. To determine the annual growth rate that transpired during a period of time from 2000-01 to 2023-24, consider the output of silk and employment. For the intention of exploration, There has been application of descriptive, graphical, and tabular basic statistical approaches. Descriptive statistics have been considered, including Mean, Standard Deviation (S.D.), Coefficient of Variation (C.V.), Annual Growth Rate (AGR), and Compound Annual Growth Rate (CAGR). Regarding presentation graphs, like Line graphs have been used.

The formulation for AGR is

AGR= (Present value – Past value/ past value) * 100 …….. (1)

Compound Annual Growth Rate (CAGR)

This study uses CAGR to know whether production and employment have increased over time.

CAGR= (Ending Value / Beginning Value) ^ (1/N)-1…… (2)

Coefficient of Variation (C.V)

The coefficient of variation method is used to determine the volatility and fluctuation in India's employment and output of raw silk.

C.V= S.D/MEAN *100 …….. (3)

Labour productivity

Labour productivity has been calculated as the ratio of production to employment for each year. Calculated using the given formula:

Labour productivity = Output/ Employment ……. (4)

A Pearson correlation and linear regression analysis has been used to determine the relationship between production and employment. SPSS version 22 has been used for statistical analysis and Microsoft Excel has been used for initial data preparation and visualization. To study the relationship between the production of raw silk and employment by the following equation:

$$Y=a+bx \quad \ldots\ldots (5)$$

Where, Y= employment in the sericulture sector and X (explanatory variable) = Silk raw production

Result and Discussion

Table 1 presents data on raw silk production in metric tons (MT) and employment in India's silk industry over 24 years from 2000-01 to 2023-24. The production of raw silk started at 15,857 MT in 2000-01 and showed fluctuations over the years, reaching 38,913 MT by 2023-24. Employment in the silk industry rose from 5,400,000 persons in 2000-01 to 9,480,000 persons in 2023-24.. The most recent data (2023-24) indicates recovery and growth after a significant decline in 2020-21.

The table 2 provides the annual growth rates (AGR) for production and employment, as well as labour productivity (output per worker) in India from 2000-01 to 2023-24. The AGR of production fluctuates significantly across the years. Notable peaks were observed in 2011-12 (12.98%) and 2013-14 (11.82%). Negative growth is observed in multiple years, with the most significant drop in 2020-21 (-5.72%). Employment growth also shows variability but with generally smaller fluctuations compared to production.

Table1: Decomposition of Production and Employment of Raw Silk in India (2000-01 to 2023-24)

Years	Production (MT)	Employment (Person)	Years	Production (MT)	Employment (Person)
2000-01	15857	5400000	2012-13	23679	7653000
2001-02	17351	5500000	2013-14	26480	7850000
2002-03	16319	5600000	2014-15	28708	8030000
2003-04	15742	5650000	2015-16	28523	8250000
2004-05	16500	5800000	2016-17	30348	8510000
2005-06	17305	5950000	2017-18	31906	8604000
2006-07	18475	6003000	2018-19	35468	9178000
2007-08	18320	6120000	2019-20	35820	9430000
2008-09	18370	6310000	2020-21	33770	8730000
2009-10	19690	6817000	2021-22	34903	8780000
2010-11	20410	7250000	2022-23	36582	9220000
2011-12	23060	7560000	2023-24	38913	9480000

Source: https://csb.gov.in/wp-content/uploads/2024/07/Raw-Silk-Production-Statistics-1.pdf and https://www.indiastat.com/

Table 2: Annual Growth Rate and Labour Productivity in India (2000-01 to 2023-24)

Year	Production (AGR %)	Employment (AGR %)	Labour productivity (output per worker)	Year	Production (AGR %)	Employment (AGR %)	Labour productivity (output per worker)
2000-01	-	-	2.94	2012-13	2.68	1.23	3.09
2001-02	9.42	1.85	3.15	2013-14	11.82	2.57	3.37
2002-03	-5.94	1.81	2.91	2014-15	8.41	2.29	3.58
2003-04	-3.53	0.89	2.79	2015-16	-0.64	2.73	3.46
2004-05	4.81	2.65	2.84	2016-17	6.39	3.15	3.57
2005-06	4.87	2.58	2.91	2017-18	5.13	1.10	3.71
2006-07	6.76	0.89	3.08	2018-19	11.16	6.67	3.86
2007-08	-0.83	1.94	2.99	2019-20	0.99	2.74	3.80
2008-09	0.27	3.10	2.91	2020-21	-5.72	-7.42	3.87
2009-10	7.18	8.03	2.89	2021-22	3.35	0.57	3.98
2010-11	3.65	6.35	2.82	2022-23	4.81	5.01	3.97
2011-12	12.98	4.27	3.05	2023-24	6.37	2.81	4.10

Source: Authors own calculation based on table no. 1

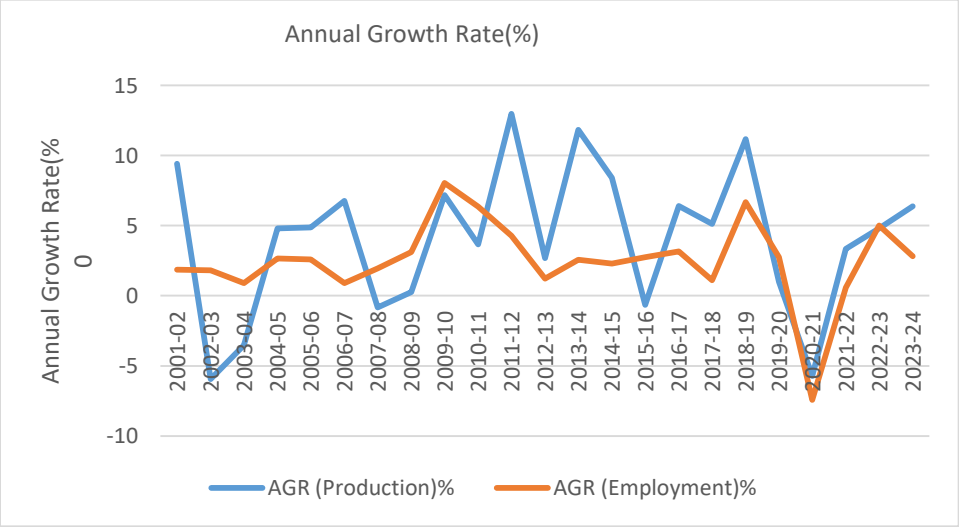

Figure 1: Trend in Annual Growth Rate of Raw Silk Production and Employment in Sericulture Sector in India
Source: Author's Compilation

Figure 2: Trends in Labour productivity of the silk industry in India
Source: Author's Compilation

Table 3: Descriptive Analysis of Raw Silk Production and Employment in India (2001-02 to 2023-24)

Tools	Production	Employment
CAGR (%)	3.81	2.37
Mean (SD)	25104.13(7951.74)	7403125(1420391)
C.V (%)	31.67	19.18

Source: Authors own calculation

Table 4: Pearson Correlations

		Production	Employment
Production	Pearson Correlation	1	.976**
	Sig. (1-tailed)		.000
	N	24	24
Employment	Pearson Correlation	.976**	1
	Sig. (1-tailed)	.000	
	N	24	24

**. Correlation is significant at the 0.01 level (1-tailed).

Table: 5 Model Summary

	R	R Square	Adjusted RSquare	Std. Error of theEstimate
1	.976[a]	.953	.951	314753.246

Predictors: (Constant), Production

	Coefficients	Standard Error	t Stat	Sig.
Constant	3025445.008	216932.203	13.947	.000
Production	174.381	8.254	21.128	.000

Dependent Variable: Employment

High growth years include 2009-10 (8.03%) and 2018-19 (6.67%). A significant negative growth in employment is seen in 2020-21 (-7.42%), likely due to the impact of the COVID-19 pandemic. Labour productivity has shown a consistent upward trend over the years. This indicates a steady increase in the efficiency and output per worker over time. Labour productivity starts at 2.94 and shows a slight decline in 2002-03 (2.91). Output per worker

shows a slight decline in 2010-11 (2.82). Labour productivity continues its upward trend, reaching 3.57 in 2016-17. From 2021-22, Production and employment growth rates stabilized, and Labour productivity reached its highest value of 4.10 in 2023-24.

Figure 1 shows the annual growth rate for production (blue line) shows significant fluctuations. High peaks are observed around the years 2010-11 and 2017-18. There are notable dips, particularly in the years 2001-02, 2008-09, and 2019-20. The annual growth rate for employment (orange line) appears more stable compared to production. There is a general trend of moderate growth, with some periods of decline. Notable dips occur around the years 2009-10, 2016-17, and 2020-21. Both production and employment growth rates show a sharp decline in 2019-20, possibly due to the global pandemic.

Figure 2 shows the initial value of approximately 0.002936 in 2000-01, labour productivity shows an overall increasing trend. There are fluctuations, but the general direction is upward. There is a notable dip around 2002-03 and 2003-04 where labour productivity falls below 0.0028. From 2010-11 onwards, labour productivity shows a more consistent increase. In recent years by 2023-224, labour productivity reaches 0.0041, the highest value in the dataset. The period from 2016-17 onwards shows steady growth, indicating improvements in productivity per worker. Table 3 presents the CAGR of raw silk production is 3.81%, indicating a moderate annual growth rate over the period analyzed. The CAGR of employment in the silk industry is 2.37%, showing a steady but slower annual growth rate compared to production. The production values have a standard deviation of 7,951.74, indicating significant variability in annual production levels.

Growth Trends: The data shows that while both production and employment in the silk industry have grown over the years, production has grown at a slightly faster rate than employment.

Variability: Raw silk production has exhibited more variability compared to employment, as indicated by the higher coefficient of variation and standard deviation.

Overall Stability: Despite the variability, both production and employment have generally followed an upward trend, contributing to the overall development of the silk industry in India.

Table 4 shows the Pearson correlation coefficient between Production and Employment is **0.976**. Given that this number is quite near to 1, production and employment have a very strong positive linear connection. The p-value (Sig.) for the correlation between Production and Employment is **0.000**. The correlation is statistically significant at the 0.01 level if this value is smaller than 0.01. At this level of significance, the likelihood that the observed link happened by chance is less than 1%.

To investigate the relationship between raw silk production and employment in India

For a study to analyse the hypothesis taken for testing set null and alternative hypotheses, which are the following, and after that use regression analysis

H0: There is no significant relation between the production of raw silk and employment in the sericulture sector in India.

H1: There is a significant relationship between raw silk production and employment in sericulture in India

Regression equation:

Y= 3025445.008+174.381……. (6)

Table 5 shows the coefficient of determination (0.953) means that the model explains 95.3% of the change in the dependent variable (Employment). This value (0.951) adjusts R Square for the number of predictors in the model, providing a more correct measure of model fit. Production: 174.381 indicates that for each additional unit of Production, Employment increases by 174.381 units. Both (Constant) and Production have p-values (.000), indicating that they are statistically significant at conventional levels (e.g., $p < .05$). Therefore, rejected the null hypothesis and can conclude that there exists a significant relationship. This analysis indicates that there is a strong, statistically significant relationship between production and employment.

Conclusion

The compound annual growth rate of employment in the silk industry shows that steady but slower annual growth rate compared to production. The most recent data (2023-24) indicates recovery and growth after a significant decline in 2020-21. The significance level of the correlation between Production and Employment, as showed by the p-value (Sig.) of 0.000, surpasses the threshold of 0.01, thereby suggesting a statistically significant correlation at the 0.01 significance level. Regression analysis shows that both (Constant) and Production exhibit p-values of (.000), suggesting statistical significance at conventional thresholds (e.g., $p < .05$). This examination reveals a robust, statistically meaningful correlation between production and employment.

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