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Analysis of growth and instability of silk production in India

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Abstract

Sericulture is an art of rearing silkworms to produce silk. This agro-based rural industry helps our economy and generates higher income and employment. The secondary time series data for 20 years i.e., 1999-2000 to 2018-19 regarding production export quantity and export value were collected from various issues of Central Silk Board, Bangalore, APEDA and FAOSTAT. The entire 20 years was equally divided into two periods. The collected data were analysed with the help of statistical tools like CGR, CV and Coppock's instability Index. The growth rate of silk production in India was found to be positive and highly significant during the period I, period II and overall period of the study. Instability in silk production was increase overall period. The instability in export quantity and export value of silk was also increase in overall period was positive and are found best fitted based on R^2 and significance of coefficients.

Keywords: CGR, CV, coppock's instability index, R^2

Introduction

India is emerging as a major silk producing country in the world. Among the countries producing silk, India ranks second behind China. Though, way behind in quantum of production, the Indian silk industry has some unique features. India is the largest producer of silk in the tropical belt and it has a big domestic market, which absorbs around 90 per cent of its total production. Indian silk has a long tradition, which is closely interwoven with the social and cultural ethos of the country. India produces four different commercial varieties of silk, viz., mulberry, tasar, eri and muga. Amongst these, mulberry silk accounts for more than 88 per cent of the total production and five traditional states of sericulture, viz., Karnataka, Andhra Pradesh, Tamil Nadu, West Bengal and Jammu & Kashmir account for almost all the production of mulberry silk.

In India the major silk producing states a Karnataka, Andhra Pradesh, Tamil Nadu, West Bengal and Jammu & Kashmir. These five states collectively account for 97% of the total area under mulberry cultivation and 95% of raw silk production in the country. The present global scenario clearly indicates enormous opportunities for the Indian Silk Industry. In 2018-19 the mulberry Silk Production Statistics estimated the world silk production to be 192,692 metric tonnes. China's contribution to world silk production is 80% (158,400 metric tonnes), and the share of Indian silk production is 30,348 metric tons (13%). China and India together account for 93% of world silk production. According to the Annual Report of the Central Silk Board (CSB) for the year 2018-2019 the silk scenario of India Domestic demand 36,000 metric tonnes, Own production 30,348 metric tonnes, Gap in production 6000 metric tonnes, Raw silk imports 3795 metric tonnes, Silk fabric imports 3000 metric tonnes, Silk exports (worth Rs.) 2093.42 cr. Sericulture villages 52,360, Sericulture families 9, 47, 631, Employment (lakh persons) 85.10. The market share of Indian silk exports in the global silk trade is 4% to 5%. Export of silk brings about Rs.15 crores in foreign exchange. (Bukari *et al.*, 2019) [3].

The Indian silk industry is an integral part of the Indian textile industry and is among the oldest industries in India. The silk industry has a distinctive position in India and plays a significant role in Textile Industry and export.

The major silk producing countries in the world are, China, India, Uzbekistan, Brazil, Japan, Republic of Korea, Thailand, Vietnam, DPR Korea, Iran, etc. few other countries are also engaged in the production of Coccons and raw silk in negligible quantities such as Kenya, Botswana, Nigeria, Bulgaria, Turkey, Uganda, Malaysia, Romania, Bolivia, etc.

Regarding the importance of the study, sericulture development in the country has gone through considerable changes in recent years and the sector is considered as an important one in national economy, since it provides substantial employment opportunities for the rural areas. Even though many of the problems are existing in the silk industry they are, the

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prevailing price instability in the cocoon and raw silk markets, lack of quality of silk cocoon, high degree of dependency on import of raw silk for running the domestic processing units is there throughout the year, in order to meet our domestic and international markets. Hence, the terms of trade for silks are not healthy and favourable in India. The import of raw silk in India has increased and the prices of cocoon and raw silk have come down resulting in uprooting of mulberry gardens. In order to promote the production and export of silk, there is need to reorient the policy initiatives for production, export, tax structures and subsidies; a comprehensive study on the silk has become imperative. Therefore, the study is undertaken with the following specific objectives.

Objective of the study

To estimate the growth and instability in production and export quantity of silk in India.

Hypothesis

There is significant stable growth in production and export of silk in India.

Methodology

Nature and sources of data

The study was based on the secondary data. The secondary data on production, export quantity, value of export, domestic price and international price of silk were collected for the years 1999-2000 to 2018-19. Different aspects required for the present study were collected from the various Government publications/websites like Food and Agricultural Organization, Agricultural and Processed Food Products Export Development Authority (APEDA), National Horticulture Board, Government of India, World Bank, India Agristat. Production, export quantity, export value were collected from FAO, and domestic prices were collected from the Central Silk Board (CSB), Agmarket website.

Period of study

The nature of data used for the study was entirely based on secondary source of data. The yearly data on production of silk, export quantity, value of export, domestic and international prices of Silk were compiled for the period of 20 years (1999-2000 to 2018-19). The period has been divided into two periods as below.

Period I: 1999-2000 to 2008-9.

Period II: 2008-09 to 2018-19.

Overall period: 1999-2000 to 2018-19.

Analytical tools and techniques employed

The data was collected from secondary sources subjected to appropriate analytical techniques in order to arrive at a meaningful conclusion. To fulfil the specific objective of the study based on the nature and extent of availability of data, the following analytical tools and techniques were adopted.

Tabular presentation

The data collected were presented in tabular form to facilitate easy comparisons. The data were summarised with the aid of statistical tools like per cent share etc, to obtain the meaningful result.

Growth rates

The objective of the present study is to estimate the growth in production of silk and export of silk in India. The growth in production, export quantity, export value realised from export were analysed by using exponential growth function as given below

$$Y = a.b^t \quad (1)$$

Where,

Y = Depended variable for which growth rate is to be estimate (Production / Export quantity / Export value of silk)

a = Intercept

b = Regression Coefficient

t = Time variable

This equation was estimated after transforming (1) as follows,

$$\text{Log } Y = \text{Log } a + t (\text{Log } b) \quad (2)$$

Then the percent compound growth rate (g) was computed using the relationship.

$$\text{CGR } (r) = (\text{Antilog } (\text{Log } b) - 1) \times 100 \quad (3)$$

Where, r = Compound growth rate

The significance of the regression coefficient was tested using the 't' test.

Instability Index

Instability in export is expected to hamper the process of economic development. This analysis was used to find out the fluctuation in export of Silk during last 20 year as done for growth analysis. To study the export instability, coefficient of variation (CV) and Coppock's Instability Index (CII) were used to estimate the variation in the export of silk.

Coefficient of variation (CV)

To study the degree of instability in production and export of Silk was measured by using Coefficient of variation.

$$\text{Coefficient of Variation (CV)} = \frac{\delta}{\bar{X}} \times 100$$

Where,

δ = Standard deviation

$$\text{S.D.} = \sqrt{\frac{\sum(X - \bar{X})^2}{n}}$$

\bar{X} = Arithmetic mean

X = Variable

n = Number of observation

Coppock's Instability Index (CII)

Coefficient of instability is another measure of instability besides coefficient of variation. The coefficient of variation measures the variation around the trend. Coppock's instability index (CII) is close approximation of the average year to year percentage variation adjusted for trend. The coefficient of instability was worked out by using Coppock's instability index (CII).

Where,

$$V \log = \frac{\sum (\log \frac{x_{t+1}}{x_t} - m)}{N}$$

Where,

X_t = production / export quantity / export value in year t

N = Number of year minus one

m = Arithmetic mean of the difference between the log of X_t and $X_{(t+1)}$, $X_{(t+2)}$ etc.

Vlog = logarithmic variance of the series

$$(CII) = [\text{Antilog} (\sqrt{V \log}) - 1] \times 100$$

Results and Discussion

Table 1: India's share in world export (Value in Rs. Crore)

| Sr. No. | Year | World export | India's Export | India's share in World Export (%) |
|---------|-----------|--------------|----------------|-----------------------------------|
| 1 | 1999-2000 | 45892248.32 | 139751.77 | 0.30 |
| 2 | 2003-04 | 67603155.91 | 293366.74 | 0.43 |
| 3 | 2008-09 | 91873282.86 | 840755.05 | 0.91 |
| 4 | 2013-14 | 139962816.36 | 1905011.08 | 1.36 |
| 5 | 2018-19 | 256585399.08 | 5207726.18 | 2.02 |

(Source: www.worldbank.org)

It can be observed from the Table 1 that, India's export during 1999-2000 was 139751.77 Cr which has been increased to 5207726.18 Cr during 2018-19. In terms of share in world export, India's export was 0.30 per cent in 1999-2000 which

The focus of the study to analyse the production and export status of silk in India. The empirical results of the study are presented as below. Keeping in view of the importance of commodity and the objective of the study, the necessary data collected from different sources were analysed and interpreted. This study deals with general information regarding export, growth and instability of silk. The data were analysed for a period 1999-2000 to 2018-2019.

Keeping the objective in view, the results are presented under the following headings.

India's share in World export

India's share in world export at different points of time was worked out and presented in Table 1.

has risen to 2.02 per cent in 2018-19. This implies that the share of India's export to world's export has been magnified over last 20 years.



Fig 1: India's share in World Export

Share of agricultural export to total export of India

The total exports of agriculture and allied products and also a

share of agricultural export to total export of the country is presented in the Table 2.

Table 2: Share of agricultural export to total export (Value in Rs. Crore)

| Sr. No. | Year | Total Export | Agriculture Export | Percentage share of Agricultural Export to Total Export (%) |
|---------|-----------|--------------|--------------------|---|
| 1. | 1999-2000 | 139751.77 | 25510.64 | 18.25 |
| 2. | 2003-04 | 293366.74 | 36415.48 | 12.41 |
| 3. | 2008-09 | 840755.05 | 81064.52 | 9.64 |
| 4. | 2013-14 | 1905011.08 | 262778.54 | 13.79 |
| 5. | 2018-19 | 5207726.18 | 584571.28 | 11.22 |

Table 2 revealed that, India's total export in 1999-2000 was Rs. 139751.77 crores which is increased to Rs. 5207726.18 crores in 2018-19 by 10.76 times. The agricultural export in 1999-2000 was Rs. 25510.64 crores which is increased to Rs. 584571.28 crores in 2018-19 by 16.51 times. However, per cent share of agricultural export to the total export has decreased from 18.25 per cent in 1999-2000 to 11.22 per cent in 2018-19. This decline in the share was due to faster growth of other sectors like service, Manufacturing etc.

Therefore, it's forgoing results depicted that, the agricultural sector has been playing a key role in the composition of Indian exports. Thus, the Table 2 highlights the surprising fact that, the share of Indian agricultural export has been fluctuating in the recent years. In the era of globalisation, the agricultural exports from India have been facing many internal and external challenges. Its share has declined from 18.25 per cent in 1999-2000 to 9.64 per cent in 2008-09 and increased gradually to 13.79 per cent in 2013-14 and then again declined to 11.22 per cent in 2018-19.

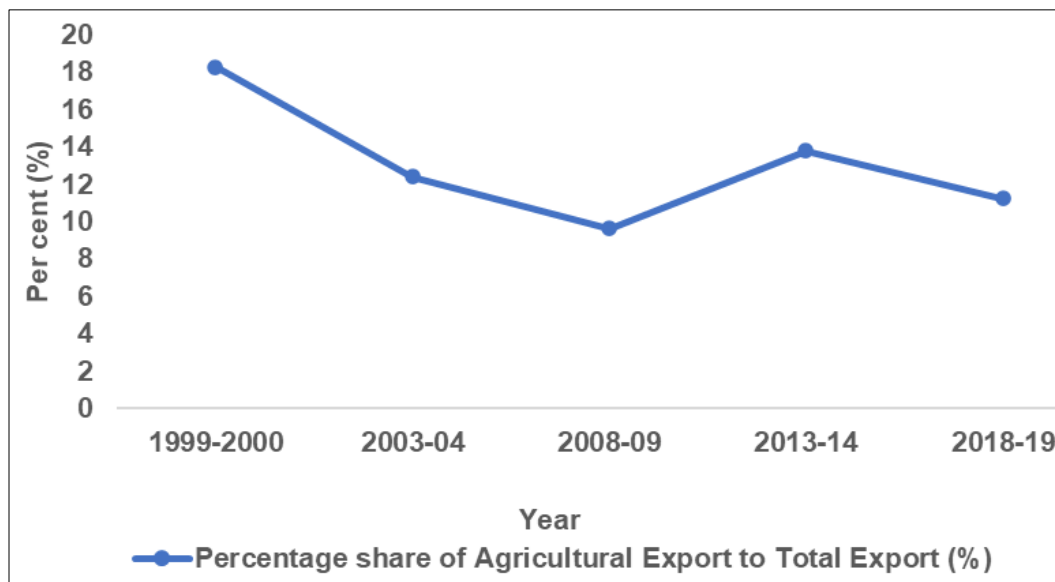


Fig 2: Percentage share of Agricultural Export to Total Export

India's share in world silk export

The world silk export and India's silk export and also a share

of India's silk export to world's silk export is presented in the Table 3.

Table 3: India's share in world silk export (Quantity in tonnes)

| Sr. No. | Year | World Silk Export | India's Silk Export | Percentage share of India's silk export to world silk export (%) |
|---------|-----------|-------------------|---------------------|--|
| 1 | 1999-2000 | 134501.51 | 45 | 0.033 |
| 2 | 2003-04 | 129661.80 | 71 | 0.054 |
| 3 | 2008-09 | 139100.02 | 313 | 0.225 |
| 4 | 2013-14 | 178057.62 | 6 | 0.003 |
| 5 | 2018-19 | 202072.83 | 5 | 0.002 |

(Source: www.fao.org)

It can be observed from the Table 3 that India's silk export during 1999-2000 was 45 tonnes which was decreased to 5 tonnes during 2018-19. In terms of share of India's silk export

to world's silk export was 0.033 per cent in 1999-2000 which is to 0.002 percent in 2018-19.

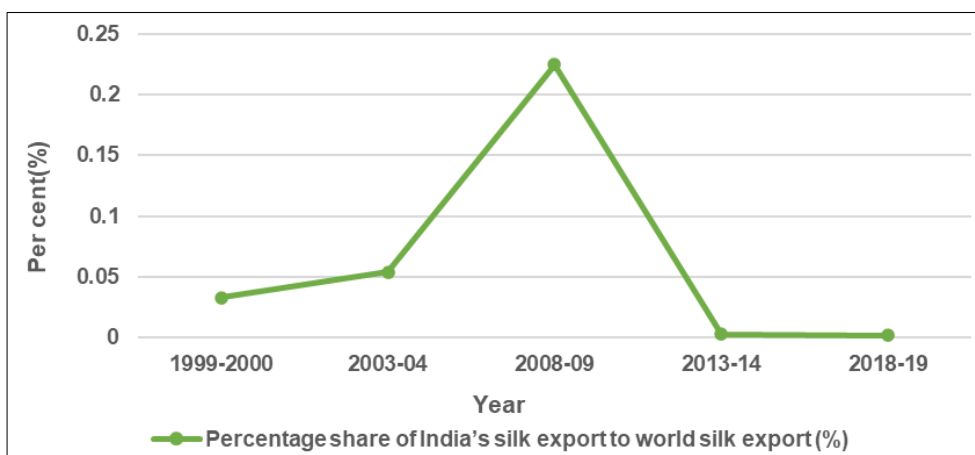


Fig 3: India's share in World Silk Export

Export of silk

The details of quantity of silk exported from India over the

years are presented in Table 4.

Table 4: Per cent share of silk export to silk production in India (Quantity in tonnes)

| Sr. No. | Year | Production | Export | Percent share of silk export to silk production (%) |
|---------|-----------|------------|--------|---|
| 1 | 1999-2000 | 15214 | 45 | 0.295 |
| 2 | 2003-04 | 15742 | 71 | 0.451 |
| 3 | 2008-09 | 18370 | 313 | 1.703 |
| 4 | 2013-14 | 23679 | 6 | 0.025 |
| 5 | 2018-19 | 38500 | 5 | 0.012 |

(Source: www.fao.org)

The table 4 revealed that the production quantity of silk exported over the years increased from 15214 tonnes in 1999-2000 to 38500 tonnes in 2018-19. The decrease in export with increase in production as India is the major producer and

consumer of silk. The export of silk in proportion to production was 0.29 percent in the year 1999-2000 which was decreased to 0.012 percent in the year 2018-19.



Fig 4: Per cent share of silk export to silk production in India

Compound growth rate of Silk**Growth rates in production and export of silk**

The exponential growth function was used for estimation of compound growth rates in production, export quantity and export value of silk. The performance of silk from India with respect to production, export quantity and export value was evaluated by the total study period (1999-2000 to 2018-19) was divided into three periods namely, period I (1999-2000 to

2008-09), Period II (2009-10 to 2018-19) and overall period (1999-2019) and the results are presented in the table 4.5.

The results revealed that there is the positive and significant growth rate of production and export of silk for period I and overall period. There is negative growth rate of export silk for period II and overall period and non-significant growth rate of export quantity, export value for period I.

Table 5: Period-wise Compound growth rates of production of silk

| | Production | Export Quantity | Export Value |
|--|------------|-----------------|--------------|
| Period I (1999-2000 to 2008-09) | | | |
| CGR | 1.986** | 14.125 | 3.862 |
| t value | 4.489 | 1.674 | 0.629 |
| SE | 0.002 | 0.034 | 0.026 |
| R ² | 0.716 | 0.260 | 0.047 |
| Period II (2009-10 to 2018-19) | | | |
| CGR | 6.800** | -20.350** | -19.113** |
| t value | 10.235 | -4.439 | -4.61 |
| SE | 0.003 | 0.222 | 0.020 |
| R ² | 0.929 | 0.711 | 0.727 |
| Overall Period (1999-2000 to 2018-19) | | | |
| CGR | 4.433** | -15.449** | -13.154** |
| t value | 13.275 | -4.487 | -5.830 |
| SE | 0.001 | 0.015 | 0.011 |
| R ² | 0.907 | 0.566 | 0.653 |

Note: ** denotes significant at 1%

The table 5 revealed that, in period I, production, export quantity, export value realized through exports have growth rate 1.986 per cent per annum, 14.125 per cent per annum, 3.862 per cent per annum. The compound growth rate (CGR) for production was found to be statistically significant at one per cent level. Whereas export quantity and export value are non-significant.

In the period II, the production, export quantity and export value of export going significantly at the rate of 6.800 per cent per annum, -20.350 per cent per annum and -19.113 per cent per annum, respectively and all were statistically significant at 1 per cent level.

The overall 20 years growth rate of production of silk in India was highly significant at 4.433 per cent per annum and much higher than the growth rate of export quantity and export value of silk and was at -15.449 per cent per annum and -13.154 per cent per annum, respectively and significant at one per cent level.

The results of the study on the compound growth rate of production during the study periods have shown positive and significant value for production indicating vast potential for the export of silk from India. Hence, the hypothesis i.e., there is significant stable growth in production of silk in India has been accepted here. The results obtained are in close agreements with the finding of Khatun and Deka (2013), they concluded that highest growth rate of production of jute (2.18%) was observed during 1951-60.

Degree of instability of silk

In order to study the extent of fluctuations in production, export quantity and export value during the study period, coefficient of variation and Coppock's instability index were used. Coefficient of variation (CV) measures the variation around the trend. Coppock's instability index (CII) was close approximation of the average year to year percentage adjusts for the trend. Thus, variations around the trends are more pronounce than the absolute variation. These two are worked out and results were presented in Table 6 and Table 7.

Degree of instability in production and export of silk

The coefficient of the variation function used for estimation of degree of Instability in production, export quantity and export value.

In order to study the degree of instability of silk from India with respect to production, export quantity and export value of silk was evaluated by the total study period (1999-2000 to 2018-19) was divided into three periods namely, period I (1999-2000 to 2008-09), period II (2009-10 to 2018-19) and overall period (1999-2000 to 2018-19) and the results of variation in production, export quantity and export value of silk from India during period I, period II and Overall period are presented in the Table 6.

Table 6: Instability index for production, export quantity and export value of Silk

| Particulars | Production | Export Quantity | Export Value |
|--|------------|-----------------|--------------|
| Period I (1999-2000 to 2008-09) | | | |
| Mean | 16944.9 | 111.1 | 149167.6 |
| SD | 1130.06 | 84.507 | 80800.3 |
| CV (%) | 6.66 | 76.06 | 54.16 |
| Period II (2009-10 to 2018-19) | | | |
| Mean | 26659.7 | 15.3 | 28249.2 |
| SD | 5394.29 | 15.69 | 20550.3 |
| CV (%) | 20.23 | 102.5 | 72.74 |
| Overall period (1999-2000 to 2018-19) | | | |
| Mean | 21802.3 | 63.2 | 88708.4 |
| SD | 6227.52 | 77.38 | 84444.2 |
| CV (%) | 28.56 | 122.44 | 95.19 |

Table 6 revealed that, production of silk the highest variation was observed 28.56 per cent in overall period with coefficient of variation at 6.66 per cent in period I and 20.23 per cent in period II.

The export quantity of silk exhibit highest variation of 122.44 per cent in overall period and less variation in period I and period II with coefficient of variation at 76.06 per cent and 102.5 per cent respectively.

As regard the export value of silk, it was found to be high in the overall period of 95.19 per cent and low in the period I 54.16 per cent, in the period II it was 72.74 per cent. The result showed that the coefficient of variation was found to be less in case of production in overall period as compare to export value and export quantity.

It is concluded that the result revealed, the coefficient of variation was found to be more in case of export quantity as compared to production and export value in the all periods. The findings can be correlated with Bhat and Chore (2014), they concluded that, Tassar silk has instability in production and growth rate.

Coppock's Instability Index

Coppock's instability index in production and export of Silk

The Coppock's Instability Index function used for estimation of degree of instability in production, export quantity and export value.

In order to study the degree of instability of silk from India with respect to production, export quantity and export value of silk was evaluated by the total study period (1999-2000 to 2018-19) was divided in to three periods namely, period I (1999-2000 to 2008-09), period II (2009-10 to 2018-19) and overall period (1999-2000 to 2018-19) and the variation in production, export quantity and export value of silk from India during period I, period II and overall period are presented in Table 7.

Table 7: Coppock's Instability Index in production, export quantity and export value of silk

| | Particular | | |
|--|------------|-----------------|--------------|
| | Production | Export quantity | Export Value |
| Period I (1999-2000 to 2008-09) | | | |
| CII | 10.72 | 21.93 | 17.21 |
| Period II (2009-10 to 2018-19) | | | |
| CII | 12.29 | 22.63 | 24.29 |
| Overall Period (1999-2000 to 2018-19) | | | |
| CII | 13.09 | 37.41 | 32.83 |

Note: CII- Coppock's instability index (per cent)

The production of silk the highest variation was observed 13.09 per cent in overall period, with variation at 10.72 per cent in period I and 12.29 per cent in period II.

Table 7 revealed that the export quantity of silk exhibits less variation of 21.93 per cent in period I and highest variation in period II and overall period with variation at 22.63 per cent and 37.41 percent respectively.

As regard the export value of silk it was found to be high in the overall period of 32.83 per cent and low in the period I of 17.21 per cent, in the period II was 24.29 per cent.

It is concluded that the result revealed, the Coppock's instability index was found to be more in case of overall period in export quantity as compared to production and export value in silk. Therefore, the hypothesis framed as 'there is significant stable growth in production and export of silk in India' is proved here.

Conclusions

The following conclusions were emerged from the present study

1. There is increase in agriculture exports but percentage share of agriculture export to total exports was decreasing due to increase in share of manufacturing sectors, service sectors etc.
2. There is decrease in quantity of India's silk export during overall period and percentage share of worlds silk export to India's silk export was decreasing in whole period of study.
3. The growth rate of silk production in India was found to be positive and highly significant during the period I, period II and overall period of the study.
4. The growth rate for export quantity and export quantity and export value of silk export was found negative and highly significant for period II, and overall period and non-significant in period I.
5. As regards the production, export quantity and export value of silk the highest variation was observed 28.56 per cent, 122.44 per cent, 95.19 percent of variation in overall period respectively.
6. Instability in silk production was increase in overall period. The instability in export quantity and export value of silk increase in overall period.

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