Statistical Trend Analysis of Global Production, Export and Imports Scenario of Raw Silk

Mote T. S.[1], Sananse S. L.[2*]

[1]District Superintending Agricultural Officer, Latur, Maharashtra, INDIA.

[2]Professor, Department of Statistics, Dr. B. A. Marathwada University, Aurangabad, Maharashtra, INDIA.

[*]Corresponding Address:

dr_sananse@yahoo.co.in

Research Article

Abstract: In the present study the statistical analysis of present status of global area, production, growth rates of global export and import of raw silk has been studied. For the present study to estimate the growth rates and other statistics, all India and country wise global secondary data of area, production and productivity of raw silk, export and import data at global level has been obtained from official sources. The statistical analysis of data indicated that the production of raw silk of China is with nearly 80% of the total production of raw silk in the world. The India stands second and its contribution is 14.91 per cent of the total production of raw silk. Among the Asian countries, China and India are larger silk producer countries. Further, it is observed from the analysis that there is increase in export earnings to India from year 1998-99 to year 2006-07 and thereafter there is decreasing trend in export earnings of raw silk goods. From C.V.(%) it is observed that there is some variation in export earnings of silk goods in India. The growth rate analysis revealed that during 1997-98 to 2011-12, the growth rate of total silk production of China and India was increased significantly by 6.90% and 2.60% respectively. During the same period the growth rate of total silk production of Japan, Brazil, Korea significantly decreased by 26.00%, 7.20% and 2.10% respectively. The growth rate of import of raw silk by our country increased significantly by 5.50 percent whereas the value paid for import significantly increased by 9.50 percent at current rates.

Key Words: Statistical Analysis, Raw Silk, Global Area, Production, Export, Import.

Introduction

Silk productivity in India between 1960 and 1970 was very low and ranged from 14 to 20 kg per hectare, however, significant increase in productivity was observed in the eighties and nineties and it reached to 87.84 kg/ha during 2007-08. Also, there is great scope to increase the silk productivity. India requires additional silk to meet its national and international demand and to meet this requirement we have to import from China. It is estimated that against the demand of around 26,000 tones per year, domestic production is around 17,300 tones. The gap is of nearly 9,500 tones (Nadagoudar *et al*., 2006). The current production of silk in the country cannot cater the demand for silk in the country. Hence India had to import raw silk. The growth rate of silk production in India has been at around 8 per cent while the demand for silk has been growing at approximately 10 per cent per annum. Global raw silk production grew at an annual rate of 13.60 per cent per annum since 2000 (Anonymous, 2007c). It means, the national and international demand of silk is growing very fastly. Therefore there is great scope to increase our silk production to earn foreign exchange. Around 53,000 villages of India are involved in growing silk cocoons by bringing approximately 185 thousand hectares under silkworm food cultivation. India has about 30 per cent more arable land than China and mulberry plantations presently constitute less than 1 per cent of the area cultivated. If increased even by 0.25 per cent the present supply-demand gap of silk in India would be bridged (Sathiyavathy *et al*., 2008). Though attempts were made to introduce sericulture in many states in a big way through different projects, sericulture production is still limited to the traditional silk producing states. Even in traditional states, sericulture is concentrated only in a few pockets. Therefore more efforts should be made to popularize this activity in nontraditional states. But traditional states like Karnataka and Andhra Pradesh, mulberry acreages is decreasing due to continuous water shortage. Hence vertical expansion through productivity increase by using advanced technology and skilled man power is the only option. In fact, emergence of new sericulture technology has not only reduced production risks (drudgery) but also increased the potential cocoon yield/unit area, relative to the traditional technology (Datta, 2008).

Research Methodology

Research Methodology of this study is presented in the following sub heads:

Collection of Data

Sericulture has achieved phenomenal success in India during the last three and half decades. For the present study to estimate the growth rates and other statistics, all India and country wise global data of area, production and productivity, of raw silk has been obtained from official sources listed below.. Further, the export and import data at global level are obtained from various official sources given below. Textile ministry website (http://www.texin.nic.in), Isc website update as on July

2012 (http://www.inserco.org/newsite), Central Silk Board, Directorate General of Commercial Intelligence and Statistics, Kolkata.

Statistical Analysis and Interpretation of Data

Analysis of data is to be made with reference to the purpose of the study and its objectives also the possible bearing on scientific discovery. For this purpose the following statistical methods have been applied;

a) Frequency.
b) Measures of Central tendencies.
c) Measures of Dispersion
d) Growth rate Analysis.
e) Graphical Representation.

The measures of central tendencies and dispersion like Arithmetic Mean, Standard Deviation, Coefficient of Variation, Skewness and Kurtosis were estimated using the SPSS 19.0 Version software. Further the simple and compound growth rates were also estimated using the estimated SPSS 19.0 Version software. The theory of the same is described below.

Simple Growth Rate (SGR)

Simple growth rates were estimated by following linear equation –

$$Y = a + b X$$

where Y is the output and X is the period in years

$$b = \frac{\sum XY - \frac{1}{N}\sum X \sum Y}{\sum X^2 - \frac{(\sum X)^2}{N}}$$

$$a = \overline{Y} - b\,\overline{X}$$

The value 'b' of linear equation gives change in values of dependent variable (Y) for unit increase in the values of independent variable and the 'a' gives the constant value of Y for X = 0.

Compound growth rate (CGR)

The CGR was calculated as below -

The curve of the type $Y = a\,b^x$ is the form of exponential growth curve.

$$Y = a\,b^x \quad (1)$$

Taking logarithms of equation (1) both sides we get

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

Let V = Log Y, A = Log a B = Log b, then (2) can be written as

$$V = A + B X \quad (3)$$

The equation (3) is linear equation. The exponential curves can be converted to linear form and the normal equations for estimating A and B are

$$\sum V = n A + B \sum X$$
$$\sum XV = A\sum X + B \sum X^2$$

Solving above equations, the values of A and B can be estimated and then the values of a and b of equation (1) can be estimated to fit the equations (1) by:

a = antilog (A) and b = antilog (B)

The values of A and B can also be estimated by using the formula of regression coefficient as equation 3 is a linear regression equation. Thus the value of B is given by:

$$B = \frac{\sum XV - 1/n \sum X \sum V}{\sum X^2 - \frac{(\sum X)^2}{N}}$$

$$\text{Log } B = \frac{\sum XY - \frac{1}{N}\sum X \sum Y}{\sum X^2 - \frac{(\sum X)^2}{N}}$$

Where V = Log Y, A = Log a B = Log b, the value of b can be estimated as

b = Anti Log (B)

Similarly Log A = $\overline{V} - B\,\overline{X}$, the value of a can be estimated as

a = Anti log (A)

The form of above equation can be used to estimate the compound growth rate of the time series data i.e. per cent growth rate. Compound growth rate (r) = [(b) -1] x 100

Results and Discussion

The information pertaining to this study was collected from the various sources as described in research methodology and the data was analyzed using SPSS 19.0 statistical software's. The results of the study are presented in the following sections.

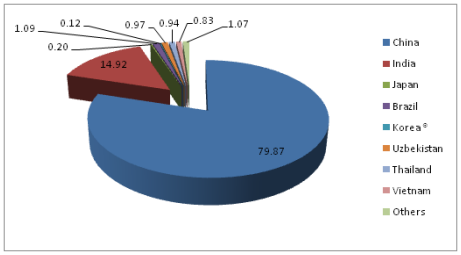
Country wise Production of Raw Silk.

The country wise global production of raw silk were collected from various reliable sources. The data were analyzed and given in Table 1. Referring to Table 1 below on the production, it is clear that production of raw silk of China is with nearly 80% of the total production of raw silk in the world. This clearly indicates that the China is the world's leading producer of raw silk. The India stands second and its contribution is 14.91 per cent of the total production of raw silk. Among the Asian countries, China and India are larger silk producer countries.

Table 1: Countrywide production of raw silk (1997-98to 2011-12)

Sr. No.	Country	Total Raw Silk Production in Various Countries	% Production to Total
1	China	948015	79.86
2	India	177034	14.91
3	Japan	2425	0.20
4	Brazil	12921	1.08
5	Korea ®	1481	0.12
6	Uzbekistan	11483	0.96
7	Thailand	11155	0.93
8	Vietnam	9795	0.82
9	Others	12642	1.065

It is clear from graph China ranks first in production of raw silk and India get second rank in production of raw silk.



Variability in Countrywide raw silk production.

The variability in production of raw silk in world China and India are large producer countries of raw silk but there is variation in production. The Coefficient of variation (C.V. %) is 24.08 and 9.11. It can be observed from the table that during the period of production of raw silk Korea is more consistent in world because it's Coefficient of variation (C.V. %) is 6.85 which is smaller than other countries. India ranks second in production of raw silk in all over world and it is more consistent producer of raw silk than China.

Table 2: Variability in Countrywide raw silk production (1997-98to 2011-12)

Sr. No.	Countries	Arithmetic Mean (AM)	Standard Deviation(SD)	C.V %	Skewness	Kurtosis
1	China	94801.50	22831.76	24.08	-0.30	-0.91
2	India	17703.40	1613.73	9.11	0.34	-1.05
3	Japan	242.50	172.62	71.18	0.66	-0.82
4	Brazil	1292.10	297.95	23.05	-0.97	-0.26
5	Korea	148.10	10.15	6.85	-0.13	-0.70
6	Uzbekistan	1148.30	484.50	42.19	2.54	7.11
7	Thailand	1115.50	352.84	31.63	-0.09	-1.78
8	Veitnam	979.50	606.70	61.94	1.71	1.37
9	Others	1264.20	1115.72	88.25	1.30	2.24
	Total	**118695**	**22295.00**	**18.78**	**-0.23**	**-0.74**

Year wise Imports of Raw Silk in India (1997-98to 2011-12)

The Import of raw silk of India is higher in year 2003-2004 and it clearly seen that import of raw silk is fluctuate from that year and it is about 5683 tones in year 2011-12. It is also conclude that from C. V. (%) there is variation in import of raw silk in India.

Table 3: Year wise Imports of Raw Silk in India

	Mean	Std. Deviation	Skewness	Kurtosis	C.V.(%)
Quantity	6435.4000	2212.63811	-0.65	-0.37	34.38
Price	662.4320	251.49852	-0.15	-0.33	37.96

Year wise Exports earnings of Silk goods in India (1997-98to 2011-12)

From graph, it is clearly seen that there is increase in export earnings to India From year 1998-99 to year 2006-07 and after that there is quite decrease in export earnings of raw silk goods to India from other countries. From C.V. (%) it is observed that there is some variation in export earnings of silk goods in India.

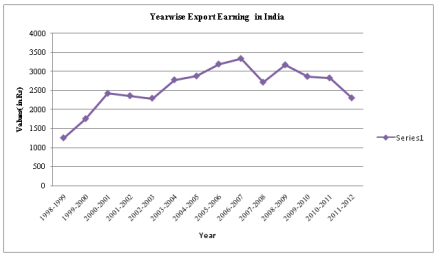
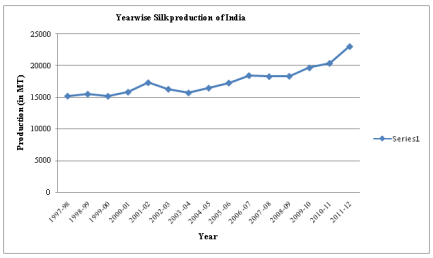


Table 4: Year wise export earnings to India from various silk goods (1997-98to 2011-12)

	Mean	Std. Deviation	Skewness	Kurtosis	C.V. (%)
Value (Crores)	2582.8836	573.42047	-0.978	0.96	22.20
Value (Millions)	571.7279	127.94648	-0.682	-0.067	22.37

Area (Ha.) Under Mulberry and Raw Silk Production in India (1997-98to 2011-12):

The total Raw silk production of India is continuously increased from year 1997-98 to 2011-12. The area under mulberry (ha.) is decreased but total cocoon production is increased.



Present status of Area under mulberry and total cocoon production in India (1997-98to 2011-12):

It can be revealed from the Table 5 that, during 1997-98 to 2011-12, on an average, there was 203200.53 ha area under mulberry and 128626.33 MT total cocoon production in India. It is seen that from table 5, on an average, there was 17559.53 tones' total production of raw silk in India. During the same period, the coefficient of variation of mulberry area was 17.29 per cent and for total cocoon production, it was of 4.98 per cent. It shows there is year to year variation due to variability of data. As there is variation in data no normality has been observed as indicated by values of skewness and kurtosis. Therefore, there is considerable scope to increase acreages under sericulture for economic stability.

Table 5: Present status of Area under mulberry and total cocoon production in India (1997-98to 2011-12)

Sr. No.	Area	Mean	Std. Deviation	Skewness	Kurtosis	C.V.(%)
1	Area Mulberry (ha.)	203200.53	35150.55	1.34	0.81	17.29
2	Mulberry Silkworm Cocoon Production (MT)	128626.33	6412.53	0.29	-0.21	4.98
3	Total Raw Silk Production (MT)	17559.53	2218.86	1.16	1.23	12.63
4	Productivity Of Mulberry Cocoon (MT)	645.74	104.96	-0.98	0.27	16.25
5	Productivity Of Mulberry Raw silk (MT)	76.81	13.94	-0.83	-0.63	18.14

Simple and compound growth rate of Production of silk over world:

It can be seen from the Table 6 that, during 1997-98 to 2011-12, the growth rate of total silk production of China and India is increased by 6.90% and 2.60% respectively which is statistically significant at 1% level of significance. The growth rate of total silk production of Japan, Brazil, Korea is decreased by 26.00%, 7.20% and 2.10% respectively.

Table 6: Simple and compound growth rate of Production of silk over world (1997-98to 2011-12)

Sr. No.	Name of Country	Simple Growth Rate	Compound Growth Rate
1	China	5910.29** (1655.91)	6.90** (0.01)
2	India	468.57** (89.81)	2.60** (0.01)
3	Japan	-55.01* (5.29)	-26.00* (0.01)
4	Brazil	-82.38* (19.03)	-7.20* (0.01)
5	Korea	-3.14** (0.41)	-2.10** (0.00)
6	Uzbekistan	39.92** (54.78)	1.00* (0.03)
7	Thailand	-80.55* (29.91)	-7.90* (0.02)
8	Veitnam	-121.60* (56.31)	-11.00* (0.04)
9	Others	-289.90* (80.43)	-39.50* (0.08)

*Statistically significant at 5% level of significance, **Statistically significant at 1% level of significance
(Values in parentheses are Standard errors)

Growth Rates of Year wise Imports of Raw Silk in India (1997-98to 2011-12)

To know the growth in import of quantity of raw silk and value paid for the period 1997-98 to 2011-12, the simple and compound growth rates were estimated using linear and exponential growth curves. This analysis is presented in Table7. It can be seen from the Table 7 that our country imported the raw silk on an average at the rate of increase was 237MT per year and it is statistically significant at 5 per cent level of probability.

Table 7: Growth Rates of Year wise Imports of Raw Silk in India (1997-98to 2011-12)

Sr. No.	Area	Simple Growth Rate	Compound Growth Rate (%)
1	Raw Silk Quantity	237.29 (120.44)	5.50* (0.023)
2	Value Crores	53.96 (4.38)	9.50* (0.01)

*Statistically significant at 5% level of significance, ** statistically significant at 1% level of significance
(Values in parentheses are Standard errors)

Simple and Compound Growth Rates (%) of area under Mulberry and Raw Silk production in India (1997-98to 2011-12:

It is revealed from the Table 8 that, on an average rate of total raw silk production of India was 447.06 MT per year and it is statistically significant at 1 percent level of significance. The compound growth rate indicated that, raw silk production is increased significantly by 2.50 per cent. Simple growth rate for raw silk productivity was2.93 and which is significant. In terms of percentage, it significantly increased by 4.10 per cent. Also, Area under Mulberry (Ha) is decreased per year by 6528.77.

Table 8: Simple and Compound Growth Rates (%) of area under Mulberry and Raw Silk production in India (1997-98to 2011-12)

Sr. No.	Area	Simple Growth rate	Compound Growth Rate (%)
1	Area Mulberry (ha.)	-6528.77 (1213.80)	3.00** (0.005)
2	Mulberry Silkworm Cocoon Production(MT)	530.31 (369.49)	0.40* (0.003)
3	Total Raw Silk Production(MT)	447.06 (59.67)	2.50** (0.003)
4	Productivity Of Mulberry Cocoon(MT)	21.88 (2.34)	3.60** (0.005)
5	Productivity Of Mulberry Raw silk(MT)	2.93 (0.29)	4.10** (0.005)

* Statistically significant at 5% level of significance, ** statistically significant at 1% level of significance
(Values in parentheses are Standard errors)

Reference

1. Anonymous (2005) Report, *Central Silk Board, Bangalore. www:cssiwb.org*
2. Anonymous (2007d) Directorate General of Commercial Intelligence and Statistics, Kalkatta.
3. Anonymous (2007a) Sericulture Industry. www.texmin.nic.in Anonymous (2007b) Sericulture Industry and its Potential in India,*www.krishiworld.com*
4. Anonymous (2007c) Silk: Testing Times. *DHL India Trade Outlook August 2007 with knowledge inputs from Dun and Bradstreet India.*
5. Anonymous (2008) Directorate General of Commercial Intelligence and Statistics, Kalkatta.
6. Anonymous (2008) Report, *Central Silk Board, Bangalore. www:cssiwb.org*
7. Anonymous (2008) Annual Research Report (2006-07), 23 April 2000, Marathwada Agriculture University, Parbhani, M.S.
8. Babulal, Datta, R.K. (2008) Indian Sericulture-Today, Tomorrow and Day-after. *The Research Paper presented in National Conference on Vanya Silk, pp. 114-119.* Nadagoudar, B.S., Manjunath, L. and Dolli, S.S. (2006) Problems and prospects of sericulture in non- traditional areas of north Karnataka, In- *Lead paper and abstract of National Seminar on Extension Management, Central Sericulture Research and Training Institute, Mysore, India, 24-25 february,2006.*
9. Sathiyavathy, M., Bhupendra Singh, and Reddy, K.S.S. (2008) Strengthening Rural Base to Expand Global Reach-Sericulture in India. *Indian Silk, December, pp.8-12.*