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RESEARCH PAPER

Temporal variations in arrivals and prices of silk cocoons in selected markets of Karnataka

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Abstract: The present study was conducted to study the temporal variations in arrivals and prices of silk cocoons in selected markets of Karnataka which was based on the secondary data from 2009-10 to 2018-19. Shidlaghatta, Chinthamani, Kolar and Srinivaspura markets for the silk cocoons were selected for the study and trends in arrivals and prices and also seasonal variations was done. The data was collected from government cocoon markets. The results revealed that the arrivals and prices were more in Shidlaghatta, Chinthamani and Kolar markets because these markets were having more competition among the reelers as compared to other markets and reeling industry was very much evolved compared to other markets. Whereas of the prices in the Shidlaghatta and Kolar markets were less fluctuating compared to Chinthamani and Srinivaspura markets, as that markets were more efficient and maintained consistency over the given trend.

Key words: Cyclical variation, Mulberry, Silk cocoons, Trend analysis

Introduction

The art and science of breeding silkworms for the production of cocoons and silk is known as sericulture. Silk has been known as the "Queen of Textiles" for centuries and no other natural fibre can compare to its shine and elegance with unsurpassed grandeur, natural sheen and intrinsic affinity for colours, great absorbency, light weight, soft touch and excellent durability.

The production of raw silk and silk fabrics are limited to only few countries in the world. China occupies the first place with the production of 53,359 metric tonnes (58.07%) and India holds second position with the production of 33,770 metric tonnes (36.75%), other countries such as Uzbekistan 2,037 metric tonnes (2.21%), Vietnam 795 metric tonnes (0.86%), Thailand 700 metric tonnes (0.76%), Brazil 480 metric tonnes (0.52%), North Korea 370 metric tonnes (0.40%), Iran 270 metric tonnes (0.29%) and Bangladesh, Turkey, Japan, Bulgaria, Madagascar, Indonesia, Philippines, Tunisia, Egypt, South Korea, Syria (0.10%) also contribute to global silk production. The total area under mulberry plantation in India was increasing over a year in 2019-20, total area of mulberry was accounted for 2,35,001.00 hectares and total mulberry silk cocoon production in India was estimated to be 1,85,143.00 metric tonnes. Mulberry silk cocoon was divided into bivoltine cocoons and cross breed cocoons which was measured to the tune of 46,295.00 metric tonnes and 1,38,848.00 metric tonnes, respectively (Anon., 2020).

Sericulture has been practiced in Karnataka for around 250 years. It was created by King Tippu Sultan, who required high-value, low-volume goods in exchange for guns and ammunition in Europe. The monarchs who succeeded him in Mysore continued to support this enterprise with royal patronage. Because of the favorable environment, governmental assistance and planning, plus the farmer's traditional expertise, Karnataka now ranks first in sericulture. Because sericulture is a state issue, the government of Karnataka developed extensive programmes, such as the Karnataka sericulture project with World Bank funding to promote the state's sericulture sector. The goal was to grow the industry's manufacturing base while also providing a solid infrastructure. The total area under mulberry plantation in Karnataka during 2019-20, was accounted for 1,05,076.00 hectares of which Chikkaballapur has the highest area 20,666.00 hectares (19.00%) followed by Kolar (18.66%), Ramanagara (18.05%), Mandya (15.66%) and Bengaluru rural district (6.69%) etc., Total mulberry silk cocoon production was formed 79,008.81 metric tonnes, of which highest share was accounted for by Mandya district 21,213.51 metric tonnes (26.84%), followed by Ramanagara shared to 19,492.61 metric tonnes (24.67%), Chikkaballapur was the third-largest producer of mulberry silk cocoon in Karnataka which showed to 12,269.41 metric tonnes (15.52%) and Kolar (12.73%) and so on (Anon., 2020a).

Material and methods

This study was purely based on secondary data regarding to monthly market arrivals and average prices of silk cocoons in selected markets of Karnataka. Major markets were chosen on the basis of quantity of arrivals. Shidlaghatta, Chinthamani, Kolar and Srinivaspura markets for the silk cocoons were selected. The monthly market arrivals and prices information of silk cocoons were directly collected from government cocoon markets for the period from 2008-09 to 2019-20. The study was underraken during 2020 at the Department of Agribusiness Management, UAS, Dharwad, Karnataka.

Trend analysis

Pattern of market arrivals and prices of silk cocoons in the selected markets was computed in the present study for a period of 10 years from 2009-10to 2018-19. Time series analysis was employed for studying the periodic fluctuations in arrivals and prices of silk cocoons in the selected markets.

Time series analysis was used to study the variation in monthly prices of silk cocoons in chronological order. Time series is a mixture of four components namely Trend (T_t), Cyclical variation (C_t), Seasonal variation (S_t) and Irregular variation (I_t). These four types of movements are frequently found either separately or in combination in a time series. The relationship among these components is assumed to be additive or multiplicative, but the multiplicative model is the most commonly used method in economic analysis, which can be represented as,

$P_t = T_t \times C_t \times S_t \times I_t$

Where,

P_t= Price in time 't'

T_t=Trend component

C_t = Cyclical element

S_t = Seasonal Variation

I_t = Irregular fluctuation

These variations where computed by following procedure in a systematic way

Seasonal variation

$$\text{Seasonal indices} = \frac{\text{Monthly average}}{\text{Average of all monthly averages}} \times 100$$

Trend equation

Trend equations were computed by running the regression between yearly average price 'Y' and time period 't'. There by fitted equations were as follow.

Regression equation, $Y = a + b^t + e$

Where,

Y= Yearly average price

a = Slope coefficient

B=Regression coefficient

t = Time period in years (T=1, 2....19)

e = Error term.

With the help of this trend equation estimated 'Y' values for yearly average prices were found out. These estimated values from regression equation were used to fit trend line

D-trend: is ratio of observed yearly average price to estimated yearly average price.

$$\text{D-trend} = \frac{\text{Actual yearly average price}}{\text{Estimated yearly average price}} \times 100$$

Moving average: Tri-period moving average of D-trend were computed for further computation of cyclical indices

Cyclical indices

Cyclical indices were computed by the ratio of moving averages to average of moving average multiplied by hundred

$$\text{Cyclical index} = \frac{\text{Moving average}}{\text{Average of moving average}} \times 100$$

Irregular variation

Irregular variation was computed by taking the difference between total variation and sum of estimated 'Y' and cyclical variation

$$\text{Irregular variation} = \frac{P_t}{T_t \times C_t \times S_t \times I_t}$$

Where,

P_t= Price in time 't'

T_t= Trend component

C_t= Cyclical element

S_t=Seasonal variation

I_t = Irregular fluctuation

Results and discussion

Trend values in arrivals and prices of silk cocoons in selected markets

The results revealed in the Table 1 depict the trend in arrivals of silk cocoons in major markets like Shidlaghatta, Chinthamani, Kolar and Srinivaspura from Chikkaballapur and Kolar districts. It could be seen from the table there was a positive and significant trend over the years which indicated that arrivals of these markets were increasing over the years. The R^2 value of Chinthamani market which was having highest variation with 0.80 which indicated 80 per cent of variation in arrivals was observed over the years. But in case of Shidlaghatta and Chinthamani markets receives more arrivals because competition among the reelers are more compared to other markets and reeling industry was very much evolved in Shidlaghatta and Chinthamani market. Whereas Kolar and Srinivasapur markets

Table 1.Trend values in arrivals and prices of silk cocoons in selected markets (Metric tonnes)

Particulars	Arrivals			Prices		
Market	Equation	R^2	F value	Equation	R^2	F value
Shidlaghatta	Y =1199.76+12.96*t	0.59	1.30	Y=320.38+3.33*t	0.65	0.86
Chinthamani	Y= 938.25+42.59*t	0.80	42.15	Y=105.10+26.88*t	0.93	140.93
Kolar	Y=11.21+1.52*t	0.49	3.39	Y=374.63+0.49*t	0.55	0.26
Srinivasapur	Y= 18.51+3.24*t	0.63	17.59	Y=143.18+19.15*t	0.77	34.54

receives less arrivals because less competition among the reelers and Srinivasapur market was smallest market compared to other three markets. The similar findings were observed by Bharathi (2009).

The results revealed in the Table 1 depict the trend in prices of silk cocoons in major markets like Shidlaghatta, Chinthamani, Kolar and Srinivaspura from Chikkaballapur and Kolar districts. It could be seen from the table there was a positive and significant trend over the years which indicated that prices of these markets were increasing over the years. The R^2 value of Chinthamani market which was having highest variation with 0.93 which indicated 93 per cent of variation in prices was observed over the years and followed by Srinivaspura market with R^2 value of 0.77. Among four markets Shidlaghatta and Kolar markets were less fluctuating compared to Chinthamani and Srinivaspura markets, as those markets were more efficient and maintained consistency over the given trend. Annual average prices from day to day and farmer to farmer also varies, because prices mainly depended on the quality, texture and colour or luster of the cocoons. Similar findings were reported in by Devi *et al.* (2016).

Cyclical variations in arrivals and prices of silk cocoons in the selected markets

The results revealed in the Table 2 depict the cyclical variations in arrivals and in prices of silk cocoons in major markets like Shidlaghatta, Chinthamani, Kolar and Srinivaspura from Chikkaballapur and Kolar districts and it were calculated by using moving average method. From the Table 2 it represents that highest variation in arrivals was observed during 2018-19 with 108.11 per cent and the lowest during 2015-16 in Shidlaghatta market, whereas in Chinthamani market the highest variation was observed during the year 2015-16 with 124.06 per cent and the lowest variation was observed during 2018-19. But in case of Kolar market the highest variations in arrivals was observed during 2011-12 with 104.75 per cent and lowest during 2017-18. Whereas in Srinivasapur market the highest variation was observed during the year 2009-10 with 117.68 per cent and the lowest variation was observed during 2018-19.The highest variations were due to more cocoon production, hence the more arrivals came to the markets and least variations were because of less production of cocoons in that particular year. The production was least which was due to the less rainfall or

Table 2. Cyclical variations in arrivals of silk cocoons in the selected markets (Per cent)

Year	Shidlaghatta	Chinthamani	Kolar	Srinivasapur
2009-10	96.64	88.25	95.81	117.68
2010-11	103.33	85.99	102.26	102.41
2011-12	102.59	89.38	104.75	87.45
2012-13	104.72	93.96	102.40	94.73
2013-14	95.31	117.83	102.98	109.21
2014-15	92.07	122.37	99.48	105.31
2015-16	91.24	124.06	102.65	103.87
2016-17	102.76	103.29	97.51	100.67
2017-18	103.18	93.53	95.68	92.72
2018-19	108.11	81.30	96.45	85.92

Table 3. Cyclical variations in prices of silkcocoons in selected markets (Per cent)

Year	Shidlaghatta	Chinthamani	Kolar	Srinivasapur
2009-10	102.97	96.21	98.97	100.84
2010-11	97.46	98.31	98.21	106.56
2011-12	92.79	100.43	98.68	103.44
2012-13	93.65	99.20	98.60	100.80
2013-14	99.49	94.78	102.23	92.64
2014-15	110.80	99.44	102.59	97.08
2015-16	111.77	105.94	103.36	100.58
2016-17	104.50	107.68	99.71	97.84
2017-18	92.28	100.10	99.63	95.45
2018-19	94.23	97.88	97.95	104.72

due to variations in the climatic conditions etc. The results were in line with the study of Mahesh (2018).

From the Table 3 it represents that highest variation with respect to prices was observed during 2015-16 with 111.77 per cent and lowest variation was observed during 2017-18 in Shidlaghatta market. Whereas Chinthamani market the highest variation was observed during the year 2016-17 with 107.68 per cent and the lowest variation was observed during the year 2013-14 with respect to prices of silk cocoons. But in case of Kolar market the highest variation with respect to prices was observed 103.36 per cent and the lowest were observed 97.95 per cent. Where as in Srinivasapur market the highest variation with respect to prices was observed 106.56 per cent and the lowest was observed 92.64 per cent. As we observed from the table price fall with the arrivals was increasing demand for cocoons during that particular years leading to more fluctuation in prices of cocoons. The results were in line with the study of Divya (2015).

Seasonal indices of arrivals and prices of silk cocoons in selected market

The results revealed in the Table 4 depict the seasonal variations of arrivals and prices of silk cocoons in major markets like Shidlaghatta, Chinthamani, Kolar and Srinivaspura from Chikkaballapur and Kolar districts and it was calculated by using 10 years moving average method and also monthly arrivals and prices of silk cocoons in the selected to calculate the seasonal indices. From the Table it represents that, seasonality in silk cocoon arrivals and prices were observed in all the selected markets. Arrivals were more during the July month in Shidlaghatta market, where as in Chinthamani market arrivals were more during the March month. In Kolar market the arrivals were more during the July month and in case of Srinivasapur market the arrivals were more during the May month. In the month of May and June heavy rainfall, which lead to production of good quality mulberry leaves increase of the good quality cocoons. Hence, the arrivals were more during those months. The least arrivals during the winter season this was due to less production of cocoons. Similar results were reported by Meera and Sharma (2016). From the table it represents that seasonal index for prices in Shidlaghatta market was highest during November month, whereas in Chinthamani market and Kolar market the seasonal index for prices was highest during April month. In Srinivasapur market the seasonal

Table 4.Seasonal indices of arrivals and prices of silk cocoons in selected markets (Per cent)

Months	Chikkaballapura district				Kolar district			
	Shidlaghatta		Chinthamani		Kolar		Srinivasapur	
	Arrivals	Prices	Arrivals	Prices	Arrivals	Prices	Arrivals	Prices
January	103.39	104.70	159.02	91.70	86.63	97.90	89.99	103.18
February	109.67	107.11	171.98	90.63	96.30	97.28	84.92	102.90
March	101.13	100.85	189.06	91.97	114.60	104.82	110.50	112.40
April	82.15	104.48	11.60	108.95	85.85	106.98	94.28	107.42
May	104.92	99.63	26.64	107.40	99.90	97.48	121.33	99.73
June	92.48	100.56	41.03	104.90	104.74	102.77	118.60	96.09
July	121.54	90.55	60.52	102.01	115.75	95.94	107.97	88.09
August	101.74	95.59	75.51	101.44	102.49	105.13	79.79	97.58
September	90.48	104.60	90.16	101.14	101.22	104.98	117.42	100.66
October	100.28	83.09	108.36	99.74	106.07	94.88	99.83	94.59
November	106.10	107.70	126.88	99.95	104.23	96.38	80.27	93.69
December	86.06	101.07	139.18	100.10	86.63	95.41	95.04	103.62

Table 5. Irregular variations in arrivals of silk cocoons in selected markets (Per cent)

Year	Shidlaghatta	Chinthamani	Kolar	Srinivasapur
2009-10	98.95	93.45	97.57	69.35
2010-11	105.96	88.14	105.30	111.31
2011-12	87.04	100.86	89.24	109.43
2012-13	109.73	89.05	96.77	79.08
2013-14	91.69	104.76	114.51	93.91
2014-15	103.02	73.47	83.49	82.13
2015-16	106.57	103.13	107.93	97.29
2016-17	101.31	87.52	97.88	90.29
2017-18	83.02	94.72	92.48	78.88
2018-19	124.45	91.92	107.78	107.08

Table 6. Irregular variations in prices of silk cocoons in selected markets (Per cent)

Year	Shidlaghatta	Chinthamani	Kolar	Srinivasapur
2009-10	89.86	96.18	100.19	93.89
2010-11	103.66	106.64	98.44	116.56
2011-12	105.98	98.07	101.75	88.93
2012-13	93.29	93.25	98.40	102.68
2013-14	102.96	107.08	102.70	110.78
2014-15	105.21	111.54	95.09	105.33
2015-16	82.95	88.03	102.04	90.36
2016-17	104.92	99.72	97.90	104.14
2017-18	110.92	106.07	102.81	113.50
2018-19	96.52	100.24	96.93	100.47

index for prices was highest during March month. The prices were increased during April, November and March months because during those months arrivals of cocoons were less, demand was more for cocoons. So prices for cocoons automatically increased. Similar results were observed by Sharma *et al.* (2015).

Irregular variations in arrivals and prices of silk cocoons in selected markets

The result revealed in the Table 5 and 6 depict the irregular variations in arrivals and in prices of silk cocoons in major markets like Shidlaghatta, Chinthamani, Kolar and Srinivaspura from Chikkaballapur and Kolar districts and it was calculated by using moving average method. From the table 6 it represents that the irregular variation with respect to arrivals were highest during 2018-19 and lowest variation was observed during the year 2017-18 in Shidlaghatta market, whereas in Chinthamani market the highest variation was observed during 2013-14 and the lowest was observed during the year 2014-15. In Kolar market the highest variation was observed during the year 2013-14 and the lowest was during 2014-15, whereas in Srinivasapur market the highest variation was observed during 2010-11 and the lowest was observed during the year 2009-10. The highest variations were due to increasing cocoon production, hence the more arrivals came to the markets and least variations are because of less production of cocoons in that particular year. The production was least which was due to the less rainfall and due to variations in the climatic conditions *etc.* These findings were in conformity with the study Ramesh (2011).

From the Table 6 it represents that the irregular variation with respect to prices of silk cocoons was highest during 2017-18 and the lowest was observed during 2015-16 in Shidlaghatta market, whereas in Chinthamani market the highest variation with respect to prices was observed during the year 2014-15 and the lowest was observed during the year 2015-16. Similarly in case of Kolar market the highest variation was observed during 2011-12 and the lowest was during the year 2014-15, whereas in Srinivasapur market the highest variation was observed during 2010-11 and the lowest was observed during the year 2011-12. It was observed that the price fall with increase in arrivals there was more demand for cocoons during that particular years leading to more fluctuation in prices of cocoons. The findings were in conformity with the study of Vani and Rajeswari (2020).

Conclusion

The results revealed that the arrivals and prices were more in Shidlaghatta, Chinthamani and Kolar markets because these markets were having more competition among the reelers means

more compared to other markets and reeling industry was very much evolved compared to other markets. Whereas prices in the Shidlaghatta and Kolar markets were less fluctuating compared to Chinthamani and Srinivaspura markets, as these markets were more efficient and maintained consistency over the given trend. The price fluctuation is the major problem in cocoon production. There should be proper regulation and dissemination of market information and there by stabilize the market prices.

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