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A Study on Growth of Cotton Industry in Tamil Nadu

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Abstract: *In this paper analyze the area, production and yield of Cotton in Tamil Nadu between 2007-08 and 2016-17. Results of the analysis reveal that, World level, it has grown for CAGR at 2.01 per cent and LGR of 0.52 million of 480 lb bales average every year. However, the China with an average of 31.28 million of 480 lb bales declines continuously at CAGR of 4.86 per cent and LGR of 1.41 million of 480 lb bales on an average every year. A significant decline in the production of cotton (Except Brazil) of United States and other countries is also visible during the study period. . In India level, Yields decline continuously at CAGR of 0.44 per cent and LGR 2.13 kilograms per hectare on an average every year. From inferences of these results, it is found that the Area and Production of cotton is significantly better than the Yield of cotton in India. In Tamil Nadu level, there has been a significant and positive growth and trend in area (CAGR = 5.24 per cent, t = 4.16, P < 0.01 & LGR = 0.07, t = 3.59, P < 0.01) and Production (CAGR = 1.83, t = 0.97, P < 0.01 & LGR = 0.08, t = 0.80, p < 0.01) while growth and trend in yields (CAGR = -3.34 per cent, t = -1.72, P < 0.01 & LGR = -23.46, t = -1.63, P < 0.01) are significantly negative.*

Key Words: *Cotton, Area, Production, Yield, Coefficient of Variation (CV), Compound Growth Rate (CAGR) and Linear Growth Rate (LGR).*

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I. Introduction

The productions of cotton, hand spinning and weaving have been practiced in India from immemorial times. However, the factory production of cotton goods dates from the middle of the 19th century.

The cotton textile industry in Indian was initiated with the establishment of the first cotton textile factory at Ghusuri near Kolkata in 1818. However, it was closed down very soon due to the shortage of raw material. Actual development of the industry had been taking place since 1859 with the establishment of cotton mill at Mumbai which is located in the cotton growing region of Western India. Since then there has been rapid growth of the industry around Mumbai and Ahmedabad.

Industry has made rapid progress since 1880. The cotton mill industry made phenomenal progress during the period of 40 or 45 years since 1880. In the beginning, yarns spinning developed a great deal. There was an export trade in yarn with China. Now, however, both yarn and cloth are manufactured for home-consumption.

Cotton plays an important role in the Indian economy as the country's textile industry is predominantly cotton based. India is one of the largest producers as well as exporters of cotton yarn. The Indian textile industry contributes around 5 per cent to country's gross domestic product (GDP), 14 per cent to industrial production and 11 per cent to total exports earnings. The industry is also the second-largest employer in the country after agriculture, providing employment to over 51 million people directly and 68 million people indirectly, including unskilled women. The textile industry is also expected to reach US$ 223 billion by the year 2021. The states of Gujarat, Maharashtra, Telangana, Andhra Pradesh, Karnataka, Madhya Pradesh, Haryana, Rajasthan, and Punjab are the major cotton producers in India.

II. Review of Literature

A large number of research studies have been conducted on growth of cotton cultivation both in India and the abroad. The available literature on the selected topic reveals that the research studies of cotton cultivation back to early forties up to the present period. An attempt is made here to review some of the selected works in this direction.

Josily Samuel et al. (2015) made a study to analyses the state - wise production scenario of cotton over the years as well as the export composition and competitiveness. For the study, the secondary data have been used. The required secondary data have been collected from Centre for Monitoring Indian Economy Private Limited. Such collected data have been analyzed with annual compound growth rate. It is found that the cotton cultivated

area was the highest in Maharashtra 35.50 per cent followed by Gujarat 16.32 per cent, Karnataka 9.20 per cent, Andhra Pradesh 8.17 per cent, Punjab 8.51 per cent, Madhya Pradesh 7.21 per cent, Haryana 5.91 per cent, Rajasthan 5.45 per cent and Tamil Nadu 3.16 per cent. They concluded that the cotton is one of the major rain fed crop in the country, making India is the second largest producer and a major exporter in the world.

Siva Sankar et al. (2015) tried to analysis the growth and instability in cotton area, production and productivity during the period 1970-71 to 2013-14. For the study, secondary data have been used. The required secondary have been collected from Cotton Advisory Board, Central Institute for Cotton Research, and various bulletins of the International Cotton Advisory Committee. Collected data have been analyzed with Annual Compound Growth Rate, Coefficient of Variation and Fitting Exponential Function. It is found that the cotton area registered a negative insignificant annual compound growth rate at -0.0433 per cent per annum in world while India fetched a positive insignificant growth at 0.3631 per cent per annum

K.Mayilsami and Dr. A. Selvaraj (2016), in their study made an attempt to analysis the Growth of Cotton Cultivation in Tamil Nadu. Cotton is an important cash crop and source of livelihood for nearly 15 million farmers in 10 India States. In India, 60% of the total cropped area is classified as dry land or rain fed area representing 40% of the total agricultural production. Tamil Nadu is one the major producers of the cotton in India along with Maharashtra (35.50%) followed by Gujarat (16.32%), Karnataka (9.20%), Andhra Pradesh (8.17%), Punjab (8.51%), Madhya Pradesh (7.21%), Haryana (5.91%), Rajasthan (5.45%), Tamil Nadu (3.16%) during 2012-13. Cotton one of the principal crops in India and enjoys pride of place and unique position in our country. Against this back ground, this study is focused on growth rate of cotton. Cotton is one of the most important textile fibers in the world, accounting for 35% of the world fiber use. Cotton was first cultivated in the old world about 7,000 year ago, by the inhabitants of the Indus Valley Civilization. This civilization covered a huge swath of the north-western part of the Indian sub – continent, comprising today parts of eastern Pakistan and North – Western India.

III. Statement of the Problem

Cotton is one of the most important commercial crops cultivated in India. India is the second largest cotton producer, but the cultivators are marred by several problems such as, rising cost of production of seeds, fertilizers, labour i.e., input costs is an issue. There is decreasing and stagnant yields with deteriorating quality and productivity of soil due to incessant use of pesticides and pests that are becoming increasingly resistant to chemical dosage, poor irrigation facilities, exposing production to monsoon fluctuations, Absence of modern technology, deterioration in genetic purity, competition from artificial fibers, fluctuating market prices, lack of participation of the Cotton Corporation of India (CCI).

IV. Objectives of the Study

This study is undertaken with the following objectives:

1) To study the growth of cotton industry in India
2) To study the growth of cotton industry in Tamil Nadu

V. Research Methodology

Research Design

The Purposive sampling techniques has been adopted in this article.

Source of Data

The present study is primarily based on secondary data. The data were collected from Cotton Advisory Board, Cotton Incorporated monthly economic letter and Websites.

Period of the study

The present study covers a period of 10 years from 2007-08 to 2016-17. The reason for confining the study to this period is the availability of latest data in the Cotton Advisory Board and various websites.

Statistical Techniques

To analyze the collected data, various statistical techniques like descriptive, time series analysis are used. That is, as the data are of time series in nature, trend and growth both in compounded terms and linear terms are calculated in addition to general descriptive statistics like mean, standard deviation and coefficient of variation. The statistical significance of compound growth and linear trend is ascertained using student t-test.

The procedures for calculating descriptive statistics such as mean, standard deviation, and also for Compounded annualized growth rate (CAGR) and Linear growth rate (CAGR) are given hereunder:

Mean ($\overline{X}$)

$$\overline{X} = \frac{\sum X_i}{n}$$

Where, X_i is ratio of year 'i' and 'n' is number of years.

Standard Deviation (σ)

$$\sigma = \sqrt{\frac{\sum X_i^{\,2}}{n} - (\overline{X})^2}$$

Where, X_i is ratio of year 'i', 'n' is number of years and $\overline{X}$ is mean score.

Coefficient of Variation (CV)

$$CV = \left(\frac{\sigma}{\overline{X}}\right) x100$$

Compounded Annualized Growth Rate (CAGR)

Consider the non-linear relationship between a study variable (Y) and time variable (X) as

$Y = a\, b^X$ …… (1)

By taking logarithms on both sides, it may be written as

$\text{Log } Y = \log a + \log b\, X$

Or simply say $Y = A + BX$

The least square estimates of A and B are given by

$$\hat{\beta} = \left(\frac{\sum xy - \frac{(\sum x)(\sum y)}{n}}{\sum x^2 - \frac{(\sum x)^2}{n}} \right)$$

$$\hat{A} = \overline{Y} - \hat{B}\overline{X}$$

Where, $\overline{Y} = \frac{\sum y}{n}$ and $\overline{X} = \frac{\sum x}{n}$

Here, n is number of time periods (years), an estimate of 'b' is given by $\hat{b} = Anti\log(\hat{B})$

Now, an estimate of Compounded Annualized Growth Rate (CAGR) = $\left[\hat{b} - 1\right] x100$

Linear Growth Rate (LGR)

Consider a linear relationship between a study variable (Y) and time variable (X) as

$Y = a + b\, X$

The Linear Growth Rate ($\hat{b}$) is given by

$$\hat{b} = \left(\frac{\sum xy - \frac{(\sum x)(\sum y)}{n}}{\sum x^2 - \frac{(\sum x)^2}{n}} \right)$$

The statistical significance of the growth and trend are ascertained using Student t-test.

VI. Results and Discussion

World Cotton Production

Cotton is cultivated in 77 countries across the globe and 105 countries consumes cotton of which 13 countries are larger consuming countries which includes China, India, Pakistan, Bangladesh, Turkey, Vietnam, United States, Indonesia, Brazil, Uzbekistan, Mexico, Thailand and South Korea. Eight countries – United

States, Australia, Brazil, India, Uzbekistan, Burkina, Greece and Mali oare the major exporters of the 56 nations that export Cotton.

In 2017-18, World Cotton Production is estimated at 121.37 million bales of 480 lb (USDA, Feb 2018), there is an increase of 14.81% than last year. Although, India maintaining the position of leading cotton producer in the World, China and United Stated has increased cotton production around 23% as compared to last year.

Table – 1 World Cotton Production (Million 480 lb bales)

Year	India	China	US	Pakistan	Brazil	Others	Total
2007-08	24.00	37.00	19.2	8.60	7.40	23.50	119.70
2008-09	22.60	36.70	12.8	8.70	5.50	20.80	107.10
2009-10	24.50	32.00	12.2	9.20	5.50	19.50	102.90
2010-11	27.20	30.50	18.1	8.60	9.00	23.70	117.10
2011-12	29.00	34.00	15.6	10.60	8.70	29.50	127.40
2012-13	28.50	35.00	17.3	9.30	6.00	27.80	123.90
2013-14	31.00	32.80	12.9	9.50	8.00	26.20	120.40
2014-15	29.50	30.00	16.3	10.60	7.00	25.80	119.20
2015-16	25.90	22.00	12.9	5.90	7.00	22.50	96.20
2016-17	27.00	22.80	17.2	7.00	7.70	25.00	106.70
Mean	**26.92**	**31.28**	**15.45**	**8.80**	**7.18**	**24.43**	**114.06**
SD	**2.67**	**5.23**	**2.56**	**1.46**	**1.23**	**3.07**	**10.16**
CV	**9.93**	**16.73**	**16.56**	**16.56**	**17.19**	**12.58**	**8.91**
CAGR	**2.01****	-4.86*	**-0.24***	**-2.24***	**1.53***	**1.67***	**-0.60***
t-Value	**(2.15)**	(-3.84)	**(-0.12)**	**(-1.15)**	**(0.77)**	**(1.22)**	**(-0.58)**
LGR	**0.52***	**-1.41***	**-0.06***	**-0.16***	**0.10***	**0.38***	**-0.64***
t-Value	**(2.07)**	**(-4.00)**	**(-0.22)**	**(-0.96)**	**(0.65)**	**(1.14)**	**(-0.55)**

t=table value for 8 df@10%1.85, @5%=2.31, @1%=3.35
***Significant at 10% level, ** Significant at 5% level, ***Significant at 1% level**
Source: Cotton Incorporated, Various Monthly Economic Letters

A perusal of the above table shows a significant increase in production of cotton in India on the whole during the period. It has grown for CAGR at 2.01 per cent and LGR of 0.52 million of 480 lb bales average every year. However, the China with an average of 31.28 million of 480 lb bales declines continuously at CAGR of 4.86 per cent and LGR of 1.41 million of 480 lb bales on an average every year. A significant decline in the production of cotton (Except Brazil) of United States and other countries is also visible during the study period.

Table – 2 Area, Production and Yield of Cotton in India during the year from 2007-08 to 2016-17

year	Area(in lakh Hectare)	Production(in lakh Bales 170 kgs)	Yield (Kilograms per Hectare)
2007-08	94.10	310.00	553
2008-09	94.06	290.00	524
2009-10	103.10	305.00	503
2010-11	111.42	339.10	513
2011-12	121.78	367.00	512
2012-13	119.78	370.00	525
2013-14	119.60	398.00	566
2014-15	128.46	386.00	511
2015-16	122.92	332.00	459
2016-17	108.45	345.00	541
Mean	**112.37**	**344.21**	**520.70**
SD	**12.19**	**35.97**	**29.60**
CV	**10.85**	**10.45**	**5.68**
CAGR	**2.69****	**2.17****	**-0.44***
(t-Value)	**(3.03)**	**(2.25)**	**(-0.67)**
LGR	**2.91****	**7.23*****	**-2.13***
(t-Value)	**(2.96)**	**(2.17)**	**(-0.63)**

t=table value for 8 df@10%1.85, @5%=2.31, @1%=3.35
***Significant at 10% level, ** Significant at 5% level, ***Significant at 1% level**
Source: Cotton Advisory Board, As per CAB meeting dated 12.12.2017

The trend and growth in Area, Production and Yield of cotton in India are analyzed and the results of the analysis are reported in table – 2. It is understood from the table that the Area and Production of the cotton in India with an average of 112.37 in lakh hectare and 344.21 in lakh bales 170 kgs have reached 108.45 in lakh

hectare and 345.00 in lakh bales 170 kgs after testing at as high as 128.46 in lakh hectare and 398.00 in lakh bales 170 kgs in 2008-09 from 94.06 in lakh hectare and 290.00 in lakh bales 170 kgms in 2008-09 at significant compound growth rate of 2.69 per cent and 2.17 per cent with crisscross movements respectively. In absolute value, the rate of growth is 2.91 in lakh hectare and 7.23 in lakh bales 170 kgs on an average every year for area and production respectively. On the other hand, Yields decline continuously at CAGR of 0.44 per cent and LGR 2.13 kilograms per hectare on an average every year. From inferences of these results, it is found that the Area and Production of cotton is significantly better than the Yield of cotton in India.

Table – 3 Area, Production and Yield of Cotton in Tamil Nadu during the year from 2007-08 to 2016-17

year	Area(in lakh Hectare)	Production(in lakh Bales 170 kgs)	Yield (Kilograms per Hectare)
2007-08	0.99	4.00	678
2008-09	1.09	5.00	780
2009-10	1.04	5.00	817
2010-11	1.22	7.20	1003
2011-12	1.33	6.50	831
2012-13	1.28	6.00	797
2013-14	1.52	5.00	559
2014-15	1.87	6.00	545
2015-16	1.42	6.00	718
2016-17	1.42	5.00	599
Mean	**1.32**	**5.57**	**732.7**
SD	**0.26**	**0.93**	**142.47**
CV	**19.82**	**16.76**	**19.45**
CAGR (t – Value)	**5.24*** (4.16)**	**1.83* (0.97)**	**-3.34* (-1.72)**
LGR (t –Value)	**0.07* (3.59)**	**0.08* (0.80)**	**-23.46* (-1.63)**

t=table value for 8 df@10%1.85, @5%=2.31, @1%=3.35
***Signifiant at 10% level, ** Significant at 5% level, ***Significant at 1% level**
Source: Cotton Advisory Board, As per CAB meeting dated 12.12.2017.

Table -3 presents the trend and growth in Area, Production and Yield of cotton in Tamilnadu. An examination of the table shows that coefficient of variation, it is apparent that the Area and Yield of cotton are highly inconsistent compared to that of production (Higher the coefficient of variation value higher the inconsistency) and there has been a significant and positive growth and trend in area (CAGR = 5.24 per cent, t = 4.16, P < 0.01 & LGR = 0.07, t = 3.59, P < 0.01) and Production (CAGR = 1.83, t = 0.97, P < 0.01 & LGR = 0.08, t = 0.80, p < 0.01) while growth and trend in yields (CAGR = -3.34 per cent, t = -1.72, P < 0.01 & LGR = -23.46, t = -1.63, P < 0.01) are significantly negative. This picture indicates that Area and Production of cotton in Tamilnadu are positive growth and trend, but yield is indicating that continuously decline level.

FINDINGS

1) **World Level Cotton Production:** It has grown for CAGR at 2.01 per cent and LGR of 0.52 million of 480 lb bales average every year. However, the China with an average of 31.28 million of 480 lb bales declines continuously at CAGR of 4.86 per cent and LGR of 1.41 million of 480 lb bales on an average every year. A significant decline in the production of cotton (Except Brazil) of United States and other countries is also visible during the study period.

2) **India Level Cotton Production:** From inferences of these results, it is found that the Area and Production of cotton is significantly better than the Yield of cotton in India.
3) **Tamil Nadu Level Cotton Production:** This picture indicates that Area and Production of cotton in Tamil Nadu are positive growth and trend, but yield is indicating that continuously decline level.

SUGGESTIONS

1) Improving irrigation facilities and water harnessing was considered imperative for enhancing production and lowering its dependence on monsoon, drip irrigation system could be adopted for better water management.
2) Initiatives should be taken to increase awareness among farmers for adoption of rain water harvesting, soil moisture conservation techniques, suitable agronomic practices in order to increase the utilization of rain water. New farming practices like precision farming should also be encouraged to increase productivity.
3) Steps could be taken to improve logistics for transporting cotton, so that cotton fiber can be supplied from surplus to deficient areas in a clean manner, and it does not get contaminated.

4) Returns on cotton fiber can be enhanced through backward integration of the cotton value chain.

VII. Conclusion

The Government should provide the Loan with lesser interest rate, cotton seeds, fertilizers and pesticides at a concession rates through the cooperative societies, if Government has consider this suggestion seriously, it is hope that more number of the cotton growers will come forward to cultivate the cotton in more area, it reveals that automatically increase the production of cotton in India and Tamil Nadu level.

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