Agric. Sci. Digest., 37(4) 2017 : 306-309
Print ISSN:0253-150X / Online ISSN:0976-0547

AGRICULTURAL RESEARCH COMMUNICATION CENTRE
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An economic analysis of augmentational trends in production and productivity in Karnataka: A case of cotton

B.C. Shreedevi*, Netravati Ashok Patil and Swati Naik

University of Agriculture Sciences,
Dharwad-580 005, Karnataka, India.

Received: 27-04-2016 Accepted: 27-09-2017 DOI: 10.18805/ag.D-4414

ABSTRACT

Cotton plays an important role in the national economy in terms of generation of direct and indirect employment in the Agricultural and Industrial sectors. It is traditional and important commercial crop has been in cultivation in India for more than five thousand years. About 74 per cent of the total area and produc-tion of cotton in the country is contributed by four states of Gujarat, Andhra Pradesh, Maharashtra and Punjab. The study revealed that annual growth rate of area was less than the annual growth rate of productivity in Karnataka, which clearly shows that positive annual growth in cotton production was due to increase in productivity rather than increase in area, which was due to the fact that adoption of improved technologies like IPM, IRM, introduction of Bt cotton and low insect pest pressure in major cotton growing tracts has enabled this transformation in production and productivity. Introduction of Bt cotton was the major factor expressed by most of the farmers with a mean score of 67.2. So this factor got assigned first rank because it's giving double yield as compared to the traditional cotton varieties and it's also covers the resistance pest like *helicovarpa armizera* and other sucking pests.

Key words: Cotton, Garrett ranking, Karnataka, Productivity.

INTRODUCTION

Cotton occupies a predominant place among cash crops touching the country's economy at several points by generating direct and indirect employment in the agricultural and industrial sectors. India ranks first in area and second largest producer of cotton in the world next to China accounting for 18 per cent of the total world production. In India, cotton is cultivated in 12.2 million hectares constituting 25 per cent of the world area (Mahesh Kumar, 2013). In the past it produced only 12 per cent of world production because Indian cotton yields were among of the lowest in the world. The productivity of cotton in the country has almost doubled from 308 kg/ha in 2001 to 552 kg/ha in 2013-14, mainly attributed directly towards the advent of Bt-cotton varieties and hybrids.

It plays a key role in the national economy in terms of generation of direct and indirect employment in the Agricultural and Industrial sectors. Textiles and related exports of cotton constitute nearly 65 per cent account for nearly 33 per cent of the total foreign exchange earnings of our country which at present is around 17 billion dollars with a potential for a significant increase in the coming year. Cotton occupies about 5 per cent of the total cropped area in the country. Despite 58.4 per cent increase in the cotton area between 1950-51 and 1998-99, it has shown stagnating trend between 1960-61 and 1990-91. However, after a fluctuating trend between 1950-51 and 1970-71 the production has witnessed phenomenal increase since 1980-81 onwards due to introduction of High Yielding Varieties (HYV). That is why the average annual rate of increase during this period (1980-81 to 1998-99) was recorded at 4.1 per cent. This is due to improvement in per hectare yield during this period. About 74 per cent of the total area and produc-tion of cotton in the country are contributed by four states of Gujarat, Andhra Pradesh, Maharashtra and Punjab. Madhya Pradesh, Rajasthan, Haryana, Karnataka, Tamil Nadu and Rajasthan supply rest of the output of the crop.

Cotton is cultivated in three distinct agro-ecological regions (North, Central and South) of the country. The Northern zone is almost irrigated, while the percentage of irrigated area is much lower in the Central and Southern zones. The lowest being in the Central zone which has nearly 60 per cent of cotton area of our country. The Northern Zone comprising of Punjab, Haryana and Rajasthan occupied an area of 16.95 lakh ha with a production of 48 lakh bales (i.e. 170 kg each). The Central Zone comprising of Madhya Pradesh, Gujarat and Maharashtra occupied an area of 78.24 lakh ha producing 218 lakh bales of cotton.

Southern zone comprising of Andhra Pradesh, Karnataka and Tamil Nadu is a zone for growing *hirsutum, arboreum- herbaceum, and barbadense* and also this zone has occupied an area of 25.24 lakh ha producing 74 lakh

*Corresponding author's e-mail: shric5666@gmail.com

bales of cotton (Anonymous 2013). Soils of this zone are both black and red and poor in fertility. Cotton cultivation is done both under irrigated and rain fed conditions. This zone has the productivity of 554 kg lint per hectare. The area is well known for growing long and extra long staple HxB hybrid and *barbadense* cottons. Pest and disease problems are more. Due to type of climate available, cotton can be grown throughout the year. Cotton is grown in south as sole crop or as intercrop with onion, chili, cowpea, maize etc. Cotton-rice rotation is also followed in this area. The South zone is occupying 20% of area and contributing nearly 24% in national production. Besides these nine states, cotton cultivation in the country has gained momentum in Odisha and in non-traditional states of Uttar Pradesh, West Bengal and Tripura.

Cotton is a major commercial crop grown in almost all the Agro-climatic zones of Karnataka. All the four cultivated species of cotton *viz,. Gossypium arboreum, G.herbaceum, G. barbadense,* and *G. hirsutum* are grown in the state where in *Gossypium hirsutum* has the major share of the hybrid cotton grown. The main cotton growing districts in Karnataka are Dharwad, Haveri, Gadag, Bellary, Belgaum, Raichuru and Gulbarga. However, there is spectacular shift in cotton growing areas in Karnataka. From traditional areas it has spread to non-traditional districts like Mysore, Shivamogga, Chamarajanagar, and Davanagere. Hence, the present study has made an attempt to analyze growth in area, productivity and production of cotton in Karnataka.

MATERIALS AND METHODS

The analysis was based secondary data, collected from different sources like publication of Cotton Corporation of India (CCI) and various other published journals. The data are collected for estimation growth in area, production and yield of cotton in Karnataka pertained to the period 1996-2013.The regression analysis was carried out analyze the CAGR (Compound annual growth rate) analysis for cotton area, production and productivity. The details of the functional analysis are given below.

To compute average compound growth rates of area, production and productivity, the following form of regression equation was used.

$Y_t = Ab^t V_t$ ..... (1)

Where, Y_t = data on area, production and productivity in the year 't'.

A = intercept indicating Y in the base period (t-0).

t = time period

V_t = error term

b = (1+g)

g = average compound growth rate to be estimated.

Equation 1 was converted into logarithmic form in order to facilitate the use of linear regression.

Taking logarithms on both sides of the equation (1)

$\ln Y = \ln A + t (\ln b) + \ln V_t$

This can be written in the following form

$Q_t = a + b_t + V_t$ ..... (2)

Where, $Q_t = \ln Y_t$

$a = \ln A$

$b = \ln B$

$V_t = \ln V_t$

The values of 'a' and 'b' are estimated by using ordinary least squares estimation technique.

Later, the original 'A' and 'B' parameters in equation (1) were obtained by taking anti-logarithms of 'a' and 'b' value as

A = anti ln a

B = anti ln b

Average annual compound growth rate was calculated as

g = (B-1) 100

The significance of the regression coefficient is tested using student's' test.

Instability index

In order to study stability in coffee industry with respect to area, production and productivity, co-efficient of variation was estimated using the expression given below.

Standard deviation (s)

$$CV = \frac{\text{Standard deviation (s)}}{\text{Mean (x)}} \times 100$$

Garret Ranking

In order to analyze the garret ranking 30 samples were taken. Based on the highest area under cotton, Haveri and Dharwad districts were selected and from each district 15 samples were taken. The order of the merit given by the respondents was changed into ranks by using the formula,

$$\text{Percent position} = \frac{100\ (R_{ij} - 0.50)}{N_j}$$

Where,

$Rij_=$ Rank given for i^{th} item by j^{th} individual

N_j = Number of items ranked by j^{th} individual

The percent position of each rank was converted to scores by referring to tables given by Garret and Woodworth (1969). Then for each factor, the scores of individual respondents were summed up and divided by the total number of respondents for whom scores were gathered. The mean scores for all the factors were ranked, following the decision criterion that lower the value the more important is the constraint to farmers.

RESULTS AND DISCUSSION

Over a long period, time series of a given variable is likely to show a tendency to increase or decrease over time which is referred to as trend. Some of the factors

responsible for such changes in time series are the population growth, change in taste of people, relative profitability of the crops, domestic and international demand and technological advances in the field. In order to study the growth of cotton in Karnataka, secondary data on the area, production and productivity of cotton from 1996-97 to 2013-14 were obtained from Cotton Corporation of India (CCI) and various other published sources. To analyze the Compound Annual Growth Rate (CAGR), the exponential form of regression analysis was employed.

The results are depicted in Table 1. The mean area of cotton was 4.96 lakh hectares whereas, average production and productivity of cotton was 9.14 lakh bales and 312.72kg per hectares, respectively. The fluctuations in area, production and productivity were respectively 19.17 per cent, 40.97 per cent and 35.76 per cent. Growth rate in case of area, production and productivity were estimated as -0.87 per cent, 4.56 per cent and 5.49 per cent per annum respectively. Growth rates in production and productivity of cotton were positive and significant at 1 per cent level of probability.

Annual growth rate of area was less than the annual growth rate of productivity. It is clear that positive annual growth in cotton production was due to increase in productivity rather than increase in area. Growth rate of productivity was also significant at 1 per cent level of probability which may be due to the fact that adoption of improved technologies like IPM, IRM, new chemistry (including Bt cotton) coupled with favorable weather and low insect pest pressure and also launch of "Technology Mission on Cotton" by Government of India in February 2000, significant achievements have been made in increasing yield and production through development of high yielding varieties, appropriate transfer of technology, better farm management practices, increased area under cultivation of Bt cotton hybrids etc. Enhanced irrigated area under the crop; modernization of market yards increased number of ginning-pressing factories; operation of minimum support price programme through Cotton Corporation of India have significantly contributed towards the growth in area, production and productivity of cotton in the Karnataka. The study conducted by Shwetha (2014) on cotton is in line with the above findings.

The cotton grower's responses revealing the factors influencing the increase in yield were subjected to Garrett Ranking Technique to organize them based on their relative importance. The results of the opinion survey presented in Table 2 are discussed here.

Table 2 depicts the results of Garrett Ranking Analysis of factors influencing the increase in yield. Among four factors considered, the introduction of double Bt was the major factor expressed by most of the farmers with a mean score of 67.2. So this factor got assigned first rank because it is giving double yield as compared to the traditional cotton varieties and it also covers the resistance to pests like *helicovarpa armizera* and other sucking pest

Table 1: Compound annual growth rates of area, production and productivity of cotton in Karnataka state.

Year	Area (lakh hectares)	Production (lakh bales)	Yield (Kgs/ha)
1996	6.68	9	229
1997	5.18	7.5	246
1998	6.08	8.75	245
1999	5.4	7	220
2000	5.6	7.75	235
2001	5.91	7	201
2002	3.93	5	216
2003	3.13	4.2	228
2004	5.21	8	261
2005	4.13	6	247
2006	3.78	6	270
2007	4.03	8	337
2008	4.08	9	375
2009	4.55	12.25	458
2010	5.45	11.1	346
2011	5.54	15	460
2012	4.85	15	526
2013	5.78	18	529

Particulars	Sum of the scores	Mean	Ranks
AVERAGE	4.96	9.14	312.72
CAGR	-0.87	4.56**	5.49**
CV (%)	19.17	40.97	35.76
F Value	0.92	9.76	53.63
R^2	0.054	0.37	0.77

Note: ** significant at 1 per cent probability level

Table 2: Factors influencing increase in yield

Particulars	Sum of the scores	Mean	Ranks
Integrated Pest Management	1782	59.4	II
Integrated Resource Management	1290	43	III
Introduction of Hybrids	2016	67.2	I
Favorable weather	1080	36.2	IV

indicated low insect pest pressure. Because incidence of boll worm was major problem in cotton. Apart from these characters some other characters also considered while selecting hybrids such as more number of pickings, high yield, high market rate, easy availability of seeds and less cost of cultivation. Second rank was given to Pest Management (II rank with a mean score of 59.4) followed by Integrated Resource Management (III rank with a mean score of 43) like irrigation and favorable weather (IV rank with a mean score of 54.32). The result showed that introduction of double Bt in 2009 has influenced aggressively the increase in productivity of cotton.

CONCLUSION

The study revealed that the mean area, production and productivity of cotton were growing at the rate of 4.96 lakh hectares, 9.14 lakh bales and 312.72 kg per hectares, respectively. Growth rate in case of area, production and productivity were estimated as -0.87 per cent, 4.56 per cent and 5.49 per cent per annum respectively. Growth rates in production and productivity of cotton were positive and significant at 1 per cent level of probability. It is clear that positive annual growth in cotton production was due to increase in productivity rather than increase in area. The result showed that adoption of double Bt in 2009 has influenced aggressively the increase in production and productivity of cotton in the Karnataka state.

REFERENCES

Anonymous, (2013) All India Coordinated Cotton Improvement Project, Annu. Rep. (2013-14). Indian Council of Agricultural Research, New Delhi. p 1.

Garret, H.E. and R.S. Woodworth., (1969). Statistics in Psychology and Education. Vakils, Feffer and Simons Pvt. Ltd., Bombay. P-329.

Maheshkumar, S., (2013), Market Survey. Retrieved from http://www.efymag.com/admin/issuepdf /9-14_cotton_FFAug-13.pdf.

Shwetha, Y., (2014), An Economic analysis of diversity in cultivation of Bt-cotton hybrids. *M.Sc (Agri.) Thesis,* Univ. Agric. Sci., Dharwad, Karnataka (India).