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Production and growth of cotton in Gujarat state- A district level analysis

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ABSTRACT : The compound growth rates (CGRs) of area, production and productivity of cotton were computed for the major districts and Gujarat state as a whole. The districts were selected on the basis of major growing districts of the state of the respective crops. The data was analyzed in period of 1999-2000 to 2011-2012. The district wise compound growth rates of cotton area, production and productivity revealed that the districts of Panchamahals, Surat and Kutchh have negative and significant growth rates of area while remaining districts registered positive growth rates during period I. During period II, all the districts registered positive growth rates of area except Bharuch and Surat districts. . In the period III, districts of Panchamahals and Surat experienced significantly negative growth rate of area, while remaining all the districts registered positive growth rates. The production of the cotton significantly increased in all the districts, except in case of Surat district, where negative growth rates was observed during the Period I and similar pattern was also observed in Surat district in during period II and III. This was also reflected by the compound growth rates of the state as a whole during period I (10.36%/annum), during period II (21.86%/annum) and during period III (10.14%/annum). During period I, the negative growth rates in productivity was observed in the districts of Gandhinagar, Surat and Bhavnagar, while remaining all the districts registered positive growth rates. Whereas, during Period II and Period III in all the districts registered positive and significantly increased growth rates in productivity.

Key words : Analysis, area, growth, production, producitivity

Cotton is grown in 75 countries across the world. India ranks first in area and second in production of cotton in the world. Average production of India is 482 kg/ha (Anonymous, 2012b). Gujarat, Maharashtra, Haryana, Punjab, Rajasthan, Madhya Pradesh, Andhra Pradesh, Karnataka and Tamil Nadu are the major cotton growing states in India. India is the second largest producer of cotton in the world. Its yield however, is half of the world average cotton and its products give substantial income and employment to agriculture and industry in India. It is estimated that more than 5.8 million farmers cultivate cotton in India and about 40-50 million people are employed directly or indirectly by the cotton industry. Government initiatives like the Technology Mission on Cotton and Technology Up gradation Fund Scheme have improved the marketability of the farm produce and helped in modernizing and upgrading the ginning and pressing factories. These initiatives have led to appreciable improvement in the quality of cotton bales, which in turn have proven beneficial for the textile industry. However, the value chain of cotton right from the farmer level till the end-user is produce the problems of inefficiency, wastage, contamination in the form of trash content, as well as unsustainable use of inputs, such as water, pesticides and fertilizers.

Gujarat is the second largest cotton growing state with acreage of 30.23 lakh ha and highest cotton producing state of India with production of 115 lakh bales. The average productivity of cotton in the state (647 kg/ha) is higher than the national average (Anonymous, 2012b). In Gujarat, the major cotton producing districts *viz.,* Rajkot, Bhavnagar, Vadodara, Amreli, Mehsana, Bharuch and Surendranagar,

produce about 85 per cent of the total cotton production in the state.

Indian cotton is considered to be among the most contaminated in the world, according to the International Textile Manufacturers Federation (ITMF). As a result of this Indian cotton is sold at a discount compared to similar international varieties. Due to this, the Indian cotton segment has not developed according to the quality needs of the international markets, thus giving it a disadvantage in textile trade as it cannot convert its inherent advantages of abundant raw material and cheap labour benefit. To study the growth rates of area, production and productivity of cotton in Gujarat state.

MATERIALS AND METHODS

The compound growth rates (CGRs) of area, production and productivity of cotton were computed for the major districts and Gujarat state as a whole. The districts were selected on the basis of major growing districts of the state of the respective crops. The data was analyzed in period of 1999-2000 to 2011-2012. In order to compute the compound growth rates of the cotton; the following form of model was fitted:

The compound growth rates were calculated by fitting the exponential function given below:

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

Where, Y= area/ production/ productivity

a = Constant

b = Regression co-efficient

t = Time variable (1, 2..., n) for each period *i.e.* year

Thus, natural log on both the sides of eq.(1) was taken to convert it in to linear form.

$\log Y = \log a + t \log b$ ..... (2)

and,

CGR (%) was worked out using following formula:

CGR (%) = (Anti log of b-1) x 100

RESULTS AND DISCUSSION

District wise compound growth rates of area, production and yield of cotton have been worked out for three different periods viz; period I (1990-1991 to 1999-2000), period II (2000-1901 to 2011-2012) and overall period III (1990-1991 to 2011-2012). A compound growth rate of cotton crop has been presented in Table 1. The results showed that the districts of Panchamahals, Surat and Kutchh have negative and significant growth rates of area while remaining districts registered positive growth rates during period I. During period II, the area under cotton reverse trend was observed in which, all the districts registered positive growth rates, except Bharuch and Surat districts. This may be due to the introduction of bt. cotton varieties. In the period III, districts of Panchamahals and Surat experienced significantly negative growth rate of area, while remaining all the districts registered positive growth rates (Anuradha and Reddy, 2013 and Reddy *et al.,* 2013).

The production of the cotton significantly increased in all the districts, except in case of Surat district where negative growth rates has observed during the period I and similar pattern was also observed in during period II and III. This was also reflected by the compound growth rates of the state as a whole during period I (10.36%/ annum), during period II (21.86%/annum) and during period III (10.14%/annum) (Ardheshna 2009).

So far as the productivity of cotton is concerned during period I, the negatively growth rates was observed the districts of Gandhinagar, Surat and Bhavnagar, while remaining all the districts registered positive growth rates. During period II and period III in all the districts positive and significantly increased growth rates were observed. Gujarat state registered a positive growth rate for productivity during period I

Table 1. Compound growth rates of area, production and yield of cotton in different districts of Gujarat (% /annum)

Districts	Period I (1990-1991 to 1999-2000)			Period II (2000 -2001 to 2011-2012)			**Period III (Overall) (1990-1991 to 2011-2012)**		
	Area	Production	Yield	Area	Production	Yield	**Area**	**Production**	**Yield**
Ahmedabad	1.99**(0.11)	3.77**(0.23)	1.76**(0.14)	2.48(0.06)	14.62**(0.42)	11.86**(0.19)	**2.20(0.08)**	**4.67**(0.37)**	**2.42**(0.20)**
Banaskantha	1.67**(0.12)	3.44**(0.23)	1.69(0.09)	10.95**(0.71)	27.45**(0.68)	14.85**(0.62)	**1.40**(0.51)**	**10.42**(0.64)**	**8.89**(0.53)**
Vadodara	4.26**(0.15)	8.86**(0.14)	4.39(0.07)	0.81(0.07)	13.30**(0.48)	12.16**(0.15)	**1.81**(0.12)**	**6.88**(0.36)**	**5.06**(0.13)**
Bharuch	12.02**(0.28)	16.73**(0.21)	4.22(0.16)	-2.67(0.08)	4.17**(0.27)	5.61(0.16)	**3.77**(0.33)**	**6.17**(0.35)**	**2.42(0.16)**
Gandhinagar	12.27**(0.44)	16.45**(0.18)	-0.51*(0.28)	26.72**(0.70)	37.16**(0.43)	8.13**(0.24)	**17.49**(0.92)**	**19.83**(0.43)**	**1.91**(0.27)**
Kheda	2.51**(0.11)	5.24**(0.27)	2.47**(0.10)	6.76**(0.23)	15.24**(0.37)	7.93**(0.23)	**3.53**(0.24)**	**7.54**(0.32)**	**3.87**(0.20)**
Panchmahals	-8.48**(0.34)	2.25**(0.36)	11.74**(0.41)	3.55**(0.17)	11.07**(0.40)	7.34**(0.19)	**-0.88*(0.29)**	**2.16**(0.48)**	**3.09**(0.29)**
Sabarkantha	9.96**(0.51)	17.39**(0.37)	6.79**(0.33)	15.70**(0.51)	25.77**(0.51)	8.69**(0.32)	**13.83**(0.85)**	**18.05**(0.47)**	**3.70**(0.34)**
Surat	-9.97**(0.46)	-12.49**(0.22)	-2.80** (0.18)	-5.34**(0.76)	7.00**(0.47)	13.24**(0.48)	**-3.00**(0.64)**	**-1.41*(0.37)**	**1.69*(0.37)**
Amreli	17.59**(0.48)	24.85**(0.52)	6.15**(0.29)	15.92**(0.30)	29.46**(0.61)	11.67**(0.36)	**11.96**(0.73)**	**15.64**(0.62)**	**3.28**(0.40)**
Bhavnagar	12.31**(0.36)	12.25**(0.43)	-0.05(0.26)	5.93**(0.18)	25.55**(0.61)	18.55**(0.35)	**6.28**(0.39)**	**10.90**(0.56)**	**4.35**(0.38)**
Jamnagar	8.15**(0.28)	11.69**(0.24)	3.27(0.14)	23.72**(0.50)	42.19**(0.78)	14.92**(0.60)	**11.50**(0.53)**	**17.05**(0.62)**	**4.98**(0.47)**
Junagadh	7.86**(0.38)	11.00**(0.30)	2.92**(0.21)	7.56**(0.43)	16.78**(0.52)	8.57**(0.36)	**6.25**(0.47)**	**11.00**(0.45)**	**4.47**(0.29)**
Kutchh	-2.55**(0.45)	3.84**(0.26)	6.55**(0.34)	5.83**(0.27)	18.66**(0.36)	12.14**(0.20)	**2.25**(0.35)**	**9.29**(0.49)**	**6.89**(0.27)**
Rajkot	5.72**(0.19)	11.58**(0.31)	5.54**(0.13)	7.26**(0.16)	30.42**(0.96)	21.61**(0.49)	**6.50**(0.24)**	**12.01**(0.74)**	**5.17**(0.52)**
Surendranagar	5.64**(0.18)	10.05**(0.30)	4.28**(0.17)	8.93**(0.55)	27.07**(0.66)	16.63**(0.59)	**4.56** (0.43)**	**10.16**(0.56)**	**5.35**(0.47)**
Gujarat	6.02**(0.18)	10.36**(0.21)	4.08**(0.11)	10.92**(0.88)	21.86**(0.77)	8.50**(0.58)	**6.25**(0.65)**	**10.14**(0.65)**	**3.27**(0.46)**

* Significant at 0.05 probability level, ** Significant at 0.01 probability level, N.S.: Non-significant

Note: Figures in parentheses indicate value of standard errors.

(4.08%/annum), period II (8.50%/annum) and period III (3.27%/annum) (Mehata, 2012).

This is mainly due to introduction of *Bt* cotton and also the large scale increase in irrigation facilities owing to good monsoon in the first decade of 21st century and constructions of large numbers of check dams for water conservation in the state. Increased uses of drip irrigation system also help increasing productivity up to some extent. Also owing to increased irrigation facilities at higher yield in this price, input prices increased relatively less as compared to output prices, due to mechanization, which reduced the labour quantity in agricultural operations and preparing for marketing (Kenamu and Alexander, 2014). With the advent of new technology, machinery and management practices cost of production was reduced by shifting costly input like human labour to machine labour resulted in higher negative growth of input indices as against output indices.

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