



**TRENDS IN AREA, PRODUCTION AND PRODUCTIVITY OF COTTON IN WESTERN MAHARASHTRA REGION OF MAHARASHTRA STATE**

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**Abstract:** Cotton is the most important fiber crop and cotton is being cultivated in more than 80 countries in the world of which the top five countries are producing about 78 per cent of cotton (Viz: China, India), United States), Pakistan and Brazil. In India, Cotton is grown in the nine major states in three different zones. The Primary data was collected from two districts from the Western Maharashtra region. Data on area, production and productivity of cotton was collected from 1960 onwards for the Western Maharashtra region of Maharashtra state. The results revealed that the performance with regard to productivity of cotton was quite satisfactory in Period III as compared to Period I and Period II in all the districts of Western Maharashtra except Pune and Solapur district. Whereas among the districts, the production of cotton has increased both by area expansion and productivity improvement in Jalgaon, Nandurbar and Dhule. Whereas, the production has declined due to decline in area in Nasik, Pune, Ahmednagar, Satara and Sangali districts.

The information regarding various constraints faced by the cotton growing cultivators were lack of technical knowledge, high wage rates, non-availability of seed, fertilizers and irrigation sources and low price to produce were the identified as the major problem.

**Keywords:** Cotton, Production, Growth.

Cotton as a cash crop is grown all over World. Cotton is being cultivated in more than 80 countries in the world of which the top five countries are producing about 78 per cent of cotton Viz; China (27.10 per cent), India (21.83 per cent), United States (12.67 per cent), Pakistan (8.58 per cent) and Brazil (7.52 per cent). Although, India occupies the top position in terms of area of cotton, its share is low in global production due to low yields. The cotton yields in the country is hardly one-third to that of China and little over 40 per cent that of USA. But India still has to go a long way to catch up with the World average yield of 754 kg per hectare as of 2012-13. India's yield position as of today is only 482 kg per hectare, whereas, it was 1326, 1446, 856 and 721 kg per hectare in China, Brazil, USA and Pakistan, respectively.

In India, Cotton is grown in the nine major states in three different zones. The production level during 2010-11 was greater by 33000 thousand bales of 170 kg each than even the previous peak of 14230 thousand bales of 170 kg each achieved during 1996-97. The average cotton yield during 1996-97 was

about 265 kg per hectare and it increased substantially to over 552 kg per hectare during 2013-14.

The area under cotton 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 TamilNadu (3.16 per cent). Gujarat was the largest producer of cotton with an average production of 29.13 per cent followed by Maharashtra (22.21 per cent) and Andhra Pradesh (12.75 per cent). In India the highest productivity recorded in year 2010-11 was 499 kg per hectare. (Gandhi and Namboodiri, 2006).

**Objectives of the Study**

1. Analyse the area, production and productivity of cotton in Western Maharashtra region of Maharashtra state
2. To study the districtwise growth in the production of cotton Western Maharashtra region of Maharashtra state.
3. To examine the constraints.

The important cotton growing districts in the state are Jalgaon and Dhule districts of Western Maharashtra, Yavatmal, Buldhana, Amaravati, Akola and Wardha districts of Vidarbha regions and Aurangabad, Jalna, Nanded, Beed and Parbhani districts of Marathwada regions of Maharashtra

(Stat.Com, 2013) as shown in Table1. However, the average yield of cotton was highest in Western Maharashtra districts (390 kg/ha), followed by districts of Marathwada (340 kg/ha) and Vidarbha (271 kg/ha).

**Table 1: Area, Production and Productivity of Cotton in major districts of Maharashtra (2013)**

Districts	Area ('00'ha)	% Share	Production ('00'Tones)	% Share	Productivity (Kg/ha)
Dhule	1331	3.40	3359	4.60	429
Jalgaon	5097	12.93	10971	14.68	366
Ahemadnagar	1017	2.60	2211	2.96	370
Aurangabad	3329	8.45	8792	11.76	449
Jalna	3033	7.70	7766	10.40	435
Beed	2768	7.02	4222	5.64	259
Nanded	3021	7.66	4622	6.18	260
Parbhani	2324	5.90	4048	5.41	296
Buldhana	2515	6.38	4361	5.84	295
Yavatmal	4798	12.17	7759	10.38	275
Akola	1678	4.25	2689	3.60	272
Amaravati	2043	5.18	3362	4.50	280
Wardha	1906	4.83	2630	3.51	235
Maharashtra	39419	100	74727	100	322

(Source: Cotton Advisory Board, 2014)

**Methodology**

In order to study the growth of cotton, secondary data on the area, production and productivity of cotton were obtained from the season and crop reports and epitomes published by the Department of Agriculture, Maharashtra State from the year 1960-61 to 2012-13. Based on the availability of data the study period was divided into period I (1960 to 1980), period II (1981 to 2000-01), period III (2001 to 2013) and overall period 1960-61 to 2012-13. The Primary data was collected from two districts from the Western Maharashtra region viz., Jalgaon and Dhule and from each district two tahsils were selected on the basis of maximum area under study. Two villages from each tahsil were selected. Among each village, 4 samples growers were selected

as per the size group of small (0.1 to 2 ha), medium (2.01 to 4 ha) and large (4.01 to above ha). The study was based on primary data for the year 2013-14. From each district, 48 farmers were selected who were practicing improved production technology of cotton cultivation. Thus, there were a total of 96 farmers. The farmers were interviewed using specially prepared schedules and asked to prioritize the most important constraints they were facing in adopting improved method of cotton cultivation.

**Growth Rate**

In order to analyze the growth rates in area, production and productivity of cotton in different districts and the region as a whole, compound growth rates were computed by using the following form of the relationship.

$$Y = ab^t$$

Where,

- Y = Area/ Production/ Productivity
- a = Constant
- b = Trend value
- t = Time period in years

$$CGR (\%) = (\text{Antilog } b-1) \times 100$$

The significance of the estimated compound growth rates were tested with the help of students “t” test.

## RESULTS AND DISCUSSIONS

**Trends in Area, Production and Productivity of cotton in Western Maharashtra region of Maharashtra state:** The districts wise area of cotton

is given in Table 2. It is evident that the area under cotton was the highest in Jalgaon (58.48 %) followed by Dhule (15.30 %), Ahmदनगर (11.70 %) and Nandurbar (9.10%). The cotton area in Western Maharashtra region was 8720 hundred hectares.

**Table 2: Area, Production and Productivity of Cotton in major districts of Western Maharashtra (2013)**

Districts	Area ('00'ha)	% Share	Production ('00'Tones)	% Share	Productivity (Kg/ha)
Dhule	1331	15.30	3359	18.28	429
Jalgaon	5097	58.48	10971	59.68	366
Nandurbar	792	9.10	965	05.26	207
Ahemदनगर	1017	11.70	2211	12.03	370
Others	483	5.6	874	4.75	238
<b>Western Maharashtra</b>	<b>8720</b>	<b>100</b>	<b>18380</b>	<b>100</b>	<b>322</b>

The average production was highest in Jalgaon district (10971 '00' tone) with a highest share of 59.68 per cent followed by Dhule (18.28 %), Ahmदनगर(12.03%), Nandurbar (5.26%) and other districts only (4.75%). The productivity was highest in Dhule district with 429 kg/ha followed by Jalgaon with productivity of 366 kg/ha and lowest in Nandurbar (207kg/ha), districts of Western Maharashtra region.

The information in respect of district wise and period wise annual compound growth rates in area, production and productivity of cotton in Western Maharashtra region is presented in Table 3.

It is revealed from the table that, at the overall period, the compound growth rates of area, production and productivity were highly significant. It clearly indicates that the production of cotton was only increased by area and productivity. Among the districts, the production of cotton has increased both by area expansion and productivity improvement in Jalgaon, Nandurbar and Dhule. Whereas, the production has declined due to decline in area in

Nasik, Pune, Ahmednagar, Satara and Sangali districts of Western Maharashtra. The districtwise analysis of growth in area of cotton showed that during the period I, a significant decline in area was noticed for all districts of Western Maharashtra. It is interesting to note that the productivity of cotton was non significant in Period I in all the districts of Western Maharashtra except Pune, Ahemदनगर and Solapur. In Period II, the productivity of cotton has increased in Dhule, Jalgaon, Pune, Solapur, Kolhapur, Satara and Sangali districts. The performance with regard to productivity of cotton was quite satisfactory in Period III as compared to Period I and Period II in all the districts of Western Maharashtra except Pune and Solapur district. During the period III, the districtwise results indicated that the annual compound growth rates in area, production and productivity were positively significant for Nasik, Dhule, Jalgaon and Nandurbar, whereas it was non-significant in other districts of Western Maharashtra.

**Table 3: District wise and period wise annual compound growth rates in area, production and productivity of cotton in Western Maharashtra region**

	District	CGR (%)											
		Period-I (1960-61 to 1979-80)			Period-II (1980-81 to 1999-2000)			Period-III (2000-01 to 2012-13)			Overall (1960-61 to 2012-13)		
		A	P	Y	A	P	Y	A	P	Y	A	P	Y
1	Nasik	-9.62***	-7.32***	2.18 <sup>NS</sup>	1.80 <sup>NS</sup>	1.49 <sup>NS</sup>	0.23 <sup>NS</sup>	4.16***	3.27***	7.31***	0.92 <sup>NS</sup>	2.08 <sup>NS</sup>	1.02***
2	Dhule	-2.59***	-1.16 <sup>NS</sup>	1.15 <sup>NS</sup>	2.46***	5.29***	2.99***	5.52***	15.65***	9.77***	0.86***	2.75***	1.75***
3	Jalgaon	-2.95***	-2.70*	0.05 <sup>NS</sup>	3.23***	8.32***	4.91***	2.77***	8.98***	6.05***	1.65***	4.50***	2.71***
4	Pune	-1.99 <sup>NS</sup>	0.04 <sup>NS</sup>	2.23*	-16.08***	-12.88***	3.85***	-10.74**	-16.21**	-0.32 <sup>NS</sup>	-10.07***	-9.34***	1.44***
5	Ahmednagar	-10.55***	-6.93***	3.72**	4.44 <sup>NS</sup>	5.22 <sup>NS</sup>	0.76 <sup>NS</sup>	4.97***	8.41***	2.76 <sup>NS</sup>	0.10 <sup>NS</sup>	1.60 <sup>NS</sup>	1.36***
6	Solapur	-0.59 <sup>NS</sup>	2.22 <sup>NS</sup>	2.48**	-5.39**	-2.72 <sup>NS</sup>	2.82***	-18.62***	-12.90	7.06***	-5.65***	-4.37***	1.22***
8	Kolhapur	-3.98**	-3.48 <sup>NS</sup>	-0.34 <sup>NS</sup>	-4.98***	-2.54 <sup>NS</sup>	3.44**	2.10 <sup>NS</sup>	3.09 <sup>NS</sup>	8.32***	-6.40***	-3.59***	2.60***
9	Satara	4.02**	5.17**	0.43 <sup>NS</sup>	1.34 <sup>NS</sup>	4.25 <sup>NS</sup>	2.77**	-0.74 <sup>NS</sup>	3.54 <sup>NS</sup>	4.37 <sup>NS</sup>	-1.59**	-1.72**	-0.24 <sup>NS</sup>
11	Sangli	-4.13***	-3.95**	-0.03 <sup>NS</sup>	0.71 <sup>NS</sup>	3.44**	2.76***	7.32 <sup>NS</sup>	10.21 <sup>NS</sup>	2.54 <sup>NS</sup>	-1.44***	-0.61 <sup>NS</sup>	0.71 <sup>NS</sup>
12	Nandurbar	--	-	-	-	-	-	7.38***	8.66***	7.13***	6.14***	7.12***	8.60***
	<b>Western Maharashtra</b>	-3.29***	-2.16 <sup>NS</sup>	1.55*	2.70***	6.83 <sup>NS</sup>	2.56*	5.66***	12.16***	3.22 <sup>NS</sup>	1.39***	3.66***	1.34***

From the foregoing discussion it is clearly indicated that Period II was a period of Bt cotton introduction, where the productivity of cotton was positive almost in all the districts. The area and production of cotton in all the districts of Western Maharashtra were negative in Period I and Period II, because during this period division of districts took place and cultivated land was increased in area under other crops like sugarcane, maize and horticultural crops, etc. During period I and II, the productivity of

cotton had increased at the rate of 1.55 and 2.56 per cent per annum in Western Maharashtra, it was positively significant.

The study revealed that, the area, production and productivity of cotton in Western Maharashtra region had significantly increased at the rate of 1.39, 3.66 and 1.34 per cent per annum respectively for the overall Period of 53 years. Results conclude that, cotton crop can be another pillar of agricultural development in the Western Maharashtra region.

**Constraints in adoption of improved production technology of cotton in Western Maharashtra region**

**Table 4: Constraints in adoption of improved production technology of cotton in Western Maharashtra**

Sr. No.	Particulars	Group			Overall (N=96)
		Small (N=32)	Medium (N=32)	Large (N=32)	
<b>A.</b>	<b>Rainfall</b>				
1	Abnormal distribution of rainfall	46.88	40.63	34.38	40.63
2	Inadequate	50.00	37.50	40.63	42.71
<b>B.</b>	<b>Seed rate</b>				
3	High cost	65.63	53.13	56.25	58.33
4	Lack of awareness	43.75	37.50	40.63	40.63
<b>C.</b>	<b>Time of sowing and variety</b>				
5	Lack of awareness	46.88	37.50	34.38	39.58
6	Non-availability of proper variety seed	62.50	56.25	53.13	57.29
<b>D.</b>	<b>Method of Sowing</b>				
7	Recommendation not known	50.00	40.63	40.63	43.75
8	Expensive and more labour required	65.63	59.38	56.28	60.42

9	<b>Seed treatment</b>				
10	Unawareness	50.00	65.63	62.50	59.38
<b>E.</b>	High cost	62.50	46.88	43.75	51.04
<b>F.</b>	<b>Fertilizer application</b>				
11	High cost of fertilizer	84.38	75.00	75.00	78.13
12	Inadequate supply	53.13	40.63	37.50	43.75
13	Lack of knowledge about fertilizers	50.00	46.88	50.00	48.96
<b>G.</b>	<b>Irrigation</b>				
14	unavailability of irrigation sources	71.88	53.13	50.00	58.33
15	lack of irrigation technology	78.13	59.38	56.25	64.58
<b>H.</b>	<b>Labour</b>				
16	Inadequate	46.88	34.38	31.25	37.50
17	High wage rates	87.50	75.00	71.88	78.13
18	Non-availability at peak period	65.63	65.63	65.63	65.63
<b>I.</b>	<b>Plant protection</b>				
20	Higher cost	68.75	62.50	59.38	63.54
<b>J.</b>	<b>Improved implements</b>				
21	High cost	40.63	40.63	40.63	40.63
22	Poor economic condition	65.63	43.75	40.63	50.00
23	Small and fragmented land holding	56.25	53.13	50.00	53.13
<b>K.</b>	<b>Lack of technical know-</b>	53.13	50.00	46.88	50.00
<b>L.</b>	<b>Low price to produce</b>	81.25	71.88	68.75	73.96

From the table 4 it is seen that, constraints regarding abnormal distribution of rainfall and inadequate rainfall were reported by 40.63 and 42.71 per cent farmers, respectively at the overall level. High price of seed was common complaint reported by 58.33 per cent of the farmers. In case of method of sowing, about 43.75 per cent farmers expressed difficulties to know the recommendation and 60.42 per cent farmers complaint expensive and more labour required method. Another major problem was high fertilizers cost, inadequate supply and lack of knowledge about the fertilizers were reported by 78.13, 43.75 and 48.96 per cent of the farmers, respectively. Inadequate supply of labour, high wage rates and non availability of labour in peak period were reported by 37.50, 78.13 and 65.63 per cent sample farmers, respectively.

Constraints regarding adoption of improved implements were high cost, poor economic condition and small and medium land holding reported by 40.63, 50.00 and 53.13 per cent farmers, respectively. Lack of technical knowledge and lack of irrigation sources as one of the constraints in attaining higher yields were expressed by 50.00 and 64.58 per cent farmers. Other constraint like the low price to farm produce was one

of the problems, which was indicated by about 73.96 per cent of the farmers.

### Conclusions

1. The area, production and productivity of cotton was the highest in Jalgaon and Dhule districts of Western Maharashtra region.
2. At the overall period, the compound growth rate of area, production and productivity were highly significant. It clearly indicates that the production of cotton was only increased by productivity during the entire period in Western Maharashtra. Among the districts, the production of cotton has increased both by area expansion and productivity improvement in Jalgaon, Nandurbar and Dhule districts. Whereas, the production has declined due to decline in both area and productivity in Nasik, Pune, Ahmednagar, Satara and Sangali districts in Western Maharashtra.
3. Abnormal distribution of rainfall, lack of technical knowledge, high cost of seed and fertilizers, high wage rates, high labour requirement, non-availability of seed, fertilizers and irrigation sources and low price to produce were the major constraints in adoption of cotton production technologies.

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