

## **Region wise compound growth rates in area, production and productivity of onion in Maharashtra - An economic analysis**

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### **ABSTRACT**

This study mainly focused on district wise growth and instability of onion in Maharashtra. Erratic weather, volatile market price and lack of adequate storage and market infrastructure caused instability in production through preventing the farmers in taking the optimal decision on allocation of area and raising farm productivity. Study categorized period as follows; Period I: 1975-76 to 1984-85, Period II: 1985-86 to 1994-95, Period III: 1995-96 to 2004-05, Period IV: 2005-06 to 2012-13 and overall period 1975-76 to 2012-13 revealed that onion production in Maharashtra is mainly driven by acreage allocation. But in the long-run increasing area under onion may not be feasible without reducing the area of other important crops. Hence, solution lies in by bridging the yield gap or increasing the yield potential. The major reason for the instability of onion production after period II was mainly due to area instability and partly due to yield instability. Although, productivity of onion has improved from last decade, still onion production is mainly driven by acreage allocation. As onion is irrigated crop and Maharashtra is endowed with relatively less irrigation potential, increasing production through scaling up area may not be feasible without reducing the acreage under other important high value crops. If acreage is not allowed to scale up to meet the growing demand, consumer price will increase, or export has to be restricted or import has to be resorted, which will entail the loss of foreign exchange. Hence, bridging the yield gap or increasing the yield potential would be the solution in the long-run. This may be partly mitigated by increasing the productivity, providing timely market information prices, upgrading information, storage facility, and extending the weather based crop insurance to the farmers.

**Key Words :** Onion, Production, Growth and instability, Maharashtra

### **INTRODUCTION**

Onion is an important fresh vegetable consumed all over the world. India ranks first in acreage in the world covering about 480 thousand ha (21 per cent of the World area) and second in production after China, with over 15 million tons. According to NSSO data, onion consumption has increased in both rural and urban areas by at least 100 and 150 g, respectively per month from 2002-03 to 2012-13. Further, this demand is likely to rise with increase of domestic population, per capita income, increasing taste consciousness and health awareness of the consumer. Also, there is steady rise in export since

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the period of liberalization. Export competitiveness of onion is also found to be very high.

In India, onion is cultivated mainly in three different seasons' viz., kharif (20 %), late kharif (20 %) and rabi (60 %). Sowing of rainy kharif takes place during February-April in Southern India while in Maharashtra and other parts takes place during May-June. And so, late kharif is in August-September and Rabi is in October-November. Erratic weather and volatile market price is the major factors causing fluctuation in production which result in excess supply or demand. This in turn leads to instability in production. The implication of instability is, on the one hand, price rise upsets consumers and contributes to inflationary pressures on economy and, on the other hand, a price fall diminishes the farm income thereby increases the poverty in rural areas. Production and price instability lead to capital rationing and less than optimal resource allocation in agriculture. Instability in agriculture may adversely affect growth in production, investment, employment, consumption, and income distribution, which may impede the economic development and growth of the country.

Onion is produced in the states of Maharashtra, Karnataka, Madhya Pradesh, Rajasthan, Gujarat, Andhra Pradesh and Bihar which together constitute around 70 per cent of the area under onion. Maharashtra is reckoned as the leading state accounting for more than 30 per cent area with an average yield of 14.2 t/ha during 2012-13. As Maharashtra is the major state contributes to the total production (33 %) and export (80-85 %) of India, this study focused on Maharashtra. With this view, the present study was undertaken to analyze region wise changes in area, production and productivity of onion in Maharashtra. The reasons for the rate of growth behind expectation have been virtually unexamined. Considering the above facts it is necessary to analyze the region wise compound growth rates in area, production and productivity of onion in Maharashtra.

## METHODOLOGY

The study on growth in area, production and productivity of onion was purposively taken up in Maharashtra state of India. The secondary data on region wise area, production and productivity of onion was used to analyze the trends. The time series data on area, production, productivity of onion was available from 1975-76 onwards. Hence the analysis was covered for the period from 1975-76 to 2012-13. Data used for the study was collected from various published sources from the Directorate of Economics and Statistics (DES), Maharashtra. The growth in the area, production and productivity of onion was estimated by using the compound growth function of the non linear form:

$$Y = ab^t$$

where, Y = area, production and productivity

t = time period

b = regression coefficient

a = intercept

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

The simple tabular analysis was done for obtaining the results on changes in area, production and productivity of onion in Maharashtra.

## RESULTS AND DISCUSSION

### Changes in area, production and productivity of onion in Maharashtra :

The onion production is determined by agro-climatic factors such as soil type, temperature and rainfall pattern. Besides the agro climatic factors, other factors such as relative price of onion, expansion of irrigation facility, provision of technological inputs, institutional facility are also responsible for onion production. It was observed that, in general there was increase in all the concerned aspects influencing the acreages and production of onion in different regions of Maharashtra. It is therefore expected that, there should have been corresponding changes in area, production and productivity of

onion under consideration, unless certain environmental factors had caused the distortion in these parameters.

The decade wise data on area, production and productivity of onion in Maharashtra for the period of last 38 years *i.e.* from 1975-76 to 2012-13 have been analyzed and changes in area, production and productivity of onion in Maharashtra for the period of 38 years have been worked out and are shown in Table 1.

Year	Area (‘000’ ha)	% Increase	Production (‘000’ MT)	% Increase	Productivity (Ton/ha)	% Increase
1975-76	50.30	100.00	870.10	100.00	17.30	100.00
1985-86	51.10	1.59	732.80	-15.77	14.34	-17.10
1995-96	93.70	86.28	1206.70	38.68	12.88	-25.54
2005-06	134.01	166.42	1645.40	89.13	12.28	-29.01
2012-13	155.70	209.54	1891.20	134.29	14.72	-14.91

(Figures in the parenthesis indicate the percentage change over the base year.)

It is observed from the table that the area and production has been increased by 209.54 and 134.29 per cent per annum to the base year 1975-76. However, the productivity of onion was declined by 14.91 per cent to the base year 1975-76. It clearly indicates that the production of onion was mainly driven by acreage allocation. It is also noted that, the area and production of onion was continuously increasing over base year except production in the year 1985-86. Whereas, the productivity of onion was continuous declined from 1975-76 to 2012-13 and again slightly increased in the year 2012-13.

**District and period wise annual compound growth rates in area, production and productivity of onion in Maharashtra:**

The area, production and productivity of onion crop have fluctuated widely during the period under consideration in all the district and regions and state as a whole. The growth rates of area, production and productivity of onion for Maharashtra as a whole were observed to be positive and significant for the entire period of 38 years. The area and production of onion have increased at the rate of 7.21 per cent and 4.21 per cent per annum, respectively, during this period. However, the productivity of onion has increased by only 2.65 per cent per annum, which is significant at 5 per cent level. This indicates that the production of onion has increased mainly due to area expansion and partly due to production improvement. The area and production of onion crop have increased at higher rate during period III and period IV as compared to period I and period II. The productivity of onion has shown dismal picture. It shows increases up to period II and declines for period III and again increased for period IV. The gains of production increase of onion arising out of area expansion phenomenon were reduced to some extent because of productivity decline.

The performance of onion crop in respect of area expansion and production increase was quite satisfactory in all the zones. But it was poor in respect of productivity improvement. In general, the area and production of onion increased at increasing rate during period I and period II and again decline during period III in all the regions. Region wise detail analysis of growth in area, production and productivity of onion is explained as below.

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

The district wise growth rates of area, production and productivity of onion in western Maharashtra

**Table 2 : District and period wise annual compound growth rates in area, production and productivity of onion in Western Maharashtra region**

Sr. No.	District	CGR (%)														
		Period-I (1975-76 to 1984-85)			Period-II (1986-87 to 1994-95)			Period-III (1996-97 to 2004-05)			Period-IV (2006-07 to 2012-13)			Overall (1975-76 to 2012-13)		
		A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y
1.	Nasik	0.85 <sup>NS</sup>	-3.56 <sup>NS</sup>	-4.4 <sup>NS</sup>	2.53 <sup>*</sup>	2.65 <sup>**</sup>	0.13 <sup>**</sup>	10.83 <sup>***</sup>	11.4 <sup>***</sup>	0.60 <sup>***</sup>	12.1 <sup>***</sup>	7.11 <sup>***</sup>	9.21 <sup>***</sup>	13.2 <sup>***</sup>	10.3 <sup>***</sup>	5.31 <sup>***</sup>
2.	Dhule	4.17 <sup>***</sup>	9.83 <sup>***</sup>	5.07 <sup>***</sup>	-1.90 <sup>NS</sup>	-1.95 <sup>NS</sup>	-0.06 <sup>NS</sup>	4.04 <sup>***</sup>	7.81 <sup>***</sup>	3.68 <sup>***</sup>	2.72 <sup>**</sup>	2.59 <sup>***</sup>	2.45 <sup>**</sup>	2.31 <sup>**</sup>	2.17 <sup>*</sup>	2.04 <sup>*</sup>
3.	Jalgaon	2.24 <sup>*</sup>	-2.84 <sup>NS</sup>	-4.99 <sup>NS</sup>	-0.98 <sup>NS</sup>	1.02 <sup>NS</sup>	2.69 <sup>**</sup>	10.2 <sup>***</sup>	14.9 <sup>***</sup>	4.29 <sup>***</sup>	10.9 <sup>***</sup>	12.5 <sup>***</sup>	4.12 <sup>***</sup>	5.71 <sup>***</sup>	7.3 <sup>***</sup>	3.91 <sup>***</sup>
4.	Pune	2.44 <sup>*</sup>	1.97 <sup>***</sup>	6.35 <sup>***</sup>	6.90 <sup>***</sup>	8.03 <sup>***</sup>	-1.02 <sup>NS</sup>	0.74 <sup>***</sup>	-0.06 <sup>NS</sup>	-1.4 <sup>NS</sup>	9.89 <sup>***</sup>	11.2 <sup>***</sup>	2.41 <sup>*</sup>	10.3 <sup>***</sup>	5.21 <sup>***</sup>	6.31 <sup>***</sup>
5.	A'Nagar	0.33 <sup>NS</sup>	2.80 <sup>**</sup>	2.46 <sup>*</sup>	3.5 <sup>***</sup>	4.03 <sup>***</sup>	6.30 <sup>***</sup>	7.10 <sup>***</sup>	11.4 <sup>***</sup>	1.56 <sup>NS</sup>	11.2 <sup>***</sup>	12.6 <sup>***</sup>	4.14 <sup>NS</sup>	10.6 <sup>***</sup>	7.11 <sup>*</sup>	1.85 <sup>***</sup>
6.	Solapur	0.83 <sup>***</sup>	8.09 <sup>***</sup>	7.20 <sup>***</sup>	1.66 <sup>***</sup>	2.9 <sup>***</sup>	1.27 <sup>**</sup>	-5.77 <sup>***</sup>	-7.83 <sup>**</sup>	-2.22 <sup>**</sup>	12.5 <sup>***</sup>	14.1 <sup>***</sup>	5.81 <sup>***</sup>	7.52 <sup>***</sup>	19.1 <sup>***</sup>	1.82 <sup>***</sup>
7.	Kolhapur	5.94 <sup>***</sup>	2.94 <sup>***</sup>	-2.29 <sup>NS</sup>	-8.93 <sup>**</sup>	-3.25 <sup>NS</sup>	7.32 <sup>*</sup>	6.78 <sup>**</sup>	2.12 <sup>**</sup>	2.11 <sup>**</sup>	13.7 <sup>***</sup>	15.6 <sup>***</sup>	7.57 <sup>***</sup>	9.32 <sup>**</sup>	1.2 <sup>**</sup>	3.11 <sup>**</sup>
8.	Satara	6.59 <sup>***</sup>	3.34 <sup>**</sup>	-3.12 <sup>**</sup>	-11.4 <sup>NS</sup>	-4.13 <sup>NS</sup>	8.61 <sup>***</sup>	4.47 <sup>**</sup>	1.99 <sup>**</sup>	3.90 <sup>NS</sup>	8.33 <sup>***</sup>	9.53 <sup>***</sup>	2.75 <sup>*</sup>	4.9 <sup>NS</sup>	13.1 <sup>***</sup>	4.13 <sup>***</sup>
9.	Sangli	1.24 <sup>NS</sup>	1.94 <sup>***</sup>	8.06 <sup>***</sup>	9.82 <sup>***</sup>	2.71 <sup>*</sup>	3.14 <sup>**</sup>	3.66 <sup>NS</sup>	3.12 <sup>***</sup>	1.29 <sup>***</sup>	9.6 <sup>***</sup>	10.2 <sup>***</sup>	4.43 <sup>***</sup>	5.81 <sup>***</sup>	11.2 <sup>***</sup>	2.26 <sup>*</sup>
10.	Nandurbar	---	---	---	---	---	---	---	---	---	---	-2.7 <sup>NS</sup>	-3.8 <sup>**</sup>	2.41 <sup>*</sup>	0.04 <sup>NS</sup>	3.18 <sup>***</sup>
	W.M.	3.64 <sup>***</sup>	2.18 <sup>**</sup>	1.17 <sup>**</sup>	6.02 <sup>***</sup>	7.65 <sup>*</sup>	1.66 <sup>*</sup>	9.92 <sup>***</sup>	6.90 <sup>***</sup>	1.44 <sup>*</sup>	11.1 <sup>***</sup>	10.4 <sup>***</sup>	2.75 <sup>***</sup>	7.25 <sup>***</sup>	6.07 <sup>***</sup>	2.40 <sup>***</sup>

\*, \*\* and \*\*\* indicates significance level at 10, 5 and 1per cent level

**Table 3 : District and period wise annual compound growth rates in area, production and productivity of onion in Marathwada region**

Sr. No.	District	CGR (%)														
		Period-I (1975-76 to 1984-85)			Period-II (1986-87 to 1994-95)			Period-III (1996-97 to 2004-05)			Period-IV (2006-07 to 2012-13)			Overall (1975-76 to 2012-13)		
		A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y
1.	Aurangabad	1.66 <sup>**</sup>	8.31 <sup>NS</sup>	2.33 <sup>*</sup>	2.21 <sup>*</sup>	7.71 <sup>***</sup>	2.88 <sup>NS</sup>	-9.2 <sup>***</sup>	-2.51 <sup>***</sup>	-2.71 <sup>*</sup>	-6.9 <sup>NS</sup>	-8.8 <sup>***</sup>	-10.8 <sup>NS</sup>	-9.8 <sup>***</sup>	-4.81 <sup>***</sup>	-5.81 <sup>***</sup>
2.	Parbhani	11.9 <sup>***</sup>	10.7 <sup>***</sup>	1.36 <sup>*</sup>	8.07 <sup>**</sup>	6.78 <sup>NS</sup>	1.49 <sup>**</sup>	4.39 <sup>***</sup>	2.54 <sup>*</sup>	1.81 <sup>NS</sup>	1.33 <sup>***</sup>	-0.96 <sup>**</sup>	-2.25 <sup>*</sup>	-3.5 <sup>NS</sup>	-4.83 <sup>***</sup>	-6.12 <sup>NS</sup>
3.	Beed	-2.34 <sup>NS</sup>	-1.26 <sup>**</sup>	-0.18 <sup>NS</sup>	1.95 <sup>***</sup>	4.12 <sup>***</sup>	1.04 <sup>**</sup>	-9.51 <sup>**</sup>	-12.3 <sup>***</sup>	0.35 <sup>**</sup>	4.68 <sup>***</sup>	11.1 <sup>***</sup>	2.52 <sup>***</sup>	2.46 <sup>NS</sup>	3.13 <sup>***</sup>	3.89 <sup>***</sup>
4.	Nanded	-16.6 <sup>NS</sup>	-13.2 <sup>**</sup>	-9.73 <sup>NS</sup>	-0.18 <sup>**</sup>	-1.51 <sup>NS</sup>	1.72 <sup>**</sup>	-7.1 <sup>***</sup>	-163 <sup>NS</sup>	-6.42 <sup>NS</sup>	-3.83 <sup>*</sup>	0.52 <sup>*</sup>	4.86 <sup>***</sup>	0.84 <sup>***</sup>	2.05 <sup>***</sup>	3.25 <sup>***</sup>
5.	Osmanabad	-3.16 <sup>NS</sup>	2.61 <sup>***</sup>	2.94 <sup>*</sup>	3.21 <sup>*</sup>	-1.04 <sup>***</sup>	-2.02 <sup>NS</sup>	-4.3 <sup>***</sup>	-3.02 <sup>***</sup>	1.87 <sup>**</sup>	1.96 <sup>**</sup>	-4.75 <sup>**</sup>	-6.13 <sup>NS</sup>	-7.5 <sup>NS</sup>	-8.89 <sup>***</sup>	-10.3 <sup>***</sup>
6.	Jalna	---	---	---	-2.42 <sup>*</sup>	1.69 <sup>***</sup>	0.46 <sup>**</sup>	2.41 <sup>***</sup>	-13.7 <sup>***</sup>	-2.01 <sup>NS</sup>	3.32 <sup>**</sup>	-1.41 <sup>**</sup>	-0.22 <sup>NS</sup>	0.95 <sup>**</sup>	2.13 <sup>*</sup>	3.34 <sup>NS</sup>
7.	Latur	---	---	---	-5.04 <sup>***</sup>	-2.29 <sup>**</sup>	-0.79 <sup>***</sup>	-3.84 <sup>NS</sup>	-11.4 <sup>***</sup>	-7.54 <sup>***</sup>	4.68 <sup>***</sup>	0.35 <sup>**</sup>	2.11 <sup>*</sup>	2.26 <sup>**</sup>	3.6 <sup>***</sup>	4.93 <sup>***</sup>
8.	Hingoli	---	---	---	---	---	---	---	---	---	4.39 <sup>***</sup>	2.54 <sup>*</sup>	1.81 <sup>***</sup>	3.84 <sup>***</sup>	4.64 <sup>***</sup>	5.43 <sup>NS</sup>
	Marathwada	2.96 <sup>**</sup>	3.40 <sup>***</sup>	1.77 <sup>*</sup>	3.02 <sup>**</sup>	3.21 <sup>**</sup>	1.24 <sup>NS</sup>	-1.28 <sup>*</sup>	-2.42 <sup>**</sup>	-1.16 <sup>NS</sup>	-2.02 <sup>*</sup>	-2.82 <sup>**</sup>	1.93 <sup>*</sup>	-2.45 <sup>**</sup>	-2.04 <sup>NS</sup>	-1.44 <sup>NS</sup>

\*, \*\* and \*\*\* indicates significance level at 10, 5 and 1per cent level

**Table 4 : District and period wise annual compound growth rates in area, production and productivity of onion in Vidarbha region**

Sr. No.	District	CGR (%)														
		Period-I (1975-76 to 1984-85)			Period-II (1986-87 to 1994-95)			Period-III (1996-97 to 2004-05)			Period-IV (2006-07 to 2012-13)			Overall (1975-76 to 2012-13)		
		A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y
1.	Buldhana	2.51*	2.61***	1.29**	0.12 <sup>NS</sup>	-3.11 <sup>NS</sup>	-7.1 <sup>NS</sup>	3.19***	1.64***	2.43*	-2.5 <sup>NS</sup>	-3.4***	-4.2***	-5.1***	-6.1***	-6.9 <sup>NS</sup>
2.	Akola	4.06***	3.77***	3.47***	3.18***	2.88*	2.59*	1.89***	2.68*	1.31 <sup>NS</sup>	1.41**	1.11**	0.82 <sup>NS</sup>	0.52***	0.23***	-0.1***
3.	Anrawati	4.74***	5.41***	4.21***	2.67 <sup>NS</sup>	6.46***	-3.2 <sup>NS</sup>	3.89***	4.72***	4.21***	2.19*	2.15*	2.11**	2.07*	3.03***	3.99***
4.	Yavatmal	-2.45 <sup>NS</sup>	-8.32**	-5.8***	-3.4 <sup>NS</sup>	-0.9***	1.62**	2.6*	2.63*	3.58**	1.61***	4.11***	2.61***	3.1***	1.51***	2.41***
5.	Wardha	-2.61*	-6.14***	-2.31 <sup>NS</sup>	-1.91***	-5.21***	-2.12 <sup>NS</sup>	-7.2***	-7.3***	-0.19 <sup>NS</sup>	-6.5***	-5.8***	-5.11 <sup>NS</sup>	-4.3 <sup>NS</sup>	-3.63***	-2.8 <sup>NS</sup>
6.	Nagpur	0.84**	-2.66*	-2.21*	-8.3 <sup>NS</sup>	-6.1**	-3.94***	-1.5**	0.19***	2.88*	0.29***	0.65 <sup>NS</sup>	1.29***	1.94***	2.58*	3.23***
7.	Bhandara	0.31 <sup>NS</sup>	-0.79***	-1.7 <sup>NS</sup>	-2.7 <sup>NS</sup>	-3.7***	-4.81***	-4.2***	-3.67**	-6.21 <sup>NS</sup>	-8.8 <sup>NS</sup>	-9.8**	-5.21 <sup>NS</sup>	-5.2 <sup>NS</sup>	-3.21***	-4.2 <sup>NS</sup>
8.	Chandrapur	-8.5 <sup>NS</sup>	-7.21**	-5.9***	-4.6***	-3.3***	-2.11 <sup>NS</sup>	-1.21**	1.05***	1.63***	3.16***	4.46***	3.75***	2.05*	4.34***	2.64***
9.	Gadchiroli	----	----	----	-3.45	-8.9***	-7.9***	-5.7***	-8.1***	-3.5 <sup>NS</sup>	-3.6 <sup>NS</sup>	-2.5*	-1.5 <sup>NS</sup>	-0.34 <sup>NS</sup>	0.56***	1.73***
10.	Gondia	----	----	----	----	----	----	----	----	----	-2.1**	-1.1***	-2.12*	-1.2***	-0.114***	1.11 <sup>NS</sup>
11.	Washim	----	----	----	----	----	----	----	----	----	-2.7*	-1.5**	-0.4 <sup>NS</sup>	-1.71***	-0.43 <sup>NS</sup>	0.92***
	Vidarbha	3.48***	2.92**	1.42 <sup>NS</sup>	3.87***	1.73 <sup>NS</sup>	0.92 <sup>NS</sup>	-1.77 <sup>NS</sup>	-1.34 <sup>NS</sup>	0.76 <sup>NS</sup>	-2.05*	-2.56**	-1.71*	-2.96**	-2.17**	-1.21 <sup>NS</sup>

\*, \*\* and \*\*\* indicates significance level at 10, 5 and 1 per cent level

**Table 5 : Region wise and period wise annual compound growth rates in area, production and productivity of onion in Maharashtra**

Sr. No.	District	CGR (%)														
		Period-I (1975-76 to 1984-85)			Period-II (1986-87 to 1994-95)			Period-III (1996-97 to 2004-05)			Period-IV (2006-07 to 2012-13)			Overall (1975-76 to 2012-13)		
		A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y
1.	WM	3.64***	2.18**	1.17**	6.02***	7.65***	1.66*	9.92***	6.90***	1.44*	11.1***	10.4***	2.75***	7.25***	6.07***	2.40**
2.	Marathwada	2.96**	3.40***	1.77*	3.02**	3.21**	1.24 <sup>NS</sup>	-1.28	-2.42**	-1.16 <sup>NS</sup>	-2.02*	-2.82**	1.93*	-2.45**	-2.04*	-1.44 <sup>NS</sup>
3.	Vidarbha	3.48***	2.92**	1.42 <sup>NS</sup>	3.87***	1.73 <sup>NS</sup>	0.92 <sup>NS</sup>	-1.77 <sup>NS</sup>	-1.34 <sup>NS</sup>	0.75 <sup>NS</sup>	-2.05*	-2.55**	1.71*	-2.96**	-2.17 <sup>NS</sup>	-1.21 <sup>NS</sup>
	MH	1.66***	2.65**	1.92*	2.42**	3.63***	2.21*	8.18***	6.14***	1.91*	9.41***	10.12***	2.42**	7.21***	4.21***	2.65**

\*, \*\* and \*\*\* indicates significance level at 10, 5 and 1 per cent level

region for period I revealed that the production increased due to area expansion in Kolhapur and Satara districts. In case of Dhule, Pune, Ahmednagar, Solapur, Sangali and Western Maharashtra region production increased both due to expansion in area as well as productivity. The production was declined due area declination in Nasik and Jalgaon districts.

For period II the production increased due to area expansion in Pune district and production increased due to productivity improvement in Jalgaon district. In case of Nasik, Ahmednagar, Solapur, Sangali and Western Maharashtra region production increased both due to increase in production as well as productivity. The production declined due to decrease in area in Kolhapur and Satara district while production shows declined trend in Dhule district both due to decrease in area as well as production.

Period III was characterized by declined production due to decrease in productivity in Pune district while both due to area as well as productivity in Solapur district. In case of Nasik, Dhule, Jalgaon, Ahmednagar, Kolhapur, Satara, Sangali and Western Maharashtra region production increased due to increase in both area as well as productivity.

Nasik, Dhule, Jalgaon, Pune, Ahmednagar, Solapur, Kolhapur, Satara, Sangali and Western Maharashtra region revealed that the production increased both due to increase in area as well as productivity in period IV. While production declined due to decrease in area in Nandurbar district.

All the districts as well as Western Maharashtra region show increased trend in production both due to increase in area as well as productivity in the entire period of study. In general the performance of area, production and productivity of onion was quite satisfactory in period III and IV for all the districts of region.

**District and period wise annual compound growth rates in area, production and productivity of onion in Marathwada region:**

The district wise growth rates of area, production and productivity of onion in Marathwada region for period I revealed that the production increased due to increase in productivity in Osmanabad district. Production declined due to decreasing trend in area as well as production in Buldhana and Nanded district. Also, the production shows increased trend due to both increase in area as well as productivity in Aurangabad, Parbhani and Marathwada region.

In Aurangabad, Parbhani, Beed and Marathwada region the production was increased due to both increase in area as well as production in period II. While, in case of Jalna district production increased due to productivity improvement. The production declined in Nanded district due to decrease in area and due to decrease in productivity in Osmanabad district. In case of Latur district production declined both due to decrease in area as well as productivity.

For period III the production increased due to increase in area as well as productivity in Parbhani district. The production declined in Beed, Osmanabad district due to decrease in area under onion crop. In case of Aurangabad, Nanded, Jalna, Latur and Marathwada region production declined due to both decrease in area as well as productivity.

The production increased due to increase in area in Nanded district for period IV. In case of Beed, Latur and Hingoli production shows increased trend due to both area expansion as well an increase in productivity. The production declined due to decrease in area under onion crop in Parbhani, Osmanabad and Jalna district. Also, Aurangabad and Marathwada region have declined production due to both decrease in area as well as productivity.

For the entire period of study, Beed, Nanded, Jalna, Latur and Hingoli have increased production due to both increase in area as well as production and Aurangabad, Osmanabad, Parbhani and Marathwada region have declined production both due to decrease in area and productivity.

**District and period wise annual compound growth rates in area, production and productivity of Onion in Vidarbha region:**

For period I the production increased both due to area expansion and increase in productivity in Buldhana, Amravati, Akola and Vidarbha region. Production declined in Nagpur and Bhandara district due to decrease in productivity. In Yavatmal, Wardha and Chandrapur district production declined due to both decrease in area as well as productivity.

The production increased due to area expansion in Amravati district in period II. Also Akola and Vidarbha region have increased production by increase in productivity. Production declined by decrease in area in Yavatmal district and due to decrease in productivity in Buldhana district. The declined area as well as productivity results into declined production in Wardha, Nagpur, Bhandara, Chandrapur and Gadchiroli district.

Chandrapur and Nagpur district have increased production due to productivity improvement in period III. The production increased due increase in area as well as production in Buldhana, Akola, Amravati and Yavatmal district. Also production shows declined trend in Wardha, Bhandara, Gadchiroli and Vidarbha region due to decrease in area as well as productivity.

The production increased not only area expansion but also due to productivity improvement in Akola, Amravati, Yavatmal, Chandrapur and Nagpur district in period IV. Also production shows declined trend in Buldhana, Wardha, Bhandara, Gadchiroli, Gondia, Washim and Vidarbha region due to decrease in area as well as productivity.

For the overall study period, production increased due to area expansion in Akola district and due to productivity improvement in Gadchiroli district. In Amravati, Yavatmal, Nagpur and Chandrapur district production increased due to area expansion as well as productivity improvement. In case of Gondia and Washim district production decline due to decrease in productivity. The production declined due to decrease in area as well as productivity together in Buldhana, Wardha, Bhandara and Vidarbha region.

The study revealed that the production increased due to area expansion as well as productivity improvement in Western Maharashtra, Marathwada, Vidarbha region and Maharashtra in period I and II. In period III production increased due to area expansion as well as productivity improvement in Western Maharashtra, and Maharashtra. For Vidarbha region production declined due to decrease in area. Also Production declined both due to decrease in area as well as productivity in Marathwada region. In period IV and overall study period production increased both due to area expansion as well as productivity improvement in Western Maharashtra, and Maharashtra. Also Production declined due to both decrease in area as well as productivity in Marathwada and Vidarbha region.

**Conclusion:**

The performance of onion crop in respect of area expansion and production increase was quite satisfactory in all the zones. But it was poor in respect of productivity improvement. In general, the area and production of onion increased at increasing rate during period I and period II and again decline during period III in all the regions.

Although, productivity of onion has improved from last decade, still onion production is mainly driven by acreage allocation. As onion is irrigated crop and Maharashtra is endowed with relatively less irrigation potential, increasing production through scaling up area may not be feasible without reducing the acreage under other important high value crops. If acreage is not allowed to scale up to meet the growing demand, consumer price will increase, or export has to be restricted or import has to be resorted, which will entail the loss of foreign exchange. Hence, bridging the yield gap or increasing the yield potential would be the solution in the long-run. This may be partly mitigated by increasing the productivity, providing timely market information prices, upgrading information, storage facility, and extending the weather based crop insurance to the farmers.

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