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Growth rate analysis of onion in India under WTO regime

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Abstract

The data were obtained for the period of 33 years beginning with 1980 to 2012. The data were divided into two periods i.e. pre-WTO period (1980 to 1995), post-WTO period (1996 to 2012) and overall period (1980 to 2012). The results of the study revealed that the area, production and productivity of onion in India has increased during the entire period of study. The area under onion, production and productivity of onion in India has increased with more growth rates during post-WTO period as compare to the pre-WTO period.

Keywords: growth rate analysis, production and productivity of onion

Introduction

Among the vegetables, onion is an important crop in India. In terms of area, India rank first followed by china. Total area under onion in India was 1.064 million ha. which is 25.78 per cent of the total area under onion in the world in 2012 (FAO). Share of the area under onion to the total area under vegetables grown in India in 2012-13 is 12.5 per cent (NHB Report, 2013) depicting its importance. Though India rank first in area under onion, it rank second in production after china. Total production onion in India in 2012 was 15.118 million MT contributing 19.16 per cent to the world production. Share of onion production to the total vegetables production in India in 2012-13 was 10.3 per cent. Productivity of onion in India is low as compared to the world. Productivity of onion in India in 2012 was 14.208 MT/ha while that of world was 19.120 MT/ha.

Onion is cultivated all over the country for the both domestic consumption and as well as for the export purposes. Major onion growing states are Maharashtra, Uttar Pradesh, Karnataka, Gujarat, Bihar, Madhya Pradesh, Tamil Nadu, Rajasthan and Andhra Pradesh. These nine states accounts for 87 per cent of area and production of onion in the country (NHB Report, 2013). Among that Maharashtra and Karnataka account 50 per cent. Maharashtra stands first in both area and production followed by Karnataka. Maharashtra contributes 39 per cent and 33 per cent in area and production, respectively. The average productivity of onion in India is about 14.2 MT/ha it varies between 10 MT/ha in Karnataka to 30 MT/ha in Gujarat. There is scope to further increase in the productivity at the national level.

Objective

To estimate the growth rate in area, production and productivity of onion in India.

Methodology**Compound growth rates**

In order to analyze the changes in area, production and productivity of onion in India, the compound growth rate was used. In the present study, the compound growth rates in area, production and productivity of onion in India were estimated by fitting exponential type of equation

$$Y = ab^t$$

Where,

Y= Area/production/productivity of onion

a= Intercept

b= Regression co-efficient or trend value

t= time variable

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

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Results and Discussion

Growth rates in area, production and productivity of onion in India

An attempt has been made to estimate the growth rates in area, production and productivity of onion in India. The growth rates were estimated with the help of model explained in methodology. The growth rates in area, production and productivity of onion were studied by estimating compound growth rates for Pre-WTO period (1980 to 1995), post-WTO period (1996 to 2012) and entire period (1980 to 2012).

Growth rates in area under onion in India

Among the vegetables onion is an important crop grown in India. In terms of area, India ranks first followed by china. Total area under onion in India was 0.958 million ha which is 25.78 per cent of the total area under onion in the world in 2012 (FAO). Share of the area under onion to the total area under vegetables grown in India in 2012-13 is 12.5 per cent (NHB Report, 2012) depicting its importance. The information on area under onion in major nine onion growing states and country as a whole during pre-WTO and post-WTO periods is presented in Table.

Table shows that the area under onion in India during 1980 was 251400 ha and it has increased to 958680 ha. In 2012. The area under onion in India, during Pre-WTO period has increased from 25, 14, 000 ha to 3,84,600 ha and 4,04,000 ha

to 9,58,680 ha during post-WTO period. The increasing trend in area under onion during both the periods was observed.

The state wise information on area under onion revealed that the area under onion in India is concentrated in nine states i.e., Maharashtra, Karnataka, Gujarat, Madhya-Pradesh, Bihar, Andhra Pradesh, Rajasthan, Tamil-Nadu and Uttar-Pradesh and it accounts to 94.18 per cent of the total area under onion in the country. The area shares of Maharashtra, Karnataka, Rajasthan, Madhya-Pradesh, Andhra Pradesh, Bihar, Tamil-Nadu and Uttar Pradesh were 27.12, 16.64, 14.50, 11.65, 9.04, 5.5, 3.93, 3.00 and 2.77 per cent, respectively in the year 2012. Two states i.e. Maharashtra and Karnataka accounts more than 40 per cent (43.76%). Total Share of these nine states during pre-WTO period was 76.52, 78.87, 80.03 and 85.56 per cent in the year 1980, 1985, 1990 and 1995, respectively. While the total shares of these nine states during post WTO period was 84.65, 86.18, 84.27 and 94.18 per cent during the years 1996, 2000, 2005 and 2012, respectively. The figures depicts that concentration of area under onion in India shows increasing trends during pre and post-WTO period. It means area under onion in India has widely distributed in pre-WTO period than post-WTO period.

The annual compound growth rates in area under onion in major nine onion growing states and country as a whole during pre-WTO and post-WTO periods as well as entire period are estimated and presented in the table.

Table 1: State wise area (ha) under onion in India

S. No.	States	Pre-WTO Period				Post-WTO Period			
		1980	1985	1990	1995	1996	2000	2005	2012
1.	Maharashtra	52300 (20.80)	54000 (19.24)	66500 (22.03)	92060 (23.94)	95500 (23.64)	118100 (26.24)	177000 (25.16)	260000 (27.12)
2.	Karnataka	35500 (14.12)	43800 (15.61)	39300 (13.02)	78800 (20.49)	84600 (20.94)	120300 (26.73)	151000 (21.46)	159600 (16.64)
	Bihar	15100 (6.01)	14500 (5.17)	14100 (4.67)	17500 (4.55)	17500 (4.33)	13800 (3.07)	15900 (2.26)	53020 (5.53)
4.	Andhra-Pradesh	16500 (6.01)	15800 (5.17)	19800 (4.67)	24000 (4.55)	27200 (4.33)	30300 (3.07)	36000 (2.26)	86670 (9.04)
5.	Gujarat	11060 (4.40)	16900 (6.02)	17900 (5.93)	19000 (4.94)	16000 (3.96)	6400 (1.42)	76000 (10.80)	28850 (3.00)
6.	Madhya-Pradesh	13000 (5.17)	13100 (4.67)	17300 (5.73)	21100 (5.49)	21100 (5.22)	19400 (4.31)	37800 (5.37)	111730 (11.65)
7.	Rajasthan	9600 (3.82)	12000 (4.28)	16900 (5.60)	21700 (5.64)	24400 (6.04)	24600 (5.47)	44500 (6.32)	139050 (14.50)
8.	Tamil-Nadu	19700 (7.84)	19800 (7.06)	21300 (7.06)	21400 (5.56)	23800 (5.89)	30900 (6.87)	29200 (4.15)	37700 (3.93)
9.	Uttar-Pradesh	19600 (7.80)	31400 (11.19)	28500 (9.44)	33500 (8.71)	31900 (7.90)	24000 (5.33)	25500 (3.62)	26630 (2.77)
	India	251400 (100)	280600 (100)	301900 (100)	384600 (100)	404000 (100)	450000 (100)	703600 (100)	958680 (100)

Source: www.nhrdf.com

(Figures in parentheses are the percentages to the total)

The area under onion in India has been increased at the rate of 3.61 per cent per annum during the entire period of 33 years. The annual compound growth rate in area under onion in India during pre-WTO period was 3.04 per cent and it was significant at 1 per cent level of significance. However, it increased and became 3.35 per cent per annum during post-WTO period.

The state wise picture of changes in area under onion revealed that at the overall level, growth rates in area under onion in Maharashtra, Karnataka, Bihar, Andhra-Pradesh, Gujarat, Madhya-Pradesh, Rajasthan, Tamil-Nadu and Uttar-Pradesh were 6.94, 5.86, 3.19, 3.99, 5.20, 5.65, 6.33, 1.91 and -0.35

per cent per annum, respectively and were found significant except Uttar-Pradesh. During pre-WTO period, the growth rates were significant except of Tamil Nadu and during post-WTO period the growth rates of area under onion in the states like Maharashtra, Bihar, Andhra-Pradesh, Gujarat, Madhya-Pradesh, Rajasthan, Karnataka and Tamil Nadu were found significant whereas in Uttar-Pradesh found non-significant and negative. Thus, the area under onion in India especially in eight major onion growing states has been increased during pre-WTO and post-WTO period increased but in Uttar-Pradesh it increased during pre-WTO period while declined in post-WTO period.

Table 2: State wise growth rate in area under onion in India

Sr. No.	States	Pre-WTO	Post-WTO	Overall
		Period	Period	Period
1.	Maharashtra	3.70***	10.33***	6.94***
2.	Karnataka	4.27***	4.48***	5.86***
3.	Bihar	1.47***	8.22***	3.19***
4.	Andhra-Pradesh	2.42***	5.07***	3.99***
5.	Gujarat	3.82***	8.05***	5.20***
6.	Madhya-Pradesh	3.16***	9.82***	5.65***
7.	Rajasthan	4.68***	8.98***	6.33***
8.	Tamil-Nadu	1.25NS	1.68***	1.91***
9.	Uttar-Pradesh	3.07***	-0.88NS	-0.35NS
	India	3.04***	3.35*	3.61***

***, ** and * = Significant at 1, 5 and 10 Per cent level of probability, respectively.

Growth rates in production of onion in India

Production figures of onion in major nine onion growing states and country as a whole during pre-WTO and post-WTO periods presented in Table.

Table shows that the production of onion in India in 1980 was 25,04,300 MT and it has increased to 1,63,08,990 MT in 2012. The production of onion in India, during pre-WTO period has increased from 25,04,300 MT to 40,80,000 MT and 41,80,000 MT to 1,63,08,990 MT during post-WTO period. The increasing trend in area under onion during both the periods was observed.

The state wise information revealed that the production of onion in India is concentrated in nine states i.e., Maharashtra, Karnataka, Gujarat, Madhya Pradesh, Bihar, Andhra Pradesh, Rajasthan, Tamil Nadu and Uttar Pradesh and it accounts to 83.54 per cent of the total production of onion in the country in 2012. The production shares of Maharashtra, Madhya Pradesh, Karnataka, Andhra Pradesh, Bihar, Gujarat, Rajasthan, Uttar Pradesh and Tamil Nadu were 28.27, 16.50, 12.28, 9.56, 6.79, 4.31, 2.91, 2.29 and 2.63 per cent, respectively in the year 2012. Two states i.e. Maharashtra and

Karnataka account 40 per cent (40.85%). Total Share of these nine states during pre-WTO period was 78.57, 83.56, 85.25 and 86.77 per cent in the year 1980, 1985, 1990 and 1995. While the total shares of these nine states during post-WTO period was 86.77, 89.81, 83.25 and 83.54 per cent during the years 1996, 2000, 2005 and 2012. The figures depicts that concentration of production of onion in India shows increasing trends during pre-WTO period while fluctuating during post-WTO period.

The annual compound growth rates in production of onion in major nine onion growing states and country as a whole during pre-WTO and post-WTO periods as well as entire period are estimated and presented in Table.

Production of onion in India has been increased at the rate of 6.18 per cent per annum during the entire period of 33 years. The annual compound growth rate in production of onion in India during pre-WTO period was 3.32 per cent and it was significant at 1 per cent level of significance. However, it increased and became 11.12 per cent per annum during post-WTO period.

Table 3: State wise production (MT) of onion in India.

S. No.	States	Pre-WTO Period				Post-WTO Period			
		1980	1985	1990	1995	1996	2000	2005	2012
1.	Maharashtra	684300 (27.33)	643000 (22.46)	804000 (24.92)	1120500 (27.46)	1189100 (28.45)	1687500 (35.74)	2469000 (26.18)	4660000 (28.57)
2.	Karnataka	227300 (9.08)	196100 (6.85)	251000 (7.78)	440300 (10.79)	558600 (13.36)	665400 (14.09)	870000 (9.22)	2395900 (12.28)
3.	Bihar	100300 (4.01)	119400 (4.17)	117000 (3.63)	137300 (3.37)	137300 (3.28)	140800 (2.98)	128100 (1.36)	1107840 (6.79)
4.	Andhra-Pradesh	114700 (4.58)	163900 (5.73)	176200 (5.46)	373600 (9.16)	369000 (8.83)	536500 (11.36)	696000 (7.38)	1560060 (9.56)
5.	Gujarat	249200 (9.95)	477700 (16.69)	463600 (14.37)	444000 (10.88)	433000 (10.36)	131200 (2.78)	2128000 (22.56)	704380 (4.31)
6.	Madhya-Pradesh	134600 (5.37)	135800 (4.74)	204400 (6.34)	235400 (5.77)	279700 (6.69)	272700 (5.78)	572000 (6.06)	2691000 (16.50)
7.	Rajasthan	28400 (1.13)	46800 (1.63)	121600 (3.77)	161700 (3.96)	205800 (4.92)	165100 (3.50)	427200 (4.53)	476210 (2.91)
8.	Tamil-Nadu	396400 (15.83)	198900 (6.95)	207900 (6.44)	231500 (5.67)	271700 (6.50)	302800 (6.41)	233800 (2.48)	429720 (2.63)
9.	Uttar-Pradesh	32400 (1.29)	410500 (14.34)	404700 (12.54)	396100 (9.71)	412400 (9.87)	338200 (7.16)	328200 (3.48)	474010 (2.90)
10.	India	2504300 (100)	2862700 (100)	3226200 (100)	4080000 (100)	4180000 (100)	4721100 (100)	9432500 (100)	16308990 (100)

Source: www.nhrdf.com

(Figures in parentheses are the percentage to the total)

Table 4: Growth rates in production of onion in India

S. No.	States	Pre-WTO Period	Post-WTO Period	Overall Period
1.	Maharashtra			
2.	Karnataka	4.87***	12.53***	7.93***
3.	Bihar	2.66***	15.40***	5.64***
4.	Andhra-Pradesh	6.95***	7.31***	7.40***
5.	Gujarat	4.07***	7.75***	5.39***
6.	Madhya-Pradesh	3.66***	13.30***	7.62***
7.	Rajasthan	11.98***	10.84***	9.62***
8.	Tamil-Nadu	0.49NS	3.32***	1.85***
9.	Uttar-Pradesh	1.45*	1.11NS	-0.37NS
	India	3.32***	11.12***	6.18***

***, ** and * = Significant at 1, 5 and 10 Per cent level of probability, respectively.

As regards the growth rates of onion production in major onion growing states, the significant increase in the production of onion in Maharashtra, Karnataka, Bihar, Andhra Pradesh, Gujarat, Madhya Pradesh, Rajasthan and Tamil Nadu was noticed and it was 6.78, 7.93, 5.64, 7.40, 5.39, 7.62, 9.62 and 1.85 per cent per annum, respectively during the entire period. But in Uttar Pradesh onion production declined during the same period and growth rate was -0.37 and non-significance. During pre-WTO period, the annual growth rates in onion production in Maharashtra, Karnataka, Bihar, Andhra Pradesh, Gujarat, Madhya-Pradesh, Rajasthan, and Tamil Nadu were 3.02, 4.87, 2.66, 6.85, 4.07, 3.66, 11.98 and 1.45 per cent, respectively and were significant. However, in case Uttar Pradesh it was 0.49 per cent, respectively but non-significant. The annual growth rate in onion production in Maharashtra (12.64%), Karnataka (12.53%), Bihar (15.40%), Andhra Pradesh (7.31%), Gujarat (7.75%), Madhya Pradesh (13.30%), Rajasthan (10.40%) and Tamil Nadu (3.32), was significant and it was non-significant in Uttar-Pradesh (1.11%) during post-WTO period.

Growth rates in productivity of onion in India

Productivity is the most important criteria for measuring

growth of any crop output. The success or failure of any improvement in the art of agriculture is measured by the resultant increase or decrease in the productivity. The productivity of onion in India is presented in Table.

The productivity of onion in 1980 was 9.96 tonnes/ha and it increased to 17.01 tonnes/ha in 2012. The productivity of onion has increased by 8.95 tonnes/ha during the period under study but still it lag behind the world's onion productivity (19.12 tonnes/ha). The state wise picture of productivity of onion revealed that the Gujarat ranks 1st with a productivity of 24.42 tonnes/ha during 2012. Onion productivity in the states like Madhya Pradesh, Bihar, Andhra Pradesh, Maharashtra and Uttar Pradesh was 24.08, 20.98, 10.09, 18.00, 17.92, and 17.80 tonnes/ha, respectively which is above the national level of onion productivity i.e. 17.02 tonnes/ha. While the onion productivity in the states like Karnataka, Tamil Nadu and Rajasthan was 15.02, 11.40 and 3.42 tonnes/ha, respectively and it was below national level productivity in 2012.

The annual compound growth rates in productivity of onion in major nine onion growing states and country as a whole during pre-WTO and post-WTO periods as well as overall period are estimated and given in Table.

Table 5: State wise productivity (tonnes/ha) of onion in India

S. No.	States	Pre-WTO Period					Post-WTO Period		
		1980	1985	1990	1995	1996	2000	2005	2012
1.	Maharashtra	13.08	11.91	12.09	12.10	12.45	14.29	13.95	17.92
2.	Karnataka	6.40	4.48	6.39	5.59	6.60	5.53	5.76	15.01
3.	Bihar	6.64	8.23	8.30	7.85	7.85	10.20	8.06	20.98
4.	Andhra-Pradesh	6.95	10.37	8.90	15.57	13.57	17.71	19.33	18.00
5.	Gujarat	21.48	28.27	25.90	23.37	27.06	20.50	28.00	24.42
6.	Madhya-Pradesh	10.35	10.37	11.82	11.16	13.26	14.06	15.13	24.08
7.	Rajasthan	2.69	3.90	7.20	7.45	8.43	6.71	9.60	3.42
8.	Tamil-Nadu	20.12	10.05	9.76	10.82	11.42	9.80	8.01	11.40
9.	Uttar-Pradesh	16.53	13.07	14.20	11.82	12.93	14.09	12.87	17.80
10.	India	9.96	10.20	10.68	10.60	10.34	10.49	13.40	17.01

Source: www.nhrdf.com

Table 6: Growth rate of productivity of onion in India

S. No	States	Pre-WTO Period	Post-WTO Period	Overall Period
1.	Maharashtra			
2.	Karnataka	0.58 ^{NS}	7.69***	1.94***
3.	Bihar	1.17**	6.53***	2.36***
4.	Andhra-Pradesh	4.42***	1.14***	3.27***
5.	Gujarat	3.09 ^{NS}	-0.27NS	0.18NS
6.	Madhya-Pradesh	0.17NS	3.71***	2.03***
7.	Rajasthan	6.97***	6.88***	3.09***
8.	Tamil-Nadu	-0.79 ^{NS}	1.60**	-0.05NS
9.	Uttar-Pradesh	-1.56NS	2.00***	-0.02 ^{NS}
10.	India	0.41**	3.95***	1.45***

***, ** and * = Significant at 1, 5 and 10 Per cent level of probability, respectively.

The annual growth rate in onion productivity during pre-WTO period was 0.41 per cent and it was significant at 5 per cent level of significance. During post-WTO period and then overall period the annual growth rate of onion productivity in India was 3.95 and 1.45 per cent per annum and it was significant at 1 per cent level of significance. For the overall period, annual compound growth rate was significant in Karnataka (1.94%), Bihar (2.36%), Andhra Pradesh (3.37%), Madhya Pradesh (2.03%) and Rajasthan (3.09%) while in Gujarat (0.18%) positive growth was observed trend but it was non-significant and in Tamil Nadu (-0.05%) and Uttar Pradesh (-0.02%) it was found negative and non-significant. During pre-WTO period positive significant growth rates

were observed in Bihar (1.17%), Andhra Pradesh (4.42%) and Rajasthan (6.79%). In Karnataka, Gujarat and Madhya Pradesh growth rate was positive but non-significant. While in Maharashtra, Uttar Pradesh and Tamil Nadu negative and non-significant growth rate was recorded during pre-WTO period.

During post-WTO period, significant positive growth rate were observed in the Maharashtra (1.18%), Karnataka (7.69%), Bihar (6.53%), Andhra Pradesh (1.14%), Madhya Pradesh (3.71), Rajasthan (6.68%), Uttar Pradesh (2.00%). and Tamil-Nadu (1.60) and Gujarat negative but non-significant growth rates in onion productivity during post-WTO period.

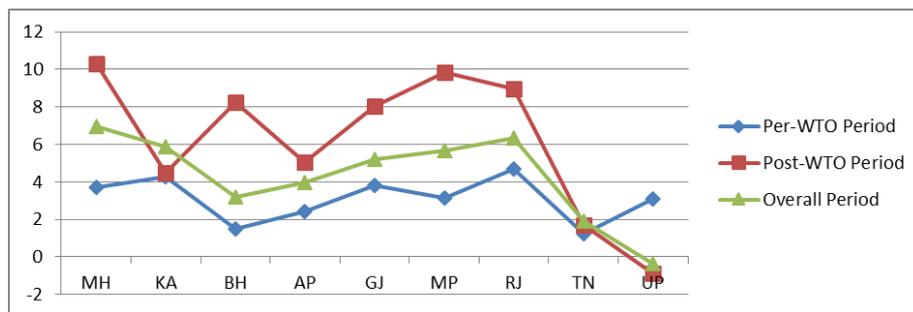


Fig 1: Growth rates of area in major onion producing states

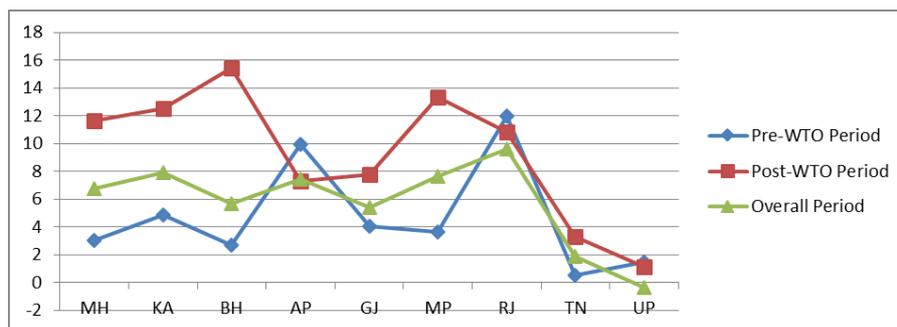


Fig 2: Growth rates of onion production in major onion Producing states

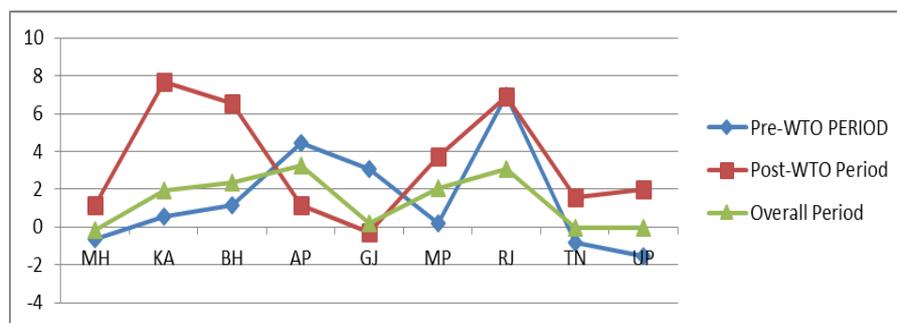


Fig 3: Growth rates of onion productivity in major onion producing states

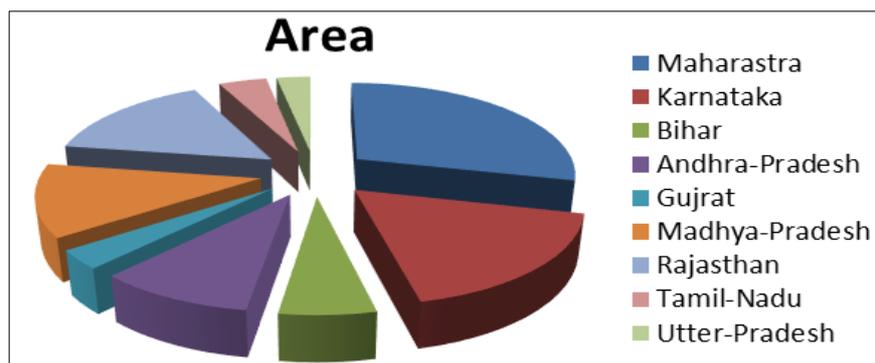


Fig 4: State wise area (ha) of onion in India (2012)

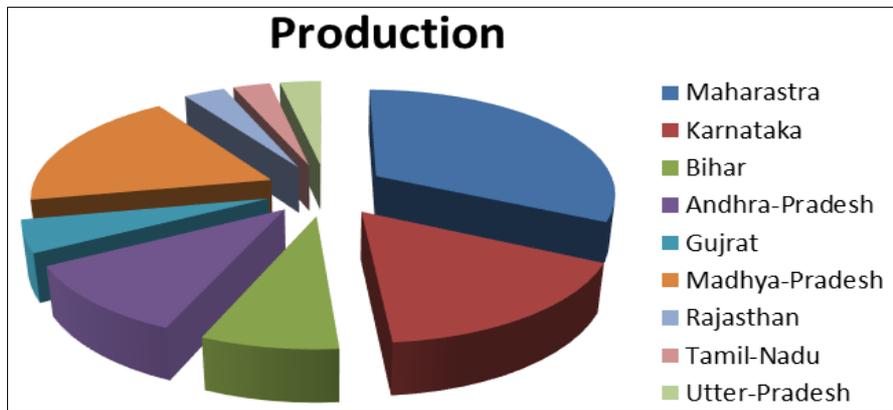


Fig 5: State wise production (tonnes) of onion in India (2012)

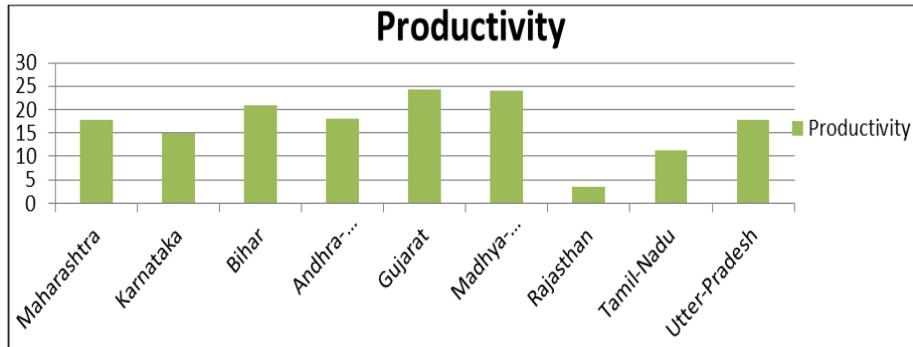


Fig 6: State wise productivity (tonnes/ha) of onion in India (2012)

Conclusion

The area under onion in India has been increased at the rate of 3.61 per cent per annum during the entire period of 33 years. The annual compound growth rate in area under onion in India during pre-WTO period was 3.04 per cent and it increased to 3.35 per cent per annum during post-WTO period. The state wise picture of changes in area under onion revealed that the area under onion in Maharashtra, Karnataka, Bihar, Andhra Pradesh, Gujarat, Madhya Pradesh, Rajasthan and Tamil Nadu has increased at the rate of 6.94, 5.86, 3.19, 3.99, 5.20, 5.65, 6.33 and 1.91 per cent per annum, respectively. The area under onion in Uttar-Pradesh (-0.3.5%) has been declined during the entire period. The highest growth rate in area was registered by Maharashtra (6.94 per cent) followed by Rajasthan (6.33 per cent). During pre-WTO period the highest growth in area under onion was registered by Rajasthan (4.68%) followed by Karnataka (4.27%) while during post-WTO period highest growth rate in area was observed in Maharashtra (10.33%) followed by Madhya Pradesh (9.82%).

The production of onion in India has been increased at the rate of 6.18 percent per annum during the entire period. The annual compound growth rate in production of onion in India during pre-WTO and post-WTO periods was 3.32 and 11.12 per cent, respectively. As regards the state wise onion production, the significant increase in Maharashtra, Karnataka, Bihar, Andhra Pradesh, Gujarat, Madhya Pradesh, Rajasthan and Utter Pradesh was observed and it was 3.02, 4.87, 2.66, 6.95, 4.07 11.98, and 1.45 per cent, respectively during pre-WTO period, However, in Tamil Nadu it was non-significant during pre-WTO period and onion production in Uttar Pradesh (1.11%) was non-significant but positive and has been declined during post-WTO period. The highest growth rate in onion production during pre and post-WTO period was in Bihar (15.40%) and Madhya Pradesh (13.30%),

respectively. While during overall period it was registered highest in Rajasthan (9.62%).

The annual growth rate of onion productivity was 1.45 per cent during entire period and in pre-WTO and post-WTO periods it was 0.41 and 3.95 per cent, respectively. The highest increase in onion productivity was in Andhra-Pradesh (3.27%) followed by Rajasthan (3.09%) during entire period and declined in Tamil Nadu and Uttar Pradesh at the rate of -0.05 and -0.02 per cent per annum, respectively during the entire period. Karnataka, Bihar, Andhra Pradesh, Gujarat, Madhya Pradesh and Rajasthan registered significant annual growth rate in onion productivity during entire study period. During pre-WTO period, the significant positive growth rates were observed in Andhra Pradesh, Bihar and Rajasthan. While in Uttar Pradesh, onion productivity has non-significant declined positively. During post-WTO period, significant positive annual growth rates were observed in Maharashtra, (1.18%), Karnataka, (7.69%), Bihar, (6.53%), Andhra Pradesh (1.14%), Madhya Pradesh (3.71%), Rajasthan (6.68%) and Uttar-Pradesh (2.00%).

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