



TRENDS IN AREA, PRODUCTION AND PRODUCTIVITY OF GRAPES IN MAHARASHTRA

Shinde V. A.¹, S. V. Satpute² and Bhosale A. B.³

1,3 Associate Professors of Agricultural Economics,

2 Junior Research Assistant, 97, Ravivar Peth, Zonal Agricultural Research Station, Solapur Maharashtra

Received: 30/01/2017

Edited: 06/02/2017

Accepted: 15/02/2017

Abstract: Grape is the most important fruit of India and scientifically is called *Vitis vinifera* L. and is also known as 'queen of fruits.' In India, mainly Maharashtra, Karnataka, Andhra Pradesh and Tamil Nadu jointly contribute to more than 90 per cent of the total area and production of grapes. Total export of grapes from India is 172.6 thousand MT, during 2012-13. Maharashtra is ranked first in production of grapes, producing about 62.7% of the total production of grapes in the country. The main objectives of the study were to study the changes in area, production and productivity of grapes and to estimate the growth rates in area, production and productivity of grapes in Maharashtra. The present study used the data for the period of 10 years i.e. from 2003-2004 to 2012-2013.

The area under grapes in Maharashtra has increased by 82.68 per cent over the base year. The annual compound growth rate in area in Maharashtra has shown increasing trend (6.68 per cent). Area under grapes has increased in Nasik district and declined in Sangli and Solapur districts. The highest annual increase in acreages was noticed in Osmanabad, Jalana and Ahmednagar districts.

The production of grapes in Maharashtra has increased by 40.29 per cent over the base year. The annual growth rates in production of grapes in Maharashtra has shown increasing trend (6.38 per cent). The increase in production of grapes in Maharashtra was only due to increase in area under grapes. The productivity of grapes has increased in Marathwada region by 63.16 per cent and it has declined by 25.38 per cent in Western Maharashtra.

Introduction

Grape is the most important fruit of India and scientifically is called *Vitis vinifera* L. and is also known as 'queen of fruits'. The country has the distinction of achieving the highest productivity of grapes among the 90 grape growing countries in the world, with an average yield of 30 t/ha. The grape is cultivated in the largest area i.e. 250 thousand ha and the production is around 2689 thousand tons in 2012-2013. Major grape-growing states in India are Maharashtra, Karnataka, Andhra Pradesh, Tamil Nadu, Punjab, Haryana, western Uttar Pradesh, Rajasthan and Madhya Pradesh. In India, mainly Maharashtra, Karnataka, Andhra Pradesh and Tamil Nadu jointly contribute to more than 90 per cent of the total area and production of grapes.

Total export of grapes from India is 172.6 thousand MT, valuing Rs. 1258.64 crores during 2012-13. The grape export from India was started in the year 1991 after economic liberalization. There is a phenomenal rise in export of grapes from India, as only 14,606 tons were exported during 2001-2002

which has increased to 17,25,999 tons in 2012-2013. The major importing countries of India's grapes were Bangladesh, Netherland, UAE, UK, Russia, Saudi Arabia, Thailand, Sweden, New Zealand, Malaysia, Australia, Shrilanka and Nepal respectively; these countries alone comprises of around 87 per cent of India's total export of grape. (Gaikwad, 2014)

Maharashtra is ranked first in production of grapes, producing about 62.7% of the total production of grapes in the country. Grapes are grown in an area of 0.09 m. ha, mainly in Ahmednagar, Nasik, Pune, Solapur, Sangli and Satara districts. In fact, grape cultivation is chiefly confined to Deccan Plateau in Western Maharashtra because of the congenial agro-climatic conditions prevailing in this region. About 600 hectares are added to grape acreage in Maharashtra every year (Shah, 1998). Nasik district of Maharashtra is the largest producer of grapes in the country. An earlier study conducted on horticulture industry of Maharashtra has shown significant growth in output and acreage under

grapes in Maharashtra (Shah, 1998). Among various fruits and vegetables, Indian grapes are highly competitive in the world market (Gulati and others, 1994). The total production of grapes is 0.77m. MT, which is highest in the country. The productivity is 9.0 t/ha. Thompson seedless is the main variety of table grapes being cultivated. An AEZ has been established for grapes covering the Districts of Nasik, Pune, Kohlapur, Satara and Sangli. The present strategy is to diversify into wine production. A number of wineries have come up at Sangli and adjoining areas and Maharashtra is now producing wines of international quality. There is a lack of adequate quantity of planting material for wine variety. Occurrence of frequent droughts has been affecting the performance of the crop. About 1.43 lakh MT of grapes have been traded in organized markets with average price of Rs. 19.14/kg.

The climate of Maharashtra is conducive for horticulture, as inadequate rainfall does not have an adverse effect on production of fruits. The horticulture scheme that became effective in Maharashtra from 1990s onwards has helped in the transformation of the drought-prone as well as rain-shadow regions. Fruit production constitutes 25 per cent of the total agricultural produce in the State. Approximately, 103 lakh tons of fruits are produced every year. Maharashtra ranks first in the country in the production of fruits. Grapes are among the major fruits grown in Maharashtra and areas under grapes have increased in the state. Therefore, the per cent changes in area, production and productivity of grapes were worked out. Also, the compound growth rates were worked out.

Objectives

1. To study the changes in area, production and productivity of grapes in Maharashtra
2. To estimate the growth rates in area, production and productivity of grapes in Maharashtra

Methodology

Grape is the major fruit grown in Maharashtra. Grapes are grown in every district of Western Maharashtra and Marathwada regions.

Hence, this fruit crop has been considered for the study. The present study used the data on area, production and productivity of grape for the period of 10 years i.e. from 2003-2004 to 2012-2013.

Methods of analysis

Temporal changes in area under grape in Nasik, Pune and Kolhapur divisions of Western Maharashtra region and Aurangabad and Latur divisions of Marathwada region have been worked out.

Growth rates analysis

Compound Growth Rates (CGR): Compound growth rates were estimated to study the percentage increase or decrease in the selected parameter. The following exponential growth function was used.

$$Y = ab^x e$$

Where,

- Y = Dependent variable for which growth is estimated
- a = Intercept or constant
- b = Regression / trend coefficient
- x = Period (in years)
- e = Error terms with zero mean and constant variance
- CGR = (Antilog b – 1)*100

The data on area, production and productivity of grapes in five divisions and two regions of Maharashtra were collected from the office of Directorate of Horticulture, Pune for the period of 10 years i.e. from 2003-04 to 2012-13 and used for estimating the compound growth rates. The simple tabular analysis was done for obtaining the results on changes in area, production and productivity of grapes and grapes.

Results

1.1 Area, production and productivity of grapes in Maharashtra

The year wise data on area, production and productivity of grape in Maharashtra for the period of last ten years i.e. from 2003-2004 to 2012-2013 have been analyzed and triennial averages are worked out and are shown in Table 1.

Table 1 Triennial averages of area, production and productivity of grape in Maharashtra

(Area in ha, Production in '00' Tons and Productivity in tons/ha.)

Sr. No.	Division/ Region	Triennium ending								
		2005-06			2008-09			2012-13		
		A	P	Y	A	P	Y	A	P	Y
1	Nasik	25854	7669	29.73	32880	9802	29.84	33870	11371	33.54
2	Pune	3989	796	19.94	4011	1059	26.13	4029	925	23.58
3	Kolhapur	6330	1608	25.31	7206	1757	24.06	1761	589	33.06
I	West. Maharashtra	36173	10073	27.86	44097	12618	28.56	39659	12886	30.07
4	Aurangabad	364	109	29.71	165	60	35.02	508	157	31.75
5	Latur	873	254	29.92	1846	379	23.01	2962	849	29.58
II	Marathwada	1238	364	29.62	2010	439	23.93	3470	1004	29.47
III	Maharashtra	37411	10437	27.91	46107	13057	28.29	43130	13890	30.36

The area under grapes in Maharashtra was 37,411 hectares during TE 2005-06 and it increased to 43,130 hectares during TE 2012-13 while the production of grape has increased from 10.43 to 13.89 lakh tons and productivity of grapes has increased from 27.91 to 30.36 tons/ha. during a period of last 10 years. Among the regions, the area under grapes in Western Maharashtra and Marathwada regions was 36,173 and 1,238 hectares, respectively during the TE 2005-06. The area under grapes has increased in Western Maharashtra and Marathwada regions over a period of time. The division wise analysis revealed that Nasik division ranked the first with a 25 to 33 thousand hectares followed by Pune division (3.9 to 4.0 thousand hectares) and least area was recorded in Aurangabad and Latur divisions.

The production of grapes in Western Maharashtra and Marathwada regions was 10.07 and 0.36 lakh tons, respectively during TE 2005-06 and it has increased in both the regions from 12.88 to 1.00 lakh tons during TE 2012-13. The production of grapes in Western Maharashtra and Marathwada regions has increased drastically by 0.25 and 1.25 times, respectively during the period of study. The highest production of grapes was recorded in Nasik division and it was 7.66 lakh tons during TE 2005-06 and it has increased to 11.37 lakh tons during the study period. The production of grapes has declined in Kolhapur division and it was largely due to decrease in the area under grapes in this division. Thus, the production of grapes in Maharashtra has

increased due to increase in the area under grapes as well as improvement in the productivity of grapes.

The productivity of grapes in Maharashtra was 27.91 tons/ha during TE 2005-06 and it has increased to 30.36 tons/ha during TE 2012-13. The productivity of grapes during TE 2005-06 was highest in Marathwada region and it was followed by Western Maharashtra region. However, the productivity of grapes during TE 2012-13 was observed highest in Western Maharashtra region. Among the divisions, the yield of grapes was observed highest i.e. 29.92 tons/ha in Latur division and it was followed by Nashik (29.73 tons/ha), Aurangabad (29.71 tons/ha) and Kolhapur (25.31 tons/ha) divisions during TE 2005-06. However, the yield of grapes has declined in Latur division (29.58 tons/ha) during TE 2012-13.

Karpagam et al. (2010), studied the status of grape sector in India and also its share in world production. In India, grapes occupied the 33 fifth position amongst fruit crops with a production of 1.08 MT. Trend analysis of area and production of different states showed that Maharashtra ranked first in the area and production of grapes followed by Karnataka and Tamil Nadu. World production of grapes had increased from 43 million tonnes in 1961 to 61 million tonnes in 2003 whereas India's share in world production had increased from 0.16 per cent in 1961 to 2 per cent in 2003.

District wise area, production and productivity of grapes in Maharashtra

The year wise data on area, production and productivity of grapes in 17 major grape growing districts of Maharashtra for the period of last ten years i.e. from 2003-04 to 2012-13 have been analyzed and triennial averages are worked out and are presented in Table 2.

The highest area under grapes was noticed in Nasik district i. e. 25.74 thousand hectares during TE 2005-06 and it has increased to 33.83 thousand hectares during TE 2012-13 while the production of grapes has increased from 7.63 to 11.36 lakh tons and productivity of grapes has increased from 29.71 to 33.58 tons/ha. during a period of last 10 years.

Sangli district ranks second in the area and production of grapes and it was 5.87 thousand hectares and 1.42 lakh tons, respectively during TE 2005-06. The area under grapes has declined in Sangli district over a period of time. Solapur district ranks third in the area and production of grapes and it was 2.64 thousand hectares and 0.35 lakh tons, respectively during TE 2005-06. The area under grapes has declined in Solapur district while production and productivity has increased over a period of time. Osmanabad and Pune districts stands fourth and fifth in the area under grapes while the production and productivity of grapes increased in Osmanabad district and decreased in Pune district.

Table 2 Triennial averages of district wise area, production and productivity of grapes

(Area in ha., Production in "00"Tons and Productivity in tons/ha.)

Sr. No.	Districts	Triennium ending								
		2005-06			2008-09			2012-13		
		A	P	Y	A	P	Y	A	P	Y
1	Nasik	25743.33	7632.05	29.71	32806.67	9781.38	29.84	33838.75	11362.16	33.58
2	Dhule	93.00	33.00	32.99	54.33	16.21	30.75	17.75	5.12	29.39
3	Jalgaon	17.67	4.52	25.49	19.00	4.78	25.28	13.75	3.87	28.79
4	Ahmednagar	442.00	149.41	32.45	813.33	205.94	24.53	1159.90	272.96	23.52
5	Pune	906.33	288.99	31.43	1289.67	378.39	28.22	1032.84	159.74	18.17
6	Solapur	2640.67	357.34	13.62	1907.67	474.58	24.54	1836.00	492.53	27.00
7	Satara	353.33	147.10	41.62	399.67	105.83	26.12	526.07	173.17	32.88
8	Sangli	5875.33	1428.39	24.21	6670.00	1605.64	23.55	1024.04	342.50	33.06
9	Kolhapur	101.67	32.48	31.39	136.67	45.35	32.96	210.50	73.75	33.48
10	Jalana	118.33	33.08	27.87	99.67	35.44	34.87	304.13	101.75	34.01
11	Beed	178.67	49.51	27.72	39.00	15.25	33.89	147.43	41.40	31.40
12	Aurangabad	67.67	26.63	37.15	26.00	9.79	35.65	56.50	14.13	25.08
13	Latur	310.33	87.70	30.02	534.33	135.24	25.60	703.84	215.92	30.47
14	Osmanabad	444.67	146.13	32.73	1203.67	218.46	22.11	2258.14	630.95	29.72
15	Nanded	48.67	8.50	17.76	45.00	9.67	21.72	NA	NA	NA
16	Parbhani	57.67	9.07	16.17	50.67	11.95	23.88	NA	NA	NA
17	Hingoli	12.00	3.12	25.97	12.00	3.61	30.12	NA	NA	NA

Next to these four major grape growing districts, grapes are grown in Ahmednagar, Satara, Latur and Jalana districts on nearby 500 hectares acreages in each district. The area under grapes has declined in Sangli and Solapur districts while it has increased in Osmanabad, Latur and Jalana districts. The productivity of grape was found relatively more in Nasik, Sangli, Jalana and Kolhapur districts while

it was low in case of Nanded, Parbhani and Hingoli districts.

(Shah, 1998) studied the trends in area, production and productivity of Grapes in Maharashtra. The highest area under grapes was noticed in Nasik district, more than 50 % area under grape cultivation in the state was accounted by Nasik. Ahmednagar, Pune, Solapur and Sangli districts were

identified as important grape growing districts of Maharashtra. As for the productivity is concerned Solapur district recorded the highest.

2. Changes in area, production and productivity of grapes in Maharashtra

The year wise data on area, production and productivity grapes in Maharashtra for the period of last ten years i.e. from 2003-04 to 2012-13 have been analyzed and division wise and region wise changes in area, production and productivity grapes in Maharashtra over a period of ten years have been worked out and are shown in Table 3.

The area under grapes in Maharashtra has increased by 82.68 per cent over the base year. Among the regions, the area under grapes has increased in Western Maharashtra and Marathwada regions by 84.14 and 46.92 per cent, respectively over the base year. The division wise analysis depicted that the highest increase (117.9 per cent) in acreages under grapes was recorded in Nashik division and it was followed by Aurangabad (61.29 per cent), Latur (42.59 per cent) and Pune (34.28 per cent) divisions. The area under grapes has declined in Kolhapur (24.92 per cent), division.

Table 3 Changes in area, production and productivity of Grapes in Maharashtra

(Area in ha, Production in '00' Tons and Productivity in tons/ha.)

Sr. No.	Division/Region	2003-04			2012-13			Percentage change		
		A	P	Y	A	P	Y	A	P	Y
1	Nashik	25062	7353.93	29.34	54407	11918.94	36.18	117.09	62.08	23.30
2	Pune	3661	637.80	17.42	4916	770.32	15.67	34.28	20.78	-10.06
3	Kolhapur	5899	1409.93	23.90	4428	1448.47	32.71	-24.92	2.73	36.84
I	West. Mah.	34622	9401.66	27.16	63751	12918.94	20.26	84.14	37.41	-25.38
4	Aurangabad	303	81.30	26.83	488	132.87	27.19	61.29	63.43	1.33
5	Latur	1007	198.56	19.72	1435	537.99	37.47	42.59	170.95	90.01
II	Marathwada	1310	279.86	21.36	1924	670.86	34.86	46.92	139.71	63.16
III	Maharashtra	35952	9686.89	26.94	65676	13589.80	20.69	82.68	40.29	-23.20

The production of grapes in Maharashtra has increased by 40.29 per cent over the base year. Among the regions, the production of grapes has increased in Marathwada and Western Maharashtra regions by 139.71 and 37.41 per cent, respectively over the base year. The division wise analysis depicted that the highest increase (170.95 per cent) in production of grapes was recorded in Latur division and it was followed by Aurangabad (63.43 per cent) and Nashik (62.08 per cent) divisions. The production of grapes has increased slightly in Kolhapur (2.73 per cent) and Pune (20.78 per cent) divisions.

The productivity of grapes in Maharashtra has decreased by 23.20 per cent over the base year. Among the regions, the productivity of grapes has increased in Marathwada region by 63.16 per cent and it has declined by 25.38 per cent in Western Maharashtra region over the base year. The division wise analysis revealed that the highest increase (90.01

per cent) in productivity of grapes was recorded in Latur division and it was followed by Kolhapur (36.84 per cent) and Nashik (23.30 per cent) divisions. The productivity of grapes has declined in Pune (10.06 per cent) division.

The similar study was conducted by Thorat et al (2009).the results revealed that area under grape in Maharashtra increased from 17.1 thousand hectares in 1991-92 to 38.38 thousand hectares in 2004-05 at a growth rate of 5.57 per cent .The production of grape in Maharashtra went up to 1275 thousand tonnes in 2006-07 from a mere production of 341.5 thousand tonnes in 1991-92 at a growth rate of 10.86 per cent annually. The productivity of grapes increased from 19952 Kg/ha. in 1991-92 to 30737 Kg/ha. in 2004-05 at an annual compound growth rate of 5.88 percent.

3. District wise changes in area, production and productivity of grapes in Maharashtra

The year wise data on area, production and productivity grapes in Maharashtra for the period of last ten years i.e. from 2003-2004 to 2012-2013 have been analyzed and district wise changes in area, production and productivity of grapes in Maharashtra over a period of ten years have been worked out and are given in Table 4.

The district wise analysis revealed that the highest increase (241.39 per cent) in area under grapes was recorded in Ahmednagar district and it was followed by Jalana (230.34 per cent), Aurangabad (132.43 per cent), Osmanabad (129.22 per cent), Nasik (117.55 per cent) and Pune (117.27 per cent) districts. The area under grapes has declined in Jalgaon (61.11 per cent), Dhule (42.31 per cent), Beed (38.59 per cent) and Sangli (28.82 per cent) and Solapur (20.26 per cent) districts.

Table 4 Changes in area, production and productivity of Grapes in Maharashtra

(Area in ha., Production in "00" Tons and Productivity in tons/ha.)

Sr. No.	Districts	2003-04			2012-13			Percentage change		
		A	P	Y	A	P	Y	A	P	Y
1	Nasik	24992	7335.15	29.3	54370	10690	19.7	117.55	45.74	-33.01
2	Dhule	52	13.95	26.8	30	8	26.7	-42.31	-42.65	-0.60
3	Jalgaon	18	4.83	26.8	7	2.15	30.7	-61.11	-55.49	14.46
4	Ahmednagar	331	70.74	21.4	1130	240	21.2	241.39	239.27	-0.62
5	Pune	822	172.02	20.9	1786	118.62	15.8	117.27	-31.04	-24.50
6	Solapur	2508	395.04	15.8	2000	411.7	20.6	-20.26	4.22	30.69
7	Satara	347	146.02	42.1	411.86	133.47	32.4	18.69	-8.59	-22.99
8	Sangli	5465	1243.12	22.7	3890	1280	31.5	-28.82	2.97	38.31
9	Kolhapur	87	20.79	23.9	127	35	27.6	45.98	68.35	15.33
10	Jalana	89	23.88	26.8	294	68	23.1	230.34	184.76	-13.80
11	Beed	177	47.49	26.8	108.7	46.25	42.5	-38.59	-2.61	58.58
12	Aurangabad	37	9.93	26.8	86	18.62	21.7	132.43	87.51	-19.33
13	Latur	435	91.02	20.9	443.37	119.9	27	1.92	31.73	29.24
14	Osmanabad	433	88.69	20.5	992.54	418.09	42.1	129.22	371.41	105.65
15	Nanded	48.67	8.50	17.7	NA	NA	NA	-	-	-
16	Parbhani	57.67	9.07	16.1	NA	NA	NA	-	-	-
17	Hingoli	12.00	3.12	25.9	NA	NA	NA	-	-	-

The district wise production of grapes in Maharashtra has showed that the highest increase (371.41 per cent) in production of grapes was recorded in Osmanabad district and it was followed by Ahmednagar (239.27 per cent), Jalana (184.76 per cent), Aurangabad (87.51 per cent), Kolhapur (68.35 per cent) and Nasik (45.74 per cent) districts. The production of grapes has declined in Jalgaon (55.49 per cent), Dhule (42.65 per cent), Pune (31.04 per cent), Satara (8.59 per cent) and Beed (2.61 per cent) districts.

The highest increase (105.65 per cent) in productivity of grapes was recorded in Osmanabad district and it was followed by Beed (58.58 per cent),

Sangli (38.31 per cent), Solapur (30.69 per cent), and Latur (29.24 per cent) districts. The productivity of grapes has declined in Nasik (33.01 per cent), Pune (24.50 per cent), Satara (22.99 per cent), Aurangabad (19.33 per cent) and Jalana (13.80 per cent) districts.

5. Growth rates in area, production and productivity of grapes in Maharashtra

The annual compound growth rates in area, production and productivity of grapes in major grape growing divisions, regions and Maharashtra state as a whole were estimated and results are shown in Table 5.

Table 5 Growth rates of area, production and productivity of grapes in Maharashtra

Sr. No.	Division/ Region	Area	Production	Productivity
1	Nasik	9.50***	8.11**	-1.27
2	Pune	0.46	1.44	0.98
3	Kolhapur	-13.06**	-9.68*	3.90**
I	Western Maharashtra	6.28***	5.99**	-0.28
4	Aurangabad	6.11	5.52	-0.56
5	Latur	16.31**	18.15***	1.58
II	Marathwada	14.04**	15.31***	1.11
III	Maharashtra	6.68***	6.38**	-0.28

*, **, *** = Significant at 10, 5 and 1 per cent significance level, respectively

The annual compound growth rates in area and production of grapes in Maharashtra has shown increasing trend during the period of 10 years and it has increased at the rate of 6.68 and 6.38 per cent per annum, respectively. However, the productivity of grapes in Maharashtra has declined by 0.28 per cent per annum over a period of time. The drastic increase in the area under grapes was observed in Marathwada and Western Maharashtra regions i.e. it has increased at the annual growth rates 14.04 and 6.28 per cent, respectively. The area under grapes has increased significantly in Latur and Nasik divisions at the annual growth rate of 16.31 and 9.50 per cent, respectively and in case of Kolhapur division it has decreased significantly at the rate of 13.06 per cent per annum during a period of last ten years.

The production of grapes has significantly increased during the period under study in Maharashtra at the rate of 6.38 per cent per annum and it has significantly increased in Marathwada and Western Maharashtra regions at the rate of 15.31 and 5.99 per cent per annum, respectively. The division wise analysis revealed that the production of grapes has increased significantly in Latur and Nasik divisions at the rate of 18.15 and 8.11 per cent per annum, respectively and it has declined in Kolhapur division at the rate of 9.68 per cent per annum during the study period.

The productivity of grapes has shown positive but non-significant coefficient in Marathwada region and negative but non-significant coefficient in Western Maharashtra region during the period of last 10 years. The productivity of grapes has increased significantly in Kolhapur region at the

annual growth rate of 3.90 per cent. The decline in productivity of grapes was noticed in Aurangabad and Nasik divisions and the annual decline was to the tune of 0.56 and 1.27 per cent, respectively.

Rahane et al. (2000), in their article titled, "Trends in Area, Production and Productivity of Important Fruits and Vegetables in Maharashtra" have examined the performance of fruits and vegetables in 24 Maharashtra. The study involved data on area, production and productivity of crops like coconut, cashew-nut, orange, grape, banana and onion during the period 1983-84 to 1997-98. Annual growth rates were worked out to examine the region-wise performance of major fruits and vegetables grown in Maharashtra. The study brought out that in the case of surveyed crops and non-surveyed fruit crops, in spite of significant increase in area and production, their productivity decreased but in the case of non-surveyed vegetables, productivity remained constant in spite of increase or decrease in area.

6. District wise growth rates in area, production and productivity of grapes

The district wise annual compound growth rates in area, production and productivity of grapes in Maharashtra were estimated and are given in Table 6.

The area under grapes has increased significantly in Osmanabad, Jalana, Ahmednagar, Latur, Nasik, Kolhapur and Satara districts at the annual growth rate of 22.98, 15.51, 14.94, 10.72, 9.55, 8.25 and 5.14 per cent, respectively and in case of Sangli and Dhule districts it has decreased significantly at the rate of 17.33 and 16.63 per cent per annum, respectively.

Table 6 District wise growth rates of area, production and productivity of grapes

Sr. No.	Districts	Area	Production	Productivity
1	Nasik	9.55***	8.16**	-1.27
2	Dhule	-16.63*	-18.41**	-2.13
3	Jalgaon	-5.50	-3.50	2.12*
4	Ahmednagar	14.94***	11.34**	-3.13
5	Pune	1.45	-8.45	-9.76*
6	Solapur	-4.53	3.28	8.19**
7	Satara	5.14***	2.86	-2.17
8	Sangli	-17.33**	-13.57*	4.55*
9	Kolhapur	8.25*	9.64	1.29
10	Jalana	15.51***	16.71**	1.04
11	Beed	-2.35	-1.89	0.47
12	Aurangabad	-1.09	-6.79	-5.76
13	Latur	10.72*	12.50**	1.61
14	Osmanabad	22.98***	23.70***	0.58

*, **, *** = Significant at 10, 5 and 1 per cent significance level, respectively

The production of grapes has significantly increased during the period under study in Osmanabad, Jalana, Latur, Ahmednagar and Nasik districts and it has increased at the rate of 23.70, 16.71, 12.50, 11.34 and 8.16 per cent per annum, respectively and it has not significantly increased in Kolhapur, Solapur and Satara districts of Maharashtra. The production of grapes has declined significantly in Dhule and Sangli districts at the rate of 18.41 and 13.57 per cent per annum, respectively.

The productivity of grapes has significantly declined (9.76 per cent per annum) in Pune district and significantly increased in Solapur and Jalgaon districts during the period of last 10 years and it has increased at the rate of 8.19 and 2.12 per cent per annum, respectively. While in case of Kolhapur, Jalana, Beed, Latur and Osmanabad districts, the growth rates of productivity were positive but not significant. Decline in productivity of grapes was noticed in Aurangabad, Ahmednagar, Dhule, Nasik and Satara districts and the annual decline was to the tune of 5.76, 3.13, 2.13, 1.27 and 2.17 per cent, respectively.

Dahiya et al. (2001), in their study, have examined the growth rates of area, production and yield of fruit crops in Haryana for the period 1990-91 to 1997-98. The results indicated that In the case of mango, citrus and grapes, the area showed the significant increasing trend but production was found to be statistically non-significant. In the case of yield, all crops showed non-significant declining trend. The

annual growth rate for fruit crops under the state registered a positive growth.

Conclusions

1. The area under grapes fluctuated widely during the period under consideration in five divisions and Western Maharashtra and Marathwada regions of Maharashtra. The area under grapes in Maharashtra has increased by 82.68 per cent over the base year. The annual compound growth rate in area under grapes in Maharashtra has shown increasing trend during the period of 10 years and it has increased at the rate of 6.68 per cent.
2. The area under grapes has increased in Western Maharashtra and Marathwada regions. Among the divisions, Nasik division ranked the first in acreages under grapes and it was followed by Kolhapur division. However, area under grapes in Kolhapur division declined over a period of time. Grapes are grown in 17 districts and Nasik, Sangli and Solapur are major grape growing districts. However, area under grapes has increased in Nasik district and declined in Sangli and Solapur districts. The highest annual increase in acreages under grapes was noticed in Osmanabad, Jalana and Ahmednagar districts and area under grapes drastically declined in Sangli district which is major grape growing district.
3. The production of grapes did not show unique pattern during the period under consideration in five divisions and two regions of Maharashtra. The production of grapes in Maharashtra has increased

- by 40.29 per cent over the base year. The annual growth rates in production of grapes in Maharashtra has shown increasing trend and it has increased at the rate of 6.38 per cent. The production increase of grapes in Maharashtra was only due to increase in area under grapes.
4. The increase in production of grapes in Marathwada was more than twice and in Western Maharashtra region marginal decline has noticed during the period of study. The production of grapes increased in Latur and Nasik divisions and decreased in Kolhapur division while in case of Pune division it remained stagnant. Among the 17 grape growing districts, production of grapes has increased in Osmanabad, Ahmednagar and Jalana districts and declined in Sangli and Dhule districts.
 5. There was no unique pattern in case of productivities of grapes during the period under consideration in five divisions and two regions of Maharashtra. The productivity of grapes has increased from 26.94 to 20.69 tons/ha. The productivity of grapes in Maharashtra has declined by 23.20 per cent over the base year. The annual growth rate in productivity of grapes in Maharashtra has shown decreasing trend and it has declined by 0.28 per cent during a period of last ten years.
 6. The productivity of grapes has increased in Marathwada region by 63.16 per cent and it has declined by 25.38 per cent in Western Maharashtra region over the base year. Among the divisions, Latur and Nasik divisions ranked the first in productivity of grapes and lowest productivity was recorded in Pune division. As regards the districts, the highest productivity improvement was noticed in Osmanabad and Solapur districts and it has significantly declined in Pune district.

Suggestions

1. The dismal picture was noticed in major grape growing districts of Maharashtra i.e. productivity of grapes in Nasik district has declined and the area has declined in Sangli and Solapur districts. There is a need to improve the productivity of grapes in major grape producing area i.e. Nasik district and efforts need to be made to arrest the shift in acreages under grapes in Sangli and Solapur districts by finding the reasons thereof.
2. The productivity of grapes was satisfactory in Osmanabad, Jalana and Latur districts of Maharashtra and acreages under grapes in these districts have increased rapidly. Hence, the farmers from these districts may be motivated to go for grape cultivation.

References

1. Dahiya, P.; Malik, D.P.; and Singh, I.J. (2001), "Trend and Growth Rate of Area, Production and Yield of Fruit Crops in Haryana", *The Bihar Journal of Agricultural Marketing*, Vol. 9, No. 2, pp. 170-177.
2. Deepak shah (1998), "Economics of export oriented horticultural crops of Maharashtra" page no. 29 – 30.
3. Gaikwad S. B. and Gaikwad N .S (2014), "Trends in production and exports of grapes in India", *Indian Streams Research Journal*, Volume: IV, Issue: II, March – 2014.
4. Karpagam, C.; Theodore, Kumar Ravi; Palanisamy, S.; and Shanthi, Rajula, T. (2010), "Grape Production-An Overvien," *Kisan World*, Vol. 37, No. 7, pp. 43-45.
5. Rahane, R.K. (2000), "Trends in Area, Production and Productivity of Important Fruits and Vegetables in Maharashtra", *Indian Journal of Agriculture Economics*, Vol. 55, No. 3, pp. 537-538.
6. Thorat V.S. (2009) "Dynamics of area, production and export of grapes in India - a performance analysis" *Lambert academic publishing*.