



## Trends in area, production and productivity of grapes in Maharashtra

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### Abstract

Grape (*Vitis vinifera*) is an important fruit crop in India. Grape is the third most widely cultivated fruit after citrus and banana. The total world production of grapes is estimated to be about 68.9 million tonnes, next only to citrus and bananas and is followed by apples. Grape scientifically is called *Vitis vinifera* L. and is also known as 'queen of fruits'. Cultivation of grapes in the country is very much localized, being confined primarily to four states, *viz.*, Maharashtra, Andhra Pradesh, Karnataka and Tamil Nadu, which together account for more than 90 per cent of the area and production. The grape is cultivated in the largest area i.e. 139 thousand ha and the production is around 2920 thousand tons in India in 2017-18(NHB). 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. Maharashtra is ranked first in production of grapes, producing about 62.7% of the total production of grapes in the country. The total production of grapes is 0.77 Million Tons, which is highest in the country. An AEZ has been established for grapes covering the Districts of Nashik, Pune, Kolhapur, Satara and Sangli. The present strategy is to diversify into wine production. A number of wineries have come up at Nashik and Sangli and adjoining areas and Maharashtra is now producing wines of international quality. Total export of grapes from India is 216.582 thousand MT, valuing Rs. 2038.63 crores during 2018-19. 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 2920 thousand tons in 2017-2018. The major importing countries of India's grapes were Netherland, Bangladesh, Russia, UK, Germany, UAE, Saudi Arabia, Hong Kong, Thailand, and Oman. The compound growth rates of area and production were 7.93 and 6.61 percent per annum which were highly significant at 1 percent level, respectively. The compound growth rate in area and production of grapes in Maharashtra has shown increasing trend during the period of 25 years. It indicate that the area and production of grape over the period 1993-94 to 2017-18 was increasing at higher rates. It was also seen from the results that the growth rate indicated by compound growth rate have higher magnitude than the linear growth rate for area and production. The result revealed that the area, production and productivity under grape crop was increasing at higher rate as it is major crop in Nashik, Sangli and Pune districts in Maharashtra and it has good opportunities for export.

**Keywords:** trends, area, production, productivity, growth rate

### Introduction

Agro processing could be defined as set of techno-economic processing activities carried out for conservation, handling and value addition in agricultural produce to make it usable as food, feed, fibre, fuel or industrial raw material. Hence, the scope of agro-processing industries encompasses all operations from the stage of harvest till the material reaches the end users in the desired form, packaging, quantity, quality and price. The agro-processing industry is regarded as extended arm of agriculture. The development of the processing industry helps to stabilize and make agriculture more beneficial and created employment opportunities in production, processing and marketing sector. When agriculture processing will be established in the production catchment area, employment will be created in the rural area. Hence, the flow of peoples towards city in search of employment will be restricted, the broad based development of the processing industry help to improve both the social and physical infrastructure and it would cause diversification and commercialization of agriculture and it will thus enhance the income of farmers and create god surpluses. Grape (*Vitis vinifera*) is an important fruit crop in

India. Grape is the third most widely cultivated fruit after citrus and banana. The total world production of grapes is estimated to be about 68.9 million tonnes, next only to citrus and bananas and is followed by apples. Grape 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. Cultivation of grapes in the country is very much localized, being confined primarily to four states, *viz.*, Andhra Pradesh, Karnataka, Maharashtra and Tamil Nadu, which together account for more than 90 percent of the area and production. The grape is cultivated in the largest area i.e. 139 thousand ha and the production is around 2920 thousand tons in India in 2017-18(NHB). 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 216.582 thousand MT, valuing Rs. 2038.63 crores during

2018-19. 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 2920 thousand tons in 2017-2018. The major importing countries of India's grapes were Netherland, Bangladesh, Russia, UK, Germany, UAE, Saudi Arabia, Hong Kong, Thailand, and Oman. Grapes can be eaten as fresh or used for making wine, jam, raisins, juice, jelly, vinegar. Approximately 71% of world grape production is used for wine, 27% as fresh fruit, and 2% as dried fruit. However, in India, 90% of the grape is used for table purpose, even though wine making has made strides. The rest of the grape is used mostly for raisin. Grapes occupy a predominant position in terms of world fruit production, accounting for about 16% of the global fruit production. The total world production of grapes is estimated to be about 68.9 million tonnes, next only to citrus and bananas and is followed by apples. The major grape producing countries are Italy, France, Spain, U.S.A, Turkey, Argentina, Iran, Portugal, South Africa and Chile. 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. The total production of grapes is 0.77 Million Tons, which is highest in the country. The productivity is 9.0 t/ha., which is very less compared with India's productivity. It may be due to climate and type of soil. Thompson seedless is the main variety of table grapes being cultivated. An AEZ has been established for grapes covering the Districts of Nasik, Pune, Kolhapur, 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, 95 million tons of fruits are produced every year. Maharashtra ranks first in the country in the production of fruits. Grapes is among the major fruits grown in Maharashtra and areas under grapes has increased in the state.

**Objectives**

1. To study the changes in cultivation area, production and productivity of Grapes in India.
2. To estimate the growth rates in area, production and productivity of Grapes in India.

**Methodology**

**1. Trends**

The linear trends in area, production and productivity will be estimated by using simple linear equation as given below.

$$Y=a+bX+ u$$

Where,

Y= Annual area, production and productivity of grapes in Maharashtra and India

a=Intercept or constant

b=Regression or trend coefficient

X=Time period (years)

u=Error term with zero mean and constant variance

The 't' test will be uses to test the significance.

**2. Compound growth rates (CGR)**

The compound growth rate analysis will be worked out to ascertain the growth in area, production and productivity of India and Maharashtra by fitting an exponential function as given below,

$$Y_t = ab^t u$$

Where,

Y=Annual area, production and productivity of in Maharashtra and India

a=Intercept

b=Regression coefficient

t=ime period (years)

u=Error term with zero mean and constant variance

Logarithmic transformation of provided estimating equation is,

$$\ln (Y_t) = \ln (a)+t \ln (b)+\ln (u)$$

The equation is estimated by ordinary least square technique (OLS). From the coefficient values, the Compound Growth Rate (CGR) was then estimated using the formula,

$$CGR(r) = [Antilog (b) - 1] \times 100$$

Where,

r = Compound growth rate in percent the 't' test will be used to test the significance.

**Results and Discussion**

**Growth performance and coefficient of variation of area, production and productivity of grapes in Maharashtra**

Maharashtra is important state in sharing area and production. The year wise data on area, production and productivity of grapes in Maharashtra for the period of last 25 years i.e. from 1993-94 to 2017-18 are presented in Table 1.

**Table 1:** area, production and productivity of grapes in Maharashtra

Year	Area (000' Ha)	Production (000' Tons)	Productivity (Tons / Ha)
1993-94	16.63	404.28	24.31
1994-95	21.09	463.10	21.96
1995-96	28.02	692.09	24.70
1996-97	27.81	762.00	27.40

1997-98	24.70	568.20	23.00
1998-99	27.82	762.53	27.41
1999-00	27.70	560.11	20.22
2000-01	26.97	683.25	25.33
2001-02	32.5	911.6	28.05
2002-03	35.2	988.7	28.08
2003-04	41.40	1163.10	28.10
2004-05	43.08	1233.90	28.64
2005-06	45.10	1275.03	28.27
2006-07	45.40	1284.23	28.29
2007-08	45.60	1290.00	28.28
2008-09	55.70	1415.00	25.40
2009-10	82.00	440.00	5.37
2010-11	86.00	774.00	9.00
2011-12	92.00	1810.00	19.67
2012-13	90.00	2050.00	22.78
2013-14	90.00	2160.00	24.00
2014-15	93.26	2292.53	24.58
2015-16	90.09	2048.11	22.73
2016-17	104.08	2378.17	22.85
2017-18	105.50	2286.44	21.67

Source: APEDA (agri-exchange) 2019, Indian agriculture database: 2019, nhb

The area under grape crop was 139.00 thousand hectares in India and was 105.50 hectares in Maharashtra. It indicates that the 75.90 percent of the total grape cultivable area in India was available in Maharashtra in 2017-18. The grape production in India was 2920.00 thousand tons whereas in Maharashtra it was 2286.44 thousand tons for the 2017-18. It implies that the Maharashtra ranks first in the production of grapes with share of 78.30 percent of the total production in India. The area under grapes in Maharashtra was 16.63 thousand hectares during 1993-94 and it increased to 105.50 thousand hectares during 2017-18, while the production of grapes has increased from 404.28 to 2286.44 thousand tons and productivity of grapes has been decreased from 24.31 to

21.67 tons/ha. during a period of last 25 years. The production and productivity of grapes in 2009-10 was decreased drastically from the previous year 1415.00 to 440.00 thousand tons and 25.40 to 5.37 tons/ha respectively due to climate change and very less temperature during grapes grown season in cluster area of Maharashtra i.e. in Nashik, which results development of extremely serious fungal disease ‘downy mildew’ of grapes that result in serve crop loss. The annual linear growth rates and compound rates and coefficient of variation were computed for area, production and productivity of grapes in Maharashtra and the results have been presented in Table 2.

Table 2: Growth rates and coefficient of variation of area, production and productivity of grapes in Maharashtra

Sr No.	Particulars	Area	Production	Productivity
A	Growth rates (Percent)			
1	Linear Growth Rate (LGR)	6.64***	5.92***	-0.90 <sup>NS</sup>
2	Compound Growth Rate (CGR)	7.93***	6.61***	-1.22 <sup>NS</sup>
B	Coefficient of Variation (CV) percent			
1	Coefficient of Variation (CV)	54.87	53.43	24.00
C	Coefficient of determination (R <sup>2</sup> )			
1	Coefficient of determination (R <sup>2</sup> )	0.95***	0.70***	0.06 <sup>NS</sup>

\*\*\*, \*\* and \* represent Significance at 1 percent, 5 percent and 10 percent

The linear growth rate for area and production of grapes in Maharashtra were 6.64 percent and 5.92 percent per annum which were highly significant at 1 percent level, respectively. The compound growth rates of area and production were 7.93 and 6.61 percent per annum which were highly significant at 1 percent level, respectively. The linear growth rate and compound growth rate in area and production of grapes in Maharashtra has shown increasing trend during the period of 25 years. It indicate that the area and production of grape over the period 1993-94 to 2017-18 was increasing at higher rates. It was also seen from the results that the growth rate indicated by compound growth rate have higher magnitude than the linear growth rate for area and production. With regard to productivity, the linear growth rate and compound growth rate has been decreased significantly at the lower rate of 0.90 percent and 1.22 percent per annum respectively, during period of last 25

years. The result revealed that the area, production and productivity under grape crop was increasing at higher rate as it is major crop in Nashik, Sangli and Pune districts in Maharashtra and it has good opportunities for export. The linear growth rates of area and production were 52.69 and 5.20 percent per annum which were significant at 1 percent level of significance, respectively. The compound growth rates of area and production were 6.48 and 5.84 percent per annum which were significant at 1 percent level of significance, respectively. It was found somewhat similar with the corresponding growth rates of Maharashtra with small variations. It is because of 75.90 percent of the total grapes cultivable area was from Maharashtra and 78.30 percent of the total production in India was from Maharashtra. It indicates that, the growth rate figures for India and Maharashtra was found similar for area, production and productivity. The result also reveals that, the

coefficient of variation of grape cultivable area and production was higher with rate of 54.87 percent and 53.43 percent per annum respectively and least for productivity (24.00 percent) per annum. The coefficient of determination shows the higher year to year variations for area (95 percent) followed by production (70 percent) at 1 percent level of significance and least in productivity (6 percent) which is not significant over a period of time for last 25 years. A higher coefficient of determination for area and production was an indicator of goodness of fit for exponential function.

### **Conclusion**

1. The area, production and productivity under grape crop was increasing at higher rate as it is major crop in Nashik, Sangli and Pune districts in Maharashtra.
2. The linear growth rate and compound growth rate was found somewhat similar for Maharashtra and India. It is because of 75.90 percent of the total grapes produced from Maharashtra.
3. The coefficient of determination shows the higher year to year variation for area (95 percent) followed by production (70 percent) and least in productivity (6 percent).

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