



ORIGINAL RESEARCH PAPER

Economics

PERFORMANCE OF THE AREA AND PRODUCTION OF GRAPES IN KARNATAKA

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ABSTRACT

The area and production of grapes in Karnataka have shown significant growth from 1991-92 to 2021-22. In 1991-92, grape cultivation covered 6.50 thousand ha. with a production of 141.70 thousand metric tons. Over the decades, both area and production fluctuated, but a sharp upward trend began in the 2010-11. By 2020-21, the area expanded to 32.47 thousand ha. and production reached 821.79 thousand MTs, with a CGR of 6.14 per cent for the area and 6.09 per cent for the production. Statistical analysis through ANOVA revealed significant differences in area and production across the decades, with the most substantial growth occurring between 2010-11 to 2020-21. The Tukey's Honestly Significant Difference (HSD) post hoc test confirmed these decadal differences. A simple regression model indicated a strong positive correlation between area and production with a coefficient of 20.77, suggesting that an increase in area leads to a corresponding rise in production. The R-squared value of 0.91 shows that 90.86 per cent of the variation in grape production is explained by the area under grape cultivation, highlighting the strong predictive power of the model.

INTRODUCTION

Grapes is one of the significant horticultural crops in India, Karnataka State is one of the emerging leading producers in the country. The state's diverse agro- climatic conditions, favourable soil types, and innovative farming practices have contributed to the growth of grape cultivation, making it a key player in the national grape industry. Over the years, Karnataka has developed a reputation for high- quality grapes, which are not only consumed locally but also exported to international markets. During the liberalization regime the export market expanded for the grapes and its processed products.

The area under grape cultivation in Karnataka has witnessed substantial changes, reflecting shifts in agricultural practices, market demand, and government policies. From modest beginnings in the early 1990s, the grape-growing area has expanded significantly, driven by advancements in viticulture, irrigation techniques, and the introduction of high-yielding grape varieties. As a result, grape production has also seen a remarkable increase, positioning Karnataka as a critical contributor to India's overall grape output.

This introduction sets the stage for a detailed analysis of the trends in the area and production of raisins in Karnataka focusing on the key factors influencing these changes. ANOVA trends in area and production across three decades are worked out and is applied for pairwise comparisons between decades. Additionally, a simple regression model is employed to assess the relationship between the area under cultivation and grape production. With this analysis the study aims to provide insights into the growth trajectory of grape cultivation in the state, highlighting the economic implications and future prospects for this important horticultural crop.

Performance Of Grapes During The First Phase Of Liberalization:

Positive performance of the grapes started with the liberalization regime as the market expanded quite significantly. The area under grapes grown at the rate of 5.58 per cent, which is more than other agricultural crops in the state or country. In the year 1991-92 the area was 6.50 thousand ha. which has gone upto 8.20 thousand ha. having 2000-01. The production of grapes was 141.70 thousand metric tons, which has gone up to 228.20 thousand tons during 1999-2000, which was declined to 144.10 tons in the following year. However the growth rate of the production was 3.99 per

cent, which is most welcome.

Table-1 Area and Production of Grapes in Karnataka (1991-92 to 2000-01)

Year	Area('000ha)	Production(MT)
1991-92	6.50	141.70
1992-93	5.80	128.40
1993-94	5.80	173.60
1994-95	5.20	157.10
1995-96	5.40	162.00
1996-97	6.50	196.00
1997-98	7.50	226.60
1998-99	7.50	226.60
1999-00	7.60	228.20
2000-01	8.20	144.10
CAGR	5.578	3.994

The Table-2 presents the total area and production from the year 2001-2002 to 2010-11, i.e. post liberalization regime. The area under grapes was 10.00 thousand ha. which has gone upto 16.29 thousand ha. with the growth rate of 8.664 per cent. This again more than the agricultural crops, in General in the country and also the state. Even the production has gone up in similar lines. The total production during the year 2001-02 was 153.21 Metric tons, which has gone up to 278.91 Metric tones during the year 2010-11. Even the production of grapes grown at the rate of 8.669 per cent on par with the growth rate of the area during the same period. There is a steady increase in the area and production in terms of the growth rate.

Table-2: Growth Rate of the Area and Production of Grapes in Karnataka (2001-02 to 2010-11)

Year	Area('000ha)	Production(MT/ha)
2001-02	10.00	153.21
2002-03	10.20	168.92
2003-04	9.10	170.9
2004-05	10.14	185.81
2005-06	10.27	190.29
2006-07	12.08	216.64
2007-08	14.31	258.81
2008-09	15.46	278.56
2009-10	17.36	317.64
2010-11	16.29	278.91
CAGR	8.664	8.669

Growth rate of the area and production of grapes are presented in the table-3. The table contains that the area and

production from 2011-12 to 2021-22. During the year 2011-12 the area under grapes was 19.06 thousand ha. which has gone up to 36.58 thousand ha. with the growth rate of 6.614 per cent. When it comes to the production it was 310.39 Metric tons during 2010-11, which has gone upto 787.18 Metric tons with the growth rate of 11.120 per cent. The production is growing more than the area is due to technological advancement and its impact on the application of the inputs like, pesticides, chemical fertilizers, harvesting methods, etc. During the second part of the post liberalization regime the performance of the area and production really better compared to the liberalization and post liberalization regimes.

Table-3 Area and Production of Grapes in Karnataka (2011-12 to 2021-22)

Year	Area('000ha)	Production(MT/ha)
2011-12	19.06	310.39
2012-13	19.76	292.65
2013-14	20.35	391.16
2014-15	21.73	417.74
2015-16	23.35	445.52
2016-17	24.43	458.02
2017-18	26.61	524.26
2018-19	29.11	642.33
2019-20	29.20	710.81
2020-21	32.47	821.79
2021-22	36.58	787.18
CAGR	6.614	11.120

The growth rate of the area and production during the three decades and also the overall growth rate are presented in the Table-4. The table presents that there is a mixed performance of the area and production of the grapes in Karnataka State. During the first period i.e. from 1991-92 to 2000-2001 the growth rate of the area and production lower than the second period i.e., 2001-2002 to 2010-2011. The growth rate of the area and production during the third period is some what different. The growth rate of the production was higher than the earlier period. But the area has shown little lower than the earlier period. The overall growth rate was 6.733 per cent for the area and the growth rate of the production is 5.600 per cent. The results are very much encourage but there is inconsistency in terms of the growth rates. However, the growth rates need to be maintained uniformly so that there will be consistency in terms of development and expansion of the area under grapes and production of the same.

Table - 4: Overall Growth Rate of the Area and Production of Grapes in Karnataka – 1991-92 to 2021-22.

Time periods	Area in %	Production in %
1991-92 to 2000-2001	5.578	3.994
2001-2002 to 2010-2011	8.664	8.669
2011 - 2012 to 2021-2022	6.614	11.120
Overall growth rate	6.733	5.630

The descriptive statistics for the area and production of grapes in Karnataka across three decades reveal significant growth. From 1991-92 to 2001-02, the mean area was 6.6 thousand hectares, increasing to 12.52 in the next decade and further to 24.61 in 2011-12 to 2020-21 (Table-5). Similarly, production rose from a mean of 178.43 thousand Metric tons in 1991-1992 to 2001-2002 to 501.47 in 2011-12 to 2020-21. The standard deviation also increased, reflecting greater variability in both area and production over time. These results suggest significant expansion in grape cultivation, which is supported by an ANOVA test highlighting distinct differences across decades.

Table 5 : Descriptive Statistics for ANOVA

Particular	Decade	N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
Area	1991-92 to 2000-01	10	6.6	1.04775	0.33133	5.2	8.2

	2001-02 to 2010-11	10	12.521	3.05206	0.96515	9.1	17.36
	2011-12 to 2020-21	10	24.607	4.58845	1.45099	19.06	32.47
	Total	30	14.576	8.23744	1.50394	5.2	32.47
	Producti on	1991-92 to 2000-01	10	178.43	38.30483	12.11305	128.4
		2001-02 to 2010-11	10	221.969	57.19799	18.08759	153.24
	2011-12 to 2020-21	10	501.467	173.5587	54.88409	292.65	821.79
	Total	30	300.622	178.9156	32.66536	128.4	821.79

The Table-6 contains the ANOVA results for the area under grape cultivation in Karnataka, which shows that there is statistically significant difference across the three decades (1991-92 to 2020-21). Between-groups sum of squares is 1684.606 with a mean square of 842.303, and the F-value is 80.304, with a significant level (p-value) of .000. This indicates that the increase in grape cultivation area over the decades is highly significant, meaning there are substantial differences in the area devoted to grapes between the decades.

Similarly, the ANOVA results for grape production also show a significant difference across decades. Between-groups the sum of squares is 614558.933, and the mean square is 307279.466, with an F-value of 26.443 and a significance level of .000. This confirms that grape production in Karnataka has significantly increased over the years, with substantial variability in production between decades. The low p-values in both area and production show that the differences observed over time are not due to random variation, but rather reflect meaningful changes in grape cultivation practices or conditions.

Table-6: ANOVA Results.

Particular		Sum of Squares	df	Mean Square	F	Sig.
Area	Between Groups	1684.606	2	842.303	80.304	.000
	Within Groups	283.200	27	10.489		
	Total	1967.806	29			
Production	Between Groups	614558.933	2	307279.466	26.443	.000
	Within Groups	313753.564	27	11620.502		
	Total	928312.496	29			

The Tukey's HS honest significant Difference test results provide insights in to the significant differences in grape cultivation area and production across the three decades (Table-7). The area under grape cultivation in 1991-92 to 2000-01 was significantly lower than the area during 2001-02 to 2010-11 (mean difference: -5.92, p = 0.001) and even more so when compared to 2011-12 to 2020-21 (mean difference: -18.01, p=0.000). Similarly, the area in 2001-02 to 2010-11 was significantly less than 2011-12 to 2020-21 (mean difference: -12.09, p = 0.000). These results indicate a substantial and steady increase in the area cultivated for grapes over the decades.

Production of grapes, the results have shown that there is no significant difference between 1991-92 to 2000-01 and 2001-02 to 2010-11 (mean difference: - 43.54, p=0.643), suggesting a relatively stable production between these two periods. However, there was a large and significant increase when comparing 1991-92 to 2000-01 with 2011-12 to 2020-21 (mean difference: - 323.04, p = 0.000), and similarly, production in 2001-02 to 2010-11 was significantly lower than 2011-12 to 2020-21 (mean difference: -279.50, p = 0.000). These findings highlight a dramatic rise in grape production in the most

recent decade. The results indicate a clear trend of increasing area and production, with the most substantial growth occurring in the 2011-12 to 2020-21 period.

Table-7: Post Hoc Test

Tukey HSD					
Dependent Variable	(I) Year	(J) Year	Mean Difference (I-J)	Std. Error	Sig.
Area	1991-92 to 2000-01	2001-02 to 2010-11	-5.92100*	1.44837	0.001
		2011-12 to 2020-21	-18.00700*	1.44837	0
	2001-02 to 2010-11	1991-92 to 2000-01	5.92100*	1.44837	0.001
		2011-12 to 2020-21	-12.08600*	1.44837	0
	2011-12 to 2020-21	1991-92 to 2000-01	18.00700*	1.44837	0
		2001-02 to 2010-11	12.08600*	1.44837	0
Production	1991-92 to 2000-01	2001-02 to 2010-11	-43.539	48.20893	0.643
		2011-12 to 2020-21	-323.03700*	48.20893	0
	2001-02 to 2010-11	1991-92 to 2000-01	43.539	48.20893	0.643
		2011-12 to 2020-21	-279.49800*	48.20893	0
	2011-12 to 2020-21	1991-92 to 2000-01	323.03700*	48.20893	0
		2001-02 to 2010-11	279.49800*	48.20893	0

*The mean difference is significant at the 0.05 level.

CONCLUSION

The analysis clearly reveals that the area and production of grapes is a promising one as both the area and production have been increasing over a period of about 30 years (Three decades). It is one of the major sources for the foreign exchange earnings and moreover, it generates more employment and income as it is having both forward and backward linkages. It means, it generates income for the grape growers, raisin processing units, wine makers and also the merchants who are involved in various marketing channels. Therefore, in four major points of the activity the income and employment are generated. And hence it is an important crop. By promoting the grape cultivation there is a major benefit for the cultivators, processors and also the Govt. Therefore, the development agencies like Govt. needs to support through financing as the cost of cultivation of grapes and processing has been more. And moreover, the extension services i.e., the link between lab to field needs to maintain effectively so that the grape related activities will be well flourished.

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