RESEARCH PAPER

Dynamics of area, production and productivity of tomato in Kolar and Belagavi districts of Karnataka state

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Abstract: The present study was conducted to analyze the dynamics of area, production and productivity of tomato in Karnataka and two traditionally tomato growing districts *viz*, Kolar and Belagavi districts were selected base on the highest area under tomato cultivation. The study was based on purely secondary data related to area, production and productivity of Tomato were collected from various public sources especially; Karnataka State Department of Horticulture, Government of Karnataka and Ministry of *Agriculture & Farmers Welfare,* Government of India from 2001-02 to 2020-21. The time series data for 20 years (2001-02 to 2020-21) was divided into two periods: Period-I (2001-02 to 2010-11) and Period-II (2011-12 to 2020-21).The Compound Annual Growth Rate (CAGR) technique was employed to evaluate trends in area, production and productivity. The results obtained from analysis indicated that, Compound Annual Growth Rate for production of Tomato in the state registered significant and positive growth rate during study Period-I (6.59%), whereas in Period-II, the area under the Tomato showed the highest growth rate (1.79%) and overall, production registered the highest growth rate (4.74%) with instability indices of 8.13,9.73 and 10.26 percent, respectively. Belagavi district, registered a significant and positive growth rate in the area during the overall study period (4.34%) with instability index of 20.28 percent which indicates area-led growth rate. In the case of Kolar, the growth rate registered a significant and positive in production during the overall study period (6.48%) with an instability index of 30.38 per cent indicating production lead growth. The study concluded with positive trend in all cases. Hence, there is a potential scope for growth in vegetable like tomato production in state and selected districts.

Key words: Area, Compound annual growth rate, Production, Productivity, Tomato

Introduction

Vegetables are important constituents of Indian agriculture and nutritional security because of their short duration, higher yield, nutritional richness, economic viability and ability to generate on-farm and off-farm employment (Rimal and Gurung, 2017). India is blessed with diverse agro-climates with distinct seasons making it possible to grow wide array of vegetables and it is the second major producer of fruits and vegetables in the world. Total area under horticultural crops was 27.74 million hectares and production was 341.63 million tonnes in 2020-21. Fruits and vegetables together contribute about 92 per cent to the total horticultural production in the country (Anonymous, 2022).

Tomato (*Solanum lycopersicum*) is a hermaphrodite vegetable crop belonging to the family Solanaceae. Tomato is one of the **"protective food"** among the vegetables, that is most often grown in India due to its higher production and wide ecological amplitude. Tomato is a native of Tropical America spread across other parts of the world in the 16th century and it has become popular in India since from the last six decades. Tomato is the worlds' third largest vegetable crop after potato and sweet potato. Tomatoes have been used as food by the inhabitants of Central and South Americas in cepre-historic times.

Tomato occupies a significant position in vegetable production of the country. India is the second largest producer of tomato after China, produced 20.57 million tonnes of tomatoes on 0.81 million hectares and average yield of 25.3 MT per hectare in 2020. Tomato ranks third next only to potato and brinjal in the production of vegetables in the country. There has been a gradual increase in the area under tomato while the production has been fluctuating due to weather related factors. In India, Andhra Pradesh is the leading state producing 2,744.32 MT of tomatoes followed by, Madhya Pradesh with 2,419.28 MT. Whereas, Karnataka stood third with a production of 2,081.59 MT (Anonymous, 2021b)

In Karnataka, tomato is produced through out the year among vegetables and it occupies first position in the total vegetable production in the state. The major tomato growing districts in Karnataka are Kolar with production of 9,30,417 MT, followed by Belagavi with production of 1,93,958 MT, Mandya with production of 1,78,702 MT, Haveri with production of 1,33,295 MT and Chikkaballapura with production of 1,29,604 MT. The total area under tomato in Karnataka is about 19,07,407 hectares in which Kolar is having highest area of about 16,328 hectares, followed by Belagavi with 6,141 hectares, Davanagere with 5,016 hectares, Chamarajanagar with 4,911 hectares and Tumakuru with 3,094 hectares respectively (Anonymous, 2021a).

Objective of the study

To study the dynamics of area, production and productivity of tomato in selected districts of Karnataka

Material and methods

The study entirely based on secondary data pertaining to area, production and productivity of tomato were collected from Karnataka state department of Horticulture, Government of Karnataka and Ministry of Agriculture & Farmers Welfare, Government of India from 2001-02 to 2020-21. The time series data for 20 years (2001-02 to 2020-21) was divided into two periods: Period-I (2001-02 to 2010-11) and Period-II (2011-12 to 2020-21) and was subjected to the Compound Annual Growth Rate (CAGR) technique to estimate the trends.

Compound annual growth tare (CAGR)

In order to analyse the growth rate in area, production and productivity of tomato Compound Annual Growth Rate technique was used and to know the variations in area, production and productivity of tomato instability index was computed using the following model (Soumya and Yeledhalli, 2020).

$$Y_t = ab^t e^u$$

Where,

Y_t = dependent variable (area/production/productivity of tomato)

a = intercept term

b = (1+r) and 'r' is the compound growth rate

t = time period

u = error term

The above model in the Logarithmic form is expressed as, log Y= log a + t log b+ log u

Thus,we cancalculate the compound growth rates (r) as under:

$$CAGR\ (r) = (Antilog\ of\ \log b-1) \times 100$$

where,

r = Compound growth rate per annum in per cent,

The coefficient of variation (CV) was used as the measure of instability as under:

$$CV\% = \frac{Standard\ deviation\ (sd)}{Mean} \times 100$$

Results and discussion

Dynamics of area, production, and productivity of tomato in Karnataka (2001-02 to 2020-21)

The growth trends in the area, production and productivity were depicted in Table 1. The time series data for 20 years (2001-02 to 2020-21) was divided into two periods: Period-I (2001-02 to 2010-11) and Period-II (2011-12 to 2020-21) and was subjected to growth rate analysis. For Period-I, the production of tomato in the state registered the highest growth rate of 6.59 per cent followed by the area and productivity with 4.13 per cent and 2.31 per cent, respectively, which (all three) were found to be significant at one per cent level of probability. Whereas, the instability index for the area, production and productivity of tomato in the state showed 6.43 per cent, 8.13 per cent and 7.18 per cent, respectively. Whereas, for Period-II, area under tomato showed the highest growth rate of 1.79 per cent trailed by production and productivity with 1.71 and 0.56 per cent, respectively. But only the area registered a significant growth rate (@ 5% level of probability).

Overall, the highest growth rate was registered for production (4.74%) followed by, area and productivity with 3.10 per cent and 1.54 per cent, respectively and all were found to be significant (@ 1% level of probability).

Dynamics of area, production, and productivity of Tomato in Kolar and Belagavi districts (2001-02 to 2020-21)

The annual growth in the area, production and productivity of tomato in Belagavi and Kolar districts are depicted in Table 2. The time series data for 20 years (2001-02 to 2020-21) was divided into two periods: Period-I (2001-02 to 2010-11) and Period-II (2011-12 to 2020-21) which was subjected to Compound Annual Growth Rate analysis. For Period-I, the production of tomato in the Kolar district registered the highest growth rate of 6.60 per cent followed by productivity and area with 5.68 per cent and 1.64 per cent, respectively. While, the instability index for the area, production and productivity of tomato in the state registered 28.66 per cent, 28.07 per cent and 16.62 per cent, respectively. However, for Period-II, the Compound Annual Growth Rate for area (8.57%), production (9.05%), and productivity (0.46%), were positive and significant at a five per cent level of probability.

Table1. Dynamics of area, production and productivity of tomato in Karnataka   (2001-02 to 2020-21)

Time period	Particulars	Mean	CAGR (%)	Instability Index (%)
Period-I (2001-02 to 2010-11)	Area (000'ha)	45.00	4.13***	6.93
	Production (000'MT)	1,308.76	6.59***	8.13
	Productivity (MT/ha)	29.07	2.31***	7.18
Period-II (2011-12 to 2020-21)	Area (000'ha)	61.02	1.79**	4.92
	Production (000'MT)	2,089.75	1.71NS	9.73
	Productivity (MT/ha)	34.03	0.56NS	11.10
Overall (2001-02 to 2020-21)	Area (000'ha)	53.01	3.10***	6.32
	Production (000'MT)	1,699.25	4.74***	10.26
	Productivity (MT/ha)	31.54	1.54***	8.66

Note: (Source: Directorate of Horticulture, Lalbagh, Bangalore, 2001-02 to 2020-21)
***specifies significantat1percent level of probability, **specifies significant at 5 per cent level of probability and NS specifies non-significant

Table 2. Dynamics of area, production, and productivity of Tomato in Kolar and Belagavi districts (2001-02 to 2020-21)

Time period	Particulars	Belagavi district			Kolar district		
		Mean	CAGR(%)	Instability Index (%)	Mean	CAGR(%)	Instability Index (%)
Period-I(2001-02 to 2010-11)	Area (ha)	3,858.40	3.71[NS]	31.99	9,563.20	1.64[NS]	28.66
	Production (MT)	1,38,532.80	4.64[NS]	24.46	3,79,434.10	6.60[NS]	28.07
	Productivity(MT/ha)	36.22	0.03[NS]	18.63	42.04	5.68**	16.62
Period-II (2011-12 to 2020-21)	Area (ha)	5,981.30	0.74*	3.08	11,955.80	8.57**	26.89
	Production (MT)	1,87,742.42	1.33**	4.41	6,85,631.80	9.05**	27.80
	Productivity (MT/ha)	31.03	0.62**	2.21	57.09	0.46**	1.52
Overall (2001-02 to 2020-21)	Area (ha)	4,919.85	4.34***	20.28	10,759.50	2.83**	31.90
	Production (MT)	1,63,137.90	3.30***	15.23	5,32,533.00	6.48***	30.38
	Productivity (MT/ha)	33.76	0.09*	14.60	49.57	3.27***	11.97

Note: (Source:Directorate of Horticulture, Lalbagh, Bangalore, 2001-02 to 2020-21)
***specifies significant at1percent level of probability, **specifies significantat 5 per cent level of probability, *specifies significant at 10 percent level of probability and [NS]indicates non-significant

Whereas, in the case of Belagavi both Period-I and Period-II production registered the highest growth rate of 4.64 and 1.33 per cent, respectively, with instability index of 24.46 and 4.41 per cent, respectively, trailed by the area and productivity with an annual growth rate of 3.71 and 0.03 per cent, respectively in Period-I and 0.74 and 0.62 per cent, respectively in Period-II.

Overall, in Kolar the highest growth rate was registered by production (6.48%), followed by productivity and area with 3.27 per cent and 2.83 per cent, respectively and all were positive and significant therefore indicating production led growth. In the case of Belagavi, the area recorded the highest growth rate (4.34%) with an instability index of 20.28 per cent followed by production (3.30%) and productivity (0.09%), which were also positively significant, with an instability index of 15.23 and 14.60 per cent, respectively.

The results of the present study substantiate the findings of (Sangya Kumari *et al.,*2022) and (Das *et al.,*2019) reported that among the vegetables, potato and leafy vegetables recorded negative growth rates and tomato, potato, gourds, Cole crops and other vegetables groups showed a positive trend in the area over the study period.

Conclusion

Among the vegetables, tomato occupies the first position because of its throughout yearly production to total vegetable production in the state. The study concluded that, the area, production and productivity of tomato had showed a positive trend in Karnataka and two traditionally tomato growingdistricts *viz,* Kolar and Belagavi districts noticed significant constant growth during the study period. The results revealed that, tomato production in state is reliable in their area. Therefore, it could be concluded that there is a potential to grow the vegetable like tomato in state and selected districts.

References

Anonymous, 2022, World horticulture production, Food and Agriculture Organization statistical year book 2021, www.fao.nic.in

Anonymous, 2021a, Karnataka state department of Horticulture, Government of Karnataka, Bangalore.

Anonymous, 2021b, Annual report (2021-22), Directorate of Economics and Statistics, Ministry of Agriculture and Farmers Welfare, Government of India, p.84

Das B, Satyapriya, Singh B, Sangeetha V, Bhowmik A and Ray P, (2019). Growth and instability in area, production, productivity and consumption of vegetables in India: an analysis. *Indian Journal of Extension Education,* 55(4): 158-161.

Rimal N S and Gurung B, (2017). Growth and dynamics of pulses production in Nepal.1-17.

Soumya P and Yeledhalli R A, (2020). Direction of Trade and Changing Pattern of Exports of Cereals from India. *International Journal of Advance Research and Innovative Ideas in Education,* 6(6): 2561-2565.

Sangya Kumari, Subhash Sharma and Amit Guleria, 2022, Trends in area, production, and productivity of capsicum in Himachal Pradesh and Solan. *International Journal of Current Microbiology and Applied Sciences,* 11(04): 261-263.