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Growth and instability in area, production and productivity of turmeric in Maharashtra

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Abstract
India is popularly known as the "Spices Bowl of the World" as a many varieties of spices grown in the country since ancient times. Turmeric is one of the oldest spices that's why it is called as "Indian Saffron". Turmeric (Curcuma longa) is significant spice crop belong to the family zingiberaceae. It is rhizomatous herbaceous plant which is originated from India. The purpose of the present investigation is to examine the growth performance and instability in area, production, and productivity of turmeric in Maharashtra. The performance of turmeric was quite effective with respect of the area expansion as well as production in Western Maharashtra, Marathwada and Vidarbha region from the introduction of turmeric in Maharashtra. It was discovered that rather than production and productivity, the area under the turmeric in Maharashtra was more stable and consistent.

Keywords: Turmeric, trends, area, production, growth, instability

Introduction
Turmeric (Curcuma longa) is a significant spice crop belonging to the family zingiberaceae, and it is rhizomatous herbaceous plant which is originated from India. It is used in diversified industries as a flavouring agent, a condiment, a coloured agent, and curry powder. India is referred to as the "Spices Bowl of the World" because many varieties of spices have been grown in the country since ancient times.

Turmeric is produced, consumed, and exported mostly in India. Central and Latin America, Thailand, various Southeast Asian nations, and Taiwan are even significant producers. The annual global production of turmeric is about 11 lakh tonnes. India leads the global production scenario with a contribution of 80 percent, followed by China with 8 percent, Myanmar with 4 percent, and Bangladesh and Nigeria together with 6 percent of the total production.

The area, production and productivity of turmeric was fluctuating during the year 2018-19 to the year 2022-23 in Maharashtra. There is an increase in area from 17.224 thousand ha in 2018-19 to 83 thousand ha in 2022-23. Similarly, the production has increased from 38.310 thousand tons in 2018-19 to 278 thousand tons in 2022-23. The productivity has increased from 2224 kg/ha in 2018-19 to 3349 kg/ha in 2022-23. Turmeric is grown in some the districts of Maharashtra.

Materials and Methods
In the state of Maharashtra, this study was conducted. The current study focused on three regions of Maharashtra namely; Western Maharashtra, Marathwada, and Vidharbha. Secondary time series data of area, production and productivity of turmeric were collected from various sources *viz*; Season and Crop Reports, Department of Economics and Statistics (DES), Government of Maharashtra. The data were collected for the years from 1970-71 to 2019-20.

Compound growth rate
Compound growth rates of area, production and productivity of turmeric were calculated by the use of non- linear equation.
$Y = ab^t$

Where,
Y = Area, production, and productivity
T = Time period
B = Regression coefficient
A = Intercept
CGR = [(Antilog b1)-1]*100.

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Instability analysis

Instability in the area, production, productivity of turmeric was estimated using two measures of instability such as Coefficient of Variation and Cuddy-Della Valle index.

C.V = (standard deviation/mean) *100

Even though Coefficient of Variation (C.V) is the simplest measure of instability, it over-estimates the level of instability in time series data which are characterized by long-term trends.

The Cuddy Della Valle Index de-trends shows the exact direction of the instability. Hence, it is a better measure to capture instability in agricultural production. A low value of this index indicates low instability in area, production, productivity and vice-versa. The Cuddy-Della Valle index corrects the CV as:

Cuddy - Della Valle Instability Index (%) = $CV\sqrt{(1-R^2)}$

Where,

C.V is the Coefficient of Variation in percent, and R^2 is the coefficient of determination from a time trend regression adjusted for its degrees of freedom.

The ranges of instability are as follows: Low instability = between 0 to 15.

Median instability = greater than 15 and lower than 30 High instability = greater than 30.

Results and Discussion

This study has made an effort to look into changes in the area, production, and productivity of turmeric in Maharashtra. The growth rates were estimated using the model stated in the methodology. The districtwise and region wise time series data on area, production and productivity has been divided into into three sub-periods: period I (1970-1971 to 1994-1995) period II (1995-1996 to 2019-20) and overall period (1970-1971 to 2019-20). The region wise annual compound growth rates of area, production and productivity for the period of 50 years (i.e. from 1970-71 to 2019-20) of turmeric for overall Maharashtra state were estimated and presented in Table1.

Table 1 revealed, the region wise yearly compound growth rates of area, production and productivity of turmeric for the whole Maharashtra state during a 50 year period (from 1970-71 to 2019-20).

The table 1 indicates that, the area, production and productivity of turmeric have improved significantly at the state level by 1.47, 5.44, and 3.92 percent, respectively, over the entire period. At the 1percent level of significance, it was significant. Turmeric area increased from -1.05 percent to 6.11 percent per year from the first to second period at the state level. This demonstrates that the highest area expansion in the region of turmeric happened during the second era. The increase in turmeric output in Maharashtra has been noted to be faster than the area expansion. Turmeric production climbed by 20.43 and 5.44 percent per year at the state level during the second and overall periods, respectively. During the first period, it was not significant. The CGR of yield during period II and overall were 13.49 and 3.92 percent, respectively. Thus, throughout period II and overall, good expansion in area and productivity resulted to considerable and favorable growth in turmeric production. Thus increase in the production of turmeric has combine effect of area expansion and productivity improvement.

In Western Maharashtra (WM) region, the CGR of area has negative trend i.e. -2.91 percent during period-I. While during

period-II and Overall period it was positive and increased by 1.67 and 1.34 percent, respectively per annum. On the other hand the production of turmeric was non-significant during period-I and during period-II and overall period it was positive and highly significant at 1 percent level of significance. It was 14.89 and 3.28 percent respectively. The productivity of turmeric has positive and significant trend in entire study period but higher growth was noticed during period II. The magnitudes of yield during two sub-period and overall period were 2.59, 13 and 1.91 percent respectively. The positive and significant growth in area and yield of turmeric during period-II and overall period leads to significant high positive growth in output of turmeric. Period II is more efficient than period I.

Tab 1: Annual compound growth rate of area, production and productivity of turmeric in Maharashtra (1970-71 to 2019-20)

Particulars	Area	Production	Productivity
Western Maharashtra			
Period I	-2.91 ***	-0.39 NS	2.59 ***
Period II	1.67 ***	14.89 ***	13 ***
Overall Period	1.34 **	3.28 ***	1.91 ***
Marathwada			
Period I	-2.38 **	-0.19 NS	2.24 *
Period II	3.38 **	14.88 ***	11.12 ***
Overall Period	2.1 ***	5.05 ***	2.89 ***
Vidarbha			
Period I	-0.06 NS	1.58 NS	1.64 NS
Period II	7.66 ***	26.66 ***	17.65 ***
Overall Period	3.86 ***	7.75 ***	3.75 ***
Maharashtra			
Period I	-1.05 **	0.52 NS	1.58 NS
Period II	6.11 ***	20.43 ***	13.49 ***
Overall Period	1.47 ***	5.44 ***	3.92 ***

Note: *, ** and*** Significant at 10, 5 and 1 percent level, respectively.

Source: Season and crop report, Commissionerate of Agriculture, Govt. of Maharashtra, 2019.

In case of *Marathwada*, significant growth in production by 14.88 and 5.05 percent, respectively during period-II followed by overall period. Period-I was resulted due to significant increase in area by 3.38 and 2.1 percent, respectively and significant expansion in productivity by 11.12 and 2.89 percent, respectively during period-II and overall period. In period-I, while negatively significant trend of area was observed i.e. -2.38 percent and productivity was positively significant and expanded by 2.24 percent per annum. Thus, the area expansion and productivity improvement have influenced the production of turmeric in *Marathwada* region during period-II and Overall period.

Greater land ownership and a higher proportion of cultivable lands in the Vidarbha and Marathwada regions led to the allotment of more acreage for turmeric, as demonstrated by 7.66 and 3.86 percent area growth during period-II and the overall research period, respectively. While area, production and productivity were non-significant in period-I, there was a significant increase in turmeric production of 26.66 and 7.75 percent, respectively, in period II. Turmeric production climbed by 17.65 and 3.75 percent, respectively, during periods II and total. As a result, increasing turmeric output in Vidarbha and Marathwada was mostly due to area expansion as well as productivity improvement.

To sum up it, the foregoing discussion shows that Western Maharashtra witnessed positive and significant growth in

area, production and productivity from 1970-1971 to 2019-2020. It reveals that both area expansion and productivity improvement in this area aided in the increase in turmeric production. The link between area and production, on the other hand, it was positive and significant over Marathwada, Vidharbha, and Western Maharashtra, of the whole state suggesting that the rise in turmeric production was primarily due to area growth. Among the various periods, the third phase (2007-08 to 2017-18) had the least acceptable rise in terms of area, production and productivity. From 2010-11 to 2017-18, it was mostly caused by variable and irregular precipitation, dry periods, and drought years.

Instability in area, production and productivity of turmeric in Maharashtra

Table 2 shows the turmeric coefficient of variation and Cuddy Della-Vella instability index for the years 1970-1971 to 2019-20 to measure the consistency and instability in area, production and productivity of turmeric for districts, regions, and the entire state of Maharashtra. The time series data on area (A), production (P), and productivity (Y) were divided into three periods: period-I (from 1970-71 to 1994-95), period-II (from 1995-96 to 1995-96), and overall period (from 1970-71 to 2019-20).

The value of coefficient of variation of turmeric in case of production and productivity was determined to be high over the study period. All of the districts in Maharashtra, with the exception of Pune, experienced considerable variability and a high value of the Cuddy Della-Vella index for an entire period of time. While Jalgaon, Pune, Solapur, Satara, Sangali, Jalna, Akola, and Chandrapur districts were found to be more consistent and steady. In the long run, the Maharashtra districts of Higoli and Yavatmal were shown to be extremely unpredictable and unstable. These are the main areas of Maharashtra where turmeric has recently been grown. In all of Maharashtra's districts, the productivity of turmeric has been highly variable and inconsistent over the long term. Although the area had lesser instability and was consistent in most of districts of Maharashtra, the production was found to be more unstable. High price volatility, unfavourable meteorological circumstances, pest and disease infestation, and inadequate crop protection methods were the main causes of high instability of production.

The table 2 reveals that, the area, production, and productivity were found to be uneven or unstable due to irregular weather conditions, significant rainfall, and extremely hot and cold temperatures. With a few exceptions, the area of turmeric was consistent and more stable in all the districts of Maharashtra. It's probable that the climate during the Kharif season was favourable for the cultivation of turmeric.

Table 2: District wise instability in area, production and productivity of turmeric in Maharashtra

Sr. No.	District		Instability Index								
			Period – I			Period II			Overall		
			A	P	Y	A	P	Y	A	P	Y
1	Jalgaon	CV (%)	-	-	-	59.65	226.53	126.65	59.65	226.53	126.65
		CDVI	-	-	-	20.53	104.21	81.01	20.53	104.21	81.01
2	Pune	CV (%)	-	-	-	23.15	61.35	45.74	23.15	61.35	45.74
		CDVI		-	-	18.49	16.71	17.57	18.49	16.71	17.57
3	Solapur	CV (%)	40.89	68.95	72.64	28.29	151.32	153.23	35.71	203.13	186.45
		CDVI	37.07	50.21	65.31	26.04	105.25	108.99	32.94	156.74	154.67
4	Satara	CV (%)	24.59	51.25	54.25	50.05	106.44	63.49	37.78	99.28	61.33
		CDVI	19.81	50.76	52.82	36.07	55.35	33.42	34.57	80.74	49.44
5	Sangali	CV (%)	43.81	45.35	56.93	25.51	107.32	95.82	36.59	103.3	87.99
		CDVI	19.59	44.14	47.67	23.74	41.17	48.28	32.66	84.36	77.08
6	Kolhapur	CV (%)	24.59	51.25	54.25	77.56	86.74	18.39	64	73.82	43.92
		CDVI	19.81	50.76	52.82	37.3	40.38	14.79	54.06	61.2	42.59
7	Nandurbar	CV (%)				53.76	149.32	113.76	53.76	149.32	113.76
		CDVI				21.92	94.47	103.41	21.92	94.47	103.41
8	Aurangabad	CV (%)	-	-	-	54.74	123.12	101.15	54.74	123.12	101.15
		CDVI	-	-	-	18.72	51.09	56.79	18.72	51.09	56.79
9	Jalna	CV (%)	31.77	45.33	52.26	26.38	113.21	105.79	35.38	98.04	72.32
		CDVI	29.71	39.34	42.82	17.59	74	74.46	19.79	69.68	62.54
10	Beed	CV (%)	89.24	174.94	82.04	50.47	145.74	214.46	72.22	182.99	202.16
		CDVI	50.3	115.98	80.89	34.25	109.58	122.52	71.17	130.96	157.16
11	Parbhani	CV (%)	25.85	98.7	81.75	41.65	110.7	109.7	58.18	123.43	114.81
		CDVI	22.61	98.17	75.6	36.49	60.66	79.51	48.8	89.81	97.54
12	Hingoli	CV (%)	-	-	-	210.69	399.41	137.98	210.69	399.41	137.98
		CDVI	-	-	-	126.86	271.61	121.74	126.86	271.61	121.74

Conclusions

The performance of turmeric was quite satisfactory with respect of the area expansion as well as production in Western Maharashtra, Marathwada and Vidarbha region from the introduction of turmeric in Maharashtra. The acreage under turmeric in Maharashtra state was noticed be more stable and consistent rather than production and productivity.

References

1. Avinash CS, Patil BL. Trends in area, production and productivity of major pulses in Karnataka and India: An economic analysis, Journal of Pharmacognosy and Phytochemistry. 2018;7(4):2097-2102.
2. Lal C, Rohtas. The Trends of Area, production and productivity of selected spices and traditional crops in Haryana. Economic Affairs. 2022;67(01 Spl.):19-24.
3. Patil VK, Tingre AS, Chaudhari DJ. Red gram price movement across major markets of Maharashtra. International Research Journal of Agricultural Economics and Statistics. 2014;5(1):70-75.
4. Pichad SP, HJ Wagh, MM Kadam. Growth in area, production, and productivity of chickpea in Amaravati district, International Research Journal of Agricultural Economics and Statistics. 2014;5(2):289-292.