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Growth and Instability of Maize Production in Andhra Pradesh: - An Inter-District Analysis

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ABSTRACT

In order to assess the performance of area, production and productivity of maize in Andhra Pradesh, the present study was taken up by estimating the patterns of growth and magnitude of instability, and assessing the explanatory variables' affects on production during last two decades. Time series data for the period 1990-91 to 2014-15. on area, production and productivity were collected. Compound growth rates (CGR), Coppock's Instability Index (CII), Decomposition of change in average production were employed for the inter-district analysis of the maize production in Andhra Pradesh.The result revealed that growth rate in area (26.64 per cent per annum), production (33.64 per cent per annum) and productivity (5.99 per cent per annum) were higher in srikakulam district whereas it was least in area (-0.68 per cent per annum) and production (3.08 per cent per annum) in Visakhapatnam district and yield (1 per cent per annum) in Vizianagaram district. The instability in production was mainly due to fluctuations in yield rather than area changes. Decomposition analysis revealed that mean area effect was higher than the mean yield effect on the production differential. So, growth in production should mainly come from area rather than yield.

Key words*: Coppocks instability index, Decomposition analysis, Growth rate and Maize.*

Maize is one of the most important cereal crops of the world and contributes to food security in most of the developing countries. In India, maize is emerging as third most important crop after rice and wheat. Its importance lies in the fact that it is not only used for human food and animal feed but at the same time it is also widely used for corn starch industry, corn oil production, baby corns etc. Corn production has nearly doubled from around 12.0 million tons in the early 2000s to around 22 million tons today. This remarkable production growth has been largely driven by adoption of single cross hybrids in the late 1980's and continuous demand in domestic and export market. The increasing use of maize as feed, increasing interest of the consumers in nutritionally enriched products and rising demand for maize seed are the core driving forces behind emerging importance of maize crop in India (Ali and Songh 1995).

Maize is grown throughout the year in India. It is predominantly a kharif crop with 85 per cent of the area under cultivation in the season. Maize is the third most important cereal crop in India after rice and wheat. It accounts for 9 per cent of total food grain production in the country. Maize production is dominated by Andhra Pradesh and Karnataka, producing 38 per cent of India's maize in 2014-15. Nine states viz. Karnataka, Andhra Pradesh, Tamil Nadu, Rajasthan, Maharashtra, Bihar, Uttar Pradesh, Madhya Pradesh and Gujarat account for 85 per cent of India's maize production and 80 per cent of area under cultivation. Andhra Pradesh has the highest yield followed by Tamil Nadu due to majority of the area being covered under Single Cross Hybrids (SCH). Maize crop is mostly grown in the districts of Kadapa, Guntur,Srikakulam, Chittor, West Godavari, Kurnool and Vizianagaram which accounted for 64.77 % of the total area under the crop in the state during 2014-15.

Therefore, an analysis of growth and instability in maize production in Andhra Pradesh is of great importance for a comprehensive understanding of the food security at the state level. In this context, the present paper assumes growth and instability of maize production in Andhra Pradesh. This paper also exhibits the inter-district analysis of the maize production in Andhra Pradesh.

MATERIAL AND METHODS

The study pertains to state as a whole and 13 districts of Andhra Pradesh. Secondary data for the period 1990-91 to 2014-15 on area, production and productivity were collected from various issues of Statistical Abstracts published by the Bureau of Economics and Statistics, Government of Andhra Pradesh.

Analytical tools:

1) Estimation of Growth Rates: Compound growth rates were estimated by fitting an exponential function of the following form.

$$Y = A.b^t$$

$$\text{Log } Y = \text{Log } A + t. \log b$$

Where, Y = Area/production/productivity

A= Constant b= (1+r)

r = Compound Growth Rate

t = Time variable in years (1,2,3…n)

The value of antilog of 'b' was estimated by using LOGEST function in MS-Excel. Then, the percent Compound Growth Rate is calculated as below;

$$CGR\ (\%) = [LOGEST\ (Y_1:Y_t) - 1] \times 100$$

2) Estimation of extent of instability: The instability was estimated using coppock's instability index. The estimable form is given below

$$V = 1/N[\text{Log} + (xt+1)/Xt-m]^2$$

The instability index is = [Antilog of (sqrt(v-1)x100].

Where X_t= volume in year t

n = number of years

N = n-1

M=

3) Decomposition of change in production: Decomposition of change in production will result into area effect, productivity effect and interaction effect of area and productivity (Radha et al 1999). In formulae form:

$$\Delta P = Ao.\Delta Y + Yo.\Delta A + \Delta A.\Delta Y$$

Where,

ΔP = Production difference

$Yo.\Delta A$ = Area effect

$Ao.\Delta Y$ = Productivity effect

$\Delta A.\Delta Y$ = Interaction effect of area and productivity.

RESULTS AND DISCUSSION

1. Growth Rates:

The growth rates of area, production and yield are positively significant during the study period (1991-2014). Among all the districts, Kurnool recorded the highest growth rate in area (26.73 percent per annum), Srikakulam in production (33.64 per cent per annum), and yield (5.99 percent per annum). Lowest growth rate in area (-0.68 percent per annum) and production (3.08 percent per annum) were noticed in Visakhapatnam; in productivity (1 percent per annum) was observed in Vizianagaram (Horridoss 2003). The increase in production growth is mostly due to its area growth rather than yield growth. The increase in the production growth rate of maize was due to increase in both area and yield growth but area growth contributed more than yield growth in all the districts of Andhra Pradesh. State as a whole, growth rates in area, production and yield were 11.97, 3.19 and 18.23 percent per annum respectively. Except East Godavari, Visakhaptanam and Prakasam, all the other districts are having more than Andhra Pradesh growth rate of 11.97 per cent per annum. Growth in production was more contributed by yield than area (Table 1)

2. Extent of Instability:

Among the districts of AP, the lowest instability in area, production and productivity (yield) were respectively recorded in Vishakhapatnam (11.06%), and East Godavari (13.30%) whereas highest instability in area, production and productivity (yield) were recorded in Kadapa (32.99%), Nellore (44.45%) and Kadapa (18.27%) as shown in table (2).The variability in area (32.99% and 11.06%) had more influence on fluctuations in production (44.45% and 13.30%) than by instability in yield (18.27% and 11.06%).

It is observed from table.2 that Nellore and Kadapa districts recorded the highest degree of production instability. The fluctuations in production is the compound result of fluctuations in crop acreage and crop yield. For all the districts except Srikakulam, fluctuations in production was mainly due to fluctuations in area whereas Andhra Pradesh as a whole, fluctuations in production was mainly due to fluctuations in yield rather than area

Table 1. Comparative compound growth rate (%) of maize Districtwise & in Andhra Pradesh.

S No	District	Compound Growth Rates	
1	Srikakulam	Area	26.64
		Yield	5.99
		Production	33.64
2	Vizianagaram	Area	21.19
		Yield	1
		Production	23.72
3	Visakapatnam	Area	-0.68
		Yield	1.58
		Production	3.08
4	East Godavari	Area	5.35
		Yield	3.4
		Production	11.14
5	West Godavari	Area	15.33
		Yield	3.44
		Production	20.33
6	Krishna	Area	12.7
		Yield	3.58
		Production	19.7
7	Guntur	Area	17.51
		Yield	4.08
		Production	26.13
8	Prakasam	Area	0.94
		Yield	2.48
		Production	5.73
9	Nellore	Area	13.7
		Yield	3.58
		Production	23.36
10	Kadapa	Area	21.84
		Yield	4.63
		Production	29.72
11	Kurnool	Area	26.73
		Yield	2.91
		Production	32.94
12	Anantapur	Area	16.73
		Yield	1.86
		Production	21.06
13	Chittor	Area	15.34
		Yield	2.73
		Production	20.87
14	Andhra pradesh	Area	11.97
		Yield	3.19
		Production	18.23

changes in production growth rare which cause instability due to number of factors which include erratic availability of irrigation water, behaviour of prices of competing crops and timely availability of agricultural inputs.

1.Decomposition of change in production:

The growth analysis revealed the general pattern of growth and direction of changes in yield and area. But this analysis does not evaluate the contribution of area and yield towards the production growth. So it is necessary to examine the source of output growth,. To appraise the source of output growth the change in production is divided into three effects i.e area effect, yield effect and interaction effect. An increase in the output of Chittor, Visakhapatnam, Kurnool and Anantapur districts under maize crop was mainly due to increase in yield with the respective yield contributing towards production. The decomposition analysis shows that production of maize crop in Andhra Pradesh was mainly due to area effect. State as a whole, change in mean area has higher influence on the change in mean production than any other sources of change.

Conclusions:

From the study it is concluded that , the increase in production growth rate was mainly due to increase in its yield growth rather than area growth rate. Area growth rate contributed less than production growth rate. Therefore, the increase in production growth is mostly due to its area growth rather than productivity growth. The instability in production was mainly due to fluctuation in yield rather than fluctuations in the area. Andhra Pradesh as whole, fluctuations in production was mainly due to fluctuations in yield rather than area changes in production growth rate which cause instability due to a number

Table 2. Comparative Coppock's instability indices (CII) of maize - Districtwise & in Andhra Pradesh.

S.NO	District	Area	Yield	Production
1	Srikakulam	13.35	16.46	15.00
2	Vizianagaram	13.51	12.97	14.12
3	Visakapatnam	11.06	11.06	14.57
4	East Godavari	12.31	12.22	13.30
5	West Godavari	13.37	12.57	13.59
6	Krishna	13.79	12.86	14.45
7	Guntur	14.75	12.88	15.79
8	Prakasam	15.99	13.43	18.95
9	Nellore	27.39	14.67	44.45
10	Kadapa	32.99	18.27	34.68
11	Kurnool	17.17	13.53	19.55
12	Anantapur	14.27	13.89	16.13
13	Chittor	14.36	13.22	14.78
14	Andhra pradesh	12.48	12.70	13.87

Table 3. Decomposition of production differential of Maize - Districtwise and in Andhra Pradesh.

S.no.	District	Yield effect	Area effect	Interaction effect
1	Srikakulam	-47.33	6495.38	-6348.053467
2	Vizianagaram	-964.88	95662.89	-94598.01
3	Visakapatnam	485.27	-257.30	-127.97
4	East Godavari	-94.58	556.041	-361.47
5	West Godavari	-214.52	7619.77	-7305.247324
6	Krishna	-249.34	3602.38	-3253.03853
7	Guntur	-81.58	1393.90	-1212.32189
8	Prakasam	-8.32	114.65	-6.32
9	Nellore	-151.71	1906.07	-1654.35706
10	Kadapa	-302.77	39592.32	-39189.54
11	Kurnool	773.03	-122096.58	121423.55
12	Anantapur	394.79	-10625.27	10330.47836
13	Chittor	933.09	-23373.891	22540.80
14	Andhra pradesh	-224.91	2293.33	-1968.4196

of factors which include erratic availability of irrigation water, behaviour of prices of competing crops and timely availability of agricultural inputs.The decomposition analysis showed that production of maize crop in Andhra Pradesh was mainly due to the area effect rather than the yield effect.

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