



GROWTH AND INSTABILITY IN AGRICULTURE (A study of Andhra Pradesh)

*** NRV. Ramana Reddy**

*Professor , Department of Economics, VikramaSimhapuri University PG Center,
Kavali, Nellore (Dt.) Andhra Pradesh.*

****B. Peera Kumar**

*Research Scholar, Department of Economics, VikramaSimhapuri University PG Center, Kavali,
Nellore (Dt.) Andhra Pradesh.*

ABSTRACT

Andhra Pradesh State popularly known as the “rice bowl of India” has huge potential to agriculture. In the state, while majority of the population (62%) for their livelihood depend on agriculture related activities, it contributes only 27.84% to the state Gross Domestic Product and is growing at 6.2% (2018-2019). Andhra Pradesh has been continuing to be significantly influenced by the face of its agricultural development. The study aims to found the growth and instability in Area, Production and Productivity of paddy with time series data of paddy. The study reveals that the area, production and yield of paddy is in decreasing trend in Andhra Pradesh year by year. The instability analysis clearly shows that there is high instability in area, production and yield of paddy.

KEY WORDS: *Agriculture Development, Growth, Instability, Paddy, Yield.*

1. INTRODUCTION

The newly formed Andhra Pradesh State in 2014, lies between 12°41' and 19.07°N latitude and 77° and 84°40'E longitude, and is bordered by Telangana, Chhattisgarh, and Orissa in the north, the Bay of Bengal in the East, Tamil Nadu to the south and Karnataka to the west. Among the other states, which are situated on the country's coastal area, Andhra Pradesh has got a coastline of around 974 km, which gives it the 2nd longest coastline in the nation. Two major rivers, the Godavari and the Krishna run across the state. A small enclave 12 sq mi (30 km²) the Yanam district of Puducherry, lies in the Godavari Delta in the north east of the state. The state includes the eastern part of Deccan plateau as well as a considerable part of the Eastern Ghats. Andhra Pradesh can be divided into two regions, namely Coastal Andhra and Rayalaseema.

Andhra Pradesh State popularly known as the “rice bowl of India” has huge potential to develop. In the state, while majority of the population (62%) for their livelihood depend on agriculture related activities, it contributes only 27.84% to the state Gross Domestic

Product (Andhra GSDP) and is growing at 6.2% (2018-2019). Andhra Pradesh has been continuing to be significantly influenced by the face of its agricultural development. The growing of area however had not being uniform or study there had been considerable fluctuations in both area and production that led to the fluctuation in yield. Fluctuations in area of crops were caused by variation in price, whether conditions, availability of irrigation facilities, marketing etc. It is the fact that area of individual crops varying systematically in response to inter-crop price movement widely accepted on the basis of area response studies.

2. REVIEW OF LITERATURE

Pichad et al. (2014) made an attempt to studied the growth and instability in area, production and productivity of Chickpea in Amravati district. Compound Annual Growth Rate and Coefficient of Variation were used for the analysis. The results revealed that compound growth rates for area, production and productivity were found positive and significant. Ayalew and Sekar (2016) studied the



trends and regional disparity of maize production in India. Compound Annual Growth Rate, Cuddy Della Valle Index and decomposition analysis were used to examine the data. The study found an increase in the area and production of maize during their study period. Harshita Tewari et al. (2017) study reveals that the area, production and productivity of wheat production have shown the positive growth during 1990-91 to 2013-14 in their study area. Shabana Anjum and Madhulika (2018) were conducted a study on the growth and instability in the major crops of India. Cuddy Della Valle Index and Coppock's instability index has been calculated for all the crops. The entire study period is divided into three sub-periods: 1990-91 to 1999-2000, 2000-01 to 2009-10 and 2009-10 to 2016-17. Several fluctuations in the growth pattern of area, production and productivity of the crops were also observed in the study. Swain, Mrutyunjay, (2014) study analyzes the nature and sources of agricultural instability in the Bolangir district of Western Odisha, India. The nature of instability in agricultural production is examined by determining the Agricultural Instability Index (AII) of variables such as area, production and yield of food grains and paddy, irrigation coverage, and annual rainfall.

Asis Kumar Senapatia and Phanindra Goyari (2019) study has analysed the growth and instability in the productivity of major crops grown across the districts of Odisha, and examines its sensitivity to weather conditions during different phases of technological change. The study found that except gram, the rate of growth in yield of other crops in the state is dismal. Productivity of rice, potato, maize, groundnut, and sugarcane has not only experienced deceleration but also witnessed instability over time. Sunita et al. (2017) study has made an attempt to examine the instability in the area, production and productivity of barley crop in India and Haryana during three phases i.e. pre-green revolution, green revolution and post green revolution period. The results showed that in case of area, the instability is more in the post-green revolution than pre-green revolution period as the focus of the green revolution was mainly on other crops like rice and wheat.

Most of the previous studies, implicitly or explicitly assumed a close and direct relationship between area and output. An increase or decrease in area was regarded as a proxy for an increase or decrease in output of food crops. Although such assumption was generally valid it is worth pointing out that in subsistence agriculture, where yield could fall, an increasing area did not guarantee a raise in output. The present study aims to find growth and instability of paddy, which is the prominent crop in Andhra Pradesh.

3. OBJECTIVE OF THE STUDY

To study the growth and instability in Area, Production and Productivity of Paddy in Andhra Pradesh.

4. HYPOTHESIS OF THE STUDY

Null Hypothesis H₀: There is **instability** in the area, production and yield of paddy over the years in Andhra Pradesh.

Alternative hypothesis: There is **instability** in the area, production and yield of Paddy over the years in Andhra Pradesh.

5. SOURCE OF DATA

For this study, the time series data on area, production and yield for selected crops were obtained from secondary sources of various issues of Season and Crop Reports of Andhra Pradesh, Farm Statistical Abstracts of Andhra Pradesh for the period of 24 years i.e. 1995-2019.

6. TOOL OF ANALYSIS

Simple Regression Model:

To fulfill the objective of the study the following simple linear regression model was used to calculate growth rates for Area, Production and Yield of Paddy, Groundnut in Rayalaseema, Coastal regions and entire Andhra Pradesh.

$$Y = a + bt$$

where

Y = area / production / yield.

a, b are the constants to be determined.

t = time point

The percentage of linear growth rate is calculated by the formula

$$L. G. R = \frac{\hat{b}}{\bar{Y}} * 100$$

\hat{b} is tested by 't'-test statistic

$$t = \frac{\hat{b}}{S.E(\hat{b})}$$

Where,

$$S.E(\hat{b}) = \sqrt{\frac{\epsilon(Y - \bar{Y})^2}{N}}$$

Co-efficient of Variation:

To determine the Instability in area, output and yield of the selected crops, the co-efficient of variation to be calculated by the formula

$$CV = \frac{\sigma}{\bar{Y}} * 100$$

Where:

σ = standard deviation

\bar{Y} = mean of area / production / productivity.

**Instability Index:**

The use of coefficient of variation as a measure to show the Instability in time series data has some limitation. If the time series data exhibit any trend, the variation measured by CV can be over-estimated, i.e. the region which has growing production are at constant rate will score high in instability of production if CV is applied for measuring instability. To overcome this limitation Cuddy Della Valle Index(1978) has introduced the Instability Index for time series data that is characterized by trend. To test the Instability the following (CDV Index) measure has incorporated for this study.

$$CDV \text{ Index} = CV \sqrt{1 - R^2}$$

Where, CV is the Coefficient of Variation in percent, and R^2 is the coefficient of determination from time trend regression adjusted by the number of degree of freedom. The value of CDV Index has a range of 0-15 is categorized as low instability, 15-30

as moderate instability and above 30 as high instability.

7. RESULTS AND DISCUSSIONS**Fitted Trend Equations Analysis:**

The fitted trend equations for area, production and yield for Paddy are shown in the Table.1.

Royalaseema Region:

The estimated trend equations of paddy for Royalaseema region, Coastal region and entire Andhra Pradesh. The trend value(-3369.84) of area in Royalaseema shows negative and statistically significant, it indicates the area of paddy is decreases by 3369.82 hectares in every year of the study period. In case of production (29248.68) and yield (342.22) are positive and statistically significant, it revealed that the production increases by 29248.68 tonnes and Yield increases 342.22 kg by in every year of study period.

Table-1: Estimated Regression Equations for Paddy

Region	Area	Production	Yield
Royalaseema	$Y = 287422.62 - 3369.84 * t$	$Y = -17221.05 + 29248.68 * t$	$Y = 307.20 + 342.22 * t$
Coastal Andhra	$Y = 2793531.31 - 28651.06 * t$	$Y = 2793531.31 - 24561.06 * t$	$Y = 4122.014 - 12.18 * t$
Andhra Pradesh	$Y = 4719974.04 - 101686.74 * t$	$Y = 1552507.65 - 5805.58 * t$	$Y = 6260.75 - 106.82 * t$

*Shows significant at 5% probability level.

Costal Andhra Region:

The trend value of area (- 28651.06), production (- 24561.06) and (-12.18) yield in Coastal Andhra are negative and statistically significant, indicates the area of paddy is decreases by 28651.06 hectares, 24561.06 tonnes of production and 12.18 kg. of yield is decreasing in every year of the study period.

Entire Andhra Pradesh:

The trend value of area (-101686.74), production (-5805.58) and (-106.82) in entire Andhra

are negative and statistically significant, indicates the area of paddy is decreases by 101686,74 hectares, 5805.58 tonnes of production and 106.82 kg. of yield is decreasing in every year of the study period.

With the analysis of trend the study reveals that the area, production and yield of paddy is in decreasing in Andhra Pradesh year by year.

Growth and Instability Analysis:

The estimated linear growth rates for Area, Production and Yield for Paddy in Royalaseema, Coastal and entire Andhra Pradesh along with CV and CVD Index of Instability has shown in the Table-2.

Table - 2: Linear Growth Rates, CV and CDV Index for Paddy

Region	Linear Growth Rates			Co-efficient of Variation			CVD Index		
	Area	Production	Yield	Area	Production	Yield	Area	Production	Yield
Royalaseema	- 13.73	8.40	7.47	21.71	101.06	101.98	19.43	81.79	87.25
Coastal Andhra	- 1.01	- 0.74	- 0.31	29.24	101.63	34.51	28.03	58.03	34.49
Andhra Pradesh	- 2.90	10.23	0.03	32.51	95.31	53.02	24.95	62.50	5074

Source: Authors calculations

**Royalaseema Region:**

The estimated Linear Growth Rate of area (- 13.73) is negative and growth rates of production (8.40) and yield (7.47) are positive, indicates the area of paddy is decreases by 13.73 hectares, production increased by 8.40 tonnes for every 1000 hectares and yield increased by 7.47 kg. of per hectare of paddy in every year of the study period. The Co-efficient of variation for area, production and yield are 21.71, 101.98 and 101.06 respectively. The calculated CVD Index is 19.43, shows moderate Instability in case of area under paddy in the study period. The calculated CVD is 81.79 for production and is 87.25 for yield of paddy, indicates the high Instability in case of production and yield in the study period

Coastal Andhra Region

The estimated linear growth rate of area (- 1.01) is negative and growth rates of production (- 0.74) and yield (- 0.31) are negative, indicates the area of paddy is decreases by 0.74 hectares, production decreased by 0.74 tonnes for every 1000 hectares and yield decreased by 0.31 kg. of per hectare of paddy in every year of the study period. The Co-efficient of variation for area production and yield are 29.24, 101.63 and 34.51 respectively. The calculated CVD Index is 28.03, shows moderate Instability in case of area under paddy in the study period. The calculated CVD Index is 58.03 for production and is 34.49 for yield of paddy, indicates the high Instability in case of production and yield in the study period.

Entire Andhra Pradesh:

The estimated linear growth rate of area (- 2.90) is negative and growth rates of production (10.23) and yield (0.03) are positive, indicates the area of paddy is decreases by 2.90 hectares, production increased by 10.23 tonnes for every 1000 hectares and yield increased by 0.03 kg. of per hectare of paddy in every year of the study period. The Co-efficient of variation for area production and yield are 23.51, 95.31 and 53.02 respectively. The calculated CVD Index is 24.9, shows moderate Instability in case of area under paddy in the study period. The calculated CVD Index is 58.03 for production and is 34.49 for yield of paddy, indicates the high Instability in case of production and yield in the study period.

8. CONCLUSIONS

The study has analysed the Growth and the Instability of paddy crop with time series data in Andhra Pradesh. There were several fluctuations in the growth pattern of area, production and productivity of paddy in Royalaseema region, Coastal Andhra and entire Andhra Pradesh. The study reveals that the area, production and yield of paddy is in decreasing trend in Andhra Pradesh year by year. The

Instability analysis clearly shows that there is high Instability in area, production and yield of paddy in region-wise and in entire Andhra Pradesh.

9. REFERENCES

1. Asis Kumar Senapatia and Phanindra Goyari (2019), "Growth and instability in agricultural productivity in Odisha", *Agricultural Economics Research Review*, 32 (1), 55-65.
2. Birhanu Ayalew and Sekar (2016), "Trends and regional disparity of maize production in India", *Journal of Development and Agricultural Economics*, Vol. 8(9), pp. 193-199.
3. Cuddy, J. D. A. and Della Valle, P.A. (1978), "Measuring the instability in time series data". *Oxford B. Econ. Stat.*, 40(1):79-85.
4. Harshita Tewari, H.P. Singh and Usha Tripathi (2017), "A Region Wise Analysis of Uttar Pradesh, India" *International Journal of Current Microbiology and Applied Sciences*, ISSN: 2319-7706, Volume 6 Number 9 (2017) pp. 2537-2544.
5. Pichad SP, Wagh HJ, Kadam MM. (2014), "Growth in area, production and productivity of chickpea in Amravati", *Eco. and Statics*, 5(2):289-292.
6. Shabana Anjum and Madhulika (2018), "Growth and instability analysis in Indian agriculture", *International Journal of Multidisciplinary Research and Development*, ISSN: 2349-4182, Volume 5; Issue 11; November 2018; Page No. 119-125.
7. Sunita, Jitender Kumar Bhatia and Heena (2017), "Growth and Instability in Area, Production and Productivity of Barley in Haryana", *Current Journal of Applied Science and Technology*, vol; 5, pp 255-257.
8. Swain, Mrutyunjay (2014), "Sources of Growth and Instability in Agricultural Production in Western Orissa", *India, Asian Journal of Agriculture and Development*, vol. 11(2), pages 1-20.