CHAPTER - III

Growth and Instability in Selected Crops
Performance of food, commercial and oil seeds crops in Andhra Pradesh

Andhra Pradesh is one of the important states in the country growing food, commercial and oilseeds crops like paddy, Jowar, Bajra, Ragi, maize, small millets, pulses, sugarcane, tobacco, Seasamum, groundnut and sunflower etc. The demand for all these crops is increasing day-to-day. All these crops are grown in both Kharif and Rabi seasons. During the plan periods the growth of these food, commercial and oilseeds crops are increasing due to the implementation of green revaluation. The total area under food grains in Andhra Pradesh during 2005-06 is 71.68 lakh hectares where as it is 62.66 lakh hectares in the year 2004-05. Therefore 14.4 per cent of variation in total food crop’s area was increased. The performance of five major food crops in Andhra Pradesh from 2001-02 to 2005-06.

The area, production and yield of groundnut crop during the year 2010-11 are 1758643 hectares 986773 tonnes and 898 kilograms per hectare respectively.

Due to area shift to more profitable crops, there was sharp decline in the production of sugarcane to 285.03 million tonnes and 277.75 million tonnes respectively during 2008-09 and 2009-10.

Paddy

Paddy is the principal crop extensively cultivated in all the districts of the state both in Kharif and Rabi seasons. It accounted for 29.8 per cent of the total cropped area, 69.1 per cent of the total food grains production
during 2005-06. The area under the paddy during 2005-06 was 39.82 lakh hectares as against 30.86 lakh hectares in the previous year regarding an increasing of 29 per cent. The area under the paddy was the highest in the last five years due to favourable seasonal conditions during south-west monsoon period. The production of paddy during 2005-06 was 117.04 lakh tonns against 96.01 lakh tonns in 2004-05 regarding an increase of 21.9 per cent. The yield rate of paddy as gone down to 2939 kgs/hectare in 2005-06 from 3111 kgs/hectare in 2004-05 due to the paddy area was affected by severe floods/cyclones. The production of paddy during 2005-06 was 117.04 lakh tonns against 96.01 lakh tonns in 2004-05 regarding an increase of 21.9 per cent. The yield rate of paddy as gone down to 2939 kgs/hectare in 2005-06 from 3111 kgs/hectare in 2004-05 due to the paddy area was affected by severe floods/cyclones.

**Groundnut**

India is one of the largest producers of groundnut in the World. But they account for a small part of international trade because most of their production is consumed domestically as groundnut oil. Approximately 90 per cent of India’s production is processed in to oil. Groundnut may be spoiled with the meld Aspergilla’s flavours, which produces a carcinogenic substance, called of aflatoxin. While this substance quickly causes liver cancer in rats, humans are far more resistant. Lower quality specimens, particularly where meld is evident are more likely to be
contaminated. To minimize this problem, make sure to obtain your groundnut from a reputable source and store the groundnut in a cool dry place such as the refrigerator or freezer.

Groundnut is the most important oilseed crop accounting for about 20 per cent of the cropped area in the state of Andhra Pradesh. The area, production and yield of groundnut crop during the year 2010-11 are 1758643 hectares 986773 tonnes and 898 kilograms per hectare respectively.

**Sugarcane**

Sugarcane is one of the major commercial crops in India. The year 2005 will go down as the revival year in cash crop segment. It is in the form of higher income for growers due to rising prices but not higher production. Sugarcane is the most widely produced cash crop in India. However, of late, sugarcane production was seen disappointing. For instance, during 2000-2005, cane production increase is a negligible increase during 2005-06, it increased by 7 per cent.

The production declined marginally to 348.19 million tonnes in 2007-08. However, due to area shift to more profitable crops, there was sharp decline in the production of sugarcane to 285.03 million tonnes and 277.75 million tonnes respectively during 2008-09 and 2009-10. During the current year the area coverage under sugarcane has increased and its
production is estimated at 324.91 million tonnes i.e. higher by 47.16 million tonnes as compared to 2009-10.

**Analysis:**

In this chapter trends and growth rates and instability were analysed with three views i.e., area, production and yield in selected crops (paddy (food crop), groundnut (oil seeds crop) and sugarcane (commercial crop)) with the help of the linear equations, co-efficient of variation and given graphical representation.

**Region-wise Growth and Instability in Selected Crops**

**Rayalaseema Region**

1.1 Paddy-Area:

The estimated linear regression equation for area of paddy in Rayalaseema is

\[ Y = 298581.3 - 3112.61 \times t \]

\[ \text{L.G.R} = -1.3132 \% \quad \text{C.V} = 20.84 \% \]

*Significant at 5 per cent probability level.

From the above equation, the estimated value of ‘b’ is -3112.61. It reveals that there is a decreasing trend in paddy area in Rayalaseema region. This value reveals that on average, 3112 hectares are decreasing every year during the study period. This decrease in paddy area is significant at 5 per cent probability level. The linear growth rate (LGR) is estimated and found as -1.3132 per cent. This rate shows that the average
annual decrease in the area of paddy in Rayalaseema region is 1.3 per cent. The coefficient of variation is 20.84 per cent in area of paddy cropping.

1.2. Paddy-Production:

The estimated equation of linear regression for paddy production in Rayalaseema is

\[ Y = 89267.057 + 3381.313 \times t \]  
L.G.R = 2.506 %  
C.V = 39.65 %

The value of linear growth rate is 2.506 per cent. It shows that the average annual growth in production of paddy in Rayalaseema region is 2.5 per cent. The value of the intercept i.e., ‘a’ is 89267.057. The estimated value of ‘b’ is 3381.313. It reveals that there is an increasing trend in paddy production in Rayalaseema region. This value reveals that on average, 3381 tons of paddy production is increasing every year during the study period. It is a significant increase in production of paddy. The
coefficient of variation reveals that 39.65 per cent of variation is in production of paddy.

1.3. Paddy-Yield:
The estimated equation of linear regression for paddy yield in Rayalaseema is

\[ Y = -411.2551 + 159.391t \]

\[ \text{L.G.R} = 9.1576\% \quad \text{C.V} = 75.61\% \]

From the above equation, the estimated value of ‘b’ is 159.391. The positive value of ‘b’ reveals that there is an increasing trend in the yield of paddy in Rayalaseema region. This value reveals that on average, 159.4 kilograms are increasing every year during the study period. It is a significant increase in paddy yield. The linear growth rate is found as 9.1576 per cent. This rate shows that the average annual growth in yield of
paddy in the region is 9.15 per cent. The value of the intercept term i.e., ‘a’ is -411.255. The coefficient of variation is 75.61 per cent.

### Fig:3.3: Rayalaseema Region: Paddy

![Graph showing yield over years](image)

#### 2.1. Groundnut-Area:

The calculated linear regression equation for area of groundnut crop in Rayalaseema is

\[
Y = 1444093 - 4526.757t
\]

- **L.G.R = -0.3273 %**
- **C.V = 13.36 %**

The linear growth rate is -0.3273 per cent. It shows that there is a negative growth in groundnut area. The average annual decrease in area of groundnut in Rayalaseema region is 0.3 per cent. The estimated value of ‘b’ is -1444093. It reveals that there is a decreasing trend in groundnut area in the region. This value reveals that an average, 1411093 hectares of area is decreasing and this decrease is significant. The value of the intercept i.e.,
‘a’ is 4526.757. The coefficient of variation is 13.36 per cent and reveals that 13 per cent of variation is in area of groundnut during the study period.

![Fig:3.4: Rayalaseema Region: Groundnut](image-url)

### 2.2. Groundnut-Production:

The computed equation for the production of groundnut crop is

\[ Y = 1359807.76 - 23011.2t \]

L.G.R = -2.1933%  
C.V = 35.12 %

From the above estimated equation, the value of ‘b’ is negative and significant at 5 per cent of probability level. It reveals that the rate of change in the equation. It means every year, on average, 23011.2 tons of groundnut production is decreasing. It is a significant increase tested by t-test statistic. The estimated linear growth rate of production of groundnut crop is -2.1933 per cent. The value of constant/intercept term is 1359807.76. The coefficient of variation is 35.12 per cent.
2.3. Groundnut Yield:

The estimated equation for groundnut yield in Rayalaseema region is

\[ Y = 925.741 - 19.442t \]

L.G.R = -2.9313 %  
C.V = 26.32 %

The estimated linear growth rate is -2.9313 per cent. It shows that the average annual decrease in the yield of groundnut in Rayalaseema region is
2% per cent. The estimated value of $b$ is -19.442. It is negative and insignificant at 5% probability level. It reveals that there is a decreasing trend in groundnut yield in the region. It discloses that on average, 19.44 kilograms of yield is decreasing every year during the study period. The coefficient of variation is 26.32%. The value of the intercept term is 925.741.

3.1. Sugarcane-Area:

The fitted linear regression equation for area of sugarcane crop is

$$Y = 31052.57 + 175.479t$$

The estimated linear equation for area under sugarcane crop in Rayalaseema region of Andhra Pradesh is 0.525% per cent. A positive growth was recorded in case of sugarcane area during the study period. But this growth was insignificant. The coefficient of ‘$b$’ is estimated and it is observed to be a positive and significant. The value of ‘$b$’ is 175.479. It
reveals that there is an increasing trend in sugarcane area in the region. On average every year 175 hectares of sugarcane area is increasing. The value of the intercept i.e., ‘a’ is 31052.57. The coefficient of variation is 20.05 per cent and reveals that 20 per cent of variation is in area of sugarcane during the study period.

3.2. Sugarcane-Production:

The calculated linear regression equation for production of sugarcane crop is

\[ Y = 219971.6 + 2793.815 \times t \]

L.G.R = 1.0842\%  C.V = 27.25 \%

From the above equation, the estimated value of ‘b’ is positive and significant (2793.815). It reveals that there is a significant increasing trend in the production of sugarcane in Rayalaseema region. This value reveals that on average, 2793.8 tons of cane production is increasing every year.

![Fig:3.8: Rayalaseema Region: Sugarcane](image-url)
during the study period. The linear growth rate is found as 1.084 per cent. It shows that the average annual growth is in increase in production of sugarcane in the region and it is 1 (one) per cent. The value of the intercept term i.e., ‘a’ is 219971.6. The coefficient of variation is 27.25 per cent and reveals that 27 per cent of variation is in cane production during the study period.

3.3. Sugarcane-Yield:

The estimated equation of linear regression for sugarcane yield in Rayalaseema is

\[ Y = -1650.14 + 363.8821^t \]

L.G.R = 11.1542%  C.V = 96.94%

From the above equation, the estimated value of ‘b’ is 363.8821. It is positive and significant at 5 per cent probability level. It reveals that there is an increasing trend in the yield of sugarcane in Rayalaseema region. It is noticed that on average, 363 kilograms are increasing every year during the study period. The linear growth rate is found as 11.154 per cent. It shows that the average annual increase in yield of sugarcane in the region is 11 per cent. The value of the intercept term is 1650.14. It is observed that the positive growth rate was recorded through the growth rates of area and production of sugarcane crop was recorded a positive growth rate in Rayalaseema region. Hence, it may infer that the effect of green revolution in agricultural sector is positive. The coefficient of variation is 96.94 per cent.
Coastal Andhra Region

1.1 Paddy-Area:

Linear regression equation for area under paddy crop in Coastal Andhra region is

\[ Y = 2105423.98 + 21143.844t \]

L.G.R = 0.8843 %  \quad C.V = 14.12 %

From the above equation, the estimated value of ‘b’ is 21143.844. It reveals that there is increasing trend in paddy (area) in Coastal Andhra region. This is noticed that on average, 21143.8 hectares are increasing every year during the study period. It is significant at 5 per cent probability level. The linear growth rate (LGR) is estimated and found as 0.8843 per cent. It shows that the average annual increase in growth of area of paddy in the region is 0.88 per cent. It may infer that the paddy cultivation is not profitable to its growers. The value of the intercept term i.e., ‘a’ is
The coefficient of variation is 14.12 per cent and it reveals that 14 per cent of variation is in area of paddy during the study period.

**Fig:3.10: Coastal Andhra Region: Paddy**

1.2. Paddy- Production:

The fitted equation of linear regression for paddy production in Coastal Andhra region is

\[ Y = 684295.27 + 30332.92t \]

\[ \text{L.G.R} = 2.7732 \% \quad \text{C.V} = 31.98 \% \]

The linear growth rate is 2.7732 per cent. This rate shows that the average annual increase in growth of production of paddy in Coastal Andhra region is 2.77 per cent. The value of the intercept is 684295.27. The estimated value of ‘b’ is 30332.92. This positive and significant value reveals that there is an increasing trend in paddy production in Coastal Andhra region. It shows that on average, 30333 tons of paddy output is increasing every year during the study period. The coefficient of variation is 31.98 per cent.
1.3. Paddy-Yield:

The estimated equation of regression for paddy yield in Coastal Andhra region is

\[ Y = -497.75 + 163.525t \quad \text{L.G.R} = 9.5637\% \quad \text{C.V} = 75.56\% \]

From the above equation, the estimated value of ‘b’ is 163.252. It reveals that there is an increasing trend in the yield of paddy in Coastal Andhra region. This value reveals that an average, 163.5 kilograms are increasing every year during the study period. The linear growth rate is found as 9.5637 per cent. This rate shows that the average annual increase in yield of paddy is 9.5 per cent. The value of the intercept term is -497.75. The coefficient of variation is 75.56 per cent and it reveals that 75.5 per cent of variation is in yield of paddy during the study period.
2.1. Groundnut-Area:

The calculated equation for groundnut crop area in Coastal Andhrais

\[ Y = 330672.6 - 6188.26t \]

L.G.R = -2.5039 %  C.V = 31.45 %

The linear growth rate is -2.5039 per cent. It reveals negative growth in groundnut area. It shows that the average annual decrease ingrowth of the area of groundnut in Coastal Andhra region is 2.5 per cent. The estimated value of ‘b’ is -6188.26. It is a negative and significant. It reveals that there is a decreasing trend in groundnut area in the region. It reveals that on average, 6188 hectares of crop area is decreasing every year during the study period. The value of the intercept i.e., ‘a’ is 330672.6. The coefficient of variation is 31.45 per cent and it reveals that 31 per cent of variation is in area of groundnut during the study period.
2.2. Groundnut-Production:
The computed linear regression equation for the production of groundnut crop in is

\[ Y = 393195.46 - 9773.47t \]

\[ \text{L.G.R} = -3.7409 \% \]
\[ \text{C.V} = 40.12 \% \]

From the above equation it is observed that the coefficient of time is negative and significant at 5 per cent probability level. Hence, the value of ‘b’ is -9773.47. It reveals that there is a decreasing trend in the production of groundnut in Coastal Andhra region. On average, 9773.4 tonnes of groundnut production is decreasing every year during the study period. It is a significant decrease. The linear growth rate is found as -3.7409 per cent. This rate shows that the average annual decrease in production of groundnut in the region is 3.7 per cent. The coefficient of variation in production of groundnut is 40.12.
2.3. Groundnut-Yield:

The linear regression equation for groundnut yield in Coastal Andhra region is

\[ Y = 1148.22 - 0.1672t \]

L.G.R = -0.0146%  C.V = 19.96%

The observed linear growth rate of groundnut yield is -0.0146 per cent.

The estimated value of ‘b’ is -0.1672. It reveals that there is a
significant decreasing trend in groundnut yield in the region. It reveals that on average, 0.16 kilograms yield is decreasing every year during the study period. The value of intercept term is 1148.22. The coefficient of variation is 19.96 per cent.

3.1. Sugarcane-Area:

The calculated linear regression equation for area of sugarcane crop is

$$Y = 101708.7 + 1977.162 \times t$$

L.G.R = 1.5398%  C.V = 19.83%

The linear growth rate is 1.5398 per cent. It expresses that the annual increase in growth in area of sugarcane in Coastal Andhra region is 1.5 per cent approximately. The coefficient of ‘b’ is recorded as positive and significant. The estimated value of ‘b’ is 1977.162. It reveals a significant increasing trend in sugarcane area in the region. Therefore, on average, 1977 hectares of area is increasing every year during the study period. The value of the intercept i.e., ‘a’ is 101708.7. The coefficient of variation is
19.83 per cent and it reveals that 19.8 per cent of variation is in area of sugarcane during the study period.

3.2. Sugarcane Production:

The calculated linear regression equation for production of sugarcane crop is

\[ Y = 495265.7 + 35437.48t \]

**L.G.R = 3.6395 %  C.V = 30.44 %**

In the above equation the estimated coefficient of time factor for sugarcane production is positive and significant i.e., the value of ‘b’ is 35437.48. Hence, a positive trend was noticed in the case of sugarcane production. It reveals that there is an increasing trend in the production of sugarcane in Coastal Andhra region. This value reveals that on average, 35437 tonnes are increasing every year during the study period. The linear growth rate is found as 3.3695 per cent. It shows that the average annual
growth in production of sugarcane in the region is 3 per cent. The coefficient of variation is 30.44 per cent and it reveals that 30 per cent of variation is in production of sugarcane during the study period.

3.3. Sugarcane-Yield:
Estimated equation of linear regression for sugarcane yield in Coastal Andhra is

\[ Y = -1814.88 + 373.731^t \]

L.G.R = 11.5688 %  C.V = 98.98 %

From the above equation, the estimated value of ‘b’ is 373.731. It is positive and significant at 5 per cent probability level. It reveals that there is a significant increasing trend in the yield of sugarcane in Coastal Andhra region. It is observed that on average, 373.7 kilograms of crop yield is increasing every year during the study period. The linear growth rate is found as 11.5688 per cent. It shows annual growth in yield of sugarcane in the region is 11.56 per cent. The value of the intercept term i.e., ‘a’ is -

![Graph: Coastal Andhra Region: Sugarcane](image)
The coefficient of variation is 98.98 per cent and it reveals that nearly 99 per cent of variation is in yield of sugarcane during the study period.

**Telangana Region**

1.1. Paddy-Area:

The estimated linear regression equation for area of paddy in Telangana is

\[ Y = 1204822.21 - 4228.97t \]

\[ \text{L.G.R: } -0.3684\% \quad \text{C.V: } 17.27\% \]

From the above equation and graph, the estimated value of ‘b’ is -4228.97. The estimated regression coefficient of time is negative and significant. A significant decreasing trend in paddy (area) in Telangana region was recorded. It reveals that on average nearly 4229 hectares of paddy area is decreasing every year during the study period. The linear growth rate (LGR) is estimated and found as -0.3684 per cent. This rate
shows that the average annual decrease in growth of area of paddy in the region is 0.36 per cent. A negligible decrease was found in paddy area. The coefficient of variation is 17.27 per cent.

1.2. Paddy - Production:
The estimated linear regression equation for paddy production in Telangana region

\[ Y = 394936.12 + 11860.1 \times t \]

L.G.R = 2.1367 %  
C.V = 38.94 %

The recorded linear growth rate is 2.1367 per cent. It shows that the average annual growth in production of paddy in Telangana region is 2 per cent. The value of the intercept i.e., ‘a’ is 394936.12. The estimated value of ‘b’ is 11860.1. It is positive and significant. It reveals that there is an increasing trend in paddy production in Telangana region. On average, 11860 tonnes of paddy production is increasing every year during the study.
period. This increase is a significant increase. The coefficient of variation is 38.94 per cent.

1.3. Paddy-Yield:
The fitted linear regression equation for paddy yield in Telangana region is

\[ Y = -446.2689 + 155.91 \times t \]
\[ \text{L.G.R} = 9.4006\% \]
\[ \text{C.V} = 74.68\% \]

From the above equation, the estimated value of ‘b’ is 155.91. The estimated regression coefficient of time is positive and significant. It reveals that there is a significant increasing trend in the yield of paddy in Telangana region. It shows that on average, 156 kilograms of yield is increasing every year in the study period. The linear growth rate is found to be 9.4 per cent. It expresses that the average annual growth in yield of paddy in the region is 9.4 per cent. The value of the intercept term i.e., ‘a’ is -446.2689. The coefficient of variation is 74.68 per cent and it reveals that 74 per cent of variation is in paddy yield in the study period.

![Fig:3.21: Telangana Region: Paddy](image-url)
2.1. Groundnut-Area:
The calculated linear regression equation for area of groundnut crop in Telangana is

\[ Y = 423179.3 - 6581.07t \]

L.G.R = -1.9684 %  C.V = 25.70 %

The value of linear growth rate is -1.9684 per cent. A negative growth rate was recorded in case of groundnut area in the region. It shows that the average annual growth is decreasing in the area of groundnut in Telangana region. The estimated value of ‘b’ is -6581.07. It is a negative and significant value. It reveals that there is a decreasing trend in groundnut area in the region. It expresses that on average, 6581 hectares are decreasing every year. The value of the intercept i.e., ‘a’ is 423179. This decreasing trend in area is due to the lack of the demand to its production. The coefficient of variation is 25.70 per cent and it reveals that 25.70 per cent of variation is in area of groundnut.

![Fig: 22: Telangana Region: Groundnut](image-url)
2.2. Groundnut-Production:

The computed linear regression equation for the production of groundnut crop in Telangana is

\[ Y = 367627.24 - 6930.05 \times t \]

L.G.R = -2.5285 \%  \quad C.V = 31.13 \%

In the above equation, the estimated value of ‘b’ is (-6930). A negative and significant trend in groundnut production was noticed in the region. It reveals that there is a decreasing trend in the production of groundnut in Telangana region. It shows that on average, 6930 tons are decreasing every year in the study period. The calculated linear growth rate is found as -2.5285 per cent. It shows that the average annual decrease in production of groundnut in the region is 2.5 per cent. The value of the intercept term i.e., ‘a’ is 367627.24. The coefficient of variation is 31.13 per cent and it reveals that 31.13 per cent of variation is in groundnut production in the study period.

![Fig:23:Telangana Region: Groundnut](image-url)
2.3. Groundnut-Yield:

The linear regression for groundnut yield in Telangana region is

\[ Y = 994.2 - 24.1823*t \quad \text{L.G.R} = -3.6216 \% \quad \text{C.V} = 35.86 \%

The linear growth rate is -3.6216 per cent. This rate shows that the average annual decrease in the yield of groundnut in Telangana region is 3.62 per cent. The estimated value of ‘b’ is -24.1823. A significant decreasing trend was noticed in the yield of groundnut crop, since the estimated coefficient of time is negative and significant. It reveals that an average, 24 kilograms of yield is decreasing every year in the study period. The value of intercept term is 994.2. The instability in groundnut yield is 35.86 per cent.

![Fig:24:Telangana Region: Groundnut](image-url)
3.1. Sugarcane-Area:

The fitted linear regression equation for area of sugarcane crop Telangana region

\[ \hat{Y} = 47657.92 + 348.482t \]

L.G.R = 0.6655\%  
C.V = 21.77\%

The value of linear growth rate is 0.6655 per cent. A negligible growth was observed in the case of sugarcane in Telangana region. The estimated value of ‘b’ is 348.48. It reveals that there is an increasing trend in sugarcane area in the region. It shows that on average 348 hectares of area is increasing every year in the study period. It is a significant increase proved by t-test statistics. The value of the intercept term is 47657.92. The coefficient of variation is 21.77 per cent and it reveals that 21.7 per cent of fluctuation is observed in sugarcane area in the study period.
3.2. Sugarcane-Production:

The linear regression equation for production of sugarcane crop is

\[ Y = 193743.8 + 12769.42t \]  
L.G.R=3.4876 %  
C.V = 30.80 %

From the above equation, the estimated value of ‘b’ is 12769.42. It reveals that there is a increasing trend in the production of sugarcane since the coefficient of time is positive and significant. On average, nearly 12769 tonnes of sugarcane production is increasing in the region. It is observed to be a significant increase. The lineargrowth rate is found as 3.4876per cent. It shows the average annual growth in production of groundnut in the region is increasing. This decrease is 3.5per cent. The value of the intercept term is 193743.8. The coefficient of variation is nearly 30.80percent and it reveals that 30.8per cent of variation is in sugarcane production in the study period.

Fig: 26: Telangana Region: Sugarcane
3.3. Sugarcane-Yield:
The estimated equation of linear regression for sugarcane yield in Telanganais

\[ Y = -2264.02 + 439.645*t \]

L.G.R = 11.9755 \%
C.V = 101.58 \%

From the above equation, the estimated regression coefficient, i.e., the value of ‘b’ is 439.645. Since, a positive and significant trend was recorded in crop of sugarcane yield. The LGR must be a positive growth. It shows that there is an increasing trend in the yield of sugarcane. It reveals that on average, 439.6 kilograms are increasing every year in the study period. The linear growth rate is found as 11.9755 per cent. It shows the average annual growth in yield of sugarcane in the region is 11.97 per cent. The value of the intercept term i.e., ‘a’ is -2264.02. The coefficient of variation is 101.58 per cent and it reveals that 101.58 per cent of variation is in sugarcane yield in the study period.

Fig: 27: Telangana Region: Sugarcane
**Andhra Pradesh State**

1.1 Paddy-Area:

The estimated linear equation for area of paddy in Andhra Pradesh State is

\[
Y = 3608820.7 + 13801.59 \times t \\
\text{L.G.R} = 0.3636 \% \\
\text{C.V} = 11.43 \%
\]

In the above equation, the estimated value of ‘b’ is 13801.59. It is positive and significant at 5 per cent probability level. It reveals that there is a significant increasing trend in paddy (area) in Andhra Pradesh State. It shows that on average, 13801.6 hectares of paddy area is increasing every year during the study period. This is a significant increase. The linear growth rate (LGR) is estimated and found as 0.3636 per cent. This rate shows that the average annual growth in area of paddy in the region is increasing 0.2 per cent, but it is a negligible increase. The value of
intercept is 3608820.7. The coefficient of variation is 11.43 per cent and it reveals that 11.4 per cent of variation is in paddy area in the study period.

1.2. Paddy- Production:

The fitted of linear regression equation for paddy production in Andhra Pradesh State is

\[ Y = 1180498 + 43830.7t \quad \text{L.G.R} = 2.4732\% \quad \text{C.V} = 33.35\% \]

The linear growth rate is 2.4732 per cent. It shows that the average annual growth in production of paddy in Andhra Pradesh State is 2.4 per cent. The value of intercept term is 1180498. The coefficient of time is observed to be positive and significant at 5 per cent probability level i.e. the value of ‘b’ is 43830.7. It reveals that there is an increasing trend in paddy production in Andhra Pradesh State. It expresses that on average, 43830.7 tonnes of paddy output is increasing every year during the study period.

**Fig:29: Andhra Pradesh State - Production**

![Graph showing paddy production over years](image-url)
period. It is observed as a significant increase. The coefficient of variation is 33.35 per cent and it reveals that 33 per cent of variation is in paddy production in the study period.

1.3. Paddy-Yield:
The estimated linear equation for paddy yield in Andhra Pradesh State is

\[ Y = -451.76 + 159.61^t \]  
L.G.R = 9.3724 %  
C.V = 74.76 %

From the above equation, the estimated value of ‘b’ is (159.61) positive and significant. It noticed that there is a significant increasing trend in the yield of paddy in Andhra Pradesh State. This value reveals that on average, 159 kilograms are increasing every year during the study period. The linear growth rate is found as 9.3724 per cent. It shows that the average annual growth in yield of paddy in the region is 9.4 per cent.
Though the area under paddy crop is decreasing, the production and productivity is increasing in the state. It may be the effect of new agricultural technology in paddy crop. The coefficient of variation in paddy yield is 42.18 per cent.

**2.1. Groundnut-Area:**

Calculated linear equation for area of groundnut crop in Andhra Pradesh State is

\[ Y = 2197944.99 - 17295.83t \]

\[
\text{L.G.R}= -0.8804 \%
\]

\[
\text{C.V}= 13.98 \%
\]

It is noticed that there is negligibly negative growth in case of groundnut area in Andhra Pradesh state observed and is -0.88per cent. This rate shows that the average annual decrease in growth of area of groundnut in Andhra Pradesh State is 0.9per cent. The coefficient of time
is negative and significant i.e., estimated value of ‘b’ is -17295.83. It reveals that there is a significant decreasing trend in groundnut area in the state. This value reveals that on average, 17295.8 hectares of groundnut is decreasing every year during the study period. The value of the intercept is 2197944.99. The coefficient of variation is 13.98 per cent. Therefore, the instability in groundnut area is 13.98 per cent in the state.

2.2. Groundnut-Production:

The computed linear regression equation for the production of groundnut in Andhra Pradesh State is

\[
Y = 2146661.21 - 42668.56 \times t \quad \text{L.G.R= -2.7166 \%} \quad \text{C.V = 31.13 \%}
\]

From the above equation, the estimated value of ‘b’ is -42668.56. It is observed to be a negative and significant. It reveals that there is a
significant decreasing trend in the production of groundnut in Andhra Pradesh State. This value reveals that on average, 42668 tonnes of production is decreasing every year during the study period. It is a significant decrease in output. The linear growth rate is found as -2.7166 per cent. This rate shows that the average annual growth in production of groundnut in the state is 2.7 per cent. The value of ‘a’ (intercept) is 2146661.21. The instability is observed to be as 31.13 per cent.

2.3. Groundnut-Yield:

The estimated linear equation for groundnut yield in Andhra Pradesh State is

\[ Y = 1024.09 - 16.243 \times t \]  

L.G.R = -2.0182 \%  
C.V = 15.66 \%

The estimated linear growth rate is -2 per cent. It shows that the average annual decrease in the yield of groundnut in the state is 2 per cent.
The estimated value of ‘b’ is -16.243. A negative and insignificant trend was recorded in case of groundnut yield in the state of Andhra Pradesh. It reveals that there is a significant decreasing trend in groundnut yield in the region. It reveals that on average, 16 kilograms of productivity is decreasing every year during the study period. The value of the intercept term is 1024.09. The coefficient of variation is 15.66 per cent and it reveals that 15.66 per cent of variation is in groundnut productivity in the study period.

3.1. Sugarcane-Area:
The calculated linear regression equation for area of sugarcane crop in the state is

\[
Y = 180419.2 + 2501.123t
\]

L.G.R = 1.1677 % C.V = 17.71 %

The linear growth rate is 1.1677 per cent. A positive growth was
recorded in case of sugarcane area. This rate shows that the average annual increasing growth in area of sugarcane in Andhra Pradesh State is 116 per cent. The estimated value of ‘b’ is positive and significant (2501.123). It reveals that there is a significant increasing trend in sugarcane area in the state. Therefore the average annual increase in sugarcane area is significant. The value of intercept is 180419.2. The recorded instability in area of sugarcane is 17.71 per cent.

3.2. Sugarcane-Production:
The linear regression equation for production of sugarcane crop is

\[ Y = 908981.6 + 51000.7t \]

L.G.R = 3.1925 %  \hspace{1cm} C.V = 27.07 %

From the above equation, the coefficient of time variable is positive and significant at 5 per cent probability level, since the estimated value of ‘b’ is 51000.7. It reveals that there is a significant increasing trend in the
production of sugarcane in Andhra Pradesh State. Therefore, on average, 51000 tonns of output is increasing every year in the study period. The linear growth rate is found as 3.1925 per cent. It shows that the average annual increase in production of groundnut in the region is 3 per cent. The value of the intercept term i.e., ‘a’ is 908981.6. The instability in sugarcane production is 27.07 per cent.

3.3. Sugarcane-Yield:
Estimated equation of linear regression for sugarcane yield in Coastal Andhra is

\[ Y = -1909.78 + 392.42t \]

L.G.R = 11.5829 %  
C.V = 98.99

In the above equation, the coefficient of time variable is positive and significant at 5 per cent probability level i.e., the estimated value of ‘b’ is 392.42. It shows that there is a significant increasing trend in the yield of
sugarcane in Andhra Pradesh State. Therefore, it value reveals that on average, 392 kilograms of sugarcane yield is increasing every year in the study period. The linear growth rate is found as 11.5829 per cent. This rate shows the average annual growth in yield of sugarcane in the state is 11.6 per cent. The value of the intercept term i.e., ‘a’ is -1909.78. The value of C.V is 98.99 per cent. So, the recorded instability in sugarcane yield is nearly 99 per cent.

**Inter-regional Analysis:**

The linear growth rate (LGR) is estimated and found as negative growth rates (-1.3132),(-0.3684) in Rayalaseema and Telangana regions. But in Coastal Andhra and Andhra Pradesh as a whole are showing positive trend (0.8843) and (0.3636) for area of paddy crop respectively.
Towards the groundnut cropped area, linear growth rate is found as negative (-0.273, -2.5039, -1.9684 and -0.8804) in whole study area.

Contradictorily, there were 0.6655, 1.1677, 0.5250 and 1.5398 per cents in Rayalaseema, Coastal Andhra and Telangana regions and also in Andhra Pradesh as a whole respectively. It means in whole study area there was positive growth rates in the view of sugarcane cropped area in the study period.

Likewise there is found the LGR as 2.506, 7732, 2.367 and 2.4732 per cents (positive growth rates) for the production of paddy crop in Rayalaseema, Coastal Andhra and Telangana regions and also in Andhra Pradesh as a whole respectively.

In accordance with the production of groundnut in Rayalaseema, Coastal Andhra and Telangana regions and also in Andhra Pradesh as a whole are -2.1933, -3.7409, -2.5285 and -2.7166 per cents respectively. It means in whole study area there was negative growth rates were found in the view of sugarcane production in the study period.

Production of sugarcane crop is maintaining positive trends (3.4876, 3.1925, 1.084 and 3.6395) in Rayalaseema, Coastal Andhra and Telangana regions and also in Andhra Pradesh state as a whole.
In view of the *yield* of paddy crop also the linear growth rate are positive like as 9.1576, 9.5673, 9.4006 and 9.3724 per cent in Rayalaseema, Coastal Andhra and Telangana regions and also in Andhra Pradesh state as a whole respectively.

The LGR for the yield of groundnut crop there were found negative growth rates (-3.6216, -2.0182, -2.9313 and -0.0146) in Rayalaseema, Coastal Andhra and Telangana regions and also in Andhra Pradesh as a whole.

Concerning to yield of the sugarcane crop the linear growth rates are 11.1542, 11.5688, 11.9755 and 11.5829 per cents in Rayalaseema, Coastal Andhra and Telangana regions and also in Andhra Pradesh as a whole respectively in the study period. It means there were found positive growth in whole study area in the study period.