CHAPTER - III

GROWTH AND INSTABILITY OF COMMERCIAL CROPS
Agriculture is a crucial sector in the Indian Economy. Which provides livelihood for 69 per cent of people. Moreover, it supplies food to all the people and raw material to Industries. Generally, all the agricultural activities are seasonal and continue to depend more on rainfall. As a consequence, agricultural activity have become more certain. However, in some developed countries agricultural sector has been developed beyond the nature is grip due to the use of advanced technology. In India, agriculture has been given priority time almost every five -years plans. The productivity in agriculture may be increased by adopting the modern technology and also through intensive and extensive cultivation. Along with the food crops, a study of commercial crops like Groundnut, sugarcane, Cotton and Tobacco becomes imperative for proper planning of agricultural development.

It is important to study the growth of the commercial crops to meet the future demands of growing production. Basing the future demands and growth of crops it is useful to make policy decisions regarding the area production, and yields of commercial crops in the state. Hence, it is proposed to study the growth of area, production and yield of four selected commercial crops in three regions of Andhra Pradesh and the state as a whole. The study period in 1970-71 to 2000-2001.

RAYALASEEMA REGION – AREA

Groundnut

The estimated linear regression equation of area under the groundnut crop in Rayalaseema region is:
Y = 665654.44 + 30184.95\*t 
(3578.85)

C.V = 23.89 \hspace{1cm} L.G.R = 2.63

Significant at 5 percent probability level/figures in the parenthesis are standard error. From the above equation, the regression co-efficient, i.e., the value of “B” is 30184.95. It is positive and significant at 5 percent probability level. It reveals that there is an increasing trend in area under the groundnut crop in Rayalaseema region. Numerically, on average, 30184.95 hectares of Groundnut area is increasing every year during the study period. The linear growth rate is estimated and it is 2.63. This shows that the average annual growth in area under groundnut crop in Rayalaseema is 2.63 percent. The value of intercept term is 665654.44.

The value of co-efficient of variation (C.V) is 23.89. It reveals that 23.89 percent of variation in groundnut area was recorded during the study period.

**Sugarcane**

The estimated linear regression equation of area under the crop in Rayalaseema region is.

Y = 20996.86 + 537.5992\*t 
(110.85)

C.V = 16.57 \hspace{1cm} L.G.R = 1.82

The estimated equation reveals that the co-efficient of time is positive and significant. It express that there is a significant increase in area under the sugarcane crop during the study period. Every year 537.60 hectors of Sugarcane area is increasing. It is observed that there is 1.82 percent growth in area of
Sugarcane. This shows that the average annual growth in cane area during the entire period is 1.82 percent. The value of intercept term is 20996.86.

The estimated value of coefficient of variation reveals that there is 16.57 percent of variation in Sugarcane area during this period. The instability in cane area is 16.57 percent.

**Cotton**

The constructed linear regression equation for cotton area in Rayalaseema region is

\[ Y = 145459.32 - 1353.31 t \]

\[ (820.4181) \]

C.V. = 9.94  
L.G.R = -1.09

In the above estimated equation, the co-efficient of time is negative and insignificant. An insignificant decreasing trend in cotton area in Rayalaseema was observed. Every year, 1353.31 hectares of cotton area is decreasing under the study period. The linear growth rate is -1.09. A negative growth rate was recorded in the case of cotton area. It expresses that the average annual growth rate in cotton area in Rayalaseema Region is -1.09 percent. The value of intercept term is 145459.32.

The estimated co-efficient of variation is 9.94 percent. Thus, it is noticed that the instability in cotton crop area is 9.94 percent.

**Tobacco**

The calculated linear regression equation is

\[ Y = 22317.31 - 168.2835 t \]

\[ (170.3182) \]

C.V. = 7.797  
L.G.R = (-0.8575)
In the above fitted equation, the co-efficient of time is (168.28) negative and insignificant, i.e., an insignificant decreasing trend in Tobacco area is noticed in Rayalaseema region of Andhra Pradesh. Every year, 168.29 hectares of Tobacco area is decreasing. The linear growth rate is (-0.86) negative. It indicates that the average annual growth under Tobacco crop in Rayalaseema Region is -0.86 percent. The value of intercept term is 22317.31.

The value of co-efficient of variation is 7.8 percent. Hence, it is noticed that the Instability in tobacco area is 7.8.

RAYALASEEMA REGION- PRODUCTION

Groundnut

The fitted linear regression equation of production is

\[
Y = 544694.83 + 25133.77 \times t
\]

C.V = 24.13 \quad L.G.R = 2.65

In the above fitted equation, the regression co-efficient of time is 25133.77, it is positive and significant at 5 percent probability level. The average annual Groundnut production is increasing significantly during the study period. On average, every year 25133.77 quintals of Groundnut production is increasing. The estimated linear growth rate is 2.65 percent. It reveals that the average annual growth during the study period is 2.65 percent. The value of intercept term is 544694.83.
The computed co-efficient of variation is 24.13 percent. The instability in Groundnut production in the Rayalaseema region was recorded as 24.13 percent.

**Sugarcane:**

The estimated linear regression equation of Sugarcane production in Rayalaseema region of Andhra Pradesh is

\[ Y = 159278.45 + 4760.46^* t \]

\[ (1085.712) \]

C.V = 18.38  
L.G.R = 2.02

In the above equation the regression co-efficient of time is 4760.46. it is positive and significant. A significant increasing trend in Sugarcane production was observed in Rayalaseema region. The average annual increase in Sugarcane production is 4760.46 quintals. The linear growth rate is estimated and it is 2.02 percent. It indicates that the average annual growth in cane output during the study period in Rayalaseema region is 2.02 percent. The value of constant intercept term is 159278.45.

The co-efficient of variation in Sugarcane production is 18.38 percent. It shows that 18.38 percent of variation in Sugarcane production was recorded during the study period.

**Cotton**

The estimated linear regression equation of cotton production in Rayalaseema region is:

\[ Y = 21323.05 + 5034.13^* t \]

\[ (801.36) \]

C.V.= 44.93  
L.G.R = 4.94
From the above equation, the regression co-efficient of time, i.e., the value of “B” is 5034.13. It is positive and significant at 5 percent probability level. It reveals that there is an increasing trend in production of cotton. Numerically, on average, 5034.13 bales of production is increasing every year during the study period. The linear growth rate is estimated and it is 4.94 percent. This shows that the average annual growth in production of cotton in Rayalaseema is 4.94 percent. The value of intercept term is 21323.05.

The value of co-variation is 44.93 percent. It shows that 44.93 percent of instability in cotton production was recorded during the study period.

**Tobacco**

The constructed linear regression equation of Tobacco production in Rayalaseema region is

\[
Y = 16829.615 - 22.97 t
\]

\[C.V = 1.27 \quad L.G.R = (-0.14)\]

In the above equation, the co-efficient of time is negative and insignificant i.e., an insignificant decreasing trend in Tobacco production is noticed in Rayalaseema region of Andhra Pradesh. Every year, on average 22.97 quintals of Tobacco production is decreasing. It expresses that a negative growth in tobacco production was recorded. Nearly, 0.14 percent of negative growth in production was noticed. The value of constant intercept term is 16829.61.

The calculated co-efficient of variation is 1.27 percent. It is noticed that the instability in tobacco output is 1.27 percent.
RAYALASEEMA REGION – YIELD

Groundnut

The estimate linear regression equation of groundnut yield is

\[ Y = 842.61 - 0.57t \]

(3.92)

C.V = 23.89 \quad L.G.R = -0.068

The estimated value of ‘B’ is negative, (-0.57) and it is not significant. The negative value indicates that there is a decreasing trend in groundnut yield during the study period. On average, -0.57 kilograms of groundnut yield is decreasing every year. But this decrease is not significant.

The estimated linear growth rate –0.07. It reveals that the average annual decrease in Groundnut yield is 0.07 percent. The value of constant intercept term is 842.61.

The computed co-efficient of variation is 23.89 percent. It indicates, the instability in Groundnut yield is 23.89 percent.

Sugarcane

The fitted linear regression form of sugarcane yield in Rayalaseema region is

\[ Y = 7748.32 + 15.78t \]

(27.96)

C.V = 1.79 \quad L.G.R = 0.20

The above estimated equation reveals that the co-efficient of time is positive and insignificant. It means every year 15.7 kgs of cane yield is increasing. This increase is not significant increase. The linear growth rate is
0.20 percent. It shows that the average annual growth during the study period is 0.20 percent. The value of intercept is 7748.32.

The estimated co-efficient of variation is 1.79 percent. Hence, the instability in sugarcane yield is 1.79 percent

**Cotton**

The linear regression equation of cotton yield in Rayalaseema Region is

\[ Y = 547.93 + 34.71 t \]

\[ (26.23) \]

\[ C.V = 28.60 \quad L.G.R = 3.15 \]

From the above equation the regression co-efficient i.e., the value of “B” is 34.71. A positive and insignificant trend in cotton yield was recorded in the region. It shows that on average, 34.71 kilograms of cotton yield is increasing every year during the study period. The estimated linear growth rate is 3.15 percent, i.e., the average annual growth rate in cotton yield is 3.15 percent. The value of intercept is 547.93.

The calculated value of coefficient of variation reveals that there exists 28.60 percent of variation in cotton yield during the study period, i.e., the instability in cotton yield is 28.6 percent.

**Tobacco**

The estimated linear regression equation for tobacco yield is:

\[ Y = 690.74194 + 7.707661 t \]

\[ (4.041425) \]

\[ C.V = 8.609 \quad L.G.R = 0.946812 \]
In the above equation, the value of “B” is (7.71) positive. Nearly 7.71 kgs of Tobacco yield is increasing during the study period. The estimated linear growth rate is 0.95 percent i.e., the average annual growth in tobacco yield is 0.95 percent. The value of intercept term is 690.74.

The value of co-efficient of variation is 8.61 percent. It shows 8.61 percent of variation in tobacco yield was recorded during the study period, i.e., the instability in tobacco yield is 8.61 percent.

COASTAL ANDHRA REGION – AREA

Groundnut

The estimated linear regression equation of area under the Groundnut crop in coastal Andhra region is:

\[ Y = 245964.3 + 685.44521t \]

\[ (1303.756) \]

C.V = 2.426 \quad L.G.R = 0.266781

From the above equation the regression co-efficient, i.e., the value of ‘B’ is 685.44. It is positive and insignificant. It shows that there is an increasing trend in area under the groundnut crop in Coastal Andhra region. The average annual increase in area is 685.44 hectares. The estimated linear growth rate is 0.27. It shows that the average annual growth in area under groundnut crop in coastal Andhra is 0.27 percent. The value of intercept term is 245964.3.

The value of coefficient of variation is 2.43. It shows that 2.43 percent of variation in groundnut area was recorded during the study period.
Sugarcane

The estimated linear regression equation is

\[ Y = 75459.71 + 1952.41 \times t \]

\[ C.V = 16.64 \quad L.G.R = 1.83 \]

In the above fitted equation, the co-efficient of time is 1952.41. It is positive and significant at 5 percent probability level. The average annual increase in Sugarcane area is significant during the study period. Every year, 1952.41 hectares of Sugarcane area is increasing. The linear growth rate is 1.83 percent. It shows that the average annual growth rate during the study period is 1.83 percent. The value of ‘A’ is 75459.71.

The estimated coefficient of variation is 16.64 percent during the study period. The instability in Sugarcane area in Coastal Andhra region of Andhra Pradesh is recorded 16.64 percent.

Cotton

The estimated linear function is

\[ Y = 63791.329 + 8100.53 \times t \]

\[ C.V = 38.082 \quad L.G.R = 4.188489 \]

From the above equation, the value of ‘B’ is 8100.53. It is positive and significant at 5 percent probability level. It reveals that there is an increasing trend in cotton area. The average annual increase in cotton area is significant during the study period. Every year, 8100.53 hectares of cotton area is increasing. This increase in area is significant. The linear growth rate is 4.19. It shows that
The average annual growth during the study period is 4.19 percent. The value of intercept term is 63791.33.

The estimated coefficient of variation is 38.08 percent during this period. The instability in cotton area in coastal Andhra region is recorded 38.08 percent.

**Tobacco**

The fitted linear regression equation of area under tobacco crop is

\[ Y = 162288.93 - 1661.82^* t \]

\[ \text{C.V} = 11.135 \quad \text{L.G.R} = -1.22 \]

In the above fitted equation, the coefficient of 'B' is negative (-1661.82) and significant. The negative coefficient reveals that there exists negative relationship between the variables. This negative relationship exhibits that the average annual decrease in tobacco area is 1661.82 hectares. But this decrease in tobacco area is significant. By this negative and significant coefficient, one can say that there is a scope to raise the tobacco area by providing better marketing facilities attractive prices etc., to its growers. The estimated linear growth rate is -1.22 percent. It is negative. It means the average annual growth in tobacco area is decreasing year to year. The value of the constant and intercept term is 162288.93.

By the value of coefficient of variation, it is noticed that the instability in tobacco area is 11.13 percent during the study period in Coastal Andhra region of Andhra Pradesh.
COASTAL ANDHRA REGION – PRODUCTION

Groundnut

The fitted linear regression equation is

\[ Y = 221338.87 + 3385.145^* t \]

\[ (1686.254) \]

C.V = 11.172 L.G.R = 1.228723

From the above equation, the regression co-efficient, i.e., the value of ‘B’ is 3385.14. It is positive and significant. A significant increasing trend in groundnut production was recorded. The average annual increase in Groundnut production is significant. The estimated linear growth rate is 1.23 percent. It reveals that the average annual growth in Groundnut production during the study period is 1.23 percent. The value of intercept term is 221338.87.

The estimated coefficient of variation is 11.17 percent. The instability in Groundnut production in coastal Andhra region is recorded as 11.17 percent.

Sugarcane

The calculated linear regression equation is

\[ Y = 624458.23 + 8557.02^* t \]

\[ (2869.34) \]

C.V = 10.22 L.G.R = 1.124

In the above equation, the value of regression co-efficient is 8557.02. It is positive and significant at 5 percent probability level. It reveals that there is a significant increasing trend in cane production during the study period. Every year, 8557.02 quintals of Sugarcane production is increasing. This increase
income output is significant. The linear growth rate is 1.12 percent. It indicates that the average annual growth rate during the study period is 1.12 percent. The value of A is 624458.23.

The estimated co-efficient of variation is 10.22 percent during the study period. The instability in Sugarcane production in the coastal Andhra region of Andhra Pradesh is recorded as 10.22 percent.

**Cotton**

The fitted linear regression equation is

\[ Y = 132080.45 + 18096.90^* t \]

\[ (3627.55) \]

\[ C.V = 39.024 \quad L.G.R = 4.29 \]

In the above equation the estimated regression co-efficient is positive [18096.90] and significant. It reveals that there is an increasing trend in production of cotton in Coastal Andhra region. Every year, on average, 18096.90 Bales of cotton production is increasing. The linear growth rate is 4.29 percent. It means the average annual growth in cotton output is 4.29 percent. The term value is 132080.45.

The estimated co-efficient of variation is 39.02 percent during the study period. The instability in cotton production in the coastal Andhra Region of Andhra Pradesh is recorded by 39.02 percent.

**Tobacco**

The estimated linear regression equation is

\[ Y = 148936.93 - 24.98 t \]

\[ (652.30) \]

\[ C.V = 0.15 \quad L.G.R = -0.017 \]
The estimated regression co-efficient of time is negative (-24.98) and it is not significant. It reveals that there is a decreasing trend in Tobacco production in coastal region under the study period. On average, 24.98 quintals of tobacco production was decreased every year during the study period. But this decrease is not significant.

The linear growth rate is estimated and it is -0.02. It indicates that the average annual decreasing in tobacco production is 0.02 percent. The value of intercept term ‘A’ is 148936.93.

The estimated co-efficient variation is 0.15 percent. During the study period, 15 percent of instability was noticed in tobacco production.

**COASTAL ANDHRA REGION – YIELD**

**Groundnut**

The computed linear regression equation is:

\[ Y = 882.20645 + 11.22097 \times t \]

\[ C.V = 9.61 \quad L.G.R = 1.057 \]

In the above equation, the co-efficient of ‘B’ [11.22] is positive and significant. It reveals that there is an increasing trend in Groundnut yield in coastal Andhra region of Andhra Pradesh. Every year on average 11.22 kilograms of Groundnut yield is increasing. This increase in Groundnut yield is significant at 5 percent. The estimated linear growth rate is 1.06. The average annual growth in Groundnut yield is 1.06 percent. The value of intercept term is 882.21.
The value of co-variation is 9.61. It shows that 9.61 percent of variation in Groundnut yield was recorded during the study period. Almost 90.39 percent of stability in Groundnut productivity was recorded in coastal region of Andhra Pradesh.

**Sugarcane**

The fitted linear regression equation is:

\[ Y = 8094.65 - 51.26^* t \]

(20.65)

C.V = 6.41  
L.G.R = -0.70

In the above equation, the co-efficient of ‘B’ [-51.26] is negative and significant at 5 percent probability level. One can say that on average, annually, 51.26 kilograms of sugarcane yield was decreasing. But this decrease in cane yield is significant. ‘A’ negative growth was recorded. From LGR value, it is noticed that the average annual growth in cane yield was decreasing by 0.7 percent. The value of intercept constant term is 8094.65.

The co-efficient of variation is 6.41 percent. It means 6.41 percent of instability in cane yield was recorded in coastal Andhra of Andhra Pradesh state.

**Cotton**

The calculated regression equation is

\[ Y = 1704.1 + 22.49 t \]

(16.79)

C.V = 9.91  
L.G.R = 1.09

In the above equation, the estimated regression co-efficient of time is 22.49. An increasing trend in cotton yield was noticed by this positive
coefficient. It reveals that every year 22.49 kilograms of cotton yield is increasing during the study period. But this increase is not significant the estimated linear growth rate is 1.09 percent. The average annual growth in cotton yield is nearly increasing by 1.09 per cent in coastal Andhra Region, during the study period. The value of intercept term \((A)\) is 1704.1.

The estimated co-efficient of variation is 9.91 percent. Almost 9.91 percent of instability in cotton productivity was recorded in the religion Coastal Andhra.

**Tobacco**

The estimated linear regression equation of the form

\[
Y = 928.56774 + 10.56331^* t \\
(3.42457)
\]

\[
C.V = 8.750 \\
L.G.R = 0.962417
\]

In the above fitted equation, the co-efficient time is 10.56. It is positive and significant. A significant increasing trend in tobacco yield was recorded in Coastal Andhra region. It means an increase in one year time period will increase 10.50 kilograms of tobacco yield during the study period. The computed linear growth rate is 0.96. The average annual growth during the study period is 0.96 percent. The value of constant intercept term is 928.57.

The co-efficient of variation is 8.75. It means 8.75 percent of variation in tobacco yield was observed i.e. the instability tobacco yield is 8.75 percent.
TELANGANA REGION – AREA

Groundnut

The calculated linear regression equation is

\[ Y = 308046.29 + 2111.132 t \]

\[ (2024.279) \]

C.V. = 5.615 \quad L.G.R = 0.617607

In the above estimated regression equation, the coefficient of time is 2111.13. It is positive but not significant at 5 percent probability level. An insignificant positive trend was observed between time and area. On average, every year 2111 acres of Groundnut area was increasing during the study period. This increase is not significant. The estimated linear growth is 0.62. It reveals that the average annual growth in area of Groundnut is 0.62 percent. A negligible growth in Groundnut area was recorded in the Telangana region. The value of intercept term is 308046.29.

The coefficient of variation in groundnut crop area was 5.62 percent during the study period. The recorded instability in Groundnut area is 5.61 percent.

Sugarcane

The estimated linear regression equation is

\[ Y = 40237.19 + 518.09 t \]

\[ (304.18) \]

C.V. = 9.71 \quad L.G.R = 1.07

From the above equation, the coefficient of time is (518.09) positive and insignificant. It means there is an insignificant relationship was established
between area and time. The co-efficient of time variable reveals that the average annual increase in area under Sugarcane crop, in Telangana region, during the study period is 518 acres. This increase is not significant. The estimated linear growth is 1.07. The average annual growth in the area under Sugarcane crop is 1.07 percent. A negligible growth was recorded in the region. The value of intercept term is 40237.19.

The value of co-efficient of variation is 9.71 percent. It express that 9.71 percent of instability in cane area was noticed in the region. It is known that almost 90.29 percent stability was recorded in Telangana region.

**Cotton**

The fitted linear regression equation is

\[ Y = -50409.37 + 21309.18 \cdot t \]

\( (1673.03) \)

C.V. = 66.68  \quad L.G.R = 7.33

The estimated regression co-efficient of time (21309.18) is positive and significant at five percent probability level. A significant increasing trend in cotton area, in Telangana region, was recorded. Every year, 21309.2 hectares of cotton area is increasing during the study period. The calculated linear growth rate is 7.33 percent. The average annual growth in cotton area is 7.33 percent. The value of intercept term is negative. (-50409.37).

The co-efficient of variation is 66.68 percent. An absolute variation in cotton area was recorded in Telangana. Nearly 66.7 percent of instability cotton area was noticed in Telangana region during the study period.
Tobacco

The calculated regression equation is

\[ Y = 22056.174 + 774.5073 \, t \]

\[ (991.7941) \]

C.V. = 20.442 \quad L.G.R = 2.248318

In the above equation, the co-efficient of time, i.e., value of ‘B’ is 774.51. It is positive but insignificant. An increasing trend has been observed by this positive value of B. Every year, 774.5 acres of tobacco area was increased in the region. But this increase is not significant. The estimated linear growth rate is 2.25 percent. The average annual growth in the area of Tobacco crop is 2.25 percent. The value of intercept term is 22056.17.

The co-efficient of variation in Tobacco area in Telangana region was 20.44 percent during the study period. Almost 20.44 percent of instability was noticed in area under tobacco.

TELANGANA REGION – PRODUCTION

Groundnut

The estimated linear regression equation for Groundnut output in Telangana is

\[ Y = 221855.58 + 3901.2 \, t \]

\[ (1547.n) \]

C.V. = 12.477 \quad L.G.R = 1.372334

In the above equation, the regression co-efficient of time is 3901.2. It is positive and significant. A significant increasing trend in Groundnut production was noticed. On average, 3901.2 quintals of Groundnut production was increasing, annually, during the study period. This increase in output is
significant at 5 percent. The estimated linear growth rate is 1.37. It shows that the average annual growth in Groundnut production is 1.37 percent. The value of intercept term is 221855.58.

Almost 12.48 percent of variation in groundnut production was observed during the study period in Telangana region by the coefficient of variation. Therefore the instability in Groundnut production is 12.5 percent approximately.

**Sugarcane**

The fitted linear regression equation of sugarcane output is

\[ Y = 338587.21 - 280.26 t \]

\[ (2263.702) \]

C.V. = 0.76 \hspace{1cm} L.G.R. = -0.08

The estimated value of ‘B’ is –280.26. The coefficient of time is negative and insignificant. An insignificant decreasing trend in cane output was recorded in Telangana region during the study period. On average 280.26 tons of Sugarcane production was decreasing every year. But this decrease is insignificant. The linear growth rate is estimated and it is (-0.08) negative. This reveals us that the average annual decrease in Sugarcane production is 0.08 percent. The value of intercept term is 338587.21.

The coefficient of variation in Sugarcane production is 0.76 in Telangana region. Very low percent of instability was recorded in case of cane output in Telangana region.
Cotton

The estimated linear regression equation is

\[ Y = -221999.3 + 33296.92^* t \]

\[ (3413.81) \]

C.V = 97.24  L.G.R = 10.71

From the above equation, the co-efficient of time is positive and significant at 5 percent probability level. A significant increase in cotton production was observed in Telangana region. Every year 33296.92 bales of cotton production is increasing during the study period. The increase in cotton output is significant. The calculated linear growth rate is 10.91 percent. The average annual growth in cotton production is 10.71 percent. The value of intercept term is negative, i.e., -221999.3.

More than 97 percent of variation of cotton production was observed during the study period in Telangana region. A high rate of instability in cotton output was notice in this region.

Tobacco

The calculated linear regression equation for tobacco output is:

\[ Y = 22039.284 + 269.1718^* t \]

\[ (139.5328) \]

C.V = 9.289  L.G.R= 1.021679

In the above estimated regression equation, the co-efficient of time, i.e., the value of B is 269.17. It is positive and insignificant at 5 percent probability level. It reveals that there is an insignificant increasing trend in production of Tobacco was noticed. On average 269 tons of tobacco production was increased.
The estimated linear growth rate is 1.02 percent. This shows that the average annual growth in tobacco production in this region is 1.02 percent. The value of intercept term is 22039.28.

During the study period, it observed that there is 9.29 percent of variation in Tobacco production in Telangana region of Andhra Pradesh was recorded. The instability in tobacco output is 9.3 percent.

TELANGANA REGION – YIELD

Groundnut

The fitted linear regression equation for Groundnut yield is

\[ Y = 697.44516 + 7.145565 \times t \]

(2.52955)

C.V. = 8.003  \hspace{1cm} \text{L.G.R} = 0.88024

In the above fitted equation, the regression co-efficient of time is 7.1456. It is positive and significant at 5 percent probability level. The regression coefficient indicates that every year 7.15 kilograms of Groundnut yield is increasing. This increase is also significant increase in Telangana region under the study period.

The linear growth rate is 0.88 it indicates that the average annual growth in yield is 0.88 percent. The constant or intercept term is found to be 697.44.

The value of coefficient of variation is 8.003. It reveals that the instability in Groundnut productivity during the study period is 8.0 percent.
Sugarcane

The estimated linear regression equation is

\[ Y = 221855.58 + 3901.2^* t \]

\( (1547.31) \)

C.V. = 12.48 \quad L.G.R = 1.37

The coefficient of variation is 12.48. Therefore, the instability in Sugarcane yield under the study is 12.48 percent in Telangana. The value of linear growth rate is 1.37. It indicates that the average annual growth in cane yield is 1.37 percent. From the estimated linear regression equation of cane yield, it is noticed that the coefficient of time is 3901.2. It is positive and significant at 5 percent probability level. A significant increasing trend in cane yield was recorded in Telangana region. Every year, 3901.2 kilograms of sugarcane yield was increasing. This increase is significant. The constant or intercept term value is 221855.6. (The coefficient of variation is 12.48 this shows that there is instability in can yield is 12.48 per cent).

Cotton

The computed linear regression equation of cotton yield is

\[ Y = 147.94 + 41.29^* t \]

\( (4.47) \)

C.V = 46.43 \quad L.G.R = 5.11

From the above equation, the coefficient of time, is the value of B is 41.29. It is positive and significant at 5 percent probability level. It means that the productivity of cotton is significantly increased in Telangana region under the study period. A significant positive trend in cotton yield was noticed. The
average increase in cotton yield is 41.29 kilograms. The estimated linear growth rate is 5.11. The average annual growth during the study period is 5.11 percent. The value of intercept term is 147.94.

The value of co-efficient of variation is 46.43. It indicates that the instability in cotton yield is 46.43 percent.

**Tobacco**

The fitted linear regression equation for tobacco yield is

\[ Y = 594.6645 + 28.9^* t \]

(6.417313)

\[ C.V = 24.854 \quad L.G.R. = 2.733557 \]

In the above fitted equation, the co-efficient of time is positive (28.89) and significant at 5 percent probability level. A significant increasing trend was recorded in the Tobacco yield in Telangana Region. On average, every year 28.89 kilograms of tobacco yield was increased during the study period in Telangana. The linear growth rate is 2.73. The average annual growth in tobacco yield, during the entire period, is 2.73 percent. The value of intercept term is 594.66.

The value of co-efficient of variation is 24.85. It means 24.85 percent of variation in tobacco yield was recorded and 75.15 percent of stability in tobacco productivity was recorded in Telangana.
ANDHRA PRADESH – AREA

Groundnut

The calculated linear regression equation of area under Groundnut in AP is

\[ Y = 1261381.6 + 31208.07^* t \]

\[ (6186.253) \]

C.V. = 16.116 L.G.R = 1.77247

From the above equation, the co-efficient of time i.e., value of B is positive and significant. A significant increasing trend have been observed in Andhra Pradesh during the study period in case of Groundnut area. Every year an average 31208 hectares of Groundnut area is increasing. This increase is significant at 5 percent probability level. The linear growth rate is estimated and it is 1.77. This shows that, the average annual growth in area under Groundnut crop in Andhra Pradesh is 1261381.6.

The co-efficient of variation is 16.12. It means 16.12 percent of variation in Groundnut area was recorded in Andhra Pradesh state.

Sugarcane

The estimated linear regression equation of Sugarcane in A.P State is

\[ Y = 138430.75 + 2985.04^* t \]

\[ (660.54) \]

C.V. = 14.58 L.G.R = 1.60

In the above equation, the co-efficient of time is 2985.04. It is positive and significant. Therefore a significant increasing trend in area of sugarcane was observed in the Andhra Pradesh state. Every year an average 2985.04 hectares of
area is increasing during the study period. This increase in cane area is significant. The linear growth rate is estimated and it is 1.6 per cent. This shows that the average annual growth during study period is 1.6 percent. The value of constant term is 138430.75.

The co-efficient of variation in area of Sugarcane is 14.58. Nearly 14.58 percent of instability in Sugarcane area was noticed in Andhra Pradesh state.

Cotton

The fitted linear regression equation is:

\[ Y = 157624.41 + 28278.01 \times t \]

\[ \text{(2124.014)} \]

C.V. = 42.14 L.G.R. = 4.63.

The estimated regression co-efficient of time is positive (23278) and significant at 5 percent probability level. It is noticed that the average annual increase in cotton area is 28278.01 hectares. This increase in area is significant. The linear growth rate is 4.63 percent. The value of intercept term (A) is 157624.41.

The estimated co-efficient of variation is 42.14. The instability in cotton area in Andhra Pradesh state is recorded as 42.14 percent.

Tobacco

The estimated linear regression equation of tobacco area is

\[ Y = 217299.42 - 2143.379 \times t \]

\[ \text{(768.917)} \]

C.V. = 10.649 L.G.R. = -1.171211
In the above estimated equation, the value of B is negative (-2143.38) and significant. One can say on average, annually, 2143.38 hectares of tobacco area was decreasing in Andhra Pradesh state. This decrease in tobacco area is significant. A negative growth rate is recorded. It reveals that the average annual growth during the study period is decreasing by \(-1.17\) percent. The value of intercept term is 217299.42.

The co-efficient of variation is noticed as 10.65. The instability in tobacco area was 10.65 percent during the study period in Andhra Pradesh state.

**ANDHRA PRADESH PRODUCTION**

**Groundnut**

The computed linear regression equation for Groundnut production is

\[ Y = 1018463.8 + 32101.16^* t \]

\[ (8843.657) \]

\[ C.V = 19.050 \]

\[ LGR = 2.095263 \]

In the above fitted equation, the co-efficient of time is 32101.16. It is positive and significant at 5 percent probability level. A significant increasing trend was observed in Groundnut production in the Andhra Pradesh state. It means 32101.16 quintals of Groundnut production is increasing every year. The computed LGR is 2.09. It reveals that the average annual growth in Groundnut production during the study period is more than two percent. The value of intercept term is 1018463.8.

The instability in Groundnut production in Andhra Pradesh state is recorded as 19.05 percent. It is expressed by the co-efficient of variation in production is 19.05 percent.
Sugarcane

The calculated linear regression equation for Sugarcane output is

\[ Y = 1107772.8 + 13717.41 \times t \]

\[ (5204.46) \]

C.V. = 9.4 \hspace{1cm} L.G.R. = 1.03

In the above fitted equation, the regression coefficient of time is 13717.41. It is positive and significant at 5 percent probability level. A significant increasing trend was observed in Sugarcane production in the Andhra Pradesh state. It means 13717.41 tons of Sugarcane production is increasing every year. The computed linear growth rate is 1.03. It reveals that the average annual growth in Sugarcane production during the study period is more than one percent. The value of intercept term is 1107772.8.

Almost 9.4 percent of variation in Sugarcane production was observed during the study period in Andhra Pradesh state. It is expressed that the instability in cane output is 9.4 percent.

Cotton

The estimated linear regression equation of cotton output is:

\[ Y = -61478.15 + 56142.72 \times t \]

\[ (3899.87) \]

C.V. = 61.00 \hspace{1cm} L.G.R. = 6.71

In the above equation, the regression coefficient of time is 56142.72. It is positive and significant at 5 percent probability level. On an average, 5614.72 bales of cotton production is increasing annually, during the study period. This increasing is significantly. The linear growth rate is estimated and it is 6.71. It
reveals that the average annual growth in cotton production is 6.71 percent. The value of intercept term (A) is negative i.e. – 61478.15.

Exactly 61.00 percent of variations in cotton production was observed during the study period in Andhra Pradesh State i.e., the instability in cotton production is 61 percent.

**Tobacco**

The estimated linear regression equation for tobacco output is

\[ Y = 176897.18 + 629.902 t \]

\[ (793.8029) \]

\[ C.V. = 3.063 \quad L.G.R. = 0.33689 \]

From the above estimated regression equation, the co-efficient of time, i.e., the value of ‘B’ is 629.90. It is positive but insignificant. It reveals that an increasing trend in production of tobacco was recorded. But this increase in tobacco output is not significant on an average, every year 629.9 quintals of production is increasing. The estimated linear growth rate is 0.34. It shows that the annual growth of production of tobacco crop in Andhra Pradesh state is 0.34 percent. The value of intercept term is 176897.2.

The value of coefficient of variation is 3.06. The variation in tobacco output was 3.06 percent. The instability in tobacco output is 3.01 percent.

**ANDHRA PRADESH YIELD**

**Groundnut**

The estimated linear regression equation is

\[ Y = 807.05806 + 27745.97t \]

\[ (29486.23) \]

\[ C.V. = 2.963 \quad L.G.R. = 0.325867 \]
Form the above equation, the value of $B$ is 27745.97. It is positive but not significant at 5 percent probability level. On an average 27745.97 kilograms of Groundnut yield is increasing every year during the study period in Andhra Pradesh. The estimated linear growth rate is 0.33. The average annual growth in Groundnut yield is 0.33 percent. The value of intercept term $A$ is 807.06.

The co-efficient of variation is 2.96. It expresses that the instability in Groundnut yield in Andhra Pradesh is 2.96 percent.

**Sugarcane**

The fitted linear regression equation of cane yield is

$$Y = 7945.271 - 41.87 \ t$$

(24.81)  

$C.V = 5.23$  

$L.G.R = -0.57$

In the above equation, the regression co-efficient of time (-41.81) is negative and insignificant. It reveals that there is a decreasing trend in Sugarcane yield was noticed. An average, 41.87 quintals of Sugarcane yield is decreasing every year during the study period. But this decrease is not significant. The linear growth rate is estimated and it is $-0.57$. It indicates that the average annual decrease in Sugarcane yield is $-0.57$ percent. The value of intercept term is 7945.27.

The estimated coefficient of variation is 5.23 during the study period. In the state Andhra Pradesh, 5.23 percent of instability in cane yield was recorded.

**Cotton**

The estimated linear regression equation of cotton yield is:

$$Y = 661.64 + 37.24 \ t$$

(6.76)  

$C.V. = 26.93$  

$L.G.R. = 2.9 \ t$
In the above equation, the co-efficient of time is 37.24. It is positive but not significant. On an average 37.24 bales of cotton yield is increasing every year during the study period. The estimated linear growth rate is 2.96. The average annual growth in cotton yield is 2.96 percent. The value of intercept term is 661.64.

The co-efficient variation is 26.93. It reveals that the instability in cotton yield is 26.93 percent during the study period in Andhra Pradesh.

**Tobacco**

The computed linear regression equation of tobacco yield is

\[
Y = 791.10968 + 15.57984^* t \\
(2.136549)
\]

C.V. 13.615  
L.G.R = 1.497504

The regression co-efficient of time, i.e., the value of ‘B’ is 15.58. It is the positive and significant at 5 percent probability level. A significant increasing trend is recorded in tobacco yield in Andhra Pradesh state. On an average, every year, 15.58 kilograms of tobacco yield was increasing in Andhra Pradesh state during the study period. The linear growth rate is 1.5. The average annual growth, during the entire period is 1.5 percent. The value of intercept term is 791.12.

The co-efficient of variation is 13.61. It means 13.61 percent of variation in groundnut yield was observed that is the stability in tobacco yield was 86.39 percent.
CONCLUSIONS

The Linear Growth Rate of area and production under groundnut crop is maximum followed by Telangana and Costal regions. Similarly regarding the productivity of groundnut the negative growth rate was recorded in Rayalaseema Region. A highest growth rate of groundnut yield was recorded in Costal Andhra Region. The growth rate and area, production and yield of groundnut is recorded as 1.77, 2.1 and 0.33 respectively in the state of Andhra Pradesh. In case of sugarcane crop the maximum growth rate in area is recorded in Costal Andhra followed by Rayalaseems and Telangana regions. In case of sugarcane production highest growth rate was recorded in Rayalaseema followed by Costal Andhra. A negative growth rate was noticed in case of Telangana region. Similarly, in case of cane yield a negative growth rate was recorded in Costal Andhra, Telanga and Andhra Pradesh State. But a negligible positive growth rate was observed in Rayalaseema Region. A major growth rate in cotton area was recorded in Telangana followed by Costal Andhra. A negative growth rate was recorded in cotton area in Rayalaseema Region. A highest growth rate on cotton production was noticed in Telangana followed by Rayalaseema and Costal Andhra. In case of cotton yield, Telangana occupied first place in growth followed by Rayalaseema and Coastal Andhra. The growth of area, production and yield of cotton crop is noticed 4.64 per cent 6.71 per cent and 2.96 per cent respectively in the entire state of Andhra Pradesh. A positive growth in tobacco area was recorded in Telangana only. Whereas it is negative in Rayalaseema and Costal Andhra. With respect to tobacco production and
yield also Telangana occupied first place and followed by Rayalaseema and coastal Andhra. The growth rates of tobacco area production and yield in Andhra Pradesh is -1.17, 0.34 and 1.5 per cent respectively.

The highest co-efficient of variation in groundnut area and production was recorded in Rayalaseema Region and the lowest variation in Telangana and Coastal Region. The co-efficient of variation in groundnut area and production was recorded by 60 per cent and 19 per cent in Andhra Pradesh. The highest coefficient of variation in Rayalaseema Region and followed by coastal Andhra and Telangana. The coefficient of variation in yield of groundnut is 2.96 per cent in Andhra Pradesh state. The highest co-efficient of variation in cane production in Rayalaseema Region followed by Coastal and Telangana. On the case of Andhra Pradesh state Sugarcane area and production was recorded by 14.58 per cent and 9.397 per cent respectively. The instability in yield is maximum in Telangana Region followed by Costal Region. The lowest variation was recorded in Rayalaseema Region. In the entire Andhra Pradesh State the co-efficient of variation in cane yield was recorded by 5.23 per cent. The maximum co-efficient of variation in cotton area was recorded in Telangana Region followed by Costal Andhra and Rayalaseema Regions. In case of Andhra Pradesh State it was recorded by 14.58 per cent. In case of cotton production and yield was maximum in Telangana Region followed by Rayalaseema and Coastal Andhra Region. In the case of Andhra Pradesh State, the variation in Cotton production and yield was recorded by 61 per cent and 26.93 per cent respectively. The highest variation in the case of tobacco area
recorded by Costal Andhra followed by Telangana and Rayalaseema Region. In the case of Andhra Pradesh State 10.649 per cent of variation was recorded in tobacco area. The maximum variation in tobacco production and yield was recorded in Telangana Region followed by Rayalaseema and Costal Andhra Regions. In case of Andhra Pradesh State is a whole the variation of tobacco yield was recorded by 3 per cent and 24.85 per cent respectively.