GROWTH AND INSTABILITY OF GROUNDNUT CROP IN MAHBUBNAGAR DISTRICT OF TELANGANA STATE, INDIA

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Abstract

As population increases, the production of food grains is not increased to meet the demand due to the instability of agriculture crops in general, particularly in groundnut crop. In Telangana State, the highest contribution of groundnut production has come from Mahbubnagar District. Therefore, the study has been attempted to analyze the growth and instability of groundnut crop's area, production and yield; and determinants of groundnut production in Mahaboobnagar District of Telangana State, India. For the analysis, multiple log linear regression has been used. The study reveals that there was a positive trend in production and yield of groundnut. The Production of groundnut has increased due to the effect of rainfall, fertilizers, pesticides and new technology. In the case of Maboobnagar District, the area was continuously decreased due to the negative growth rate of yield in period-I and II but not in Period-III and overall period. The area was maintained stability in period-III and production & yield of groundnut were maintained stability in period-II compared to other period of the study respectively in Mahaboobnagar District. There was a high and significant correlation between area and production in period-I compared to other periods, due to extended area and production in State and Mahaboobnagar district. The regression results found that the area and yield were only significant determinants of groundnut production but not rainfall in Telangana State and Mahaboobnagar district. At the same time, in Mahaboobnagar District also the coefficient value of area and yield were same more or less. The hypotheses 1 and 2 are rejected. The first and second hypothesis reveals that there is a significant difference between all periods except the production of groundnut in Telangana State and there is no significant effect of rainfall on the production of groundnut in State and district respectively. The study suggests that area under groundnut should be increased and irrigation facilities also be improved.

Keywords: Growth, Instability, Groundnut and Agriculture

Introduction

The Indian agriculture history has witnessed of the new agriculture arrangements which took place and has changed the overall traditional cropping patterns in India, particularly in Telangana State. There are many agriculture reforms such as land reforms, green revolution, minimum support price, trade and new economic reforms have been adopted in Indian agriculture. All these initiatives have directly influenced the agriculture sector. Due to these reforms, there was a positive impact on productivity and production of all the food and non-food crops but they have inadequately affected in terms of crop stability (Sihmar 2014). Almost all the agricultural crops have been maintained instability from last few couple of years in Telangana State. Out of total area, only 39 percent of the land is under agriculture and

more than half of the state's population depends on agriculture for their livelihood in Telangana State (Socio-Economic Outlook-2016, Telangana State). There are several crops; such as rice, wheat, maize, cereals, cotton, soybean, sugarcane, and groundnut etc., which have played a vital role in the development of agriculture sector in Telangana State. Among all these crops, groundnut is one of the major crops which play a key role in sustaining agriculture in the state as well as in India. Its contribution is very high in part of oilseeds. These crop is mostly cultivated under irrigation sources in Rabi season and cultivated in almost all districts, but the highest area under cultivation of groundnut is in Mahaboobnagar, Warangal and Nalgonda districts in the Telangana State. These three districts account for 87.40 percent and only Mahaboobnagar district accounts 62.20 percent of total area in 2015-16 in the State. The area under the cultivation of groundnut and its production have decreased from 2.10 to 1.55 lakh hectares and 3.55 lakh tonnes to 2.95 lakh tonnes from 2013-14 to 2014-15 respectively, but yield rate has been increased in the same period (Socio-Economic Outlook-2016, Telangana State). Therefore, it seems that there is a fluctuation in terms of area and production of groundnut crop in the State. Consequently, this crop is not in a position to contribute its significant amount towards the development of agriculture sector in the Telangana State.

Need for the Study

The agriculture sector plays a significant role in economic development in Telangana State in particular and India in general. It has contributed 14.1 percent of Gross Domestic Product (GDP) to the State Economy (CESS Report on HDI of Telangana State, 2015). There are some commercial crops which are playing a significant role and providing sufficient contribution in terms of production such as cotton, rice and other cereal crops, to meet the demand from the population and industry side. However, the population has been increasing day-by-day at an exponential rate, but food-grains at a constant rate over a period of time in the country as well as in the state (Misra S.K. Puri V.K. 2017). Hence, as population increases, the production of food grains is not increased to meet the demand, due to the instability of agriculture crops in general, particularly in groundnut crop. In Telangana State, the major districts of area under cultivation and production of groundnut are Mahaboobnagar, Warangal and Nalgonda followed by other districts. These three districts account for 87.40 percent and only Mahaboobnagar district accounts 62.20 percent of total area in 2015-16 in the State. Keeping this in view, there is a need to study the growth and instability of groundnut crop in Mahaboobnagar district of Telangana State, India.

Review of Literature

Malhotra (2008) studied growth and structure of agriculture exports and imports for the period of 1980-81 to 2003-04, the pattern of trades of agricultural commodities in India and instability of agricultural imports and exports both aggregates and commodity wise. The growth rate was estimated CAGR by fitting exponential time trend, $Y_t=b_o(b_i)t$, the instability index Standard Error/Mean*100. The study has found that agricultural exports are rising at increasing rate when as imports continue to be low expected for the edible oils and fertilizers and pesticides manufactured items, the ratio of exports to imports has improved over time and fear that liberalization will adversely affect agricultural does not seem to be valid. Immense export opportunities are opened by export market and our farmers are also taking advantages of these opportunities. They suggested that need for change cropping pattern and domestic oilseeds production should be promoted in a big way to reduce imports dependence. All fruits

and vegetables and pulses have very vast scope for further growth as India accounts for a very small proportion of these in the world market. The Government should provide appropriate facilities in the form of transportation and storage, infrastructure, better verities of seeds, packing and branding and also quality testing centers for mastery our products with international quality standards. Thus domestic marketing information must be these with the liberalization of extended trade of agricultural commodities.

Narayana (2009) studied that performance of the rate of growth of selected agricultural crops and to examine the acceleration in the rate of growth of the area, production and productivity of selected crops in Andhra Pradesh. In order to study the objectives, he used Log quadratic form equation has been fitted to the time series points the period of 1956-57 to 2005-06. Log $y=a+b_1t+b_2bt_2$. The study has found that there was a significant increase in the growth rate of area and production increased due to increases in the growth rate of yield. It shows that there were no accelerated growth rates in respect to area, production, and productivity.

Ahmad, Bathla et al (2012) studied that estimation of area and production of important fruits and vegetables are being obtained under the scheme "Crop estimation survey on fruits and vegetables (CES F&V)" only for eleven states. They concluded that the percentage standard errors of the estimates obtained for fruits are in between 4 percent to 20 percent and for vegetables are between 2 percent to 30 percent at the district level. The total production of important fruits can be estimated with less than 10 percent standard error and total production of important vegetables can be estimated with less than 15 percent standard error at 95 percent confidence interval. Finally, the study has revealed that very encouraging, demonstrated the feasibility of estimating the production of fruits and vegetables with much smaller sample size.

Rehman (2013) analyzed the recent performance of agriculture in Tamil Nadu in terms of area, production and yield of major crops. Indian agricultural has made and way into in the phase of globalization and diversification. It is estimated that the collective effect of the transformation in the domestic policies and international trade reforms would result in the much better incorporation of the Indian economy within itself and with the rest of the world and such a development would bring about sustainable benefits to the Indian farmers. He concluded that agriculture growth has always been an important constituent for inclusiveness and recent experience suggests that high GDP growth without high agricultural growth-inflation in the country, which would adversely affect the national growth process at large.

Kondal (2014) analyzed trends, growth and instability of Indian horticulture sector. He has been used the coefficient of variance and correlation models to study instability and association respectively. He concluded that there was instability in all horticultural crops except plantation and mushroom crops, and positive strong and significant correlation between area and productions of horticultural crops.

Gaps in Research

The earlier studies mostly concentrated on major agricultural crops in various states and few studies in Telangana State. Since the Telangana State formed on 2nd June, 2014. Here, the researcher has interested to trace out, whether, is there any growth and trends in groundnut crop over a period of time in

Mahaboobnagar District of Telangana State, India? Keeping this in view, the researcher is an attempt has been made to analyze the growth and instability of Mahaboobnagar District of Telangana State, India.

Objectives of the Study

1. To analyze the trends in area, production, yield of groundnut crop; and
2. To study the growth and instability of groundnut crop's area, production and yield in Mahaboobnagar District of Telangana State.

Hypotheses of the Study

1. There is no significant difference between all periods of Groundnut crop's area, production and productivity in Mahaboobnagar district of Telangana State.
2. There is a significant effect of rainfall on the production of groundnut in Telangana State and Mahaboobnagar district of Telangana State.

Methodology

In order to trace out the objectives and hypotheses, the methodology is followed; the study is based on secondary data. It has been collected from various sources like Directorate General of Commercial Intelligence and Statistics (DGCI& S), Directorate of Economics and Statistics of Telangana State and Andhra Pradesh (DES of TS and AP), Socio-Economic Outlook of Telangana State, books and journals etc. The study has considered 36 years of data. i.e., from 1980-81 to 2015-16. The total period has been classified into mainly three (3) different periods.

1. 1980-81 to 1991-92 *(Period-I)*
2. *1992-93 to 2003-04 (Period-II)*
3. 2004-05 to 2015-16 *(Period-III)*
4. *1980-81 to 2015-16 (Overall Period)*

Graphs, simple growth rate, compound growth rate (CGR), the coefficient of variation, the coefficient of correlation and multiple log-linear regression have been employed.

Growth rates of area, production and yield has been estimated by the following regression;

$\text{Log} Y_t = a + bt$......... (1)

Where,

Y_t = Area, production, and yield

a = Constant

t = Time variable

b = coefficient value

CGR= Antilog of (b) value - 1*100

The Coefficient of Variation (CV) is widely used as a measure of instability.

CoV= Standard Deviation/Mean*100

Multiple Log Linear Regression Model $\ln Y_t = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + U_t$

Where,

lnYt   = Production
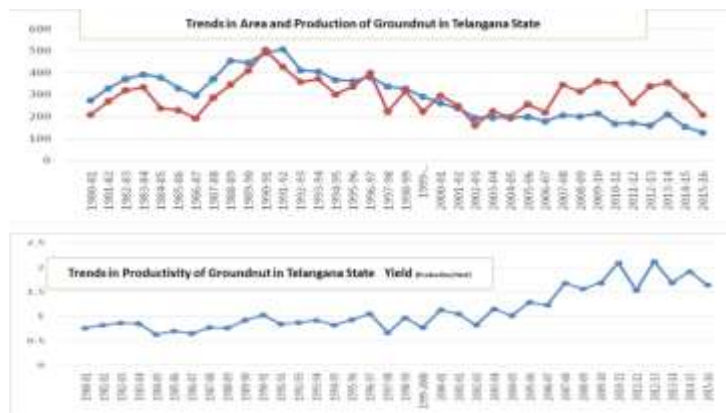
β's   = Coefficient of Parameters

X_1, X_2 and X_3 are Independent Variables (Area, Yield and Rainfall)

Result and Analysis

Figure: 1

Trends in Area, Production and Yield of Groundnut in Telangana State

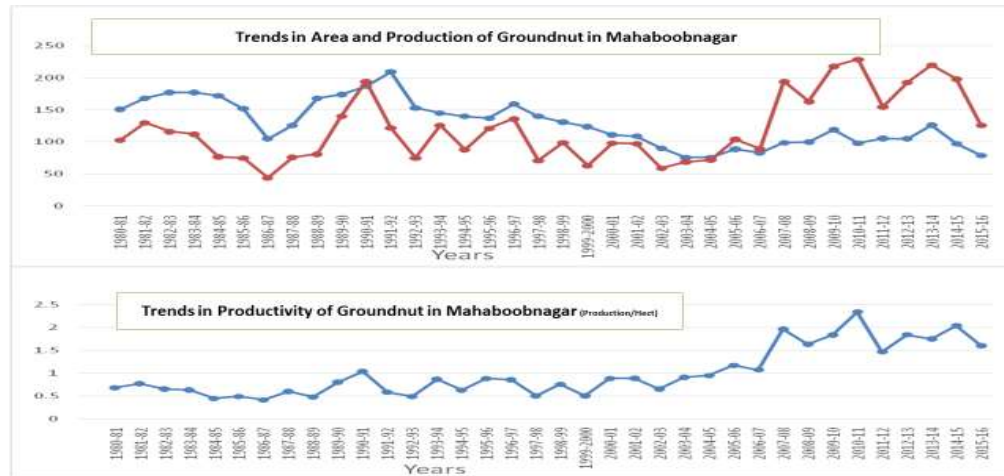*[Area (In 000 Hect), Production (In 000Tonnes)]*

Source: Researcher calculation based on Directorate of Economics and Statistics of Telangana State and Andhra Pradesh.

Figure 1 shows that trends in the area, production and yield of groundnut in Telangana state. The groundnut production and yield were increased at the same time area under groundnut cultivation gradually decreased during the study period. In the year 1991 and 1986, production of groundnut was occupied highest and lowest respectively. After 1990, the area under the cultivation has been decreasing. With respect, simple growth rate, Area under cultivation has been secured highest and lowest growth rate 31.49 and -18.77 percent in the year of 2013 and 1992 respectively. The highest and lowest yield growth rate of groundnut was 46.50 and (-26.93) percent in the year of 1998 and 2011 respectively. It reveals that there was a positive trend in groundnut's production and yields over a period of time, due to area and yield effect, the growth rate of groundnut production fluctuated eventually. In the year 2007 and 1997, the growth rate of groundnut production was highest and lowest 56.82 and -44.11 percent respectively.

Figure: 2

Trends in Area, Production and Yield of Groundnut in Mahaboobnagar District
[Area (In 000 Hect), Production (In 000Tonnes)]

Source: Researcher calculation based on Directorate of Economics and Statistics of Telangana State and Andhra Pradesh.

Figure 2 shows that trends in the area, production and yield of groundnut in Mahaboobnagar. Trends of Telangana seems as it is Mahaboobnagar district because of half of the state groundnut production comes from Mahaboobnagar district only. The growth rate of the area under groundnut was highest and lowest 33.33 and -30.92 percent in the year 1988 and 1986 respectively. At the same time, highest yield growth rate of groundnut was 82.75 in 2007 and lowest growth rate -43.73 percent in 1992. These two components (area and yield) were mostly influencing the growth rate of production in the Mahaboobnagar. In the year 2007, the highest growth rate in production was 117.98 and lowest growth rate was -43.73 percent in 1991. All these trend lines and growth rates reveal that the production of groundnut is mostly influenced by yield than the area under the cultivation of groundnut.

Table: 1
Compound Growth Rates of Area, Production and Yield in Telangana State and Mahaboobnagar District (Figures in %)

	Telangana State				Mahaboobnagar District			
	Period-I	Period-II	Period-III	Overall Period	Period-I	Period-II	Period-III	Overall Period
Area	4.33*	-6.86*	-2.71**	-2.93*	0.99^{NS}	-5.31*	1.55^{NS}	-1.98*
Production	5.65*	5.78*	1.6^{NS}	0.13^{NS}	1.61^{NS}	-3.47^{NS}	6.54**	1.79*
Yield	1.26^{NS}	1.49 ^{NS}	4.43*	2.87^{NS}	0.6^{NS}	-1.93^{NS}	4.9*	3.84*

Source: Researcher calculation based on Directorate of Economics and Statistics of Telangana State and Andhra Pradesh.
Note: * and** significant at 0.01 and 0.05 percent level respectively.   **NS**: Not significant.

Table 1 shows that compound growth rates of area, production and yield in Telangana state and Mahaboobnagar district. It reveals that compound growth rate of the area under the cultivation of groundnut was positive and significant in period-I but not in other periods and overall period also. The yield growth rate was positive but not significant in period –I, II and overall period but high and significant in period-III. The compound growth rate of production was high in period-II compared to other periods in Telangana. The above tables reveal with respect to Telangana State, that production has been increased due to mainly increases in yield. That yield has been increased because of rainfall, fertilizers, pesticides and new technology.

With respect to Mahaboobnagar district, the area under groundnut was continuously decreased. Yield's compound growth rate was negligible in period-I and II but not in Period-III and overall period and also showed highest growth rate. Due to increases in yield, production of groundnut has been increased in period-III and overall period.

Table: 2
Descriptive Statistics and Coefficient of Variation in Telangana State and Mahaboobnagar District
(CoV values are in %)

	Years	Descriptive Statistics	Area	Production	Yield
Telangana State	Period-I	Mean	386	313	1
	Period-II		314	288	1
	Period-III		182	292	2
	Overall period		294	298	1
	Period-I	Standard Deviation	74.33	90.43	0.11
	Period-II		77.15	72.61	0.15
	Period-III		26.6	60.81	0.33
	Overall period		105.85	76.2	0.42
	Period-I	Coefficient of Variation	19.24	30.46	14.13
	Period-II		24.57	25.18	15.96
	Period-III		14.63	20.85	20.51
	Overall period		36	25.59	37.94
Mahaboob Nagar	Period-I	Mean	164	106	1
	Period-II		126	92	1
	Period-III		98	163	2
	Overall period		129.39	120.33	1
	Period-I	Standard Deviation	27.51	39.37	0.18
	Period-II		25.28	25.67	0.17
	Period-III		15.06	54.18	0.41
	Overall period		35.44	51	0.53
	Period-I	Coefficient of Variation	16.79	37.27	27.76
	Period-II		20.02	27.95	22.86
	Period-III		15.35	33.18	25.29
	Overall period		27.39	42.38	52.82

Source: Researcher calculation based on Directorate of Economics and Statistics of Telangana State and Andhra Pradesh.

Table 2 shows the descriptive statistics and coefficient of variation of in Telangana State and Mahaboobnagar District. With respect to Telangana State, on an average, the area under the cultivation was 386, 314, 182 and 294 in period-I, II, III and overall period respectively. It seems that area under the cultivation was highest in period-I compared to other periods. On an average, the production of groundnut was 313, 288, 292 and 298 in period-I, II, III and overall period respectively. It seems that production of groundnut was highest in period-I compared to other periods. On an average, the yield of groundnut was 1, 1, 2 and 1 in period-I, II, III and overall period respectively. It seems that yield of groundnut was highest in period-III compared to other periods, due to increase in production and decrease in area under the cultivation of groundnut in Telangana State. With respect to Mahaboobnagar district, on an average, the area under the cultivation was 164, 126, 98 and 129.39 in period-I, II, III and overall period respectively. It shows that area under the cultivation was highest in period-I compared to other periods. On an average production of groundnut was 106, 92, 163 and 120.3 in period-I, II, III and overall period respectively. It shows that production of groundnut was highest in period-III compared to other periods. On an average yield of groundnut was 1, 1, 2 and 1 in period-I, II, III and overall period respectively. It shows that yield of groundnut was highest in period-III compared to other periods, due to increase in production and decrease in area under the cultivation of groundnut in Telangana State. The coefficient of variation of groundnut in Telangana State, area and production were maintained stability in period-III but yield maintained stability in period-I compared to other period of the study. Here, the yield was stability in period-I because of high value was deviated from the mean value. The coefficient of variation of groundnut in Mahaboobnagar district, the area was maintained stability in period-III, and production and yield of groundnut were maintained stability in period-II compared to other period of the study respectively.

Table: 3
Correlation among Area, Production and Yield of Vegetables in Telangana State

Correlation between Variables	Telangana State				Mababoobnagar			
	Period-I r value	Period-II r value	Period-III r value	Overall Period r value	Period-I r value	Period-II r value	Period-III r value	Overall Period r value
Between Area and Production	.922**	.822**	.391NS	.541**	.694*	.541NS	.808**	-.027NS
Between Area and Yield	.612*	-.308NS	.352NS	-.697**	.419NS	-.284NS	.520NS	-.511**
Between Production and Yield	.866**	.275NS	.721**	.194NS	.941**	.642*	.921**	.857**

Source: Researcher calculation based on Directorate of Economics and Statistics of Telangana State and Andhra Pradesh.
Note: * and ** at 0.05 and 0.01 level respectively (2 tailed test)

Table 3 shows that correlation among area, production and yield of groundnut in Telangana state and Mahaboobnagar district. It reveals that correlation between area and production was higher and significant at 0.05 percent level in period-I than other periods, and there was a relation in period-III but

not significant in Telangana State. There was a negative correlation (-697) between area and yield at 0.05 percent level in the overall period and (-308) in period-II but not significant in Telangana State. The relationship between yield and production was negligible in the period-II and overall period but significant and high correlation in period-I and III.

With respect to Mahaboobnagar district, the correlation between area and production of groundnut was negligible in period-II and very low negative in overall period, and positive and higher in period-III and I. At the same time, the study reveals that the relationship between area and yield was negligible in period-I, II and III but negative and significant in overall period. The correlation between production and yield was highest in period-I followed by period-III, overall period and period-II. Above analysis states that there was a positive relationship between production and yield in Mahaboobnagar district but not a strong association in Telangana State.

Table: 4
Determinants of Groundnuts' Production in Telangana State and Mahaboobnagar District

	Telangana State	**Mababoobnagar**
Variables	Coefficient	Coefficient
Constant	-.001 NS (.015)	.000 NS (.000)
Area	1.003* (.002)	1.000* (.000)
Yield	1.003* (.002)	1.000* (.002)
Rainfall	-.002 NS (.002)	-1.588E-5 NS (.000)
	R^2= 1 Adjusted R^2= 1 DW statistics = 1.88 (N=36)	R^2=1 Adjusted R^2= 1 DW statistics = 1.85 (N=36)

Source: Researcher calculation based on Directorate of Economics and Statistics of Telangana State and Andhra Pradesh.

Note: * *at 0.01 percent significant level and* **NS= Not Significant**

Table 4 shows that determinants of groundnut's production in Telangana State and Mahaboobnagar district. The production of groundnut depends on several factors which are more significant determinants such as area, yield, rainfall, technology, pesticides, fertilizers and irrigated area etc., Due to unavailability of data and multicollinearity problem, study considered only three major independent variables such as area, yield, and rainfall. The study found that the area and yield were only significant determinants of groundnut production but not rainfall in Telangana State and Mahaboobnagar district. The coefficient of the area was 1.003. It states the one percent change in the area, it leads to change more than 1 percent in the production of groundnut in Telangana at 0.01 percent level.   The coefficient of yield was 1.003. It states that one percent change in yield, it leads to change more than 1 percent in the production of groundnut in Telangana at 0.01 percent level. At the same time in Mahaboobnagar district also the coefficient value of area and yield were same more or less. The rainfall was insignificant in both the State and district. The coefficient of rainfall was negatively insignificant (- 002) and (-1.58) in the State and district respectively. The hypothesis-2 rejected. It states that there is no significant effect on the production of groundnut in State and district. Actually, at the time of sowing season, farmers depend on rainfall after that they depend on tube wells. That is the reason that it might have been affected

negatively on the production of groundnut. It seems that there was no difference between Telangana State and Mahaboobnagar district because of half of the production has come from it only.

Table: 5
One way Analysis of Variance (ANOVA) Test

		Sum of Squares	df	Mean Square	F	Sig.
Area in Telangana State	Between Groups	258081.556	2	129040.778	31.754	.000
	Within Groups	134104.333	33	4063.768		
	Total	392185.889	35			
Production in Telangana State	Between Groups	4360.222	2	2180.111	.362	.699
	Within Groups	198823.417	33	6024.952		
	Total	203183.639	35			
Yield in Telangana State	Between Groups	4.672	2	2.336	48.767	.000
	Within Groups	1.581	33	.048		
	Total	6.252	35			
Area in Mahaboobnagar district	Between Groups	26115.722	2	13057.861	24.139	.000
	Within Groups	17850.833	33	540.934		
	Total	43966.556	35			
Production in Mahaboobnagar District	Between Groups	34544.056	2	17272.028	10.056	.000
	Within Groups	56680.250	33	1717.583		
	Total	91224.306	35			
Yield in Mahaboobnagar district	Between Groups	7.266	2	3.633	47.516	.000
	Within Groups	2.523	33	.076		
	Total	9.789	35			

Source: Researcher calculation based on Directorate of Economics and Statistics of Telangana State and Andhra Pradesh.

Table 5 shows that one-way Analysis of Variance (ANOVA) test. In order to study the significant difference between all period (Period-I, II, III and Overall period) of groundnut's area, production and productivity in the Telangana State and Mahaboobnagar district. It reveals that the hypothesis-1 is rejected. It states that there is a significant difference between all periods except the production of groundnut in Telangana State.

Conclusion and Suggestions

The study reveals that there was a positive trend in the production of groundnut over a period of time. The production increased due to increases in yield and these yield has been affected by rainfall, fertilizers, pesticides and new technology in State. In the case of Maboobnagar district, groundnut's area was continuously decreased due to the negative growth rate of yield in period-I and II but not in Period-III and overall period. Area and production were maintained stability in period-III but yield maintained stability in period-I compared to other period of the study in Telangana State. The area was maintained stability in period-III, and production & yield of groundnut was maintained stability in period-II

compared to other period of the study respectively in Mahaboobnagar district. The study found that, there was a high and significant correlation between area and production in period-I compared to other periods, due to extended area and production in State and Mahaboobnagar district. After period-I, there was no significant relation between area and yield except an overall period. However, there was a positive relationship between production and yield in Mahaboobnagar district but not a strong association in Telangana State. The regression results found that the area and yield were only significant determinants of groundnut production but not rainfall in Telangana State and Mahaboobnagar district. At the same time, in Mahaboobnagar district also the coefficient value of area and yield were same more or less. The hypotheses 1 and 2 are rejected. The first and second hypothesis reveals that there is a significant difference between all periods except the production of groundnut in Telangana State and there is no significant effect of rainfall on the production of groundnut in State and district respectively.

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