Asian Journal of Agricultural Extension, Economics & Sociology

39(7): 81-87, 2021; Article no.AJAEES.70864
ISSN: 2320-7027

Growth Performance of Groundnut in Ananthapuramu District of Andhra Pradesh – A Temporal Analysis

I. Krishna Teja[1*], S. V. Ramana Rao[2], I. Bhavani Devi[1], S. V. Prasad[1], B. Ravindra Reddy[1] and Paladugu Praveen Kumar[3]

[1]S. V. Agricultural College, Acharya N. G. Ranga Agricultural University, Tirupati-517 502, Andhra Pradesh, India.
[2]Division of Social Sciences, ICAR-Indian Institute of Oilseeds Research, Hyderabad-500 030, Telangana, India.
[3]Department of Agricultural Economics, IGKV, Raipur-492012, Chhattisgarh, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJAEES/2021/v39i730611
Editor(s):
(1) Dr. Roxana Plesa, University of Petrosani, Romania.
Reviewers:
(1) B. Aparna, India.
(2) Biswajit Mondal, ICAR-National Rice Research Institute, India.
Complete Peer review History: https://www.sdiarticle4.com/review-history/70864

Original Research Article

Received 30 April 2021
Accepted 10 July 2021
Published 13 July 2021

ABSTRACT

Ananthapuramu district is considered as one of the major groundnut growing districts in the Andhra Pradesh state, with an average area, production and yield of 7.04 lakh hectares, 3.65 lakh tonnes and 512 kg ha^{-1} respectively, during the present millennium (from 2000-01 to 2018-19). Though the district is drought prone and majority of the cultivated area is under rainfed ecosystem, groundnut still continues to be one of the largest cropped area in the district. This interesting feature of the district has driven to take up the study on the performance of groundnut in the district through Compound Annual Growth Rates (CAGR) and decomposition analysis. CAGR of area, production and yield of the groundnut and decomposition analysis of groundnut production in the district were analyzed from 1970-71 to 2018-19. For lucidity, the study period was divided in three sub-periods *viz.,* Period I (1970-71 to 1985-86), Period II (1986-87 to 1999-2000) and Period III (1999-2000 to

**Corresponding author: E-mail: krishnateja.indurupalli@gmail.com;*

2018-19). It was evident from the results that, the growth performance of groundnut in Ananthapuramu district declined over the years, particularly in Period III, which implies that, despite lot of efforts from researchers and government to encourage groundnut production at macro level, the contribution of groundnut at district level showed a declining trend. This scenario could be attributed to low farm level yields with higher farm level inefficiencies, gaps in production technology, geographical location of the district under rain shadow region, declining scenario in the length of growing period, shift towards competing crops, poor post-harvest support, changing climate, lower yields, low extension contact at field level, low market prices and high abiotic and abiotic stresses. It was opined that, groundnut cultivation in the district should be encouraged with the partnership of private institutional players, where the farmers would get high quality seed, agro-advisory, post-harvest support, value addition support, remunerative and assured price support *etc*., encouragement of value addition, reduction of the length of market channels to reduce the supply gap between farmer and consumer would help in realignment of the growth performance of groundnut in the district.

Keywords: Ananthapuramu; compound annual growth rates (CAGR); decomposition analysis; groundnut.

1. INTRODUCTION

Groundnut (*Arachis hypogaea* L.) is the most important oilseed crop in India. At national level, during 2019-20, it was grown in the area of 47.44 lakh ha with the production of 82.44 lakh tonnes and with the productivity of 1738 kg/ha [1]. It is majorly cultivated in Gujarat, Andhra Pradesh, Rajasthan, Tamil Nadu, Karnataka, Telangana, Maharashtra, Odisha, West Bengal, Madhya Pradesh, Uttar Pradesh and also cultivated in small tracts in states like Chhattisgarh, Haryana, Jharkhand, Manipur and Bihar. It is predominantly grown in *kharif* season, but also has a significant presence in *rabi* and summer seasons. About 75% of cropped area of groundnut in India lies in low to moderate rainfall areas (parts of the peninsular region and western and central regions), with a short period of distribution. [2] Groundnut kernel contains 47-50% oil and 25-30% protein and It is an important source of edible oil and vegetable protein (Isanga and Zhang, [3]; Singh and Singh, [4]).

Andhra Pradesh is one of the major states in the country in area and production of important edible oilseed crops in India (Pathan et al., [5], Sameer et al, [6]). Groundnut, sesame, safflower and castor are the major oilseed crops grown in the state. Andhra Pradesh is one of the leading producers of groundnut with significant contribution of area and production to the country. During 2019-20, In Andhra Pradesh, the area, production and yield of groundnut was recorded as 6.61 lakh ha, 8.49 lakh tonnes and 1284 kg ha^{-1} respectively [1].

Ananthapuramu district is considered as one of the major groundnut growing districts in the Andhra Pradesh state, with an average area, production and yield of 7.04 lakh hectares, 3.65 lakh tonnes and 512 kg ha^{-1} respectively, during the present millennium (from 2000-01 to 2018-19). Though the district is drought prone and majority of the groundnut area is cultivated under rainfed ecosystem, it continued to be one of the largest producing area for groundnut.

Ananthapuramu is the southern-most district of the Rayalaseema region of Andhra Pradesh, which was regarded as the key contributing region to the area and production of the groundnut in the state [7]. The district lies between 13°40' and 15°15' Northern Latitude and 76°50' and 78°30' Eastern Longitude. The district is bounded by Kurnool district in the north; YSR Kadapa district in the north-east; Chittoor district in the south-east and Karnataka State on the West. The district has a total geographical area of 19.13 lakh hectare. Being located in the rain-shadow region of Andhra Pradesh, the district is deprived of both the monsoons and subjected to droughts frequently (CPO, Ananthapuramu) [8]. In the district, during 2019-20, Groundnut area, production and yield was recorded as 4.09 lakh ha, 3.44 lakh tonnes and 841 kg ha^{-1} respectively [1]. Several studies were conducted to assess the growth performance of oilseeds.

Upendra and Venkateshwarlu [9] investigated the growth in area, production and productivity of groundnut in Andhra Pradesh and all-India over the period from 1949-50 to 1990-91. The results of the linear growth rate analysis indicated that the annual growth rate of area, production and

productivity were higher during the post-green revolution period for all-India, as well as for the state as compared to the pre-green revolution period.

Pathan et al [5] in their study on groundnut production in India made an attempt to analyze the scenario of groundnut at global level in connection with the scenario at national and state levels during 2006-07. It was noticed that, the most important groundnut growing countries are India, China, Nigeria, Sudan and USA. It was also revealed that, In India, Gujarat is the largest producer contributing 25 per cent of the total production, followed by Tamil Nadu (22.48%), Andhra Pradesh (18.81%), Karnataka (12.64 %) and Maharashtra (10.09%).

Rao et al. [10] studied the performance of safflower in India using trend analysis, compound annual growth rates, instability analysis and decomposition analysis. They divided the study period into three based on inception of AICRP on safflower, TMO and trade liberalization and portrayed the scenario of safflower during these periods.

Paul [11] measured the change and instability in area, production and yield of groundnut crop in Andhra Pradesh based on secondary data during 1995-96 to 2010-11. The result of the study reported that, the area, production and productivity declined during the study period. The compound growth rates of area, production and productivity of groundnut over the study period were negative but statistically non-significant. The decomposition analysis revealed that, the change in total production of groundnut was completely due to change in the area under the crop while the yield and interaction effects were negligible.

Rambabu et al. [12] examined the performance of groundnut in Andhra Pradesh over a period of 1995-96 to 2010-2011 by fitting semi log trend equation. It was noticed that, the compound growth rates of area, production and productivity of groundnut over the study period was negative and non-significant.

Shruthi et al. [7] worked on area, production and productivity of groundnut crop in erstwhile Andhra Pradesh from 2000-01 to 2013-14 and observed that in the state, the area and production of groundnut was high in Rayalaseema region compared to other regions of the state. It was also noticed that, from 2001-02 to 2011-12, the change in the area was recorded as 5.02 per cent, while in case of production the change was -27.01 per cent.

Review of literature emphasized the importance and potentiality of groundnut cultivation in Andhra Pradesh and Rayalaseema districts of the state. However, it can be evident from the review that, there was deceleration in area, production and productivity at state and region level, where Ananthapuramu district is geographically located. Thus, the objectives of the present study are:

1. To measure the Compound Annual Growth rates (CAGR) of groundnut in Ananthapuramu district of Andhra Pradesh and
2. To estimate the decomposition analysis of the groundnut production in Ananthapuramu district of Andhra Pradesh.

2. METHODOLOGY

The present study employs the time series data on area, production and productivity of groundnut in Ananthapuramu district of Andhra Pradesh, which was collected from season and crop reports published by Directorate of Economics and Statistics. The total period from 1970 -71 to 2018-19 was divided into three sub-periods *viz*., Period I (1970-71 to 1985-86), Period II (1986-87 to 1999-2000) and Period III (2000-01 to 2018-19). Significance of the time periods selected for the study were, Period I is pre–Technology Mission on Oilseeds (TMO) period, Period II is from TMO implementation to liberalization and Period III is post liberalization period.

Table 1. Time periods selected for the study

Time period	Significance	Selected years
Period I	Pre–Technology Mission on Oilseeds (TMO) period	1970-71 to 1985-86
Period II	TMO implementation to liberalization	1986-87 to 1999-2000
Period III	Post liberalization period	2000-01 to 2018-19

2.1 Estimation of Compound Annual Growth Rates (CAGR)

In order to estimate the CAGR, the exponential time trend equation of the form

$$Y=a\ b^{t} \quad (1)$$

was used

It becomes linear when converted to log form, *i.e.*,

$$Ln\ Y=Ln\ a + t\ Ln\ b_1 \text{ where} \quad (2)$$

Y: Variable whose growth rate is being computed
t: Time trend (1, 2…n)

a and b are regression coefficients to be estimated.

This form implies a constant growth rate over time. There will be a constant deceleration if b < 0. A value of b=0 indicates absence of any trend and a positive value for b indicates a constantly accelerating growth.

Using the compounding formula,

$$Y_t=Y_0\ (1+r)^{t} \quad (3a)$$

Or

$$Ln\ Y_t=Ln\ Y_0 + t\ Ln\ (1+r) \quad (3b)$$

Or

$$Ln\ Y_t=A + tb \text{ where} \quad (3c)$$

$$A = Ln\ Y_0 \text{ and } B = Ln\ (1+r) \quad (4)$$

This equation is the log linear form of the exponential function and gives CAGR when differentiated with respect to t as follows:

$$1/Y_t.dY_t/dt = Ln(1+r) \quad (5)$$

$$e^{B} = 1 + r \quad (6)$$

$$r = e^{B} - 1 \quad (7)$$

Thus, the CAGR (per cent) is given by $(e^{B} - 1)$ X 100

In this study, Y represents the area or production or productivity of the groundnut.

2.2 Estimating the Effect of Area, Yield and their Interaction on the Change in Production of Groundnut Using Decomposition Model

The following procedure was adopted to estimate the effect of area, yield and their interaction on the change in production of the groundnut.

$P_o= A_o*Y_o$
$P_n= Y_o*Y_n$
$P= P_n - P_o$ (Change in production)
A_o=Area in the base year
A_n=Area in the current year
Y_o=Yield in the base year
Y_n=Yield in the current year
ΔA=Change in Area (A_n-A_o)
ΔY=Change in Yield (Y_n-Y_o)

Finally,

$$P = P_n - P_o = \underbrace{A_o*\Delta Y}_{\text{Yield effect}} + \underbrace{Y_o*\Delta A}_{\text{Area effect}} + \underbrace{\Delta A*\Delta Y}_{\text{Interaction effect}}$$

The change in production when more pronounced through yield effect indicates that the yield (technology) has contributed to the change in production.

In the present study, the estimation of the effect of area, productivity and their interaction on change in production of groundnut production was worked for the three respective periods as mentioned earlier. The triennium averages of the respective base and current years were considered for the estimation to minimize and/or eliminate the biasness, since groundnut cultivation is chiefly confined to cultivation under rainfed situations in Ananthapuramu district.

3. RESULTS AND DISCUSSION

3.1. Compound Annual Growth Rates

Compound annual growth rates of area, production and yield of groundnut in Ananthapuramu district of Andhra Pradesh in three periods under the study were worked out and presented in the Table 2.

Table 2. Compound annual growth rates of area production and yield of Groundnut in Ananthapuramu district

Periods	CAGR		
	Area (%)	Production (%)	Yield (%)
Period -I	4.51 ***	4.88 **	0.36 ^{NS}
Period -II	2.18 **	-0.90 ^{NS}	-3.01 ^{NS}
Period-III	-2.79 ***	-3.14 ^{NS}	-0.36 ^{NS}

**** Significant at 1 per cent level,** Significant at 5 per cent level, NS-Statistically non-significant*

Inspection of Table 2. revealed that during Period I, the growth rates of area and production of groundnut were positive and statistically significant at 1 per cent level and 5 per cent level respectively. However, the growth rate in yield was recorded to be positive but statistically non-significant during this period.

In Period II, the growth rate of area was positive and statistically significant at 5 per cent level, while the growth rates of production and yield were negative but statistically non-significant. In Period III, the growth rate of area was negative and statistically significant at 1 per cent level, while the growth rates of production and yield were negative but statistically non-significant.

Inter-period comparison among the growth rates of area under groundnut revealed that Period I witnessed the highest growth rate with 4.51 per cent, followed by Period II (2.18%) and Period III (-2.79%).

Inter-period comparison among the growth rates of production of groundnut revealed that the growth rate was highest in Period I with 4.88 per cent, followed by Period II (-0.90%) and Period III (-3.14%). It can be observed that among all the growth rates of production in the three periods under the study, the growth rate of production in Period I was only positive and statistically significant at 5 per cent level.

Inter-period comparison among the growth rates of yield in groundnut showed that the Period I witnessed the highest growth rate with 0.36 per cent, followed by Period III (-0.36%), and Period II (-3.01%). Growth rates of yield for all the periods under the study were found to be statistically non-significant.

In the district, accelerated growth rates of area were noted in Period I and Period II, which could be attributed to encouragement of groundnut received from AICRP on oilseeds in Period I and positive impetus from TMO implementation in Period II. Both the programmes focused on transfer of technology, timely support of inputs and services, enhancement of production technologies, favourable output prices, enhancement of post-harvest support, enhancement of extension support to farmers *etc*., This positive growth momentum in the Period I and Period II was not sustained and even led to decelerated growth rate of area in Period III, which could be ascribed to shift in area towards competing crops *viz*., redgram, castor and cotton [13]; changing climate scenario, frequent drought spells, as the district is in rain shadow region; low market prices, high abiotic and biotic stresses, low yields *etc*., Accelerated growth rate of production in the Period I could be attributed to increased area under groundnut cultivation, increased use of inputs at farm level, increased use of High Yielding Varieties (HYVs) etc.,

3.2 Decomposition Analysis

Effect of the area, productivity and their interaction on change in groundnut production in Ananthapuramu district was worked out using decomposition analysis and presented in the Table 3.

Examining the Table 3. It can be noticed that in Period I, yield effect was profound contributor to the change in production with 69.74 per cent, followed by area effect (16.41 per cent) and interaction effect (13.85%), while in Period II, area effect was the dominant contributor to the change in production with 247.80 per cent, followed by interaction effect (67.90%) and yield effect (-215.70%). In Period III, change in production was chiefly influenced by yield effect (70.60 %), followed by area effect (44.78%) and interaction effect (-15.38%).

Table 3. Decomposition analysis in area production and yield of Groundnut crop in Ananthapuramu district

Periods	Change in Production (in Tonnes)	Area Effect (%)	Yield Effect (%)	Interaction Effect (%)
Period -I	201102	16.41	69.74	13.85
Period -II	-69294	247.80	-215.70	67.90
Period-III	-251454	44.78	70.60	-15.38

The analysis revealed that, during Period I, yield effect (technology) had contributed to the change in production, while during Period II, the change in production was negative, even though there is area expansion. This scenario could be attributed to the expansion of groundnut area to low fertile and marginal lands under the rain shadow region, which are less or marginally suitable for groundnut cultivation. In Period III also, the change in production was negative, which could be ascribed to deceleration of technology, coupled with biotic and abiotic stresses; reduced length of growing period, market and non-market forces; poor management practices and cultivation of groundnut under less or marginally suitable lands for groundnut production.

4. CONCLUSION AND POLICY IMPLICATIONS

CAGR Analysis of area, production and yield of groundnut in three periods under the study revealed that there was accelerated growth rates of area in Period I and Period II, which could be attributed to oilseeds development programmes *viz*., AICRP on oilseeds and TMO implementation, where in focus was laid on transfer of technology, developing High Yielding Varieties (HYVs), timely input support *etc*., However, this acceleration in growth rates of the area was not sustained and even led to decelerated growth rates of groundnut area in Period III, which could be attributed to frequent drought spells, changing climate scenario, high abiotic and biotic stresses, low market prices, shift towards competing crops *viz*., redgram, castor and cotton. These results suggest that the growth performance of groundnut in Ananthapuramu district declined over the years, particularly in Period III, *i.e.,* Post liberalization period. Despite lot of efforts from researchers and government to encourage groundnut production at macro level, the contribution of groundnut to the state's economy showing a declining trend. This scenario could be attributed to low farm level yields with higher farm level inefficiencies, gaps in production technology, low extension contact at field level, geographical location of the district under rain shadow region, declining scenario in the length of growing period, shift towards competing crops, poor post harvest support, changing climate, lower yields, low extension contact, low market prices and high abiotic and abiotic stresses. To rectify this existing situation, it was opined that, groundnut cultivation in the district should be encouraged with the partnership of private institutional players, where the farmers would get high quality seed, agro-advisory support, post-harvest support, value addition support, remunerative and assured price support *etc*., Providing high quality seeds to farmers, timely input support, encouragement of micro-irrigation to tackle with high and frequent moisture stress at field level; encouragement of region specific profitable intercropping systems, development and popularization of drought tolerant HYVs, enhanced extension support, agro-advisory support through latest available technology, implementation of Minimum support price (MSP) as announced by government, encouragement of value addition to groundnut, reduction in the length of market channels to reduce the supply gap between farmer and consumer, promoting collective bargaining capacity of farmers to realize high price through cooperative organizations like Farmers Producer Organizations (FPOs) etc., would help in realignment of the growth performance of groundnut in the district.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Directorate of economics and statistics, department of agriculture, co-operation and farmers welfare, ministry of agricultural and farmers welfare, government of India.

Available:https://eands.dacnet.nic.in/
2. Directorate of oilseeds development (DOD), government of India. Status Paper on Oilseeds. Hyderabad; 2016. Available:https://oilseeds.dac.gov.in/StatusPaper/StatusPaper.pdf
3. Isanga J, Zhang G N. Biologically active components and nutraceuticals in peanuts and related products: Food Reviews International. 2007;23(2):123-140. Available:https://doi.org/10.1080/87559120701224956
4. Singh B, Singh U. 1991. Peanut as a source of protein for human foods. Plant Foods for Human Nutrition. 1991;41(2):165-177. Available:https://doi.org/10.1007/BF02194085
5. Pathan AL, Sananse SL, Bhonde SR. Groundnut production in India - scope for extended cultivation. Financing Agriculture. 2009;42(9):32-36.
6. Sameer L, Ravi G, Kulakarni G N. Production and export of groundnut from India - an overview. International Research Journal of Agricultural Economics and Statistics. 2014;5(2):293-298.
7. Shruthi G, Rao BD, Devi YL, Masih J. Analysis of area, production and productivity of groundnut crop in Telangana. Agricultural Science Digest. 2017;37(2):151-153.
8. Chief Planning Officer, Hand book of Statistics. Ananthapuramu. 2009; 18-20. Available:https://cdn.s3waas.gov.in/s333e8075e9970de0cfea955afd4644bb2/uploads/2019/07/2019071836.pdf
9. Upendra M, Venkateshwarlu P. Area, productivity and production of groundnut - A comparative analysis of growth and instability. Southern Economist. 1996;34(18):12-14.
10. Rao SVR, Damodaram T, Madhuri P, Varaprasad KS. Performance of safflower in India-A temporal analysis. Journal of Oilseeds Research. 2012;29:487-499.
11. Paul SRK. Change and instability in area, production of groundnut in Andhra Pradesh. Agricultural Situation in India. 2013;70(2):5-8.
12. Rambabu VS, Farukh Md, Paul SRK. Estimating growth rates, decomposition analysis and instability of groundnut crop production in Andhra Pradesh. International Journal of Development Research. 2014;4(1):81-85.
13. Rama Rao CA, Kareemulla K, Dixit S, Ramakrishna YS, Ravishankar K. Performance of agriculture in Andhra Pradesh – A spatial and temporal analysis. SEPR Series. Central Research Institute for Dryland Agriculture (ICAR), Hyderabad; 2008.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle4.com/review-history/70864