A Trend Analysis of Area, Production, and Yield of Groundnut in India

Dr. J. Gayathri
Assistant Professor of Economics, Department of Economics
PSG College of Arts & Science, Coimbatore, Tamil Nadu, India

OPEN ACCESS

Volume: 6

Issue: 3

Month: June

Year: 2018

ISSN: 2319-961X

Received:
16.04.2018

Accepted:
14.06.2018

Published:
28.06.2018

Citation:
Gayathri, J. (2018). A Trend Analysis of Area, Production, and Yield of Groundnut in India. Shanlax International Journal of Economics, 6(3), 15–21.

DOI:
https://doi.org/10.5281/zenodo.1299659

Abstract

Groundnut is the most important oilseeds crop in India. India ranks second next to China in groundnut production. During 2015-16 groundnut crop is cultivated in India about 4.56 million hectares, with the total production of 6.77 million tonnes with the average yield of 1486 kg/ hectare. The area under groundnut shows declining trend over the years due to various reasons. Groundnuts being the major edible oil seed crop in India, planners are concerned with the declining area. Hence this study is carried out to find the status of groundnut area, production, and yield in India. The present study was carried on the base o f the secondary data collected from the various reports of the Directorate of Economics and Statistics. The study revealed that the trend values of groundnut except for area, production and yield shows an increasing trend. The compound growth rate of the area of groundnut is showing the negative trend, whereas production and yield shows a positive trend with one percent and 3.26 percent respectively. This reveals that the yield is contributed more than by the production than by area. The compound growth rate of the area, prod uction, and yield of groundnut of major producing states in India reveal that except Madhya Pradesh and Rajasthan all other states are showing a negative trend. Regarding the Production of groundnut, the states like Gujarat, Madhya Pradesh, Rajasthan and Uttar Pradesh shows a positive trend. While considering the yield of groundnut in Gujarat, Maharastra and Tamil Nadu show positive trend during the reference period.

Keywords: *Groundnut, edible oil seed crop, anti-cancer, fertilizer, Trend Analysis, cultural practice*

Introduction

Groundnut is one of the important Kharif oil seed crops and the botanica l name is Arachis hypogaea, Linn. The word groundnut is derived from two Greek words, 'Arachis' meaning a legume and 'hypgea,' meaning below ground, referring to the pods in the soil and occupied a significant position in the agricultural economy of the country. It is believed that groundnut is the native of Brazil to Peru, Argentina, and Ghana. It was introduced in India during the first half of the sixteenth century.

Groundnut is a species in the legume or "bean" family. They have a rich nutty flavor, sweet taste, crunchy texture and over and above a relatively longer shelf life. The groundnut is valued for its protein content (26 percent). In addition to protein, groundnuts are a good source of calcium, phosphorous, iron, zinc and vitamin E and Vitamin B. The nutrient found in groundnuts, including folic acid, phytosterols, phytic acid, and resveratrol have anti-cancer effects. The oil content of the seed varies from 44 to 50 percent, depending on the varieties and agronomic conditions. It is edible oil used extensively not only for cooking but also in making soaps and cosmetics. Groundnut kernels are exported to foreign countries. The residual oilcake contains 7 to 8 percent of N, 1.5 percent of P2 O5 and 1.2 percent of K2O used as a fertilizer.

India has been one among the top three producing countries of Groundnut in the world. It ranks second next to China. Nearly 16 percent of Groundnut production is contributed by India to the world production during 2016. In India, Gujarat, Rajasthan, Tamil Nadu are the major producing states during 2015-16. Groundnut crop is cultivated about 4.56 million hectares, with the total production of 6.77 million tonnes and with the average yield of 1486 kg/hectare. The area under groundnut constitutes approximately 3.3 percent of the net sown area in India. The area under groundnut shows declining trend over the years due to various reasons. Groundnuts being the major edible oil seed crop in India, planners are concerned with the declining area. With this background, the present study has been made to study the trends in area, production, and yield of groundnut in India.

Review of Literature

Shenbagavalli et al. (2016) worked on "Trend Analysis of Area, Production, Productivity of Groundnut Crop in Cuddalore District, Tamil Nadu," The study revealed that 80 percent of the total groundnut area in the country is under rainfed conditions. Because of this, the annual groundnut production, and average groundnut productivity, in the country are closely linked to amount and distribution of rainfall during the crop season in the major groundnut growing states (Gujarat, Andhra Pradesh, Tamil Nadu, Karnataka, and Maharashtra). In addition to droughts, groundnut suffers from several diseases and pests that can cause serious damage and limit productivity. These stress cause wide fluctuations in annual production and productivity, particularly in the rainy season groundnut crop, and need to be arrested if groundnut is to retain its leading position among oilseed crops. Notwithstanding almost a century of groundnut research in the country, an effective and economic solution to many of these ailments continues to elude scientists.

Chandra Mohan Misra (2017) studied "Trends in Area, Production and Productivity of Groundnut in India: Issues and Challenges " The analysis revealed that India has been ranking among top three producers of groundnut in the world. Gujarat, Madhya Pradesh, TamilNadu being the major producing states in the country. However, there has been a consistent fluctuation in the area and production over the years and across the states. The study aims to examine India by deploying orthogonal polynomial technique on the time series data of determinants of production. The major issues and challenges relating to production and productivity of groundnut have also been dealt with. Concluding remarks suggest some recommendations for augmenting the overall production and its consistency.

Shruthi et al. (2017) done an "Analysis of Area, Production, and Productivity of Groundnut Crop in Telangana" The study brought out clearly that India is the fourth largest oilseed producing country in the world. The present study was carried on based on the secondary data collected from varies websites and directorate of economics and statistics. The results reveled that the compound growth rate of area and production of groundnut in India shows a negative trend while the productivity was positive over the years. In pre bifurcated Andhra Pradesh the annual average production of groundnut during 2011-12 was 1231 thousand tons, and the annual average yield per hectare was 873 kg/ha. The area and production of groundnut were high in Rayalaseema region compared to other regions of the state. The area, production, and productivity of groundnut in Mahabubnagar district of Telangana was an increase over the study year. The annual average production of groundnut crop during 2013-14 was 220 thousand tonnes and annual average yield per hectare during the same period was 1751 kg/ha.

Viswanatha Reddy et al. (2017) analyzed "Area, Production, Yield Trends, and Pattern of Oilseeds Growth in India ." This analysis showed clearly that India is the fourth largest producer of oilseeds accounting for about 19 percent of the global area, 2.7 percent of global production in the world. The oilseeds crops have registered the significant growth in area and production in last 30 years. However, compare to cereals like paddy and wheat, the growth rate of area and production of oilseeds is insignificant, and there exists wide variability in their yield in different states of the country. The study has explored the growth performance and dynamics of major oilseeds in different states of

the country. Oilseeds exhibited a dismal picture in their production performance both spatially and temporally.

Objectives of the study

1. To estimate the trend of an area, production and yield of Groundnut for all India during the year 2000-01 to 2015-16.
2. To know the trend of an area, production and yield of groundnut in major producing states of India during the year 2000-01 to 2015-16.

Data Sources and Methodology

The study takes into account the secondary data related to the area, production, yield of groundnut from various reports of Directorate of Economics and Statistics, Government of India. The study takes 16 years period from 2000-01 to 2015-16. Exponential growth rates were carried out for groundnut area, production and Yield. The trend equations of exponential function were fitted to the time series data for the period 2000-01 to 2015-16. For the study of growth rates, the estimates of area, production and productivity are converted into index numbers with 2000-01 as the base year instead of actual figures.

Formulae used for the construction of index numbers for an area are given below.

Index of an area under crops= $\frac{\sum a_{ij}}{\sum a_{io}} \times 100$

Index of agricultural production= $\frac{\sum P_{ij} \times p_{io}}{\sum P_{ij} \times p_{io}} \times 100$

Index of agricultural yield= $\frac{\text{Index of agricultural production}}{\text{Index of area under a crop}} \times 100$

a_{io} = area under the i^{th} crop during the base period, a_{ij} = area under the i^{th} crop during the j^{th} year, p_{io} = production of the i^{th} crop during the base period, p_{ij} = production of the i^{th} crop during the j^{th} year, p_{io} = price per unit of the i^{th} crop in the base period.

Let the exponential trend line be given by

$Y=AB^{t}$……(1)

Where Y=area (hectares), T=trend variable, i.e., year corresponding to the respective area.

A and B are constants, The equation (1) above can be rewritten as follows.

Log Y=Log A + Log Bt…….(2)

Now let Log Y = y, Log A = a, Log B = b

Then (2) can further be written as Y=a +bt……..(3)

If percent rate of compound growth rate is denoted by 'r' then

r =Anti (log b-1)*100

Area, Production, and Yield of Groundnut in India

The area, production, and yield of groundnut and its index values are presented in Table 1. The area under groundnut was 6.56 million hectares during 2000-01 which was declined to 4.56 million hectares. The production of groundnut is fluctuating during the study period. The yield has increased from 977 kg/hectare in 2000-01 to 1486 kg/hectare in 2015-16. The mean average for area, production, and yield of Groundnut was calculated for the study period. Karl Pearson's coefficient of Variation was calculated to measure the variation in the time series data. The co-efficient of variation is insignificant for the variables. This reveals that there occurred drastic changes in these variables. The trend values of index numbers concerning area, production, and yield of Groundnut reveals a decrease in area, and increase in production and yield. This shows that for the increase in yield contributed by production rather than the area. Table 2 shows the trend values of the area, production, and yield of groundnut. The trend value of the area is decreasing during the study period. Regarding production and yield of groundnut, they are showing increasing trend.

Table 1 Area, Production, and Yield of Groundnut in India: 2001-01 to 2015-16 (Base Year = 2000-01)

Year	Area (In Million Hectare)	Index	Production (In Million Tonnes)	Index	Yield (Kg/ Hectare)	Index
2000-01	6.56	100.00	6.41	100	977	100
2001-02	6.24	95.12	7.03	109.67	1127	115.35

2002-03	5.94	90.55	4.12	64.27	694	71.03
2003-04	5.99	91.31	8.13	126.83	1357	138.89
2004-05	6.64	101.22	6.77	105.62	1020	104.40
2005-06	6.74	102.74	7.99	124.65	1187	121.49
2006-07	5.62	85.67	4.86	75.82	866	88.64
2007-08	6.29	95.88	9.18	143.21	1459	149.33
2008-09	6.16	93.90	7.17	111.86	1163	119.04
2009-10	5.48	83.54	5.43	84.71	991	101.43
2010-11	5.86	89.33	8.26	128.86	1411	144.42
2011-12	5.26	80.18	6.96	108.58	1323	135.41
2012-13	4.72	71.95	4.7	73.32	995	101.84
2013-14	5.51	83.99	9.71	151.48	1764	180.85
2014-15	4.77	72.71	7.4	115.44	1552	158.85
2015-16	4.56	69.51	6.77	105.62	1486	152.10
Total	**92.34**		**110.89**		**19372**	
Mean	**5.77125**		**6.930625**		**1210.75**	
SD	**0.685642**		**1.57349492**		**284.6777**	
CV	**11.8803**		**22.7035068**		**23.51251**	

Source: Compiled from Indiastat.com.

Table 2 Trend values of Area, Production and Yield of Groundnut in India: 2000-01 to 2015-16 (Base Year = 2000-01)

Years	Area	Production	Yield
2000-01	-	-	-
2001-02	102.33	97.72	97.72
2002-03	100.00	100.00	100.00
2003-04	97.72	100.00	104.71
2004-05	95.50	102.33	107.15
2005-06	93.33	102.33	112.20
2006-07	91.20	104.71	114.82
2007-08	89.13	104.71	117.49
2008-09	87.10	107.15	123.03
2009-10	85.11	107.15	125.89
2010-11	83.18	107.15	128.82
2011-12	81.28	109.65	134.90
2012-13	79.43	109.65	138.04
2013-14	77.62	112.20	144.54
2014-15	87.10	107.15	123.03
2015-16	74.13	114.82	151.36

Source: Compiled from Indiastat.com.

Compound Growth Rate of Area, Production, and Yield of Groundnut in India

The following Table 3 shows the compound growth rate of the area, production, and yield during the 2000-01 to 201 5-16.

Table 3 Compound Growth Rate of Area, Production, and Y ield of Groundnut in India

Years	Area	Production	Yield
2000-01	-	-	-
2001-02	102.33	97.72	97.72

Source: Compiled from Indiastat.com.

The Compound growth rate for groundnut area is negative with -2.22 percent on the other hand Groundnut Production (1 percent) as well as Yield (3.26 percent) shows positive value. This also reveals that yield is contributed more by the production than by area. The insignificant area value gives as the warning sign that area under groundnut should not get shrink in future.

Year wise Area, Production and Yield of Groundnut in Major Groundnut Producing States in India

The Appendix I show the year wise area, production and yield of groundnut in major producing states in India viz, Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, Maharastra, Rajasthan, Tamil Nadu and Uttar Pradesh. The mean of the area is maximum in Andhra Pradesh, whereas it is too minimum in Madhya Pradesh. The mean average of production is very high in Gujarat and very low in Uttar Pradesh. The mean average of yield is maximum in Tamil Nadu and minimum in Karnataka.

Compound Growth Rate of Area, Production, and Y ield of Groundnut in the Major Producing States in India

Table 4 shows the compound growth rate of the area, production, and yield of groundnut in major producing states in India. In case of area, except Madhya Pradesh and Rajasthan, all other states are showing negative trend values. Regarding Production, the states like Gujarat, Madhya Pradesh, Rajasthan and Uttar Pradesh show positive values. While considering yield Gujarat, Maharastra and Tamil Nadu show positive values.

Table 4 Compound Growth Rate of Area, Production, and Y ield of Groundnut in the Major Producing States in India

States	Area	Production	Yield
Andhra Pradesh	-4.6	-4.3	-5.1
Gujarat	-2.4	0.90	3.3
Karnataka	-3.1	-1.51	-4.3
Madhya Pradesh	0.19	4.91	-2.13
Maharashtra	-2.9	-2.4	0.9
Rajasthan	4.2	10.6	-1.6
Tamil Nadu	-5.05	-0.8	4.3
Uttar Pradesh	-0.008	1.5	-0.6

Source: Compiled from Indiastat.com.

Concluding Observation

One of the important oilseed crops in India is Groundnut. The Compound growth rate of the area, production, and yield during the 2000-01 to 2015-16 reveals that the groundnut area is negative whereas production and yield shows a positive trend value. It highlights the fact that area under groundnut is shrinking. The compound growth rate of the area, production, and yield of groundnut in major producing states in India reveals that except Madhya Pradesh and Rajasthan all other states are showing negative trend values. Regarding the groundnut production, the states like Gujarat, Madhya Pradesh, Rajasthan and Uttar Pradesh Shows a positive trend. While considering the yield, Gujarat, Maharashtra and Tamil Nadu show a positive trend. Since groundnut is cultivable throughout the year, the area under groundnut can be increased with improved cultivars, and improved cultural practices contribute significantly towards increase and stability of yield in all the states. Hence, there is a need to develop improved location-specific cultural practice to increase and sustain groundnut yield and production in the country.

Appendix I Year wise Area, production and yield of Groundnut in Major Groundnut producing States in India

	Andhra Pradesh			Gujarat			Karnataka			Madhya Pradesh		
Year	Area	Production	Yield	Area	Production	Yield	Area	Production	Yield	Area	Production	Yield
2000-01	1873.9	2142.9	1144.0	1745.2	689.0	395.0	1063.4	1081.1	1017.0	214.9	227.5	1059.0
2001-02	1690.7	1249.6	739.0	1887.7	2646.6	142.0	854.8	585.8	685.0	217.4	243.6	1121.0
2002-03	1470.0	820.0	558.0	2029.4	1094.5	539.0	843.9	539.0	639.0	208.1	131.5	632.0
2003-04	1493.6	986.0	660.0	2003.4	4477.6	2235.0	817.3	433.5	530.0	217.7	252.3	1159.0
2004-05	1841.4	1639.5	890.0	2000.4	1886.6	943.0	969.0	742.0	766.0	209.5	243.0	944.0
2005-06	1876.0	1366.0	728.0	1954.0	3389.0	1734.0	1040.0	671.0	645.0	208.2	234.0	1124.0
2006-07	1334.0	743.0	557.0	1773.0	1435.0	809.0	763.0	379.0	497.0	204.0	139.4	948.0
2007-08	1795.0	2604.0	2615.0	1857.0	3299.0	2855.0	908.0	733.0	1996.0	198.7	186.8	1940.0
2008-09	1766.0	1554.1	880.0	1907.4	2661.0	1395.0	850.0	501.0	589.0	199.7	227.6	1140.0
2009-10	1301.0	1006.0	2128.0	1822.0	1757.0	1908.0	818.0	512.0	804.0	188.1	217.9	1158.0
2010-11	1426.6	1107.6	776.0	1806.0	3366.1	1864.0	848.0	742.0	875.0	201.6	301.6	1496.0
2011-12	1136.0	582.4	513.0	1686.0	2717.0	1563.0	677.0	485.0	716.0	213.0	344.6	1618.0
2012-13	1158.0	780.4	674.0	1285.0	758.0	590.0	589.0	395.0	671.0	205.7	311.7	1515.0
2013-14	1176.0	881.3	749.0	1843.0	4917.6	2668.0	655.0	565.0	863.0	206.9	324.2	1567.0
2014-15	874.0	493.0	564.0	1401.0	3018.0	2154.0	654.0	502.0	768.0	231.0	370.0	1159.0
2015-16	775.0	801.0	103.0	1414.0	2339.1	165.0	570.0	395.0	69.0	236.0	331.6	140.0
Total	**22987.2**	**18756.8**	**14278.0**	**28414.5**	**40451.1**	**21959.0**	**12920.4**	**9261.4**	**12130.0**	**3360.5**	**4087.3**	**18720.0**
Mean	**1436.7**	**1172.3**	**892.375**	**1775.9**	**2528.1938**	**1372.44**	**807.525**	**578.8375**	**758.125**	**210.03**	**255.45375**	**1170**
SD	**353.383**	**575.030165**	**624.1346**	**225.62**	**1229.1674**	**881.79**	**148.978**	**181.380719**	**390.871**	**11.886**	**70.31306629**	**419.9478**
CV	**24.5968**	**49.0514514**	**69.94084**	**12.705**	**48.618402**	**64.2499**	**18.4487**	**31.3353435**	**51.5575**	**5.6592**	**27.52477358**	**35.89297**

Source: Indiastat.com, Ministry of Agriculture and Farmers welfare, Government of India.

Appendix I (Continued) Year wise Area, production and yield of Groundnut in Major Groundnut producing States in India

	Maharastra			Rajasthan			Tamil Nadu			Uttar Pradesh		
Year	Area	Production	Yield	Area	Production	Yield	Area	Production	Yield	Area	Production	Yield
2000-01	490.0	470.0	959.0	195.7	180.8	6948.0	699.4	1359.7.	1944.0	115.4	96.4	835.0
2001-02	429.4	492.2	1146.0	242.6	297.6	1227.0	663.0	1250.0	1885.0	107.5	90.2	839.0
2002-03	419.0	450.0	1074.0	241.8	166.1	687.0	502.1	717.4	1429.0	81.7	50.5	618.0
2003-04	379.0	437.0	1153.0	212.0	331.9	1566.0	591.7	918.2	1552.0	93.3	59.4	1651.0
2004-05	447.0	502.0	1123.0	287.8	446.8	1552.0	615.9	1005.3	1632.0	85.1	69.4	816.0
2005-06	428.0	410.0	558.0	317.0	491.0	1549.0	618.8	1098.2	1775.0	106.3	90.5	851.0
2006-07	449.0	399.0	889.0	302.1	395.7	1310.0	508.0	1006.5	1981.0	100.0	73.0	730.0
2007-08	404.0	472.0	2354.0	276.3	477.4	2728.0	535.3	1047.6	3282.0	9959.2	59.2	1598.0
2008-09	318.0	355.0	1116.0	321.5	536.8	1670.0	490.1	974.6	1989.0	95.0	67.0	705.0
2009-10	321.0	359.0	1557.0	326.0	354.5	1087.0	412.0	889.8	3104.0	91.0	61.0	670.0
2010-11	357.0	460.0	1289.0	34.9	681.1	1963.0	385.6	895.7	2323.0	85.0	84.0	988.0
2011-12	303.0	351.0	1158.0	418.2	805.3	1926.0	385.6	1060.7	2751.0	92.0	92.0	1000.0
2012-13	270.0	285.0	1056.0	398.5	617.3	1549.0	338.3	783.2	2315.0	94.0	94.0	1000.0
2013-14	315.0	393.0	1248.0	462.0	900.9	1950.0	336.6	915.9	2721.0	96.0	86.0	896.0
2014-15	327.0	379.0		500.8	1011.2	2019.0	336.5	926.4	2753.0	98.0	84.0	857.0
2015-16	309.0	334.0	108.0	516.9	1048.7	202.0	346.6	892.3	257.0	1.1	1.5	414.0
Total	**5965.4**	**6548.2**	**16788.0**	**5054.1**	**8743.1**	**29933.0**	**7765.5**	**14381.8**	**33693.0**	**11300.6**	**1158.1**	**14468.0**
Mean	**372.8375**	**409.2625**	**1049.25**	**315.9**	**546.445**	**1870.81**	**485.3**	**898.8625**	**2105.813**	**706.285**	**72.38125**	**904.25**
SD	**65.99472**	**62.9095316**	**477.147**	**124.1**	**276.624471**	**1472.50**	**125.8**	**129.2834**	**744.1008**	**2467.572**	**23.86543**	**319.7367**
CV	**17.70066**	**15.371438**	**45.4751**	**39.28**	**50.6225642**	**78.7094**	**25.91**	**14.383**	**35.33557**	**349.3735**	**32.97185**	**35.35932**

Source: Indiastat.com, Ministry of Agriculture and Farmers welfare, Government of India.

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