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Research Paper

Trends In Area Production And Productivity of Groundnut In India: Issues & Challenges

Chandra Mohan Misra
Senior Research Associate Indian Institute Of Management Lucknow

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ABSTRACT: *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 paper aims to examine the trends in area under cultivation, production and productivity of Groundnut in India by deploying orthogonal polynomial technique on the time series data of fifty years. It also analyses the area and productivity effect as preliminary 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.*

Keywords: *Trends, Polynomial, productivity, Groundnut, Micro nutrients*

I. INTRODUCTION

India ranks among top three producers of groundnut in the World and stood 2nd in the world groundnut production scenario with an annual groundnut seed production of 5.9 million tons and annual groundnut oil production of 1.5 million tons in 2005. Besides, India has the maximum area covered under groundnut cultivation. The major states in India that are indulged in the production of groundnut are Gujarat (2.5 million tons),Tamil Nadu (1 million tons),Andhra Pradesh (1 million tons), Karnataka (0.5 million tons), Maharashtra (0.5 million tons), Madhya Pradesh, Orissa and Rajasthan. The Indian production and area covered is largely concentrated in the above-mentioned states. Today, groundnut has a share of approximately 25% in the total Indian oilseed production. But this share is persistently reducing since India got independent, as it was around 70% in 1950s. Indian groundnuts are available in different varieties: Bold or Runner, Java or Spanish and Red Natal. They have a rich nutty flavor, sweet taste, crunchy texture and over and above a relatively longer shelf life. Soil conditions in some producing regions are ideally suited for dry, clean and spotless Groundnuts in shell. Groundnuts in India are available throughout the year due to a two-crop cycle harvested in March and October. Groundnuts are important protein crops in India grown mostly under rain-fed conditions.It is also known as peanut, is one of the world's principal oilseed crops, widely grown in areas ranging from latitude 40°N to 40°S. The nuts are eaten in a variety of forms, or crushed to provide vegetable oil for human consumption and protein-rich meal for livestock. Groundnut is known by many other local names such as earthnuts, pea nuts, goober peas, monkey nuts, pygmy nuts and pig nuts. Despite its name and appearance, the peanut is not a nut, but rather a legume.

Review of Literature

Introduced in India during 16th century the country is the 5th largest vegetable oil economy in the world, next only to China, Brazil, and Argentina and has an annual turnover of about 80,000 crore, accounting for 12-15 per cent of area, 7-8 per cent seed production, 6-7 per cent oil production, 9-12 per cent of vegetable oil imports and 9-10 per cent of edible oil consumption (V Bal Krishnan and others). Dr. B. Madhusudhana (2013) stated that, Groundnut is called as the key of oilseeds. It is one of the most important food and cash crop of our country. Groundnut is also called as wondernut and poor men's cashew nut.

Among measures to increase the crop production, the use of chemical fertilizers is perhaps the quicker and the most important. In fact fertilizer use is essential not only for increasing the production of Groundnut but even for maintaining the current production levels. This becomes evident when we realize that an average crop of Groundnut removes about 112 kg of Nitrogen, 27kg of Phosphorus and 34 kg of Potassium from the land. Groundnut is a legume, so less of Nitrogen is required by the soil.

A review of manuring of oilseed crops was done as early in 1934 by Vandhynathan and Panse in 1947 and export committee on Manures and Fertilizers in 1953. These reviews indicate that the application of Nitrogen was found beneficial for the yield of Groundnut in parts of Maharashtra, Madhya Pradesh and Tamil Nadu, additional yield being 7.5 to 12 kg per hectare for 1 kg of nitrogen. In Bihar, application of Nitrogen and Phosphorous showed beneficial effect on the yield of crop.

Groundnut like other legumes is also very responsive to the application of micronutrients. The response is high in soils deficient or marginal in nutrients like zinc, boron, Molybdenum and copper. Sekhar and Associates (1978) studied the nutrient status of Groundnut in Punjab. The response to Zinc, Phosphorous and Boron were very marked.

Saini and Associates (1975) reported that data from experiments in Ludhiana showed Molybdenum, and Zinc increased the production. Muthuswamy and Sudararajan (1973) from Tamilnadu reported that Boron treatment increased the yield significantly. Yadahallir and Associates (1970) reported that application of Boron, Zinc, and Copper on red soils of Karnataka increased the yield of Groundnut.

The series of experiments conducted by ICAR during 1972-73 revealed that Sunflower proved more remunerative in coastal alluvial soil in Jamnagar, medium black in Indore and Sholapur, and mixed red and black in Kurnool. J. S. Kanwar and Associates (1983) observed that Groundnut out yielded Sunflower and cereals like paddy and bajra and pulses like Arhar (tur) in all districts except in Indore and Gulbarga in Karnataka.

Ma Cynthia Bantilan (2012) point out that huge inefficiencies exists both in Groundnut production and processing sector in India and suggested that replacement of old varieties with improved varieties through innovative seed system, adoption of low-cost technology to increase efficiency in production and also recommend promotion of oil seed clusters to increase efficiency in processing sector. These are some measures that can boost and stabilize the Groundnut production in India.

Experiences from some countries (Cameron) have revealed that high levels of technical efficiency of groundnut crop can be obtained among small holders farmers. These differences in technical efficiency can be attributed to various local factors like location specific technologies and their adoption, soil and weather conditions and access to credit, road and extension.

Objectives

1. To analyze the trends in area, production and productivity of Groundnut in India
2. To address the issues and challenges responsible for low productivity and production of Groundnut
3. To suggest policy measures for enhancing the production and productivity of Groundnut

Methodology

We have used secondary data of Groundnut Area, Production and Productivity which has been collected from statistics published by Ministry of Agriculture and Farmers Welfare. A fifty year time series has been used to apply orthogonal polynomial technique to get trends in area production and productivity. In order to know relative strength of area or productivity in production, Area and Productivity effect has been calculated with the help of simple regression analysis. SPSS has been used for data processing and analysis. The trend fitting by the use of the orthogonal polynomial has been simple as it does not assume any particular degree of the polynomials. The tabulated values of the ξ have been obtained from the statistical table for the required number of observations (N=50). If a polynomial of five degrees has to be fitted the final equation obtained would be of the type:

$$\mathbf{Y_t = a_0 + a_1 \square_1 + a_2 \square_2 + a_3 \square_3 + a_4 \square_4 + a_5 \square_5 + a_n \square_n}$$

Where Y' is the estimated trend value while a_0, a_1, a_2, a_3, a_4 and the a_5 are the constraints and Where Y' is the estimated trend value while a_0 , a_1, a_2, a_3, a_4 and the a_5 are the constants and $\square$ are the tabulated values of the polynomials' for required number of observations.

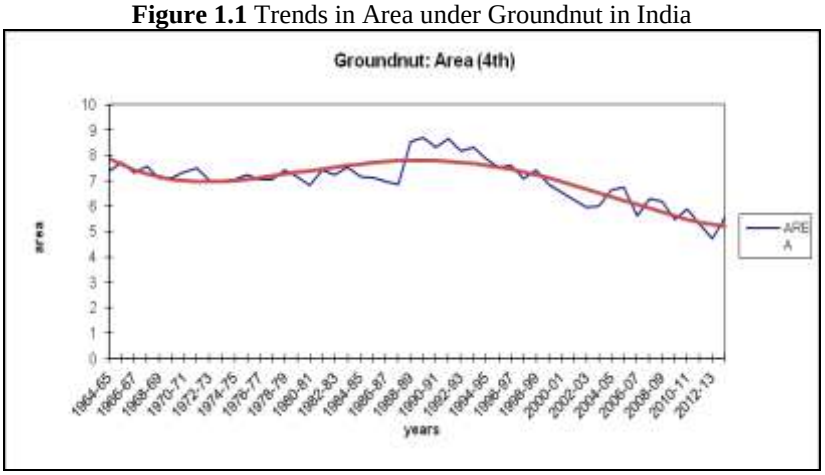
Trends in Area under Cultivation

In order to get the best fit we have taken trend line of Groundnut area at 4^{th} degree of polynomial corresponding to the equation below:

$$\mathbf{Y_t = 2465.71 + 11.71 \square_1 + 11.36 \square_2 + 2.64 \square_3 + 2.26 \square_4 + 0.76 \square_5}$$

The overall compound annual growth rate of area on actual and estimated basis over a period of fifty years has shown a negative trend. Figure 1.1 illustrates the movement of trend of estimated values against the actual of the area under cultivation

Figure 1.1 Trends in Area under Groundnut in India



During the period 1964-65 to 2013-14 the actual area showed a growth rate of-0.499 per cent, while, the estimated trend also grew at a rate of -0..499, indicating that area sown has declined. The fourth degree fit apparently shows fluctuations in three phases as shown in the Table below:

Table 1.1: Phase wise Compound Annual Growth Rate (CAGR) of area under Groundnut

Phase	**Period**	**CAGR (%)**
Phase 1	1964-65 to 1972-73	-1.488
Phase 2	1972-72to 1989-90	0.803
Phase 3	1989-90 to 2013-14	-1.82

Source: *Author's Calculation on secondary data obtained from IndiaStat.com*

In the first phase during the period 1964-65 to 1972-73 area grew at -1.488 per cent indicating that area sown has declined. However, in the second phase during the period 1972-73 to 1989-90 area grew at 0.803 per cent specifying that area sown has increased. Moreover, third phase during the period 1989-90 to 2013-14 again shows a declining trend exhibiting the growth rate of -1.882.

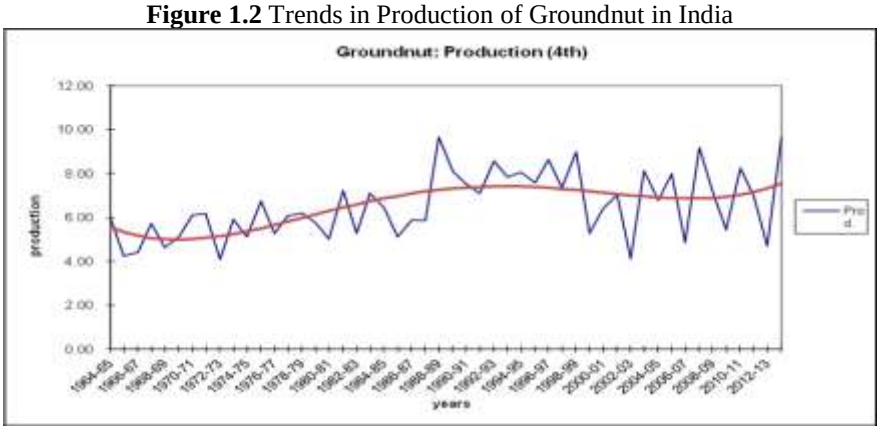
Trends in Production

In order to get the best fit, we have taken Groundnut production trend line at fourth degree polynomial corresponding to the equation:

$$Y_t = 2136.97 + 24.76\ \square_1 + 6.44\ \square_2 + 0.35\ \square_3 + 4.84\ \square_4 + 2.63\ \square_5$$

The overall compound annual growth rate of production on actual & estimated basis over a period of fifty years has shown a positive trend. During the period 1964-65 to 2013 -14 the actual production showed a growth rate of 0.702 per cent while, the estimated trend grew at a rate of .803 per cent, indicating that production has increased. Figure 1.2 below shows actual and estimated values of Groundnut production

Figure 1.2 Trends in Production of Groundnut in India



The fourth degree fit apparently shows fluctuations in four phases. In the first phase during the period 1964-65 to 1969-70 production grew at -1.980 per cent indicating that production has declined as exhibited in the Table

1.2 below. However, in the second phase during the period 1969-70 to 1993-94 production grew at 1.92 per cent specifying that production has increased. Moreover, Third phase during the period 1993-94 to 2007-08 again showed a declining trend exhibiting the growth rate of -0.598. Furthermore, fourth phase during the period 2007-08 to 2013-14 again exhibited increasing trend and grew at a rate of 1.51 per cent.

Table 1.2: Phase wise Compound Annual Growth Rate (CAGR) of production of Groundnut

Phase	Period	CAGR (%)
Phase 1	1964-65 to 1969-70	-1.980
Phase 2	1969-70 to 1993-94	1.92
Phase 3	1993-94 to 2007-08	-0.598
Phase 4	2007-08 to 2013-14	1.51

Source: *Author's Calculation on secondary data obtained from IndiaStat.com*

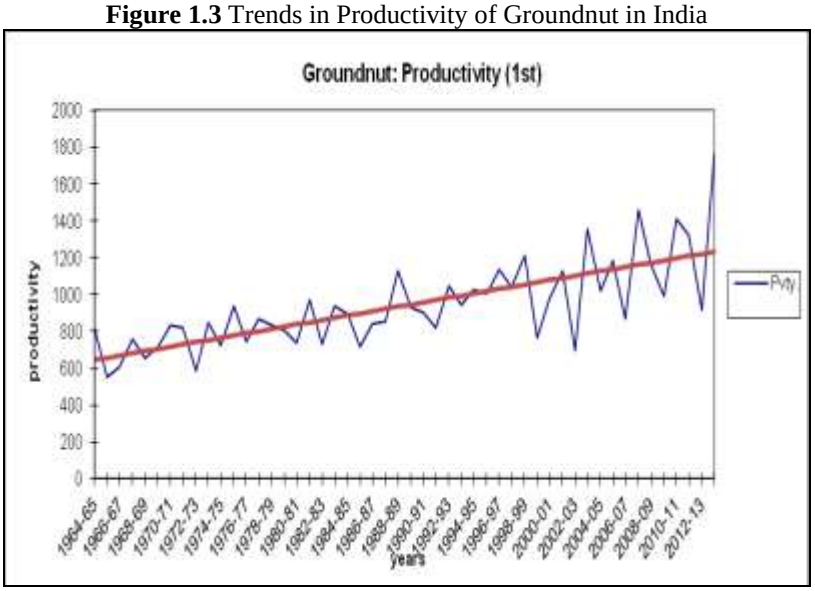
Trends in Productivity

In order to get the best fit, we have taken Groundnut productivity trend line at first degree polynomial corresponding to the equation:

$$Y_t = 44208306.64 + 1498934.76\ \square_1 + 41685.69\ \square_2 + 35338.86\ \square_3 + 24543.88\ \square_4 + 17445.81\ \square_5$$

The overall compound annual growth rate of productivity on actual & estimated basis over a period of fifty years has shown a positive trend as shown in the Figure1.3 below.

Figure 1.3 Trends in Productivity of Groundnut in India



During the period 1964-65 to 2013 -14 the actual productivity showed a growth rate of 0.803 per cent while, the estimated trend grew at a rate of 1.308 per cent, indicating that productivity has been showing an increasing trend. Despite the fact that area has shown continuously declining trend, production has sustained its pace. The comparison of overall growth rates of actual and estimated values is attempted below.

Table 1.3: Compound Annual Growth Rate of Area, Production and Productivity of Groundnut in India

1964-65 to 2013-14	Area	Production	Productivity
Overall Actual	-0.499 %	0.702 %	0.803 %
Overall Estimated	-0.499 %	0.803 %	1.308 %

Source: *Author's Calculation on secondary data obtained from IndiaStat.com*

This has been possible due to increase in productivity of Groundnut which can be attributed to the number of factors ranging from technological innovation to efficient use of fertilizers and HYV seeds. In order to quantify the net effect of area and productivity, area and productivity effect has been calculated with the help of simple regression analysis.

Area and Productivity Effect

To analyze the stability/ instability in overall Groundnut Production in India we need to see the area and productivity effect. To achieve this we have treated production as dependent variable, area and Productivity as independent variable. In order to obtain comparability we have computed the growth rates in conformity with phases and corresponding time periods of dependent variable i.e., production.

The sub-divisions of the trend line by phases will pose the problems of comparisons of the growth rates since the trend phases in the dependent and the independent variables may not be as uniform as desired for comparison. We shall, therefore, compare the rates of growth in the independent variables by dividing the series of the independent variables into phases which conform to the phases in the dependent variable.The One Way-Anova technique (regression) has been deployed. The results have been presented in the Table below

Table 1.4: Overall and Phase wise Compound Annual Growth Rates as well as Area and Productivity Effect of Groundnut

Period/ Phases	**Growth Rates (%)**			**Estimated Regression between Production as Dependent Variable & Area as independent variable**			**Estimated Regression between Production as Dependent Variable & Productivity as independent variable**		
	Production	**Area**	**Productivity**	**Constant**	**Reg.Coeff. associatedwith Area**	**R^2**	**Constant**	**Reg.Coeff. associated with Productivity**	**R^2**
Actual 1964-65 to2013-14	0.702	-0.499	0.803	4.005 (2.335)	.361 (1.487)	.044	1.653 (3.452)	.005 (10.520)	.697
Estimated 1964-65 to 2013-14	0.803	-0.499	1.308	7.504 (6.438)	-.138 (-.834)	.014	2.714 (7.051)	.004 (10.098)	.680
Phase I (1964-65 to 1969-70)	-1.980	-2.078	1.82	.095 (.252)	.688 (13.518)	.976	11.418 (10.754)	-.009 (5.873)	.896
Phase II (1969-70 to1993-94)	1.92	0.60	1.410	-13.503 (-18.595)	2.676 (27.340)	.970	-2.101 (-7.610)	.010 (30.700)	.976
Phase III (1993-94 to 2007-08)	-0.598	-1.88	1.11	4.682 (42.357)	.355 (22.255)	.974	11.351 - (69.710)	-.004 (-25.930)	.981
Phase IV (2007-08 to 2013-14)	1.51	-2.078	1.005	12.060 (12.721)	-.899 (-5.232)	.846	-3.988 (-2.678)	.009 (7.450)	.917

Source: *Author's Calculation on secondary data obtained from IndiaStat.com*
Note: *Figures in bracket indicate t values*

As evident from the table both the overall and estimated series shows a negative growth rate of area against positive growth rates of both production and productivity. The R^2 values of .697 and .680 clearly indicate that the productivity effect has been significant over a period of fifty years. The phase wise analysis also reveals interesting trends. In phase I both area and production show a negative growth though area effect appears significant. It is in the years following 1993-94 that we find area effect loses its significance and in the last phase lasting between 2007-08 to 2013-14 the production is sustained by productivity effect (R square.917), while area during these years shows a negative growth rate. The phenomenon is well illustrated by Figures 1.1, 1.2 and 1.3. In the last phase the graph of area dips sharply while that of production picks up and moves upwards. The productivity graph shows steady increase, more prominent in the last phase. In fact the scrutiny of actual productivity figures in the last eight to ten years shows that in spite of fluctuations the productivity attains very prominent peaks, never observed in the past. The trends here are logically explainable. With the launch of technology mission in mid 80's and subsequent focus on oilseed production in the country started showing the results from 90's onwards. The productivity levels were strengthened and the technology incorporation in the groundnut production has given encouraging response.

Issues And Challenges

The recent enhancement in the productivity of groundnut in India though encouraging poses many challenges before the development planners and practiceners. The average yield of groundnut in India (1212 kg per hectare, triennium ending 2012) according agricultural statistics at a glance is below the world average of 1626 kg per hectare triennium ending 2012 and far below the highest yield of 4069 kg per hectare triennium ending 2012 recorded by USA.

Indian groundnut production is lagging behind the international levels though in some parts of the country soil conditions may be suitable but majority of the cultivation is carried out in marginal lands under rain fed conditions. The crop is susceptible to weather and pests. The low investment in technology and limited marketing facilities leads to low producers prices. Low efficiency in the processing sector also reduces the overall profitability of the cultivators and thus also the production. All field operation right from land

preparation to harvesting are done manually. Lack of improved varieties of seeds and lack of balanced use of fertilizers (chemical/organic) and micro nutrients have also been affecting the overall production. In the absence of appropriate crop rotation the acreage is further reduced by insects like Tibacco Caterpillar and Groundnut Leaf Miner while Aflatoxin contamination is a major health hazard for humans and animals which hampers the sale and export of output. Post-harvest management leading to huge crop losses is also one amongst several issues highlighted above and which pose serious challenges before the Indian agriculture.

II. CONCLUSION

The literature review, trend analysis and examination of issues and challenges lead to three major phenomenon. Firstly there have been recent improvements in the performance of the productivity though it is still low when compared internationally. Secondly, non-remunerative prices and inadequate profitability inhibits the farmers from shifting groundnut cultivation from marginal to improved lands. Thirdly, low investment in technology, susceptibility to pests and diseases and poor availability of good quality seed and storage is also a major hurdle. To break the productivity plateau the investment in technology up gradation and mechanization in groundnut production, opening of better market avenues and improving the efficiency in the processing sector shall go a long way in augmenting the overall production and productivity, better cropping systems like rice-groundnut, rice-mustard etc. may also be advocated. Improving extension activities with adequate focus on post-harvest management, pest and disease control by incorporating scientific methods can also help elevate the crop production and yield. Promoting cultivation in the specific zones having suitable ago-climatic-soil conditions with increased investment and better farming practices will no doubt produce some long lasting results.

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