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A study on technical efficiency of groundnut production in Tamil Nadu

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Abstract
The main aim of the study was to measure the technical efficiency of groundnut production in Tamil Nadu. Diagnostic research design was used to find the technical efficiency of groundnut production in Tamil Nadu. A field survey was carried out with a well-structured interview schedule. Primary data of the selected sample farmers were collected and analyzed. The sample respondents were selected from Villupuram and Tiruvannamalai districts of Tamil Nadu who had cultivated groundnut. The random sampling technique was used to collect the sample data. The total sample size for the study was 100. Stochastic production function was used for analyzing the technical efficiency of groundnut production. The results of the stochastic frontier production function revealed that seeds, fertilizers and plant protection chemicals were significantly influencing the technical efficiency of the groundnut production. Hence, the increase in the use of these inputs could increase technical efficiency. Further, the elasticity of human labour and bullock labour inputs were negative and statistically insignificant. It was found that the efficiency of groundnut farmers ranged from 67.41 to 99.86 per cent with a mean technical efficiency was 88.06 per cent.

Keywords: Technical efficiency, groundnut production, cobb-douglous production function and stochastic frontier production function

Introduction

Groundnut is an important oilseed crop grown in tropical areas of the world. It is the third-largest oilseed crop in the world. India ranks second in terms of output and first in terms of crop area in the world. China is the world's largest producer and consumer of groundnut. The area under groundnut in China was (17.39 million tonnes), followed by India (6.70 million tonnes), Nigeria (2.89 lakh tonnes), Sudan (2.88 million tonnes), and Myanmar (1.60 million tonnes) respectively in 2018-19. India exported 0.66 million tonnes of groundnut worth of Rs. 5,096 crores during the year 2019-20. Groundnut was exported to Indonesia, Vietnam, the Philippines, Malaysia, and Thailand from India. In India, the area under groundnut was declined from 5.47 million hectares to 4.73 million ha in 2019-2020. The groundnut area shrunk by 13.52 per cent during the period. However, groundnut production increased from 5.42 million tonnes in 2009 to 6.72 million tonnes in 2019. Groundnut production increased by 23.98 per cent during the period. Tamil Nadu was the fourth-largest producer of groundnut in the country. The area under groundnut was decreased from 4.89 lakh hectares to 3.35 lakh hectares in recent times. Similarly, Groundnut production was also decreased from 9.75 lakh tonnes to 9.11 lakh tonnes in 2018-19. Last ten years, the groundnut area and production were decreased to 31.5 per cent and 6.51 per cent respectively. Tiruvannamalai and Villupuram were the major districts in the state with the production of 114.3 and 199.7 thousand tonnes in 2018-19 respectively. The area and production under groundnut were decreasing over the years in the state. In this context, it was necessary to study the efficiency of groundnut production in the state. Hence, the main purpose of carrying out this research was to find out the technical efficiency of groundnut production.

Review of Literature

Bathla and Srinivasulu (2011) [1] found that the despite seed and oil markets being vertically integrated in the long-run, there was not enough evidence in support of a greater and higher degree of price transmission and symmetry in the selected markets. Price transmission elasticity of rising seed prices was larger than the corresponding elasticity of falling prices, which indicates that an increase in seed price was passed through to oil price more fully than its decrease.

Mofya-Mukuka (2013) [2] highlighted the critical pathways for increasing the private and public sector participation at different stages of the groundnuts value chain and improve production, assembling, and storage, processing and marketing.
Florkowski (2014) [3] examined production and marketing practices in Ghana's groundnut value chain to obtain a clear understanding of the sources and levels of aflatoxin contamination in the crop and how such contamination can be sharply reduced.
ldoko *et al* (2014) [4] found that most of the women groundnut farmer are young and are in to full time groundnut production and in most cases the respondents stated that they did not see any extension worker at all.
Bonabana-Wabbi *et al*., (2015) [5] revealed that Small farmer's access to improved groundnut production and value addition technologies in Eastern Uganda. He analyzed the determinants of awareness of soil fertility improvement technologies in the three districts of Bukedea, Mbale and Tororo. Results revealed that the biggest challenges include un-affordability, lack of technical knowledge regarding use of the technology and unavailability of fertilizers.
Guchi (2015) [6] determined the stakeholders' perceptions about groundnut qualities with respect to aflatoxin contamination and pre-and post-harvest practices affecting development of aflatoxigenic fungi and aflatoxin contamination.
Misra (2017) [7] analysed the area and productivity effect as preliminary determinants of production. The major issues and challenges relating to production and productivity of Groundnut had also been dealt with. It concluding remarks suggest some recommendations for augmenting the overall production and its consistency.
Choudhary *et al*.,(2017) [8] examined trends, costs and returns structure, resource use efficiency of groundnut farmers. This study that the farmers were not fully aware of some of the components of improved groundnut production. There was a scope for extension agencies to educate the farmers for adopting recommended technologies. Non-availability of labour and other inputs at peak period, high cost of key inputs, low price to produce and lack of technical knowledge were the major constraints faced by cultivators in kharif groundnut.
Dadhania (2017) [9] examined the price spread, marketing efficiency and factor affecting of groundnut marketing.
Maurya *et al*., (2017) [10] found that the producers share in consumer rupee were decreased with increase number of intermediaries. The marketing cost and marketing margin were increased with increase in number of intermediaries.
Sangeetha *et al*., (2017) [11] found that price transmission analysis revealed that bi-directional relationships exist within domestic markets which indicated the price transmission happening in short run adjustments and the presence of long run equilibrium existed among the groundnut markets in Tamil Nadu, Karnataka, Andhra Pradesh and Gujarat.
Devi *et al*., (2017) [12] constructed a value chain map containing various actors involved in the value chain. The result revealed that showed the linkage potential between actors of value chain and studied the relationship and services of supporting markets.
Nandi *et al*., (2021) [13] studied groundnut value chain mapping and various value chain actors and their role. The impact of COVID-19 on local groundnut production was seen to have spread across the value chain actors starting from local farmer producers, primary and secondary processors (oil mills), exporters and end consumers. Emergences of digital platforms and digital technologies had helped to make supply chains more efficient in the pandemic situation.

Objective of the study

- To measure the technical efficiency of groundnut production in Tamil Nadu.

Methodology

Tamil Nadu was purposively selected for the study. Villupuram and Tiruvannamalai districts were chosen based on the largest area under groundnut cultivation in Tamil Nadu. Similarly, Thiruvennainallur and Vikkiravandi blocks in Villupuram district and Kilpennathur and Thandarampattu blocks in Tiruvannamalai district were selected based on the largest area under groundnut. In the next stage, five villages were chosen from each block with five sample farmers from each village to carry out the research. Thus, the total sample size of the farmers accounted for 100. Random sampling was used to collect the primary data from sample respondents in this study. The survey was carried out through a well-structured interview schedule. Cobb-Douglas production function and stochastic frontier production function were used to analyze the data.

Cobb-Douglas production function

The empirical model for groundnut production using Cobb-Douglas frontier production function (Tadesse and Krishnamoorthy, 1997) was defined as follows:

$\ln Y_i = \ln\beta_0 + \beta_1\ln X_1 + \beta_2\ln X_2 + \beta_3\ln X_3 + \beta_4\ln X_4 + \beta_5\ln X_{5+} + V_i - U_i$

Y = Yield of Groundnut (Kg/ha)
X_1 = Human Labor (man days/ha)
X_2 = Bullock labour (hours/ha)
X_3 = Seeds (Kgs/ha)
X_4 = Fertilizers (Rs/ha)
X_5 = Plant Protection Chemical (Rs/ha)
Vi = Random variation in output
Ui = Technical inefficiency effects

Stochastic frontier production function

The stochastic frontier approach was used to estimate the technical efficiency of groundnut production. The functional form used in the study as follows;

$Ln(y_) = \ln\beta_0 + \beta_1\ln X_1 + \beta_2\ln X_2 + \beta_3\ln X_3 + \beta_4\ln X_4 + \beta_5\ln X_5 + \beta_6\ln X_6 + \beta_7\ln X_7 + \beta_8\ln X_8 + V_it$

Y = Yield of Groundnut (Kg/ha)
X_1 = Human Labor (man days/ha)
X_2 = Bullock labour (hours/ha)
X_3 = Seeds (Kg/ha)
X_4 = Fertilizers (Rs/ha)
X_5 = Plant Protection Chemical (Rs/ha)
V_it = Error

The frontier 4.1 program was used in different field of research especially in agricultural studies. Hence, this study applied frontier 4.1 for the estimation of technical efficiency.

Results and Discussion

The demographic characters include age, education, occupation, family income and landholdings of the sample respondents were collected for the study. The distribution of demographic characteristics of sample respondents is presented in Table 1.

Table 1: Demographic characteristics of sample respondents

Characteristics	Category	Percentage
Age	Young (< 34)	12
	Middle (35-55)	47
	Old (>55)	41
Education	Illiterate	51
	Primary	17
	Secondary	19
	Higher secondary	10
	Graduate	3
Occupation	Agricultural only	73
	Agricultural and others	27
Land holdings (ha)	Marginal (< 1 Ha)	31
	Small (1 to 2 Ha)	61
	Semi medium (2 to 4 Ha)	9
	Medium (4-10 Ha)	0
	Large (>10 Ha)	0
Annual income	< 0.90 lakhs	41
	0.91- 2 lakhs	46
	2.01 – 5 lakhs	13

It could be inferred from the table that the maximum percentage of farmers (47 per cent) were of the middle age group (35 to 55 years). It was followed by the old group of 41 per cent and only 12 per cent of the sample farmers were younger age group of below 34 years. In the case of education, 51 per cent of the sample farmers were not educated, followed by 19 per cent had secondary education and only 3 per cent of the sample farmers had college-level education. It could be observed from the table that 73 per cent of the respondents had agriculture as their main occupation while 27 per cent were employed in private or government services along with the agriculture profession. It could be inferred that the majority of respondents were small farmers (61 per cent) followed by marginal farmers (31 per cent). With regards to family income, the majority of the farmers (46 Percent) had an annual income of upto 2 lakhs and negligible number of farmers were earning between 2 to 5 lakhs. Hence, it could be concluded that the majority of farmers were middle-aged, illiterate, smallholding with an annual income of up to2 lakhs per year.

Cobb-Douglas production function

The result of the Cobb-Douglas production function for Groundnut production is presented in Table 2. The coefficient of multiple determination (R^2) was 0.81 which indicated that 81 per cent variation in the dependent variable was explained by the independent variables included in the model. The coefficient of seed, fertilizer and plant protection chemicals were significant at one per cent level. It indicated that a one per cent increase in the use of seeds would increase the yield by 0.43 per cent from the mean level. Similarly, a one per cent increase in the expenditure of fertilizer would increase the groundnut output by 0.46 per cent. Further, a one per cent increase in the expenditure of plant protection chemicals would increase output by 0.31 per cent. The coefficients of human labour and bullock labour were negative and insignificant. It could be concluded from the results that groundnut productivity could be increased by cultivating the suitable varieties according to the season and by appropriate use of fertilizer and plant protection chemicals.

Table 2: Cobb-Douglas Production Function for Groundnut production

Explanatory Variables	Coefficient	Standard error	t-stat	p-value
Constant	12.310**	0.548	22.457	1.48E-39
Human Labor(man days/ha)	-0.577	0.038	-14.833	2.34E-26
Bullock labour (hours/ha)	-2.367	0.165	-14.279	2.82E-25
Seeds (Kg's/ha)	0.437*	0.048	9.051	1.91E-14
Fertilizers (Rs/ha)	0.461*	0.041	11.207	5.14E-19
Plant Protection Chemical (Rs/ha)	0.311*	0.036	8.533	2.39E-13

R^2 - 0.81, Adjusted R^2 - 0.78

Note: ** - significant at one per cent level,

*-significant at five per cent level

Stochastic Frontier production function

The result of the stochastic frontier production function estimates for groundnut cultivation is presented in Table 3. The results showed that all the variables included in the model were significant, except human labour and bullock labour. It implied that the groundnut output could be increased by the use of seeds, fertilizers and plant protection chemicals. The results revealed that the area under cultivation remains an important contributor to the improvement of technical efficiency in groundnut production in the study area. The elasticity of human labour and bullock labour for groundnut cultivation was negative and statistically insignificant, The gamma value (γ) of the MLE of the stochastic frontier production model was 0.914. This value implied that 91.4 per cent of the variability of agricultural production was attributed to the technical efficiency in agricultural production techniques and the rest (9.6 per cent) was due to random noises. Moreover, the presence of technical inefficiency was tested by the Likelihood Ratio (LR) test which was 4.86.

Table 3: Maximum likelihood estimates of the stochastic production of groundnut production in Tamil Nadu

Explanatory Variables	ML Estimates		
	Coefficients	Standard error	t ratio
Constant	8.086**	1.441	5.081
Human Labor(man days/ha)	-0.218	0.111	-1.964
Bullock labour hours/ha	-0.486	0.305	-1.593
Seeds (Kg's/ha)	0.048*	0.120	0.398
Fertilizers (Rs/ha)	0.109*	0.067	1.632
Plant Protection Chemical (Rs/ha)	0.0456*	0.079	0.574
Sigma-Square (σ^2)	0.019**	0.005	3.57
Gamma (γ)	0.914	0.096	0.947
LR test of the one side error	4.863		
Log –likelihood function	103.06		
Mean technical efficiency (%)	88.06		

Note: ** - significant at one per cent level,
* - significant at five per cent level

Frequency distribution of groundnut farmers based on technical efficiency

It could be inferred from Table 4 that the efficiency of groundnut farmers ranged from 67.41 to 99.86 per cent with a mean efficiency of 88.06 per cent. The mean technical efficiency indicated that an average of 42 per cent of the farmers fell short of the maximum possible level of technology. About 45 per cent of the groundnut farmers were in the most efficient category (>90). The second level of the groundnut farmers (42 per cent) belonged to the efficiency group of 81 to 90. Therefore, the least efficient groundnut growers could adopt better variety and utilize the fertilizer and plant protection chemicals efficiently to increase the productivity of groundnut

Table 4: Frequency distribution of groundnut farmers based on technical efficiency

Technical Efficiency class (Per cent)	No of Units	Percentage to total
61-70	2	2.00
71-80	11	11.00
81-90	42	42.00
91-100	45	45.00
Total	100	100
Mean Technical efficiency	88.06	

Conclusion

It could be concluded that there was considerable scope to improve the yield of the groundnut with the existing conditions of input use and technology. The study revealed that seed, fertilizer and plant protection chemicals were highly significant. Hence, groundnut production could be increased by the selection of suitable varieties according to the season and usage of appropriate quantity of seed, fertilizer and plant protection chemicals. Stochastic frontier production function concluded that all the explanatory variables were significant, except human labour and bullock labour. It implied that the groundnut output could be increased by the use of seeds, fertilizers and plant protection chemicals. The elasticity of human labour and bullock labour were negative and insignificant. It was found that the efficiency of groundnut farmers ranged from 67.41 to 99.86 per cent with a mean technical efficiency was 88.06 per cent.

References

1. Bathla S, Srinivasulu R. Price transmission and asymmetry: an empirical analysis of Indian groundnut seed and oil markets. Indian Journal of Agricultural Economics 2011,66(902-2016-66740).
2. Mofya-Mukuka R, Shipekesa AM. Value chain analysis of the groundnuts sector in the Eastern Province of Zambia (No. 1093-2016-87750) 2013.
3. Florkowski WJ, Kolavalli S. Strategies to control aflatoxin in groundnut value chains. Intl Food Policy Res Inst 2014, 1369.
4. Idoko MD, Sabo E. Challenges in groundnut production and adoption of groundnut production technology information packages among women farmers. Agriculture and Biology Journal of North America 2014;5(6):252-258.
5. Bonabana-Wabbi J, Kirinya J, Kasenge V, Semalulu O, Mugonola B. Smallholder farmers access to improved groundnut production and value addition technologies in Eastern Uganda. Journal of Agricultural Extension and rural development 2015;7(8):247-256.
6. Guchi E. Stakeholders' perception about aflatoxin contamination in groundnut (*Arachis hypogaea* L.) along the value chain actors in eastern Ethiopia. International Journal of Food Contamination 2015;2(1):1-7.
7. Misra CM. Trends in area production and productivity of groundnut in India: Issues & Challenges. Journal of Research in Agriculture and Animal Science 2017;4(7):01-06.
8. Choudhary R, Rathore DS, Sharma A. An economics analysis of production and marketing of groundnut in porbandar district of Gujarat. Economic Affairs 2017;62(3):547-553.
9. Dadhania MV. Price spread, marketing efficiency and factors affecting of groundnut marketing in Junagadh district. Trends in Biosciences 2017;10(24):5019-5022.
10. Maurya SK, Kushwaha RR, Mourya KK, Kumar S. Price spread and marketing efficiency of groundnut marketing in Gorakhpur Districts of Eastern UP. Journal of Pharmacognosy and Phytochemistry 2017;6(6):712-715.
11. Sangeetha R, Ramanand MS, Menaka S. An econometric analysis on groundnut markets in India. International Journal of Current Microbiology and Applied Sciences 2017;6(8):2131-2142.
12. Devi IS, Suhasini K, Prabhakar BN. Value chain of groundnut-An analysis of constraints and opportunities ahead. Indian Journal of Economics and Development 2017;13(2a):341-346.
13. Nandi R, Nedumaran S, Selvaraj A, Datta Mazumdar S, Kumar S. The COVID-19 Induced Disruptions across Groundnut Value Chain: Empirical Evidence from South India. Sustainability 2021;13(4):1707.