

Determinants and Resource Use Efficiency of Groundnut Production in Chikun Local Government Area, Kaduna State, Nigeria

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Abstract:- This study analyzed the determinants and resource use efficiency in groundnut production in Chikun Local Government Area of Kaduna State. The objectives of the study were describe the socio-economic characteristic, estimate the production relationship of inputs and output for groundnut production and analyze the resource use efficiency in groundnut production. Multi-stage and random sampling techniques were used to select eighty three farmers used for the study. Descriptive statistics was used to analyzed the socio-economic characteristics of the respondents, production function using multiple regression analysis was used to show the relationship between inputs and output while resource use efficiency of the groundnut farmers were estimated using marginal value productivity- marginal factor cost approach. About (59%) of the respondents are married while majority (87.5%)of the respondents have formal education. The result shows 80.20 % of the variation in the output of groundnut were accounted for by the inputs and capital was the only input that was significant at 1 % probability level and was positively signed which shows that as capital increases the output of groundnut increases. The result also revealed that all the inputs used were underutilized which shows that the farmers are inefficient in their used of their resources for production of groundnut in the study area. The study recommends that farmers should be assisted with loan facilities from commercial bank to help them increase groundnut production in the study area since capital significantly influences the output of groundnut.

Keywords :- Determinants, Output, Resource Use, Efficiency, Groundnut, Production.

I. INTRODUCTION

Groundnut (*Arachis hypogaea L.*), a species in the family Leguminasaea, is annual legume. It is known by many local names, including peanut, earthnut, monkey- nut and goobers. The groundnut originated in Latin America and was introduced to African continent from Brazil by the Portuguese in the 16th century (Adinya, Enun and Ijoma 2010). The crop is mainly grown for oil seed, food, and animal feed (Upadhyaya *et al.*, 2006). It is the world's 13th most important food crop, 4th most important source of edible oil and 3rd most important source of vegetable protein (Taru *et al.*, 2010). Groundnut seeds, known as kernels, contain 40-50% fats, 20-50% protein and 10-20% carbohydrates (Sorensen *et al.*, 2004). They are source of vitamin E, niacin, riboflavin, thiamine calcium, phosphorus, magnesium, zinc, iron, and potassium. Groundnut is useful in the treatment of

haemophilia, stomatitis and prevent diarrhea. It is beneficial for pregnant woman, nursing mothers and growing children. The crop can be used for producing industrial materials, such as oil-cakes and fertilizer. Extracted oil from the kernel is used as culinary oil and other crop extracts are used as animal feeds. Almost every part of the crop is used in one way or other. The multiple uses of the groundnut plant make it an important food and cash crop for domestic consumption and export in many developing countries. Globally, 50% of total groundnut production is used for oil extraction, 37% for Confectionary use and 12% for seed (Taru *et al.*, 2010).

In the Northern part of Nigeria, apart from being consumed whole, edible groundnuts are included as an ingredient in a wide range of other products which includes groundnut paste which is fried to obtain groundnut cake (*Kulikuli*), salted groundnut (*Gyadamaigishiri*), a gruel or porridge made with millet and groundnut (*Kununhyada*), groundnut candy (*Kantumgyada*) and groundnut soup (*Miyagyada*). The shells are used for fuel by some local factories or they are sometimes spread on field as a soil amendment. They could also be used as bulk in livestock rations or in making chipboard for use in joinery (Mukhtar, 2009).

The main goals of resource use efficiency measurement is to find ways of increasing output per unit input and attaining desirable transfer of factors of production in other to raise our economic standard of living. Many authors have analyzed the efficiency of resource use in the agricultural sector by using farm level data from many parts of Nigeria. Taphee and Jongur (2014) used Cobb-Douglas stochastic frontier analysis to analyze the productivity and technical efficiency of groundnut production in northern Taraba state, Nigeria. The empirical results showed that farm size, quantity of fertilizer, quantity of seeds and family labour were the key determinants of groundnut production in the study area. Moreover, the inefficiency component of the groundnut production in the study area was attributed to the age of the farmer, farmers contact with agricultural extension officers as well as the size of the family.

Ibrahim *et. al.* (2013) reported that land; labour, fertilizer, seed and herbicides are all over utilized except insecticides which is underutilized in their study titled socio –

economic factors affecting groundnut production in Sabon-Gari local government area of Kaduna state, Nigeria. In a similar study in Bekwara local government area of Cross River state, Nigeria Edete et. al. (2018) reported that quantity of seed and farm size had positive significant relationship with groundnut production and the inefficiency model showed that educational level, membership of cooperative, access to credit and the amount received were the significant variables that increased the technical efficiency of the respondents. In a study of resource use efficiency of groundnut by Zekeri and Tijjani (2013) in Ringim local government area of Taraba state observed that seed, hired labour and pesticides used in groundnut production were significant while fertilizers, family labour and farm size were not significant. They also reported that seeds, family labour and hired labour were under-utilized while fertilizers and pesticides were over-utilized. Aboki (2018) reported that seeds and labour were under-utilized while agro-chemicals were over-utilized by groundnut farmers in Gassol local government area of Taraba state.

II. MATERIALS AND METHODS

A. Study Area

The study was carried out in Chikun Local Government Area of Kaduna State. The local government covers area of about 4456.59km and lies between the latitude 10°N and longitude 90°E. and situated in the Northern Guinea Savannah Zone. It shares boundary with Igabi and Kaduna South Local Government Area to the North - East and with Kajuru to the East, Birnin Gwari and Giwa Local Government Area to the North - West and Kachia Local Government Area to the South East. The ethnic group in the study area comprises of Gbagyi predominantly, with other tribes like Hausa, Kataf, Igbo, Fulani and Yoruba. Their occupation is farming and crops cultivated include groundnut, rice, yam, maize, guinea corn, millet and cassava. They also reared livestock such as goat, sheep, pig, cattle and poultry bird.

B. Sampling Techniques and Frame

Multi-stage and random sampling techniques were adopted to select the respondents for the study. In the first stage three (3) districts namely; Matagyi, Kakau and Narayi were selected purposively due to high concentration of groundnut farmers in the districts. In the second stage one village each from the three (3) districts were also purposively selected which includes; Kamazo, Sabon-Gaya, and Bayan-Dutse because of their predominance and intensively cultivation of groundnut. In the third stage random sampling was used to select thirty (30) groundnut farmers in the selected villages in the study area which gave a total of ninety (90) respondents respectively. However seven of the questionnaires were discarded due to non retrieval. So eighty three farmers were used for the study.

C. Data Collection

Data for this study was obtained from primary sources. The primary data was obtained through the use of structured questionnaire and oral interview to gather information on the socio-economic characteristic such as age, sex, level of education, household size etc. other information that was gather from the respondents include the inputs and output variables associated with groundnut production in the study area.

D. Data Analysis

The following tools of analysis were employed to achieve the stated objectives of the study.

- i. Simple descriptive statistics
- ii. Production function using multiple regression analysis
- iii. Marginal value productivity – marginal factor cost model

1). *Simple Descriptive Statistics*: This involves the use of descriptive statistics such as table percentage, mean and frequency distribution.

2). *Production Function*: Production function was used to determine the physical relationship between the inputs and output of groundnut production using multiple regression analysis. The implicit model is given as:

$$Y = F(X_1, X_2, X_3, X_4, \dots, U)$$

While the explicit models are given as:

Linear production function; $Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + U$

Semi-log production function; $\text{Log} Y = b_0 + b_1 \text{log} X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + U$

Double-log production function; $\text{Log} Y = b_0 + b_1 \text{log} X_1 + b_2 \text{log} X_2 + b_3 \text{log} X_3 + b_4 \text{log} X_4 + U$

Where,

Y= Groundnut output (kg)

X₁= Land (ha)

X₂= labour (kg)

X₃= Capital input (₦)

X₄= Seed (kg)

b₁- b₄= Regression coefficients

b₀= Constant

u= error term

3). *Marginal value productivity – Marginal factor cost model*: This was adopted to estimate the resource use efficiency as follows:

$$r = MVP / MFC$$

The values of MVP and MFC will be estimated as follows:

$$MVP = MPP.PY$$

$$MPP = bi.Y$$

$$MFC = PXi$$

Where: r = Efficiency ratio

MVP = Marginal Value Product

MPP = Marginal Physical Production

MFC = Marginal Factor Cost

PXi = (Unit Price of Input X)

y = Arithmetic mean value of output

X = Arithmetic mean value of input considered

Py = Unit price of output t

bi = Estimated coefficients of independent variables

Based on the econometric theory, a firm maximizes profits with regard to resource use efficiency when use ratio of marginal reform to the opportunity cost is one. The values are interpreted as follows:

If **r is less than 1** = resource was excessively used or over-utilized, hence decreasing quantity use for that resources increases profit.

If **r is greater than 1** – resource is under use or being under-utilized, hence increasing it rate of use will increase profit level.

If **r = 1** it shows the resource is efficiently used, that optimum utilization of resource hence the point of maximization.

III. RESULTS AND DISCUSSION

E. Socio – Economic Characteristics of Respondents

1). *Age of Respondents*: Table 1 shows that respondents (42.2%) are within the age range of between 21-30 years, (28.9%) of the respondents are within the age range of 31-40 years, (16.9%) of the respondents are between the range of 41-50 years, (7.2%) of the respondents are below 20 years, while few (4.8%) of the respondent are 50 years and above, the result shows that most of the respondents are in their youthful age which makes them active in groundnut production, Taru *et. al.* (2008), opined that eligibility of one’s performance in certain activities or role including agricultural activities is determined by the age and too young or too old people are generally inactive or of low productivity on the farm.

2). *Marital Status of Respondents*: Table 2 shows (59.0%) of the respondents are married, (33.8%) of the respondents are single, (4.8%) of the respondents are widow, while (2.4%) of the respondents are divorcee. This implies that majority of the respondents are married people.

3). *Religion of Respondents*: Table.3 revealed that majority of the respondents (66.9%) are Christians, (27.7%) are Muslims, while very few (8.43%) are traditional worshippers. This implies that Christians dominated groundnut production in the study area. This result is in line with the finding of NAERL (2011) that most groundnut producers in Chikun LGA of Kaduna State are predominantly Christians.

Table 1: Distribution of the Respondents Based on Age Range

Ages	Frequency	Percentage(%)
Below 20	6	7.22
21-30	35	42.2
31-40	24	28.9
41-50	14	16.9
Above 50	4	4.8
Total	83	100

Source: Field survey, 2018

Table.2: Distribution of the Respondents Based on Marital Status

Marital status	Frequency	Percentage(%)
Single	28	29.55
Married	49	53.41
Divorcee	2	2.4
Widow	4	4.8
Total	83	100

Source: Field survey, 2018

Table 3: Distribution of the Respondents Based on Religion

Religion	Frequency	Percentage(%)
Muslim	23	27.7%
Christian	54	68.9%
Tradition	7	8.43%
Total	98	100

Source: Field survey, 2018

4). *Household Size of the Respondents*: Table 4 shows that majority of the respondents (37.3%) have household size ranging from 1-5 members, (36.1%) of the respondents have household size ranging from 6-10 members, (13.3%) of the respondents have household size that is between 11 – 15 and 16 above. Respectively. This implies that majority of the farmers have over five household members which signifies that labour can be easily sourced from the family members. Alabi *et. al.* (2005) stated that family with high family members are more helpful to their family in terms of agricultural production than family with small family member

Table 4: Distribution of the Respondent Based on Household Size

Ages	Frequency	Percentage(%)
1-5	31	37.3%
6-10	30	36.1%
11-15	11	13.3%
16 Above	11	13.3
Total	83	100

Source: Field survey, 2018

5). *Educational Qualification of Respondents*: Table 5 shows that (33.7%) of the farmers have secondary education, (30.1%) of the respondents have tertiary education, (15.7%) of the respondents have Qur'anic education, (12.1%) have non-formal education, while few of the respondents (8.5%) have primary education. This shows that about 63 % of the farmers had secondary school certificate and above. Murtala *et al* (2004), stated that education plays a important role in farming activities. It gives the farmer an insight about important technology and decision making that determines success of their farming enterprise

6). *Sources of Capital of Respondents*: Table 6 shows that (59.36%) of the respondents acquire their capital from personal saving, (15.7%) of the respondents sourced their capital from family, (6.02%) of the respondents sourced their capital from Bank loan, while (4.8%) of the respondents sources the capital through friends, This implies that most of the farmers sourced capital through personal saving which implies that they will have ability to manage their finances well if given credit loan.

7). *Farm Size of Respondents*: Table 7 revealed that (33.7%) of the respondents have farm size of one hectare of land, (32.53%) of the respondents have farm size of less than one hectare, (16.9%) of the respondents have three hectares, (13.3%) of the respondents have two hectares, while (2.6%) of the respondents have four hectares and above, the result shows that most of the respondents are small scale groundnut farmers.

8). *Years of Experience of Respondents*: Table 8 shows that majority of the respondents (38.6%) have 1-5 years farming experience in groundnut production, (33.8%) of the respondents have less than one years in groundnut farming experience, (12.0%) of the respondents have within 11-15 years of experience in farming, (9.6%) of the respondents have 15 and above years in groundnut farming in the area. According to Alabi *et al* (2005) more years of experience in farming enhance efficiency and productivity in business.

F. Production Function Analysis

Different functional forms were fitted for the regression analysis; this include linear, semi-log, and double log functions. The choice of best functional form (lead equation) was based on both statistical and economic criteria (F-test statistics and R²) and a prior expectation of the sign of the coefficient. Linear regression analysis was the lead equation and is presented in Table 9. The coefficient of multiple determinations of 0.802 shows that 80.2% of the variation in the output of groundnut farmers is accounted for by the variation in the explanatory variables in the model, while the remaining 19.8% was due to error term. The F-value for the equation 79.169 showed that the strength of association between the dependent and independent variables is very high. The coefficient for capital input is significant, at (1%) and positively signed. This implies that if more capital is used, it will lead to increase in groundnut production. The

coefficient of land, labour and seed were positively signed which shows they have direct relationship with output of groundnut in the study area but does not influenced production because they are not significant. This non significant of farm size and the result of R² and F-statistics differs from the findings of Audu *et. al.* (2017) who reported that land (farm size) was significant at 5 % probability level and obtained a lower values for R² (53.60 %) and F-statistics (6.89) respectively in their study titled productivity and profitability of groundnut production in Lafia local government area of Nasarawa state, Nigeria.

G. Resource Use Efficiency of the Farmers

The result of the resource use efficiency for groundnut production in Chikun Local Government area is presented in table 10. The result revealed that the value for resource used efficiency (r) for land (X₁) is 15.07, labour is 81.16, capital input is 13.91 and for seed is 350.76. All the values obtained for the input are greater than 1, which shows that land, labour, capital input, and seed are under utilized for production of groundnut in the study area. Therefore there is the need for the farmers to increase the use of this resources so that they can be more efficient in maximizing profit in groundnut production in the study area, This finding negate the study of Gideon *et. al.* (2015) that reported over utilization of labour and seed by smallholder groundnut farmers in Northern Region of Ghana.

Table 5: Distribution of the Respondents by their Educational Qualification

Education background	Frequency	Percentage(%)
Non-formal education	10	12.05
Qur'anic education	13	15.7
Primary education	7	8.5
Secondary education	28	33.7
Tertiary	25	30.1
Total	83	100

Source: Field survey, 2014.1.8

Table 6: Distribution of the Respondents Based on Sources of Capital

Sources	Frequency	Percentage(%)
Personal saving	49	59.36
Loan from family	12	14.45
Credit from bank	4	4.8
Asusu	13	15.7
Total	83	100

Sources: Field survey, 2018

Table 7: Distribution of the Respondents Based on Farm Size

Farm size	Frequency	Percentage(%)
Less than one hectare	27	32.53
One hectare	28	33.7
Two hectare	11	13.3
Three hectare	11	16.9
Four and above	3	2.6
Total	83	100

Source: Field survey, 2018

Table 8: Distribution of the Respondents Based on their Years of Experience

Years of experience	Frequency	Percentage(%)
Less than one year	28	33.8
1-5	32	38.6
6-10	5	6.0
11-15	10	12.0
15 above	8	9.6
Total	83	100

Source: Field survey, 2018

Table 9. Estimate of Production Function of Groundnut Production in Chikun Local Government Area of Kaduna State

Variable	Estimated parameters	Coefficient	Standard error	t-Value	Significant
Constant	X0	-51256.761	94727.353	-.541	.590
Land	X1	.208	.821	.254	.800
Labour	X2	7.556	8.550	.884	.380
Capital	X3	4.286	.247	17.317	.000*
Seed					
Adjusted R ²	X4	8.389	15.207	.552	.583
F Statistics = 79.169	0.802				

Source: Field survey, 2018

Table 10: Resources Use Efficiency of the Respondent

Variable	MVP	MFC	MVP/MFC (r)
Land (X ₁)	45,223.98	3,000	15.07
Labour (X ₂)	1,642,848.18	20,241.70	81.16
Capital input (X ₃)	931874.98	66,992.42	13.91
Seed (X ₄)	1,823,961.55	5,200	350.76

Source: Field survey, 2018

IV. CONCLUSION

In conclusion the study revealed that there is strong relationship between the independent and dependent variables with high value of F – statistics and that 82,2 % of the variations in the output of groundnut production in the study area is accounted by the explanatory variables in the model with only capital have great influence on groundnut production in the study area being significant at 1% probability level which indicates that the higher the capital the farmers possess the higher the output of groundnut in the study area. However the farmers are found to be inefficient in the use of their resources such as land, labour, capital and seed which are under utilized. The study therefore suggest that loan facilities should be provided to groundnut farmers from the commercial bank or government with single digit interest rate to increase their capital base which in turn will boost groundnut production in the study area and. the farmers also be encouraged to form a co-operative society that will enable them have access to loan from the various financial sectors. Farmers should also be advised to increase the use of resources such as land, labor, capital and seed so that they can

be more efficient in utilizing these resources and maximize profit in their groundnut production.

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