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Technical Efficiency of Maize Production in Rijau Local Government Area of Niger State, Nigeria

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Abstract: *This study assessed the technical efficiency of maize production in Rijau Local Government Area of Niger state, Nigeria using Stochastic Frontier Approach. A multi-stage sampling technique was used in selecting 120 maize farmers. Descriptive statistics was used to assess the socio-economic characteristics of farmers and to identify the constraints to maize production in the study area. The Cobb-Douglas functional form of the stochastic frontier model was used to determine the technical efficiency of the maize farmers and estimate the elasticity of output to factor inputs used in maize production. The results revealed that 65% of the respondents had formal education while 95.8% of the farmers owned farm size of between 1 and 5ha. The Maximum Likelihood Estimate of the stochastic frontier production model revealed that labour (1.8488), seed inputs (1.6022), fertilizer (3.4089) and agro-chemicals (1.9350) were significant at 10%, 5%, and 1% probability levels respectively. The study further revealed that farmers' household size and educational level in the inefficiency model have direct relationship with their production efficiency and each was significant at 10% probability level. Maize output has the highest level of responsiveness to seed (0.57), followed by labour (0.18), agro-chemicals (0.13), farm size (0.12) and fertilizer (0.08). High cost of improved inputs (97.5%), limited or lack of extension contacts (82.5%), poor road network (80.0%) and problem of pest and diseases (50.8%) were the major challenges militating maize production in the study area. The study affirmed the need for the farmers to be linked with the Federal Government's Growth Enhancement Scheme programme (GES) in order to gain access to agro-inputs at a subsidized rate, also government should strengthen extension service delivery scheme towards educating farmers on the importance of improved and advanced technologies that will assists them heighten their production efficiency.*

Keywords: *Technical Efficiency, Stochastic Frontier Approach, Elasticity of production*

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I. Introduction

Maize is one of the commonly consumed food crops in Nigeria and other Sub-Saharan African countries. It is an important source of carbohydrate, mineral, protein and vitamin B (Aminu, Ayinde and Ibrahim, 2015). Maize is one of the numerous food crops that form the mainstay of the total calorie supply, especially in the poorer populations. Maize cultivation spread rapidly around Sub-Saharan African countries owing to its soaring productivity and adaptability. It is at present being cultivated in nearly all countries of the world (Aminu *et al.*, 2015). Maize has been rated as the second most grown crop in Nigeria with an output of 9,180,270 tonnes contributing about 1.4% of the world production (FAO, 2013).

Maize production is constrained by the advancement of modern/sophisticated technologies such as pesticides, improved seed, fertilizer, and improved agronomic practices etc. which remain confining factors for underdeveloped countries. One of the preliminary plans for maximizing agricultural production (output) is the utilization of highly developed technology. However, regardless of how prolific a technology may seem, optimum production can simply be achieved when the technology is effectively used (Aminu *et al.*, 2015).

Considering the rate of population growth in the country, and by extension, in the study area as well, there is the need to match population increase with increase in food production. Increase in maize production through technical efficiency enhancement is one way of actualizing this dream. In addition, maize is the staple food of the majority of households in Rijau Local Government Area, hence increasing the output of maize is an essential step towards achieving food self-sufficiency within the study area. Despite the fact that small scale farmers in Rijau local government area are engaged in maize production there has been a gap between demand and supply, and also between output of sorghum and maize, maize being the farmer's preference.

Arising from the above, it has become imperative to efficiently allocate resources in maize production, with a view to addressing the productivity gap. It is therefore, anticipated that this study will assist in identifying all but efficient means of combining progressively limited resources, with the view to maximizing productivity and to investigate the degree to which technical inefficiency could be contributing to the challenge of low productivity (yield/ha) of maize in the study area.

The broad objective of this research work is to assess the technical efficiency of maize production in Rijau local government area of Niger state. The specific objectives of the study were to:

i. Determine the technical efficiency of maize farmers in Rijau local government area;
ii. Estimate the elasticity (level of responsiveness) of output to the factor inputs;
iii. Identify the challenges to maize production in the study area.

II. Literature Review

Theoretical Framework for Technical Efficiency

Technical efficiency is the ability of the farmer to produce a greatest level of output given existing resources. While allocative efficiency refers to the ability of the farmer to incur best possible output for specified inputs' prices. Measurement of technical efficiency and allocative efficiency are pre-requisite to attainment of economic efficiency. A production function denotes the technical and mathematical relationship between input (resource) and output in a production process. It is depicted in terms of the greatest output that a farm can produce from a particular set of inputs, given the available technologies existing on the farm (Kibirige, 2008; Battese, 1992). A farm is considered to be technically efficient when it use certain level of resources to produce maximum output i.e. producing along the best production frontier level. The most frequent postulation is that the objective of the farmers/manufacturers is profit maximization; nevertheless, it is assumed that these goals and objectives of the farmers are entwined with their mental constitute (Kibirige, 2008; Debertin, 1992). Technical efficiency is concerned with the efficiency of converting input to output.

Stochastic Frontier Production Function Model

Productive efficiency can be enhanced through developing and embracing advanced technologies and improving farmer's access to resources. The most widely used techniques in the prediction of productive efficiency level and its causal factor are stochastic frontier analysis (SFA) and data envelopment analysis (DEA). The Stochastic Frontier Analysis uses a parametric approach and it is extensively used in estimation of the technical efficiency of farm or production method with multiple inputs and one output, while Data Envelopment Analysis is a non-parametric approach that uses linear programming technique to determine the technical efficiency of farm/firm with multi-outputs and multi-inputs (Boundeth, Nanseki, and Takeushi, 2012).

The Stochastic Frontier Approach was used in this study to analyze the technical efficiency of maize production (individual maize farmers) and the factors that influence efficiency. Coelli and Battese (1996), stated that the stochastic frontier production analysis is more relevant than data envelopment analysis in agricultural production, particularly in developing countries where data are more liable to be greatly influenced by measuring of the two sided errors, other factors outside the farmers control such as; pest, weather conditions, disease, etc., and a one-side factor that account for inefficiency (Boundeth *et al.*, 2012).

The specification of stochastic frontier model allow for a non-negative random factor in the error term to create a determinant of technical inefficiency or the proportion of genuine or anticipated highest output given a specific input and the existing technology (Boundeth *et al.*, 2012). In practice, the frontier production function is a regression where the evaluation of the production function is executed with the acknowledgment of the hypothetical restriction that all observations situate below it and is usually a way to another end. The measurement of efficiency comes forth logically after the estimation of the frontier production function, because it represents the distance linking an observation and the empirical estimate of the hypothetical thought.

Concept of Elasticity of Production

Elasticity of production (output elasticity) measures the degree of responsiveness of output to changes in the variable inputs. It can also be defined as measures of the percentage change in output as a result of percentage change in the input.

Mathematically expressed as:

$$Ep = \frac{\mathrm{Y1-Y2}}{\mathrm{Y2}} \div \frac{\mathrm{X1-X2}}{X1} \text{ -------- (1)}$$

$$= \frac{\Delta \mathrm{Y}}{\mathrm{Y}} \div \frac{\Delta \mathrm{X}}{X} \text{ ------------ (2)}$$

$$= \frac{\Delta \mathrm{Y}}{\Delta \mathrm{X}} \div \frac{\mathrm{X}}{Y} \text{ ------------ (3)}$$

$\frac{\Delta \mathrm{Y}}{\Delta \mathrm{X}}$ = MPP, and $\frac{\mathrm{X}}{Y}$ = APP

Therefore, the relationship can be express thus:

$$\mathrm{Ep = MPP.}\frac{1}{\mathrm{APP}} = \frac{\mathrm{MPP}}{\mathrm{APP}} \text{ --------- (4)}$$

This end product of output elasticity will guide one to determine elasticity of production in the three stages of production function.

III. Methodology

Study Area: This study was carried out in Rijau Local Government Area of Niger State. The entire area is situated in Northern Guinea Savannah zone of Nigeria, with a population of 230,255 people (Niger State Bureau of Statistics, 2014). It has an area of 3,432.2km^2. The zone experiences dry and wet season with the wet season beginning around April and running through October; while dry season starts from November and ends in March. The headquarters of Rijau Local Government is the town of Rijau, which lies at 11^{0}06`N5$^0$16`E.

The Dukkawa and Kambari people form the largest ethnic groups in this area, with Dukkawa (Dukkanci) and Kambari (Kambarci) languages widespread. There are some other ethnic groups, including Hausas and Fulani's. Maize and Sorghum farming is the major economic activity in the area, although Groundnut, Cowpea, Rice, and Soybean are also cultivated.

Sampling Procedure and Sampling Size: Multi-stage sampling technique was used to select respondents for the study. The first stage entails the random selection of 4 wards from the 11 wards of Rijau Local Government Area, and the second stage the random selection of 2 farming communities from each of the selected ward, and thirdly the random selection of 15 maize farmers from the selected farming communities of the study area. The sampled 120 maize farmers used were gotten from the database of maize farmers in Niger State Agricultural Mechanization and Development Authority (NAMDA) Kontagora and some were identified through the District and Village Heads of the study area.

Data Collection and Type of Data: This study used primary data that was derived by survey research method using a well-structured questionnaire to collect relevant data. The socio-economic information collected includes gender of respondents, educational level attained, age, etc. Production data collected includes quantity of seed planted, type of labour used in maize production, quantity of fertilizer applied, and quantity of maize harvested, access to extension services (number of contacts), information about challenges faced by maize farmers in the study area were also collected.

Data Analysis: The tools used for the analysis of data include descriptive statistics, stochastic frontier production function using Cobb-Douglas functional form of the stochastic frontier model to compute the elasticity of output with respect to factor inputs used.

Descriptive Statistics: Descriptive statistics such as frequency and percentages were used to analyze the socio-economic characteristics of maize farmers and challenges faced by maize farmers in the study area.

Empirical Model: This study used stochastic frontier model to determine the technical efficiency of maize farmers in the study area. The general stochastic model is given as:

$Y_i = (X_i; \beta) \exp (V_i - U_i)$ -- (1)

Where;

Y_i= output of the ith farmer;

X_i= variable inputs;

β = vector of parameters to be estimated;

V_i= assess the random deviation in output due to factors outside farmer's control,

$U_{i\,=}$ are factors that are within the farmer's control responsible for technical inefficiency.

The composed error term, ε_i is defined as:

$\varepsilon_i = V_i - U_i$ -- (2)

Where:

ε_i= two-sided error,

V_i= random variables that are presumed to be independent of U_i.

U_i= Non-negative random variables that are presumed to account for technical inefficiency in production.

Model Specification: Production frontier is defined in terms of the greatest output that can be attained or produced by a farmer from the set of available inputs given the existing technology on the farm (Ekunwe, Orewa and Emokaro, 2008). The empirical analysis is based on the estimation of a Cobb-Douglas frontier production function in which the output and inputs were both expressed in logarithmic form.

Following Ekunwe, Orewa and Emokaro, (2008), the production technology of the farmers was specified by the Cobb-Douglas frontier production function in logarithmic form as:

$\text{Log}Y = b_0 + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + b_5 \log X_5 + b_6 \log X_6 + (V_I - U_i)$ ---------- (3)

Where:

Log = Natural logarithm

Y = Quantity of maize produced in kg ha^{-1}

b_0, b_1, b_2, and b_3 = Parameters to be estimated

X_1 = Farm size (Hectares)

X_2 = Labour (Man-days ha^{-1})

X_3 = Seed inputs (kg ha^{-1})

X_4 = Fertilizer (kg ha^{-1})

X_5 = Agro-chemicals (Liters ha^{-1})

V_i = Random variables that are presumed to be independent of U_i.
U_i = Non-negative random variables presumed to account for technical inefficiency in production.
Inefficiency Model: The determinant of technical inefficiency is expressed as:
$\mu = \delta_0 + \delta_1 Z_1 + \delta_2 Z_2 + \delta_3 Z_3 + \delta_4 Z_4 + \delta_5 Z_5 + \delta_6 Z_6$------------------------------------- (4)
Where:
μ = Technical inefficiency
Z_1 =Age of the farmers (Yrs)
Z_2= Household size (No)
Z_3= Farming experience (Yrs)
Z_4= Educational level (Yrs)
Z_5= Maize variety used (1 if improved variety; 0 if traditional variety)
δ_0, δ_{1}--------δ_6= Inefficiency parameters

IV. Results And Discussion

Socio-economic Characteristics of Maize Farmers

In agricultural production, age is one of the determinants of productivity of labour and of significance particularly when considering the form and nature of farm operations. Table 1 below reveals that 80.8% of the respondents situate between the ages of 10 and 50 years. This posits that most of the respondents are energetic and in their productive stages of life labour wise as they can put in their best in all types of manual farm operation in order to achieve optimum output.19.2% of the farmers fall within the age group of 51years and above. This finding disagrees with the result of Essilfie, Asiamoh and Nimoh (2011) who reported that most of the active age group that engaged in maize production in Mfantseman Municipality are within group of 50years and above.

With the current trend of gender inequality in every aspect of human living, agriculture is not an exception. The gender of farmers is of key note and importance in agricultural production especially where family labour is predominant. Men tend to endure every facet of farm operations and provide more horse power required for farm activities than women, this in turn increases labour productivity and reduces the cost of non-family labour. The outcome in Table 1, presents that maize production in the study is male gender biased as there is no single female from the respondents sampled. This development may be attributed to religious affirmation of the study area that limits female to partake in farm activities and the tedious nature of the work involved in maize production. This finding is closely related with the finding of Salau (2010), who reported that the restriction of women from engaging in farming and other forms of activities may be due to the religious and cultural belief of the farmers that forbid women to go out freely and engage themselves in such activities. However, most of the female farmers especially in Shambo and Tungan Magajiya of the study area are actively engaged in rice production.

Table 1: Socio-economic Characteristics of the Maize Farmers

Characteristics	Frequency	Percentage
Age (yrs)		
10 – 20	4	3.3
21 – 30	22	18.3
31 – 40	45	37.5
41 – 50	26	21.7
51 and Above	23	19.2
Gender		
Male	120	120
Female	0	0
Marital Status		
Married	107	89.2
Single	13	10.8
Educational Level		
Informal	30	25.0
Primary	14	11.7
Secondary	32	26.7
Tertiary	33	27.5
None	11	9.2
Household Size		
1 – 5	47	5.0
6 –10	28	35.0
11 – 15	20	36.7
16 – 20	17	15.0
20 above	8	6.7
Farming Experience		

1-10	61	50.8
11-20	36	30.0
21-30	10	8.3
31 – 40	9	7.5
41 – 50	4	3.3
Farm Size (Ha)		
1 – 5	115	95.8
6 – 10	4	3.3
11-15	1	0.8
Extension Contacts		
None	79	65.8
1 – 4	55	32.5
5 – 8	2	1.7
Total	**120**	**100**

Source: Field survey; 2017

When considering family labour in agricultural production, the marital status of farmers plays a significant role in agriculture in that a married farmer with large family size is likely to have a readily supply of family labour than a farmer that is not married. Table 1 above, presents that 10.8% of the respondents are single, while 89.2% of the farmers were married thence enunciating the tendency of having substantial family labour to carry out farm operations. This result coincides within the range of result reported by Kibirige (2014) and Oladejo *et al.*, (2012). As the adage goes that education is the bedrock to success of every societal development, in agriculture, education is an important and influential element in production. This is because it enhances efficient and better management of farm resources, adoption of new and improved technology easily and by extension, increment in output, productivity and income level of the farmers. The Table 1 presents that 25.0% of the respondents had informal (Quranic) education, perhaps due to the strong religious bond they have which necessitates them to focus and have deep indulgent of their religious knowledge. 65.9% of the farmers are literate. 9.2% of the respondents had no any form of the education; this may have significant effect on technology adoption. According to Salau (2010), education level of farmers have significant impact on their productivity, income earning opportunity and ability to adopt better management practices effectively.

Household size of farmers contributes a lot to the output realized in that it affects the size of land cultivated. Thence, expectations are that farmers with colossal household size are likely to cultivate more farmlands compared to the farmers with small household sizes. The results from Table 1 above show a disparity in the household sizes of the study area. 39.2% the maize farmers have household sizes sandwiched between 1 and 5 persons in their households. 40% have household sizes of between 6 and 15 while 20.7% have household sizes of between 16 and above 20. The insinuation is that most of the respondents are likely to have considerable number of family labour for farm activities; Ceteris paribus. According to Salau (2010), household size is used as a proxy of family labour given that each individual in the household is a potential source of labour.

The result depicts that 80.8% of the maize farmers had 1 – 20years of farming experience. This result presents that the farmers are moderately experienced in their maize farming enterprise. While 19.1% of the respondents had experience of over 20years that range between 21 and 50years, this result is enunciating that this category of farmers have more experience than the later 80.8% and by implication they may have sufficient knowledge in carrying out farm operations such as fertilizer application, seed rating, seed spacing and better management practices amongst other. According to Kibirige (2014), the more experience the farmers are the better for positive output given that they may have additional techniques for minimizing production risk. The result shows that 95.8% of the maize farmers are small-scale farmers having land size of between 1 and 5 hectares while 3.3% and 0.8% of the respondents own land size above 5 hectares, the average is 1.06 hectare. This could be dues to low capital base of the farmers to expand maize production per hectare and per farmer. The average farm size of 1.06 coincides with the finding of Kibirige (2014), who found that majority of maize farmers in Masindi District dedicates 1.04 hectare to maize production.

Extension service heightens the diffusion and adoption of innovation to farmers, which is anticipated to lead to increased output, increased income and increased standard of living of the farming households. Table 1 above presents 65.8% farmers were not visited by extension agents, 32.5% respondents were visited by extension agents receiving a considerable number of visit of between 1 and 4 visits, while 1.7% of the farmers received between 5 and 8 number of visits. By implication this result has negative effect on technology adoption and productivity improvement as the farmers in the study area lack influential factor that will make them adopt new technology and find it user friendly. This result relates intimately with the findings of Essilfie *et al.*, (2011) who found that 80.8% of maize farmers in Mfantseman Municipality don't have extension contact.

Determinants of Technical Efficiency and Inefficiency of Maize Production

The result in Table 2 below presents Maximum Likelihood Estimates of the Cobb-Douglas functional form of stochastic frontier production model for maize production in Rijau local government area. Out of the five (5) variables considered four variables were significant and these include labour, seed inputs, fertilizer and agrochemical. These variables mentioned are significant at 10%, 5% and 1% probability level respectively, thus having significant effect on the maize output. The implication of this result is that a percentage increase in these inputs will result to increase in the quantity of maize output by the value of each coefficient of the variables. That is maize output will increase by 0.18 for labour, 0.57 for seed inputs, 0.08 for fertilizer and 0.13 for agrochemicals respectively.

A percentage increase in the quantity of seed input used by the farmer would lead to increase in the quantity of maize output by 0.57%. This finding corroborates with the findings of Ahmed *et al.,* (2014). The estimated coefficients of labour, fertilizer and agrochemicals are other significant factors on the output of maize and are statistically significant at 10% and 1% respectively. Thus enunciating that increase in the quantity of these inputs by the farmers would result to increase in the quantity of maize output. This finding closely relate with the findings of Abdulai *et al.,* (2013).

For the diagnostic statistics, the sigma-squared (σ^2) estimates is 0.0648 and statistically significant at 10% thence attesting to the good fitness and correctness of the distributional assumption of the composite error term of the model. While the gamma (γ) estimates is 0.9304 indicating that the amount of variation in the output of maize results from the farmer's technical inefficiencies. This shows that 93% of the variation in the output of maize is as a result of technical inefficiency.

The inefficiency model/function provides valuable explanations for the comparative efficiency of individual maize farmers. The negative signs of the inefficiency coefficients point out that the related variables have affirmative effects on the technical efficiency of maize production contrariwise. These factors are believed to affect the technical efficiency level of maize production.

Table 2: Maximum Likelihood Estimates of the Stochastic Production Function for Rijau LGA

Variables	Parameter	Coefficient	Std. Error	t-ratio
Constant	β_0	0.46113075	0.75592616	0.61002089
Farm size [X_1]	β_1	0.11700570 ^{NS}	0.53416455	0.21904430
Labour [X_2]	β_2	0.18437705****	0.099728548	1.8487884
Seed inputs [X_3]	β_3	0.56738273****	0.35412131	1.6022270
Fertilizer [X_4]	β_4	0.078625523**	0.023064115	3.4089981
Agro-chemicals [X_5]	β_5	0.12474640***	0.064466974	1.9350435
Inefficiency Model				
Constant	δ_0	0.090275009	0.25849233	0.34923670
Age of farmer (yrs)	δ_1	0.020419024 ^{NS}	0.41349427	0.049381637
Household size (No)	δ_2	-0.41392226****	0.23234512	-1.781497541
Farming experience (yrs)	δ_3	0.094816074 ^{NS}	0.15974354	0.59355186
Educational level (yrs)	δ_4	-0.34139190****	0.21324164	-1.600962645
Maize variety (dummy)	δ_5	0.068276652 ^{NS}	0.10817100	0.63119181
Variance parameters				
Sigma-squared	σ^2	0.064763356****	0.0342234633	1.8923671
Gamma	γ	0.93043404**	0.048359824	19.239814
Log likelihood	Λ	55.2054		
Mean efficiency		0.831		

, *, and **** indicates parameters statistically significant at 1%, 5%, 10%, and NS = Not significant

The result of the five variables considered in the inefficiency model shows that two variables namely; household size and educational level were negative and significant at 10%. These variables have direct relationship with the farmer's maize production efficiency. Thus an increase in household size would significantly increase maize production efficiency by 0.41, while increase in the educational level would increase maize production efficiency by 0.34. This finding corroborates with the findings of Aminu *et al.,* (2015), Ahmed *et al.,* (2014) and Abdulai *et al.,* (2013).

Specific Technical Efficiency

The result from Table 3 below shows that majority of the farmers had technical efficiencies that ranges between 0.81 – 0.90 and 0.91 – 1.00 that is 34.17% and 30% of the farmers respectively, while 0.83% had efficiency range of <50. 4.4% of the respondents were operating in the efficiency range of 0.51 – 0.60, 13.3% had efficiency range of between 0.61 – 0.70, while 17.5% of the respondents had efficiency range of 0.71 – 80. This implies that maize farmers of the study area are producing below the highest frontier level.

Table 3: Distribution of Maize farmers based on their Technical Efficiencies level

Efficiency Range	Frequency	Percentage
< 50	1	0.83
0.51 – 0.60	5	4.2
0.61 – 0.70	16	13.3
0.71 – 0.80	21	17.5
0.81 – 0.90	41	34.17
0.91 – 1.00	36	30
Total	**120**	**100**

Source: Field survey, 2017

The mean efficiency was found to be 83.1% this means that in the short-run there are chances of reducing inputs of maize production and increase its production by 16.9% through farmers adopting the practice of using least inputs (technical efficiency) and efficient allocation of resources. This finding is in tandem with the findings of Ahmed *et al.*, (2014).

Elasticity of Output to the Factor Inputs used in Maize Production

The coefficients of the Cobb-Douglas production function are the direct output elasticities that is the partial elasticity are equal to the each of the parameters. Table 4 below presents the result of inputs elasticity for each of the input in Cobb-Douglas frontier production function. The implication of this result is that a percentage increase in the farm size increase output of maize by 0.12%, 1% increases in labour increase maize output by 0.18%. Furthermore, a percentage increase in the quantity of seed used increase maize yield by 0.57%, 1% increase in the quantity of fertilizer applied increase output of maize by 0.08% while a percentage increase in agrochemicals increased maize output by 0.13%.

Table 4: Elasticity of Output to the Factor Inputs Used in Maize Production

Variable inputs	Elasticity of production
Farm size	0.12
Labour	0.18
Seed	0.57
Fertilizer	0.08
Agro-chemicals	0.13
Return to scale	1.08

Source: Field survey, 2017

The result further revealed that maize output has the maximum level of responsiveness to seed (0.57), followed by labour (0.18), agrochemicals (0.13), farm size (0.12) and fertilizer (0.08). This finding affirms with the findings of Kibaara (2005) and Essilfie *et al.*, (2011), that there is propensity of maize farmers to increase their maize output through the use of advance and improved maize variety. The summation of the direct output elasticities with respect to each input used is 1.08. This indicates return to scale, also refers to as total output elasticity (Kibaara, 2005).

Challenges to Maize Production in the Study Area

Maize farmers in the study area have faced variety of challenges at some stage in farm operations and production process. These constraints are presented below in Table 5 and are ranked according to the most frequent challenge faced.

Table 5: Distribution of Maize farmers according to the Challenges Faced

Challenges	Frequency	Percentage	Rank
High cost of improved agro-inputs	177	97.5	1st
Limited or Lack of extension contacts	99	82.5	2nd
Poor road network	96	80.0	3rd
Pest and diseases	61	50.8	4th
Limited accessibility to credit	54	45.0	5th
Other challenges	47	39.2	6th
Limited rainfall	16	13.3	7th
Weak support from cooperative	13	10.8	8th
Difficulty in accessing land	9	7.5	9th
Flood and drought occurrence	2	1.7	10th

Source: Field survey, 2017 *Multiple Responses

Table 5 above shows that 97.5% of the farmers had problem of high cost of improved farm inputs. Implying that high cost of agro-inputs may have been a confining factor in their production. Considerable numbers of the farmers 82.5% and 80.0% had problem with lack of extension contact and poor road network respectively as indicated by the respondents. The study shows that 50.8% of the farmers are faced with the problem of pest and diseases, 45.0% of the famers are confronted the challenge of limited accessibility to credit while 39.2% of the farmers had other challenges such as; theft, lack of government support, delay in input supply and difficulty in getting hired labour. 13.3% had problem of limited rainfall, 10.8% had challenge of weak support from cooperative society while 7.5% and 1.7% of the respondents had problems of difficulty in accessing land and flood and drought respectively.

V. Conclusion

The study revealed that maize farmers in the study area were producing below the maximum frontier production level with the existing resources available to them. However, they can as well enhance maize production efficiency by 16.9%. Maize output has the highest level of responsiveness to seed, followed by labour, agrochemicals and fertilizer. High cost of improved inputs, limited or lack of extension contact, poor road network and problem of pest and diseases were the major challenges militating maize production in the study area.

VI. Recommendations

Based on the outcome of this study, the following recommendations were made by the researchers:

1. Rijau local government council in collaboration with Niger state Agricultural Mechanization and Development Authority (NAMDA) should help link farmers with the Federal Government’s Growth Enhancement Support Scheme programme in order for the farmers to gain advantage of getting agro-inputs at a subsidized rate.
2. There is the need for farmers to adopt better and improved agronomic practices on maize production. Government should fortify enhanced extension service delivery scheme towards educating farmers on the importance of improved and advanced technology(ies) that will assist them heighten their levels of production efficiency.
3. The study revealed that educational level of the farmers had direct relationship with their technical efficiency. Thus, government should provide mass literacy center for adult and/or continuing education in order to encourage farmers to ameliorate their educational levels.
4. The study revealed that most of the farmers (65.8%) lack extension contact during cropping season. Effort should be made by the government or non-governmental organization towards motivating the extension agents to carry out their duties diligently which will in turn pivot to increase in production efficiency. Also there is the need for government to provide good road network for easy conveyance of farm produce to the market.

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