NIGERIAN AGRICULTURAL JOURNAL
ISSN: 0300-368X
Volume 54 Number 1, April 2023 Pg. 459-466
Available online at: http://www.ajol.info/index.php/naj
https://www.naj.asn.org.ng

Maize Production Scale Efficiency and its Socioeconomic Determinants among Smallholder Farmers in Funtua Local Government Area, Katsina State, Nigeria

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Abstract
This study was conducted to analyze the scale-efficiency of maize production in Funtua Local Government Area (LGA) of Katsina state, Nigeria. A multi-stage sampling technique was employed in the selection of 80 maize farmers for the study. The cross-sectional data collected with the aid of a structured questionnaire were analyzed using descriptive statistics, data envelopment analysis (DEA) model, Tobit regression model, and net farm income. The results of the socioeconomic analysis show that maize farmers in the study area have an average age of 45 years, an average household size of 11 persons, and an average maize farming experience of 20 years. The net farm income analysis revealed a total maize production cost of ₦96,958.00 per hectare; and total revenue of ₦179,363.04 per hectare. Meanwhile, the return per naira invested is ₦1.85, indicating that for every ₦1 invested in maize production in the study area, a profit of ₦0.85 was made. Furthermore, the result shows maize farmer's scale efficiency average score of 0.701 with a range and standard deviation of 0.203 to 1.00 and 0.225 respectively. The age of the farmer and their educational level were found to significantly ($p<0.05$) influence the scale efficiency of the farmers. The major constraint associated with maize production in the study is high cost of inputs. The study concluded that farmers in the area are scale efficient and are breaking even. The study therefore recommended building educational capacity of farmers and inputs subsidy to strengthen the scale efficiency of maize farmers in the study area.

Keywords: Scale efficiency, determinants, maize production, farmers, revenue

Introduction

Maize is a staple food of great socioeconomic importance in Sub-Saharan Africa (Food and Agricultural Organization [FAO], 2013). It is a significant source of protein, minerals, carbohydrates, and vitamin B. and the most vital cereal in the world after wheat and rice; it's also one of the widely consumed staple food crops in Nigeria (Karimov, *et al.*, 2014). Because of maize's high productivity and flexibility, its cultivation quickly spread throughout Sub-Saharan African nations (Abubakar and Sule, 2019). It is recognized as a significant energy source and among all the cereals, has the highest productivity per man-hour invested. In practically all of Nigeria's vegetation zones, it is produced as a single crop or in rotation with other crops as an intercrop, and its cultivation offers rural livelihood options and employment. It is just as crucial to the nation as sorghum and millet (Oyelade and Awanane, 2013).

The production of maize is very central to the realization of national food security and achieving higher agricultural growth. It is a commercial crop and is highly demanded as a raw material in agro-industrial sector (Karimov, *et al.*, 2014). Even on small plots of land, it can be grown as a subsistence crop to feed rural households and lessen hunger. Due to this, the country may become impoverished if the supply side changes negatively (Yakubu, *et al.*, 2019). The area planted with maize in Nigeria went from 653,000 ha in 1984 to 5.1 million ha in 2018, an increase of roughly 4%. The output projection for maize is 9.7 million tons in 2012 compared to the output forecast of 11 million tons in 2019, which is an increase of 7.74%. (Yakubu, *et al;* 2019). Despite these, the crop continues to be characterized by a poor yield, low input level, and a small area under cultivation (Abdulrahman et al, 2021).

The growth in Maize output despite dropping yields shows that an increase in the cultivatable area is primarily responsible for the production increase (Abdulhameed & Galadima, 2016). As agriculture becomes more capital-demanding, there is an appeal for larger farm size to farmers' productivity since the inverse relationship between farm size and land productivity is favourable (Helfand, 2003; Rios and

Gerald, 2005). If farmers are to increase their land holdings, they must be guided on the best or optimal size of farm holding to attempt to achieve scale efficiency (optimal operation level). According to Ogunsumi *et al.,* (2005) farmers in Nigeria often inefficiently allocate their available farm resources; land, labour, seed, and fertilizer, these managerial resources are inefficiently allocated thereby leading to a decrease in productivity and reduced agricultural output. In order to achieve scale efficiency and be on an optimal scale, this study therefore analyzed the scale efficiency and its determinants in maize production in Funtua Local Government of Katsina State as a case study for the North-Western part of Nigeria. In this context, improving maize production efficiency will have substantial policy implications for the national strategies pursued in the agricultural sector, which is still a key industry in Nigeria.

Methodology

Description of Study Area

This research was carried out in Katsina State, Nigeria's Funtua Local Government Area (LGA). It was established after the 1976 Local Governments Reforms and is currently one of the top Local Governments in Nigeria. It serves as the administrative center for the Katsina South senatorial district, which includes Bakori, Danja, Dandume, Faskari, Sabuwa, Kankara, Malumfashi, Kafur, Musawa, and Funtua. Funtua LGA is located between latitude 11^{o} 12'N to 11^{o} 70'N and longitude 7^{o} 12'E to 7^{o} 42'E. Funtua is located in Katsina State's far southernmost region. After Katsina, it is the second-largest city in the state. Giwa Local Government of Kaduna State, Bakori, Danja, Faskari, and Dandume boarder it to the south, east, southeast, northwest, and west, respectively. With a 448 km2 area, it has 225,571 people as of the 2006 census and an estimated 402,400 people in 2022. Trading, farming, and animal rearing are their primary economic activities and its one of the notable location for maize production in the state. The region has a tropical wet and dry climate, designated as Aw by Koppen. About 1000 mm of rain falls on average each year. An average minimum and maximum temperatures are 19^{0}C and 32^{0}C respectively. Generally speaking, the climate varies greatly depending on the time of year. A less pronounced season after rains is during the months of October and November that is characterized by decreasing rainfall and a gradual lowering of temperature. These seasons are as follows: a cool dry (harmattan) season from December to February; a hot dry season from March to May; a warm wet season from June to September. The LGA is primarily made up of plains with undulations that often reach altitudes of 600–700 m above sea level.

Sampling Technique

A multi-stage sampling technique was adopted for this study. The first stage involved a purposive selection of the Funtua Local Government based on predominance of maize production in the area. In the second stage, four villages were randomly selected (using balloting) in the LGA. In the third stage; twenty (20) maize farmers were randomly selected (maize farmers) from each village to give a total sample size of 80 maize farmers for the study.

Data Collection

Primary data was used for this study. The data were collected with the aid of a structured questionnaire. The information collected was that of the year 2021 cropping season on a single visit and information on input and output data was collected such as; Farm size, seed, fertilizer, labour, herbicide and output of maize. Additionally, data on a farmer's socioeconomic traits, such as age, household size, educational attainment, credit availability and accessibility, number of extension contacts, and cooperative membership, were gathered.

Analytical Techniques

Descriptive statistic was used to achieve objectives on description of socioeconomic characteristics of farmers and constraints facing maize production among the farmers. These descriptive statistics tools involve the use of measures of central tendencies that includes Mean, standard error, standard deviation, frequency distribution, and percentages. Net farm income was used to estimate costs and return of maize production among the farmers. Data envelopment analysis (DEA) was used in estimating farmers' production efficiency level and Tobit regression model was used in identifying socioeconomic characteristics influencing farmers' efficiency levels.

Net farm income

The Net Farm Income (NFI) was used to find out how profitable maize production was in the research area. The following is a formula for calculating net farm revenue.

NFI = TR + TC where NFI is for net farm income; TR stands for Total Revenue; and TC stands for total cost of production. TVC+TFC = TC. The equation serves as a model for estimating net agricultural income.

$$\sum_{i=1}^{m} pyiYi \ - \sum_{j=i}^{m} pxiXj \ - \sum_{k=i}^{m} fk$$

Where:

Yi = output (maize, kg/ha),

pyi= unit price of maize (₦),

Xj= quantity of variable input (seed, fertilizer, labour and herbicide),

pxi= price per unit of variable inputs,

fk = cost of fixed input (where k= 1,2,3……k fixed input) and

Σ = summation sign.

Return per naira invested (RNI) was obtained through dividing the gross income (GI) by the total cost (TC).

Therefore, RNI= GI/TC

Where,

RNI = return per naira invested,

GI = gross income and

TC = total cost.

Decision Rule

RNI > 1 this implies there is profit in production.

RNI =1, imply farmer is at breakeven.

RNI<1 this implies that the farmer is at loss.

In this study, the depreciation of enduring farm instruments such knap-sack sprayers, hoes, and cutlasses were measured using fixed cost. For long-lasting farm tools, a fixed cost is determined using the straight-line approach of analyzing depreciation. Following are the details of the straight-line depreciation method:

$$D = \frac{P-S}{N}$$

Where:

D = depreciation,

P = purchase price,

S = salvage value and

N = number of years of life of the asset.

The DEA Model Specification

A measure of the ratio of all outputs to all inputs, such as Uyi/Vxi, would be desirable for each decision-making unit (DMU), which in the context of our empirical application refers to maize farmers. U is a Mx1 vector of output weights and V is a Kx1 vector of input weights. One defines the mathematical programming problem to choose the best weights:

Max u,v (U'yi/V'xi), st U'yj/V'xj ≤1, j=1,2,…, N, u,v≥ 0 ......(1)

Finding values for u and v that maximize the efficiency measure of the i_{th} DMU under the restriction that all efficiency measures must be less than or equal to one is required. This particular ratio formulation has an issue in that there are an endless number of possible solutions. To avoid this one can impose the constraint v'xi = 1, which provides:

Max xì,v(ì'yi), St v'xi = 1, μ'yj– v'xj ≤0, j =1,2, …,N, μ, v ≥0.....(2)

Where:

The transformation relationship is reflected in the notation shift from u and v to μ and v, and can be referred to as the multiplier form of the linear programming problem was this structure. Using the duality in linear programming, one can derive an equivalent envelopment form of this problem:

Minθ,λ θ, St -yi + Yλ ≥0, θxi - Xλ ≥0, λ ≥0,......(3)

Where:

θ is a scalar and λ is a N x1 vector of constants. This envelopment form is typically easier to solve since it has fewer restrictions than the multiplier form (K + M N+ 1). The i_{th} DMU's efficiency score will be the value of the obtained function. It will satisfy θ≤1, with a value of 1 indicating a point on the frontier and hence a technically efficient DMU. An implicit assumption of the model described is the return to scales and thus farmers are operating at an optimal scale (Fraser and Cordina, 1999). Keep in mind that N periods must be elapsed between each solution of the linear programming problem for each DMU in the sample. A value of é is then obtained for each DMU. By introducing the convexity requirement, the linear programming problem with CRS can readily be changed to take VRS into account: N1"λ=1 to (3) to provide:

Minθ,ëθ, st -yi + Yλ ≥0, θxi-Xλ ≥0, N1"λ=1 λ ≥0, ...(4)

where: θ is a scalar and λ is a N x1 vector of The value of θ obtained will be the efficiency score of the i-th Decision Making Unit (DMU).

According to (Banker *et al.,* 1984) definition, it will satisfy 1, with a value of 1 denoting a point on the frontier and afterwards a technically efficient of DMU. One would then run the following cost minimization data envelopment analysis:

Minλ,xi* Wi2Xi* st -yi + Yλ ≥0, xi* - Xë ≥0, N1"λ=1 λ ≥0,.........(5)

Where: wi is a vector of input prices for the i_{th} DMU and xi* (which is calculated by the LP) is the cost-minimizing vector of input quantities for the i_{th} DMU, given the input prices wi and the output levels yi. The total cost efficiency (CE) or economic efficiency of the i_{th} DMU would be calculated as:

CE = wi2 xi */ wi2 xi ....(6)

That is, the ratio of minimum cost to observed cost. One can then calculate the allocative efficiency residually as:

$$AE = \frac{CE}{TE} \text{........ (7)}$$

Keep in mind that the overall economic efficiency is produced by the product of technical efficiency and allocative efficiency. Keep in mind also that the boundaries of all three metrics are 0 and 1. Solving N linear programs of the form yields the technical efficiency measure under CRS, commonly known as the "overall" technical efficiency measure. The output and input-oriented models will estimate exactly the same frontier surface and therefore, by definition, identify the same set of firms as being efficient. The efficiency measures may, however, differ between the input and output orientations. Under the assumption of CRS, the estimated frontier and the efficiency measures remain unaffected by the choice of orientation. For this study, one output and five inputs were used in the model; the only output is the maize output per hectare, the inputs are land, seed, fertilizer, labour and herbicide. Calculation of Scale-Efficiency (SE) assumes the calculation of technical efficiency (TE) measures. Technical efficiency scores can be obtained by running Constant Returns to Scale (CRS) DEA model to achieve total or overall technical efficiency (TECRS) and variable returns to scale (VRS) DEA model to achieve pure technical efficiency (TEVRS). If there is a difference between the scores of technical efficiency under CRS and VRS for a certain farm, the difference indicates that a farm is scale-inefficient.

Scale efficiency can be obtained residually from CRS and VRS technical efficiency scores as follow:

$$SE = \frac{TECRS}{TEVRS} \quad .... (8)$$

If SE = 1, then a farm is scale-efficient, its combination of inputs and outputs is efficient both under CRS and VRS and the farm is operating under increasing returns to scale. If SE < 1, then the combination of inputs and outputs is not scale-efficient and the farm is operating under decreasing returns to scale. In estimation of Scale Efficiency relationship with maize productivity of this study, input-oriented DEA was employed to determine how much input size the farmers would have to change to achieve the maize productivity level that coincides with the best practice frontier. One output and inputs were used in the model; the output is obtained as residuals from CRS and VRS technical efficiency scores and the inputs are farm size, seed, fertilizer, labour and herbicide.

Tobit Model Specification

The general formulation of the model with a limited dependent variable as proposed by Greene (2003) and applied by Ceyhan and Karem,(2010) is defined as:

$$y_i^* = \beta^t X_i + e_i \ldots i=1,2,\ldots n$$

$$y = y_i^* = \{\frac{y_{i=y_i^* \text{ if } y_i^*>0}}{y_{i}=0 \text{ if } y_i^* \leq 0}\} \ldots\ldots(9)$$

Where:

Yi*= Latent (dependent) variable representing the efficiency score of farmers j;

βi= Vector of unknown parameters to be estimated;

Xi= Vector of explanatory variables m (m =1, .k) for farmers

j; which is known constant and hypothesized as determinants of efficiency.

μi= an error term that is independently and normally distributed with a mean

zero and a constant variance (δ2).

(Y_i=β)_0+∑_(i=1)^n(β_(iX_ij)+ μi;if u_(i)) >β_0+∑_(i=0)^nβ_(iX_ij) ……(10)

(Y_i=0;ifu_i ≤β)_0+∑_(i=1)^n(β_(iX_ij ……(11)

The Tobit regression model for the maize farmers was empirically specified as:

$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + u$ ….. (12)

Where,

Y= Production efficiency indices of the mean efficiency scores from VRSTE

X_1 = Age of farmers (years),

X_2 = Marital status (dummy variable; 1=married, 0=otherwise),

X_3 = Level of Education (years of schooling),

X_4 = Family size (number of members in the households),

X_5 = Number of Extension visits,

β_0 = Constant term,

$\beta_1 - \beta_5$ = Regression coefficients of independent variables, and

u = Error term.

Results and Discussion

Socioeconomic Characteristics of the Respondents

The result in Table 1 below shows that 71% of maize farmers in the study area are men, while the rest (29%) are women. The current trend of gender inequality is in every aspect of human living of which agriculture is not an exception. Suleiman and Balaraba (2019) opined that the gender of farmers is crucial and significant for agricultural production, particularly in areas where family labour is predominance. Men are more likely than women to put up with every aspect of farm work and offer the additional horse power needed for farm tasks, which boosts labour productivity and lowers the cost of non-family labour. The average age group of the farmers is 45 years with majority (About 73%) of the maize farmers being between the ages of 20 and 50 years. The minimum and maximum ages are 18 and 80 years respectively. Suleiman and Balaraba (2019) also found and concluded that the majority of the active age group involved in maize production in Rijau Local Government Area of Niger State are 50 years and beyond. The marital status of farmers is important when considering family labour in agricultural output because a married farmer with a big family is more likely to have a ready supply of family labour than a farmer who is not married. Table 1 further shows that a good majority (73%) of the respondents are married. The results also show that most of maize farmers had no formal education (50%). However, one form of formal education or the other is obtainable among the respondents. The level of education is crucial for the adoption of technologies. Yakubu *et al.* (2019) posit that western education facilitates the adoption of modern technologies and improved farm practices. A majority of the respondents have household sizes ranging between 1 and 30 members with an average of 11 household members. Suleiman and Balaraba (2019), observed that 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 shows that about 59% of the maize farmers had land size of between 1 and 2 hectares, while the average farm size is 2.26 hectare with a minimum and maximum of 1 and 7ha respectively. This implies that most of the respondents in the study area are small-scale farmers.

The result also shows that the majority (66%) of the respondents in the study area have farming as their major occupation. The distribution of maize farmers by their maize farming experience revealed that the mean farming experience was 20 years with a minimum and maximum of 4 years and 50 years respectively. This result shows that majority of the farmers are experienced in maize production. This implies that farmers with more years of farming experience are expected to be able to make sound decisions that are technically feasible as regards to resource allocations and management of their farm operations that is economically worthwhile. This finding is in line with that of Yakubu *et al.* (2019) who worked on analyses of productivity among maize farmers in the Doguwa Local Government Area of Kano state, Nigeria who reported that years of farming experience increased agricultural productivity among farming households in Nigeria, that the more the number of years of production by maize farmer, the more knowledge and skills gained which in turn brings about efficiency. Result further shows that farmers obtained their funds for maize production through formal and informal sources; most of them (45%) financed their maize production from personal savings, 32.5% through both savings and borrowing while 22% of them financed their maize production with borrowed funds. This implies that Maize farmers in the study area have an appreciable level of financial inclusiveness.

Cooperative membership is very poor in the study area as the majority (about 78%) of the respondents does not belong to any cooperative society. The result indicates low membership of cooperatives by a significant proportion of maize farmers in the area selected, which implies that maize farmers might not be benefiting from group support for input acquisition or produce marketing although Samson and Obademi (2018), observed that membership of cooperative societies have advantages of accessibility to micro-credit and input subsidy. It also serve as an avenue of availing ideas and information that could help them in pooling of resources together in order to expand their production efficiency and profit maximization. Production Credit is available to most (55%) of maize farmers while 45% financed their maize production from personal savings. The amount of credit obtained ranged between ₦100,000 - ₦500,000 with an average of ₦420,000. Regarding extension services access by maize farmers in the study area; the result shows that the majority (62%) of farmers do not have access and the number of visit is between 1 and 4 times visits per season. This finding implies that farmers in the research area may be less likely to adopt new technology that could have an adverse impact on productivity growth. This result agrees with the findings of Suleiman and Balaraba (2019), who also found that 65.8% of maize farmers in the Rijau Local Government Area of Niger State don't have extension contact.

Cost and Returns Associated with Maize Production in the study area

Net farm income analysis in Table 2 below presents the cost and returns associated with maize production in the study area and was determined on a hectare basis. The variable cost includes all the expenses encountered in the maize production process. These include cost of variable inputs namely, Seed, fertilizer, agrochemicals, and labour while the fixed cost is composed of the depreciated values of assets, and land rent. On the other hand, the gross return was computed by considering the money realized by selling the maize output obtained. The result shows that the total variable cost (TVC/ha) was estimated at ₦86,788/ha which represented 89% of the total costs, while the depreciation cost on fixed items (TFC/ha) was ₦10,170 which represent 11% of the total cost of maize production, the total cost per hectare was computed at ₦96,958 while the total revenue (TR) was ₦179,363.04/ ha. Using the farmers' maize yield average of 9.12 bags/ha that was observed to vary from one farmer to another and from one location to the other on the average. The result findings revealed a Net Farm Income of ₦82,405.04/ha and an average rate of the return on investment (return per naira invested) as ₦1.85, this indicates that for every ₦1 invested in maize production in the Funtua Local Government Area of Katsina state, a profit of ₦0.85 kobo was made. Thus, it could be implied that maize production in the area was economically viable the finding is consistent with what was found by Yakubu *et al.* (2019) in Kano state Nigeria.

Scale Efficiency of maize production in the study area

The Scale Efficiency scores in Maize production are presented in Table 3. The findings showed that the research area's maize producers' scale efficiency ranged from 0.1 to 1.00, with a mean value of 0.701. This suggests that in order for inefficient maize farmers to reach full-scale efficiency, they would need to expand their operations by an average of 29.9%. Additionally, it shows that the bulk of maize farmers are small-holder farmers that don't perform at their best. According to Umar et al. (2014), this may be related to farmers' limited access to financing, which restricts their ability to scale up their operations. This means that the study area's maize producers also lack access to sufficient credit to finance their crops. The majority (77.5%) of the farmers possess scale efficiency scores less than 0.85. This implies small maize farmers in the study area are operating on a small scale. This suggests that the study area's small-scale maize producers are working there. The outcome also shows that in order for an average farmer in the area to reach the same level of scale efficiency as his most efficient counterpart, he would need to expand his business by 29.9% (or 0.701/100) of its current size. While the least effective farmers would need to scale up their business by 90% to match the scale efficiency of their most successful counterparts. This result supports the observation made by Umar *et al*. (2014) that larger farms are more productive than smaller ones.

Socioeconomic Determinants of maize production scale efficiency in the study area

The result of the Tobit regression analysis is presented in Table 4. The result shows that the coefficient of age was positive and significant at ($p<0.05$).). This implies that older and more experienced farmers are more scale efficient. The coefficient of educational qualification is also positive and significant at 10% ($p< 0.10$). This can be interpreted to mean that scale efficiency increases with the level of education. Suleman and Balaraba's (2019) observed that the influence of education on scale efficiency could be linked to the ability of better educated farmers to obtain loans from the official financial institutions and grow their scale of operation is another finding that supports this. Likewise, in terms of personal income, the more educated farmers fared better than their less educated counterparts (wage). Because of their high income, they were able to save enough money to pay for the increase in their production.

Constraints Associated with Maize Production in the Study Area

The constraints faced by maize farmers in the study area were ranked according to their severity as indicated in Table 5. The most significant barrier to maize production in the study area was the high cost of inputs including fertilizer, better seeds, and labour. During the busiest time of land clearing, ridging, weeding, and harvesting, labour is typically in high demand and pricey. Ranking second, among the challenges faced by farmers in the research area, lower pricing of maize output attributed by farmers in the study area was because they do not sell all the farms produce at the same time because farm produce is associated with seasonal price variation and therefore they try to take advantage of periods when supply is low and the demand is high so as to get good prices, thereby maximizing profit. The third most important constraint is inadequate assess to credit. The availability of credit, a highly important aspect of agricultural production enterprises, could impact the level of output capacity. This supports the findings of Nasiru (2010), who stated that access to microcredit might potentially increase farmer output and help disadvantaged rural farming communities improve their standard of living.

Conclusion

The efficiency of maize production in the study area is on average; therefore increasing the production efficiency of maize farmers will bring about increase in output per unit area and these subsequently lead to increasing maize productivity as well as profitability to farmers. It is therefore recommended the training of farmers on innovative agronomic practices through extension agent visits will enhance maize production efficiency in the study area.

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Table 1: Socioeconomic Characteristics of the Maize Farmers

Variable	Frequencies	Percentage
Gender		
Male	57	71
Female	23	29
Age		
20-30	18	22.5
31-40	20	25
41-50	20	25
51-60	12	15
61-70	7	8.8
>70	3	3.8
Marital status		
Married	61	73.3
Single	8	10
Widow	11	13.8
Level of education		
Informal education	43	53.8
Primary education	14	17.5
Secondary education	14	17.5
Tertiary education	9	11.3
Household size		
1-6	19	22.5
7-12	36	47.5
13-18	8	10
19-24	15	17.5
25-30	2	2.5
Farm size		
1-2	47	58.8
3-4	30	37.6
4-6	2	2.6
>6	1	1.3
Major occupation		
Farming	53	66.3
Business	24	30.0
Civil servant	1	1.3
Student	2	2.5
Years of maize farming experience		
1-8	12	15.0
9-16	22	27.5
17-24	23	28.7
25-32	12	15.0
33-40	5	6.3
41-48	5	6.3
>48	1	1.3
Source of capital		
Personal saving	36	45.0
Borrowing	18	22.5
Both saving and borrowing	26	32.5
Membership of cooperative		
Yes	18	22.5
No	62	77.5
Years of participation in cooperative		
0	62	77.5
1-5	7	8.8
6-10	11	13
Amount of capital		
100000-200000	43	53.8
201000-300000	18	22.5
301000-400000	17	21.3
401000-500000	2	2.5
Source of borrowing		
Personal savings	36	45
Commercial bank	16	20.0
Bank of Agriculture	1	1.3
Cooperative societies	7	8.8
Family and Friends	20	25.0
Number of extension contact		
No contact	50	62.5
Contact	30	37.6

Source: Field Survey, 2021

Table 2: Average cost and return per hectare of maize production

Inputs	Price/Unit(₦)	Quantity (Bag/Ha)	Value In Naira/Ha	% of Total Cost
Variable cost				
Seed(kg)	820	2	1640	1.7
Fertilizer(bag)	17808.9	4	71227.5	73.5
Agro-chemicals(L)	940	2	1880	1.4
Labour(manday)	860	14	12040	12.4
(a)Total variable cost			**86,788**	
Fixed costs				
Depreciation of tools	-	-	1440	2
Depreciation of land(Ha)	-	1	8730	9.00
(b)Total fixed costs			**10,170**	**100**
(c)Total Cost (a+b)			**96,958**	
Returns				
Maize yield	19667	9.12	179,363.04	
(d)Gross Revenue			**179,363.04**	
NFI(d-c)			**82,405.04**	
RNI			**1.85**	

Table 3: Distribution of Scale Efficiency

Efficiency	Frequency	Percentage
0.10-0.25	18	22.5
0.25-0.40	10	12.5
0.40-0.55	4	5
0.55-0.70	12	15
0.70-0.85	18	22.5
0.85- 1.0	5	22.5
Mean	0.701	
Std.dev.	0.225	
Min	0.203	
Max	1.000	

Table 4: Socioeconomic Determinants of Maize Production Scale Efficiency in the Study Area

Scale Efficiency	Coefficient	Standard error	t	P>|t|
Age	0.005838	0.0028281	2.06	0.042**
Marital status	-0.008834	0.0409883	-0.22	0.830
Education	0.048566	0.0269351	1.80	0.075*
Household size	0.0008175	0.0059268	0.14	0.891
Number of extension visits	0.0760635	0.062621	1.21	0.228
Log likelihoods	-17.458062			
No of obs	80			
LRchi2(5)	12.05			
Prob>chi2	0.0342			

Note: ***P<0.01, **P<0.05,*P<0.10

Table 5: Constraints Associated with Maize Production in the Study Area

Constrains Factor	Frequency	Percentage	Ranking
High cost of inputs	25	31.3	1st
Low output price	18	22.5	2nd
Lack of access to credit	15	18.8	3rd
Non-availability of tractor hiring service	12	15	4th
Pest and disease	10	12.5	5th
Total	**80**	**100**	