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# Analysis of Production Efficiency of Food Crop Farmers of Bank of Agriculture Loan Scheme in Ogun State Nigeria

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**Abstract:** The study analyzed the production efficiency of food crop farmers of Bank of Agriculture loan scheme in Ogun State Nigeria. A total of 240 beneficiaries of the bank were sampled in a multistage sampling procedure. The data collected were analyzed using descriptive statistics, test of mean difference and stochastic frontier analysis. The findings revealed that loan beneficiary food crop farmers were fairly educated and in their active ages. The result of test of difference of means revealed that farmers divert some of the loan meant for farming to other uses. The stochastic production function revealed that farm output increases with farm size, family labor, planting material and herbicide but decreases with hired labor and fertilizer. The means technical efficiency, allocative efficiency and economic efficiency were 91, 74 and 67%, respectively implying there is room for improvement in technical efficiency by 9%, allocative efficiency by 26% and economic efficiency by 33% with the present technology. The study suggests that the loan beneficiary food crop farmers should reduce the use of hired labor and fertilizer. Also, there is need for farm expansion to ensure efficient utilization of resources. Finally, formal education and adult literacy education should be strengthened among farmers as education and extension contact increase the technical efficiency of food crop farmers.

**Keywords:** Efficiency, food crop, loan beneficiary, Nigeria, stochastic frontier

## INTRODUCTION

Efficiency is an important concept in economics. The scarcity of resources is the major factor that makes the improvement in efficiency so important to an economic agent or to a society (Jema, 2008). The conceptualization and measurement of efficiency relies on the specification of a production function which represents the maximum output attainable from the use of a given level of inputs. Adequate loan had been advocated over years to enhance high production efficiency through the use of technological innovations. Many empirical studies, including Rhaji (2000) had emphasized that loan is a basic tool of production which provides the farmers with capital to mobilize resources and appropriately combine same to achieve high efficiency. This suggests that a strong link between production efficiency and loan availability to farmers.

In order to enhance the flow of financial services to Nigeria's rural areas, government has, in the past, initiated a series of publicly-financial micro/rural credit programmes and policies targeted at the poor who are mostly small-holder food crop farmers (CBN, 2005). Notable among such programmes and policies were the Rural Banking Programme (RBP) launched in 1973, Sectoral Allocation of Credit, Concessionary Interest Rate and the Agricultural Credit Guarantee Scheme (ACGS) in 1977. Other institutional arrangements were the establishment of the Nigerian Agricultural and Cooperative Bank (NACB) in 1973, the Nigerian Agricultural Insurance Corporation (NAIC) in 1988, the People's Bank of Nigeria (PBN) in 1989, the Community Banks (CBs) in 1990 and the Family Economic Advancement Programme (FEAP) in 1991. In year 2000, government merged the NACB, FEAP and PBN to form the Nigerian Agricultural Cooperative and Rural Development Bank limited (NACRDB) to enhance the provision of finance to the agricultural sector. In year 2010, the nomenclature of the NACRDB was changed to Bank of Agriculture (BOA).

Whether these instituted publicly-financing micro/rural credit programmes and policies achieved the set goals remains an important policy issue. The CBN (2005) also asserted that in Nigeria, like in most developing countries, the formal financial system

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provides services to only 35% of the economically active population while the remaining 65% are excluded from access to the financial services. These 65% are often served by the informal sectors through Non-Governmental Organization Microfinance Institutions (NGO-MFIs), money lenders, friends, relatives and credit unions (CBN, 2005).

The short fall in the provision of financial services to the poor (small-holder food crop farmers) had undoubtedly affected the agricultural production in Nigeria. Therefore, little progress had been recorded in agricultural production despite Government's efforts geared towards ensuring food security. This is reflected in the contribution of agriculture to the Gross Domestic Product (GDP) which increases slightly annually from 39.43% in 1991 to 42.1% in 2008 with crop production accounting for the largest proportion; 25.34% in 1981, 32.50% in 2004 and 34.2% in 2008 (CBN, 2005, 2008).

With her reserves of human and natural resources, Nigeria has the potential to build a prosperous economy and provide for the basic needs of the population (Ogundari and Ojo, 2007). This enormous resource base if well managed could support a vibrant agricultural sector capable of ensuring the supply of raw materials for the industrial sector as well as providing gainful employment for the teeming population. Nigeria's rich human and material resource endowments give her the potential to become Africa's largest economy and a major player in the global economy (Ajibefun, 2002). When compared with other African and Asian countries, economic development in Nigeria has been disappointing.

It is not a gain-say that agricultural sector has a multiplier effect on any nation's socio-economic and industrial fabric because of the multifunctional nature of agriculture. This is obvious as agriculture still employs the larger percentage of the population, contributing 42.1% of the real GDP and remains the most viable sector among the oil and non-oil sectors (CBN, 2008). The provisional data from the National Bureau of Statistics (NBS) showed that the GDP, measured at 1990 constant basic prices, stood at N674.9 billion in 2008 indicating a growth rate of 6.4% with agriculture accounted for almost half of the GDP growth rate, contributing about 2.8% points (CBN, 2008). However, in year 2010, the GDP growth rate was estimated at 8.29% with agriculture accounted for about 2.39% (CBN, 2010). This shows a decline in the contribution of agriculture to the GDP growth rate.

It was estimated that the annual food supply in Nigeria would have to increase at an average annual rate of 5.9% to meet the food demand and reduce food importation significantly (Amaza *et al*., 2006). It was also on record that the production of food in Nigeria has not increased at the rate that can meet the increasing population. While food production increases at the rate of 2.5% food demand increases at the rate of more than 3.5% due to the high rate of population growth of 2.83% (CBN, 2004). The reality is that Nigeria has not been able to attain self-sufficiency in food production despite increasing land area put into food production annually. The constraints to the rapid growth of food production seem to mainly be that of low crop yields and resource-use efficiency attributable to inefficient farm management and inadequate finance.

The efficiency with which farmers use available resources and improved technology is important in agricultural production. This implies that increased efficiency is associated with the quality of resources used, as well as their quantity and increased resource mobilization and efficient use help to account for productivity increase. Given the low income of the small-scale food crop farmers, only little can be expected from their savings. Similarly, most financial institutions are reluctant to grant loans to the farmers who form the bulk of rural inhabitants because of the nature of agriculture in Nigeria.

Ekpedu (2006) reported that the performance of the agricultural sector has been unsatisfying over the years due to insufficient funding or loan facilities, inadequate infrastructural facilities, low technology base, high cost of farm inputs and inadequate extension services. Amaza and Olayemi (2002) also observed that the low agricultural output in Nigeria is revealed by the actual yields of major crops compared to the potential yields, implying that there is scope for additional increase of output from the existing hectares of food crops if resources are properly harnessed and efficiently allocated. Amaza and Olayemi (2002) equally reported that existing low level of output in food crop production is a reflection of low level of technical efficiency and that increased output is directly related to high efficiency arising from not only the optimal combination of inputs but also the given state of technology.

Due to the aforementioned problems, the demand for loan to boost agricultural production became so high among all categories of Nigerian farmers. The importance of loan is in the fact that it removes the financial constraints of farmers thereby increasing the likelihood of adoption of new technologies which often involve additional expenditures on improved farm inputs. No doubt, food crop farmers in Nigeria are faced with loan problems from both formal and informal sources. Some of these problems, from the side of the non-institutional sources, loan supply is generally scarce, unreliable and subsequently very expensive. It is believed that interest rates charged by local money lenders are excessive. Apart from the high interest charged, farmers do lose their crops, farmland, houses and other valuable assets when they are unable to pay back the loan and high interest rate to the money lenders. In addition, loans from friends and relatives are generally small and of short duration. On the part of the

formal financial institutions, loan terms and loan rationing mechanisms have posed a major constraint to small-holder food crop farmers. Some farmers are therefore automatically excluded from benefiting from loan.

As these constraints are viewed to bring about food insecurity, subsidies and loan have been advocated. In view of this, the Bank of Agriculture (BOA) and few commercial banks have occasionally introduced and implemented some kind of loan advancement to needy farmers as a way of promoting greater agricultural production efficiency through empowering farmers to procure essential inputs. While many credit institutions have complained of their seemingly inability to recover loans disbursed to farmers, most farmers have complained of inadequate loan availability. As a consequence, most small-holder food crop farmers still operate at a subsistence level. The question however, remains that are the few loan beneficiary food crop farmers operate at a high efficient level? Are the farmers really utilizing the loan to acquire improved farm inputs for crop production? These motivate this study to examine the variation in the amount of loan requested by food crop farmers from BOA and amount granted as well as variation in amount of loan granted and amount spent on farming and estimate the technical, a locative and economic efficiency of the loan beneficiary food crop farmers in Ogun State, Nigeria.

## METHODOLOGY

**The study area:** The study was carried out in Ogun State in South-Western, Nigeria. The state has 20 local government areas. It lies approximately between latitude 3°30 N and 4°30 N and longitude 6°30 E and 7°30 E. It falls within the humid tropical lowland region with 2 distinct seasons. The shorter dry season lasts for 4 months usually from November to February. Average annual rainfall ranges from 1,200 mm in the Northern part to 1,470 mm in the Southern part. The monthly temperature ranges from 23°C in July to 32°C in February. The mean daily sunshine hours ranges between 3.8 and 6.8. Relative humidity ranges between 76 and 95% coinciding with dry and wet season respectively. The northern part of the state is mainly of derived savannah vegetation while the central part falls in the rainforest belt. The southern part has mangrove swamp vegetation. Ogun State is endowed with fertile soil, making it possible to support the growth of food crops, cash/ permanent crops and livestock. The State shares boundary with Republic of Benin in the West, Lagos State and Atlantic Ocean in the South, Ondo State in the East and Oyo State in the North. Ogun State covers a land area of 16,762 $km^2$ with a population of 3,728,098 (NPC, 2006). For administrative convenience, the state has been divided into four agricultural zones by the Ogun State Agricultural Development Programme (OGADEP). These include Abeokuta, Ijebu-Ode, Ilaro and Ikenne zones. The zones are further divided into blocks while blocks are divided into cells. Eight (8) branch offices of the Bank of Agriculture are located across the 4 agricultural zones in the State. They are located at Ago-Iwoye (Ijebu-Ode zone), Abeokuta (Abeokuta zone), Ayetoro (Ilaro zone), Odeda (Abeokuta zone), Imeko (Ilaro zone), Abigi (Ijebu-Ode zone), Sango (Ilaro zone) and Sagamu (Ikenne zone).

**Sampling procedure:** Multistage sampling technique was employed to select the primary data for the study. The first stage involved the purposive selection of 1 block known for high food crop production from each of the agricultural zones and where the Bank of Agriculture branch offices are situated. The selected blocks include Odeda (Abeokuta zone), Yewa North (Ilaro zone), Ogun Waterside (Ijebu-Ode zone) and Sagamu (Ikenne zone). The 2$^{nd}$ stage involved a purposive selection of 4 cells known for high food crop production from the selected blocks. The 3$^{rd}$ stage involved a random selection of 15 beneficiaries of the Bank of Agriculture Loan Scheme was from each cell selected in stage 2. These procedures led to a selection of 240 loan beneficiary food crop farmers used for the study. The range of data collected covered farmers' specific characteristics as well as inputs and output used in production. Small-holder food crop farmers in Nigeria usually practice mixed farming system and the predominantly cultivated food crops include cassava, maize, yam, melon, cocoyam and vegetables which are classified as either cassava-based or yam-based farming system depending on whether yam or cassava is the dominant crop. In the study area, cassava is majorly intercropped with maize, for this reason, cassava-maize farmers were selected as the representatives of food crop farmers. The quantity of outputs of crops was obtained in their local measures and then converted to kg. The output in kg was later converted to Grain Equivalent using the conversion factor by Kormawa (1999). This was done to allow output aggregation as well as allowing for a technical relationship between inputs and outputs to be estimated for the crop mixture.

**Analytical techniques:** The data collected were subjected to descriptive and econometric analyses.

**Difference of mean:** Test of difference of means was used to determine the variation in the amount of loan requested and amount granted and amount of loan granted and amount spent on farming. The formula is specified as:

$$t = \frac{\overline{X}_A - \overline{X}_B}{\sqrt{\frac{\delta_1^2}{n_1} + \frac{\delta_2^2}{n_2}}} \quad (1)$$

$\overline{X}_A$ = Mean amount of loan requested; amount granted
$\overline{X}_B$ = Mean amount of loan granted; amount spent on farming
$\delta_1^2$ = Variance of the amount of loan requested; amount granted
$\delta_2^2$ = Variance of the amount of loan granted; amount spent on farming
N = $n_1 + n_2$ = Number of loan beneficiary food crop farmers

**The stochastic frontier production and cost functions:** The Stochastic frontier production function model of Cobb-Douglas functional form was employed to estimate the farm level technical efficiency of food crop farmers. The Cobb-Douglas functional form was used because the functional form meets the requirement of being self-dual, it allows the examination of economic efficiency and it has been applied in many empirical studies (Battese and Coelli, 1988; Amaza and Olayemi, 2002). The Cobb-Douglas production functional form is specified as:

$$Y_i = f(X_i; \beta) \exp V_i - \mu_i \quad (2)$$

The technical efficiency of individual farmers is defined in terms of the ratio of observed output to the corresponding frontier output conditioned on the level of input used by the farmers. Hence, the Technical Efficiency (TE) of the farmer is expressed as:

$$TE_i = Y_i/Y_i^* = f(X_i; \beta) \exp (V_i - \mu_i) / f(X_i; \beta) \exp V = \exp(-\mu_i) \quad (3)$$

where,
$Y_i$ : The observed output
$Y_i^*$ : The frontier output
TE : Ranges between 0 and 1

The corresponding cost frontier of Cobb-Douglas functional form which is the basis of estimating the economic efficiency of the farmers is specified as:

$$C_i = g(P_i; \alpha) \exp (V_i + \mu_i) \quad (4)$$

where,
$C_i$ : The total input cost of the $i^{th}$ farms
g : The suitable function
$p_i$ : Input prices employable by the $i^{th}$ farm in food crop production measured in naira
$\alpha$ : The parameter to be estimated

$V_i$ and $\mu_i$ are defined below. The cost efficiency ($CE_i$) of individual farmers is defined in terms of the ratio of the predicted minimum cost $C_i^*$ to observed cost ($C_i$). That is:

$$CE_i = C_i^*/C_i = g(P_i; \alpha) \exp\mu_i / g(P_i; \alpha) \exp (V_i + \mu_i) = \exp(V_i) \quad (5)$$

Hence, $CE_i$ ranges between zero and one. The farmer's Economic Efficiency ($EE_i$) was estimated as the inverse of cost efficiency i.e., $EE_i = 1/CE_i$

The production technology of the food crop farmers was specified by the Cobb-Douglas frontier production function defined as follows:

$$\ln Y_i = \beta o + \beta_1 \ln X_{1i} + \beta_2 \ln X_{2i} + \beta_3 \ln X_{3i} + \beta_4 \ln X_{4i} + \beta_5 \ln X_{5i} + \beta_6 \ln X_{6i} + V_i - \mu_i \quad (6)$$

where,
$Y_i$ : Farm Output (Grain Equivalent (Kg)) from farm i
$X_{1i}$ : Farm Size (hectare)
$X_{2i}$ : Hired labor (man days)
$X_{3i}$ : Family labor (man days)
$X_{4i}$ : Cost of planting materials (naira)
$X_{5i}$ : Fertilizer (kg)
$X_{6i}$ : Herbicides (liter)
$V_i$ :`Random variability in the production that cannot be influenced by the farmer. Vis are assumed to be independent and identically distributed random errors having normal N ~(0, $\delta v^2$) distribution and independent of $\mu_i$
$\mu i$ : Deviation from maximum potential output attributed to technical inefficiency. The $\mu$ is are assumed to be non-negative truncation of the half-normal distribution N~ ($\mu$, $\delta\mu^2$)
$\beta_0$ : Intercept
$\beta_1$-$\beta_6$ : Production function parameters to be estimated
i : 1, 2, 3, … n farms

The Cobb-Douglas cost frontier function for the food crop farmers is specified as:

$$\text{In } C_i = \alpha_0 + \alpha_1 \ln P_{1i} + \alpha_2 \ln P_{2i} + \alpha_3 \ln P_{3i} + \alpha_4 \ln P_{4i} + \alpha_5 \ln P_{5i} + V_i + \mu_i \quad (7)$$

where:
$C_i$ = Total input cost of the ith farms (naira)
$P_{1i}$ = Rent on land per hectare (naira)
$P_{2i}$ = Wage rate of labor per man day (naira)
$P_{3i}$ = Average price of planting materials (naira)
$P_{4i}$ = Price of fertilizer per Kg (naira)
$P_{5i}$ = Average price of herbicides per litre (naira)

The technical and cost inefficiency effects, $\mu i$ is defined as:

$$\mu_i = \delta_0 + \delta_1 Z_1 + \delta_2 Z_2 + \delta_3 Z_3 + \delta_4 Z_4 + \delta_5 Z_5 + \delta_6 Z_6 \quad (8)$$

where,

$\mu_I$ : Inefficiency effect
$Z_1$ : Age of the farmer (years)
$Z_2$ : Educational level of farmer (years)
$Z_3$ : Farming experience (years)

$Z_4$ : Household size
$Z_5$ : Gender of farmer (male = 1, female = 0)
$Z_6$ : Number of contact with the extension agent within the cropping season

The $\delta_0$ and $\delta_i$ coefficients are un-known parameters to be estimated along with the variance parameters $\delta^2$ and $\gamma$.

The variances of the random errors, $\delta v^2$ and that of the technical and cost inefficiency effects $\delta\mu^2$ and overall variance of the model $\delta^2$ are related. Thus $\delta^2 = \delta v^2 + \delta\mu^2$. The $\delta^2$ indicates the goodness of fit and the correctness of the distributional form assumed for the composite error term. The ratio $\gamma = \delta\mu^2/\delta^2$, measures the total variation of output from the frontier which can be attributed to technical or cost inefficiency. The sigma square ($\delta^2$) and the gamma ($\gamma$) coefficients are the diagnostic statistics that indicate the relevance of the use of the stochastic production frontier function and the correctness of the assumption made on the distribution form of the error term. The estimates of all the parameters of the stochastic frontier production function and the inefficiency model were simultaneously obtained using the program FRONTIER version 4.1 (Coelli, 1996).

## RESULTS AND DISCUSSION

**Socio-economic characteristics of loan beneficiary food crop farmers:** The summary of the socio-economic characteristics of the food crop farmers is presented in Table 1. The dominant indicator shows that majority of the food crop farmers are middle aged, with the mean age of 50 years and 67.5% are ages between 35 and 54 years. This implies that majority of the farmers are still in their active age and thus expected to be productive, ceteris paribus. In terms of gender, it was revealed that 93.3% of the farmers are males. This shows active involvement of men in farming in the study area. The findings also revealed that majority (87.5%) of the farmers were married. This implies that the farmers have additional responsibility. In a traditional rural setting a wife is a good source of family labor in food crop production whose activities begin from decision making on production to processing and marketing of farm produce. The finding further revealed that the mean household size for the further revealed that the mean household size for the cassava-based farm households was approximately 7 persons. Majority (79.1%) of the farmers had between 6 and 10 household members. This may be an indication that more members of household are available for farming at the expense of formal education. However, majority (77.4%) of the farmers had formal education, though with low educational level (mean years of formal education is 10 years). The mean farming experience was 28 years, with 55.1% having between 21 and 40 years of experience in farming. This implies that the farmers are relatively experienced. The study also revealed that majority (60.9%) of the farmers met with extension personnel quarterly. Extension service to farmers is an important incentive in farm production as it aids information dissemination and adoption of innovation. The proportion above shows low extension services to farmers.

**Mean difference between amount of loan requested and amount granted and amount of loan granted and amount invested on farming:** The results of the test of mean difference between the amount of loan requested and amount granted as well as amount of loan granted and amount invested on farming are presented in Table 2. The result of mean difference test showed that significant difference exists between the amount of loan requested and amount granted to farmers. This implies that the financial institution tends to meet the loan demand of the farmers. The reason for this may be attributed to the fact that most small-holder farmers applied for small amount of loan (usually below N 100,000) due to lack of collateral security and fare of default. In contrast, the result of the difference of means test showed that significant difference exists between the amount of loan granted to farmers and amount of loan spent on farming. The reason for this variation may be attributed to the fact that farmers spend greater part of loan granted to them on other economic activities and to meet the household needs rather than investing on farming.

**Maximum likelihood estimates of the production function of loan beneficiary food crop farmers:** The result of the Maximum Likelihood Estimates (MLE) of the production function of loan beneficiary food crop farmers is presented in Table 3. The variance parameters, sigma-squared and gamma were 0.157

Table 1: Dominant analysis of socio-economic characteristics of loan beneficiary food crop farmers

| Variables | Dominant indicator | Mean |
|---|---|---|
| Age | 67.5% between 35 and 54 years | 50 years |
| Gender | 93.3% males | |
| Marital status | 87.5% married | |
| Household size | 79.1% had between 6 and 10 members | 7 |
| Education | 77.4% had formal education | 10 years |
| Farming experience | 55.1% had between 21 and 40 years | 28 |
| Extension visit | 63.3% were visited quarterly | |

Computed from field survey data (2011)

Table 2: Test of mean difference between the amount of loan requested, amount granted and amount invested on farming

| | Mean | S.D. | N | t-value | Decision |
|---|---|---|---|---|---|
| Mean test between amount requested and amount granted | | | | | |
| Amount requested | 105,750 | 86,681.71 | 240 | 0.619 | Accept $H_o$ |
| Amount granted | 99,500 | 68,756.66 | | | |
| Mean test between amount granted and amount invested on farming | | | | | |
| Amount granted | 99,500 | 68,756.66 | 240 | 3.673*** | Reject $H_o$ |
| Amount spent on farming | 75,508 | 19,807.05 | | | |

***: Implies significant at 1%; Computed from field survey data (2011)

Table 3: Stochastic frontier production function results for the loan beneficiary food crop farmers

| Variable | Coefficient | S.E. | t-ratio |
|---|---|---|---|
| Production function | | | |
| Constant | 6.67*** | 0.5190 | 12.85 |
| Farm size ($X_1$) | 0.74*** | 0.0584 | 12.59 |
| Hired labor ($X_2$) | -0.028 | 0.0191 | -0.0149 |
| Family Labor ($X_3$) | 0.0183** | 0.00858 | 2.130 |
| Planting material cost($X_4$) | 0.267*** | 0.0590 | 4.530 |
| Fertilizer ($X_5$) | -0.00204 | 0.00123 | -0.0165 |
| Herbicide ($X_6$) | 0.00247* | 0.00146 | 1.695 |
| Inefficiency model | | | |
| Constant | -0.221*** | 0.0412 | -5.360 |
| Age ($Z_1$) | 0.0245 | 0.0465 | 0.526 |
| Education ($Z_2$) | -0.0359*** | 0.00576 | -6.240 |
| Farming experience ($Z_3$) | 0.00964 | 0.0288 | 0.335 |
| Household size ($Z_4$) | -0.068 | 0.0951 | -0.718 |
| Sex ($Z_5$) | -0.340 | 0.6300 | -0.542 |
| Extension contact ($Z_6$) | -0.0464*** | 0.00635 | -7.310 |
| Diagnostic statistics | | | |
| Sigma-squared | 0.157*** | 0.0266 | 5.900 |
| Gamma | 0.912*** | 0.0140 | 69.68 |

***: Implies significant at 1%; **: Implies significant at 5%; *: Implies significant at 10%; Computed from field survey data (2011)

Table 4: Stochastic frontier cost function estimates for the loan beneficiary food crop farmers

| Variable | Coefficient | S.E. | t-value |
|---|---|---|---|
| Constant | 13.110 | 1.75 | 7.51*** |
| Rental value on land | -0.2800 | 0.1980 | -1.41 |
| Labor wage rate | 0.1470 | 0.0460 | 3.20*** |
| Price of planting material | -0.00747 | 0.0784 | -0.095 |
| Price of fertilizer | 0.00334 | 0.0089 | 0.146 |
| Price of herbicide | -0.0013 | 0.0089 | -0.146 |
| Sigma-square ($\delta^2$) | 0.3570 | 0.1480 | 2.41** |
| Gamma ($\gamma$) | 0.7220 | 0.3000 | 2.41** |

Computed from field survey data (2011)

($p<0.01$) and 0.912 ($p<0.01$) respectively. The gamma implies that about 91.2% of the variation in output of loan beneficiaries is due to the differences in their technical inefficiency. Thus, inefficiency effects were present and make significant contribution to the efficiency of the food crop farmers. The parameter estimates of the production function of loan beneficiary food crop farmers showed that farm size ($p<0.01$), family labor ($p<0.05$), planting material ($p<0.01$) and herbicide ($p<0.10$) have positive significant influence on the farm output. The negative signs of the coefficients of hired labor and fertilizer showed that these inputs are over-utilized among the loan beneficiaries. The contribution of farmers' personal characteristics: age, years of formal education, farming experience, household size, sex and extension contact to farm inefficiency was also examined. The sign of the coefficients of these variables has important policy implications as positive sign implies negative effect on efficiency while negative sign signifies a positive effect on efficiency. The finding revealed that increase in educational level ($p<0.01$) and frequency of extension contact ($p<0.01$) will increase the farm efficiency.

**Maximum likelihood estimates of the parameters of the stochastic frontier cost function:** The result of the maximum likelihood estimates of the Stochastic Frontier Cost Function is presented in Table 4. The sigma-square was 0.148 ($p<0.05$), attesting to the good fit of the model. Also, the variance ratio (gamma) revealed that inefficiency effects exist among the loan beneficiary food crop farmers as shown by the gamma value of 0.72 ($p<0.05$). This implies that about 72% of the variation in total production cost of loan beneficiaries is due to differences in their cost inefficiency. Labor wage ($p<0.01$) and price of fertilizer conform with the a priori expectation with positive signs while other variables have negative signs and not significant. The magnitude of the labor wage rate and price of fertilizer implies that increase in the unit cost of these variables will lead to an increase in the total cost of production. The implication of the negative signs on the co-efficient of other variables is that these variables are underutilized by loan-users.

**Efficiency analysis of the food crop farmers:** The frequency distribution of the efficiency estimates of the loan beneficiary food crop farmers is as presented in Table 5. The technical efficiency of the loan beneficiaries is fairly distributed with majority (70.8%) having their efficiency above 0.90. This gives a mean technical efficiency of 0.91 suggesting that the farmers achieve relatively high efficiency. The allocative efficiency is ranged between 0.32 and 0.99 with the mean efficiency of 0.74, implying there is room for improvement by 26%. The findings also revealed that 23.33% of the loan beneficiaries have their allocate efficiency between 0.71 and 0.80 and 0.51 and 0.60, respectively. The economic efficiency estimates of the loan beneficiaries ranged between 0.31 and 0.88 with the mean efficiency of 0.67. In addition, the mean

Table 5: Distribution of technical efficiency, allocative efficiency and economic efficiency estimates of loan beneficiary's food crop farmers

| | Technical efficiency | | Allocative efficiency | | Economic efficiency | |
|---|---|---|---|---|---|---|
| Class | Frequency | Percentage | Frequency | Percentage | Frequency | Percentage |
| 0.11-0.20 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0.21-0.30 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0.31-0.40 | 0 | 0 | 3 | 2.50 | 4 | 3.30 |
| 0.41-0.50 | 0 | 0 | 4 | 3.30 | 12 | 10.0 |
| 0.51-0.60 | 0 | 0 | 28 | 23.3 | 26 | 21.7 |
| 0.61-0.70 | 3 | 2.5 | 16 | 13.3 | 21 | 17.5 |
| 0.71-.080 | 12 | 10 | 28 | 23.3 | 40 | 33.3 |
| 0.81-0.90 | 20 | 16.7 | 19 | 15.8 | 17 | 14.2 |
| >0.90 | 85 | 70.8 | 22 | 18.3 | 0 | 0 |
| Total | 120 | 100 | 120 | 100 | 120 | 100 |
| Mean | 0.91 | | 0.74 | | 0.67 | |
| Minimum | 0.66 | | 0.32 | | 0.31 | |
| Maximum | 0.99 | | 0.99 | | 0.88 | |

Computed from field survey data (2011)

economic efficiency of the farmers implies there is room for improvement by 33%.

## CONCLUSION AND RECOMMENDATIONS

The findings revealed that the BOA loan beneficiary food crop farmers are fairly educated. The Bank of Agriculture tends to meet the loan demand of the farmers but the farmers diverted some of the loan meant for farming for other uses. The stochastic production function revealed that farm output increases with farm size, family labor, planting material and herbicide but decreases with hired labor and fertilizer. Thus, hired labor and fertilizer are over-utilized among the loan beneficiaries. The mean output efficiency of 91% implies that there is room for improvement in output by 9%. The mean allocate efficiency of the farmers implies there is room for improvement by 26%. Also, the mean economic efficiency of the farmers implies there is room for improvement by 33%. Policy option requires that loan-beneficiaries should reduce the use of hired labor and fertilizer. More so, farm expansion is recommended to ensure efficient utilization of resources. Finally, formal education and adult literacy education should be strengthened among farmers as education increases the efficiency level of farmers and to afford the farmers the benefit of loan.

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