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Cost Efficiency of USAID Markets II Beneficiary Smallholder Rice Farmers in Nigeria's Kano State

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Abstract. The present research attempted to address cost inefficiency of USAID MARKETS II smallholder farmers in Nigeria's Kano State using farm survey data obtained from 189 farmers through a multi-stage sampling technique. The farm survey data were elicited *viz*. well-structured questionnaire coupled with interview schedule during the 2018 cropping season. The collected data were analyzed using both descriptive and inferential statistics- stochastic cost frontier function. The empirical evidence showed that none of the technical unit was cost efficient and this owed majorly to extension gap given its interwoven link with risk inducing factors. Besides, only 57.7%, marginally above half of the sampled technical units were fairly cost efficient i.e. close to the optimum minimum cost preferred for the production process. On the average, a technical unit wasted 14.7% of its actual incurred cost which translates to ₦1100 ($3.7) relative to the best practiced farmers facing the same technology and producing the same output. Therefore, since the farmers still have the room to eliminate the extra cost incurred, the study advice the program to explore further the advisory services offered to the farmers, thus addressing the extension gap that inhibited the farmers' cost efficiency. The sustainability of the project in the near future in the absence of the advisory services especially farmer-2-farmer extension services if not explored is unlikely.

Keywords: cost, economies of scale, efficiency, Nigeria, USAID MARKETS II

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1. Introduction

Nigeria's ability to produce enough product, staple, and nutritious food crops for its citizens while serving regional markets and producing inclusive, sustainable agriculture-led economic growth has been hampered by inefficient market dynamics and sporadic conflict. Despite the fact that agriculture, forestry, and fisheries account for approximately 20.8% of GDP [1] and 36.5% of labor [2], Nigeria's poverty rate is about 53.5% [3], [4]. According to [4], the Nigerian government targeted agriculture after the 2008 oil price crash to reduce rural poverty and improve food security.

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The Maximizing Agricultural Revenue and Key Enterprise in Targeted Sites (MARKETS II) project is the flagship project of USAID/Feed Nigeria's the Future (FTF) Agricultural Transformation Program (ATP), and it is the successor to the MARKETS and Bridge to MARKETS 2 (BtM2) projects that run for the previous seven years. Following its inception in April 2012, MARKETS II aims to improve the performance, incomes, nutrition, and food security of Nigerian poor rural farmers or smallholders in an environmentally sustainable manner by implementing established private sector demand-driven market interventions, with a particular focus on constraints in the agricultural value chain [5], [6]. Smallholder farmers will benefit from improved inputs (such as improved seeds and fertilizer use), sufficient financing, better water management, effective technology, extension services, and improved nutritious uses of grown or purchased basic foods, among other goals.

In order to alleviate poverty and achieve food security in the studied region and the country as a whole, it is critical to identify the factors that impede farmer efficiency in rice production and to quantify the degree to which these factors restrict rice farm efficiency [7], [8]. A better understanding of cost efficiency and its relationship with rice farmers will significantly assist policymakers in developing efficiency-enhancing policies and assessing the efficacy of current and previous reforms [9], [10].

Taking into account the above evidence, this research was carried out in order to gain a better understanding of the cost efficiency of USAID MARKETS II beneficiaries and to predict their allocative efficiencies in Nigeria's Kano state. Using the stochastic frontier cost function, this study determined the cost efficiency of USAID MARKETS II smallholding rice farmers in order to recognize the value of each factor and detect if there is cost inefficiency in rice production. The findings of this study will help farmers and policymakers gain a new perspective on how to increase rice production by evaluating the degree to which rice farms can be made more efficient using existing resources and available technology in order to address rice food insecurity issues in Nigeria's Kano State.

2. Theoretical Framework

Farrell [11] as reported by Sadiq and Singh [10] uses a frontier production and cost function to discriminate between technical and allocative efficiency (or price efficiency) as a measure of production efficiency. He defined technical efficiency as a firm's ability to create a particular level of output with a small number of inputs under a given technology, and allocative efficiency as a firm's ability to choose the best input levels for a given set of factor prices. Economic efficiency (EE) is an overall performance measure in Farrell's paradigm, equivalent to the product of TE and AE.

Farrell's methodology, on the other hand, has been widely used over the years, while it continues to be refined and improved. The creation of a stochastic frontier model, which allows one to quantify firm-level efficiency using a maximum likelihood estimate, is an example of such progress. A composite error structure with two-sided symmetry and a one-sided component is included in the stochastic frontier model.

The one-sided component represents inefficiency, whereas the two-sided component captures random influences outside of the control of the production unit, such as measurement errors and other statistical noise common in empirical relationships.

The cost of function can be reflected by the production technology. The cost function represents a dual approach in which technology is viewed as a constant in organizations' behavior optimization [12]. Any optimization error in the context of a cost function is interpreted as a greater cost for the producers. The theoretical least cost frontier, however, would be stochastic due to the stochastic character of the production frontier.

The cost function can be used to anticipate a firm's technical and allocative efficiency at the same time [13]. Additionally, because it is generally positive, non-decreasing, concave, continuous, and homogeneous to degree one to one input prices, it may be used to revive all economically relevant information about farm level technology [12].

3. Research Methodology

The co-ordinates of Nigeria's Kano state in the northern region are latitudes 10° 33ˈ to 12° 37ˈN and longitude 07° 34ˈ to 09° 25ˈE of the Greenwich meridian time. The vegetations of the northern and southern parts of the state are characterized by Northern-Guinea savannah and Sudan savannah respectively. The annual rainfall in the Northern-Guinea savannah varies from 600-1200 mm to 300-600 mm in the Sudan savannah. Furthermore, in the Sudan savannah region, arable crop growing periods vary from 90 to 150 days; while in the Northern-Guinea savannah region, they range from 150 to 200 days. The state has an approximate estimated population of 9.4 million habitants [14] with a population growth rate of approximately 3.5% per annum. The cultivable land in the state is over 1,754,200 hectares. The state is famous for its commercial activities as majority of the inhabitants engaged in trading of agricultural commodities.

A multi-stage sampling technique was used to draw a representative sample size of 195 participating farmers from the project sites. In the first stage, high concentration of smallholder rice producers was used as a yardstick/justification for the purposive selection of six (6) participating Local government areas (LGAs) out of the nine (9) LGAs designated for USAID MARKETS II program in the state. The chosen LGAs are Bunkure, Garun-Mallam, Kura, Dambatta, Bagwai and Makoda. Secondly, from each of the selected LGAs, five (5) participating communities were randomly selected. In the third stage, from Bunkure, Garun-Mallam and Kura LGAs each, nine (9) farmers were randomly selected while four (4) farmers were randomly selected from each of these LGAs- Dambatta, Bagwai and Makoda. Thus, a total of 195 farmers formed the representative sample size. However, only 189 questionnaires were found to be valid, thus subjected to analysis. A well-structured questionnaire complemented with interview schedule was used to elicit data of 2018 rice cropping season. The stochastic cost frontier function and descriptive statistics were used for data analysis.

3.1. Model Specification

Stochastic Cost Frontier Function(SCF) function as adopted by [9], [10] and [15], [16] is presented below:

$$C_i = f(P_{ij}, Y_{ij}, ;\beta) + (V_i + U_i) \quad (i=1,2.....n) \tag{1}$$

where: C_i=Total production cost of the i^{th}farmer ; P_i=Vector prices of the actual j^{th} inputs used by the i^{th}farmer;Y_i=Vector of the actual j^{th} output of the i^{th}farmer;β_i=parameter to be estimated;V_i=Uncertainty which is beyound the control of the i^{th}farmer;andU_i=Risk which is attributed to the error of the i^{th}farmer;

Positive sign comes before the composite error term because inefficiency is always assumed to increase cost.

Given the level of technology at the disposal of a technical unit, the cost efficiency is expressed as the ratio of the observed cost (C^b) to the corresponding minimum cost (C^{min}), and it is given below:

$$C_e = \frac{C^b}{C^{min}} = \frac{f(P_{ij}, Y_{ij}, ;\beta) + (V_i + U_i)}{f(P_{ij}, Y_{ij}, ;\beta) + V_i} = \exp (U_i) \tag{2}$$

where: C_e is the cost efficiency and takes the value of ≥ 1 with 1 defining cost efficient technical unit. The observed cost(C^b) represents the actual total cost while the minimum cost(C^{min}) represents the frontier total cost or the least total cost level.

The explicit form of the Cob-Douglas functional form of the SCF function is as follow:

$$\ln C_i = \ln\beta_0 + \sum \beta_k \ln P_{ij} + \beta_l \ln Y_{ij} + V_i + U_i \tag{3}$$

Where: C_i = Total production cost of i^{th}farmer (₦);P_i= vector of unit prices of farm inputs used;P_1= cost of NPK fertilizer (₦/kg);P_2= cost of urea fertilizer (₦/kg);P_3= cost of family labour (₦/man-day);P_4= cost of hired labour (₦/man-day);P_5= cost of insecticides (₦/kg);P_6= cost of herbicides (₦/litre);P_7= cost of seed (₦/kg);P_8= rental value of land (₦/hectare);P_9= depreciation on capital items (₦); andY_i= rice output (kg) from i^{th}farmer; V_i = random variability in the production that cannot be influencedby the i^{th} farmer also known as uncertainty; U_i= deviation from maximum potential output attributable to cost inefficiency and also known as risk. β_0=intercept; β_k=vector of cost parameters to be estimated;β_l=vector of output parameter to be estimated; i= 1,2,3, …,n farmers; j = 1,2,3, …, m inputs.

The inefficiency model is:

$$U_i=\delta_0+\delta_1 Z_1+\delta_2 Z_2+\ldots+\delta_n Z_n \quad (4)$$

Where Z_1 = gender (male=1, otherwise=0); Z_2 = marital status (married=1, otherwise=0); Z_3 = age (year);Z_4 = educational level (year);Z_5 = primary occupation (farming =1, otherwise=0); Z_6 = secondary occupation (farming =1, otherwise=0); Z_7 = Household size (number); Z_8= rice farming experience (year); Z_9= mixed cropping (yes =1, no = 0); Z_{11} = extension visit (yes=1, otherwise=0);Z_{12} = length of participation in MARKETS II (year); Z_{13} = Duration of adoption of urea deep placement (UDP)(year); Z_{14} = proportion of farm size cultivated under UDP (%);Z_{15} = co-operative membership (yes=1, otherwise=0); Z_{16} = total livestock unit (TLU) (Camel=1.0; Horse=0.8; Cattle=0.7; Donkey=0.5; Sheep & Goat =0.1; and, Chicken=0.01); Z_{17} = commercialization index (CI)(ratio of marketed surplus to marketable surplus); and Z_{18} = dead stocks (capital assets); δ_0 = intercept;δ_{1-18} = regression coefficient; and, ε_t = chance.

Economies of Scale (Es): Following [17], [18] the economies of scale can be calculated from equation (5):

$$E_s=[1-\sum(\partial \ln CV/\partial \ln Z_k)/(\partial \ln CV/\partial \ln Y) \quad (5)$$

Where: CV= cost variable; Z parameter estimates of the idiosyncratic variables; and Y= parameter estimate of the output coefficient.

4. Results and Discussion

4.1. Summary Statistics of the Socio-Economic Profile

From the empirical evidence it can be suggested that the programme is gender sensitive given the slight advantage of 60 to almost 40% in the ratio of men to women composition (Table 1). This may be attributed to the target goal of the programme which focused on women and youth empowerment as gender stereotype hindered women involvement in downstream supply chain. The mean age of 39.6 years implied that the project aroused the interest of the teeming youth population despite their ergonomic perception about downstream supply chain of agriculture. Besides, government favourable policy on rice production enhancement is a major supportive stimulant. Also, majority been in their prime age suggests a productive farming population that is vital for enhancement of rice food security in the studied area. However, the rice food security is dicey given that most of the participants are marginal farmers cultivating less than a hectare.

Adequate access to advisory services coupled with sufficient years of experience in the rice farming will enhance managerial efficiency in the project programme. Besides, evidence of poor literacy level among majority who didn't exceed first school living certificate (5.5 years) is a possible threat to effective adoption and diffusion of the rice project innovative packages. However, the challenge of the population pressure- large household size (averagely 9 persons) among the majority is likely to jeopardize the sustainability of the project owing to high cost of household's livelihood maintenance which has the tendency of hampering their business going concern, especially among the vulnerable farm families- high dependency ratio. Most of the participants (0.936) explore the advantage of social capital, a veritable self-help tool for economic empowerment; majority are pluriactive farmers (diversification index of 0.85), an insurance against risk and uncertainty; and, most are driven by profit motive while keeping in view households' food security as indicated by the commercialization index of 0.71. The TLU index of 1.22 implied that most of the participants have a moderate possession of livestock asset, a store or deferred reserve that will enable them to assuage any future unforeseen condition *viz*. urgent need for cash.

Table 1. Socio-Economic Profile of the Farmers

Variables	Mean	SD	Min	Max
Farm size	0.764074	0.612794	0.1	4
Gender	0.613757	0.488181	0	1
Age	39.68783	11.89998	17	70
Marital status	0.915344	0.279109	0	1
Education	5.465608	5.40834	0	18
Primary occupation	0.925926	0.262587	0	1
Secondary occupation	0.322751	0.501658	0	3
Household size	9.31746	6.284459	0	33
Experience	12.38624	8.375752	2	45
Mixed cropping	0.851852	0.35619	0	1
Extension contact	0.989418	0.102595	0	1
Length of part. in MKT11	3.714286	1.107449	2	8
Length of adoption of UDP	3.047619	2.384091	0	15
% of farm under UDP	51.74603	33.85858	0	100
Co-operative membership	0.936508	0.244494	0	1
TLU	1.220529	1.351675	0	8.35
CI	0.704595	0.165345	0	1

Source: Field survey, 2018

4.2. Maximum Likelihood Estimate of Stochastic Cost Frontier Function

The plausibility of the sigma-squared and gamma coefficients of the Maximum Likelihood Estimation (MLE) within the acceptable margin of 10% degree of freedom implies the fit and correctness of the distribution of the specified composite error term, and the presence of inefficiency which owes to the farmers' disparity in cost efficiencies, respectively (Table 2).

Table 2. MLE of the Stochastic Cost Frontier

Variable	Coefficient	Standard error	t-statistic
Deterministic model			
Constant (β_0)	3.1640352	0.45506936	6.9528636***
NPK fertilizer (₦)(β_1)	0.044358417	0.036746222	1.2071558NS
Urea fertilizer (₦)(β_2)	0.066146611	0.023067288	2.8675504***
Family labour (₦)(β_3)	0.12608298	0.013167105	9.5756036***
Hired labour (₦)(β_4)	0.22859010	0.024505060	9.3282816***
Insecticides(₦)(β_5)	0.058430917	0.018182738	3.2135378***
Herbicides (₦)(β_6)	0.052914952	0.015182384	3.4852862***
Seed (₦)(β_7)	0.15910474	0.023073463	6.8955725***
Depreciation on cap. (₦)(β_8)	0.093296527	0.010196166	9.1501581***
Rent value of land (₦)(β_9)	0.053721079	0.019580011	2.7436695***
Output (kg)(β_{10})	0.0034257041	0.020023164	1.7108705*
Inefficiency model			
Constant (δ_0)	-3.1080639	1.6526504	1.8806542*
Gender (δ_1)	-0.34999167	0.15029265	2.3287344**
Marital status(δ_2)	0.014790804	0.0062233167	2.3766754**
Educational level(δ_3)	0.37031292	0.20673764	1.7912215*
Primary occupation (δ_4)	0.015509227	0.0080968947	1.9154537*
Secondary occupation (δ_5)	-0.45111326	0.19129989	2.3581471**
Household size (δ_6)	-0.25717842	0.12279095	2.0944412**
Experience (δ_7)	-0.022757560	0.010219112	2.2269606**
Mixed cropping (δ_8)	-0.0027308430	0.0054602092	0.50013524NS
Extension contact(δ_9)	-0.025868978	0.12915930	0.20028739NS
Length of part. in MKT11(δ_{10})	1.5046592	0.89009879	1.6904407*
Length of adoption of UDP(δ_{11})	0.029127791	0.032380982	0.89953390NS
% of farm under UDP(δ_{12})	0.022507037	0.015527573	1.4494884NS
Co-operative membership(δ_{13})	-0.0073037273	0.0025752454	2.8361287***
Total livestock unit (TLU)(δ_{14})	0.89855469	0.50694594	1.7724862**
Commercialization index (CI)(δ_{15})	0.053177792	0.026451930	2.0103558**
Ln Dead-stock (δ_{16})	0.32362365	0.23321131	1.3876842NS
Variance parameters			
Sigma-squared (σ^2)	0.098309801	0.033141491	2.9663663***
Gamma (γ)	0.96878462	0.015135651	64.006801***

Source: Field survey, 2018

*, **, *** and ^{NS} means significance at 10%, 5%, 1% and non-significant respectively

The estimated gamma coefficient being 0.9688 means that 96.88% of the variation in the total cost of production owes to differences in the farmers cost efficiencies. Besides, the significant of the LR Chi^2 as evidenced by its critical value which is greater than the tabulated at 5% implies that the Cobb-Douglas function is the best fit for the data rather than the traditional response function- ordinary least square (OLS) (Table 3).

Table 3. Generalized Likelihood Ratio Test of Hypothesis for Parameters of SCFF

H_o	*LLF* (OLS)	LLF-MLE (Cobb-Douglas)	Λ	Critical (5%)	Decision
$\gamma = 0$	104.51948	142.28500	75.54	67.32	$\gamma \neq 0$

Source: Field survey, 2018

The empirical evidence showed presence of economies of scale (*ES*) as indicated by the computed *ES* value of 1.86 which is greater than unity (1). Thus, despite that the farmers cultivate rice on smallholdings they tend to expand their production capacities in order to decrease their production cost to the barest minimum. Therefore, it can be inferred that the farmers are operating in the stage II of the production surface given that the technical units are experiencing decreasing but positive return to scale, since economies of scale and return to scale are equivalent measures [12]; [9]; [10]; and [7]. This result supports Schultz's poor-but-effective hypothesis, which states that peasant farmers in conventional agricultural settings are efficient resource allocators given their operating conditions [19]; [9]; [10]; and [7].

Furthermore, it was observed that the cost function monotonically increases as input prices increase as evidenced by the positive signs of all the monetary (cost) explanatory parameters. In addition, all the cost-explanatory parameter estimates are different from zero as indicated by their respective estimated coefficients that are within the acceptable margin of 10% probability level, thus have significant influence on the total production cost. The cost elasticities with respect to all the cost-explanatory variables been positive mean that an increase in each of these inputs will lead to an increase in the total production cost. Thus, a 1% increase in the costs of inorganic fertilizers-NPK fertilizer and Urea fertilizer; biocides-herbicides and insecticides; and human labour-family and hired labours will lead to increases in the total cost by 0.04 and 0.07%; 0.06 and 0.05%; and, 0.13 and 0.23% respectively. Also, a unit increase in the costs of seeds, depreciation on capital item and rental value will lead to an increase in the total production cost by 0.16, 0.09 and 0.05% respectively. The non-significant of the output coefficient, the only physical variable, may be attributed to sub-optimal productivity due to extension gap i.e. a significant slight variation of the actual yield from potential yield vis-à-vis the experimental productivity.

A cursory review of the cost inefficiency model showed gender, age, marital status, educational level, primary occupation, secondary occupation, household size, proportion of farm size cultivated under UDP, co-operative membership and TLU to be the driving factors behind cost inefficiency as indicated by their respective estimated coefficients that are different from zero at 10% degree of freedom (Table 2). Factors *viz*. gender, primary occupation, secondary occupation, household size and proportion of farm size cultivated decreases cost inefficiency as evidenced by the negative sign associated with their respective estimated coefficients while age, marital status, educational level, extension contact, co-operative membership and TLU increases cost inefficiency based on the positive sign associated by their respective estimated coefficients.

The negative sign of the gender coefficient shows how access and control to productive resources enable male farmers to be cost efficiency against their female counterparts who are inhibited by gender inequality. This didn't puzzled the researchers as the study area is located in the core northern part of the country where the influence of Islamic religion aids in promoting gender stereotype-women in *purdah* (veiled) are advised to be confine to household chore, thus affecting women active participation in primary production. Thus, being a male farmer will help in decreasing cost inefficiency as against their female counterparts. Both primary and secondary occupations been negatively signed implies that farming as a profession is a lucrative enterprise that generates remunerative income for a sustainable livelihood and the going concern of the farm business, thus enhancing farm cost efficiency. Thus, taken-up farming as a primary occupation likewise secondary occupation will lead to an increase in cost efficiency by 0.45 and 0.26% respectively. The negative sign associated with household size implies that large farm family composed of able-bodied people incurred less labour cost due to access to free labour, thus enhanced their cost efficiency as against farm family with few members. Therefore, a unit increase in a farm family household size by one able-bodied person will lead to a decrease in cost inefficiency by 0.02%. Besides, the negative sign of the proportion of farm size cultivated under urea deep placement (UDP) technology showed how allocation of appreciable farm land to the cultivation of rice under UDP enhanced farmers productivity, thus high benefit to cost ratio, thereby enhancing cost efficiency. Therefore, a unit increase in the percentage of farm size cultivated under rice for UDP will decrease cost inefficiency by 0.007%.

The positive sign of age coefficient showed that aged/old farmers due to their reluctance for marketable surplus-their prime goal is household food security encountered diseconomies of scale as against the youthful farmers who are driven by market-orientation, thus affected their cost efficiency. Therefore, a unit increase in a farmer's age by a year will lead to an increase in his/her cost inefficiency by 0.015%. Lack of social capital as well as economic capital inherent with marriage affected the capital stream of farmers that are single against their counterparts that are married as indicated by the positivity of the marital status coefficient, thus affected their cost efficiency. Thus, for farmers that are unmarried, there tendency of being cost inefficiency will increase by 0.37%. Search for white collar jobs among the literate farmers is affecting their tacit concentration on rice farming as indicated by the positivity of the educational level coefficient. Likewise, complacency due to low educational level of the advisory agents make literate farmers to be reluctant on technical advices offered by the extension agents; thus inhibited their managerial efficiency which inturn affected their cost efficiency. Therefore, a unit increase in a farmer's education by one year will increase his/her cost inefficiency by 0.016%. The positive sign of the extension contact coefficient showed that farmers with poor access to advisory services failed to adequately harness the USAID program packages, which inturn inhibited cost efficiency due to poor business turnover. Thus, farmers with poor access to extension services are liable to have their cost inefficiency being increased by 1.51%.

Lack of access to pecuniary advantages among farmers with no social capital leads to cost inefficiency as evidenced by the positivity of the co-operative membership coefficient. Thus, non-membership in co-operative association will lead to an increase in cost inefficiency by 0.899%. Capital consumption of livestock assets, a cash reserve which is expected to supplement farm business capital investment inhibits farms' cost efficiency as indicated by the positivity of the TLU coefficient. Therefore, a unit increase in the TLU index will lead to an increase in farmers cost inefficiency by 0.053.

Despite been negative signed, the non-significant of the extension contact may be attributed to poor literacy level, thus inhibited efficiency of advisory services among majority who didn't exceed first school leaving certificate. Also, being mostly marginal farmers, the pressing need for cash requirement affected their ability to explore the benefit of pluriactivity as evident by the non-significant of the diversification index.

4.3. Individual Farm Cost Efficiency

A cursory review of the results showed the mean cost efficiency to be 1.147, implying that an average farm unit incurred an extra cost of 14.7% above the frontier level (Table 4).

Table 4. Frequency Distribution of Cost Efficiency Scores

Efficiency level	Frequency	Relative efficiency %
1.01-1.09	109	57.7
1.10-1.19	33	17.5
1.20-1.29	29	15.3
1.30-1.39	7	3.7
1.40-1.49	5	2.6
1.50-1.59	2	1.1
1.60-1.69	1	0.5
1.70-1.79	1	0.5
≥2.00	2	1.1
Total	**189**	**100**
Mean	**1.147108**	
Maximum	**2.283265**	
Minimum	**1.012159**	
Standard deviation	**0.177887**	

Source: Field survey, 2018

In other words, it means that the average technical unit incurred an extra cost of 14.7%, cost wastage of ₦1100 (Table 4), relative to the best practiced technical unit producing the same output and facing the same technology. It was observed that more than half (57.7%) of the farmers are fairly efficient in producing at a given level of output using a cost minimization approach which reflects the tendency of farmers to minimize inputs wastage that are associated with production process from the perspective of cost.

The worst inefficient decision making unit (DMU) had an efficiency score of 2.28, thus incurred an extra cost of ₦91700 while the best inefficient DMU recorded an inefficiency score of 1.01, thus incurred ₦467. Therefore, for the worst inefficient DMU to be on the frontier and at par with the best inefficient DMU, he/she needs to reduce its cost inefficiency by 28 [1-(2.28/1.00)*100]and 26 [1-(2.28/1.01)*100] respectively. Generally, it can be inferred that the farmers are cost inefficient, thus the need to be rational in their resource mix in order to optimize profit in rice production.

5. Conclusion and Recommendation

Based on the findings, it was inferred that none of the technical unit is cost efficient in the allocation of their farm scare resources. The cost inefficiency was due to poor labour productivity as a result of old age, lack of social and economic capital, poor interest for farming due to paid salaried job, poor extension service delivery, non-viable social capital pooling and capital consumption of cash reserve from livestock earnings. Consequently, on the average, a technical unit incurred an extra cost of 14.7% which translates to ₦1100 ($3.7), relative to the best practiced farmers facing the same technology and producing the same output. However, it was established that just slightly above half of the sampled farms were fairly efficient in cost minimization- that is closed to the potential minimum cost required in the production process. Generally, the farmers are advice to decrease their cost wastage *viz*. addressing extension gap given its multifaceted dimension on the inefficiency factors- idiosyncratic factors, thus achieving an optimum minimum cost in the production process. Besides, farmer-2-farmer extension approach is suggested given the large number of participants with low literacy level. Enhancement of the foregoing is a pivot to the sustainability and expansion of the area coverage of the project in the long-run in the studied area.

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