Profit efficiency of small-scale farmers participating in USAID MARKETS* II in Kano state of Nigeria

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Abstract

The present research determined the profit efficiency of smallholder farmers participating in USAID Markets II in Nigeria's Kano State using undated data collected from 189 farmers drawn through a multi-stage sampling technique. Data elicitations were done through a well-structured questionnaire complemented with interview schedule and both descriptive and inferential statistics were used to analyze the data. The empirical evidence showed an improvement in women folk participation in the program despite strong advocacy of gender stereotype viz. religious and cultural barriers in the studied area. However, this progress owes to the tacit focus of the program on women and youths. Furthermore, it was established that none of the farmer is profit efficient and it majorly owes to extension gap. On the average, a technical unit gained 58.5% of its potential profit, thus lost a profit of ₦123008 due to inefficient resource mix. Besides, an average farm unit still has the potential to increase his profit efficiency by 41.5%, thus bridging its discrepancy from the frontier surface. Therefore, the study calls on the program promoters to enhance their extension services delivery structure thereby addressing the problem of extension gap that inhibit profit efficiency given its multifaceted influence on risks associated with farmers socio-economic characteristics.

Keywords: Profit efficiency, USAID Markets II, Small-scale, Rice farmers, Nigeria

INTRODUCTION

Agricultural production is obviously fraught with risks and unpredictability (dry-spell, hailstorms destroying crops, flooding, etc), and high inputs do not always yield high returns (Bidzakin *et al.*, 2014). However, farmers who invest in better seeds, fertilizer, and improved production methods, among other things, are more likely to see changes. Small-scale agriculture faces a number of challenges, including a lack of adequate access to production inputs and competitive produce markets. New innovations, such as improved seed varieties and agrochemicals, have been found to be exorbitantly expensive for the average small-scale farmer, who has limited access to formal credit. This means that small-scale farmers are less likely to implement new innovations, resulting in lower annual yields and incomes. Small-scale farmers continue to use inefficient practices that result in low yields and high post-harvest losses. Some farmers, on the other hand, are making the best of their limited resources and expertise to get out of this predicament. Farmers like these have shown that with better agro-business management, they can help other farmers get out of poverty and become more efficient and competitive (Bidzakin *et al.*, 2014).

Small-scale farmers dominate agriculture in Nigeria, producing the majority of the country's food requirements (Asogwa *et al.*, 2006; Oladeebo and Oluwaranti, 2012). Despite the fact that these small-scale farmers hold a unique and pivotal role, they are among the poorest members of the society (Sadiq *et al.*, 2021) and thus cannot afford to invest heavily in their farms. With reference to Sadiq *et al.*(2020), the agricultural sector's poor output is due to a vicious cycle of poverty among these farmers. As a result, resources must be used more effectively, which necessitates the elimination of waste, resulting in increased productivity and revenue.

Many countries' rice yields surpass 2 t/ha, which is substantially higher than that of Nigeria (Sadiq *et al.*, 2020). However, since there is a wide yield difference between research stations and farmer's fields, productivity can be increased. As a result, rice production capacity must be expanded in order to meet increasing demand. One way to do this is to increase the profits earned by the producers. Profit efficiency is described as a farm's ability to achieve the highest possible profit, given the prices and levels of fixed factors on the farm, according to Ali and Flinn (1989); Sadiq and Singh (2015); Sadiq *et al.* (2017). Profit inefficiency, on the other hand, is characterized as profit loss due to failure to operate on the profit frontier, given farm-specific prices and resource base. Hence, this research is needed in order to contribute to the literature on profit efficiency studies on food crops, especially the USAID Markets II rice production project, which aims to improve the welfare of its beneficiaries-farmers in Nigeria. Therefore, this research aimed at determining the profit efficiency of small-scale farmers participating in USAID Markets II in Kano State of Nigeria.

* MARKETS: Maximizing Agricultural Revenue and Key Enterprises in Targeted Sites

RESEARCH METHODOLOGY

The co-ordinates of Nigeria's Kano state in the northern region are latitudes 10° 33' to 12° 37' N and longitude 07° 34' to 09° 25'E 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 and 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 (NPC, 2006) 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. Using an easy cost-route approach, a well-structured questionnaire complemented with interview schedule was used to elicit data of 2018 rice cropping season. The stochastic profit frontier function and descriptive statistics were used for data analysis.

Model Specification

Stochastic Profit Frontier Function: Following Sadiq *et al.* (2017); Sadiq *et al.* (2015); Sadiq (2015); Sadiq and Singh (2015); Bidzakin *et al.* (2014) the stochastic profit frontier (SPF) function is given below:

$$\pi_i = \frac{\pi}{P_y} = f\left(P_{ij}, Z_{ij,}; \beta\right) + (V_i - U_i) \quad (i = 1,2 \ldots .. n) \qquad (1)$$

$\pi_i = Normalized\ profit\ of\ the\ i^{th} farmer$
$\pi = Profit\ computed\ as\ gross\ revenue\ minus\ total\ cost$
$P_y = Unit\ price\ of\ output$
$P_i = Cost\ of\ \ actual\ j^{th}\ inputs\ used\ by\ \ the\ i^{th} farmer\ normalized\ by\ P_y$;
$Z_i = Quantity\ of\ actual\ j^{th}\ fixed\ input\ of\ \ the\ i^{th} farmer;$
$\beta_i = Parameter\ to\ be\ estimated;$
$V_i = Uncertainty\ which\ is\ beyound\ the\ control\ of\ the\ i^{th} farmer; and,$
$U_i = Risk\ which\ is\ attributed\ to\ the\ error\ of\ the\ i^{th} farmer;$

Given the level of technology at the disposal of a technical unit, the profit efficiency is expressed as the ratio of the actual profit (π) to the corresponding potential profit (π*) and it is given below:

$$\pi_e = \frac{\pi}{\pi^*} = \frac{f\left(P_{ij,} Z_{ij,}; \beta\right) + (V_i - U_i)}{f\left(P_{ij,} Z_{ij,}; \beta\right) + V_i} = \exp\left(U_i\right) \quad (2)$$

Where π_e is the profit efficiency and takes the value of ≤1, with 1 defining profit efficient decision making unit (DMU). The observed profit (π) represents the actual profit while the potential profit (π*) represents the frontier profit level.

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

$$ln\pi_i = ln\beta_0 + \sum \beta_k lnP_{ij} + \beta_l lnZ_{ij} + V_i - U_i \qquad (3)$$

Where π_i = Normalized profit i^{th} of farmer (₦); P_i= cost 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), and P_7 = cost of seed (₦/kg); Z_i= Quantity of fixed input: Z_1 = Farm size (hectare), and Z_2 = depreciation on capital items (₦); V_i = random variability in the production that cannot be influenced by the i^{th} farmer also known as uncertainty; U_i = deviation from maximum potential profit attributable to profit inefficiency and also known as risk. β_0 =intercept; β_k =vector of cost parameters to be estimated; β_l =vector of fixed input parameter to be estimated; *i=1,2,3,...n farmers*; *j=1,2,3,...m inputs.*

The inefficiency model is:

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

Where Z_1 = gender (male=1, otherwise=0); Z_2 = age (year); Z_3 = marital status (married=1, otherwise=0); 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_{10} = extension visit (yes=1, otherwise=0); Z_{11} = length of participation in MARKETS II (year); Z_{12} = Duration of adoption of urea displacement project (UDP)(year); Z_{13} = proportion of farm size cultivated under UDP (%); Z_{14} = co-operative membership (yes=1, otherwise=0); Z_{15} = total livestock unit (TLU) (Camel=1.0; Horse=0.8; Cattle=0.7; Donkey=0.5; Sheep & Goat =0.1; and, Chicken=0.01); and, Z_{16} = commercialization index (CI)(ratio of marketed surplus to marketable surplus); δ_0 = intercept; δ_{1-16} = regression coefficient; and, ε_t = chance.

RESULTS AND DISCUSSION

Socio-Economic Profile of the Farmers

Less than 40% of the women farmers against barely above 60% of the male farmers were involved in the rice production enterprise, an indication of gender inequality due to the manifestation of gender stereotype, thus the resultant poor participation of women folk in the program (Table 1). The enterprise is dominated by able-bodied men as indicated by the mean age of 40 years, thus reflecting a visible active, productive and economic viable farming population. However, these farming population will soon aged, thus a threat to the rice food security if not urgently replaced. Therefore, the program should be incentivized more so as to encourage those within the early youthful stage to venture into the rice program project.

Most of the farmers have family responsibilities to carter for as indicated by the mean marital status of 0.92, thus suggesting that most of the beneficiaries are engaged in the rice project for livelihood sustenance. Evidence showed that the educational level of most of the farmers didn't exceed primary education as indicated by the mean educational level value of 6 years, thus indicating a fair literate farming population. This low educational level status has the consequence of undermining the speed of the technological transfer packages of this program. Most of the beneficiaries of the rice program project are driven by market-orientation as indicated by the primary occupation proportional value of 0.93. However, a proportion of 0.32 of the beneficiaries as evidenced by the secondary occupation variable have their objective tilted towards farm family food security.

The mean household size of 9 persons indicates large household among most of the beneficiaries, thus a threat to a sustainable household livelihood- high consumption expenditure for a household composed of high dependency ratio-vulnerable groups. Rice farming experience mean value of 12.4 years reveals that most of the farmers have adequate experience in rice production, thus efficient in resource mix for profit maximization vis-à-vis cost minimization. The proportion of 0.85 for mixed cropping indicates crop diversification among most of the farmers, thus indicating adoption of safety measures-coping mechanism against food insecurity. It was observed that there is adequate provision of technical support as evidenced by the proportion of 0.99 who had access to extension contact. This is expected as the rice project is program driven. Besides, it shows the possibility of the program sustainability as there exists an effective synergy between the clienteles and the program promoters.

The empirical evidences showed that most of the beneficiaries are new entrants into the USAID Markets II program, consequently venturing into the UDP rice project not long ago as evidenced by the mean value of less than 4 years for both length of USAID Markets II and duration of adoption of urea displacement project (UDP) respectively. Most of the beneficiaries devoted half of their farm size to the cultivation of rice under the program as indicated by the proportion of farm size cultivated under UDP rice project mean value of 51.7 %. There is adequate harnessing of the social capital among the beneficiaries as evident by the co-operative association proportional value of 0.94, an indication that the farmers are economically empowered *viz*. exploration of the pecuniary advantages inherent with co-operative organization. Most of the beneficiaries have high marketable surplus, that is, ability to fend for farm family food security and farm consumption; and sales to the non-farming population. Thus, it can be suggested that most of the beneficiaries eked a sustainable livelihood from participating in this program, thus a plus to the program going concern in the studied area. The average total livestock index (TLU) of 1.22 implies that most of the beneficiaries have low deferred cash reserve as livestock assets. Thus, it can be hedged that most of the program participants are resource poor, thus the need for high credit provision for program sustainability so as to achieve rice food security.

Table 1: Socio-economic profile of the farmers

Variables	Mean/Proportion	SD
Gender	0.613757	0.488181
Age	39.68783	11.89998
Marital status	0.915344	0.279109
Educational level	5.465608	5.408340
Primary occupation	0.925926	0.262587
Secondary occupation	0.322751	0.501658
Household size	9.317460	6.284459
Experience	12.38624	8.375752
Mixed cropping	0.851852	0.356190
Extension contact	0.989418	0.102595
Length of part. in USAID MKT II	3.714286	1.107449
Length of adoption of UDP	3.047619	2.384091
% of farm under UDP	51.74603	33.85858
Co-operative membership	0.936508	0.244494
Total livestock unit (TLU)	1.220529	1.351675
Commercialization index (CI)	0.704595	0.165345

Note: SD= Standard deviation *Source: Field survey, 2018*

Maximum Likelihood Estimate (MLE) of Stochastic Profit Frontier Function

The maximum likelihood estimation (MLE) of the stochastic profit frontier function shows the variance parameters- sigma-squared and gamma to be different from zero as evidenced by their respective estimated coefficients which were within the acceptable margin of 10% probability level (Table 2). For the former, it implies that the distribution of the specified composite error term is fit and correct while the later indicates that there is presence of inefficiency which owes to differences in the farmers idiosyncratic factors. The gamma coefficient being 0.9364 means that 93.64% of the variation in the normalized profit of rice production owes to disparity in their profit efficiencies. Besides, the critical Chi^2 been greater than the tabulated Chi2 as indicated by the generalized log likelihood ratio depicts that the traditional response function *viz.* ordinary least square (OLS) is not an adequate representation for the data but rather the stochastic frontier *viz*. MLE (Table 3). Sequel to the foregoing, the estimated parameters are reliable for future prediction with certainty and accuracy.

A perusal of the profit function showed only seed and farm size to be the significant variables that influenced the normalized profit as evidenced by the plausibility of their respective estimated parameters at 10% probability level. The positivity of the seed coefficient indicated how subsidy on improved seed variety enhanced the business turnover, thus enhanced profit margin. Thus, a percent increase in the cost of improved seed will lead to an increase in the normalized profit by 0.38%. Besides, the positivity of the farm size indicated that economies of scale enhanced the normalized profit. Thus, an increase in the farm size by 1% will increase the normalized profit margin by 0.11%.

Though all the remaining variables *viz*. costs of inorganic fertilizer, human labour and sunk capital were not significant but the signs associated with their estimated parameters connote information. The negativity of the inorganic fertilizers indicated how high cost of fertilizers due to lack of subsidy coupled with excessive use given the low fertility of the soil affected the business income stream, thus plummeted the normalized profit margin. The positivity of the human labour-family and

Table 3: Generalized Likelihood ratio test hypothesis

H_0	LLF (OLS)	LLF-MLE (Cobb-Douglas)	λ	Critical (5%)	Decision
$\gamma=0$	216.835	261.527	89.3851	67.32	$\gamma\neq0$

Source: Field survey, 2018

Table 2: MLE of the stochastic profit frontier

Variable	Coefficient	Standard error	t-statistic
Deterministic model			
Constant (β_0)	4.872677	0.999608	4.874587***
NPK fertilizer (₦) (β_1)	-0.22752	0.209821	1.084356^{NS}
Urea fertilizer (₦) (β_2)	-0.13642	0.157137	0.868184^{NS}
Family labour (₦) (β_3)	0.069227	0.06235	1.110295^{NS}
Hired labour (₦) (β_4)	0.129421	0.094384	1.371215^{NS}
Insecticides (₦) (β_5)	0.144192	0.092712	1.555268^{NS}
Herbicides (₦) (β_6)	0.111773	0.079055	1.413865^{NS}
Seed (₦) (β_7)	0.374709	0.15292	2.450354**
Depreciation on cap. (₦) (β_8)	0.072548	0.049081	1.47812^{NS}
Farm size (hectare) (β_9)	1.053006	0.128283	8.208455***
Inefficiency model			
Constant (δ_0)	-1.82587	1.799206	1.014821^{NS}
Gender (δ_1)	-1.89714	0.949146	1.998782**
Age (δ_2)	-0.03015	0.029439	1.024287^{NS}
Marital status (δ_3)	1.97001	1.057488	1.862915*
Educational level (δ_4)	0.301127	0.112434	2.678249***
Primary occupation (δ_5)	3.052651	1.291449	2.363741**
Secondary occupation (δ_6)	0.65498	0.619047	1.058045^{NS}
Household size (δ_7)	0.036499	0.047108	0.774793^{NS}
Experience (δ_8)	-0.26571	0.113486	2.341349**
Mixed cropping (δ_9)	1.736348	1.088872	1.594631^{NS}
Extension contact (δ_{10})	-5.03946	2.005746	2.512513**
Length of part. in MKT11 (δ_{11})	-0.3622	0.270086	1.34107^{NS}
Length of adoption of UDP (δ_{12})	0.468579	0.200661	2.335178**
% of farm under UDP (δ_{13})	-0.01898	0.010917	1.738876*
Co-operative membership (δ_{14})	-1.37421	1.049622	1.309243^{NS}
Total livestock unit (TLU) (δ_{15})	-0.62169	0.297734	2.088079**
Commercialization index (CI) (δ_{16})	3.961256	2.057951	1.924855*
Variance parameters			
Sigma-squared (σ^2)	3.54572	1.25383	2.827912***
Gamma (γ)	0.936425	0.026546	35.27496***

, **, * and ^{NS} means significance at 10%, 5%, 1% and non-significant respectively, Note: ₦ = Nigerian Naira currency Source: Field survey, 2018* hired labours indicated how unorthodox use of human labour as it is relatively cheap and free enhanced the business turnover ratio, thus increased the normalized profit margin. The positivity of depreciation on capital items showed how negligible sunk cost due to the use of rudimentary implements that characterized small holding farming in the studied area didn't exert significant influence on the business turnover ratio, thus the increase in the normalized profit margin.

Furthermore, in the inefficiency component, profit inefficiency was affected by gender, marital status, educational level, primary occupation, experience in rice farming, extension contact, length of adoption of UDP, proportion of farm size cultivated under rice project, TLU and CI as evidenced by the plausibility of their respective estimated parameters at 10% significance level (Table 2). The variables-gender, experience in rice farming, extension contact, proportion of farm size cultivated under rice project and TLU decreased profit inefficiency based on the negative sign associated with their estimated coefficients while the positivity associated with marital status, educational level, primary occupation, length of adoption of UDP and CI implied that they increased profit inefficiency.

The negative sign of the gender coefficient implied that gender inequality that owes to access to and control of productive resources among the male farmers against their female counterparts enhanced their profit efficiency. This is expected as religion and cultural barriers have created gender inequality and gender stereotypes thus affecting the financial wherewithal of women farmers in the production of rice, thereby inhibited their profit efficiency due to poor business turnover ratio. Therefore, being a male farmer against woman farmer will lead to a decrease in profit inefficiency by 1.897%. The negative sign of the rice farming experience coefficient implied that experienced farmers-farmers that have spent adequate years farming rice are profit efficiency against those farmers with few/ less experience in rice production. The possible reason may be due to efficient resource allocation among the experienced farmers, thus profit maximization vis-à-vis cost minimization. Therefore, the elasticity implication of a unit increase in the year spent in rice farming by a farmer will lead to a decrease in his/her profit inefficiency by 0.27%.

Agricultural services, a leverage to market-led extension *viz.* market information and adoption of technologies increased profit efficiency among farmers with access to extension services against their counterparts with no access to change agents as evidenced by the negativity of the extension contact coefficient. Thus, having access to extension service delivery will lead to a decrease in a farmer's profit inefficiency by 5.04%. Farmers with adequate proportion of their farm size cultivated under rice project had marketable surplus as evidenced by the negativity of the estimated coefficient, thus increased their profit efficiency. Therefore, the elasticity implication of a percent increase in the proportion of land cultivated to rice project will lead to a decrease in a farmer's profit inefficiency by 0.019%. Utilization of cash reserve- money from livestock assets *viz.* investment in farm capital increased profit efficiency as indicated by the negative sign of the TLU index coefficient. Thus, the elasticity implication of a percent increase in a farmer's TLU index will lead to a decrease in his/her profit inefficiency by 0.62%.

The positive sign of the marital status estimated coefficient implied that unmarried farmers faced challenge of increased profit inefficiency against married farmers. The possible reason may be attributed to access to both social and economic capitals that are inherent in marriage in the traditional agrarian community, an investment stimulus *viz.* credit which in turn increase farm income, thus enhance profit efficiency. Just as money is not wealth, credit is not an income but a catalyst to generate income, a requisite for sustainable business going concern and better household livelihood. This comparative advantage is lurking among unmarried farmers, thus inhibited their profit efficiency. Therefore, the elasticity implication of being unmarried will lead to an increase in profit inefficiency by 1.97%.

The positivity of the educational level coefficient implied that lackadaisical approach towards rice farming because of engagement in paid salaried jobs affected the profit efficiency of literate farmers. Thus, the elasticity implication of a unit increase in a farmer's educational level by 1 percent-1 year, will lead to an increase in his/her profit inefficiency by 0.30%. The positive sign of the primary occupation coefficient implied that farmers that are not driven by market-orientation i.e. production for household consumption only are profit inefficiency as against those that sees farming as a business-major occupation. Besides, these farmers are liable to marketed surplus against marketable surplus. This is expected as those that engaged in rice farming as a secondary occupation will rely on alternative source of livelihood earning for survival as against farmers that see farming as a *de facto* business for livelihood sustenance. Therefore, the elasticity implication of taking up rice farming as a secondary occupation will results in a decrease in a farmer's profit efficiency by 0.47%. Market imperfection and policy incentives affected the profit efficiency of farmers with high marketable surplus as evidenced by the positive sign of the commercialization index (CI). Therefore, the elasticity implication of a percent increase in a farmer's CI will lead to an increase in his/her profit inefficiency by 0.396%.

Distribution of Profit Efficiency score

A cursory review of the results showed the deciles distribution of the profit efficiency to range from 0.0015 to 0.8802 with a mean score of 0.5847 (Table 4).

On the average, it entails that an average technical unit achieved a profit efficiency of 58.47%, falling short of 41.53%- a potential profit lost of ₦123008 (Table 5) from the profit frontier achieved by the best practiced technical unit facing the same technology and competitive market. This suggests that an average of 58.47% of the maximum potential profit is gained due to economic efficiency while the short fall-discrepancy of 41.53% between the actual profit and potential profit owe to extension gap due to mismatch of resource allocation. Furthermore, the occurrence of the predicted efficiency score above the mean efficiency score of 0.5847 is 58.70%, an indication that more than half of the sampled technical units facing a perfect competitive market were fairly efficient in their cost allocation in the course of rice production. Therefore, it can be inferred that none of the technical unit is profit efficiency; however, more than half of the technical units are fairly efficient as their efficiency score is close to the frontier surface. Besides, the average technical unit lost a potential profit of ₦123008 while the worst and best inefficient technical units lost potential profits of ₦110843 and ₦220.55 respectively (Table 5). Therefore, for the worst farmer to be on the same level with the best practiced and best inefficient farm units, he/her must increase his allocation efficiency- profit efficiency by 99.85% [1-(0.0015/1.00)*100] and 99.83% [1-(0.0015/0.8802)*100] respectively. For the best inefficient technical unit to be on the frontier, he/her needs to increase his profit efficiency by 11.98% [1-(0.8802/1.00)*100].

Table 4: Frequency distribution of profit efficiency scores

Efficiency level	Frequency	Relative efficiency %
≤ 0.09	9	4.8
0.10-0.19	8	4.2
0.20-0.29	10	5.3
0.30-0.39	10	5.3
0.40-0.49	18	9.5
0.50-0.59	23	12.2
0.60-0.69	40	21.2
0.70-0.79	41	21.7
0.80-0.89	30	15.9
Total	**189**	**100**
Mean	**0.58473**	
Maximum	**0.88017**	
Minimum	**0.001518**	
Standard deviation	**0.223232**	

Source: Field survey, 2018

Table 5: Individual-wise profit efficiency, actual profit, potential profits and profit loss

FIRM	ES	AP	PP	LOSS	FIRM	ES	AP	PP	LOSS
DMU 01	0.756285	349011.7	461481.8	-112470	DMU 41	0.666392	174720	262187.8	-87467.8
DMU 02	0.350914	46915.17	133694.3	-86779.1	DMU 42	0.670369	343220	511986.8	-168767
DMU 03	0.220043	30500	138609.3	-108109	DMU 43	0.840508	549632.7	653929	-104296
DMU 04	0.571613	51160	89501.14	-38341.1	DMU 44	0.529751	129830	245077.5	-115247
DMU 05	0.064174	29860	465300.5	-435440	DMU 45	0.851148	402780	473219.8	-70439.8
DMU 06	0.832693	905430	1087352	-181922	DMU 46	0.625182	99060	158449.8	-59389.8
DMU 07	0.731472	531143.3	726129.3	-194986	DMU 47	0.637819	115810	181572	-65762
DMU 08	0.718167	265634	369877.6	-104244	DMU 48	0.501443	38270	76319.72	-38049.7
DMU 09	0.088632	10618.5	119805	-109187	DMU 49	0.20566	31050	150977.7	-119928
DMU 10	0.772884	1071.5	1386.366	-314.866	DMU 50	0.644004	261900	406674.3	-144774
DMU 11	0.045466	4115.167	90509.94	-86394.8	DMU 51	0.778366	183880	236238.3	-52358.3
DMU 12	0.030578	3978.5	130109.1	-126131	DMU 52	0.737064	113210	153595.8	-40385.8
DMU 13	0.001518	168.5	111012	-110843	DMU 53	0.633696	114640	180906.9	-66266.9
DMU 14	0.733828	164400	224030.7	-59630.7	DMU 54	0.039203	6183.333	157727.2	-151544
DMU 15	0.786166	583280	741929.9	-158650	DMU 55	0.74707	358250	479540.1	-121290
DMU 16	0.716007	244093.3	340908.9	-96815.6	DMU 56	0.482972	82980	171811.2	-88831.2
DMU 17	0.745317	336760	451834.8	-115075	DMU 57	0.634188	54980	86693.56	-31713.6
DMU 18	0.637508	262950	412465.7	-149516	DMU 58	0.699865	216882.7	309892.4	-93009.6
DMU 19	0.306019	150030	490263.9	-340234	DMU 59	0.126077	15812.73	125421.6	-109609
DMU 20	0.356853	62260	174469.4	-112209	DMU 60	0.422967	123200	291275.9	-168076
DMU 21	0.275774	41420	150195.4	-108775	DMU 61	0.468472	75370	160884.7	-85514.7
DMU 22	0.703373	482260	685639.4	-203379	DMU 62	0.246741	14512.73	58817.61	-44304.9
DMU 23	0.668336	365800	547329.1	-181529	DMU 63	0.65787	68420	104002.4	-35582.4
DMU 24	0.283063	19363.33	68406.4	-49043.1	DMU 64	0.689623	196720	285257.3	-88537.3
DMU 25	0.255049	41163.33	161393.9	-120231	DMU 65	0.063002	2300	36506.95	-34207
DMU 26	0.694303	241350	347614.9	-106265	DMU 66	0.719616	120500	167450.3	-46950.3
DMU 27	0.59888	258300	431305	-173005	DMU 67	0.692302	65661.67	94845.43	-29183.8
DMU 28	0.850158	737870	867920.5	-130051	DMU 68	0.784865	94120	119918.7	-25798.7
DMU 29	0.495466	67300	135831.7	-68531.7	DMU 69	0.85051	4418.333	5194.921	-776.587
DMU 30	0.677606	220680	325676.2	-104996	DMU 70	0.703891	107680	152978.3	-45298.3
DMU 31	0.834881	782563.3	937335.5	-154772	DMU 71	0.768544	79540	103494.4	-23954.4
DMU 32	0.196039	62015.33	316342.3	-254327	DMU 72	0.662974	102810	155073.9	-52263.9
DMU 33	0.300682	56711.67	188610.4	-131899	DMU 73	0.590911	52181.67	88307.16	-36125.5
DMU 34	0.59569	133261.7	223709.9	-90448.2	DMU 74	0.88017	1620	1840.554	-220.554
DMU 35	0.873006	457410	523948.3	-66538.3	DMU 75	0.582252	58780	100952.9	-42172.9
DMU 36	0.480844	112950	234899.5	-121949	DMU 76	0.679705	100670	148108.3	-47438.3
DMU 37	0.477128	139480	292332.7	-152853	DMU 77	0.835841	426424	510173.8	-83749.8
DMU 38	0.582542	135050	231828.9	-96778.9	DMU 78	0.665722	230693.3	346531.1	-115838
DMU 39	0.599648	238820	398267.2	-159447	DMU 79	0.488755	88080	180213	-92133
DMU 40	0.752499	283430	376651.8	-93221.8	DMU 80	0.220234	31900	144846.2	-112946

Source: Field survey, 2018

Table 5: Continued …

FIRM	ES	AP	PP	LOSS	FIRM	ES	AP	PP	LOSS
DMU 81	0.715137	275913.3	385818.9	-109906	DMU 137	0.097285	13350	137225.9	-123876
DMU 82	0.851335	654120	768346.1	-114226	DMU 138	0.481857	84700	175778.3	-91078.3
DMU 83	0.584212	139430	238663.3	-99233.3	DMU 139	0.72877	23630	32424.49	-8794.49
DMU 84	0.332769	94030	282568.5	-188539	DMU 140	0.11533	17970	155813.6	-137844
DMU 85	0.464938	141483.3	304305.9	-162823	DMU 141	0.748842	277550	370639	-93089
DMU 86	0.502446	45380	90318.15	-44938.1	DMU 142	0.849562	579360	681951.2	-102591
DMU 87	0.802925	255710	318473.1	-62763.1	DMU 143	0.553886	34500	62287.24	-27787.2
DMU 88	0.794204	187890	236576.4	-48686.4	DMU 144	0.698843	63260	90521.08	-27261.1
DMU 89	0.695203	179600	258341.8	-78741.8	DMU 145	0.732666	91970	125527.8	-33557.8
DMU 90	0.786969	103900	132025.6	-28125.6	DMU 146	0.564204	48000	85075.61	-37075.6
DMU 91	0.806181	143050	177441.5	-34391.5	DMU 147	0.35735	27280	76339.65	-49059.7
DMU 92	0.810016	338130	417436.1	-79306.1	DMU 148	0.523785	32980	62964.79	-29984.8
DMU 93	0.621923	183420	294923.9	-111504	DMU 149	0.534428	29000	54263.59	-25263.6
DMU 94	0.700579	153650	219318.6	-65668.6	DMU 150	0.191747	21550	112387.6	-90837.6
DMU 95	0.61931	195833.3	316211.9	-120379	DMU 151	0.707382	2480	3505.885	-1025.89
DMU 96	0.797684	392366.8	491882.3	-99515.5	DMU 152	0.083006	4760	57345.22	-52585.2
DMU 97	0.696001	139190	199985.3	-60795.3	DMU 153	0.318431	34750	109128.7	-74378.7
DMU 98	0.839896	128760	153304.8	-24544.8	DMU 154	0.768077	212200	276274.5	-64074.5
DMU 99	0.869725	186060	213929.8	-27869.8	DMU 155	0.137602	27960	203194.3	-175234
DMU100	0.644483	93310	144782.7	-51472.7	DMU 156	0.501878	41750	83187.63	-41437.6
DMU 101	0.837204	590002	704729.2	-114727	DMU 157	0.720617	710243.3	985604.1	-275361
DMU 102	0.433735	53050	122309.6	-69259.6	DMU 158	0.224263	47950	213811.9	-165862
DMU 103	0.736793	48831	66275.05	-17444.1	DMU 159	0.60907	49100	80614.77	-31514.8
DMU 104	0.597937	85320	142690.7	-57370.7	DMU 160	0.845958	409230	483747.3	-74517.3
DMU 105	0.553093	99030	179047.5	-80017.5	DMU 161	0.68617	201953.3	294319.5	-92366.2
DMU 106	0.627324	124950	199179.3	-74229.3	DMU 162	0.519788	273113.3	525432.7	-252319
DMU 107	0.70346	132700	188639.1	-55939.1	DMU 163	0.793374	1339497	1688355	-348858
DMU 108	0.419547	64853.33	154579.3	-89726	DMU 164	0.598586	55200	92217.36	-37017.4
DMU 109	0.416679	43790	105092.9	-61302.9	DMU 165	0.467677	45360	96989.98	-51630
DMU 110	0.663361	73023.33	110080.9	-37057.6	DMU 166	0.260251	14160	54408.92	-40248.9
DMU 111	0.72342	63510	87791.3	-24281.3	DMU 167	0.812118	178840	220214.2	-41374.2
DMU 112	0.485986	70850	145786.2	-74936.2	DMU 168	0.593455	31480	53045.26	-21565.3
DMU 113	0.396878	41070	103482.6	-62412.6	DMU 169	0.690742	82820	119900	-37080
DMU 114	0.443386	68930	155462.6	-86532.6	DMU 170	0.606159	52050	85868.54	-33818.5
DMU 115	0.873258	25440	29132.29	-3692.29	DMU 171	0.601192	60400	100467	-40067
DMU 116	0.692768	73250	105735.3	-32485.3	DMU 172	0.505017	150723.3	298451.8	-147728
DMU 117	0.154163	12561.67	81482.99	-68921.3	DMU 173	0.23905	69643.33	291333.7	-221690
DMU 118	0.477197	79230	166032	-86802	DMU 174	0.690167	25088.33	36351.1	-11262.8
DMU 119	0.584413	51190	87592.19	-36402.2	DMU 175	0.706006	27558.33	39034.15	-11475.8
DMU 120	0.655981	221380	337479.2	-116099	DMU 176	0.830876	283652.7	341389.9	-57737.1
DMU 121	0.841695	11880	14114.38	-2234.38	DMU 177	0.419836	99280	236473	-137193
DMU 122	0.823594	7040	8547.9	-1507.9	DMU 178	0.664776	280763.3	422343	-141580
DMU 123	0.843185	1504203	1783955	-279752	DMU 179	0.843216	19850	23540.83	-3690.83
DMU 124	0.781974	311770	398696.2	-86926.2	DMU 180	0.633858	148990	235052.5	-86062.5
DMU 125	0.679867	83511.67	122835.4	-39323.7	DMU 181	0.81804	5432.1	6640.381	-1208.28
DMU 126	0.701087	4538.333	6473.286	-1934.95	DMU 182	0.299982	47190	157309.5	-110120
DMU 127	0.444087	74080	166814.1	-92734.1	DMU 183	0.527884	86890	164600.6	-77710.6
DMU 128	0.38235	61230	160141.3	-98911.3	DMU 184	0.717008	346600	483397.9	-136798
DMU 129	0.636716	102980	161736.2	-58756.2	DMU 185	0.728671	528700	725567.9	-196868
DMU 130	0.810866	406430	501229.3	-94799.3	DMU 186	0.824414	834880	1012696	-177816
DMU 131	0.143192	15503.33	108269.5	-92766.2	DMU 187	0.833429	3337.267	4004.261	-666.994
DMU 132	0.797461	483040	605722.1	-122682	DMU 188	0.652406	107110	164176.8	-57066.8
DMU 133	0.735051	157690	214529.2	-56839.2	DMU 189	0.829415	421690	508418.3	-86728.3
DMU 134	0.174762	14300	81825.64	-67525.6	**MEAN**	**0.58473**	**173203.4**	**296211.2**	**-123008**
DMU 135	0.647946	44140	68122.94	-23982.9	**MIN**	**0.001518**	**168.5**	**111012**	**-110843**
DMU 136	0.782299	441880	564847.8	-122968	**MAX**	**0.88017**	**1620**	**1840.554**	**-220.554**

Note: ES= Efficiency score; AP= Actual profit; PP= Potential profit
Source: Field survey, 2018

CONCLUSION AND RECOMMENDATIONS

Based on the findings it was observed that there is improvement in the participation of women folk in the program despite gender stereotype and this strongly owes to the mandate of the program which targets youth and women. Furthermore, the profit efficiencies of all the technical units are below the potential optimum profit level-frontier, thus sub-optimal in profit efficiency. On the average, a technical unit attained a profit efficiency of 0.5847, thus results in a potential profit lost of ₦123008. Therefore, for an average farm to achieve optimum profit it needs to increase its profit efficiency by 41.53% *viz*. enhancement of resource allocation. Besides, the profit inefficiency owes to risk *viz*. reluctance for farming against paid salaried job, market imperfection that affects marketable surplus-extension gap. Therefore, the research advise the program promoters to enhance the structure of their extension service delivery, thus addressing the challenge of extension gap affecting profit efficiency given its multifaceted links with risk.

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