Microcredit Effect on Agricultural Productivity: A Comparative Analysis of Rural Farmers in Ogun State, Nigeria

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Abstract

This study examines the effect of access to credit on the productivity of rural farming households in Ogun State, Nigeria. Data were collected, with the use of well structured questionnaire, from 240 small-scale rural farmers, who were categorized into users and non-users of micro-credit based on their statement, through multi-stage sampling technique. Descriptive statistics, budgetary technique and multiple regression analysis, involving the use of ordinary least square (OLS) method of estimation, were employed in analyzing data for this study. The results revealed that total cost per hectare of credit user farmers is higher (₦41,632.53) than that of non-credit user farmers (₦32,667.79), indicating misallocation of resources by credit-user farmers. Again, profit per hectare of credit users farmer is greater (₦44,466.59) than that of non-credit users (₦27,833.03), suggesting that, access to credit could lead to improved farmers' productivity and higher income in form of revenue and profit. Regression analysis showed that only fertilizer and farm size, both being positive, affect credit users farmer's output, whereas, planting material, agrochemical, farm size and fixed inputs affects non-credit users farmer's output. R^2 values suggested that variation in output by the two categories of farmers is explained by 57 and 52 percent of explanatory variables in their production functions, respectively. F-value of 9.84 and 10.11 recorded for the two categories of farmers respectively, and being significant at 1 percent each, led to the rejection of the hypothesis of inputs having no significant effect on output. It is thus concluded that credit could bring about higher productivity and profit in agricultural production, hence, this study recommends that existing banks should be encouraged to have more rural outlets, while there should be federal government policy of empowering rural farmers to have access to more agricultural lands.

Keywords: *Micro-credit, Productivity; Rural-farmers; Ogun State, Nigeria*

Introduction

In Nigeria, production of food crops has not increased at a rate that can keep pace with the ever increasing human population. While food production increases at the rate of 2.5%, food demand increases at a rate of more than 3.5% due to high rate of population growth of 2.83% (CBN, 2004; FOS, 1996). The apparent disparity between the rate of food production and demand for food in Nigeria has led to

(i) a widening gap between domestic food supply and total food requirement;
(ii) an increasing resort to heavy food importation, and
(iii) high rates of increase in food prices despite the heavy food importation

(Yusuf and Malomo, 2007; FMA WRRD, 1988).

Among the reasons advanced for the disparity in food production and demand has been traced to past policy that over emphasized cash crops cultivation at the expense of food crops, which necessitated successive governments in Nigeria allocating a larger share of their agricultural support to export crops, in their quest to generate tax revenue and foreign exchange earnings, right from colonial era (Amaza and Olayemi, 2002; FPRD Commonwealth Secretariat, 1990; Olatunbosun, 1978).

Over the years, successive governments in Nigeria have designed and implemented many programmes/projects, such as Operation Feed the Nation (OFN), Rural Basin and Development Authority (RBDA), Directorate of Food, Roads and Rural Infrastructure (*DFRRl),* Root and Tuber Expansion Project(RTEP) and the recent cassava revolution, all aimed at increasing domestic food supply in the country, all to little or no avail (Tijani, 2008). In addition, the peasant farmers who produce the bulk of Nigeria's food requirement are equally constrained by a number of factors such as land tenure problem, unstable input prices, non availability of/inaccessibility to credit facilities, efficient marketing system, among others (Zeller and Sharma, 2001; Olatunbosun, 1978).

However, there is an emerging consensus on the fact that, to increase the level of food crops production in the country, rural peasant farmers need to be strengthened financially, as agricultural credit has been cited as being used in developed countries to accelerate agricultural production, implying that inadequate flow of credits into agriculture is a critical factor that is militating against incremental food production in Nigeria (Aihonsu, 2001; Olomola, *et al.,* 1998; Olieh, 1980). In essence, credit is being cited as an important factor in agricultural production systems. It allows producers to satisfy their cash needs- often induced by production cycle of agriculture- for consumption and production in terms of purchase of inputs to be used on farms (Feder, *et al.*, 1990), as well as adoption of the yield-inducing techniques, both of which have been adjudged being responsible for increased demand for agricultural credit. Hence, access to credit is viewed as being necessary for economic growth and the alleviation of rural poverty (Hazarika and Alwang, 2003; Khan, 1994), thus leading to the welfare of the farmers (Feder, *et al.*, 1990). In essence, improved access to credit by rural farmers can lead to both improved and increased productivity increase agricultural production and income (Hazarika and Alwang, 2003; Khan, 1994).

Table 1: Social-Economic Characteristics of Respondents

	Credit Users		Non-Credit Users	
Variables	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Age (Yrs)				
16-30	2	1.93	10	8.00
31-45	40	38.46	37	27.21
46-60	42	40.38	64	47.06
61-75	19	18.77	22	16.18
>75	2	0.92	2	1.46
Total	105	100.00	135	100.00
Mean	50		47	
Family Size				
1-5	6	5.77	36	26.47
6-10	78	75.00	91	66.91
>10	20	19.23	8	6.62
Total	105	100.00	135	100.00
Mean	9		7	
Farming Exp. (Yrs)				
05-19	21	20.20	38	27.94
20-34	52	50.00	60	44.12
35-49	27	25.96	34	25.74
50-64	3	3.85	1	00.73
>64	-	-	1	01.47
Total	105	100.00	135	100.00
Mean	29		27	
Educ. Status (Yrs)				
Non-Formal	37	34.62	51	37.24
Primary	40	38.46	54	40.71
Secondary	19	18.27	25	18.38
Post Sec. (Grade II, NCE,OND)	3	2.88	3	2.21
Tertiary	6	5.77	2	1.46
Total	105	100.00	135	100.00
Mean	5		4	
Farm Size (Ha)				
0.1-1.5	7	6.67	24	17.78
1.6-3.0	20	19.05	44	32.59
3.1-4.5	32	30.48	30	22.22
4.6-6.0	22	20.95	18	13.33
6.1-7.5	10	9.52	06	4.44
>7.5	14	13.33	13	9.63
Total	105	100.00	135	100.00
Mean	4.40		3.46	

Source: Field Survey, 2008

Conceptual Framework

(i) **Micro-credit Concept:** Micro-credit in relation to rural economy is defined as any credit facility and ancillary services, extended to both peasant farmers and poor non-farmers (rural populace), aimed at not only boosting agricultural production, but also at improving the standard of living of the rural populace, as well as, stimulating rural sector economic growth and development (Tijani, 2008). Access to credit (formal and or informal) is often confused with participation in credit (formal and or informal) programmes, as the two concepts are often used interchangeably in many studies.

A household is said to have access to a particular source of credit if it is able to borrow from that source, although for a variety of reasons it may choose not to. The extent of access to credit is measured by the maximum amount a household can borrow (its credit limit). If this amount is positive, the household is said to have access to credit. A household is said to be participating if it is borrowing from a source of credit. A household is credit constrained when it lacks access to credit or cannot borrow as much as it wants (Diagne and Zeller, 2001). The most common reason for not borrowing was availability of sufficient own resources (Feder, *et al., 1990).*

Access to credit has generally been measured by dichotomous membership in credit programmes, and actual loan uptake, both of which may be unsuitable for estimating the true causal effect of credit access on economic outcomes (Zeller, *et a!.,* 1996; Feder, *et al.,* 1990). Since credit programme participation and loan uptake are voluntary, the measures are potentially endogenous with outcomes such as productivity and income. A farmer who avails of loans from a credit agency may be found to be more productive, .but it may not be, concluded that loans lead to higher productivity since it is plausible that farmers with more ambition and ability are likelier to seek out loans. Such traits, being unobserved, are unlikely to be controlled for in a regression relating agricultural productivity to farmer loan uptake, with the result that the regression's error term, consisting partially of unobserved farmer traits, will be correlated with loan uptake, resulting in the OLS estimate being bias and leading to difficulties in measuring access to credit.

More generally, actual loan uptake would be an accurate measure of credit only if credit limits were universally binding i.e. if everyone's loan uptake were equivalent to her credit limit (Hazarika and Alwang, 2003). Hence, credit limit- the maximum amount that may be borrowed- which is often considered to be a better measure of credit access, unlike credit programme participation or actual loan uptake which are related to demand for credit, reflecting mainly supply side factors such as the availability of credit programmes and financial resources of the lenders, is a true measure of an exogenous credit constraint (Diagne and Zeller, 2001; Diagne, 1998). Feder, *et al.* (1990), however, concluded that, whether the household can borrow the entire desired amount or is constrained by a binding upper limit on the availability of credit is of considerable consequence because it determines whether production decisions

are separable from the consumption decisions.

(ii) **Farmer's Performance Concept:**

The performance of a farmer is often adjudged through productivity and efficiency. Productivity relates to labour, land and capital (incase of large scale commercial farms), as volume of farm output is regarded as a function of cultivated area, labour and capital, as well as other variables such as weather and, pest and diseases effect (Tshibaka, 1989). Growth in output, according to Cavallo and Mundlak (1982), can come from either an increase in resources (efficiency) or from an increase in productivity.

Productivity, according to Barrett (1996), is often proxies by (physical) yield per unit of critical factors earlier mentioned especially labour and land. Literature, according to Binswanger, *et al.*, (1993), often equates physical yields with "productivity", although yields are only a partial productivity measure that fails to account for the differential use of other inputs; and that, weight of empirical evidence suggests that small farms are more productive than large farms even when differences in other inputs' use are accounted for, because power relations preclude efficient resource transfer among farms, meaning that small farms possess intrinsic productivity advantages.

Labour productivity (von Braun, *et al.* 1991) is determined by availability and quality of land, human capital and that demographic composition of the household, especially the share of women in the work force, impinges on average labour productivity in agriculture, while farm size and land quality (will) significantly impact on labour productivity. True indices of productivity performance, according to von Braun, *et al. (1991),* are income/revenue, profit and gross margin' (sometimes used as measures of profitability), and are all expressed per unit of land (farm size), and per man-day of labour (both family and hired).

Normally, the survival of a firm (farming business), according to Blank, *et al.,* (2004), depends on its profitability, both in absolute and relative terms. The authors concluded that productivity growth, which is adjudged to have strong relationship with farm size, is a key to (sustainable) future profitability of agricultural sector, and that farm profit vary widely by farm type, size and location, among others.

Table 2: Distribution of Respondents According to Secondary Occupation

Occupation	**Credit Users**		**Non-credit Users**	
	Frequency	**Percentage**	**Frequency**	**Percentage**
Informal Occupation	83	75.00	124	91.67
Formal Occupation	22	25.00	11	8.33
Total	105	100.00	135	100.00

Source: Field Survey, 2008

Table 3: Budgetary and Ratio Analysis per Hectare by Category of Farmers

Category	Total Cost (₦/Ha)	Gross Revenue (₦/Ha)	Profit (₦/Ha)	Rate of Return on Investment (RRI)
Users	41,632.53	86,099.12	44,466.59	1.07
Non-users	32,667.79	60,500.83	27,833.03	0.85

Source: Field Survey, 2008

Objectives of the Study

The main objective of this study is to analyse the effect of microcredit on the performance of food crops rural farmers in Ogun State, while specific objectives considered are, to:

i. describe the socioeconomic profile of the rural farmers;
ii. determine and compare the productivity of factor inputs used by users and non-users of micro credit among the farmers;
iii estimate and compare revenue and profit per critical factor inputs used by users and non-users of microcredit among the rural farmers; and
iv. make policy recommendations on the basis of research findings.

Study Hypotheses

The hypotheses tested in this study, in the null form are:

1. *Ho*: There is no significant difference in the mean revenue and profit level of users and non-users of microcredit.
2. *Ho*: There is no significant effect of inputs used by the two categories of farmers on their outputs.

Materials and Methods

The Study Area

The study was carried out in Ogun State, which is endowed with extensive fertile soils suitable for agriculture and enjoys abundant rainfall almost all year round, and as well has a number of rivers, and streams. The principal employer in the rural parts of the state is small farm-holding agriculture, while major farming practice in the rural parts of the state is mixed cropping. Main crops grown in the rural settings within the state include both arable food and tree crops.

Data Collection and Sampling Technique

Cross-sectional data were collected from 240 respondents from eight villages that were evenly distributed among four local government areas, representing the major administrative divisions from which the state emerged. A multistage sampling technique was used to select sample units within the state, while well structured questionnaire were used to collect information on the socio-economic characteristics of the fanners, in addition to the production cost and returns for crops as cassava, maize, and yam. Respondents were categorized into two main groups,

namely users and non users of microcredit based on their statement.

Data Analysis

Descriptive statistics, multiple regression analysis and budgetary techniques were employed for data analysis. Descriptive statistics involving the use of frequency table, percentages and mean were used to describe respondents' socioeconomic characteristics, while budgetary techniques that involves the calculation of revenue, profit, rate of returns on investment among others were carried out to know how accessing credit has positively or otherwise, affected the productivity of the farmers, whereas, the regression analysis was carried out to show the marginal effect of the use of various inputs could bring to bear on the output of these crops.

Model Specification:

(a) **Budgetary technique:** This involve estimation of total cost of production, revenue, profit, which in pure economic term represent return to investment in excess of that obtainable elsewhere, and rate of return on investment (ROI or RRI). The techniques as specified by Adewuyi (2007) and Adewuyi, *et al.* (2006), are expressed thus:

$\prod = TR - TC$
$TR = P.Q$
$TC = TVC + TFC$
$RRI \text{ or } ROI = \prod / TC$
Where, $\prod$ = Profit per hectare (₦/ha)
TR = Total revenue per hectare (₦/ha)
P = Unit price of output (₦)
Q = Quantity of output per hectare (Kg/ha)
TC = Total cost of production per hectare of land (₦/ha)
TVC = Total variable cost (₦)
TFC = Total fixed cost (₦)

(b) **Regression Analysis:** This was carried out to find out the marginal effect the inputs, especially the critical ones, will have on the output of individual farmer in each category of respondent. Cobb-Douglas production functional form was chosen for this analysis because of its wide use/acceptance, theoretical fitness, manageability and suitability when dealing with small farms (Ajibefun *et al.*, 2002; Aihonsu, 1999). Its general form is specified thus:

$Q_i = \alpha\ X_{1i}^{\beta 1} X_{2i}^{\beta 2} \ldots\ldots\ X_{4i}^{\beta 4}\ ;\ e_i$, which when line arised becomes

$LnQi = \alpha + \beta_1 LnX_{1i} + \beta_2 LnX_{2i} + \ldots\ldots\ldots + \beta_4 LnX_{4i} + e_i$

Where:
X_1 = Farm size (ha)
X_2 = Labour wage (₦)
X_3 = Fertilizer or Manure (Kg)
X_4 = Planting materials (₦)
X_5 = Fixed inputs (₦)
X_6 = Agro-chemicals (liters)
e_i = Error term
α & β are parameters that were estimated.

Results and Discussion

Socio-economic characteristics: Table1 shows some contrasting characteristics between users and non-users of micro-credit. Most of the respondents were within the age range of 31-60, corresponding to 79% for users and 74% for non-users, while mean age were 50 years and 47 years for the two categories, respectively. The age factor differential

between these categories of farmers, agrees somewhat with findings by Adewuyi, *et al.* (2006) in a similar study involving categorization of farmers, but on the determinants of farm mechanization among arable crop farmers in Oyo State, implying that propensity for the use of micro-credit in farm operation is more popular among the relatively younger farmers, who are still active, as such, access to credit facility by this age group will impact positively on their productivity.

Furthermore, difference between the groups is noticed in their educational status (mean year of schooling was 5 and 4 for users and non-users respectively), family size, farm size and farming experience. Users of micro-credit were more educated, which again agrees with Adewuyi, *et al.* (2006), but contrast with the finding of their study in the area of family size, as users have larger family size than non-users. This contrast could be due to emigrational effect on the part of non-users of micro-credit, in search of other source of income as a way of taking care of their credit needs, due probably to their inability to access credit facility. This is affirmed by their higher percentage in secondary occupations shown in table 2, a submission that agrees with Chavas, *et al.* (2005) findings in a study in Gambia. Again, micro-credit users are more endowed on average with farmland resources as reflected in table 1, which might probably be due to the users' access to credit facility which must have enabled them to purchase or lease more land, the effect of which is increase in marginal productivity of labour (Zeller, *et al.*, 2001).

Table 4: Results of Regression Analysis

		Credit Users		Non-credit Users	
Variables		**Coefficients**	**t-value**	**Coefficients**	**t-value**
Constant		7.204***	(2.807)	18.890***	(7.224)
Farm size	X_1	0.681***	(3.531)	1.035***	(6.451)
Labour wage (Man-days)	X_2	0.005	(0.033)	0.112	(0.802)
Fertilizer or Manure (Kg)	X_3	0.444***	(3.128)	-0.170	(-1.529)
Planting materials	X_4	-0.201	(-1.137)	-0. 370**	(-2.366)
Farm tools	X_5	-0.150	(-1.330)	-0.644***	(-5.233)
Agro-chemicals	X_6	0.102	(0.852)	0.222*	(1.936)
R^2		0.573		0.520	
F		9.844***		10.113***	

Source: Field Survey, 2008

*** = 1% α-level; ** = 5% α-level; * = 1% α-level

Table 5: Difference of Means Test

Variable	**z-computed**	***p>/z/***	**Decision**
Revenue (Rev_{cu} –Rev_{ncu})	2.140	0.099	Reject *Ho*
Profit (Pft_{cu} -Pft_{ncu})	4.573	0.010	Reject *Ho*

Source: Field Survey, 2008

Budgetary Analysis: Table 3 shows the variable, fixed and total costs per hectare for users of micro-credit being higher (₦29,939.15, ₦11,693.38, and ₦41,632.53, respectively) than that of non-users (₦25,479.82, ₦7,187.97, and ₦32,667.79, respectively). This have serious implication on excessive resource use on farm by micro-credit users, calling for micro-credit policy design that ties provision of credit facility or participation in credit prograrnme with training on prudent management of funds by credit beneficiaries and or providing such credit in kind, a method which Diagne and Zeller (2001) claimed is not too good as rural households (farmers in this study) are left with little choice of finding what is optimal for themselves, given their specific constraints. Moreover, observed pattern in the table with respect to the three costs are operation of law of variable proportion in the case of credit users and law of economies of scale in the case of nonusers respondents.

Table 3 indicates revenue per hectare by categories of farmers, and per hectare by enterprise type. Revenue per hectare by categories was higher for credit users (₦86,099.12) than non-credit users (₦60,500.83), showing the effect of access to credit on the employment of improved technologies that translated to higher revenue for credit users, whereas, revenue per hectare by enterprise type shows micro-credit users recording higher revenue for cassava and maize than non-users, while non-credit users farmer recorded higher revenue for yam enterprise than credit users farmer. Overall, credit users recorded average revenue of ₦81,909.94 for all the enterprises combined, while noncredit users recorded average revenue of ₦64,519.96 for the same enterprise combination, showing again the effect of credit on the employment of improved technologies that eventually result into higher revenue. Profit per hectare by category of farmers, as shown in table 3, has credit users leading with a value of ₦44,466.59, whereas non-users farmer recorded a value of ₦27,833.03.

Conclusion derivable from these results is that credit users practice intensified farming system due to the use of high yielding technology acquired with credits accessed from credit institutions, while noncredit users resorted to extensive land cultivation to break-even, implying that access to credit could lead to improved farmers' productivity and higher income (revenue). This is consistent with Bravo-Ureta and Evenson (1994), and findings by Olomola (1988). The difference of means test shown in table 5 revealed that both the revenue and profit per hectare, for both users and non-users of micro credit, are statistically significant at 10 and 1 per cent level, implying that access to credit accounted for higher value of these variables for credit users compared to that of non-users, thus leading to the reject of the null hypothesis that there is no significant difference between users and non-users of micro credit. The outcome of this test is in line with the outcome of similar test carried out by Adewuyi, *et al.*, (2006) in a study, that involves categorization of farmers in Oyo State into users and non-users of farm machinery.

Regression Analysis: Table 4 shows that fertilizer and farm size positively affected crop outputs for credit users, whereas for non-credit users, the variables that significantly affect outputs are planting materials, agro-chemical, farm size and fixed inputs; with agro-chemical and farm size being positively significant. Farm size coefficient being positively significant for the two groups indicates the existence of positive relationship between farm size and output.

Furthermore, fertilizer and farm size being positively significant for credit users implies that the use of fertilizer will increase as farm size increases, a conclusion that agrees findings from (Amaza, *et al.,* 2001 and, Tadesse and Krishnamoorthy 1997) that, farmers should be encouraged to use more fertilizer to increase production and to improve productivity of their existing land, as fertilizer is considered to be a major land enhancing input, whereas for non-credit users, positive correlation between agro-chemical and farm size indicate that as farm size increases use as well as cost of chemicals to control weeds and pests increases, a case of substitution of labour for improved technology as farm size increases. This is plausible because of general labour shortage being experienced presently at the rural sector cum high cost of this labour.

These submissions are in line with the findings of Adewuyi, *et al.,* (2006) on farm mechanization among arable crop farmers in Oyo state. Finally, R^2 value for the estimated equation, for micro credit users, shows that 57 percent variation in the equation were due to the specified explanatory variables, while for non-users equation, 52 percent of the variation were due to explanatory variables. The low value of R^2 for the two categories of farmers has to do with the nature of data used in this study (cross-sectional), whose sample observations have different units (Gujarati and Sangeetha, 2007). The *F*-value, which is positive and significant at 1 percent level, for the estimated equations for the two categories of farmers indicate that, the hypothesis that the inputs have no significant effect on output was rejected.

Conclusion and Policy Recommendation

Arising from the findings in this study, it is concluded that, access to credit brings about higher productivity and profit in agricultural production. Meaning that, if Nigeria government really want to attain the objective of self-sufficiency in food and fiber production, the government need to put in place policy that will encourage existing banks (both commercial and micro-finance) to have functional rural outlets and facilities package with financial management training, for easy accessibility by rural farmers and judicious use of this credit for the purpose it is taken. In addition, on going federal government land reform exercise should make acquisition of large expanse of land for agricultural practices possible and easy, so that rural peasant farmers can go beyond their present subsistence level of farming, while policy that will address astronomical increase in the price of critical agricultural inputs is seriously canvassed for.

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