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MICRO-CREDIT UTILIZATION AND ITS IMPACT ON FAMERS MAIZE OUTPUT AND HOUSEHOLD FOOD SECURITY IN KADUNA STATE, NIGERIA

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ABSTRACT

This study examined micro-credit utilization and its impact on farmers' maize output and household food security in Kaduna State, Nigeria. Primary data based on 2015 farm season were collected from two categories of farmers; beneficiaries and non-beneficiaries of micro-credit with the aid of structured questionnaire and interview. A multi-stage sampling procedure was adopted to collect data from four Local Government Areas (LGAs): Zango-Kataf, Chikun, Lere and Giwa. The data were analyzed using descriptive statistics and Propensity Score Matching (PSM) model. The study revealed that there is statistically significant difference between beneficiaries and non-beneficiaries of microcredit with respect to age, educational level and farming experience of the respondents sampled. The results from PSM estimator revealed that micro-credit utilization had a positive and statistically significant impact on maize output and food security among maize farming households. The Nearest Neighbor marching (NNM) shows that maize output per hectare and per capita income of 2,920.47 kg/ha (29%) and N254, 080.94/annum (29%) on average was achieved, by maize farming household who used microcredit during the production period under study. The study revealed that there is a significant impact of microcredit accessibility on maize output and household food security of the beneficiaries in the study area. There is need for the provision of infrastructure such as electricity, roads, markets, portable water, health and communication to compliment credit use that would improve the welfare of the farmers. There is also the need to improve the pricing system of maize output. The credit should be monitored by relevant bodies for effective utilization in maize production to avoid diversion to consumption activities.

Keywords: Beneficiaries; maize farmers; micro-credit; poverty alleviation

INTRODUCTION

Since its introduction in the mid-1970s, microcredit has been considered a major tool for development and poverty reduction in many developing countries. By the end of 2007, microcredit programmes reached over 154 million clients worldwide, notably women in developing countries. The promise of microfinance lies in its ability to empower people to

work on their own to eradicate poverty while avoiding dependency (Fisher and Sriram, 2002; Mohummed and Wencong, 2013). Proponents of microcredit claimed that it helps poor people to reduce risk, raise productivity, obtain high returns on investment, increase income, and improve the quality of their lives and that of their households (Goldberg, 2005; Girabi and Mwakaje, 2013). It is further believed that microcredit can play a major role in assisting the poor to come out of poverty by providing start-up capital, which they have been unable to access historically because financial markets are underdeveloped in poor countries (Getaneh, 2004). It is also importance to note that microfinance will enable smallholder farmers to easily access credit facilities without collateral. There is, however, no consensus among researchers about the actual impact of microcredit on poverty reduction and household food security (Fisher and Sriram, 2002; Weiss and Montgomery, 2005; Banerjee *et al*., 2009). According to Karlan and Zinman (2010), despite claims about the role of microcredit in lifting the poor out of food security and poverty, there is little agreement as to whether credit does borrowers more good than harm. Food security can be defined as the existences of sufficient, safe and nutritious food available comprising key concepts on sustained basis for all people in all times at prices commensurate with their income (Economist, 2012; Rukhsana *et al.*, 2017).

Studies have shown that people living in poverty devise mitigation measures to overcome their economic vulnerability (Yunus, 2004). From our discussion above and document policy by most developing countries especially Nigeria, the most important objective of microcredit facilities is to alleviate poverty and enhance food security status of rural farming households and urban populace.

Considering credit as a crucial factor in ascertaining sustainable development of the agricultural sector, it is necessary to find ways in which maize farmers' access to credit can be ensure. Most small-scale maize farmers have little or no access to formal sources of credit, microcredit can provide them access to purchase of inputs such as seed, fertilizer and irrigation at proper times. This, in turn, helps use of new production technologies thereby increasing food production and ensuring food security. It is pertinent to note that Maize is an important food and feed crop in Nigeria, and remains an important crop for rural food security. The production of the crop must be increased in order to ensure food and income security through the provision of credit to procure improved maize varieties and technologies. The question would then be the extent to which microcredit has been utilized and whether or not it has empowered the beneficiaries. Hence, this study focuses on impact of microcredit on food security of maize farmers in Kaduna state, Nigeria. socio-economic characteristics of beneficiaries and non-beneficiaries of microcredit in the study area which specifically examine the impact of microcredit utilization on farmers' maize output and household food security by beneficiaries and non-beneficiaries of microcredit in Kaduna State of Nigeria.

MATERIALS AND METHODS

Study Area

The study was conducted in Kaduna State, North-West zone of Nigeria which has 23 Local Government Areas (LGAs) with Kaduna as its capital. The State lies between Latitudes 11° 32‟ and 09° 02‟ N and longitudes 08° 50‟ and 06° 15‟ E (Kaduna state government, 2012) and shares common borders with Zamfara, Katsina and Kano States to the North, Niger State to the West, Bauchi and Plateau States to the East and the Federal Capital

Territory, Abuja and Nassarawa State to the South. It occupies an area of approximately 48,473.3 km^2 and a projected population of 8,853,101 persons in 2018 at a growth rate of 3.2 percent per annum based on National Population Census (NPC) of 2006. The entire land structure consists of an undulating plateau with major rivers in the State including Rivers Kaduna, Kagom, Gurara and Gaima. The state experiences a tropical continental climate with two distinct seasonal climates, dry and rainy seasons. The wet season is usually from May to October and dry season often November to April. The mean annual rainfall ranged from 1,016 mm to 1,524 mm and the average annual temperature is 25.2 °C (NPC, 2006).

Sampling Procedure, Sample size and Data Collection

A multi-stage sampling procedure was employed to select the appropriate sample of beneficiaries and non-beneficiaries of microcredit in the study area. The first stage was the stratification of the study area into four (4) zones in line with the KADP subdivision of the State and these are Maigana, Samaru Kataf, Birnin Gwari and Lere zones (KADP, 2012). The second stage was the purposive selection of one LGA within each of the four operational zonal offices of the KADP (2015) in the State. This selection was based on the number/predominance of both formal and informal microcredit institutions that grant agricultural credit to individuals and/or households in the LGAs. Based on a reconnaissance survey, Zango-Kataf, Chikun, Lere and Giwa LGAs were selected for the purpose of the study. The third stage involved the random selection of one microfinance bank (MFB) from each of the LGAs selected for the study. The selected microfinance banks and their corresponding LGAs as well as sampling frame for beneficiaries are presented in Table 1. It is pertinent to note that these four MFBs had strong interest towards lending of agricultural credit to small-scale farmers.

Table 1: Distribution of agricultural credit beneficiaries by selected MFBs in the state

Local Govt. Area	Microfinance Bank	Beneficiaries
Chikun	SabonYelwa MFB	423
Giwa	Giwa MFB	457
Lere	Balera MFB	406
Zango-Kataf	Atyap MFB	390
Total		1,676

Source: Reconnaissance Survey (2015)

Table 2: Sampling size of respondents

Local Government Area	Beneficiaries	Non-beneficiaries
Chikun	42	42
Giwa	46	46
Lere	41	41
Zango-Kataf	39	39
Total	168	168

Source: Reconnaissance Survey (2015)

Primary data were collected in 2015 farming season with structured questionnaires administered on both beneficiaries and non-beneficiaries of microcredit with the help of trained enumerators under the supervision of the researcher. Thereafter, 10% of the sampling frame, 168 beneficiaries were randomly selected from the four microfinance banks as respondents. Similarly, 168 non-beneficiaries of micro-credit were also randomly selected from a list of households obtained from the respective Zonal KADP resulting in a total number of 336 respondents for the entire study as illustrated in Table 2.

Analytical Techniques

Descriptive statistics such as percentage mean and standard deviation and Propensity Score Matching (PSM) model were used to analyse the data. PSM was used to examine the impact of microcredit utilization on farmers' maize output and household food security. The estimated propensity scores are used to estimate the Average Treatment Effect on the Treated (ATT) which was the parameter of interest as:

$$\delta = E\left(\frac{Y_i^1 - Y_i^0}{D_1=1}\right) = E\left\{\frac{E\left(\frac{Y_i^1}{D_1=1}, P(Z_i)\right) - E\left(\frac{Y_i^0}{D_1=0}, P(Z_i)\right)}{D_1=1}\right\} \quad (1)$$

Where: P (Z_i) is the P-Score, Y_i and Y_i are the potential outcomes maize output and food security status) in the two counterfactual situations of receiving treatment (beneficiaries of micro-credit and no treatment non-beneficiaries of micro-credit).

Two important properties of the PSM are the balancing property and conditional independence assumption (CIA). Testing for this property is important to ascertain if maize farmers' behaviour within each group is actually similar. Related to the balancing of P-score is CIA, which states that participating in micro-credit is random and uncorrelated with the maize output or food security status by the farmer, once the set of observable characteristics, Z are controlled. A further requirement is the common support condition, which requires that persons with the same values of covariates Z have positive possibilities of being both beneficiaries and non-beneficiaries (Heckman *et al.*, 1999). Thus, all individuals in the common support region actually can exist in all state that is

$$0 < P(D = {}^{1}/_{Z} > 1) \quad (2)$$

The challenge in impact evaluation based on observational data lies on the estimation of the counterfactual of the treated group based on the observations on the untreated group. Nevertheless, these two groups are very unbalanced; that is, they are different to a certain degree socially and economically. However, in the literature researchers have often employed a number of statistical strategies to ensure the comparability of the two groups. In alignment with those authors, this study chose the Propensity Score Matching (PSM) method to assess the impact of microcredit utilization on farmers' maize output and food security.

Prior to the evaluation of the impact of microcredit, the propensity score of microcredit utilization that is probability to utilize microcredit was estimated and assessed in terms of its success in balancing the distribution of covariates across the beneficiaries and non-beneficiaries of microcredit among maize farmers. Besides balancing the distribution of the covariates across users and non-users of microcredit, another difficulty in the implementation of PSM lies on the choice of the most appropriate algorithm. While some

authors advocate the use of several algorithms to ensure robustness of the impact's findings, others believe that selecting the right algorithm to match the treated and untreated groups is critical. Thus, in our analysis we first present the extent of bias between beneficiaries and non-beneficiaries, followed by the estimation of the propensity score, the choice of the most appropriate algorithms and finally the impact's results.

Food Security Cost-of-Calorie Index

The cost-of-calorie index method as employed by Oladimeji *et al.* (2018) was used to determine food insecurity line. The food insecurity line is given as:

$$lnX = a + bC \quad (3)$$

Where X is the adult equivalent food expenditure and C is the actual calorie consumption per adult equivalent in a household. The recommended minimum daily calorie requirement per adult equivalent is 2700 kcal. The food insecurity line (S) was determined the equation:

$$S = e^{(a+bL)} \quad (4)$$

Where: S = cost of buying the minimum calorie intake (food security line), a = intercept
b = slope, L = recommended minimum daily energy (calorie) level 2700 kcal

RESULTS AND DISCUSSION

Socio-Economic Characteristics of Beneficiaries and Non-beneficiaries of Micro - credit

Table 3 summarizes the socio-economic characteristics of beneficiaries and non-beneficiaries of micro-credit in Kaduna State, Nigeria. The result of age variable indicated that majority (76%) of beneficiaries and non-beneficiaries (81%) of micro-credit were within the age brackets 29-48 years with mean age of 42 and 40 years respectively. The mean age of the two categories of respondents shows that large numbers of respondents were young, active and are likely to be more productive, such as given adequate level of farming resources; the farmers have the potential to increase their farm output. Sani and Oladimeji. (2017) opined that age of household head is considered an important variable in terms of experience and responsibility. The finding is in line with Oladimeji and Abdulsalam (2013) and Abdulazeez *et al.* (2018) that found the mean age of rice farmers in Kwara and Kogi States respectively to be 42 years and opined that age of farmers significantly influence the decision making process of farmers with respect to production-related decisions.

Results also revealed that majority (82%) of the beneficiaries of micro-credit and non-beneficiaries (89%) were male. It can therefore be inferred that beneficiaries of micro-credit and non-beneficiaries among male and female was highly skewed towards the male maize farmers. The predominance of male farmers is an indication that farming is generally labour intensive and still a strenuous enterprise in Nigeria in line with studies of Babalola (2014) and Oladimeji and Abdulsalam (2013). Furthermore, the tedious and time-consuming nature

of the cultural practices involved in arable cropping discourages most prospective female entrances into the business.

The study revealed that the average household size among respondents in the study areas was greater than 6 members per household. This is above the national average of approximately 5 person per household (Babalola, 2014; NBS, 2009). The larger household size of beneficiaries of micro-credit could be of advantages in terms of ready labour supply in the face of hired labour scarcity and high wage rate that is consistent with findings of Kareem *et al*. (2008). The finding is consistent with the study of Onojah (2013) who found out that household heads in maize farming belonged to family with an average of 12 members.

Results also revealed that the difference between beneficiaries and non-beneficiaries of micro credit was statistically significant as a result of education level. Research has shown that, access to education enables households in the rural area to adapt to new agricultural methods, cope with risk, and respond to market signals and consequently improve agricultural productivity (Rosalyn, 2002). This finding is in line with a similar study on microfinance scheme in Western Nigeria by Oke *et al.* (2007) in which they reported that 81 % of the respondents had formal education and it concluded that the high level of literacy was likely to afford respondents better managerial skills in handling their businesses.

Table 3: Dominance indicators of socio-economic characteristics of respondents

Variable	Class	Beneficiaries		Non		Pooled		
		F	%	F	%	F	%	t-value
Age	29-38	55	33	75	45	130	39	2.91***
	39-48	73	43	61	36	134	40	
	Mean	42		40		41		
	Stdev.	7.38		8.11		7.84		
Sex	Male	137	82	150	89	287	85	-
	Female	31	18	18	11	49	15	
Marital status	Married	135	80	133	79	268	80	-
	Single	29	17	31	18	60	18	
	Divorced	2	1	2	1	4	1	
	Widowed	2	1	2	1	4	1	
Household size	2-7	43	26	72	43	115	34	4.29***
	8-13	67	40	64	38	130	39	
	Mean	12		9		10		
	Stdev	5.44		4.89		5.35		
	Min. (max.)	2(22)		2(25)		2(23)		
Educational	Adult	20	12	54	32	74	22	6.60***
Level	Primary	38	23	60	36	98	29	
	Secondary	70	42	21	13	91	27	
Experience	Less than 10	59	35	97	58	156	46	2.03**
(years)	11-15	67	40	26	15	93	28	
	Mean	25		23		24		
	Stdev	13.05		11.1		10.08		
	Min. (max.)	5(45)		3(43)		3(43)		

***P<0.01 and **P<0.05

It was found that pooling the respondents together, 46% had less than 10 years of farming experience, 28% had 11-15 years of experience, and only 3% had above 26 years of experience in farming with mean farming experience of 24 years. Within the beneficiaries of micro-credit, 35% had less than 10 years of farming experience, 40% had 11-15 years of experience, with mean farming experience of 25 years. In addition, within the non-beneficiaries of micro-credit, 58% had less than 10 years of farming experience, 15% had 11-15 years of experience with mean farming experience of 23 years. The implication is that the more experienced a farmer is, the better he is to utilize the loans advanced to him judiciously. This is likely to impact positively on the effective management and organization of farms and enhances loan repayment (Nwankwo, 2004).

Food Security Status between Beneficiaries and Non-beneficiaries Microcredit based on Socio-economic Characteristics

The food security status of beneficiaries and non-beneficiaries of micro-credit among maize farming households in Kaduna State based on their socio-economic characteristics are present in Table 4. Food security status was determined after estimating the food security line (₦148) which represents the minimum cost of consuming 2,700 kcal per person on a daily basis to be food secure. The pooled result revealed that 31% and 69% of maize farmers were food secure and insecure respectively. The result revealed that male-headed maize farming households were more food secure than female-headed maize farming households based on the pooled data and even across beneficiaries and non-beneficiaries of micro-credit. However, there were more food secure maize-farming households among micro-credit beneficiaries (35.12%) compared non-beneficiaries (26.19%).

It was observed in the pooled data in Table 4 that majority of food secure maize farming households (55.77%) and food insecure maize farming households (47.41%) were those with household heads aged between 34-43 years in both groups. It is also noted that the number of food secure and food insecure maize-farming households decreased with age of household heads beyond certain age point between the age group 34-43 years with both categories of respondents.

This would therefore imply that the relationship between food security status and age could be quadratic which is also consistent even after accounting for micro-credit status. The result also implies that married-headed maize farming households were more likely food secured than their unmarried counterparts irrespective of their micro-credit status. However, married-headed and unmarried-headed maize farming households that benefited from micro-credit were more likely food secure than married-headed and unmarried-headed counterparts that did not benefit from micro-credit.

Result also shows that 97.12% and 2.88% maize farming households falling in the household size of 2-7 and 8-13 respectively were food secure while no maize farming household with more than or equal to 14 members were found to be food insecure which may be due to large number of dependent either too young to participate in farming activities or enrol in formal or Arabic education and partly or entirely not contributing to farm labour. This could imply that the probability to become food secure decreases with increase in household size in the pooled data. This could imply that, although the likelihood to become food secure decreases with increase in family size irrespectively of micro-credit status, maize faming household with family size ranging from 2-13 would be more likely to be food secure if they receive credit than if they do not. The proportion of maize farming households that

operated either small or medium scale farm with access to micro-credit was greater compared to maize farming households that operated either small or medium scale farm without access to micro-credit. In other words, access to credit could increase the probability of small and medium scale maize farming households to become food secure while reducing the likelihood of medium scale farming.

Table 4: The food security status of maize farming households based on socio-economic characteristics by micro-credit group

		Beneficiaries		Non-beneficiaries		Pooled	
Variable	Range	FS	FI	FS	FI	FS	FI
Sex	Male	50	85	39	111	89	196
		(84.75)	(78.7)	(88.64)	(89.52)	(86.41)	(84.48)
	Female	9	23	5	13	14	36
		(15.25)	(21.3)	(11.36)	(10.48)	(13.59)	(15.52)
Age (years)	21-30	5	11	7	32	12	43
		(8.33)	(10.19)	(15.91)	(25.81)	(11.54)	(18.53)
	31-40	35	56	23	54	58	110
		(58.33)	(51.85)	(52.27)	(43.55)	(55.77)	(47.41)
	>40	20	41	14	38	34	79
		(33.33)	(37.97)	(31.82)	(30.65)	(32.69)	34.05
Marital status	Married	44	91	33	100	77	191
		(73.33)	(84.26)	(75)	(80.65)	(74.04)	(82.33)
	Single	16	17	11	24	27	41
		(26.67)	(15.74)	(25)	(19.35)	(25.96)	(17.67)
Household Size	2-7	57	54	44	66	101	120
		(95)	(50)	(100)	(53.23)	(97.12)	(51.72)
	8-13	3	41	0	45	3	86
		(5)	(37.96)	(0)	(36.29)	(2.88)	(37.07)
	14 & above	0	13	0	13	0	26
		(0)	(12.04)	(0)	(10.48)	(0)	(11.21)
Farm size (ha)	Small scale	29	57	32	100	61	157
		(48.34)	(52.78)	(72.73)	(80.65)	(58.66)	(67.68)
	Medium scale	31	51	12	24	43	75
		(51.67)	(47.22)	(27.27)	(19.35)	(41.35)	(32.33)

*Source: Author's estimates from survey data (2015); Note: Cost of calorie function is given by Ln X=4.23 + 0.00028 *C where X=Per capita daily food expenditure, C= Per capita daily calorie consumption. Food security line = N148/person/day. <=2 ha, 2.1-5 ha and >5 ha of land corresponds to small, medium and large scale farm respectively. Values in parentheses are percentages. FS = Food secure, FI = Food Insecure*

Impact of Microcredit Utilization on Farmers' Maize Output and Household Food Security

Extent of selection bias in the decision of microcredit utilization prior to matching

Table 5 presents the difference between the beneficiaries and the non-beneficiaries based on the mean values of their selected socio-economic characteristics and the extent of bias that would be introduced if the naïve method of impact evaluation based the difference-in-means estimator was undertaken. Although the list of covariates retained appears too

small, but it is still consistent with the ignorability assumption since a large list of covariates would violate it. Three algorithms were considered as the maintained hypothesis and then four statistics: the t-value, Standardized Percentage Bias (SPB), Rubin' B and the Rubin's R-were retained for the evaluation of the extent of bias between the treated and the control groups after matching based on the algorithms under study.

It is evident from Table 5 that the beneficiaries and the non-beneficiaries differ in four socio-economic characteristics, age, sex, education and farm size out of the six retained based on the t-values of the difference in mean. The implication of this finding is that, the beneficiaries were significantly older, had more males, had more farming households headed by no formally educated people and had larger farms than the non-beneficiaries of microcredit. Based on the Standardized Percentage Bias (SPB), it can be said that the four covariates are sources of substantial bias between the two groups since the values are greater than 30% in absolute value.

Table 5: Comparison of beneficiaries and non-beneficiaries of microcredit among maize farmers in terms of socio-economic characteristics prior to matching

	Mean					
Variables	Treated	Control	T-value	SPB	Rubin's B	Rubin's R
Age	42.35	39.89	2.91***	31.70	174	6.24
Sex	0.80	0.89	-2.29**	-25.00		
Marital status	0.80	0.79	0.27	2.95		
Household size	6.54	6.56	-0.05	-0.52		
Education	0.37	0.14	5.06***	55.25		
Land	3.40	1.18	14.92***	162.75		

***P<0.01 and **P<0.05 levels of probability. Treated = Beneficiaries, Control= Non-beneficiaries. SPB = Standardized Percentage Bias

The Rubin's B is greater than 25% while the Rubin's R is greater than 2 which confirm the extent of bias between the beneficiaries and the non-beneficiaries. The implication of these findings as mentioned earlier is that the beneficiaries and non-beneficiaries are not directly comparable; that is, the non-beneficiaries cannot be used as the counterfactual of the beneficiaries. This necessitates the choice of the propensity score-matching algorithm in Table 5.

Choice of the Propensity Score Matching Algorithm

Table 6 shows the comparison between Nearest Neighbor Matching (NNM), the Radius Matching (RM) and the Kernel Matching (KM) algorithms. Three common PSM algorithms from the literature were considered in this study: the NNM, RM and KM algorithms. According to the three algorithms, the difference in means of the socio-economic characteristics between the beneficiaries and non-beneficiaries is completely eliminated based on the t-value. In terms of the SPB, the NNM has reduced the number of substantial bias from four to two while the RM and the KM has reduced the substantial bias from four to three. Only the Rubin's B estimate for the NNM is less than 25% which implies that only the NNM is effective in balancing the covariates across beneficiaries and non-beneficiaries

based on the Rubin's B criterion. But in terms the Rubin's R, it can be said that all the three algorithms were effective in balancing the covariates across the treated and control groups. Overall, it can be concluded that the NNM is the best algorithm for the estimation of the impact of microcredit utilization on Maize output and household food security.

Table 6: Comparison between NNM, RM and KM algorithms

Algorithms	T-value	SPB	Rubin' B	Rubin's R
NNM	6	4	19.7	0.69
RM	6	3	25.8	1
KM	6	3	26.3	1.15

Note: NNM=Nearest Neighbor Matching, RM=Radius Matching and KM=Kernel Matching

Impact of Microcredit Utilization on Maize Output

Table 7 shows impact of microcredit utilization on maize output. The result revealed that microcredit utilization has a positive and statistically significant impact on maize output among maize farming households in the study area. Specifically, the NNM shows that a maize farming household who used microcredit during the production period under study achieved maize output of (29%) or 2,920.47 kg per hectare, on average. Moreover, a positive and statistically significant impact of microcredit utilization on maize output is found for male-headed maize farming households (3,381.82 kg) and no statistically significant impact is found for female-headed maize farming households. The impact for maize farming households cultivating less than or equal to two ha (2,774.81 kg) was positive and statistically significant while the impact for those operating more than 2 ha was not statistically significant. It should be noted that the impact based on the RM and KM was equally positive and statistically significant therefore showing the robustness of the findings. However, the RM and KM overestimate the impact of microcredit utilization on output.

Table 7: Average treatment effect on the treated (ATT) of microcredit utilization on maize output among maize farmers

Impact	NNM	RM	KM
Pooled	2,920.47***	3,528.14***	3,751.25***
	(1,273)	(1,009.41)	(1,013.84)
Male (sex)	3,381.82***	4,304.42***	4,551.76***
	(1,461.68)	(1,148.91)	(1,155.71)
Female	1,031.25	1,340	2,257.25
	(1,693.02)	(1,915.72)	(2,050.36)
<=2ha (farm size)	2,774.81**	3,245.92***	3,120.22***
	(1,228.37)	(959.5)	(938.44)
>2ha	85.26	1426.32	1711.13
	(2,845.4)	(2,885.76)	(2,883.81)

Note: ***P<0.01 and **P<0.05 levels of probability. NNM=Nearest Neighbor Matching, RM=Radius Matching and KM=Kernel Matching. Standard errors in parentheses

Impact of microcredit utilization on food security

Table 8 illustrates that the impact of microcredit utilization on food security. The per capita farm income is positive and statistically significant. Specifically, using microcredit raised per capita income, on average, (29%) or by ₦254, 080.94 annually.

Table 8: Average treatment effect on the treated of microcredit utilization on food security among maize farmers

Impacts	NNM	RM	KM
Pooled	254,080.94***	306,948.01***	326,359.18***
	(110750.978)	(87818.4608)	(88204.3723)
Male (sex)	294,218.18***	374,484.14***	396,003.30***
	(127,166.03)	(99,954.81)	(100,546.91)
Female	89,718.75	116,580	196,381.04
	(147,292.63)	(166,667.77)	(178,381.68)
<=2ha (farm size)	241,408.89***	282,395.33***	271,458.89***
	(106,868.00)	(83,476.87)	(81,644.30)
>2ha	7,417.89	124,089.47	148,868.63
	(247,549.41)	(251,060.84)	(250,891.60)

Note: ***P<0.01 and **P<0.05 level of probability. NNM=Nearest Neighbor Matching, RM=Radius Matching and KM=Kernel Matching. Standard errors in parentheses

The per capita income for males increased significantly, on average, by ₦294, 218.18 annually, but the impact for the females was not statistically significant. The impact for maize farmers cultivating less than or equal to 2 ha was positive and statistically significant. In effect, an average maize farmer operating less than or equal to 2 ha had an additional ₦241, 408.89 annually for using microcredit. As pointed out earlier, the RM and the KM overestimated the impact of microcredit utilization on food security, although they all show that the impact is positive and significant.

Test of Hypothesis

The hypothesis that stated that microcredit accessibility has no impact on output and food security of the beneficiaries in the study area is depicted in Table 9. The maize farmers with access and without access to microcredit after nearest neighbour matching were 10,436.47 kg and 7,516 kg respectively. Hence, the impact of access to microcredit on maize output was 2,920 and was statistically significant at 5 percent level of probability. In the same vein, the food security level of a household with access and without access to microcredit after nearest neighbour matching were 12,855 kcal per day and 10,028 kcal per day respectively. Accordingly, the impact of microcredit accessibility on food security was 2,827 per household on average and was also statistically significant at 5 percent level of probability. The duo implies that the null hypotheses that microcredit accessibility has no impact on maize output and household food security of the beneficiaries in the study area

was rejected at 5% level of probability. In other words, there is a significant impact of microcredit accessibility on maize output of the beneficiaries in the study area.

Table 9: T-test of the impact of micro-credit accessibility on output and food security of beneficiaries

Parameters	Units	Treated	Controls	ATT	S.E.	t-stat
Maize output (kg)	Kg/ha	10,436.47	7,516	2,920.47	1,273	2.29**
Food security	(Kcal/hhs/day)	12,855	10,028	2,827	984	2.87***

Source: Author's estimates Note: **<0.05. ATT=Average Treatment Effect on the Treated (Impact)

CONCLUSION

The study revealed that there is statistically significant difference between beneficiaries and non-beneficiaries of microcredit with respect to socio-economic variables such as age, sex, educational level and farming experience. The study also revealed that there is a significant impact of microcredit accessibility on maize output and household food security of the beneficiaries in the study area. It was observed that micro-credit had a positive impact on maize output and household food security status of beneficiaries in the study area hence; there is need for the provision of infrastructure such as electricity, roads, markets, portable water, health and communication to compliment credit use, which would improve the welfare of the farmers. The credit should be monitored by relevant bodies for effective utilization in maize production to avoid diversion to consumption activities.

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