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Farmers' awareness, use and perception on cocoyam value addition technologies in South-East Agro-ecological Zone, Nigeria

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Abstract
The study examined farmers' awareness, use and perception on cocoyam value addition technologies in South-East Agro-ecological Zone, Nigeria. A Multi-stage sampling procedure was employed in selecting the respondents. Data collected were analyzed using descriptive statistical tools such as frequency counts, percentages, mean etc and ordinary least square (OLS) regression model. Results of the study showed that out of the seven (7) value addition technologies, respondents' awareness of "Using cocoyam leaves for soup" (72.5%) and "Preparing of cocoyam soup thickener" (97.7%) was highest in all the three States, especially in Ebonyi and Enugu States. The result showed low extent of use of most of the value addition technologies in the study area. Result from the zone showed that respondents perceived that the cocoyam value addition technologies are of high nutritional quality ($\bar{x} = 3.9$), lack of knowledge of improved methods of processing was a serious constraint with a mean ($\bar{x}$) score of 2.29 and also observed as a serious constraint across the three States of Abia, Ebonyi and Enugu with mean ($\bar{x}$) scores of 1.98, 2.04 and 2.84 respectively. The result of Ordinary Least Square Regression revealed that age (5%), farm size (5%), household size (5%), income (1%), membership to social organization (1%) and access to credit (1%) were the determinants of use of cocoyam value addition technologies in the study area. The study indicates that awareness for cocoyam production technologies were relatively high, while that of value addition and its level of use were low. It was recommended therefore that beyond production, it is essential to target value addition technologies in order to realize the usefulness of cocoyam, scale up production potentials of the states, and in turn create employment opportunities for our teeming youth population.

Keywords: Awareness, Use, Perception, Cocoyam Value Addition Technologies

Introduction

Cocoyam *(Colocasia esculentum)* (L) Schott and (*Xanthosoma sagittifolium)* (L) Schott. (*Colocasia species*), both of which originated from South-East Asia and South America, respectively; refer to two members of the *Araceae.* They are herbaceous perennial plants for many people in developing countries. Colocasia is also referred to as taro, old cocoyam, while Xanthosoma also Tannia is referred to as new cocoyam (Azeez and Madukwe, 2010). Furthermore, Offor and Onyewuchi (2013) observed that as Nigeria search for a solution to the challenge of food insecurity, embracing cocoyam production and consumption will empower Nigeria economically, socially and health-wise. Cocoyam ranks third in importance after cassava and yam among the root and tuber crops cultivated and consumed in Nigeria. Nigeria has been the world's leading producer of cocoyam (taro), accounting for up to 3.7 million metric tonnes in 2009 (Nwosu, 2009) and still maintains the lead among cocoyam producing nations, with an annual production of 4.55 million metric tonnes in 2012, representing 61.2% and 43.1% total production in West Africa and Africa, respectively (Chukwu, 2015). Cocoyam is propagated vegetatively using the corms and cormels. The underground corms and cormels provide easily digestible starch and the leaves are nutritious, providing folic acid, riboflavin, vitamins A and C, calcium, phosphorus, and the corms are ready to harvest within 6-9 months (Onwubuya and Ajani, 2012). Cocoyam is a tuber crop with lots of potentials. According to Ugbajah and Uzuegbunam (2012), a large number of households grow cocoyam as cash crop, selling at least half of their yearly produce. As food, cocoyam corms and cormels are eaten in homes in various forms. They can be boiled or roasted like yam, pounded alone or mixed with cassava and eaten with soup. The corms and cormels sliced can be dried and used to make flour or sliced and fried to make chips. The leaves of the plant and flower are also edible and are usually consumed as a vegetable and spice to garnish

food in dishes such as stews (Chukwu *et al*., 2012).

Cocoyam flour is highly digestible and it is used for invalids and as an ingredient in baby foods (Darkwa and Darkwa, 2013). The flour is also used as soup thickener in preparation of soup, biscuits, bread, beverages and puddings. In Nigeria, cocoyam is grated, mixed with condiments and wrapped in leaves and steamed for about 30minutes to prepare a delicacy popularly known as *epankuko (ikokore*). Cocoyam flakes is another end product of cocoyam which is cooked, cut into chips and dried under the sun. The resulting flakes are later soaked in water and cooked with vegetable and Cajanus cayan seeds (Onwuka, 2012) during famine or planting season when food is scarce. Other uses of Cocoyam include; maintaining healthy urinary function, anti-ageing and heart disease, lowering cholesterol and diabetes (Kumawat, Chaudhari, Wani, Deshmukh, and Patil, 2010). Like yam, it can be stored for 3-6 months and it will still retain its taste. It is best stored in a cool, dry and well-ventilated area. Most times, it is stored on raised racks because the bare floor causes it to rot (Offor and Onyewuchi,2013) In the area of the study, cocoyam production involved growing of cocoyam till maturity, harvesting, processing and marketing (Ukonze and Olaitan, 2010). Considering the nutritional quality of cocoyam, its high content of fine starch grains that are easily digestible, the level of utilization of cocoyam in homes and industries appears quite low. In spite of the high nutritional value of cocoyam, the rate at which most Nigerians consume cocoyam is still low when compared to other root and tubers crops. People and industrialists seem to be ignorant of the nutritional and industrial potentials of cocoyam (Nnabuko *et al*., 2012).

Several studies have been documented on Cocoyam production output in Nigeria (Ezeocha, Omodamiro, Oti and Chukwu, 2011; Chukwu 2015; Chukwu *et al*., 2015). In view of these numerous challenges associated with cocoyam production and utilization in Nigeria, the National Root Crops Research Institute, Umudike has developed, promoted and disseminated several technologies aimed at boosting cocoyam production and utilization especially in the South East Nigeria. Nevertheless, it is a common assumption that cocoyam production and utilization are on the decline. The assumption probably stems from the fact that cocoyams are no longer seen easily in most rural and urban markets, neither do they feature as meals in most homes in the study area. Furthermore, there is dearth of empirical data regarding status of use of cocoyam production and value addition technologies in Nigeria, especially in the Southeast Zone. It is therefore pertinent to examine farmers' awareness, use and perception on cocoyam value addition technologies in South-East Agro-ecological Zone, Nigeria.

Methodology

The study was carried out in the South-East agro-ecological zone of Nigeria. The choice of this region was informed by the fact that all the States in the zone produce and utilize cocoyam. The zone comprises five States, namely: Abia, Anambra, Ebonyi, Enugu, and Imo. The south-east agricultural zone of Nigeria lies between latitudes $4^0 20'$N and $7^0 25'$N and longitude $5^0 21'$ and $8^0 51'$E (NPC, 2006). Multi-stage sampling procedure was employed in selecting the respondents. In the first stage, three out of five States in the zone were purposively selected basically because of high intensity of cocoyam production and utilization in the States. The states include; Abia, Ebonyi, and Enugu. In the second stage, two agricultural zones were randomly selected from each State. In the third stage, two blocks were randomly selected from each zone. In the fourth stage, four circles in each of the selected blocks were randomly selected. Finally, ten (10) cocoyam farmers were randomly selected from each circle. This meant that there were 160 respondents randomly sampled from each State. Thus a sample size of four hundred and eighty (480) respondents was randomly selected. The services of agricultural extension agents were engaged in locating and collecting data from the respondents. Data collected were analyzed using descriptive statistical tools such as frequency counts, percentages, mean etc as well as ordinary least square (OLS) regression model. Extent of use of Cocoyam Value Addition Technologies (Y) in the study area was realized using descriptive statistics such as mean scores. A five point Likert-type scale was employed to determine the magnitude of responses and numerical values assigned as follows; Strongly agree (SA) = 5, Agree (A) = 4, Undecided (UD) = 3, Disagree (DA) = 2, Strongly disagree (SD) = 1

The mean value of the rating was determined with the formula thus;

$$\overline{X} = \frac{\Sigma n}{} = \frac{5+4+3+2+1}{} = \frac{15}{} = 3.0 \ldots. (1)$$

Thus a mean decision point (3.0) was obtained from the five point Likert-type scale and use as benchmark for the objectives. Any mean score greater than or equal to the bench-mark mean would be considered high extent of use of cocoyam value addition technologies, otherwise was regarded as low. Any variable with mean ($\overline{X}$) value of 3.0 and above was regarded as possessing superior grade variable and so employed in the interpretation of the results. To ascertain the perception of the respondents on cocoyam value addition technologies was realized using descriptive statistics such as mean scores. A five point Likert-type scale was also employed to determine the magnitude of responses and numerical values assigned as in equation (1). Any mean score greater than or equal to the bench-mark mean would be considered high extent of use of cocoyam value addition technologies, otherwise was regarded as low. Any variable with mean ($\overline{X}$) value of 3.0 and above was regarded as possessing superior grade variable and so employed in the interpretation of the results. To ascertain the constraints to use of cocoyam value addition technologies in the study area was realized using descriptive statistics such as mean scores. For each of the objectives which were realized with mean scores, a five point Likert-type scale was employed to

determine the magnitude of responses and numerical values assigned as in equation (1). Any variable with mean ($\bar{X}$) value of 3.0 and above was regarded as possessing superior grade variable and so employed in the interpretation of the results. The effect of some farmer socioeconomic characteristics on the level of use of cocoyam value addition technologies was realized using Ordinary Least Square Regression Model. The model is specified implicitly as;

$$Y_1 = f(X_1, X_2, X_3, X_4, X_5, X_6, X_9, X_{10}, X_{11}, X_{12}) + e$$

Where;
Y_1 = cocoyam value addition technologies used (mean score)
X_1 = Sex (male = 1; Female = 0)
X_2 = Age (actual number of years lived by the respondent)
X_3 = Marital Status (married = 1, others 0)
X_4 = Level of Education (number of years)
X_5 = Occupational status (Full-time farmer = 1; part-time = 0)
X_6 = Farming experience (number of years spent in cocoyam production)
X_7 = Farm size (number of hectares cultivated)
X_8 = Household size (actual number of persons living in a household)
X_9 = Monthly income (in naira)
X_{10} = Membership of Social Organization (yes = 1 ; otherwise = 0)
X_{11} = Access to Credit (Access = 1 ; otherwise = 0)
X_{12} = Extension contact (Number of contact with extension in a month)
e = error term

Results and Discussion

Awareness of the respondents of cocoyam value addition technologies

The awareness of the respondents of cocoyam value addition technologies was studied and the result presented in Table 1. The value addition technologies were processing corms into flour, converting cocoyam flour into bread, converting cocoyam flour into chin chin, making of cocoyam cakes, making of Cocoyam Flakes, use of cocoyam leaves for soup, and preparing of cocoyam soup thickener. Results of the study showed that out of the seven (7) value addition technologies, respondents' awareness of "Using cocoyam leaves for soup" (72.5%) and "Preparing of cocoyam soup thickener" (97.7%) was highest in all the three States, especially in Ebonyi and Enugu States. However, there were variations across the three States of Abia, Ebonyi and Enugu. For instance, in Abia State, four value addition technologies "Processing corms into flour" (64.4%), "Converting Cocoyam flour into chin chin" (54.1%), "Making of Cocoyam Flakes" (54.7%), and Preparing of Cocoyam soup thickener" (97.5%) recorded high awareness among the respondents. This result is likely due to the efforts of NRCRI located in Abia State. In Ebonyi and Enugu, only two value addition technologies (use of Cocoyam leaves for soup and preparing of Cocoyam soup thickener) had high percentage awareness of 93.4%, 72.5% and 96.8%, 97.7% respectively. The result from Ebonyi and Enugu States shows that respondents are not aware of most of the value addition technologies. The result is likely to have implication on the extent of use of the technologies among the respondents. It is most likely that extension efforts/activities to disseminate these technologies among the respondents in the area especially in Ebonyi and Enugu States have been quite low/few. Awareness creation is key to enlightenment of individuals on technological innovations, and until a proper awareness is created among the respondents, the uptake of these value addition technologies is most likely to remain low. This also will hamper the maximization of the benefits of cocoyam (Chukwu *et al*., 2015), which has great implication on food security and poverty alleviation in the agro-ecological zone.

Extent of use of cocoyam value addition technologies

The extent of use of the disseminated cocoyam value addition technologies among the respondents in the study area is presented in Table 2. The result showed that "Preparing of cocoyam soup thickener" ($\bar{X}$) 3.62) was the only significant technology variable above the mean benchmark of 3.0. The result further showed a slight variation across the three States of Abia, Ebonyi and Enugu. The result showed low extent of use of most of the value addition technologies in the study area. The result is an indication of the poor awareness of the respondents of these technologies which if not addressed, would continuously deter the utilization of these technologies. The essence of value addition is to increase economic gains from agricultural production. It is therefore, not enough to produce more without commensurate efforts to increase market share of what is being produced through value addition. This result aligned with Nnabuko *et al*. (2012) who stated that: Considering the nutritional quality of cocoyam, the high starch content and its quality (*i.e*. fine starch grains), the level of utilization of cocoyam and its products both domestically and industrially is quite low.

Respondents' perception of cocoyam value addition technologies

The cocoyam value addition technologies disseminated to the farmers were equally investigated to ascertain the respondents' perceptions about them as presented in Table 3. Result from the zone showed that respondents perceived that the cocoyam value addition technologies are of high nutritional quality ($\bar{X}$ = 3.9). This result was also true for the three states that constituted the study area. The study showed that Abia ($\bar{X}$ = 3.68), Ebonyi ($\bar{X}$ = 3.56) and Enugu ($\bar{X}$ = 4.36) perceived these technologies as of high nutritional quality. The high nutritional quality of the innovation goes a long way in encouraging positive perception of the innovation and its utilization. The result is positive and favourable for the use of cocoyam value addition technologies in the study area. Similarly, Ezeocha *et al*. (2015), had reported that rural households in Imo State also had positive perception towards cassava postharvest technologies disseminated to them which enhanced

adoption of such technologies. The study further investigated the perception of the respondents of the attribute of the technologies to increase cocoyam production. The result from the investigation showed that a larger proportion positively perceived the value-added products as helping to reduce hunger in the family ($\overline{X}$ = 3.9) and this also the situation in the three States of Abia ($\overline{X}$ = 3.89), Ebonyi ($\overline{X}$ = 3.27) and Enugu ($\overline{X}$ = 4.38). This is one of the critical attributes that drives the use of any technological innovations among end users since there is a desire to always win in the fight against hunger in the household which is the most crucial felt needs of the rural household. A critical outcome of value addition of technologies is diversification of food forms encourage their consumption and win the war against hunger (NRCRI, 2010).

Constraints to use of cocoyam value addition technologies

Value addition technologies are means to increasing the market value of our farm produce. In this study, certain constraints have been investigated to ascertain their influence on the use of value addition technologies among farmers in south-east Nigeria. The results are presented in Table 4. The result in Table 4 shows that lack of knowledge of improved methods of processing was a serious constraint with a mean ($\overline{X}$) score of 2.29 and was also observed as a serious constraint across the three States of Abia, Ebonyi and Enugu with mean ($\overline{X}$) scores of 1.98, 2.04 and 2.84 respectively. The poor knowledge which orchestrated this result may be attributed to either the low educational standard of some of the farmers or ineffectiveness of the delivery agencies in adequately disseminating the value addition technologies to the farmers. An introduction of something new, different from what the farmers have been practicing as earlier observed, requires that proper farmer education on the use of such technologies be carried out in order for the farmers to be adequately armed to use such technologies. Knowledge base of clients in any technology has great implication for the level of use of that technology. Onwuka, (2012) believe that knowledge of any technology which translates to ability to use has in many circumstances influenced farmers use of a technology disseminated. The high cost of farm inputs was also reported as a major constraint to the use of cocoyam value addition technologies among respondents in the zone with a mean ($\overline{X}$) score of 2.03. Also, across the States, this constraint was also found to be serious with mean ($\overline{X}$) scores of 1.91, 1.94, and 2.25 for Abia, Ebonyi and Enugu. High cost of inputs was also reported by Onwuka, (2012) as a constraint to cocoyam production and value addition. This result is expected to have significant influence on the farmers in the use of the value addition technologies. These technologies must be made affordable and available for the rural farmers who are always seeking alternative ways to cut production cost.

Determinants of use of cocoyam value addition technologies

The result in Table 5 showed the Ordinary Least Square Regression result of the relationship between socioeconomic characteristics of the respondents and their use of cocoyam value addition technologies in the study area. . Four functional forms of multiple regression were tried and Double-log functional form was selected based on the magnitude of the R^2 value, number of significant variables and F- ratio. The R^2 (coefficient of multiple determination) value was 0.86 which implied that 86.0% of the total observed variations in the dependent variable (Y) were accounted for, while 14% of the variation were due to error. F–statistics was significant at1% indicating the fitness of the model used for the analysis. The coefficient of age was statistically significant at 5% and negatively related to the use of cocoyam value addition technologies in the study area. This implies that as the age of farmers increase, their use of value addition technologies decreases. This inverse relationship implies that the age of the farmers increases use of cocoyam value addition technologies. The coefficient of farm size was statistically significant at 5% and positively related to the use of cocoyam value addition technologies in the study area. This implies that any increase in the farm size will increase the probability of use of cocoyam value addition technologies in the study area. The coefficient of coefficient of house size was positively related and statistically significant at 5% level of probability. This result of implies that an increase in household size will result to a corresponding increase in the use of cocoyam value addition technologies in the study area. The increase of household size suggests that more family labour would be readily available since relatively large household size is an obvious advantage in terms of labour supply, where wage rate is relatively costly (Ugbajah and Uzuegbunam 2012). The coefficient of income was statistically significant at 1% and it is positively related to use of cocoyam value addition technologies. This implies that a unit increase in income will lead to an increase in use of cocoyam value addition technologies. This may be attributed to the fact that an increase in income will enable the farmers to adopt new production strategies. The coefficient of membership to social organizations was statistically significant at 1% and positively related to use of cocoyam value addition technologies. This result implies that any increase in the membership to social organizations by farmers will lead to a corresponding increase in use of cocoyam value addition technologies. The coefficient of access to credit was statistically significant at 1% and positively related to use of cocoyam value addition technologies. This result implies that a unit increase in the access to credit by the farmers will lead to a corresponding increase in use of cocoyam value addition technologies.

The study therefore rejected the null hypothesis which stated that there was no significant relationship between the socioeconomic characteristics of the respondents and their use of value addition technologies and concluded otherwise at 5% alpha level.

Conclusion

While there is a relative high level of awareness of the

production technologies, most of the respondents are not aware of the value addition technologies, most of the value addition technologies are relatively in low level of use. Respondents' perceived that the cocoyam value addition technologies are simple to use, is labour-intensive, value added products reduces hunger and that the products increases farmers income. Meanwhile, "High disease occurrence," High cost of farm inputs," and "dwindling interest in consumption are the serious constraints affecting Cocoyam value addition technologies in the study area.

Based on the findings, the following recommendations were made;

1. Beyond production, it is essential to target value addition technologies in order to realize the usefulness of cocoyam, scale up production potentials of the states in turn create employment opportunities for our teeming youth population.
2. Since most of the farmers are not aware of the value addition technologies, creating more awareness and training farmers on these technologies is recommended for the ADP and other government and private organizations involved in extension and advisory services delivery in the area.
3. Extension services is quite low for cocoyam production and value addition technologies, More Village Extension Workers (VEW) should be trained in the area of cocoyam production technologies and value addition technologies and deployed to our rural communities to train the farmers on these technologies.

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Table 1: Respondents' awareness of cocoyam value addition technologies

Variable	Abia State		Ebonyi State		Enugu State		South-east (pooled)		Remarks
Value addition dissemination	**Yes (%)**	**No (%)**	**Yes (%)**	**No (%)**	**Yes (%)**	**No (%)**	**Yes (%)**	**No (%)**	
Processing corms into flour	64.4	35.6	17.5	82.5	32.7	67.3	**49.9**	**61.3**	**unaware**
Converting cocoyam flour into bread	39.5	60.5	8.8	91.3	3.1	96.9	**17.1**	**82.9**	**unaware**
Converting cocoyam flour to chin-chin	54.1	45.9	14.4	85.6	1.3	98.7	**23.3**	**76.7**	**unaware**
Making of cocoyam flakes	54.7	45.3	15.0	85.0	25.8	74.2	**31.8**	**68.2**	**unaware**
Making of cocoyam cakes	37.5	62.5	11.3	88.8	3.8	96.2	**17.5**	**82.5**	**unaware**
Using cocoyam leaves for soup	40.1	59.9	83.1	16.9	94.3	5.7	**72.5**	**27.5**	**aware**
Preparing of cocoyam soup thickener	97.5	16.3	98.8	18.1	96.8	3.1	**97.7**	**12.5**	**aware**

Source: Field Survey, 2017: NB: Technologies scoring 51% and above were regarded as having high awareness rate, while those scoring 50 and below had low rate of awareness

Table 2: Extent of use of cocoyam value addition technologies

Variable	Abia State	Ebonyi	Enugu	S.E Zone
Utilization Technologies	**Mean**	**Mean**	**Mean**	**Mean**
Processing corms into flour	2.57	1.23	1.94	**1.91**
Converting cocoyam flour into bread	1.89	1.05	1.11	**1.35**
Converting cocoyam flour to chinchin	1.99	1.19	1.04	**1.40**
Making of cocoyam flakes	2.43	1.20	1.66	**1.76**
Making of cocoyam cakes	1.87	1.13	1.13	**1.37**
Using cocoyam leaves for soup	1.75	3.01	2.68	**2.48**
Preparing of cocoyam soup thickener	3.53	3.44	3.91	**3.62**
Total mean	16.03	12.25	13.47	**13.89**
Grand mean	2.29	1.75	1.94	**1.98**

Source: Field Survey, 2017

Table 3: Distribution of mean responses of respondents according to their perception of the attributes of cocoyam value addition technologies

Production Technologies	Abia	Ebonyi	Enugu	South East	Remark
Value-added products are of high nutritional quality	3.68	3.56	4.36	**3.9**	Positive
Value-added products are food for the poor	1.97	2.09	2.08	**2.0**	Negative
Usually considered as food for women and children	2.18	2.43	1.94	**2.2**	Negative
Cocoyam value added products do not have much market	2.33	2.42	2.49	**2.4**	Negative
Value-added products helps to reduce hunger in the family	3.89	3.47	4.38	**3.9**	Positive
Total mean	14.05	13.97	15.25	**14.4**	
Grand mean	**2.81**	**2.79**	**3.05**	**2.88**	

Source: Field Survey, 2017

Table 4: Constraints to the use of cocoyam value-addition technologies in the study areas

Constraints to use of cocoyam value addition technology production	Abia	Ebonyi	Enugu	South East	Remark
Lack of knowledge of improved methods of processing	1.98	2.04	2.84	**2.29**	Serious
High cost of inputs	1.91	1.94	2.25	**2.03**	Serious
Not in popular demand	1.53	1.44	1.41	**1.46**	Not serious
Mouth itching	1.22	1.29	1.02	**1.18**	Not serious
Dwindling interest in cocoyam consumption	1.71	1.26	1.06	**1.34**	Not serious
Total grand	8.35	7.97	8.58	**8.30**	
Grand mean	1.67	1.60	1.72	**1.66**	

Source: Field Survey, 2017

Table 5: OLS Regression estimates of the relationship between farmer's socioeconomic characteristics and the use of cocoyam value addition technologies

Variables	Linear	Exponential	Semi-log	Double log +
Constant	3324.578	8.150	6151.804	1.324
	(4.238)**	(6.913)***	(10.334)***	(10.545)***
Sex	-447.06	-0.511	-891.993	0.743
	(-1.310)	(-0.44)	(0.900)	(0.551)
Age	-4.123	-0.009	-648.511	-0.370
	(-4.090)***	(-2.907)***	(-2. 348)**	(-1.972)**
Marital Status	18.923	0.004	309.629	0.071
	(0.950)	(1.132)	(1.050)	(0.830)
Level of Education	-82.300	-0.077	-35.354	-0.117
	(-0.596)	(-0.907)	(-0.101)	(-0.685)
Occupation	9.592	0.002	420.526	0.003
	(0.690)	(1.570)	(1.062)	(0.033)
Farming experience	-33.500	-0.014	320.904	0.045
	(-0.743)	(-0.390)	(0.613)	(0.255)
Farm size	0.001	2.301E-7	52.349	0.107
	(0.860)	(6.988)***	(7.330)***	(3.716)***
Household Size	170.124	0.008	69.215	0.006
	(0.587)	(0.044)	(0.131)	(2.505)**
Monthly Income	5.313E-5	3.083E-8	267.550	0.143
	(5.596)	(0.564)	(2.079)	(2.282)**
Membership of social organization	.781	1.614E-5	22143.785	.290
	(14.544)***	(8.871)***	(11.343)***	(11.343)***
Access to Credit	0.054	1.766E-6	8394.982	.048
	(0.247)	(0.633)	(0.767)	(3.390)***
Extension Contact	0.002	1.476E-6	-908.842	-0.280
	(2.875)**	(1.706)*	(-2.260)**	(-1.430)
R^2	0.67	0.78	0.85	0.86
R Adjusted	0.65	0.76	0.83	0.84
F – Ratio	34.909***	22.813***	11.942***	30.419***

Field Survey, 2017. Key: * Significance at 10%, ** Significance at 5%, *** Significance at 1% ***, + = Lead Equation and the values in bracket are the t-value