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ASSESSMENT OF FACTORS INFLUENCING ADOPTION OF NARICT NEEM ORGANIC FERTILIZER AMONG SMALLHOLDER TOMATO FARMERS IN KADUNA STATE, NIGERIA

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ABSTRACT

This study was designed to assess smallholder tomato farmer's level of awareness of NARICT neem organic fertilizer as well as to determine the factors influencing its adoption by the smallholder tomato farmers in the study area. Four Local Government Areas (LGAs) were randomly selected from the four ADP zones of the state. One village was randomly selected from each of the four selected LGAs and then 11% of the tomato farmers from each of the four villages were randomly selected to arrive at the sample size of three hundred and fifty (350) tomato formers. Both inferential and descriptive statistics were used in the analysis of data. The mean age of respondents was found to be 42yrs for adopters and 35yrs for non-adopters, 96.9% were males for adopters and 22.1% are females for non-adopters respectively. The mean household size for the non-adopters was 11 persons and 8 persons for non-adopters. 94.3% of the interviewed farmers were aware of the NARICT neem organic fertilizer and 5.7% are not aware of the NARICT neem organic fertilizer. It was therefore concluded that even though about 54.3% of the respondents are aware of NARICT neem fertilizer, only about 45.7 % use it. Also, it was found out that the socio-economic and Institutional characteristics of the farmers have significant influence on the adoption of NARICT neem organic fertilizer. The result shows that socio economic factors such as farming experience, educational level, farm size, age and source of credit significantly influence adoption of the fertilizer. The study equally found out the benefits of NARICT neem organic fertilizer is on the farmers.

Keywords: Factors influencing, Adoption of NARICT neem organic fertilizer, Smallholder tomato farmers

INTRODUCTION

Africa, home to a huge population of subsistence farmers has for long sought to achieve its Green Revolution, aiming to rejuvenate its vast farmlands. Nigeria with an active agrarian population of 50% youth engaged in year round agricultural activities, whose main export commodities used to come from the agricultural sector has now witnessed a turn of events occasioned by the absences of good quality fertilizers to rejuvenate its farmlands and re-fertilize exhausted land. Nigerian farmers utilize about 8-10kg per hectare compared with 200kg/ha that is recommended by the food and Agricultural Organization. The country is among the lowest users of fertilizer in the world.
(NARICT 2015).

Following the Federal Government's partial disengagement from procurement and distribution of fertilizers and the withdrawals of subsidy on imported fertilizers, emphasis is being given to development of local technology in fertilizer production. According to the International Center for soil fertility and Agricultural Development (IFDC), no region of the world is better endowed with the principal ingredients required to manufacture fertilizer than Africa. It is in response to some of the challenge faced by the farmer with a view to transform the agricultural landscape in Nigeria and improve food supply towards ensuring food security that the National Research Institute for Chemical Technology, Zaria, in pursuance of its mandate began studies aimed at producing minero-organic fertilizer, that would be affordable, accessible and ecofriendly (NARICT 2015).

The use of inorganic fertilizer on farms can cause problems of serious soil degradation, increased soil acidity, nutrient imbalance and finally bring about low yield (Obalola, and Tanka,2016).Tomato farmers in the study area are face with the problem of law productivity as a result of constant application of in-organic fertilizer thereby reducing the nutrient in the soil, the study is introducing the adoption of organic fertilizer most especially the NARICT neem organic fertilizer so as to increase the tomato farmers productivity and income.

Neem base organic fertilizer also known as NARICT neem organic fertilizer is formulated from the neem tree which is a specie of the mahogany family (meliancea) commonly known locally in Hausa language as Dogonyaro, Bedi, Darbejiya or Maina. With the advancement in biotechnology, NARICT has explored commercial uses of the neem tree in organic fertilizer and related areas. NARICT fertilizer can be used on different crops, among which is tomato (NARICT, 2015). Tomato (Lycopersicon esculentum) is an important vegetable crop in many parts of the world. It is one of the most important vegetables grown for its edible fruits in virtually every part of Nigeria. It is also one of the most widely cultivated crops in the world. It is an important source of vitamins and an important cash crop for smallholder commercial farmers (Shankara, Joep, Marja, Martin and Barbara, 2005).

The adoption of NARICT neem organic fertilizer by tomato farmers is expected to have a positive effect on farmer's yield, income and can also help in protecting the soil and its eco-friendliness over the inorganic fertilizer (Ibeawuchi, Alagba, Ofor, Emma-Okafor, Peter-Onob and Obiefuna, 2015). In spite of the fact that NARICT neem organic fertilizer has been disseminated to farmers, especially smallholder tomato farmers in Kaduna State, there have been no studies to assess its level of awareness nor its adoption among the tomato smallholder farmers in the study area. As such, this study assesses the smallholder tomato farmer's level of awareness of NARICT neem organic fertilizer as well as determine the factors influencing its adoption by smallholder tomato farmers in the study area.

MATERIALS AND METHODS

Four Local Government Areas (LGAs) were randomly selected from the four ADP zones of the state. One village was randomly selected from each of the four selected LGAs. This was followed by a random selection of 11% of the tomato farmers from each of the four villages, which constitute the sample size of tomato farmers to be three hundred and fifty (350) farmers. This is in line with the recommendation of Glen (2013), who asserted that 11% of a population can be taken as sample size once the total sample taken does not exceed one thousand (1000). A total sample size of one hundred and ninety-one (191) tomato farmers using NARICT Neem organic fertilizer were selected Furthermore, a corresponding sample of 191 farmers was drawn randomly from the population of the farmers not using NARICT neem organic fertilizer. Data were collected by the use of structured questionnaire which were administered by the researcher to the farmers with the help of enumerators. A total of 191 questionnaires were administered to the farmers who adopted the NARICT neem organic fertilizer application in their farms, in Igabi, Sabon-gari, Birnin Gwari, and Kachia LGAs, while 191 questionnaires were also administered to the non-adopters of the NARICT neem organic fertilizers in the study areas.

The total sample size for the study was three hundred and fifty (350) tomato farmers. However, only 160 and 190 questionnaires were retrieved from farmers using NARICT Neem organic fertilizer and those not using the NARICT Neem organic fertilizer respectively. Therefore, the total sample used for analysis was three hundred and fifty (350).

Table 1: Summary of sample distribution

KADA Zone	LGAs	Rural Villages	Population size of tomato famers in the villages	Population size of farmers using NARICT organic fertilizer	Sample size of farmers using NARICT organic fertilizer (11%)	Population size of farmers not using NARICT organic fertilizer	Corresponding Sample size of farmers not using NARICT organic fertilizer
Lere	Igabi	Birnin Yero	11,500	575	63	10,925	63
Maigana	Soban-gari	Sakadadi	10,000	500	55	9,500	55
Birnin Gwari	B/Gwari	Kuyallo	10,000	500	55	9,500	55
Samarun Kataf	Kachia	Awon	3250	163	18	3,087	18
Total			34,750	1,738	191	33,012	191

Data generated were analyzed using both descriptive and inferential statistics. The descriptive statistics was used to describe the socio-economic characteristics of tomato farmers in the study area, and to examine the smallholder tomato farmer's awareness of NARICT neem organic fertilizer. While the inferential statistics, specifically logistic regression was used to determine the factors influencing the adoption of NARICT neem organic fertilizer by the farmers. The model specification used are represented as follows:

Logistic Regression Model

The logistics Regression model is presented as:-

$$P\ (v\ -1) = \frac{e^{Bx}}{e^{Bx}}) \quad (1)$$

$$P\ (v-1) = \frac{1-e^{Bx}}{1\times e^{Bx}} = \frac{1}{1\ e^{Bx}} \quad (2)$$

$$Log - \left(\frac{p}{R-P}\right) \quad (3)$$

Linearizing

$$Y = B_0 + B_1X_1 + B_2X_2 + \cdots B_{11}X_{11} + U) \quad (4)$$

Where

Y = Adoption Y = 0 for non- adopters
Y= 1 for adopters

B_0 = constant and intercept of the equation
B_1- B_{11} = the coefficient,
U_1 = Error term
X_0 and X_0, stand for pre-test for the four groups
X_1 and X_2 stand for treatment for the control groups
Y_0 Represent treatment for the groups
X_1 stand for post- test for all the groups
X_1–X_{11} =Explanatory variable (Socio–economic characteristics and Institutional factors of tomato farmers)

Where;

Y_1 = Adoption of NARICT neem organic fertilizer
$U1$ = Error term
X_1 = Age (Years)
X_2 =Marital status (Married 1, otherwise = 0)
X_3 =Educational level (years in education)
X_4= Sex (Male 1, Female 0)
X_5 = Household size (Numbers)
X_6 = Farm size (Hectares)
X_7 = Membership of organization (yes, 1 or No, 2)
X_8 = Extension visit (yes or no)
X_9= Farming experience (Years)
X_{10}= Access to credit (yes or no)

RESULT AND DISCUSSION

Table 2: Socioeconomic characteristics of the respondents

	Adopters		Non-Adopters	
Variables	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Age (yrs)				
Less than 20	-	-	9	4.7
21-40	46	28.8	96	50.5
41-60	102	63.3	78	41.1
61≥	12	7.9	7	3.7
Total	160	100	190	100

Min		20		17	
Max		70		88	
Mean		42		35	
SD		12.01		13.65	
CV		29		39	
Marital status					
Married	102	63.8	140		73.7
Divorce	20	12.5	9		4.7
Single	38	23.7	41		21.6
Total	160	100	190		100
Educational Level					
No formal education	3	1.9	5		2.6
Primary	53	33.1	46		24.2
Secondary	36	22.5	64		33.7
Tertiary	29	18.1	18		9.5
Qur'anic	39	24.4	57		30
Total	160	100	190		100
Gender					
Female	5	3.1	42		22.1
Male	155	96.9	148		77.9
Total	160	100	190		100
Household size					
1-3	1	0.6	19		10
4-6	47	29.4	78		41.1
7-9	20	12.5	30		15.8
10-12	28	17.5	34		17.9
13-15	29	18.1	16		8.4
16≥	35	21.9	13		6.8
Total	160	100	190		100
Min		1		1	
Max		25		26	
Mean		11		8	
SD		5.914		5.267	
CV		53		69	
Farm size					
1hactare	9	5.6	21		11.1
1.0-2.5 hectares	80	50.0	120		63.2
2.6 -4.9 hectare	43	26.9	28		14.7
5.0–7.4 hectare	26	16.3	19		10.0
7.5 - 8 hectares	2	1.3	0		0.0
8.1≥			2		1.1
Total	160	100	190		100
Min		5		5	
Max		8		11	
Mean		2.723		2.092	
SD		1.6756		1.6356	
CV		62		78	
Farming Experience					
1-5 years	1	0.6	17		8.9
6-9 years	4	2.5	13		6.8
10-14 years	14	8.8	22		11.6
15-19 years	36	22.5	38		20
20-24 years	28	17.5	33		17.4
25-years and above	77	48.1	67		35.3
Total	160	100	190		100
Min		1		1	
Max		40		20	
Mean		10.53		5.58	
SD		9.796		4.924	
CV		93		88	

Min = Minimum, Max. = Maximum, SD = Standard Deviation, CV = Coefficient of Variance
Source: field survey, 2020

The result in Table 2 above showed adopters within the age group of 41-60 years have the highest percentage of 63.3% followed by the age group of 21-40 years with 28.8%; while 50.5% of the non – adopters are within the age group of 21-40 years, with only 3.7% of the non –adopters are 60 years and above. This indicates that the majority of the farmers both those using and those not using NARICT Neem organic fertilizer in the study area are the youth and the middle age. This finding is supported by Nwaiwu (2012), who posited that 69.79% of farmers in Imo State are of the middle age within the working-class limit of 21 to 50 years. Adebayo and Adekunle (2016), also reported that the age of an individual can influence the type and quality of work carried out by the individual.

The result further showed that adopters had 33.1% primary education, and 22.5% had secondary education. This indicates that the formal educational level of the farmers could have positive effects on the use of NARICT neem organic fertilizer in the study area and other related technologies that may come with it. This agrees with the result of Banabana- Wabbi (2006) in Uganda, Jones (2006) in Togo-Benin; Muyange (2009) in Kenya and Kudi et al. (2011) in Nigeria who reported high level of formal education among households in their studies.

Also, the result showed that 96.9% of the respondents are males and 3.1% females for the adopters, while 22.1% females and 77.9% males are non-adopters. This could be attributed to the fact that in some part of Northern Nigeria, females are prevented from going to farm due to cultural factors. This contradicts with the study of Adebayo and Adekunle (2016), who reported that 77.5% of vegetable farmers in Asa Local Government Area of Kwara State are females, while only 22.5% are males. Furthermore, household size showed that 29.4% of the adopters had household size of up to 6, while 21.9% had 16 and above members. While for non-adopters, it shows about 18% had 10-12 members in their household as presented in the Table. This implies that the respondents in the study area had large family size which could have a positive effect on the use of NARICT neem organic fertilizer. This will make it easier for the farmer to use the technology so as to increase his productivity and income. Kpadonon et al. (2015) noted that, although migration may provide additional income to the household through remittances, it may also result in a smaller workforce in farming activities. Household size is used as a proxy for labour because individual in household is a potential source of labour. Their availability reduces labour constraints faced during the peak of the farming season (Teklewold et al., 2016).

The result further showed that 5.6% of the adopters had less than 1 hectare of land, 50% had 1.0-2.5 hectares, 11.1% of the non-adopters had less than 1 hectare of land, and 63.2% had 1.0-2.5 hectare of land as indicated in the Table 4.1. This shows that the non-adopters had more land to cultivate than the adopters, which implies that had they adopted the technology, they would have had more productivity and income. Generally, farmers in the study area have an average land holding of about 2.2ha, and thus can be classified as small scale farmers Azih (2006), classified Nigerian farmers to fall into three broad categories namely small scale with 0.10 to 5.99 hectares, medium scale with 6 to 9-99 hectares and large scale holdings with 10 hectares and above.

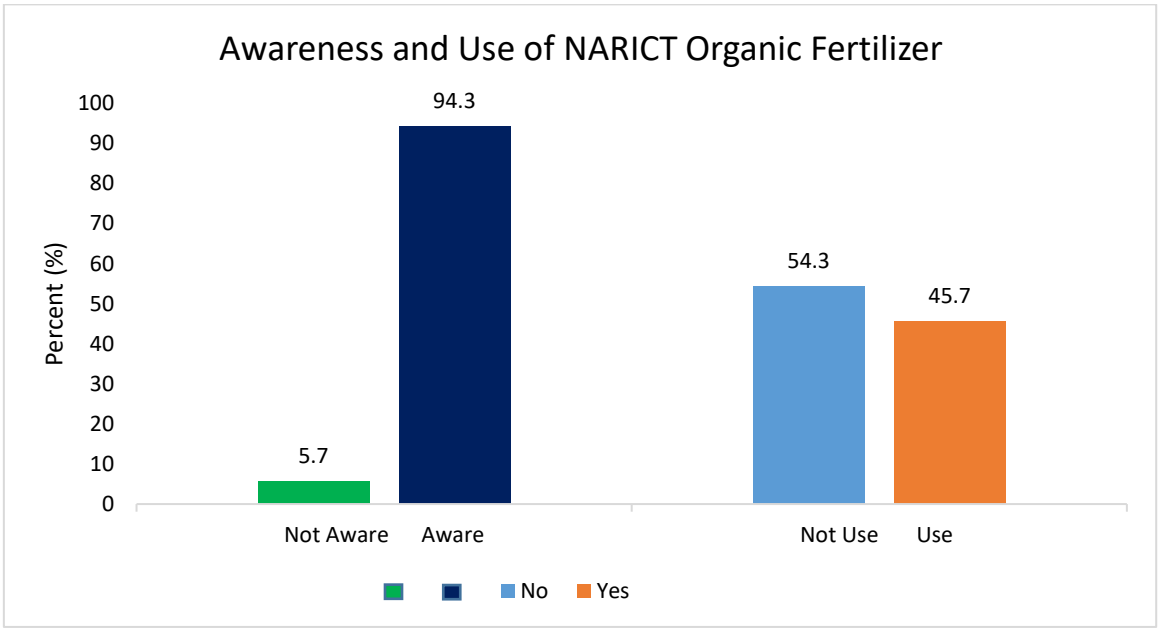

Figure 1: the awareness and adoption of NARICT neem organic fertilizer in the study area

Figure 1 above shows the awareness and adoption of NARICT neem organic fertilizer in the study area. The figure indicated that about 94.3% of the interviewed farmers were aware of the NARICT fertilizer and 5.7% not aware of the NARICT fertilizer. However, from the total number of farmers that were aware of the NARICT fertilizer, not all of them used it on their farms. The study found that among the farmers that were aware of the fertilizer, only some (about 46%) of them actually use the fertilizer on their farms. The remaining 54.3% even though were aware, did not use it. This might be due to the fear of the unknown or some other factors not examined by the study.

Table 3: Result of Logit Regression on Factors Influencing Adoption of NARICT Neem Organic Fertilizer

NARICT neem fert used	Coefficient	Std. Err.	z-value	P>|z|	Marginal effect
Age	1.115	0.054	2.24	0.025**	0.003
Marital status	0.791	0.485	-0.38	0.702	-0.007
Educational background	3.581	1.503	3.04	0.002***	0.040
Gender	76.82	213.8	1.56	0.119	0.136
Household size	1.083	0.113	0.76	0.446	0.002
Farm Size	174.6	174.0	5.18	0.000***	0.162
Group membership	0.827	0.939	-0.17	0.867	-0.006
Contact with extension agents	0.307	0.232	-1.56	0.118	-0.037
Years in farming (experience)	0.817	0.045	3.68	0.000***	0.006
Primary occupation	0.748	0.230	-0.95	0.345	-0.009
Credit amount from source	1.000	0.000	2.46	0.014**	0.000
Total income	1.000	0.000	-0.66	0.512	0.000
Constant	0.000	0.000	-4.26	0.000***	
Number of obs				350	
LR chi2(13)				409.44	
Prob > chi^2				0.0000	
Log likelihood				-36.5966	
Pseudo R^2-square				0.8483	

Source: Field survey, 2020 * 10% ** 5% *** 1%

Education was positive and statistically significant at 1% level and also has the marginal effect of 0.040. This implies that a one-year increase in education of the household head Increase the probability of adopting organic fertilizer by about 4 %. Increase in education level had positive and significant influence on the adoption of NARICT Neem organic fertilizer among tomato farmers. The key policy implication that emerged from this finding is that, organic fertilizer can be promoted significantly by investing in education targeted for the small holder farming population. It is also expected that, educated farmers would know the importance of organic fertilizer over the use of inorganic fertilizer. This is similar to the finding of Ajiwole (2010), who confirms in his result that the higher the level of education, the more farmers utilize organic fertilizer. The result was however contrary to Adebayo and Adekunle (2016), who found that the majority of their respondent had low formal education. It therefore implies that, the vegetable farmers are likely to have much difficulty in understanding and adopting modern agricultural technologies and innovations.

Farming experience was positive, significantly influenced the adoption of the fertilizer at 1% level, the marginal effect indicates that a unit increase in farming experience will increase the likelihood to adopt organic fertilizer by about 0.6%. The long years of experience may enable farmers to engage in farming practice that are most suitable to their ever – changing environment. This was similar to the findings of Adebayo and Adekunle (2016), who noted that farmers tend to use more organic fertilizer in their farms due to their experiences. They further posited that farmers with more experience tend to use organic fertilizer than the less experienced farmers; and again, this should be expected as tomato farmers who have committed several years into farming should know, how, why and when to apply organic fertilizer on their farms.

The result in (Table 3) showed that the coefficient of age was positive and significant at 5% level, with a marginal effect of 0.3%. This implies that, a unit increase in age of the household head will increase the likelihood of adopting organic fertilizer by 2.5%. This is similar to the findings of Adebayo and Adekunle (2016) who posited that older farmers tend to use more organic fertilizers than the younger ones. This could be that due to their age and the experience gathered by the older farmers, they already know the benefits of the usage of organic fertilizer on vegetable farming.

The result further showed the coefficient of credit was positive and statistically significant at 1% level. Access to credit had a positive marginal effect on adoption. This implied that a unit increase in the amount of credit will invariably lead to an increase in the adoption of NARICT neem organic fertilizer. Credit access is often regarded as the key element for increasing agricultural productivity and has been an effective strategy to increase small holder productivity and alleviate poverty. It enables farmers to relax the liquidity constraints that small holder farmers face to improve their risk bearing capability. This finding agrees with that of Idrisa (2009); Ayayi and Solomon (2010) and Adesope et al. (2012) who found in their studies that credit availability was very essential for agricultural productivity. The study found out that marital status, primary occupation, membership of co-operative do not influence the adoption of NARICT neem organic fertilizer.

CONCLUSION

Based on the findings from this study, it was concluded that even though about 54.3% of the respondents are aware of NARIC neem fertilizer, but did not use it. Which might be due to the fear of the unknown or some other factors not examined by the study. Also, the socio-economic and Institutional characteristics of the farmers have significant influence on the adoption of NARICT neem organic fertilizer.

RECOMMENDATIONS

The study presents the following recommendations;

i. NARICT should come up with ways to make the organic fertilizer available to farmers in the market at affordable price.
ii. Increase awareness of NARICT neem organic fertilizer among farmers NARICT should liaise with the Institute of Agricultural Research (IAR) and NAERLS on radio programme, production of bulletin, guide and pamphlets on the use of this fertilizer in Ajami and local languages.

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