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Effect of Technologies of National Root Crops Research Institute, Umudike on Poverty Reduction among Farmers in Umuahia Agricultural Zone, Abia State

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ABSTRACT

The study determined the effectiveness of dissemination of National Root Crops Research Institute (NRCRI) technologies to rural farmers in Abia State, using Umuahia Agricultural Zone that hosts the Institute as case study. Purposive sampling technique was used in the selection of Umuahia Agricultural Zone. A sample of 120 farmers was randomly selected from six sub-circles. Data were collected using structured questionnaire, and were analyzed with descriptive statistics, such as mean, while multiple regression was used to test the hypothesis. The result showed that farmers adopted the following technologies with the following means: yam-mini-sett technology ($\bar{X}$=3.0), cocoyam technology ($\bar{X}$=3.0), sweet potato technology ($\bar{X}$=2.9), pro- vitamin A cassava ($\bar{X}$=2.5), agro-processing ($\bar{X}$=3.4), turmeric technology ($\bar{X}$=3.0), ginger technology ($\bar{X}$=3.0), and value addition ($\bar{X}$=3.3). The Institute was effective in staff visits ($\bar{X}$=3.2), field meetings ($\bar{X}$=3.2), regularity of meetings ($\bar{X}$=3.2), method demonstration conducted ($\bar{X}$=3.0), result demonstration ($\bar{X}$=3.2), field workshops ($\bar{X}$=2.7,) and on-farm adaptive research ($\bar{X}$=2.7). The result of multiple regression analysis showed that the coefficients for the following technologies were positive and significant in increasing the incomes of the farmers at the following levels: yam-mini-sett, 1%; sweet potato, 5%; Pro vitamin-A cassava technology, 1%. The study found a significant relationship between adoption of NRCRI technologies and increase in the income of the respondents. The null hypothesis that, there is no significant relationship between adoption of NRCRI technologies and income of the farmers was rejected at 5% level the study also found a poverty incidence of 55% and a poverty gap of N36,240.68 The study *concluded that NRCRI technologies were effective in alleviating poverty among rural farmers in the study area, and that greater adoption of the technologies would help reduce the poverty gap among the farmers. The paper recommended that the adoption of technologies disseminated should be sustained through effective extension work.*

Keywords: Effectiveness, technology, adoption, poverty, reduction
Sub- theme: 1

INTRODUCTION

In the past five decades, Nigeria has witnessed serious promotion of agricultural technologies with broad objectives of achieving food self-sufficiency, rural development and poverty reduction. Although the effect of adoption of the various agricultural technologies in reducing poverty in Nigeria has received huge attention, it remains under-researched (Saleth, 2002). Studies explicitly concerned with the measurement of poverty reduction impact of agricultural technology have tended to focus primarily on the direct effect of adoption of such technologies. Scholars, development practitioners and policy makers have not extensively studied the effect of adoption of the technologies on poverty reduction in the rural communities where such agricultural technologies were introduced. In order to make ensure that investments in agricultural technology in developing countries alleviate poverty, the poverty reduction impact need to be evaluated within the contexts of the differences between the adopters and non-adopters, or using other research techniques to measure the impact of use of such new technologies. For instance, Shah *et al.* (2002) illustrated how little investments in agricultural technology can benefit landless households directly through production of root and tubers crops, and indirectly through employment generation.

The establishment of National Root Crops Research Institute, and huge investment in agricultural technology notwithstanding, hunger and poverty continue to plague areas of the developing world. Despite increased agricultural activities, without widespread and intensified use of the high yielding varieties of the major crops, such as cassava, cocoyam and yam, maize, rice, etc., increased food supply and poverty reduction may not be possible in Africa (Okon and Nwosu 2012). Agricultural extension delivery, however, is faced with a lot of problems. Prominent among them are improper packaging of research results, thus leading to misinterpretations; release of technologically unsuitable, economically unviable, socially undesirable and culturally incompatible technologies (Nwachukwu and Mbanaso, 2012). Modern agriculture requires appropriate technologies, such as high yielding varieties in combination with the needed inputs, application of appropriate fertilizers and management practices in order to increase food supply and alleviate poverty (Okon and Nwosu 2012). Agricultural technology is a primary factor contributing to increases in farm productivity, hence playing a unique role in poverty reduction. The Specific objectives of the study were to: examine the various NRCRI technologies; determine the adoption level of the technologies, and ascertain the effectiveness of NRCRI technologies on poverty reduction in the study area. The study hypothesized that adoption of NRCRI technologies do not significantly influence the income of the participants.

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MATERIALS AND METHODS

Abia State is one of the 36 states of the Federal Republic of Nigeria, which was created on 27th August, 1991, and is located in the South-East geo-political zone of Nigeria. It lies between longitude 7°23‘and 8° 02“E and Latitude 5°47‘and 6° 12N. According to National Population Commission (2006) census with a projection based on 3.5% growth rate, the State has a current estimated population of 5,585,696,169 people. It covers a land area of 776,720 square kilometers. Abia State shares boundaries with Imo, Ebonyi, Anambra Rivers and Akwa Ibom States (NPC, 2006). The State is made up of 17 local government areas, divided into three agricultural zones namely: Ohafia, Umuahia and Aba Agricultural Zones.

Purposive sampling technique was used in selection of Umuahia Agricultural Zone, which is the host zone to NRCRI. Stratified sampling was used in the selection of the sample size of 120. In the first stage, wo extension blocks were randomly selected from the Zone, while in the second stage, 2 sub-circles were selected from each block, giving a total of 6 sub-circles. In the third stage, twenty farmers were randomly selected from each sub-circle, giving a sample size of one hundred and twenty (120) farmers. Data collected through structured questionnaire were analyzed with descriptive statistic, such as mean, while multiple regression was used to test the hypothesis. The questionnaire was a 4-point rating scale of Strongly agree, Agree, Disagree, and Strongly disagree to which numerical values 4, 3, 2 and 1 were assigned respectively. The scores up to up 10, and gives a mean of 2.5 when divided by 4. Hence, the cut-off point of 2.55 as the upper limit was used to determine a positive response (i.e., 2.5 + 0.005 = 2.55). Income of respondents was used as proxy for poverty determining poverty status.

Model specification: The multiple regression model used to test the hypothesis is specified thus:

$Y_1 = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7 + b_8x_8 + e$

Where;
Y = participant income (Naira equivalent used as proxy for poverty alleviation),
X= Adoption of disseminated technologies: measured on a 4-point rating scale
X_1 = Yam mini-sett technology
X_2 = Cocoyam technology
X_3 = Sweet potato technology
X_4 = Pro-vitamin A cassava technology
X_5 = Agro-processing improvement service
X_6 = Turmeric technology
X_7 = Ginger technology
X_8 = Value addition
e = error term.

RESULTS and DISCUSSION

Table 1 shows the result on adoption of the selected NRCRI technologies. The Table shows that the various technologies had the following adoption means: yam mini-sett technology ($\bar{X}$=3.0); cocoyam technology ($\bar{X}$=3.0), sweet potato technology ($\bar{X}$=2.9), Pro-vitamin A cassava ($\bar{X}$=2.5), agro-processing improvement service ($\bar{X}$=3.4), turmeric technology ($\bar{X}$=3.0), ginger technology ($\bar{X}$=3.0), aerophilic technology ($\bar{X}$=2.6) and value addition ($\bar{X}$=3.3). The result further revealed that, NRCRI was effective in technology dissemination with the concomitant high level of adoption as the grand mean was 3.00 on a 4-point rating scale, which is above the cut-off point of 2.55. This result is in line with Agbarevo (2012), Nwosu and Nwachukwu (2005), who noted that farmers would readily adopt technologies that meet their felt needs if extension service was effective.

Table 1: Mean adoption levels of NRCRI technologies

NRCRI Technologies	**Scores (120)**				$\sum F\bar{X}$	**Mean**
	SA(4)	A(3)	D(2)	SD(1)		
Yam mini sett technology	50(200)	40(120)	20(40)	10(10)	370	3.0
Cocoyam technology	45(180)	50(150)	15(30)	10(10)	370	3.0
Sweet potatoes technology	39(156)	50(150)	17(14)	14(14)	334	2.9
Pro vita A cassava technology	40(160)	40(120)	25(50)	15(15)	345	2.9
Agro-processing improvement service	55(220)	30(90)	20(40)	15(15)	365	3.0
Turmeric technology	45(180)	40(120)	25(50)	10(10)	360	3.0
Ginger technology	50(200)	40(120)	15(30)	15(15)	365	3.0
Value addition	49(196)	57(171)	9(18)	5(5)	390	3.3
Overall mean score						**3.0**

Source: Field Survey, 2017

The result in Table 2 shows the effectiveness of NRCRI in technology dissemination. NRCRI was very effective in dissemination seven of the eight technologies, with the following means: staff visit ($\overline{X}$=3.2), field meeting ($\overline{X}$=3.2), number of meetings scheduled that held ($\overline{X}$=3.2), method demonstration ($\overline{X}$=3.0), result demonstration ($\overline{X}$=3.2), field workshops ($\overline{X}$=2.7), and research extension linkage ($\overline{X}$=2.7). However, they were not effective in visits to farmers. This is confirmed by the findings of Agbarevo (2013), who in a similar study reported that extension delivery in Cross River was very poor.

Table 2: Mean ratings of the effectiveness of NRCRI in technology dissemination among farmers

Technologies	**Scores (n=120)**				$\sum F\bar{X}$	$\bar{X}$
	Monthly 4	Quarterly 3	Annually 2	No visit 1		
Staff visits	50(200)	40(120)	20(40)	10(10)	370	3.1**
Field meeting	55(220)	40(120)	20(40)	5(5)	385	3.2**
Number of meetings scheduled that held	57(228)	43(129)	10(20)	10(10)	387	3.2**
Method demonstration	60(240)	25(75)	20(40)	15(15)	370	3.0**
Result demonstration	57(228)	33(99)	25(50)	15(15)	392	3.2**
Number of trainings	30(120)	20(60)	40(80)	30(30)	290	2.4*
Field workshop	40(160)	27(81)	33(66)	20(20)	327	2.7**
Research extension linkage	30(120)	39(117)	40(80)	11(11)	328	2.7**
Overall mean score						**2.5**

Source: Field survey, 2017. Note: Key ** = effective, * = not effective

The result in Table 3 shows the regression analysis with respect to the hypothesis. The double-log functional form was chosen as the lead model because it had the highest value coefficient of multiple determination (R^2), F-statistic, number of significant variables and the signs on the variables, which conform to a priori expectations. The model showed that, the independent variables included in the model explained about 90.8 percent of the observed variation in the income status of the respondents in the study area. The F- statistic of (71.920) was significant at 1% level. The effectiveness of yam mini-sett technology, sweet potato technology, pro-vitamin A cassava, agro-processing improvement services, turmeric technology, ginger technology, and value additions were the significant variables that influenced the level of income of the respondents.

The coefficient of yam-mini-sett technology was positively signed and significant at 1% level. This implies that a direct relationship exists between yam mini-sett technology and the level of income of the respondents. Thus, increase in dissemination and adoption of yam-mini-sett technology would lead to an increase in level of income of the respondents. The adoption of yam mini-sett technology would enable farmers to multiply their seed yams for cultivation. The cultivation of more land area of yam will increase the output, and hence generates more income for the farmers when sold. The coefficient of sweet potato technology was positively signed and significant at 5% level. This implies that a direct relationship exists between sweet potato technology and the level of income of the respondents. The coefficient of Pro-vitamin A cassava technology was positively signed and significant at 1% level. This implies too that a direct relationship exists between adoption of Pro-vitamin A cassava technology and the farmer's income. The cultivation of more land area of pro-vitamin A cassava will increase their vitamin in-take, and would help the farmers to generate more income to the farmers when sold. Again, this finding is corroborated by the findings of Agbarevo and Obinne (2008) and Agbarevo (2012), who reported that increase in adoption of cassava improved technologies increased farmers' yield, which translated into increased farmers' income.

The coefficient of agro-processing improvement service was positively signed and significant at 1% level. This implies a direct relationship exists between agro-processing improvement service and

level of income of the respondents. The utilization of this technology will increase their income. The coefficient of turmeric technology was positively signed and significant at 5% level. This implies that a positive relationship exists between turmeric technology and income of the respondents.
The coefficient of ginger technology was positively signed and significant at 5% level. This also implies that a positive relationship exists between adoption of ginger technology and income of the respondents. The coefficient of value addition was equally positively signed and significant at 1% level. This implies a positive relationship exists between value addition and income level of the respondents. This finding is consistent with that of Okon and Nwosu (2012), who noted that agricultural technology is a primary factor contributing to increases in farm productivity, hence playing a unique role in poverty reduction.

Table 3: Ordinary least square multiple regression result on the effectiveness of NRCRI technologies on poverty reduction in the study area

Variable	Linear	Exponential	Double-log+	Semi-log
Constant	2920591	13.216	5.821	37237502
	(8.330)***	(5.216)***	(8.486)***	(-6.780)***
Yam mini-sett technology	-7452.395	0.025	1.887	-3510247
	(-2.583)**	(2.606)**	(3.460)***	(-2.672)**
Cocoyam technology	-1845.552	-0.123	-0.074	-311374
	(-1.689)	(-2.258)**	(-1.604)	(-1.222)
Sweet Potato technology	1259.529	0.330	0.683	74080.011
	(0.226)	(0.807)	(2.553)**	(0.965)
Pro vita A Cassava	-1943.689	-0.576	1.277	41924.303
	(-2.304)**	(-2.366)**	(4.323)***	(1.981)**
Agro-processing improvement	195.024	0.130	1.029	-50360.812
service	(2.418)**	(1.253)	(3.071)***	(-3.191)***
Turmeric technology	1922.581	-0.502	1.642	714663
	(2.325)**	(-3.011)***	(2.556)**	(0.896)
Ginger technology	-232.980	0.406	1.193	99044.184
	(-0.276)	(0.969)	(2.393)**	(2.555)**
Value addition	100.273	-1.670	1.683	45440.982
	(1.269)	(-2.377)**	(3.516)***	(2.416)**
R^2	**0.814**	**0.840**	**0.908**	**0.784**
Adj. R^2	**0.790**	**0.826**	**0.882**	**0.766**
F-statistic	**60.129*****	**63.082*****	**71.920*****	**55.815*****

Source: Field survey, 2019. Ho_1 reject at 5% level

Table 4 shows the poverty level of farmers using income as proxy for poverty line, poverty incidence and poverty gap. The result also shows the annual mean household expenditure of the respondents (N146,670.96), poverty line of farmers (N97,780.64 per annum), with average annual income of two hundred and seventy thousand Naira (N270,000.00). The Table also shows that, the poverty incidence, which is also the percentage of people living below the poverty line is 55% of the total respondents, and by extension, 55% the population of the study. This implies that 55% farmers are poor because their mean annual income fell below the poverty line of ninety-seven thousand, seven hundred and eighty Naira, sixty-four kobo (N97,780.64). The poverty gap, also known as the income shortfall, is used to assess the degree of poverty in a population. It is the amount needed to take out those under the poverty line to live above the poverty line. Table 4 shows that the poverty gap is N36,240.68. This means that farmers below the poverty line in the study area would require additional N36,240.68 annually to get out of poverty. This level of poverty among farmers is corroborated by Nwaobiala, and Nwosu (2015), who posted a similar result among farmers in Cross-River State.

The regression analysis, which shows that a positive relationship exists between adoption of NRCRI technologies and increase in the farmers income implies that continued adoption of the technologies by the farmers would help reduce the poverty gap.

Table 4 : Analysis of poverty of farmers in the study area

Indicators (per annum)	Estimate
Mean Household Expenditure (N)	146,670.96
Mean annual income (N)	270,000.00
Poverty line (N)	97,780.64
Poverty incidence (% below poverty line)	55.00
Poverty gap (Income short fall in Naira)	36,240.68

CONCLUSION

The study concluded that technologies developed by NRCRI met the felt needs of the farmers, and coupled with effective extension service delivery there was high adoption. It further concluded that NRCRI was effective in alleviating poverty among rural farmer in Abia State as exemplified by the significant increase in the farmers' income.

RECOMMENDATIONS

Base on the findings, the following recommendations were made:

1. The technologies developed and disseminated should be sustained through a more effective extension delivery of its technologies.
2. More farmers should be encouraged to adopt the disseminated technologies through sensitization of the benefits of adopting the technologies since the adopted technologies increased the farmer's income significantly.
3. The study has revealed that turmeric and ginger, cocoyam, and sweet potato technologies which are not widely cultivated can significantly increase farmers' income. Hence, it is recommended that they should be vigorously promoted by extension service.

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