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Original Article

Does Improved Management Practices Usage Affect Farm Income? Evidence from Cassava Farmers in Kwara State, Nigeria

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ABSTRACT

In the face of climate change, improved management practices (IMP) may play a significant role in driving up productivity and profitability. However, studies on the impact of IMP use on farm revenue, particularly among producers of cassava, have not gotten enough attention. So, we looked at how using Improved Management Practices affected the income of cassava growers in Kwara State, Nigeria. The specific goals were to: a) identify the Improved Management Practices used by cassava farmers; b) examine how using Improved Management Practices affected the farmers' farm income; and c) define the poverty profile of the cassava farmers. Using descriptive statistics, index ranking, correlation, and the Foster Greer and Thorbecke (FGT) poverty decomposition model, the cross-sectional data collected from 120 cassava farmers were analyzed. The findings showed that the three most commonly used Improved Management Practices in the research area were guided planting time, herbicides, and guided planting distance. Additionally, the intensity of IMP consumption positively and significantly affects farm income. According to the FGT results, 30% of farmers were in poverty. It is important to explore any tactics and laws that would encourage farmers to learn more about Improved Management Practices and, as a result, enhance the intensity of IMP usage.

Introduction

Around 210 million people in sub-Saharan Africa depend heavily on cassava as a root and tuber food source (Ojeleye, 2018). Cassava is a versatile food security crop in Nigeria. For instance, rural households can get their calories and money from cassava roots and leaves. Over 30 million farmers, as well as a sizable number of processors and traders in Nigeria, rely on cassava for food and money (Ojeleye, 2018). Nigeria will dominate the world in cassava production in 2021, with an output of approximately 59.9 million MT (FAO, 2021). However, Nigeria's average production of cassava is only 10 MT per hectare, which is extremely low when compared to nations like Thailand and Indonesia, where the yields are 23.4 MT and 22.2 MT per hectare, respectively.

One obvious problem for Nigeria's agricultural sector has been adjusting to climatic variability in order to achieve food security. The threats that have already begun to affect crop production, price, and ultimately the income and way of life of farmers include declining crop productivity, shifts in the production season caused by changes in rainfall and temperature patterns, prolonged drought periods, and increased incidence of insect pests and diseases. The most significant variables in a long-term increase in yield and decrease in poverty are the employment of enhanced management methods (such as guided planting timing, depth, spacing, and use of herbicides) and technological advancement (such as improved cassava varieties) (Solomon *et al.*, 2012).

Improvements in farming techniques are required as a result of the ongoing climate change, as agriculture is more vulnerable to this change (Tambo & Abdoulaye, 2012). Uncertainties about food security are brought about by climate change for populations whose survival depends on climate-sensitive livelihoods (AlHassan and Poulton, 2009; Athula and Scarborough, 2011). Through rising temperatures, less precipitation, frequent droughts, and water scarcity, climate change is becoming a global threat (Adger *et al.*, 2003; IPCC, 2007). Climate change significantly impacts the fundamental components of food production, such as soil, water, and biodiversity (FAO, 2009).

In order to better adjust to the changing environment, farmers have been adjusting their farming techniques. But in order to deal with the medium- to long-term effects of climate change, conventional coping methods are insufficient (FAO, 2009). Therefore, utilizing new technologies is crucial to reducing climate change and preparing for it (Tambo & Abdoulaye, 2012). Additionally, it's critical to comprehend the timing, manner, and effects of farmers' employment of these technologies (Doss, 2006).

Several studies investigating the impact of farming techniques on the maintenance and regulation of ecosystem services have been conducted in recent years (Williams and Hedlund, 2013, Birkhofer *et al.*, 2016). However, there is a lack of actual data to show how better management methods, particularly among cassava growers, increase farm income. Therefore, the objectives of this study are to: a) identify the improved management techniques currently being used by cassava farming households in the study area; b) analyze the effects of improved technology usage on the farm income of cassava farming households in the study area; and c) describe the poverty profile of cassava farming households.

Materials and Methods

Study Area

The study was conducted in Kwara State Nigeria. This State is situated in Nigeria's North Central Zone. It is located between longitudes 2030°E and 6025°E and latitudes 7045°N and 9030°N. The average daily temperature is between 210C and 350C, and there are two distinct seasons (the wet and dry seasons). The state-wide average for yearly precipitation is between 1,000 and 1,500 mm. With a population of roughly 2.59 million and a population density of 42.5 square kilometers, Kwara State has a total land area of 32,500 square kilometers.

Sampling Techniques

For this investigation, samples of respondents were drawn using a three-stage sampling approach. In stage 1, Kwara State's three local governments were chosen at random. In stage 2, four communities from each local government—where cassava is primarily grown—were purposefully chosen. In the third stage, 10 households from each hamlet are randomly chosen. For the study, 120 cassava farming households in total were surveyed.

Source of Data

A semi-structured interview schedule was used to obtain data through an interview survey. Utilizing Statistical Packages for the Social Sciences, several descriptive and inferential statistical approaches, such as percentage, index ranking, correlation, and the Foster, Greer, and Thorbecke (FGT) poverty decomposition model, were used to provide relevant results (SPSS).

Analytical Techniques

Index ranking

Based on the degree of application, the enhanced management methods being utilized by the cassava farmers were ranked using the Index ranking, which was developed using the methodology of Ndamani and Watanabe, 2016. Responses to this were scored on a four-point scale, with 3, 2, 1, and 0 representing frequently, somewhat, rarely, and "not at all," respectively. After that, the following formula was used to estimate a weighted average index (WAI) analysis:

$$\mathrm{WAI} = \frac{F_3W_3 + F_2W_2 + F_1W_1 + F_0W_0}{F_3 + F_2 + F_1 + F_0}.$$

$$\mathrm{WAI} = \frac{\sum F_i W_i}{\sum F_i} = \frac{WI}{\sum F_i}.$$

Where: F = frequency
W_i = weight of each scale
i = individual scale
WI = weighted index

Correlation Formula

Correlation was used to determine the effect of usage of improved cassava farming practices on the farm income. This is to address objective three (3) of the study.

$$\frac{n\sum xy - (\sum x)(\sum y)}{\sqrt{n\sum x^2 - (\sum x^2)(n\sum y^2 - (\sum y^2))}}.$$

Where;
N = number of pairs of scores
$\sum xy$ = sum of the product of paired scores
$\sum y$ = sum of usage intensity score
$\sum x$ = sum of income score
$\sum x^2$ = sum of square of income
$\sum y^2$ = sum of square of usage intensity
FGT Approach: Foster, Greer, and Thorbecke
Based on their adoption of improved management methods, it was utilized to characterize the poverty profile of cassava farming households in the third study goal.

Calculating Poverty

In order to estimate the poverty headcount (Incidence), poverty depth, and poverty severity, or P0, P1, and P2, respectively, the Foster, Greer, and Thorbecke (FGT) poverty decomposition model was utilized. The three measurements are based on the same methodology, but each index gives a different weight to how much below the poverty line home or individual is. Giving the FGT poverty index are:

$$P_\alpha(y, z) = \frac{1}{2}\sum_{i=1}^{q}\left(\frac{z - y_i}{z}\right)$$

Where:
n = total number of households in the population
q = the number of poor households
z = poverty line for the household
y_i= household income
α = poverty aversion parameter and takes on value 0, 1, 2
$\frac{z - y_i}{z}$ = proportion shortfall in income below the poverty line

Results and Discussion

Table 1. Improved Management Practices in use among cassava farmers in order of predominance.

Improved Management Practices	Always	Often	Moderately	Seldom	Weight Index	Weight Average Index	Rank
Guided planting time	17	46	42	11	301	2.51	1st
Herbicide	2	46	43	16	248	2.07	2nd
Guided planting distance	4	26	55	28	232	1.93	3rd
Guided planting population	3	27	60	23	227	1.89	4th
Guided planting depth	10	22	26	26	184	1.53	5th
Tractor	0	33	22	8	119	0.99	6th
Improved cassava variety	0	17	19	23	112	0.93	7th
Fertilizer	0	15	10	33	98	0.81	8th
Pesticide	0	9	8	20	63	0.52	9th

The result in table 1 revealed that guided planting time was ranked first in terms of intensity of use among the cassava farmers in the study area. This is probably due to the effect of climate change on rainfall. Farmers, therefore, rely on meteorological forecasts and other relevant weather reports before planting so as to reduce the risk of experiencing poor yield. This result is in tandem with the results of Akerele *et al.*, 2016. Guide planting time is closely followed by herbicide usage and guided planting population. The cassava farmers in the study area rarely used pesticides.

Improved Management Practices and Farm Income

Table 2. Effect of improved management practices usage on the farm income.

		Intensity	Monthly income
Farm income	Pearson Correlation	1	.341*
	Sig. (2-tailed)		.000
	N	120	120
Usage Intensity	Pearson Correlation	.341*	1
	Sig. (2-tailed)	.000	
	N	120	120

*. Correlation is significant at the 0.05 level (2-tailed).

The result in Table 2 shows that Improved Management Practices usage intensity has a positive effect on the farm income which is significant at 0.05% significant level and a Pearson correlation coefficient of 0.341. This implies that the higher the level of improved cassava management practices used by the farmers, the higher the level of farm income of such farmers. This result compares favourably with the findings of Tingting *et al.*, 2018 who opined that best management practices have positive and significant effect on farm income.

Poverty profile of cassava farming households in the study area

Table 3. Computing the poverty line.

Items	Amount (₦/month)
Mean PCI	33166.67
TPCI	853,570.08
Mean TPCI	7,113.08
2/3MTPCI (Poverty Line)	4,742.06

The result in Table 3 is a presentation of the estimation of the poverty line that was used to determine the poverty status of the farmers in the study area. The poverty line formed the basis for further analysis. The Foster-Greer-Thorbecke (FGT) class of poverty measures was employed to estimate the poverty status of the farmers in the study area. Following the adoption of Foster, Greer and Thorbecke measures, households' total income was used to determine households' poverty status. The result shows the households monthly Per capita Income, total per-capita income and mean total per capita income (MTPCI), and the poverty line. The poverty line was constructed as two-thirds of the mean per capita household income (MTPCI) of all households. This approach has been used by several researchers such as Oni and Yusuf, 2008 as a measure of welfare.

Households were then classified into their poverty status based on the poverty line. Non-poor households were those whose per capita income was above or was equal to two-thirds of the mean total per capita income of all households while those whose per capita income was below two-thirds of the mean total per capita income were classified as poor. The poverty line constructed as two-third of the mean total per-capita income of all the households was ₦4,742.06. This implies that households whose monthly per capita income fell below ₦4,742.06 were classified as poor while households whose per capita income equaled or was above the poverty line were classified as non- poor.

Table 4. Poverty profile of the cassava farmers.

Items	Results
Poverty Line(₦)	4,742.06
Poverty headcount	0.30
Poverty gap (depth)	0.09
Poverty severity	0.04
Poor (%)	30
Non-poor (%)	70

The result in Table 4 shows the values for the poverty measures, (poverty incidence, depth, and severity). Based on the poverty line, households were classified into their poverty status as either non-poor or poor as presented. The headcount index (incidence of poverty) computed for the study area was 0.30 implying that 30% of the farm households in the study area are poor while 70% are non-poor. Poverty gap (depth) represents the depth of poverty was 0.09. Poverty severity value was 0.04.

Conclusion

This study revealed that, improved management practices have a positive and significant effect on the farm income of the cassava farming households. Guided planting time, herbicide use and guided planting depth were the predominant improved management practices in use in the study area. It is therefore recommended that all strategies and policies that would promote farmers' education on the Improved Management Practices and consequently lead to increased Improved Management Practices usage intensity should be pursued.

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