



Determinants of the adoption of improved Cassava Technologies for Sustainable Agriculture in Oyo State Nigeria

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Abstract

Keywords:

Determinants, Adoption, Technologies, Sustainable, Cassava, Oyo, Nigeria

Cross sectional data was obtained on the determinant of the adoption of improved cassava technology for sustainable agriculture in Oluyole Local Government area in Oyo State, Nigeria; Using descriptive and inferential statistics in analyzing the data collected with the use of a well-structured questionnaire. 70 respondents were randomly selected from three villages namely Abanla, Onigambari and Idi-Ayunre in Oyo State. The result revealed that 81.4% of the respondents were male, 60.0% were between the ages of 41-60 years, 88.6% of them had one form of formal education, 77.1% were married, 52.9% had between 1-10% years farming experience, 65.7% inherited their farmland, 90.1% had 1-5 hectares of farm size while more than half 51.4% of them source their credit through personal saving, 90.0% of the farmer adopted land clearing, 82.9%, 17.1%, 25.7%, 52.9%, 55.7% and 92.9% adopted chemical application, fertilizer application, mechanical harvester mode, hybrid stem varieties and dry season planting time as means of improved technologies respectively. 50%, 68.6% and 65.7% strongly agreed that land tenure system, storage facilities and harvesting system are the major constraint to the adoption of cassava improved technologies in the study. The regression result revealed that educational level, farming experience, farm size, source of land, source of credit and income were the major determinants of the adoption of improved cassava technologies to sustainable farming in the study.

Accepted: 27 June 2019

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INTRODUCTION

Cassava (*Manihotesculenta*) originated in Brazil, South America and is one of the most important food crops in West Africa. It is ranked the most important root crop in terms of world production (IITA, 2005). Cassava is a perennial wood shrub of the Euphorbiaceae family. It is grown principally for its swollen roots but its leaves are also eaten in some parts of Africa. Cassava is rich in carbohydrate and it is a major source of energy (Olumide, 2004 and Nwekeet al., 2002). It is adapted to a wide range of climate and edaphic conditions which gives it a comparative advantage. The cassava is cultivated mainly in the tropic and sub-tropic regions of the

world, over a wide range of environmental and soil conditions. It is very tolerant of drought and heat stress and produces well on marginal soils, also thrives and produces stable yields under conditions in which other crops fails. Cassava is a versatile crop and can be processed into a wide range of products such as starch, flour, tapioca, beverages and cassava chips for animal feed. Cassava is also gaining prominence as an important crop for the emerging biofuel industry and, as corroborated by Ziskaet al., (2009)

In Nigeria, cassava is grown in all the ecological zones; the crop is planted all year round depending on the availability of moisture, the peak of planting

period is practiced as a method of cassava production. Cassava is important not as a food crop but even more so as a major source of income for rural households. Nigeria is the highest producer of cassava in the world with total production of about 57 million metric tonnes (FAOSTAT, 2017)

A common philosophy among sustainable agriculture practitioners is that 'healthy' soil is a key component of sustainability. It means that a healthy soil will produce healthy crop plants that have optimum vigour and are less susceptible to pests. Sustainable farmers maximize reliance on natural, renewable and on-farm inputs.

There are some constraints to cassava production in Africa especially in Nigeria. Some of them are pest related. These include cassava green mite, cassava mosaic disease, cassava bacterial blight, cassava anthracnose and the root-rot. According to IITA (2001), these together with poor cultural practices combine to cause yield losses that may be as high as 50% in Africa. Improved cassava varieties that are disease and pest resistance, low cyanide content, drought tolerance early maturing and high yielding are very important in production. However, availability of these improved varieties of planting stock has not been consistent because up to 40% of the farmers do not have access to the improved technologies

Nigerian farmers embarked upon various farming activities at farm level in order to keep up their farmland for long time use. Such farming activities include fertilizer application, addition of organic manure, land fallowing, pesticide and herbicides application as well as those measuring farmer production practices (Oyewo, 2016). Therefore, the study will bring to light the major cassava technologies available in the study area and their adoption level which will help extension workers to develop effective extension strategies to disseminate improved cassava production technologies to the farmers. This research therefore assesses the adoption of improved cassava technologies in Oluyole Local Government Area of Oyo State, Nigeria with the following objectives: examine the socio economic characteristic of cassava farmer in the study area, examine the cassava physical inputs, examine the level of adoption of the improved technology, examine the problem facing the adoption of improved cassava technologies in the study area, and analyze the determinants of the adoption of improved cassava technologies in the study area.

METHODOLOGY

Scope of the Study

The study was carried out in Oluyole Local Government area of Oyo State in south-western Nigeria, with its capital at Ibadan. It is bounded in

the north by Kwara State, in the East by Osun State, in the south by Ogun State. Oyo state covers approximately an area of 28,454 square kilometers. The landscape consists of old hard rock and some shape hill which rise gently from about 500 meters in the Southern part and reaching a height of about 1,219 meter above sea level in the Northern part.

The climate is equatorial notable with dry a wet season lasts from November to March while the wet season starts from April and end in October. Average daily temperature ranges between 25^oc (77.0^of) and 35^oc (95.0^of) almost throughout the year. The climate in the State favour the cultivation of crops like maize, yam, cassava, millet, rice, plantain, cocoa tree, palm tree cashew and various non-timber forest product. Oluyole Local Government area falls within the rain forest zone or the lowland forest zone of Nigeria with characteristic of high density of trees and a highly stratified structure. Rain forest in Nigeria area covered an estimated area of 19, 8279,138 ha.

Sample Technique and Sample Size

Multistage sampling techniques were used in the sample selection. In the first stage, Oluyole Local Government was purposively selected due to the population of cassava farmers in the study. Second stage, three villages were selected which are Abanla, Onigambari and Idiyunre. Third stage, involved the random section of 20, 20 and 30 cassava farmer from Abanla, Onigambari and Idiyunre making a total of 70 cassava farmers. This study used both primary and secondary data. The instrument for collecting the primary data was structure questionnaires.

Data Analysis

Descriptive statistics such as percentages, frequency count, means and multiple regressions were used for the analysis of this study. The adoption index was calculated as the number of technologies adoption by a particular farmer as a percentage of the total number of technologies as adopted by Olumba and Raji (2014)

The regression model specifications

$$Y=f(x)$$

$$Y=b_0+b_1X_1+b_2X_2+b_3X_3+b_4X_4+b_5X_5+b_6X_6+b_7X_7+b_8X_8+b_9X_9+\mu$$

Where Y= Adoption index

X₁= Education level

X₂= Marital status

X₃= Farming experience

X₄= Farming size

X₅= Source of land

X₆= Source of credit

X₇= Extension contact

X₈= Stem used

X₉= income

B_0 = parameter
 μ = error term

Results and Discussions

Table1: revealed that 18.6% were female while 81.4% were male this implies that majority of the cassava farmer are males, this could be due to the rigorous activities involved in cassava farming, while the female involved in cassava processing and other domestic activities, 31.4% of the farmer were between the age of 51- 60 years, 28.6% were between the ages of 41-50, While 11.4% were between the ages of 31-40 year with mean age of 55 year, this shows that cassava farming is mostly dominated by age people because of the mean age which is tendency toward ageing farming. 65.7% were Christians, while 34.3% Islamic worshipper, the study further reveal that 35.7%, were secondary school certificate holders while 28.6% were primary school certificate holders, 20.0% were NCE / OND,11.4% had no formal education,4.3 had tertiary education, it also shows that 77.1% were married 11.4% were divorced 7.1% were single while 4.3%were widow /widower. Majority (100%) of the respondent were involved in farming as the primary occupation. 52.9% had farming experience for between 1-10 years 21.42% of respondent had 11-20 years and 21-30year of farming experience respectively while 4.3% had 31years and above 68.6% had family size of 1-5 household while 31.4% had family size of 6-10 person with mean household size of 4.84% this indicate that the farmer had a fairly large family size which could be used as family labour. 54.3% used hired labour while 45.7% use their family as labour for their farming operation, this could be due to the family size and the age group of the family member, most especially the children who are not fully grown up to handle farming operation or activities. 65.7% source their farmland through inheritance, 17.1% through communal, 2.9% through government while 14.3% also source their farmland through rented/leased. Inherited and government (2.9%) are typically small 90.1% had 1-10 acre of farm size while 9.9% had 1-10 acre of farm size, this indicate that majority farmer are operating on a small scale production. The table also shows that 51.4% source their credit through personal saving, 42.9% through cooperative while 1.4% sources their credit through bank loan and friends respectively. This indicate that majority source of credit were through personal saving, thus may not enhance or encourage farmers the adoption of various improved technologies involved in cassava farming in the study area.

Table 1: Socio-economic characteristics of cassava farmers.

Variable	Frequency	Percentage
Gender		
Male	57	81.4
Female	13	18.6
Total	70	100.0
Age		
31 – 40	8	11.4
41 – 50	20	28.6
51 – 60	22	31.4
61 – Above	20	28.6
Total	70	100.0
Religion		
Christianity	46	65.7
Islam	24	34.3
Total	70	100.0
Education		
No former	8	11.4
Primary	20	28.6
Secondary	25	35.7
NCE/OND	14	20.0
University/HND	3	4.3
Total	70	100.0
Marital Status		
Single	5	7.1
Married	54	77.1
Divorced	8	11.4
Widow/Widower	3	4.3
Total	70	100.0
Primary Occupation		
Farming	70	100.0
Total	70	100.0
Experience		
1 – 10	37	52.9
11 – 20	15	21.42
21 – 30	15	21.42
31 – above	3	4.3
Total	70	100.0
Labour Source		
Hired	38	54.3
Family	32	45.7
Total	70	100.0
Farm Source		
Communal	12	17.1
Inherited	46	65.7
Government	2	2.9
Rented/leased	10	14.3
Total	70	100.0
Farm Size		
1 – 5	63	90.1
6 – 10	7	9.9
Total	70	100.0
Credit Source		
Government	2	2.9
Personal Saving	36	51.4

Cooperative	30	42.9
Bank Loan	1	1.4
Fiend	1	1.4
Total	70	100.0
Extension Contact		
No	50	71.4
Yes	20	28.6
Total	70	100.0

Source: Field survey, 2018

Table 2: Shows that 92.9% plant cassava twice in a year while 7.1% plant once in a year, 81.4% sold cassava in lorry per tones ,10.0% were sold in bags while other were selling in basket, 81.4% source their cassava item through hybrid sources while 18.6% through local sources, majority 91.4% of the farmer plant during the dry season while 8.6% plant during rainy season ,71.4% did not have access to extension contact while 28.6% had access to extension agent .This is an indication that majority of cassava farmer in the study area did not have access to recent technologies, and information though the extension agent which may likely affect the farmers level of adoption of improved technologies

TABLE 2: Cassava physical inputs

VARIABLE	PERCENTAGE	FREQUENCY
PLANTING TIME		
One	5	7.1
Two	65	92.9
Total	70	100.0
YIELD		
Per bag	7	10.0
Per basket	6	8.6
Per lorry	57	81.4
Total	70	100.0
STEM SOURCE		
Hybrid	57	81.4
Local	13	18.6
Total	70	100.0
STEM PURCHASE		
NO	21	30.0
YES	49	70.2
Total	70	100.0
PROCESSING		
NO	42	60.0
YES	28	40.0
Total	70	100.0
PLANTING PERIOD		
Rainy season	6	8.6
Dry season	64	91.4
Total	70	100.0
EXTENSION CONTACT		
NO	50	71.4
YES	20	28.6
Total	70	100.0

Source: Field survey,2018

Table 3: the result reveal that majority (90.0%) of the farmer adopted, land clearing while, 82.9% adopted chemical application, 17.1% adopted fertilizer application, 25.7% adopted mechanical harvesting mode, 52.9% adopted hybrid stem varieties, 55.7% adopted the use of tractor as a mechanical

means of clearing, 24.3% adopted mulching, while majority 92.9% of the farmer adopted planting time (dry season) as a means of technology.

TABLE 3: Level of adoption of improved cassava technology

VARIABLE	FREQUENCY	PERCENTAGE
LAND CLEARING		
Not adopted	7	10.0
Adopted	63	90.0
Total	70	100.0
CHEMICAL		
Not adopted	12	17.7
Adopted	58	82.9
Total	70	100.0
FERTILIZER		
Not adopted	58	82.9
Adopted	12	17.1
Total	70	100.0
HARVEST MODE (MECHANICAL)		
Not adopted	52	74.3
Adopted	18	25.7
Total	70	100.0
STEM VARITIES (HYBRID)		
Not adopted	33	47.1
Adopted	37	52.9
Total	70	100.0
TRACTOR		
Not adopted	31	44.3
Adopted	39	55.7
Total	70	100.0
MULCHING		
Not adopted	53	75.7
Adopted	17	24.3
Total	70	100.0
PLANTING TIME		
Not adopted	5	7.1
Adopted	65	92.9
Total	70	100.0

Source: Field survey, 2018

Table 4: revealed that 50.0% of the farmers agreed and 44.3% strongly agreed that land tenure system is one of the problem of improved cassava technologies 27.1% agreed and 35.7% strongly agreed that credit facilities is a problem, insufficient stem(27.1%)agreed and 14.3% strongly agreed, transportation(42.9%)agree and 44.3% strongly agreed, labour expenses (31.4%) agreed and 11.4% strongly agreed while 54.3% strongly disagreed, harvesting (14.3%) agreed and 68.6% strongly agreed, storage facilities(65.7%) strongly agreed and 12.4% agreed, hybrid cassava(11.4%) agreed and 5.4% strongly agreed while 67.1% strongly disagreed, (44.3%)agreed and 42.9% strongly agreed. This shows that majority of the famer agreed and strongly agreed that land tenure system, credit facilities, transportation, harvesting, storage facility and weather are the problem facing the adoption of improved cassava technologies in the study area.

Table 4: Problem facing the adoption of improved cassava technologies

Variable	Frequency	Percentage
LAND TENURE		
STRONGLY DISAGREE	0	0.0
DISAGREE	4	5.7
AGREE	35	50.0
STRONGLY AGREE	31	44.3
Total	70	100.0
CREDIT FACILITIES		
STRONGLY DISAGREE	7	10.0
DISAGREE	19	27.1
AGREE	19	27.1
STRONGLY AGREE	25	35.8
Total	70	100.0
INSUFFICIENT STEM		
STRONGLY DISAGREE	30	42.9
DISAGREE	11	15.7
AGREE	19	27.1
STRONGLY AGREE	10	14.3
Total	70	100.0
TRANSPORTATION		
STRONGLY DISAGREE	3	4.3
DISAGREE	6	8.6
AGREE	30	42.9
STRONGLY AGREE	31	44.2
Total	70	100.0
LABOUR EXPENSES		
STRONGLY DISAGREE	2	2.9
DISAGREE	38	54.3
AGREE	22	31.4
STRONGLY AGREE	8	11.4
Total	70	100.0
HARVESTING		
STRONGLY DISAGREE	1	1.4
DISAGREE	11	15.7
AGREE	10	14.3
STRONGLY AGREE	48	68.6
Total	70	100.0
STORAGE FACILITIES		
STRONGLY DISAGREE	9	12.8
DISAGREE	6	8.6
AGREE	6	8.6
STRONGLY AGREE	46	65.7
Total	70	100.0
HYBRID CASSAVA		
STRONGLY DISAGREE	47	67.1
DISAGREE	11	15.7
AGREE	8	11.4
STRONGLY AGREE	4	5.7
Total	70	100.0
WEATHER		
STRONGLY DISAGREE	1	1.4
DISAGREE	8	11.4

AGREE	31	44.3
STRONGLY AGREE	30	42.9
Total	70	100.0

Source: Field survey, 2018

The table 5 revealed that educational level and source of credit has a significant relationship to the level of adoption of improved cassava technologies at 1% farm size and income has a positive relationships and significant at 5% respectively, while farmer experience and source of land also has a significant relationship to the level of the adoption of improved cassava technologies in the study area. This implies that the more educated the farmer are, the more they will be willing and have a better knowledge of the adoption of the improved cassava technologies involved in cassava farming and also farming experience, farm size and farmers income will also increase the farmer level of adoption of the improved cassava technologies because the more experienced the farmers are the more they will be willing to adopt the improved technologies and also the more the farmers income and farm size increases the more the adoption of the technologies. This is because income plays a vital role in the adoption of new technologies by the farmer, and the more they expand their farm size the better the adoption of cassava improved technologies. This is in line with the finding of Ekwe, 2004 and supported by Olumba and Rahji (2014) in their study of the analysis of the determinant of adoption of improved plantain technologies in Anambra State. However, the coefficient of source of land and credit were negatively signed this could however bring about non adoption of the improved cassava technologies, this was not expected, but this could be due to the majority of farmers having access to credit through personal savings which may not encourage the farmer to adopt the improved technologies, because little amount could be sourced through personal savings and cooperative society. R^2 was 0.62, which implies that 62% of the variation in the explanatory variables could be explained by the model specified while 38% could be captured by error term. It was therefore concluded that all the significant variable in the model were the major determinant of the adoption of improved cassava technologies in the study area.

Table 5. Determinants of the Adoption of Improved cassava Technologies

Variables	Coefficient	Std. Error	t	sig
Constant (b0)	10.319	2.284	4.518	0.000
X ₁ = Educational level	0.002***	0.001	3.59	0.001
X ₂ = Marital status	- 0.480	0.293	- 1.637	0.110
X ₃ = Farm experience	0.047*	0.023	1.993	0.053
X ₄ = Farm size	0.236**	0.111	2.119	0.041
X ₅ = Source of land	-0.312*	0.167	-1.870	0.069
X ₆ = Source of credit	-0.718***	0.245	-2.934	0.006
X ₇ = Extension contact	-0.044	0.367	-0.121	0.905
X ₈ = Stem quantity	-0.005	0.003	-0.012	0.991
X ₉ = Income	2.130**	1.032	2.065	0.046

R²0.620

Author's computation 2018

RERERENCES

- An,H.(2013).“The Disadoption of Recombinant Bovine Somatotrophin (rBST) and Its Economic Impact: A Switching Regression Approach.” *Applied Economic Perspectives and Policy* 35 (3): 528–549. doi:10.1093/aep/ppt016.
- Alexandratos, N. (1995). *World Agriculture: Towards 2010. An FAO Study*, New York: Food and Agriculture Organization of the United Nations; John Willey and Sons.
- Alabi and Oviasaagie (2002).Nutrient composition and contribution of noodles (abacha) andLocal salad from cassava (*Manihot* spp.) to nutrient intake of Nigerian consumers. *African Journal of Food Science* 4 (7) pp. 422-426.
- Akubuilu, C.J.C., E. E. Umebali., Mgbada, D. S. Ugwu., W. E. Egwu and M.U. Awoke, (2007) “Readings in Agricultural Economics and Extension”, Computer Edge Publishers, Enugu.pp.45-89
- Bekele, H. K., H. Verkuijl, W. Mwangi, and D. Tanner.(2000). Adoption of Improved Wheattechnologies in Adaba and Dodolawaoredas of the Bale Highlands, Ethiopia. Mexico, D. F.: International Maize and Wheat Improvement Center (CIMMYT) and Ethiopian Agricultural Research Organization (EARO); 26
- Erhabor P.O, Azaiku S.S, Inagwa SA (2007). “Cassava White Gold. Ravel Printing Press, initiative Publication Company. Benin City. Edo State. 4(1): 1-6.
- FAO, (2005). *Food and Agricultural Organization: Food Outlook*, pp: 36Erhabor PO, Azaiku SS,
- Inagwa SA (2007). “Cassava White Gold. Ravel Printing Press, initiative. Publication Company. Benin City. Edo State. 4(1): 1-6
- FAO, (2005). *Food and Agricultural Organization: Food Outlook*, pp: 36
- FAO (Food and Agriculture Organization of the United Nations) *Yearbook*, (2007).Website: www.fao.org
- Hillocks R. J., Thresh J. M. and Bellotti A. C. (2002). *Cassava; biology, production and utilization*. New York: CABI Publishing.
- IITA (2005).*International Institute of Tropical Agriculture, Ibadan, Statistical Handbook*. 3 (24): 16-18.
- Olumba, C.C and Rahji M.A.Y (2014) Analysis of the determinants of the adoption of improved plantain technologies in Anambra State, Nigeria. *Journal of Agriculture and Sustainability*, 5 (2): 232-245
- Pinstrup-Andersen P. Lorch P, and Rose grant, M. (2001) *Global food security: A received of the Challenges: 2020 vision*, Washington, D.C., IFPRI.
- Nweke FI, Spenser DSC, Lynam JK (2002). *The Cassava Transformation: Africas best-kept Secret*. Michighan State University Press, Michighan, USA. 3(9): 231-232.
- Nweke, F. I., S. Dunstan, C. Spencer, and J. K. Lynam. (2002). *The Cassava Transformation: Africa's Best-Kept Secret*. East Lansing, MI, USA: Michigan State University Press.
- Nartey, F.(1978). *Manihotesculenta in Africa: Utilization as human food and animal feed*. Munksgaard, Copenhagen. pp: 42-43.
- Perez, R.D. and Villamayor, F.G. (1984). Relationships among specific gravity, dry matter and Starch contents of cassava roots. *National Science and Technology Authority Technology Journal* 9 (2), 18-22.
- Plucknett, D. L., Phillips, T. P. and Kagbo, R. B. (1998). *A Global Development Strategy for Cassava: Transforming a Traditional Tropical Root Crop: Sparing Rural Industrial Development and Raising Incomes for the Rural Poor*. Available online: http://www.fao.org/docrep/006/y0169e/y0169e04.htm (accessed 9 August 2011)

- Olumide T.O (2004). The Global cassava Devt. Strategy. Food and Agriculture Organizations(FAO) of the United Nations. 2(10): 12-16.
- Oyewo, I.O (2016), Determinants of Sustainable Land Management Practices among Small holder Cassava Farmers in Oyo State. Unpublished Mphil/PhD Thesis) pp 70
- Ziska, L., Runion, G. B., Tomecek, M., Prior, S. A., Torbet, H. A. and Sicher. R. (2009). An Evaluation of cassava, sweet potato and field corn as potential carbohydrate sources for bioethanol production in Alabama and Maryland. Biomass and Bioenergy 33:1503-1508.