Cassava Innovation Application among Small Scale Farmers in North Central Nigeria: A Panacea for Farmers Livelihood Status

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ABSTRACT

The study assess cassava innovation adoption among small scale farmers in North Central Nigeria. Specific objectives are to; describe socio-economic characteristics of the respondents, examines sources of information, determine level of cassava innovation adoption, and to identify the constraining factors affecting cassava innovation adoption in the study area. A multistage sampling techniques was used to select 750 cassava farmers. Primary data were collected with validated questionnaires having reliability coefficient of r=0.87. Descriptive statistics, adoption scale and factor analysis were employed for data counts. The results revealed that, the mean age was *35.5*years, 60.0% and 96.0% were male and married. 57% had secondary education, 73.3% were members of cooperative. 96.0% and 73.3% of the respondents operates less than two hectares and had annual income from ₦151,000- ₦200, 000 respectively. Majority (73.3%) acquired their land through inheritance. 80% had no extension contact. Major source of information was radio. Among innovations adopted were improved cassava variety (TME419) with adoption score of 78.7% which ranked 1st and the use of pickup van for transportation with adoption score of 77.3% which rank 2nd. In adequate extension service and poor extension contact were the major constraints to cassava innovations adoption with the mean values of $(x = 4.69)$ and $(x = 4.67)$ respectively. It was recommended that, there should be adequate and quality extension contact to acquaint cassava farmers with technical information to increase productivity and improve their livelihood status.

Key words: Cassava, Innovation, and Livelihood status

INTRODUCTION

Cassava *(Manihot esculenta)* is an important staple food and cash crop in several tropical African countries especially Nigeria where it plays a principal role in the food economy. Nigeria is the largest cassava producing country in the world with an annual estimate of 39 million tonnes (Central Bank of Nigeria, 2003). Nigeria's production accounts for 19% of the world output and 34% of Africa's output (Okoro *et al.,* 2005). Among the starchy staples, cassava gives a carbohydrate production which is about 40% higher than rice and 25% more than maize, with the result that cassava is the cheapest source of calories for both human nutrition and animal feeding (Tonukari, 2004). In Nigeria, the most common forms being `garri`, `fufu`, tapioca, composite flour, vegetable alcohol, starch and its pellets for livestock feed (IITA 1993, 1994). Nigerian cassava average yield of 7-12 metric tonnes per hectare is still lower compare to high yield of 25-40 metric tons/ha obtained in Thailand and Brazil and also lower than the world average yield of 10.76 tonnes per hectare irrespective of her being ranked highest cassava producer in the world. The main solution to this problem is adoption of improved cassava varieties and production technologies by the farmers (Imo, 2006).

The high consumption of cassava in the country led to an increase in the demand for this crop both for food and for industrial uses, which exceeded the supply (Odigboh, 1985). To reverse

this trend, the International Institute of Tropical Agriculture (IITA) and National Roots Crop Research Institute (NRCRI) in Nigeria led the development of improved cassava cultivars through their breeding programmes to obtain higher quality cassava stems at relatively shorter time and pest/disease resistant cassava cultivars capable of adapting to a wide range of ecological conditions and farming systems. These cultivars include TMS 30572, TMS 30555, TMS 4(2)1425, NR 8082, TEM419 and NR 8203. These have been tried and found to be high yielding as well as disease and pest resistant. Consequently, they have been distributed through the public extension service (Agricultural Development Programme) and adopted in varying degrees in different ecological zones of Nigeria. However, the first step in assessing the usefulness of the technology to cassava farmers is to determine the attributes responsible for choice of cultivars among the farmers as well as the major constraints militating against the effective use of these cultivars. Dorp and Rulkens (1993), Agwu (2002), Springer *et al.* (2002) and Kimenju *et al.* (2005) show that farmers decision to use particular crop cultivars were influenced by a number of reasons, some of which are market driven or socio-culturally based. Therefore, it is against this background that this study seeks to determine the level cassava innovation adoption among small scale farmers Kogi State, Nigeria. The specific objectives are to: describe the socio-economic characteristics of the respondents; examine the source of awareness of cassava varieties in the study area; examine the level of cassava innovation adoption and identifies major constraining factors to cassava innovation adoption among small scale farmers in the study area.

Methodology

Kogi State fells within Guinea Savannah ecological zone of Nigeria geographically located at Latitude 7° 47'N and Longitudes 6° 44'E and have the temperature of 22^0C to 31^0C. Annual rainfall of 1100mm-1600mm, they engage in farming and fishing well known for the cultivation of crops such as; cassava, yam, cashew, maize, groundnut, melon and rice. Seven hundred and fifty (750) respondents were sampled for the study from established sample frame of 7,500 famers. A validated questionnaire with Cronbach's Alpha reliability co-efficient of (r=87) was used to elicit data in October 2018 of which age and educational attainment were measured in years, while cooperative membership and sex were measured using binary and household size was measured in number. The data collected were analysed using descriptive statistics, adoption scale analysis and factor analysis. The study was limited to only Kogi State in the North Central of Nigeria.

Results and Discussion

Socio-Economics Characteristics of the Respondents

From Table 1, the result revealed that more than half (53.3%) of the respondents fell within the age ranges of 31- 40 years which means that bulk of the respondents are within the active age. The likely implication is that the majority of the respondents are expected to participate in adoption of improved cassava varieties technologies as they are agile and physically disposed to pursue economic activity for poverty reduction while only 2.7% were above 50 years of age. The mean age was 35.5 years. Cassava production in the study area is male dominated venture (60%). This may be attributed to the tedious nature of agricultural activities which many women cannot cope with. Nevertheless, in all most the communities sampled, women still played a very vital role in cassava production, especially in the areas of planting, harvesting, transporting and processing of the cassava produce. Study revealed that family labour formed a significant proportion of the total labour used on farm thereby enabling the cultivation of

large hectares of land and reducing the cost of bring labour for farm operations. Majority (82.7%) of the respondents had household size between the ranges of 1-10 persons.

Majority (73.3%) were member of one cooperative or the others. This agrees with Chikezie *et al*. (2012) who stated that cooperative groups are organized for the promotion of special interest or to meet certain needs that can rarely be achieved by the individual efforts. Ojukaiye (2001), classification of farm size of 0.1hectare to 5.9hectares as small farms, this implies that majority subsistence farming are small-holder farmers, which means that their production will be limited to household consumption with little left for sale and this will not give room for investment on the farm as the respondents may have fragmented farmland used for cassava production. Majority (96.0%) of the respondents operate less than two hectare of land. This is in line with findings of Chikezie *et al*. (2012) who found that one major characteristic of small-scale farmers is fragmented land holdings.

The study reveals that about 77.3% of the respondents had farming experience of up to 20years. This implies that cassava farming is not new to the farmers due the number of years they have been involved in farming the produce and are expected to be able to make better decisions as regards adoption, resource allocation and management of their cassava farms. This findings corroborate with Chikezie (2012) who opined that experience is gained with age and as age increases among farmers, their years of experience also increases. Education is an important socio-economic factor that influences the behaviour of people in general. It can play a significant role in determining farmers` acceptance and adoption of new and improved farm technologies. Majority (80%) of the respondents were literate and could easily adopt an improved technology. The findings agrees with Okoye, Okorji and Asumugha (2004), who opined that educated farmers are expected to be more receptive to improved farming techniques. Land is definitely the most important natural and production resource for agricultural purposes and it is often given a wide economic definition to include all materials and forces that are supplied by nature for use in the production of goods and services. Depending on the land tenure system available in any given area, there are several ways of acquiring land. Majority (73.3%) of the respondents acquired their land through inheritance, only few (6.7%) purchases the land for farming cassava.

Table 1: Socio-Economics Characteristics of Respondents

Age	**Frequency**	**Percentage**
21-30	100	13.3

31-40	400	53.3
41-50	230	30.7
>50	20	2.7
Mean = 35.5		
Marital Status		
Single	30	4.0
Married	720	96.0
Gender		
Male	450	60.0
Female	300	40.0
Extension Contact		
Contacted	150	20.0
No Contact	600	80.0
Household size		
1-5	200	26.7
6-10	420	56.0
>10	130	17.3
Mean = 5		
Cooperative Membership		
Member	550	73.3
No Member	200	26.7
Farm Size (Ha)		
< 1 Ha	120	16.0
1-2 Ha	600	80.0
>2 Ha	30	4.0
Farming Experience		
1-10 years	130	17.3
11-20 years	450	60.0
>20 years	170	22.7
Educational Status		
Primary	70	9.3
Secondary	430	57.3
Tertiary	170	22.7
Adult Education	80	10.7
Annual Income		
100,000- 150,000	150	20.0
151,000-200,000	550	73.3
>200,000	50	6.7
Mode of Land Acquisition		
Inheritance	550	73.3
Purchase	50	6.7
Gift	80	10.7
Lease	70	9.3

Source: Field Survey, 2018

Respondents Sources of Information

From table 2, it can be seen that majority (92.0%) of the respondents sourced information on improved cassava varieties from friends and neighbours; this implies that most of information were obtained from their fellow farmers. This finding is in line with Abamu (2006) who stated that in the stage of adoption of improved varieties, farmers were most likely to be influenced by such information sources like agricultural cooperatives, radio, and friends with neighbours. Only few 20% got their information from television, this may be attributed to the poor power supply

Table 2. Distribution of Respondents according to Information Sources

Sources of Information	**Frequency***	**Percentage**
Radio	550	73.3
Television	150	20.0
Newspaper/ Bulletin	100	13.3
Extension Agent	400	53.3
Neighbour/ Friends	690	92.0

*Multiple responses

Sources: Field Survey,2018

Respondents Levels of Cassava Innovation Adoption

Level of Cassava Innovation Adoption. Table 3 revealed that improved cassava varieties (TEM419), use of pickup van and storage of the cassava stem under the shade for 2-3 before cutting for planting rank first, second and third with adoption score of 78.7%, 77.3% and 70.0% respectively while cassava innovation that were rejected are; weeding at 4,8 and 12 weeks after planting; biological methods of weed control e.g fallowing, use of cover crops application of 8 bags of NPK 15:15:15: 4-8 weeks after planting and transportation using wheel barrow. The cassava innovation that farmers were not aware of are; recommended planting space of 1m by 0.8m; chemical methods of weeds control; mechanical harvester e.g lifter; motorised cassava harvester and storage.

Table 3: Level of Cassava Innovation Adoption n=750

List of Cassava innovations	NA	A	I	E	T	A	D	AS (%)	Rank
Good soil-better ridges	-	125	45	20	50	420*	-	56.0	7th
Improves cassava varieties (TME419)	-	100	50	-	20	590*	-	78.7	1st
Stem for planting should be 10-12 months old	-	150	130	50	40	400*	-	53.3	9th
Stem should be store under the shade 2-5 days before being cut and planted	-	170	-	50	-	530*	-	70.0	3rd
Stem should be cut with sharp tools preferably secateurs	-	170	20	20	20	520*		69.3	4th
Stem cutting should be 25cm length with 5-7 nodes	200	150	-	-	-	400*	-	53.3	9th
Planting should be horizontally inclined or vertically on the mould and one-third above the soil surface	-	120	70	60	80	420*	-	56.0	7th
Buds pointed upwards	-	250	40	-	30	430*	-	57.3	5th
Spacing 1m by 0.8m on crest of ridges will give 12,500 stand/ha	390*	200	60	50	-	50		52.0	
Weeding at 4, 8, 12 weeks after planting	-	200	190	-	40	20	400*	53.3	
Cultural method of weed control. eg hoeing, tillage and mulching	-	200	-	80	70	400*	-	53.3	9th
Biological method eg fallowing and use of cover crops	30	250	100	-	-	-	370*	49.3	
Chemical methods e. g pre-planting; Atrazine+metolachor	-	200	80	60	20	390*	-	52.0	13th
Chemical methods e.g post emergence Fusilade Forte 5-6 L/ha	450*	50	45	35	25	20	125	60.0	
Intercropped with legumes to sustained soil fertility	-	50	50	50	50	400*	150	53.3	9th
8 bags of NPK 15:15;15 4-8 weeks after planting	-	250	-	-	-	120	380*	50.6	
Ring method of fertilization	-	95	85	75	70	425*	-	56.7	6th

Mechanical Harvesting method; Cassava lifter	395*	100	95	60	50	50	-	52.7	
Motorized Cassava Harvester	450*	200	100	-	-	-	-	60.0	
Storage	480*	220	50	-	-	-	-	64.0	
Transportation using wheelbarrows	-	260	200	90	-	-	490*	65.3	
Transportation using Pickup van	-	120	40	-	-	580*	-	77.3	2nd

Keys; NA= Not Aware; A=Awareness; I=Interest; E= Evaluation; T=Trial; A=Adoption

D=Discontinuance; AS= Adoption Scores as adopted by Adesope, 2012

Decision Rules; Adoption Scores $\geq$ 50% = High Adoption *Levels of adopted practice by farmers

Ease of Cassava Innovation Adoption

Table 4 reveals that good soil-better ridges, improved cassava varieties, cutting cassava stem with sharp tools, bud pointed upward when planting, cultural method of weed control and ring methods of fertilizers application were the major innovations that were affordable and simple to adopt. Innovations that were very complex to adopt by the farmers were; length of the stem with numbers of nodes as farmers see it as time consuming, planting with specification of angle (horizontally and vertically incline), intercropped with legumes as farmers finding it difficult to know exactly leguminous cropped will be best intercropped with the cassava.

Table 4: Ease of Cassava Innovation adoption by the respondents

Innovations Adopted	**Aims**	**A**	**S**	**C**	**A**
Good soil-better ridges	To know the nutrients status of the soil- improve soil structure	X	X		
Improves cassava varieties (TME419)	Disease resistance and high yielding	X	X		X
Stem for planting should be 10-12 months old	Should be mature, healthy without stem and leaf damage from pest and disease		X		
Stem should be store under the shade 2-5 days before being cut and planted	To ease nodes innitiation		X		X
Stem should be cut with sharp tools preferably secateurs or cutlasses	Smooth surface cut enhanced establishment of plant in the field. Jagged cut destroyed the nodes	X	X		X
Stem cutting should be 25cm length with5-7 nodes	The higher the number of nodes the quicker the establishment			X	
Planting should be horizontally inclined or vertically on the mould and one-third above the soil surface	To make root initiation easy			X	
Buds pointed upwards	Upwards of the bud will increase the rate of photosynthesis	X	X		
Cultural method of weed control. eg hoeing, tillage and mulching	To increase water infiltration	X	X		

Chemical methods e. g pre-planting; Atrazine+metolachor 4 L/ha	To make the farm land neater			X	
Intercropped with legumes to sustained soil fertility	To fix atmospheric nitrogen and reduces soil erosion		X		X
Ring method of fertilization	To evenly circulate nutrient at the base of the plant	X	X		
Transportation using Pickup van	To carry more quantity at a time			X	

Keys; A= Affordable; S=Simplicity; C=Complexity; A= Accuracy

Sources; Field Survey, 2018

Factors Constraining Cassava Innovation Adoption. Data from table five shows that inadequate extension service, poor extension contact and high cost of cassava stem were the major constraining factors hindering the adoption of cassava innovation which 1st, 2nd and the third respectively with the mean values of 4.69, 4.67 and 4.65 and agein values of 0.67, 0.67 and 0.65

Table 5: Distribution of Respondents according to Constraining Factors

Constraining Factors	**Mean**	**Varimax rotated component matrix**					
		MF	**IF1**	**CF1**	**IF2**	**CF2**	**Rank**
Age of the farmers	3.0					0.50	27th
High level hydrocyanic	4.2	0.80					10th
Market problem	3.86	0.70					15th
Pest and diseases	3.61	0.69					18th
High cost of cassava stem	**4.65**	**0.65**					**3rd**
Price fluctuation	4.54	0.62					6th
Water problem	3.64		0.82				17th
Poor road network	4.23		0.73				8th
Flood and drought	3.25		0.70				21th
Non-availability of agro-chemicals	3.19		0.65				22nd
Poor power supply	4.13		0.62				12th
High transportation cost	4.19		0.59				11th
Inadequate capital	4.40			0.68			7th
Limited access to credit	3.49			0.57			19th
Problem of land tenure system	3.72				0.74		16th
Poor government policy	4.21				0.70		9th
Research problem	3.47				0.68		20th
Inadequate extension services	4.69				0.67		1st
High labour cost	3.96				0.55		14th
Storage facility problem	4.55				0.63		5th
Predators	4.0				0.42		13th
Low consumer preference	3.11					0.32	26th
High risk and uncertainty	3.13	0.37					25th
Lack of technical know how	3.19					0.38	22nd
Shortage of planting materials	3.15	0.50					24th

Poor extension contact	4.67				0.67		2nd
Complexity of technology	4.64				0.66		4th

Keys: MF= Market Factors; IF1=Infrastructural Factors; CF=Credits Factors; IF2= Institutional Factors; CF=Cultural Factors

Source: Field Survey, 2018

Authors Biography

The lead author was born in 1976 in Niger State Nigeria. He obtained first, second and third degrees in 2004, 2011 and 2016 respectively in Agricultural Extension and Rural Development. He joined the service of Federal University of Technology Minna, Niger State Nigeria since 2007. He is married with children.

Conclusion and Recommendations

It was concluded that majority of the respondents were male, married with mean household size of 5. Majority acquired their land through inheritance and had no extension contact. Radio was major source of information. Improved cassava variety (TME419) with adoption score of 78.7% ranked 1st. In adequate extension service and poor extension contact were the major constraints to cassava innovations adoption. It was recommended that, there should be adequate and quality extension contact to acquaint cassava farmers with technical information to increase productivity and improve their livelihood status.

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