



Socio-economic Determinants of Adoption of Improved Cassava Varieties among Crop Farmers in ADP Zone I, Jigawa State, Nigeria

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Abstract

The study examined the Socio-economic factors affecting adoption of improved cassava varieties among farmers in Jigawa State, Nigeria. A 4-stage sampling technique was used to elicit information from 150 respondents through structure questionnaire and interview schedule. Both judgmental and simple random sampling procedure was adopted in the study. The data were analyzed using both descriptive and inferential statistical tools such as frequency tables, percentages, mean, standard deviation and Probit model. Majority of the respondents were males (56.0%), Married (72.0%) and members of cooperative movement (54.0%). Majority (82.7%) were having primary, secondary or tertiary level of education with average monthly income of ₦62,073.33k. The clienteles were involved in cassava production on part time basis (58.7%). Majority of the respondents were aware of TMS 92/0057 95.3%), TME419 (67.3%) and NR8083 (65.3%) but adopted TMS419 (32.0%), TMS96/0002 (30.0%) and NR8083 (29.3%) varieties mostly. The mean age of the respondents is 49 years, average farming experience of 26 years and mean land areas under cultivation of 3.0 Acres respectively. The determinant factors of adoption of improved cassava varieties are; educational level, age, sex, complexity of the varieties, adaptability to innovation to the socio cultural system of the clienteles and compatibility of the varieties. The perceived measures for adoption of improved cassava varieties are provision of inputs, subsidy and labor, market outlets as well as loan facilities to the clienteles among others. It was recommended that, favorable measures of adoption of improved cassava varieties such as provision of farm inputs 76.0%, agricultural labor subsidy 66.0% and provision of loan facilities/market outlets for cassava(53.3% should be enhanced and the positive determinant factors of adoption of improved cassava varieties among the respondents. adaptability and appropriateness of the technology. Compatibility(X14) has positive and significant relationship at 5% levels for the improved varieties showing that the compatibility of the innovation increases the adoption of the innovation when the technology is similar and agreed with the existing culture it will hasten the adoption of such technology. It is recommended that extension agents must try to transfer simple innovations to rural farmers rather than complex innovations. Also, agricultural extensions must adopt to changes taking place in rural setting and provide answers to the problems facing the rural populace.

Keywords: Adoption, Cassava Farmers, Improved Varieties, Socio-Economic Factors

Introduction

In Africa Cassava (*Manihotesculenta*) is amid the most significant food crops among the rural poor populace and urban part of Africa. Abdoulaye et al; (2014) asserted that cassava is a significant regional source of food for almost 200 million households in the sub-Saharan Africa. It is a dicotyledonous root crop and the major root crop grown in Nigeria. In Nigeria for example, cassava production is pivotal to the economy of the country being the world's biggest cassava producer. The significance of the crop in tropical agriculture has been recognized in the area of its growth potentials, human and animal food, its enrichment and fortification, toxicity, industrial uses, economics of production and genetic improvement (Okereke and Ojewola, 2011). In economic value the root and leaves are major source of domestic safety net (income) for rural households as well as an essential source of high calorific value. Cassava produces bulky storage roots with about 80% carbohydrates concentration. The leaves constitute good vegetable rich in protein, vitamins and minerals. Cassava is of growing importance, however, both for animal feed and as raw material for producing starch- based products and starch derivatives. Over thirty million farmers and high proportion of traders and processors in Nigeria obtained income and food from cassava production and its numerous value chain (Abdoulaye et al., 2014). In order not to underestimate its importance, especially on the need for technological improvement (i.e. processing technology and improved cassava varieties), Solomon (2010); Solomon et al; (2011), posited that it is the most crucial factor for increasing agricultural productivity and poverty reduction in the long run. To increase productivity, technology must be adopted in the production process and the rate of adoption of a new technology is subjective to the socioeconomic characteristics of farmers, degree of profitability, associated risks on it, agricultural policies and the underlying capital involvements (Shideed and Mohammed 2005; Ojeleeye, 2018).

Since the 80s, there has been mounting recognition of the contribution that cassava can make to increasing incomes and generating employment opportunities in the rural sector (Adebayo, 2006). Cassava can be eaten as fufu, garri, tapioca. It can be eaten raw, roasted or fried, boiled and in many other forms. The leaves serve as a source of protein for both human and livestock (Ravindran and Kenkpen, 2006). Cassava serves as a raw material when processed into flour, for bakery industries, starch for textile industries, adhesive glucose for pharmaceutical industries and ethanol for brewery and bottling industries, National Root Crop Research Institute. (NRCRI, 2006). Cassava Utilization, as livestock feed, is very popular in the whole world, especially in Brazil, Columbia, Thailand among others. The main cassava producer in Nigeria is the North central zone, followed by the South-South and South West zones. National Agricultural Extension and Research Liaison Services (NAERLS, 2013). Kogi state is situated in the North central zone and it is the leading producer of cassava in Nigeria. In 2013, estimated 492.71ha of land were cultivated, yielding 4506.7Mt of cassava, which is about 9.51% of the national output (NAERLS, 2013). It is at this premise that the study is poised to answer some pertinent objective questions.

The general objective of the study is to examine the socio-economic determinants of adoption of improved cassava varieties among crop farmers in ADP Zone One, Jigawa State, Nigeria. The specific objectives are to;

1. Describe the socio-economic characteristics of the cassava farmers in the study area;
2. Examine the awareness of the respondents on the improved cassava varieties;
3. Examine the Socio-economic Factors Affecting Adoption of Improved Cassava Varieties among respondents;
4. Examine the perceived measures for adoption of the improved cassava varieties;

Methodology

The study is conducted in Jigawa State. The State was excised from Kano State on August 27, 1991. The State covers a total land area of about 22,410 sq Km. It lies between longitude 8.00° E to 10° 15' E and latitude 11.00° N and 13.00° N in the Sudan savanna with traces of Guinea savanna in the southern part of the state. It is bordered on the West by Kano State, on the East by Bauchi and Yobe States and on the North by Katsina State and the Republic of Niger. Nigeria Information Guide (N.I.G, 2004). The State has a population of 4,348,649 people. National Population Commission (NPC, 2006) while the projected population in 2021 was 5,828,163 at 2.9% rate of population growth. Farming is among the major occupation of the people who are predominantly Hausa/Fulani. Out of 5,828,163 people, about 90% of the populations are predominantly engaged in rural and subsistence farming. Agriculture is the mainstay of livelihood for over 90% of the population. Many of the citizens are involved in production of crop such as groundnut, millet, sorghum, soybean, cassava etc. (JARDA, 1991). The State's economic activity is largely characterized by informal sector activities with agriculture as the major economic activity. Over 80% of household in the state derived their income from farming. Jigawa State, with its capital at Dutse is currently made up of 27 local government areas and is administratively classified into four (4) zones by Jigawa State Agricultural and Rural Development Authority (JARDA). The zones are as follows:

Zone 1: Birnin Kudu, Gwaram, Buji, Jahun, Kiyawa, Dutse and Miga LGAs

Zone 2: Gumel, Maigatari, Garki, Ringim, Taura and Gagarawa LGAs

Zone 3: Hadejia, Guri, Birniwa, MalamMadori, Auyo, Kirikasama, Kafin Hausa and Kaugama LGAs

Zone 4: Kazaure, Yankwashi, Roni, Babura, SuleTankarkar and Gwiwa LGAs (JARDA, 2006).

The highest proportion of cassava area is estimated to fall under Zone I of the State Agricultural Development Programme (ADP) i.e. in the central part of the state (JARDA, 1991). Thus, this zone was purposively selected for the study.

Sampling Procedure

The Population for this study comprised all the cassava farmers in ADP Zone Jigawa state. A multistage (4-stage) sampling technique was employed in the selection of respondents for the study. The first stage is a purposive selection of ADP Zone One out of the four ADP Zones of the state. The second stage is a simple random selection of 75% of the available local government areas in the zone to give 5 LGAs (Birnin Kudu, Gwaram, Buji, Jahun and Miga). The third stage involved a simple random selection of two (2) communities each from the five (5) selected local government areas. A total of Ten (10) communities were therefore involved in this study. The fourth stage was a simple random selection of fifteen (15) cassava farmers from each of the selected communities from the list of the registered cassava farmers obtained from JARDA. This means that in each local government areas thirty (30) farmers were interviewed by means of structured questionnaire to make a total of 150 cassava farmers for the study.

Analytical Technique

Descriptive Statistics These are concerned with scientific methods for summarizing data as well as drawing valid conclusions and making reasonable decisions on the basis of such analysis. This is done with the aid of mean, percentage, frequency distribution, range and ratio etc.

Arithmetic Mean: is defined as the set of score divided by the number of score. Mathematically Written as:

$$X = \frac{X_1 + X_2 + X_3 + \dots + X_n}{n} \quad (1)$$

Where

\sum = summation notation

X_i = individual observation

$i = 1, 2, 3, \dots, n$

n = total number of observations

Percentage: the ratio that equate the second number ratio to 100.

$\% = \frac{\sum X}{n} \times 100 \dots \dots \dots (2)$

n

Where

$\%$ = percentage

X = individual observation

n = total observation or sample size

Frequency Distribution: Frequency distribution is the tabulation of a given collection of data in an order with its frequency attached to each value or group of values (Mamman B.Y, Ahungwa, G.T et al; (2018). Descriptive statistics were used to analyze Objective 1 and Objective 3 while Objective 2 was analyzed using the maximum likelihood probit analysis. The general form of the model is specified as follows

Model Specification

The model is specified in the implicit form as follows:

Where $Y = F(X_1, X_2, X_3, X_4, \dots, X_{14} + U)$ is the implicit form of the model and

Y = Adoption Index (Stages of adoption by respondents Adoption=1, Non=0)

X_1 = Age of farmers (in years)

X_2 = Sex Male=1, Female=0)

X_3 = Marital status (Married=1, Not Married=0)

X_4 = House-hold size (No of people feeding from the same pot)

X_5 = Educational status (in years)

X_6 = Level of income (per annum)

X_7 = Farming experience (in years)

X_8 = Membership of a co-operative or farm association (membership=1 Non=0)

X_9 = Total farm size (in hectares)

X_{10} = Contact with extension staff (in Months)

X_{11} = Complexity of technology (complex 1, Non 0)

X_{12} = Profitability (Profitable 1, Non 0)

X_{13} = Adaptability (Adaptable 1, Non 0)

X_{14} = Compatibility (Compatible 1. Non 0)

U = Error term (implicit)

Result and discussion

Socio-economic Characteristics of the Respondents

The socio-economic characteristic of the cassava farmers is indicated in Table 1. It shows that majority of the cassava farmers (81.9%) were within the ages of 41 to above 61 years with a mean age of 49 years. This implies that the respondents were still in their active and productive age range where energy is more concerted and needed for cassava production. This assertion is in conformity with the findings of Abdulsalam, (2010) who reported similar age range (41-50 years) for small holder's irrigation farmers in Hadejia- Nguru wet- lands of Jigawa State. This is also in line with

the work of Obisesan, *et al.*, (2013), who pointed out that the active age is regarded as agile age with more energy to dissipate and concentrate on cassava productive activities. Majority similarly are Males (56.0%), Married (72.0%), with farming experience of 11 to above 30 years (92.6%). Mean farming experience is 26years. The study showed that the male folks dominated the cassava farming in the study area. Marriage confers responsibility according to Vogelstein (2013) and Akinbile (2007) and they are highly experienced cassava farmers judging from the year of cassava farming experience. The farming experience corroborates the ascertain of Nwanu (2004) that, the higher the farming experience the more the cassava farmers would have gained more knowledge and technological ideas on how to tackle issues relating to cassava production activities and the higher would be their output and income. The implication is that cassava farming requires strong and energetic individual which men are always ready to take-up than women. This is in agreement with the report of Idrisaet *al.*, (2012) who stated that older farmers are full of experience and technical know-how of the production techniques hence both the two are essentials. Mean farming experience and farm size are 26years and 3.0Acres (86.6%). Average monthly income on cassava is ₦62, 073.33 (89.3%). The farming experience is an indication that the clientele are very experienced cassava farmers. The monthly income too implies that the respondents have a dependable means of livelihood from the accrued monthly income from cassava production. This finding is tandem with Gender baseline survey (2006) and Nayak, (2013) who reported that rural families earn their livelihood from Agriculture, petty trading and daily wage working. Smaller proportions (17.3%) were with no formal education while greater proportions (82.7%) were either primary, secondary or tertiary education compliant respectively. Ogunladeet *al.*, (2010) posited that, literate respondents stand a chance of understanding the general information on cassava production and this assist their information seeking habits. Majority were involved in farming activities as means of livelihood on a part time basis (58.7%) which implies that the respondents have other sources of income or dependable livelihood engagement in the study area. This agrees with (Nwakor, *et al* 2011) that respondents were into farming as secondary occupation in Abia state. Mixed cropping is the major farming in the study area. Slightly above average of the respondents are members of cooperative groups (54.0%).

Table 1: Socio-Economic Characteristics of Cassava Farmers (n=150)

Variable	Frequency	Percentage	$\bar{x} \pm \delta$
Age (Years)			
≥ 20	05	3.3	48.85±6.99
21-30	09	6.0	
31-40	13	8.7	
41-50	47	31.3	
50-60	53	35.3	
≤ 61	23	15.3	
Sex			
Male	84	56.0	
Female	66	44.0	
Marital Status			
Single	42	28.0	
Married	108	72.0	
Membership of cooperative			
Membership	81	54.0	
Non- Membership	69	46.0	
Educational Status			
No School	26	17.3	
Primary	25	16.7	
Secondary	62	41.3	
Tertiary	37	24.7	
Farm Involvement			
Full Time	62	41.3	
Part Time	88	58.7	
Farming Experience (Years)			
1-10	11	7.3	26.26±5.12
11-20	29	19.3	
21-30	47	31.3	
≥ 31	63	42.0	
Farm size (Acre)			
≤ 1	42	28.0	3.18±1.78
2-3	47	31.3	
4-5	41	27.3	
6-7	8	5.3	
≥ 8	12	8.0	
Average Monthly Income (₦)≤			62,073.33±249,145
20,000	8	5.3	
21,000- 40,000	8	5.3	
41,000-60,000	67	44.7	
61,000-80,000	23	15.3	
≥ 80,000	44	29.3	

Source: Field Survey, 2019 $\bar{x} \pm \delta$ = Mean±SD

Awareness of the Respondents on the Improved Cassava Varieties

The farmers' awareness of improved cassava variety as presented in Table 2 below was evaluated based five varieties: TMS96/0002, TMS92/0057, TME419, NR8082, and NR8083 known to the cassava farmers. Majority (68.0%) of the farmers adopted TME419 variety among the introduced improved cassava varieties in the study area because of its thin stem and larger yield compared to other varieties introduced. This result is similar to the findings of Ojeleye (2014) in Ekiti State where 60.6% farmers were found to have adopted TME419 among improved cassava varieties introduced to them in the state. The farmers also established the fact that TME419 was the best technology introduced to them because of its disease resistance and low water moisture content compared to other varieties.

This was closely followed by NR8082 with awareness proportion of 67.3%. Finally, the TMS92/0057 has the least in awareness of 55.3%. The average level of awareness is 61.6% and this implies that the level of awareness of improved cassava is 61.6% and this implies that the level of awareness of improved cassava varieties is high. This may be attributed to the fact that the International Institute for Tropical Agriculture (IITA), Agricultural transformation agenda support programme (ATASP), International Cereal Research institute for semi- arid tropics (ICRISAT) have trained farmers and provided them with the quality improved variety of cassava seedlings in the study area. The purpose of their training was to create awareness among cassava farmers' member cooperative on the need to be aware and adopt the improved cassava variety in their local communities. Therefore, with a combination of cooperative organization augmented by extension activities, greater impact in winning adoption of agricultural innovations in the study area will be more assured Nasiru, A. (2017). The level of farmer's adoption of improved cassava varieties as presented in table 4 above was based on TME419, NR8082, NR8083, TMS92/0057, TMS96/0002, which are mostly familiar improved cassava varieties used by the farmers in the study area. The result shows that, the TME419 have the highest adoption level of 32.7%. This was followed by NR8082 with the adoption level of 30.0%. Similarly, the NR8083 have adoption level of 24.7% each, the average level of adoption is 28.28% and this implies that the level of adoption of the improved cassava variety is fairly low.

Table 2: Distribution of the Respondents based on awareness of the Improved Cassava Varieties

S/No	Improved cassava varieties	Awareness		Adoption	
		Frequency	%	Frequency	%
1	TMS96/0002	78	52.0	45	30.0
2	TMS 92/0057	98	65.3	37	24.7
3	TME 419	101	67.3	49	32.7
4	NR 8082	83	55.3	37	24.7
5	NR 8083	98	65.3	44	29.3
Average level of Adoption					28.28

Source: Field Survey, 2019

The Socio-economic Factors Affecting Adoption of Improved Cassava Varieties.

The result of the probit model analysis of the socio-economic determinant factors of adoption of improved cassava varieties is shown in Table 2. The result of probit model analysis in Table 3 shows an R^2 value of 0.2566 for the improved cassava variety studied, this indicated that 26.0% of the variation in adoption of these cassava varieties was explained (or accounted for) by the independent variables considered in this study. Also, the Log likelihood of -52.823552 and chi-square of 0.0002 indicates a good fit for the model. Specifically, educational status, age, sex, complexity, adaptability of the innovation and compatibility of the technology were significant factors on adoption of improved cassava varieties at varying degree of significance. Adaptability (X13) has a positive and significant relationship at 10% level with these varieties the implication is that any increase in this variable will lead to increase in adoption. This agrees with Asiabaka, (2002), Lawalet *et al* (2018); that factors related to determinants of adoption include adaptability and appropriateness of the technology. Compatibility(X14) has positive and significant relationship at 5% levels for the improved varieties showing that the compatibility of the innovation increases the adoption of the innovation when the technology is similar and agreed with the existing culture it will hasten the adoption of such technology. This agreed with Rogers (1995), that there are characteristics of the farmers that affect their rate of adoption such as compatibility and complexity of the technology. The above findings agree with the findings of Uwakah, (1990); Ojeleye (2018); Yusuf and Malamo, (2007); that educational status affects adoption. Adoption is higher among farmers of high social class who are literate because such farmers can read papers and interact effectively with the extension agents.

Table 3: The Result of Probit Model Analysis on the Socio-economic Factors Affecting Adoption of the Improved Cassava Varieties

Variable	Coefficient	Standard error	T- value
Age (X1)	-.424333	.1713467	-.38**
Sex(X2)	.6710462	.2201037	2.05**
Marital status (X3)	-.81644863	.5813808	-1.30
House hold size(X4)	.0631152	.1658271	0.32
Educational status (X5)	0.4307061	.17055	2.87***
Income(X6)	-.175753	.2074743	-0.80
Farming Experience(X7)	.1433757	.1613108	0.80
Member of cooperative(X8)	.341216	.3055107	1.37
Farm Size(X9)	-.0707101	.1402208	-0.43
Extension contact(X10)	-.1810177	.1750868	-1.02
Complexity of Technology (X11)	-.0685073	.308758	-2.46**
Profitability(X12)	-.5445623	.8518705	-0.65
Adaptability(X13)	.2650250	.532602	4.14***
Compatibility(X14)	.5126161	.2880136	2.08**
Constant	.4742858	.9474685	0.41

Source: Field Survey, 2019*** Significant at 10% level; ** Significant at 5% level

Perceived Measures for Adoption of the Improved Cassava Varieties among Respondents

The respondents perceived measures to adoption of the improved cassava varieties are shown in Table 4. The result of perceived measures by the farmers to adoption of improved cassava varieties in the study area shows that provision of farm input (76.0%) was the best option given. This was followed in order by agricultural labour/subsidy (66.0%) while provision of loan facilities and market outlets for cassava (53.3%) was third in the hierarchy of arrangement respectively. Other measures for better adoption of improved cassava varieties shows that below average of the respondents agreed with the suggestions and these are: mechanized agriculture (37.3%), provision of adequate land for cassava farming/ farm settlement scheme (33.3%), Regular supply of improved cassava varieties (28.7%), development of resistant varieties (26.7%), establishment of cassava demonstration plots (20.0%), improved processing technologies on cassava/creation of awareness campaign among stakeholders on improved cassava varieties (9.3%), reduction in cost of pre-emergence/availability of herbicides (8.0%), employment of more extension staff (6.7%) and Agricultural shows/Seminars, workshops and symposia for all the stake-holders (4.0%). This conforms to the findings of *Seyounet al. (1998)*; *Kundiri e tal; (2020)*, who found that education increases productivity of farmers and their level of adoption of innovation as well as other important variables.

Table 4: Distribution of the Respondents Based Perceived Measures for Adoption of Improved Cassava Varieties

Farmers suggested remedies	Frequency	Percentages (%)	R
Establishment of demo plots	30	20.0	8 th
Provision of loan facility	80	53.3	3 rd
Provision of agricultural inputs	114	76.0	1 st
Provision of expert advice	02	1.3	13 th
Provision of market outlet	80	53.3	3 rd
Agricultural subsidy/labour	99	66.0	2 nd
Agricultural shows, workshop & seminars	06	4.0	12 th
Employ more extension staff	10	6.7	11 th
Mechanized Agriculture	56	37.3	4 th
Improved processing technology	14	9.3	9 th
Create awareness campaign among stake holders	14	9.3	9 th
Development of resistance varieties	40	26.7	7 th
Provision of adequate land	50	33.3	5 th
Reduce cost of pre-emergence	12	8.0	10 th
Herbicides	12	8.0	10 th
Farm settlement scheme	50	33.3	5 th
Regular supply of improved cassava varieties	43	28.7	6 th

Source: Field Survey, 2019 * Multiple responses recorded R=Rank

Conclusion

Based on the study the following conclusions can be adduced:

Education was found to be significant and positive this implies that education plays a significant role in the adoption of improved cassava varieties. Thus, if education is further encouraged in the study area, more respondents will adopt the varieties. Educational status affects adoption. Adoption is higher among farmers of high social class who are literate because such farmers can read papers and interact effectively with the extension agents.

Similarly, access to information from the extension agents and the extension organization is very fundamental to enable farmers to adoption particular technology such as the improved cassava varieties in order to improve their agricultural productivity, generate income and increased their means of livelihood. Farmers are advised to form cooperatives so that they can pull resources together and thereby reducing subsequent input cost.

Recommendations

The following recommendations are made based on the findings of the study:

It is recommended that the extension agents should transfer simple technologies to farmers in the study area instead of complex technologies; Extension arm of Jigawa State Agricultural and Rural development (JARDA) should be strengthened to enable it meet the challenges of technology dissemination and adoption by introducing labour saving, simple, improved and cost effective technologies to cassava farmers to ease their task. Farmers are advised to form cooperatives so that they can pull resources together and thereby reducing subsequent input cost.

Most of the positive significant socio-economic variables of adoption of improved cassava varieties should be strengthened e.g. complexity and adaptability of the improved varieties of cassava as well as compatibility to the socio-cultural background of the clientele.

Favorable measures for adoption of improved cassava varieties such as: provision of farm inputs, agricultural labor/subsidy and provision of loan facilities/market outlets for cassava should be enhanced for more adoption of the improved cassava varieties.

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