

Research Article

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Knowledge Status and Disease Control Practices of Cassava Farmers in Delta State, Nigeria: Implications for Extension Delivery

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Abstract: The study assessed the knowledge and control of cassava diseases by farmers in Delta State, Nigeria and the resultant implication for agricultural extension. Data were obtained from 569 cassava farmers by a simple random sampling technique. Data were analyzed by means, percentage, frequency counts and binary logit model. Mean results depicted that cassava farmers in the area were 42.5 years old, spent 13 years in schooling, had a farming experience of 9.5 years and had poor (1.68) annual extension contacts. Extension contact and friends and neighbours were the major sources of information on cassava disease control. Results of the logit regression of the relationship between farmers' characteristics and knowledge of cassava diseases gave an R^2 value of 0.74 indicating that age (negative coefficient), education, farming experience, farm size and extension contact were statistically significant in explaining cassava farmers knowledge of disease control measures. Logit estimates for control of diseases indicated that age, farming experience, farm size and extension contact were statistically significant at $P < 0.05$. Although education was crucial in determining farmers' knowledge, it was not significant in determining adoption of control measures. The study recommends urgent and good extension contact, good government policy on enlightenment of farmers to improve not only farmers' knowledge but their adoption of disease control measure as well.

Keywords: Cassava; significant level; Logit regression; Knowledge index; Delta State

1 Introduction

Cassava (*Manihot esculenta*) is among the major staple crops in Delta State, Nigeria. Nigeria is indisputably the biggest producer of cassava in the world, its production surpassing other major producers like Brazil, Indonesia and Thailand (Akinpelu et al. 2011; FAO 2013). In terms of consumption, cassava is the most important root crop in Nigeria. In fact, Abdoulaye et al. (2014) asserted that cassava is the most important food crop in the country. Thus, cassava constitute an important staple food crop in Nigeria, especially in the Niger Delta area (of which Delta State is a part) and in much of tropical Africa at large (IITA 2006).

Cassava is rich in carbohydrate, especially starch and has multiple uses. It can be consumed in several processed forms, in the industry and also as livestock feed. The roots and leaves can be used to make flours (Adeniji et al. 2005). There are three types of flour, namely, yellow garri, white garri, or intermediate garri flours, with yellow garri considered the best product in Nigeria. Other cassava products are bio-ethanol, dry extraction of starch, glue or adhesives, modified starch in pharmaceutical as dextrines, as processing inputs, as industrial starch for drilling, and processed foods (Okogbenin et al. 2012). Over the years, cassava has become a prominent economic sustenance food crop (Adeniji et al. 2005).

The cultivation of cassava serves as a chief source of food, income and foreign exchange in Nigeria. Cassava is used for several products including flour, paper, textiles, food additives and animal feed (Govender 2015). In fact, Hershey (2010) asserted that the popularity of the crop in the tropics is due to this diverse use of cassava. Thus, Cassava production is vital to the Nigerian economy.

Cassava is produced in 24 states of Nigeria although the production is concentrated in the southern part of the country, both in terms of area covered and number of farmers growing the crop (USAID 2013). The major states in Nigeria that produce cassava are Anambra, Delta, Edo, Benue, Cross River, Imo, Oyo, and Rivers, and to a lesser

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extent Kwara and Ondo (Adekanye et al. 2013).

In a drive to boost self-sufficiency in food production, the government wants to encourage the use of cassava while reducing the importation of rice and wheat (Okpetu 2012). The 2002 Presidential Initiative by former president, Olusegun Obasanjo, on composite cassava flour was, however, reversed even before it reached maturity by his successor, President Umaru Musa Yar' Adua (Okpetu 2012). This is due to most people's preference for white collar jobs. Most educated individuals are not willing to go into farming as a career since they feel that white collar jobs like working in the oil company or banks, will pay off. Olanrewaju (2014) reported that the youth are ready to participate and practice agriculture to eke out a living instead of white collar jobs provided by the government; creating an enabling environment by making funds available, review of the land tenure system, provision of infrastructural facilities and rural development will encourage the youth. He further asserted that youth will find agriculture attractive if the government collaborate with private sector in the setting up of modern agriculture communities, providing modern agricultural implements coupled with modern agricultural practice training and skills acquisition to bridge the gap caused by the outdated curriculum of our tertiary institutions. This invariably will address human capital development and lead to capacity building in the agricultural sector including cassava production.

Despite the importance and developments in cassava production, several constraints including pests and diseases could constitute a serious limiting factor to its production. Cassava yield depends on factors like the variety grown, month of planting, soil type and fertility (IFAD & FAO, 2000) and with the level of infestation and infection of the crop with pests and diseases (Bock 2004). However, many pathogens or diseases tend to lower cassava outputs, especially in Africa (Dixon et al. 2003; Oerke 2006) including Nigeria. Diseases like cassava mosaic disease (CMD), which is transmitted by a whitefly (*Bemisia tabaci/nigeriensis*) vector, cassava brown streak virus disease (CBSD), Cassava bacterial blight (*Xanthomonas axonopodis* pv. *manihotis*) (CBB), and cassava anthracnose (*Colletotrichum gloeosporoides*) (CA) are some of the common diseases limiting cassava production (Abaca et al. 2014). Hillocks (1997) identified cassava mosaic disease (CMD) and Cassava brown streak disease (CBSD) as the prevalent diseases limiting the production of cassava in Africa.

Kumakech, Acipa, Tumwine and Maiteki (2013) reported that CBSD is the most damaging disease causing more than 60% yield loss and threatening the means of

sustenance of small scale farmers. Therefore, if CBSD is not controlled, cassava production is likely to decline. Donald (2010) regarded CBSD as one of the most dangerous diseases in the world. Muhana et al. (2004) reported that the overall effect of CBSD can lead to a reduction of root yield by up to 74% and Hillocks et al. (2001) also indicated poor quality. When CBSD is combined with cassava mosaic disease this can lead to total yield loss. With regards to control, the most economically viable method for cassava brown streak disease management is the use resistant planting materials (Munga 2008).

Several control measures have been carried out by some farmers over the years to curtail the menace of cassava diseases (Abaca et al. 2014). When CMD infects young plants, reduction in yields may be up to 80% in the first season and total 100% loss in the subsequent season (Gibson et al. 1996; Sserubombwe et al. 2001; Thresh and Cooter 2005).

Cassava diseases have been managed or controlled by using various means (Msikita et al. 2000). The most effective control measure for CMD, and indeed most cassava diseases, is using improved, resistant cassava varieties like TMS 4(2)1425. Some local cultivars have proved to be resistant to cassava diseases and roguing (Sserubombwe et al. 2001)

Information about disease management is available in ADP (Babaleye et al. 2002). There is a need to ascertain whether farmers access and/ or utilize this information. Omoregbee and Banmeke (2014) and Oyakhilome (2000) observed that many farmers do not have enough information about markets, production (including disease management) and other aspects needed to successfully grow cassava. Against this background, the determination of cassava farmers to access information about disease control becomes sine qua non as extension personnel can use this study to serve as a guidepost in providing advisory services to farmers.

In view of the importance of cassava, it is thus widely grown all over the World. Table 1 depicts the 20 countries leading in cassava production in the World. The Food and Agriculture Organization of the United Nations (FAO) in Rome (FAO, 2004) estimated that cassava production in Nigeria to be about 34 million tonnes. However, recent estimates for 2016 which was over ten years later, by FAOSTAT (2017) estimated cassava output to be over 57 million metric tonnes (see Table 1). Other major producers of the crop (FAO Statistics, 2017), apart from the ones shown in Table 1 are: Laos, Uganda, Philippines, Madagascar, Burundi, Colombia, Guinea, Republic of the Congo, Peru, Togo, Zambia, Cuba, Central African Republic, Kenya, Liberia, Haiti, Burma, Senegal, Sri Lanka,

Gabon, Venezuela, Chad, Zimbabwe, Bolivia, Argentina, Nicaragua, Dominican Republic, Costa Rica, Papua New Guinea, Niger, South Sudan, Mali, Somalia, Ecuador, Malaysia, Fiji, Equatorial Guinea, Comoros, Guinea-Bissau, El Salvador, Timor-Leste, Honduras, Mexico, Jamaica, Panama, Anguilla, Gambia, Sudan, Federated States of Micronesia, Tonga, Cape Verde, Suriname, Burkina Faso, Guatemala, Guyana, French Polynesia, Brunei, Solomon Islands, Trinidad and Tobago, Wallis and Futuna, Saint Lucia, Dominica, Bahamas, Sao Tome and Principe, Mauritius, Saint Vincent and the Grenadines, Belize, New Caledonia, Cook Islands, Samoa, Barbados, Seychelles, Grenada, Puerto Rico, Antigua and Barbuda, American Samoa, Niue, Cayman Islands, Maldives and Singapore. The list of these countries unequivocally suggests that cassava is a widely distributed root crop, grown all over the world.

Table 1: List of 20 countries that are Top Producers of Cassava in the World

S/N	Country	Quantity produced (tonnes)
1	Nigeria	57,134,478
2	Brazil	21,082,867
3	Indonesia	20,744,674
4	Thailand	31,161,000
5	Democratic Republic of Congo	14,677,809
6	Angola	9,981,245
7	Ghana	17,798,217
8	Mozambique	9,100,000
9	Vietnam	11,045,184
10	India	4,554,000
11	Sierra Leone	4,778,393
12	United Republic of Tanzania	5,575,304
13	China, mainland	4,794,262
14	Cambodia	10,206,514
15	Malawi	5,088,595
16	Cameroon	5,501,749
17	Benin	4,317,642
18	Cote d'Ivoire	3,210,614
19	Rwanda	3,537,566
20	Paraguay	3,166,800

Source: FAOSTAT, 2017

According to the Nigerian Presidential Initiative of 2002, the total land area earmarked for the growing of cassava was proposed to increase to 5 million hectares by the end of 2010 with an estimated annual yield of 150 million tonnes leading to an annual export revenue of US\$5 billion. There was also to be the introduction of vitamin A-rich cassava for about 1.8 million farmers to adopt (HarvestPlus (Challenge Program of the CGIAR), 19 March 2012).

In spite the importance of cassava in Nigeria and the Government effort to boost the production of cassava, yields are usually about 12 tons/ha in comparison to 40-50 tons/ha achievable under good conditions (UBOS, 2012). The poor output of cassava per land area cultivated can be attributed to several constraints, including the prevalence of pests and diseases as well as poor farming practices. Therefore, disease is one of the limiting factors in the crop production, not only in Nigeria but the world over. Cassava is the most widely grown and consumed food crop in Delta State, Nigeria. In fact, Delta state is one of the leading states involved in cassava production in Nigeria. Chief Austin Chikezie (2018), The Commissioner for Agriculture and Natural Resources of Delta State, Nigeria recently asserted that the mean annual cassava production was 2.2 million metric tonnes, produced from 140,000 hectares of cassava farmland cultivated and that the mean yield is 15.7 metric tons per hectare. The commissioner further mentioned that the total number of registered cassava farmers in the State were 57,514. He asserted that there had been steady rise in cassava cultivation in Delta since 2012 as a result of the State government's intervention in the sector (Chikezie 2018).

From all available data, there is a high potential for increased cassava production in the state. However, this increased potential for cassava production can be dampened due to many factors including the effects of pests and diseases. According to Adeniji et al. (2005) and Lozano and Booth (2009) production of cassava in Nigeria is faced with problems of pests like green mite, the cassava mealybug, and the variegated grasshopper, and diseases like African cassava mosaic disease, bacterial blight, anthracnose, and root rot (Adeniji et al. 2005; Asante-Pok 2013; Kumakech et al. 2013). According to Moses (2018), cassava diseases are important economically in the sense that they: cause low yields of edible roots; affect incomes of farmers; reduce food security of the populace; lead to famine in an area of incidence; lead to loss or shortages in available planting materials; affect the availability of leafy vegetables; and poor yield of storage roots and leaves which can affect livestock production like goat in communities that feed on cassava.

It therefore becomes imperative that for cassava farmers in Delta state to improve in the production of the crop, they should be able to have access to information on disease control and use the same. Effective Extension delivery to cassava farmers is certainly one of the ways to assist cassava farmers to gain access to information on the control of cassava diseases. Despite the attempt at a technological innovation transfer, wide gap exists between the expected level of production which research contends

and that which farmers achieve, implying a missing link (Oladele 1999). Moreover, weak linkages exist between the farmer, extension and researcher, indicating that the farmers are not included in the planning of the innovation and thus do not know where to obtain their technologies, even though they are the end users. Agricultural innovations (including those on diseases' control) disseminated by different information sources need to be determined. How cassava farmers obtain relevant information to manage diseases of cassava could help them a great deal. Unfortunately, comprehensive study of this nature on how cassava growers have access to vital information on the management of cassava diseases is lacking in Delta State. Therefore, a study of this nature becomes necessary. This study will be very relevant to all stakeholders in the cassava production chain: Policy makers, Extension Agents and other rural development workers will find the outcome of this study very useful in planning and developing any rural intervention with regards to, not only cassava, but other food crop production. It is therefore necessary to identify the sources of agricultural information on control of cassava diseases utilized by farmers. In view of the aforementioned, the following research questions thus emanate: what are the socio-economic characteristics of cassava farmers in Delta state? What are the major cassava diseases in the area? How much knowledge do cassava farmers have about the control of these diseases? Do cassava farmers in Delta state have access to information on the control of cassava diseases? If they had access, do they practice disease control, and what are the various sources of this information? What are the problems encountered by farmers in obtaining information on control of cassava disease? It is the aim of this study to address these questions.

The broad objective of this study is to determine farmers' knowledge and control practice of cassava diseases in Delta State, Nigeria. The specific objectives were to:

1. Describe the socio-economic characteristics of cassava farmers in Delta state;
2. Identify the major cassava diseases in the study area
3. Ascertain cassava farmers' knowledge of control measure of the identified diseases;
4. Determine cassava farmers who practice control of diseases;
5. Determine the various sources of information on control of cassava diseases;
6. Determine the problems affecting cassava farmers in Delta state in sourcing for information on the control of cassava diseases.

The following hypotheses stated in their null forms were tested:

Ho₁: There is no significant relationship between cassava farmers' socio-economic variables and their access to information on disease control.

Ho₂: There is no significant relationship between cassava farmers' socio-economic variables and their knowledge of disease control.

2 Research Methods

2.1 Study Area

This research work was conducted in Delta State, in the South-South geopolitical area of Nigeria. The state's headquarters is at Asaba. Delta State has a land area of 17,774 square kilometres and a population of about 4,000,000 (National Population Commission, 2006). Delta State lies on the coastal low land of the Niger Delta area with no prominent hills. Delta State lies on longitudes 5°00' and 6°45' East and latitudes 5°00' and 6°30' North. The State is bordered by Edo and Ondo States in the North-West, by Imo and Anambra States to the North-East, by Rivers and Bayelsa to the South-East, and in the South and South-West it has roughly 122 km of coast line bounded by the Bight of Benin on the Atlantic Ocean. The major ethnic groups in the State are Ibo, Urhobo, Izon, Isoko, Okpe and Itsekiri. The majority of the people are engaged in agriculture. Major agricultural crops grown include cassava, yam, cocoyam, vegetables, pepper and tree crops like oil palm, mango, citrus. The State is one of the major producers of cassava in the South-South area of Nigeria. Deltans are also involved in animal husbandry as well as hunting, carving and weaving.

The sampling frame consists of all registered cassava farmers in Delta State. This includes farmers who grow cassava whether as sole cropping, inter-planting or intercropping systems of production. The sample size was 569 respondents. The simple random sampling technique was adopted in composing this sample size, in which every registered cassava farmer has an equal and independent chance of being picked. The list of farmers used was obtained from the Office of the Delta State Agricultural Development Programme (DSADP). There were 57,514 registered cassava farmers obtained from the State's ADP.

The data used for the study were obtained from primary sources with the aid of a well structured and validated questionnaire for literate respondents; interview schedules were used in soliciting information from non-literate farmers. Enumerators who were trained



Figure 1: Location of Delta State in Nigeria; Source: Wikipedia, 2017 (https://en.wikipedia.org/wiki/Delta_State)

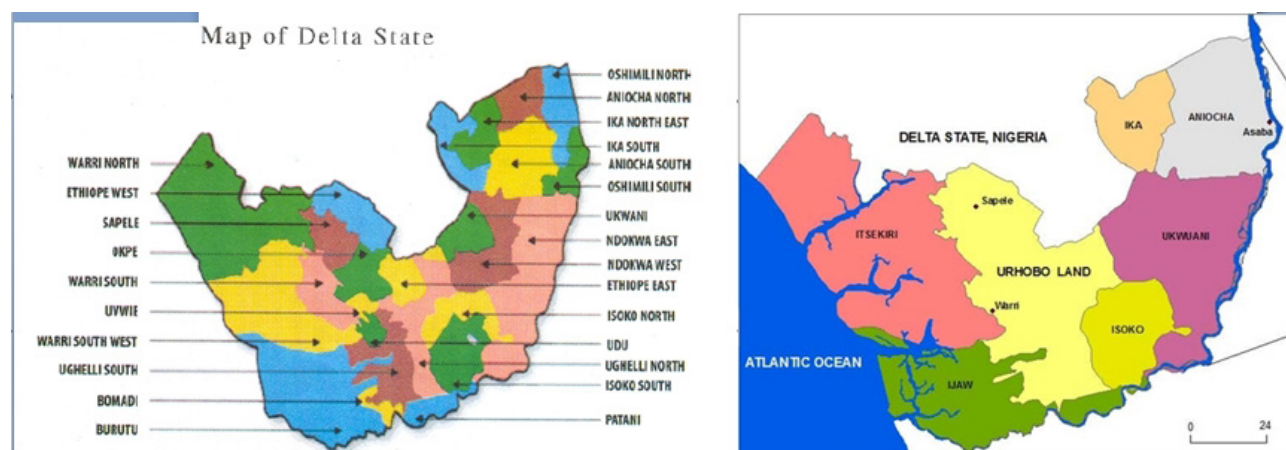


Figure 2: The map of Delta state showing the study area; Source: Wikipedia, 2017 (https://en.wikipedia.org/wiki/Delta_State)

were used in the distribution and collection and collation of data. Descriptive statistical tools like mean, percentage, standard deviation and inferential statistics like binary logistic regression analysis were employed for data analyses. Twenty (20) knowledge test items were provided to solicit respondents' knowledge on control of cassava diseases. Knowledge was measured by constructing a teacher-made knowledge test as used by Rizwana and Paris (2009). The test was based on the agronomic package of control of cassava diseases as recommended by Ministry of Agriculture of Delta State and standard disease control practice (Thresh and Cooter 2005; Kumakech, et al. 2013).

Twenty items covering control of cassava diseases were chosen from the package of practices after discussion with staff of Ministry of Agriculture, ADP and Staff of Agronomy Department. Each practice was presented in a question form to seek responses from the cassava farmers on their knowledge of disease control. A correct response was scored one and incorrect response scored zero. The grand score for each respondent was calculated by adding up the scores on all the knowledge items. The maximum and minimum score obtainable for each respondent was 20 and 0 respectively. Using the total scores obtained, the knowledge index (Rizwana and Paris 2009; Solomon

2008) was calculated as follows:

$$\text{Knowledge Index} = \frac{\text{Number of correct responses}}{\text{Total Number of Knowledge item}} \times 100$$

The average score was 60%. Any respondent that scored 60% or more fell into the high knowledge level, while any respondent that score below the average fell into low knowledge.

2.2 Specification of Model

The model for this study which was used to test the stated hypotheses was the logit regression model (also known as the logit analysis). The assumption of the model is that the dependent variable follows a logistic distribution.

For the purpose of this study, binary logit regression was used. Binomial (or binary) logit regression is used when the dependent variable (in this study the adoption of control practice of cassava diseases) is dichotomous and the independent variables are of any type. The Logit Model has been used by many scholars like Uzmay et al. (2009), Karkacier and Gokalp (2011), Lange (2012), and Ferjani et al. (2015) in exploring various behavioural issues of farmers like adoption behaviours of farmers. The binary logit regression equation is simply specified as:

$$Y_i = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + et \quad (1)$$

or

$$Y_{i=F(Z)} = F \left[\frac{b_0 + \sum_{i=1}^n b_i X_i}{1 + e^{-(b_0 + \sum_{i=1}^n b_i X_i)}} \right] \quad (2)$$

where

$Y_i = (1, \text{probability of respondent } i \text{ using improved variety; } 0, \text{ otherwise})$

$b_0 = \text{Constant}$

$b_i = b_1, b_2, b_3, \dots, b_7 = \text{respective coefficients}$

$X_1 = \text{Gender (1, male; 0, otherwise)}$

$X_2 = \text{Age (in years)}$

$X_3 = \text{Marital status (1, married; 0, otherwise)}$

$X_4 = \text{Educational attainment (number of years spent in formal schooling)}$

$X_5 = \text{Farming experience (number of years spent as a cassava farmer)}$

$X_6 = \text{Farm size (in hectares)}$

$X_7 = \text{Household sized (measured as number person in the home)}$

$X_8 = \text{Extension contact (Number of exposure to extension information per year)}$

Ethical approval: The conducted research is not related to either human or animal use.

3 Results and Discussion

Table 2 shows the distribution of the respondents according to their socio-economic characteristics. The result in Table 2 shows that more females (74.00%) than males (26.00%) were involved in cassava production. Agbamu (2014) reported that cassava farmers in Delta State are mainly women as about 60.00% of them were females. The average age of the respondents was 37 years, the age range 20 – 30 years being the modal class interval as this accounts for about 34.27% of the respondents. Strictly speaking, about 80% of the cassava farmers are in their economic active age. This finding invariably means that cassava farmers are in their active and productive years which could have an effect on increased cassava production.

About 58.88% of the cassava farmers in the study area were married. Cassava cultivation is labour intensive and farmers generally need a large family to support in farm drudgery and reduce the cost of labour. It was discovered that 3.51% of the farmers have no formal education, 18.98% had primary education, 31.99 had secondary school education (Posses WASC) and as high as 45.52 of them have higher education. This indicates that there is very high level of literacy among the cassava farmers. This could have a positive effect on cassava production in the area. The fact that a high proportion (45.52%) of them have higher education supports the fact that the educational attainment of cassava farmers in the study area is high. This result also agrees with the findings of Awoyinka (2009) in Oyo State which depicted the cassava farmers as literate.

The mean farming experience of the cassava farmers was 9 years. This result indicated that the respondents were quite experienced in cassava production. This result agrees with the finding of Echebiri and Edaba (2008) in South-Eastern Nigeria where most cassava farmers were known to be well experienced in cassava production. The number of years the respondent spent in farming is likely to improved performance, and this wealth of experience is likely to enhance cassava production. The farmers have an average farm size of 2.5ha. A Cassava farm, as used in this study, consists of all plots containing cassava as sole or intercrop. The implication is that the cassava farmers have reasonable hectares of farmland under cultivation. The mean household size was 6 persons. This implies a large household size With this household size, the farmers would be able to have some people to contribute to farm labour.

As shown in Table 2, 15.29% of the respondents have no extension contact, 74.17% have between 1 to 5 extension contacts per annum, while only about 10.54%

Table 2: Distribution of Socioeconomic characteristics of respondents (n = 569)

Variable	Frequency (569)	Percentage (100)
Gender		
Male	148	26.00
Female	421	74.00
Age (years)		
20 & below	56	9.84
21 – 30	86	15.11
31 – 40	195	34.27
41 - 50	109	19.16
51 – 60	65	11.42
61 & Above	58	10.19
Marital Status		
Never Married	195	34.27
Married	335	58.88
Divorced/Widowed	39	6.85
Educational Level		
No formal	20	3.51
Primary	108	18.98
Secondary	182	31.99
Tertiary	259	45.52
Farming Experience (year)		
5 & below	52	9.14
6 – 10	249	43.76
11 – 15	146	25.66
16 and Above	122	21.44
Farm Size (Hectare)		
1.0 and below	121	21.27
1.1 – 2.0	378	66.43
Above 2.0	70	12.30
Household Size (Number)		
5 and below	166	29.17
6 – 10	348	61.16
Above 10	55	9.67
Extension Contact Per Year		
None	87	15.29
1 -5	422	74.17
Above 5	60	10.54

Source: Survey data, 2018

of them have over 5 contacts per year with extension. Thus, there is a low level of contact between agricultural extension and farmers. This finding was corroborated by the finding of Agbamu (2005).

The disproportionate extension worker to farmer ratio is a serious problem facing

agricultural extension in Delta State of Nigeria. There is an insufficient number of agricultural extension workers that provide advisory services to the large number of farmers. The contacts observed in this study were far below the minimum standard of two contactsts per month as recommended by Benor and Baxer (1984) and cited by Nlerum (2009) as the productive contact between farmers

and extension workers. Since as much as 89.46% of the respondents indicated they had either no or between 1 to 5 contacts with extension indicated weak extension contacts in the study area.

Some of these socioeconomic variables are presented in the pie charts in Figure 1.

3.1 Major Cassava Diseases in the Area

The major diseases identified by farmers in the area are presented in Table 3. The result shows that cassava mosaic is the most prevalent disease of cassava in the study area (Mean = 4.79), followed by bacterial blight (Mean = 4.44). The third most serious disease identified in the State is the cassava brown streak (mean = 4.02). Other major diseases identified in the State which are of great severity are cassava root rot (CRR) (mean = 4.00) and cassava anthracnose (mean = 3.52). The seriousness of these diseases merits the urgent attention of extension to enlighten the farmers on how to combat them.

3.2 Cassava Farmers' Knowledge of Control Measure of Diseases

The knowledge of cassava farmers of some control practice of cassava diseases is presented in Table 4. Analysis of the results in Table 4 indicates that the knowledge of most farmers on control of cassava diseases was low in all the test items. This finding was similar to a study elsewhere in Africa (Chikoti et al. 2016), whereby farmers were found to have a very low knowledge of cassava disease control measures.

Most cassava farmers answered wrongly for most of the questions used to test them which made the majority of them belong to the low knowledge category. This must have been adduced to ignorance of most cassava farmers on cassava disease control. Table 5 shows that most cassava farmers belonged to the category of low knowledge (172 scored 60% and above) whereas few cassava farmers belong to the high knowledge category (397 score below 60%).

3.3 Control of diseases by Cassava Farmers

The number of farmers practicing disease control is shown in Table 6. Results in Table 6 indicated that only about 17.0% of the cassava farmers actually practice disease control. This is surprising since about 30.2% of

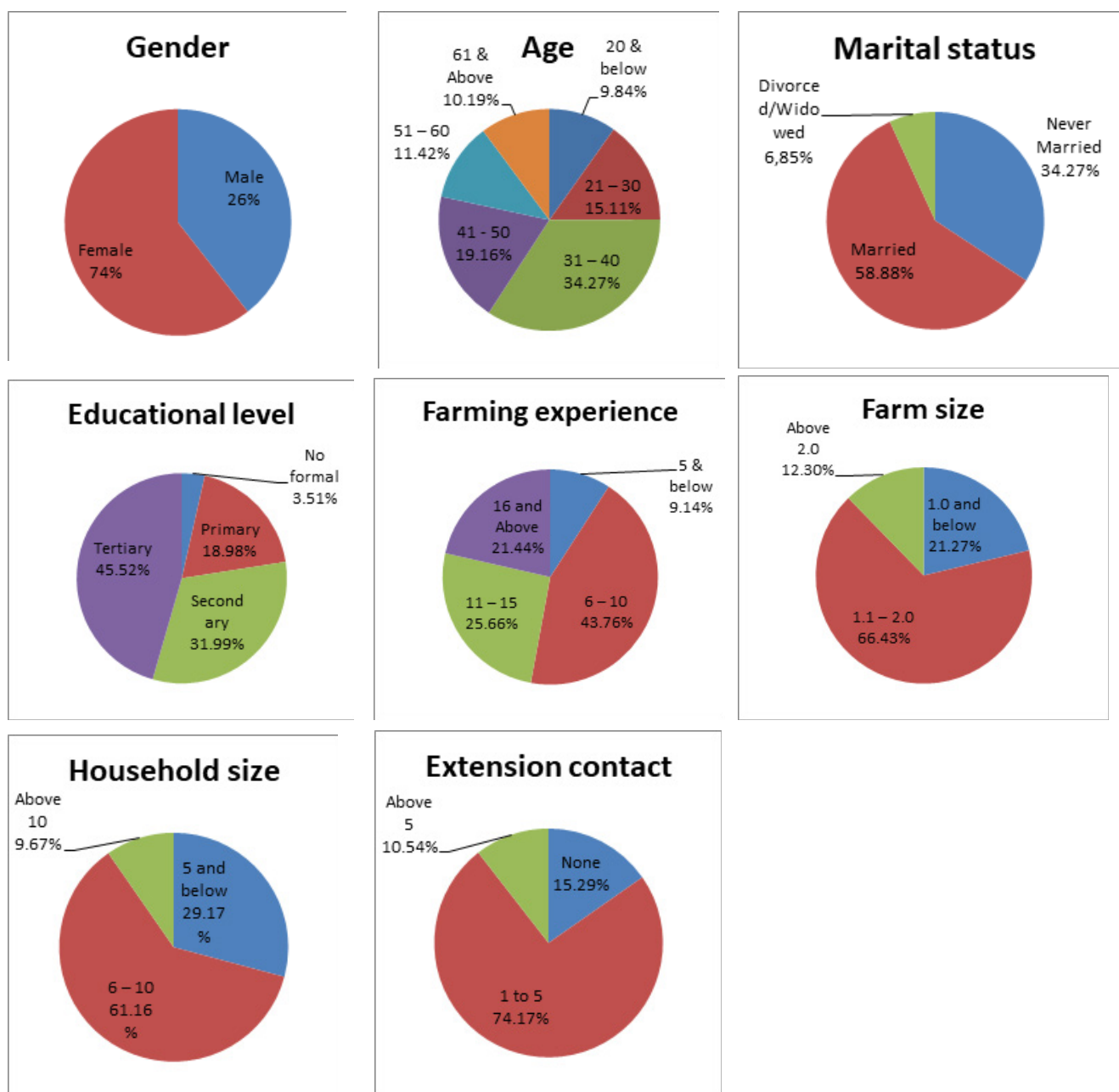


Figure 1: Pie charts presentation of socio-economic variables of respondents

Table 3: Prevalent diseases of cassava

S/N	Cassava Disease	Standard deviation	Mean	Rank of mean
1	Cassava Mosaic Disease (CMD)	0.86	4.79	1 st
2	Cassava Bacteria Blight (CBB)	0.45	4.44	2 nd
3	Cassava Brown Streak Disease (CBSD)	0.63	4.02	3 rd
4	Cassava Root Rot (CRR)	0.92	4.00	4 th
5	Cassava Anthracnose (CA)	0.58	3.52	5 th

Source: Survey data, 2018

Table 4: Respondents' Knowledge of Control of Cassava Diseases

S/N	Knowledge test Item	Frequency(Correct score)	Percentage
1.	Use of disease resistant varieties	355	62.4
2.	Use of disease free planting materials	100	17.6
3.	Crop hygiene	122	21.4
4.	Removal (rouging) of diseased plants	252	44.3
5.	Adjustment of field size and shape	0	0.0
6.	Adjustment of planting date	88	15.5
7.	Crop spacing	178	31.3
8.	Soil fertility and nutrient status	0	0.0
9.	Varietal mixtures	122	21.4
10.	Intercropping	89	15.6
11.	Vector control with insecticides	345	60.6
12.	Biological control measures	182	32.0
13.	Mild-strain protection	65	11.4
14.	Use of vector-resistant varieties	186	32.7
15.	Integrated control measure	147	25.8
16.	Practice of crop quarantine	144	25.3
17.	Practice of crop rotation	0	0.0
18.	Good site and land selection	88	15.5
19.	Allowing land to fallow	188	33.0
20.	Destroying of host range	154	27.1

Source: Survey data, 2018

Table 5: Grand Knowledge level of Cassava farmers with respect to Disease Control

Category of score (%)		Knowledge level of farmers	
		Frequency	Percentage
60 – 100	High	172	30.2
Below 60	Low	397	69.8
	Total	569	100

Source: Survey Data, 2018

Table 6: Farmers' Practice of control of cassava diseases

S/N	Control of cassava diseases	Frequency	Percentage
1.	Yes	97	17.0
2.	No	472	83.0

the respondents have a high knowledge of how to control cassava diseases. This shows that although the cassava farmers have some knowledge of the control of cassava diseases, only a few of them actually practice disease control measures. This result is very disappointing owing

to the importance of cassava in Delta State. The result is supported by the finding of Chikoti et al. (2016) who reported low levels of disease control among cassava farmers in lupaula province of Zambia.

3.4 Sources of Information to Cassava Farmers on Control of Diseases

Table 7 shows that an extension agent was the main source of information to cassava farmers in the study area. The next most important sources were friends, neighbours and relatives which accounted for 48.33%. This result is corroborated by the findings of Nsoanya *et al.* (2011) who observed Extension Agents were the principal sources of information to farmers. Nlerum *et al.* (2012) reported that friends and relatives were good sources of information to farmers in Rivers State, Nigeria. Only about 12.4% of the respondents sourced their information from the mass media (i.e. television newspaper, radio and the like)

3.5 Problems militating against sourcing for information on the control of cassava diseases

The result in Table 8 showed that several factors were adduced for inaccessibility of farmers to information sources on the control of cassava diseases. Observation in many developing countries suggests that lack of access to information occurs for many types of agricultural technologies, including access to control measures of diseases (Musingafi and Zebron 2014). Ignorance (non-exposure to information) (90.0%), poor extension contact (87.7%), financial bottlenecks (68.4%), small

farm holdings of farmers (68.4%), farmers not seeing any need for control (37.7%) and the low market price of cassava products leading to low income (31.1%) are the major culprit hampering cassava farmers from obtaining information on disease control.

Lack of exposure to information sources is the major factor preventing the farmers from sourcing information. Studies have shown that exposure of farmers to information sources is most likely to be a major factor affecting their adoption of behaviour (Musingafi and Zebron 2014). Even though the level of education in the area was fairly high, most of them are ignorant on control of cassava diseases. As mentioned previously, extension contact is the main source of information for the cassava farmers. However, the extension contact with the farmers is very weak. When a farmer lacks extension contact, he may not have access to information. Agbamu (2014) observed that cassava farmers' extension contact in Delta State is very low. Finance is very critical to the farmer in executing their decision. However, most of the farmers in the study area are financially handicapped, probably as a result of their small-sized farms. This could limit their access to disease control packages. Also, some farmers in the area do not see disease as a threat to their farm business, and as a result do not practice disease control. They see this as a sheer waste of effort, time and valuable resources. Finally, some of the respondents asserted that since the price of cassava products is low the effort of sourcing for information to control disease is not worth it.

Table 7: Sources of information of cassava farmers

Source of Disease Control	Frequency (97)	Percentage (100)
Extension agent	78	80.4
Friends and neighbours	66	68.0
Relatives	54	55.7
Mass media	12	12.4

Source: Survey data, 2018

Table 8: Factor affecting farmers' access to control measure of cassava diseases

Factor	Frequency	Percentage
Ignorance	512	90.0
Poor extension service	499	87.7
Financial constraints	389	68.4
Small farm holding	389	68.4
No need for control	214	37.7
Low price of cassava	177	31.1

They feel that when they control diseases, this will add to their cost and lower their net farm returns.

3.6 Relationship between socioeconomic characteristics of respondents and knowledge of disease control measures of cassava

The Binomial Logit Model used to determine the relationship was a good fit, since Hosmer and Lemeshow Test showed the Chi-square value of 18.604 and P value = 0.388). The overall correct classification was 89.62 per cent, which was equally good. Eight variables were fitted in the final model (as shown in Table 9). These variables were: gender, age, marital status, education attainment, farming experience, farm size, household size and extension contact. The logistic regression coefficient B only showed the direction of change; although some were found to be negative and others positive. In the Model, the odds ratio was computed as Exponential of B. The odds ratio more than one showed positive change, odd ratio equal to one showed no change, and odd ratio less than one showed negative change (Nag et al. 2018). However, Osborne (2006), suggested that to simplify, the interpretation of the values less than one must be converted to their corresponding ratio counterpart above 1.0 by taking the inverse of the odds ratio.

Odds of increased Knowledge of control of cassava diseases with one unit increase of extension contact for

instance is 1.256 times, keeping other variables constant. Obviously, extension contact implies more opportunity for farmers to acquire more knowledge on control of cassava diseases, which would result in more effective disease control.

Logit regression analysis showed the coefficients that are significant in determining the adoption decisions of the farmers. The parameter estimates for the model were at a 5% level of significance. The Logit regression Model estimates indicated that apart from age, education, farming experience, farm size and extension contact were statistically significant in determining cassava farmers' knowledge of disease control measures; gender, marital status, and household size were not statistically significant at 5% level. Nag, et al. (2018) opined that several researchers strongly believe that age is crucial to the dissemination, adoption and diffusion of new ideas. The literacy among respondents in the study area was quite encouraging. People who are literate are expected to have more favourable disposition towards agricultural skills, knowledge and information as compared to illiterate ones (Hassan 1991; Habib et al. 2007). The implication of this is that literate farmers are more likely to acquire knowledge than their non-literate counterparts. Oluwatusin and Shittu (2014) asserted in their work that experience is usually said to be the best teacher, thus they believed that experience is likely to increase the wealth of knowledge of farmers. This connotes that farmers with more years of experience are more likely to have better knowledge on disease control practice than those with fewer years of experience. Increased farm size means

Table 9: Logit Regression result of socio-economic variables affecting famers Knowledge

Variable	B	SE	Wald	Df	Sig	Exp (B)	1/Exp B	95% CI for EXP B	
								Lower	Upper
Constant	11.05	1.78	28.79	1	0.00	2.89	-	-	-
Gender	-2.976	1.295	9.44	1	0.28	.566	1.767	.422	.677
Age	-0.152	0.063	11.06	1	0.02	.210	4.762	.056	.786
Marital status	-1.097	0.543	3.45	1	0.33	.990	1.010	.766	.877
Education	0.635	8.800	11.78	1	0.00	.432	2.315	.796	.864
Experience	-0.645	0.312	12.99	1	0.04	.890	1.124	.210	.655
Farm size	-0.301	0.264	8.98	1	0.03	.786	1.272	.078	.098
Household	0.0688	0.865	6.02	1	0.63	.887	1.127	.550	.798
Ext. Contact	2.779	0.822	11.01	1	0.01	.796	1.256	.067	.812
Model chisquare	18.60								
Negerkelke R2 Square	0.74								
Sample size	569								

more likelihood to increase productivity and tendency to adopt innovations. Farm size of farm holding plays a major role in the dissemination and adoption of new ideas among farmers. Income depends directly or indirectly on the size of the farm and also has a direct bearing on the adoption of innovations.

The positive sign and significance of the extension contact variable implies that extension is an important factor that will improve farmers' knowledge of control of diseases. This should be expected as extension contact improves farmers' knowledge about agriculture, including disease control practices.

3.7 Relationship between socio-economic variables and practice of disease control

The parameter estimates for the Model were at a 5% level of significance. Logit estimates for control of diseases revealed that age, farming experience, farm size and extension contact were found to be statistically significant in explaining cassava farmers' adoption disease control measures; gender, marital status, education level and household size were not statistically significant at a 5% level. Farmer's age was found to be negatively related to adoption behaviour. Nag et al. (2018) opined that several researchers strongly believe that age plays a crucial role in the dissemination, adoption and diffusion of innovations. This implies that younger cassava farmers are more likely to adopt the practice of controlling diseases on their

farms. This finding is supported by those of Crusan et al. (1982) and Habib et al. (2007) who asserted that younger farmers respond more readily to the adoption of new ideas than the older farmers. Matthew-Njoku (2005) also observed that young farmers appear to be more adaptable in their decisions, adopt new ideas quickly because of the anticipated life span within which investment in new farming techniques will pay off.

Farming experience was positively correlated with the adoption of disease control measure ($P < 0.05$). This implies that farmers with many years of experience in cassava production will be more likely to control diseases on their farms. Ebewore, et al. (2015) made similar observation among yam farmers in Delta State. There was a positive and significant relationship also between adoption of control measures and farm size of farmers. According to Nag et al. (2018), increased farm size means more likelihood to increase productivity and efficiency in adopting innovations and the size of the farm holding plays a crucial role in the dissemination and adoption of improved agricultural practices (including disease control measures) among farmers. Moreover, extension service was positive and highly significant. Extension contact furnishes the farmers with more information and also persuades the farmers to adopt disease control measures, hence the correlation between extension contact and adoption of control measures is positive. Agbamu (2014) asserted that extension contact serves as an avenue of providing advisory services (including information on disease control) to farmers.

Table 10: Logit Regression Showing relationship between socio-economic variables and practice of disease control

Variable	B	SE	Wald Stat.	Df	Sig	Exp (B)	Odd ratio	95% CI for EXP B	
								Lower	Upper
Constant	14.02	2.22	16.45	1	0.00	1.99	-	-	-
Gender	-2.976	1.295	9.44	1	0.28	.566	1.767	.422	.677
Age	-0.152	0.063	11.06	1	0.02	.210	4.762	.056	.786
Marital status	-1.097	0.543	3.45	1	0.33	.990	1.010	.766	.877
Education	0.435	5.722	1.09	1	0.31	.997	1.005	.796	.864
Experience	0.645	0.312	12.99	1	0.04	.890	1.124	.210	.655
Farm size	0.301	0.264	8.98	1	0.03	.786	1.272	.078	.098
Household	0.0688	0.865	6.02	1	0.63	.887	1.127	.550	.798
Ext. Contact	2.779	0.822	11.01	1	0.01	.796	1.256	.067	.812
Model chisquare	21.21								
Nagelkerke R ²	0.66								
Sample size	569								

4 Conclusion and Recommendations

The study has indicated that the present knowledge and control of diseases by cassava farmers is very low in the study area and this may portend doom for cassava production if this ugly situation is left unattended to. Although extension contact was the principal source of information in the area, such contacts were very weak (as depicted in the socio-economic variable session). The study therefore recommends good contacts between extension and cassava farmers and greater activities of agricultural extension and rural development workers to help farmers access and apply information on cassava diseases for improved production of cassava in the area. Farmers should be properly enlightened to improve, not only their knowledge of disease control but their application of control measures as well. Thus, policy makers, rural development worker and other stakeholders in the cassava production process should therefore make a concerted effort to enlighten farmers through workshops, seminars and lectures about disease control practice. Finally, farmers should be encouraged to increase their farm holdings as this increases their probability of acquiring knowledge and adopting disease control practices

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