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An International Journal



Keywords: Calcareous mudstone; Soil properties; Taxonomic Classification; Nutrients

## Introduction

Calcareous mudstone is a sedimentary rock and consolidated product of calcareous sands, limy mud and crushed shells (Anatale, 1996). It is composed of carbonates in the form of aragonite, calcite and dolomite (Wicandor, 1995). The mudstone formations have been referred to as River Shale group or the oldest marine carbonate sequence which are mostly impervious shale with

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## Farmers' attitude towards adoption of bio-fortified cassava technologies disseminated by public and private extension system in southwest, Nigeria

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### Abstract

Cassava production has witnessed technological innovations in recent times to address vitamin A deficiency among many households. The study examined the attitude of farmers towards the adoption of bio-fortified cassava technologies in southwest Nigeria. A total of three hundred and sixty respondents were drawn from public and private extension systems for the study. Data were collected using a validated questionnaire and focus group discussion and analysed with descriptive statistics while hypotheses were tested with t-test and Pearson Product Moment Correlation. Results show that adoption of bio-fortified cassava varieties among farmers in both public and private extension systems (42.0% and 35.0% respectively) was low despite the essential attributive benefits to farmers. A significant difference exists in the attitude towards the adoption of bio-fortified cassava technologies between farmers in public and private extension systems ( $t = 4.729$ ,  $p = 0.000$ ). Farmers under public extension services, unlike their counterparts in private extension system were unfavorably disposed to the adoption of bio-fortified cassava technologies due to some varietal characteristics. The attitude of farmers under public extension system was influenced by age ( $r = 0.143$ ,  $p = 0.055$ ) while those in the private extension system was influenced by years spent on education ( $r = 0.149$ ,  $p = 0.046$ ). The study concludes that farmers in public and private extension systems exhibited differential attitudinal response towards adoption of bio-fortified cassava technologies. It is therefore recommended that technologies on bio-fortified cassava should be re-visited by researchers to make them more demand-driven and feasible within farming circumstances.

**Keywords:** Cassava, Farmers, Attitude, Bio-fortified cassava technologies, Extension systems

### Introduction

Cassava being one of the dominant staple food crops with many other potential benefits is grown in many developing countries especially in the humid and sub-humid tropics of Africa. More than 500 million people in the tropics particularly Africa depend on cassava for their daily consumption (Montagnac *et al.*, 2009; RTIP, 2004). Cassava has witnessed technological innovation in recent times especially in most of the developing countries where vitamin A deficiency is on the increase. According to Ilona *et al.*

(2017); Bouis, *et al.*, (2009), bio-fortification of cassava with pro-vitamin A carotenoids is an emerging sustainable technology to address vitamin A status of the vulnerable resource poor farmers. It is known to be cost-effective and sustainable solution that uses conventional plant breeding to increase the density of vitamins of cassava. The innovation has enabled the release of bio-fortified cassava varieties in Nigeria through the working collaboration of National Root Crops Research Institute (NRCRI), Umudike; International Institute

of Tropical Agriculture (IITA), Ibadan and Harvestplus. The released bio-fortified yellow cassava varieties include TMS 01/1371, TMS 01/1412, TMS 01/1368, TMS 07/593, TMS 07/539, NR 07/0220) (Oparinde *et al.*, 2016). These varieties are characterized with deeply yellow to slightly orange colour with an excellent  $\beta$ -carotene, energy and some matching agronomic characteristics which serve as incentives for farmers' adoption (Consortium, 2012).

The adoption and utilization of the bio-fortified cassava with extension playing a pivotal role would pave way for overcoming nutritional challenge caused by vitamin A deficiency among rural households whose daily meal depends on cassava. Bio-fortified staple foods can bring millions of rural households over the threshold from malnourishment to micronutrient sufficiency though it may not fully supply the daily required level of minerals and vitamins as those of supplements or industrially fortified foods. In addition, the new yellow cassava varieties can reach rural household who cannot afford protein-source food, fortified products and where supplemental programmes cannot reach.

Given the potential benefits of bio-fortified cassava technologies in improving the nutritional status of the farmers, Adeniran *et al.* (2019) reported that uptake by farmers remained very low in southwest Nigeria. In essence, farmers' characteristics such as attitude have been found to influence technology adoption. According to Rehman *et al.* (2007) attitude of farmers play an important role in their behaviour intent, which usually leads to actual adoption behaviour. Gidado (2003) opined that disposition of one to respond favorably or unfavorably to an object, person, institution or event is a function of attitude.

It is therefore believed that attitude is the main factor in changing behaviors (Haney, 2008). In the study of Ogunsunmi (2011), it was found that there was differential attitudinal response among farmers towards selected agricultural technologies while positive attitude of the farmers is an indication of the importance of improved agricultural technologies. Salum (2016) found that some farmers had negative attitude towards improved cassava varieties due to lack of planting materials. Wole-Alo and Okunlola (2015) added that farmers had positive attitude towards improved cassava varieties due to the resistance to pests and diseases as well as high yield compared to local varieties. Attitudes thus, can be strong predictors of behaviours or the acceptance of ideas (Arbuckle *et al.*, 2013). Giving the role of attitude of farmers towards improved technology adoption, it is therefore pertinent to examine the attitudinal response of farmers towards adoption of bio-fortified cassava technologies.

### **Objective of the study**

The objective of the study was to examine the attitude of farmers towards adoption of bio-fortified cassava technologies disseminated by public and private extension systems in southwest, Nigeria.

Specifically, the study was able to:

- i. describe the socio-economic characteristics of the respondents;
- ii. identify technologies adopted on bio-fortified cassava;
- iii. examine the attitude of farmers towards adoption of bio-fortified cassava technologies.

### **Hypothesis**

- Ho<sub>1</sub>: There is no significant difference in attitude towards adoption of bio-fortified cassava technologies between farmers in public and private extension systems.
- Ho<sub>2</sub>: There is no significant relationship between farmers' socio-economic characteristics and attitude towards adoption of bio-fortified cassava.

### Methodology

The study was conducted in Southwest, Nigeria which is one of the six geo-political zones in Nigeria. The zone is made up of six states which are Lagos, Oyo, Ogun, Ondo, Osun and Ekiti States. The area lies between longitude 2° 31' E and 6° 00' E East and Latitude 6° 21' N and 8° 37' N (Agboola, 1979) with a total land area of 91 77,818 km<sup>2</sup> and a projected population of 28,767,752 in 2002 (NPC, 1991). The study area has 85 constituted forest reserves with a forest area cover of 842,499 hectare. The temperature ranged between 21 and 34°C while the annual rainfall ranged between 150mm and 3000mm. The vegetation in Southwest Nigeria is made up of fresh water swamp and mangrove forest at the belt. The low land in the forest stretches inland to Ogun and part of Ondo State, while secondary forest is towards the northern boundary where the derived southern Savannah exists (Agboola, 1979 in Faleyimu *et al.*, 2013).

Three (3) states namely Osun, Oyo and Ogun (Fig. 1) were purposively selected for the study because of noticeable production of cassava as well as extension services on bio-fortified cassava by both public and private extension systems. Agricultural Development Programme (ADP) represents the public extension system while Justice Development & Peace

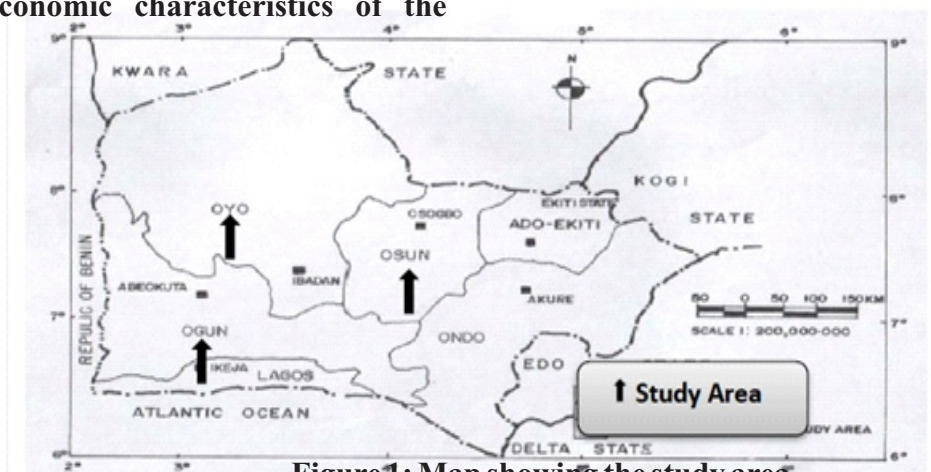
Movement Rural Development Programme (JDPM- RUDEP) represents the private extension system. The two extension organizations are the key partners of Harvestplus/IITA in the dissemination of bio-fortified cassava.

Multi-stage sampling procedure was adopted to draw the sample size from private and public extension systems. At the first stage, two ADP zones were randomly selected from each of the States using simple random sampling techniques to provide a full coverage of the state. At the second stage, 40% of the extension blocks were randomly selected from each of the selected zones. In the third stage, 40% of extension cells were selected from the selected blocks in the selected zones. In the fourth stage, thirty (30) farmers were selected from the list of registered farmers in the selected cells using a simple random sampling technique to arrive at a sample size of one hundred and eighty (180) respondents. In the private extension system, forty (40) per cent of the existing zones were selected from each of the States. Secondly, 20% of the existing societies from the selected zones were randomly selected from each of the States. Thirdly, sixty farmers were selected from the list of registered farmers across the selected societies in each of the State using a simple sampling technique to arrive at a total sample size of one hundred and eighty respondents. Quantitative and qualitative data were collected with the use of structured, validated interview schedule and focus group discussion. Data were analysed using descriptive statistics while Pearson Product Moment Correlation and t-test were used to test the hypotheses.

To ascertain farmers' attitude towards adoption of bio-fortified cassava technologies, a list of thirty two attitudinal statements consisting of positive and negative statements were presented to the respondents. Responses were measured at interval level using a four point scale and scored as strongly disagree = 1, disagree = 2, agree 3 and strongly agree = 4 for positive statements while reverse order was for the negative statements. The index of respondents' attitude towards adoption of bio-fortified cassava technologies was obtained from the attitudinal statements used. Thirty two statements were used with a maximum score of 128 and a minimum score of 32 based on the scale. This gave an average of 48 with mid-point value of 80. All scores below the mid-point value that is, 32 – 80 were tagged as the percentage of farmers with unfavourable attitude to adoption of bio-fortified cassava technologies while all scores above the mid-point value (80.5 - 128) were tagged as the percentage of farmers with favourable attitude to adoption of bio-fortified cassava technologies.

**Results and Discussion**

**Socio-economic characteristics of the**



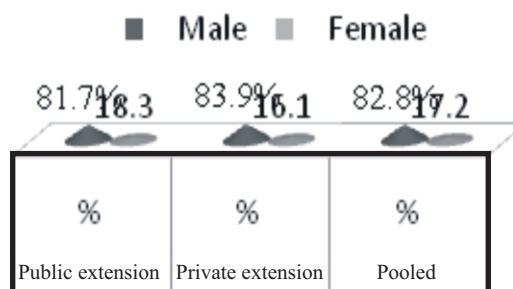
**Figure 1: Map showing the study area**

**farmers**

**Sex**

Distribution of respondents based on sex as found in Figure 2 shows that 81.7% of the respondents in the public extension system were male while 83.9% of the respondents in the private extension system were male. The pooled data show that majority of the respondents (82.8%) were male. This implies that bio-fortified cassava production across the study area was male dominated. This agrees with the findings of Yekinni *et al.* (2011); Osikaboret *et al.* (2011); Adeniran *et al.* (2019) that men are more involved in cassava production because of the energy demand.

**Age of respondents**



**Figure 2: Sex of respondents**

Results on age in Figure 3 show that 31.7% of the respondents in the public extension system were within the age bracket 40-49 years while the mean age was found to be 54 years (SD±11.036). Also, 27.8% of the respondents in the private extension system were within the age bracket 50-59years and the mean age was 55years (SD±11.048). The pooled data show that the mean age of the farmers was 54years (SD±11.036). This implies that most of the respondents were in their productive and active age which may positively influence their decision to adopt improved technologies. This is because acceptability of innovation will be influenced by farmers' age and activeness (Ayoade, Akintonde & Oyelere, 2012; Ayoade, 2013). The results further imply that most of the farmers are becoming old leaving very few young farmers in the production system of cassava. This

undoubtedly will negatively affect the production level of cassava and food sufficiency in the future.

**Marital Status**

Findings on marital status in Figure 4 revealed that majority of the respondents in public and private extension systems (91.7% and 82.2% respectively) were married. This implies that the respondents were dominated by married men and women who invariably contributed to increase in household size farm labour. Marital status therefore has implication for adoption of bio-fortified cassava technologies. According to Idrisa (2009) and Mohammad *et. al.* (2014), married people have more responsibilities which prompt their engagement in any enterprise

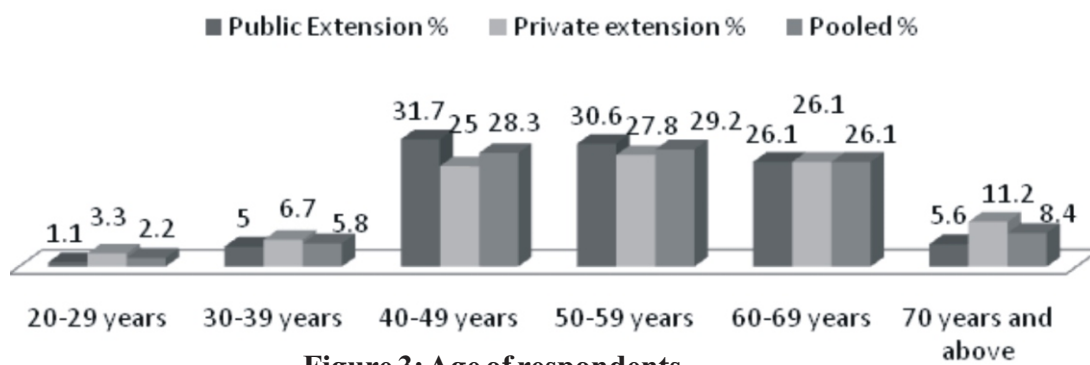


Figure 3: Age of respondents

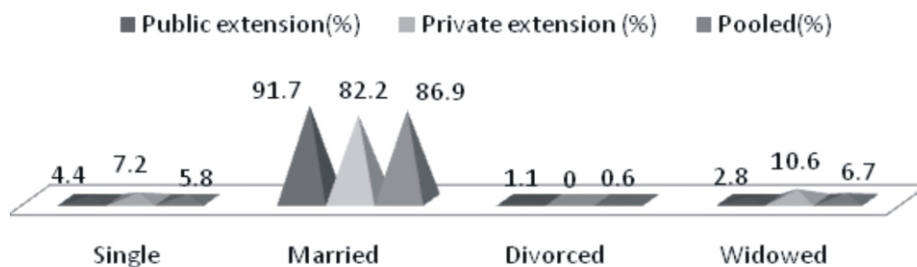


Figure 4: Marital Status

with higher levels of seriousness. This makes it necessary to seek improved agricultural technologies such as that of bio-fortified cassava to enhance the welfare of their families.

### Years of farming experience

Entries on farmers' years of farming experience in Figure 5 show that 38.3% of the respondents in the public extension system had between 11 and 20 years of farming experience. The mean years of farming experience was found to be 23 years. Thirty per cent of the respondents in the private extension system indicated their farming experience between 11 and 20 years and the mean was 24 years. The pooled data show that mean years spent on farming was 23 years. The results imply that the farmers had considerable years of experience in farming and this is a crucial factor for ensuring sustainable cassava production and adoption of improved technologies. The results confirm the findings of Folayan and Oguntade (2011)

that most farmers are well experienced in their farming activities and this increases their level of acceptance of new ideas such as that of bio-fortified cassava technologies.

### Household size

Distribution based on household size among the public extension beneficiaries (Figure 6) reveals that most of the respondents (61.1%) had between 6 and 10 household members and very few (7.8%) had between 11 and 15 members with the mean household size of 7 members. In the private extension system, more than half of the respondents (58.9%) had between 6 and 10 household members and the mean household size was 7 members. The pooled data show that the mean household size was 7 members. Considering the fact that labour is a major factor of crop production (Mbuk, Bassey, Udoh&Udoh, 2011), the findings imply that there was a considerable large household size which could be used as source of labour for production, processing and marketing activities of bio-fortified

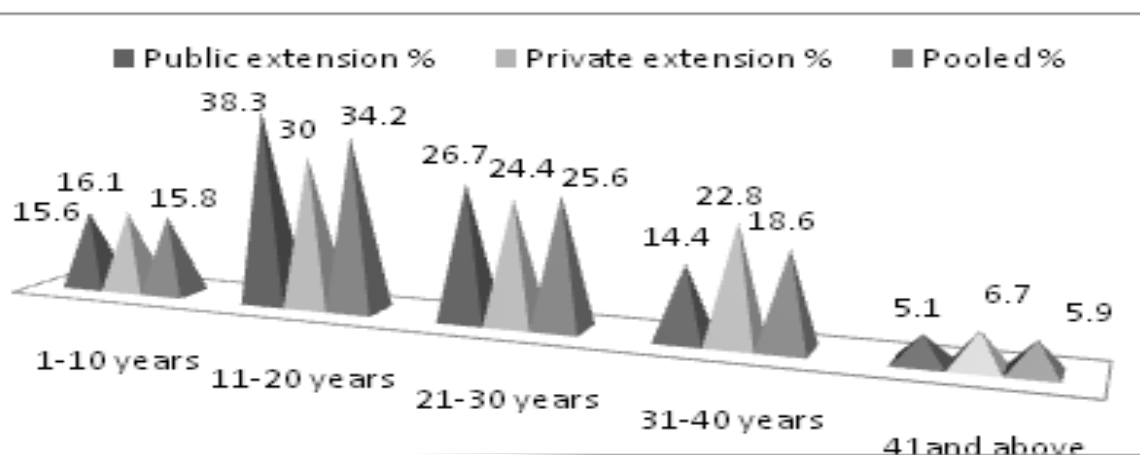
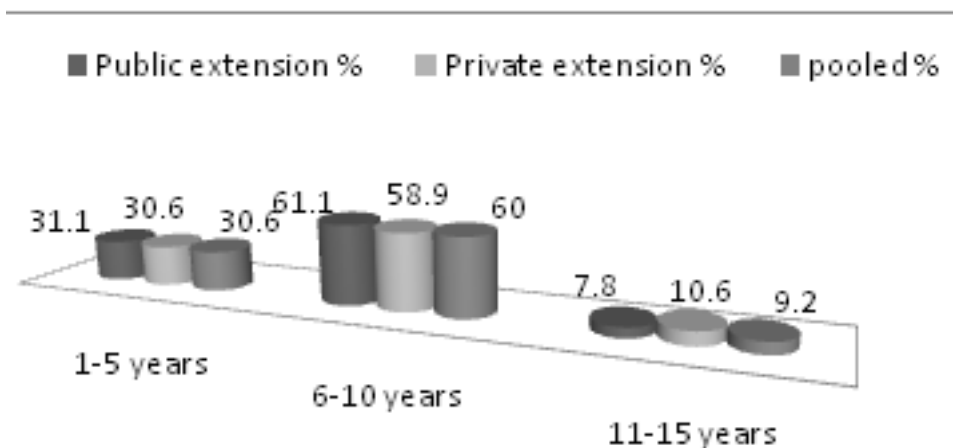
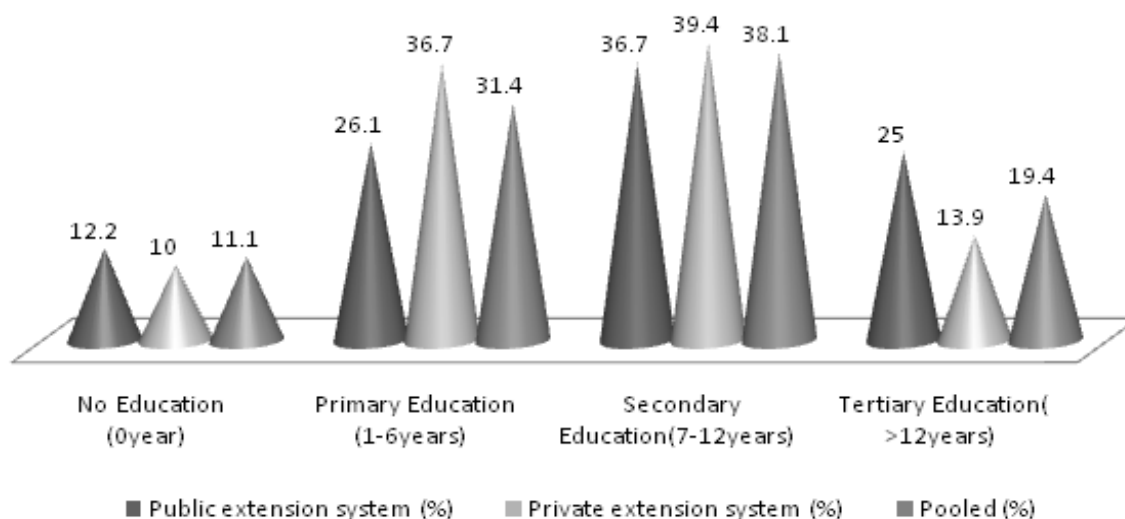


Figure 5: Years of farming experience



**Figure 6: Household size**



**Figure 7: Level of Education**

cassava. The large household size also implies that farmers may have some demands from members such as that of nutrition that will necessitate the adoption of bio-fortified cassava technologies.

**Level of Education**

Distribution of respondents on educational qualification in Figure 7 indicates that 36.7% and 39.4% of the in the respondents in public and private extension systems respectively had secondary school education. The results show that the majority of the respondents had one form of

education or the other. Education is an underlying tool that facilitates the adoption of improved technologies as well as serving as a tool for evaluating new production techniques. According to the submission of Agada, Onuche & Mbah (2018), education helps in the adoption of improved agricultural technologies. Also, Akinnagbe and Ajayi (2010) opined that education is an important factor influencing adoption of farm innovations. Poorly educated farmers tend to be conservative as they resist innovations which consequently results in low productivity. Thus, adoption of bio-fortified cassava technologies is somehow expected among the farmers because of their high literacy level.

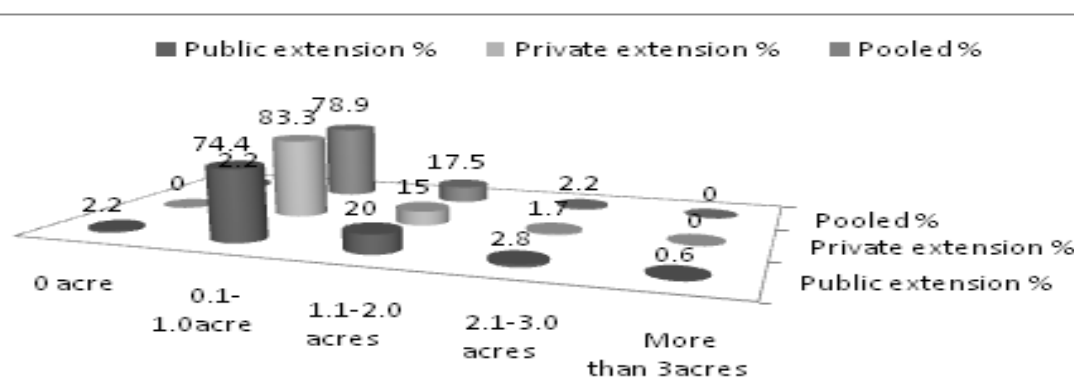
**Size of farmland for cultivating bio-fortified cassava (acre)**

Out of the indicated size of farmland cultivated by the farmers, majority of the respondents (74.4%) in public extension system (Figure 8) used between 0.1 and 1.0 acres of the farmland for the cultivation of bio-fortified cassava. This accounted for 83.3% of farmers in private extension system. Very few respondents (0.6%) in the public extension system and none

(0.0%) in the private extension system planted bio-fortified cassava on more than 3 acres of farmland. The mean size of farmland used for cultivating bio-fortified cassava across the extension systems was 1acre. This is indicative that the size of farmland for cultivating bio-fortified cassava was very small compared to the total size of farmland cultivated by the farmers. This is attributive to that fact that farmers were still very skeptical about the production of bio-fortified cassava because of the low market demand. Low output as well as low income generation will be consequential to this low cultivation of bio-fortified cassava.

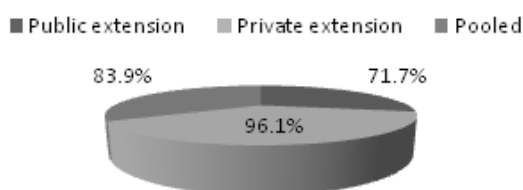
**Membership of farmers' organization**

The pooled data on membership of farmer's organization in Figure 9 revealed that majority of the respondents (83.9%) belong to farmer's organization. Studies of Wollni *et al.* (2010); Kassie *et al.*(2011); Fischer and Qaim (2012); Abebaw and Haile (2013) have shown a positive relationship between membership of farmers organization and adoption of improved agricultural technologies. The result however, to some extent guaranteed the adoption of bio-



**Figure 8: Size of farmland for cultivating bio-fortified cassava (acre)**

fortified cassava technologies in the study area. Also, membership of farmers organization translates to some advantages which include accessibility to micro-credit, input subsidy and avenue for cross breeding of ideas and information.



**Access to credit facilities**

Entries in Figure 10 show that majority of the respondents (83.3% and 71.7%) in public and private extension systems respectively did not have access to credit facilities. As noted by Omonona et al. (2010), access to credit enhances the production efficiency of small scale farmers. Credit therefore has the capacity to facilitate optimal input use leading to a positive impact on productivity. Poor access to credit in the study area undoubtedly will lower the capacity of the farmers to procure necessary inputs needed for the production of bio-fortified cassava technologies.

**Source of labour for farming**

Labour for farm production activities in Figure 11 was mostly hired (90.6%) while personal and communal source of labour accounted for a very low percentage (14.2% and 1.4%, respectively). This implies that the farmers appreciably used hired labour in crop production but also depended on other sources of farm labour. This result is in line with Ajibefun et al. (2000) cited by Anyiro et al., (2013) that hired labour contributes more than three-quarter of the total labour used for crops production on farms.

**Technologies adopted on bio-fortified cassava**

Results in Table 1 show that adoption of bio-fortified cassava varieties among farmers in both public and private extension systems (42.0% and 35.0% respectively) was low despite the essential attributive benefits to farmers. This corroborates the findings of Ayinde, Adewumi, Ajewole, Ologunde (2017) that adoption of bio-fortified cassava was low among farmers in Oyo State. Farmers indicated that the bio-fortified cassava varieties, though rich vitamin A, have low starch content causing low quality and acceptance of the final products than those of the existing white cassava varieties. During focus group discussion at Kogou

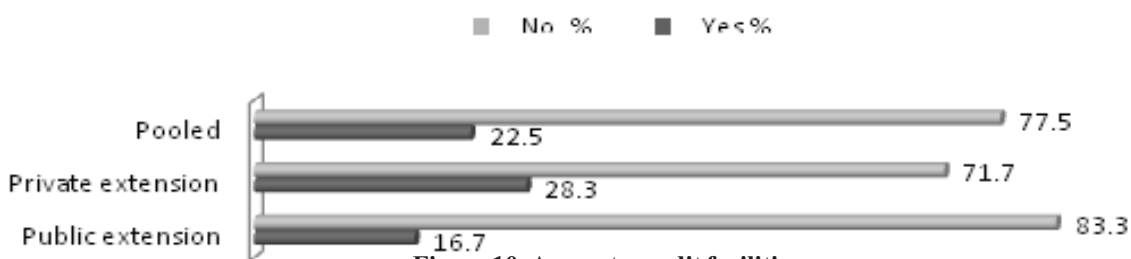


Figure 10: Access to credit facilities

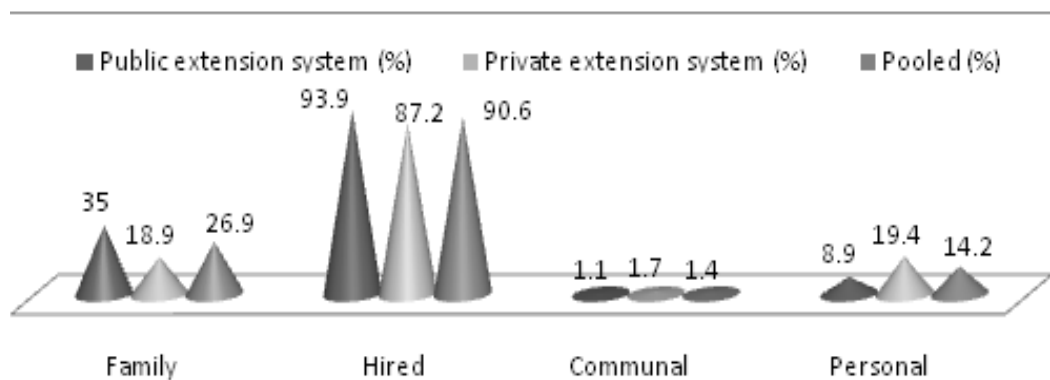


Figure II: Source of labour for farming

village, Ido Local Government Area; a farmer stated that:

*“Bio-fortified cassava contains low starch and when consumed either as gari or fufu, does not stay longer in the stomach. Also, when consumed in the morning before we set out for farm, it hardly sustained us for the day because of the low starch content. Thus, we will need supplemental energy-based food to keep us going throughout the day. The low starch content is also responsible for the gari not to draw like that of white cassava gari”.*

It was also shown that soil fertility was not an issue in the production of bio-fortified cassava as 28.9% and 2.3% of farmers in public and private extension system respectively recorded low adoption of fertilizer application. Farmers also stated that the use of agrochemicals in cassava production is not necessary as there was low adoption of chemicals for pest and disease control (29.4%) by the respondents.

This is in line with Ayoade *et al.* (2012) report of low adoption of herbicides in cassava production in among farmers.

Most of the respondents accepted technologies on stem cuttings preparation (64.5%) possibly for stem multiplication. Results further revealed a low adoption of land preparation technique as indicated by 41.9% and 35.3% of the respondents in public and private extension systems respectively. Low adoption of land preparation techniques can be traced to the low size of farmland for production of bio-fortified cassava among the farmers as earlier reported. However, adoption of planting technique accounted for 56.1% which is expected to accord the farmers efficient utilization of available farmland for maximum output. Also, 51.1% and 20.6% of the respondents in public and private extension systems respectively adopted the processing technique specifically frying for short period to avoid discolouration of gari and volatilization of vitamin A content.

**Table 1: Technologies adopted on bio-fortified cassava**

<b>Technologies</b>	<b>Public Extension system</b>	<b>Private Extension system</b>	<b>Pooled</b>
Improved bio-fortified cassava varieties	76(42.0)	63(35.0)	138(38.5)
Site selection technique	100(55.6)	90(25.0)	145(40.8)
Land preparation technique	76(41.9)	64(35.3)	139(38.6)
Preparation of cuttings	118(65.9)	113(60.6)	232(64.4)
Planting technique	114(63.3)	88(48.7)	202(56.1)
Spacing	102(56.4)	56(39.8)	173(40.1)
Weed control	60(33.1)	14(5.3)	74(20.5)
Fertilizer application	52(28.9)	11(2.3)	56(15.6)
Pest and disease control	80(44.4)	26(14.4)	106(29.4)
Harvesting technique	75(41.7)	38(21.1)	113(31.4)
Storage technique	33(18.4)	5(2.8)	38(10.6)
Processing technique	92(51.1)	37(20.6)	129(35.8)

Source: Field survey, 2019

#### **Attitude of farmers towards adoption of bio-fortified cassava technology**

Results in Figure 12 showed that 53.9% of the farmers in the public extension were unfavorably disposed to adoption of bio-fortified cassava technologies while 57.2% of the farmers in the private extension system showed favourable disposition towards adoption of bio-fortified cassava technologies. However, 51.7% of the farmers across the study area were favourable disposed to adoption of bio-fortified cassava technologies. According to Rehman *et al.* (2007); Rezvanfar (2011), attitudes of farmers towards production technologies played an important role in

their behaviour intent which eventually leads to adoption behaviour. A favourable attitude raises the probability of technology adoption (Meijer *et al.*, 2015). The results therefore imply that farmers in the private extension system, because of their positive attitude, have tendency for adoption of bio-fortified cassava technologies than those in the public extension system. This could likely be attributed to the extension service delivery on bio-fortified cassava to farmers in the private extension system. However, the overall result is not promising because it is still indicative of low adoption of bio-fortified cassava technologies among the farmers across the study area.

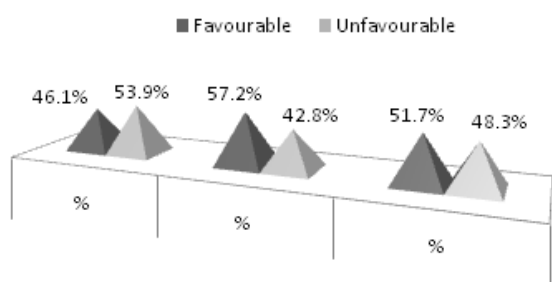


Figure 12: Attitude towards adoption of bio-fortified cassava technologies

Source: Field survey, 2019

### Test of hypotheses

**Ho1: There is no significant difference in attitude towards adoption of bio-fortified cassava technologies between farmers in public and private extension systems**

Table 2 shows that there is a significant difference in the attitude between farmers in public and private extension systems towards adoption of bio-fortified cassava technologies ( $t = 4.729$ ). This differential result on farmers' attitude originated as a result of some factors earlier identified to affect the adoption of bio-fortified cassava technologies. Also, the nature of extension services received by the farmers in the extension systems accounted for this result.

For instance, effort was concentrated in the private extension system on processing of bio-fortified cassava for value addition for more income than in the public extension system.

**Ho2: There is no significant relationship between farmers' socio-economic characteristics and their attitude towards adoption of bio-fortified cassava**

Results in Table 3 reveal that there was a positive correlation between age and attitude of farmers in public extension system towards adoption of bio-fortified cassava technologies ( $r = 0.143, p = 0.055$ ). It therefore implies that age of the farmers had influenced the formation of unfavourable attitude towards adoption of bio-fortified cassava technologies. However in the private extension system, years spent on education was found to be positively related with farmers attitude towards adoption of bio-fortified cassava technologies ( $r = 0.149, p = 0.046$ ). This finding clearly indicates that educated farmers might develop favourable attitude towards adoption of bio-fortified cassava technologies unlike the non-literate farmers.

Table 2: Results of difference in attitude of farmers in public and private extension systems towards adoption of bio-fortified cassava technologies

Variable	Extension system	n	Mean	Mean difference	df	t-value	Sig.
Attitudinal difference in adoption of bio-fortified cassava technologies	Public	180	53.5167	3.16111	358	4.729	0.000
	Private	180	50.3556				

Source: Field survey, 2019

**Table 3: Test of relationship between farmers' socio-economic characteristics of the respondents and their attitude towards adoption of bio-fortified cassava**

Variable	Adoption of bio-fortified cassava technologies by beneficiaries of Public Extension			Adoption bio-fortified cassava technologies by beneficiaries of Private Extension		
	r-value	p-value	Decision	r-value	p-value	Decision
Age	0.143	0.055	S	0.025	0.740	NS
Years spent on education	0.021	0.775	NS	0.149	0.046	S
Farming Experience	0.041	0.581	NS	-0.094	0.207	NS
Household size	0.012	0.872	NS	-0.079	0.289	NS
Size of farmland	0.061	0.413	NS	0.003	0.967	NS

### Conclusion and recommendation

The study sought to examine farmers' attitudes towards adoption of bio-fortified cassava technologies disseminated by public and private extension systems. Most of the farmers were male, married, educated and in their active age with considerable years of experience in farming. Although, farmers across the study area were favourably disposed towards adoption of bio-fortified cassava technologies, some underlying characteristics of bio-fortified cassava have caused differential attitudinal response between farmers in the private and public extension systems. Age and years spent on education was found to influence the attitude of the farmers in public and private extension systems respectively. Stimulating favourable attitudes among farmers may yield positive effect on adoption. This holds implication for the extension systems to work closely with the researchers for development and delivery of demand-driven bio-fortified cassava varieties and associated technologies. This will go a long way in enhancing optimal attitude formation for adoption to take place.

### References

- Abebaw, D. and Haile, M. G. (2013). The impact of cooperatives on agricultural technology adoption: Empirical evidence from Ethiopia. *Food Policy*, 38, 82–91.
- Adeniran A. A., Akinagbe O. M., Abegunrin O. O. and Okunlola J. O. (2019). Information sources on cassava production among farmers in Oyo State: Policy implication for Extension delivery. In: Olufayo, M. O., Adegunle, V. A. J., Adebay, R. A., Oparinde L. O., and Gbadamosi, O. K. (eds). "Challenges of Sustainable Agriculture and Food Security in emerging countries of sub-Saharan Africa". Proceedings of the 10<sup>th</sup> Annual National Conference of the School of Agriculture and Agricultural Technology, Akure, Nigeria.
- Adeniran, A.A. (2019). Adoption of bio-fortified cassava technologies disseminated by public and private extension systems in southwest Nigeria. Unpublished PhD. Thesis of Federal University of Technology, Akure.

- Agada, M. O., Onuche, F. I. and Mbah, E. N. (2018). Gender Participation and Constraints in Cassava Production, Processing and Marketing in Makurdi, Benue State, Nigeria. *International Journal of Gender and Women's Studies* Vol. 6, No. 1, pp. 79-87.
- Agboola, S.A. (1979). An agricultural atlas of Nigeria. Oxford University Press, London. 248pp.
- Ajibefun, I. A., Ademola, G., and Obioma, A. (2000). Investigation of factors influencing Technical Efficiency of Small-holder crop farmer in Nigeria. CEPA Working papers N0. 10/96. Dept. of Economics, University of New England.
- Akinagbe, O. M. and Ajayi, A. R. (2010). Assessment of farmers' benefits derived from Olam organization sustainable cocoa production extension activities in Ondo State, Nigeria. *Journal of Agricultural Extension*. 14 (1): 13 – 24.
- Anyiro, C. O., Emerole, C. O., Osondu, C. K., Udah, S. C., Ugorji, S.E. (2013). Labour-use efficiency by smallholder yam farmers in Abia State, Nigeria: A Labour-Use Requirement Frontier Approach. *International Journal of Food and Agricultural Economics*, 1, 151–163.
- Arbuckle, J.G., Morton, W.L. and Hobbs, J. (2013). Farmer beliefs and concerns about climate change and attitudes toward adaptation and mitigation: Evidence from Iowa. *Climatic Change*, 118: 551-563.
- Ayinde, O. E., Adewumi, M. O., Ajewole, O. O. and Ologunde, O. O. (2017). Determinants of adoption of vitamin A bio-fortified cassava variety among farmers in Oyo State, Nigeria. *Croatian Journal of Food Science Technology* (2017) 9 (1) 74-79.
- Ayoade A. R. (2013). The adoption impact of improved cassava varieties on social life of rural farmers in Orire Local Government Area of Oyo State. *International Journal of Humanities and Social Science* 3(12):278–286.
- Ayoade A.R., Akintonde J.O. and Oyelere G.O (2012). Factors Affecting Adoption of Appropriate Technologies on Cassava Production in Oriire Local Government Area of Oyo State, Nigeria. *International Research Journal of Agricultural Science and Soil Science* Vol. 2(3) pp. 089-093, <http://www.interestjournals.org/>
- Bouis, H.E., C. Hotz, B. McClafferty, J.V. Meenakshi and Pfeiffer W (2009). Bio-fortification: A new tool to reduce micronutrient malnutrition. In International Congress of Nutrition, 19th, Bangkok, Thailand. 4–9 Oct. 2009.
- Consortium (2012). Nigeria releases Vitamin A cassava to improve public health for millions. Stories of Change, CGIAR. Accessed on August 16, 2013 from <http://www.cgiar.org/consortium-news/nigeria-vitamin-a-cassava-improve-public-health>
- Faleyimu, O. I., Agbeja B. O. and Akinoyemi O. (2013). State of forest regeneration in Southwest Nigeria. *African Journal of Agricultural Research* 8(26), pp. 3381-3383.
- Fischer, E. and Qaim, M. (2012). Linking smallholders to markets: Determinants and impacts of farmer collective Action in Kenya. *World Development* 40:1255-1268.
- Folayan J.A. and Oguntade E.A.(2011). Analysis of cost and returns to

- management in yam wholesale market in Efon Alaaye Local Government, Ekiti State, Nigeria. *Journal of Food, Agriculture and Environment* 9(3/4): 552-556
- Gidado, S.A. (2003). Multivariate determinants of farmers and extension worker attitude towards animal traction technology in Bauchi State. PhD Thesis in Agricultural Extension (Unpublished), Agricultural Economics and Extension Programme, School of Agriculture and Agricultural Technology, Abubakar Tafawa Balewa University, Bauchi, Nigeria.
- Haney, C. (2008). A culture of harm: Taming the dynamics of cruelty in supermax prisons. *Criminal Justice and Behavior*, 35(8), 956-984.
- Idrisa, Y. L., Ogunbameru, B. O. and Madukwe, M. C. (2012). Logit and Tobit analyses of the determinants of likelihood of adoption and extent of adoption of improved soybean seed in Borno State, Nigeria. *Greener Journal of Agricultural Sciences*, 2(2), 37-45.
- Iloa, P., Bouis, H.E., Palenberg, M., Moursi, M. and Oparinde, A. (2017). Vitamin A cassava in Nigeria: crop development and delivery. *African Journal of Food Agriculture and Nutritional Development* 17(2): 12000-12025 DOI: 10.18697/ajfand.78.HarvestPlus09
- Kassie, M., Shiferaw, B. & Muricho, G. (2011). "Agricultural Technology, Crop Income, and Poverty Alleviation in Uganda," *World Development* 39 (10): 1784-1795.
- Mbuk, E. M., Basse, N. E., Udoh, E. S. and Udoh, E. J. (2011). Factors influencing Post Harvest Losses of Tomato in Urban Market in Uyo, Nigeria. *Nigerian Journal of Agriculture, Food and Environment*, 7(2), 40-46.
- Meijer, S.S., Catacutan, D., Ajayi, O.C., Sileshi, G.W. and Maarten, N. (2015). The role of knowledge, attitudes and perceptions in the uptake of agricultural and agro forestry innovations among smallholder farmers in sub-Saharan Africa. *International Journal of Agricultural Sustainability*, 13 (1), 40-54.
- Mohammad, B. T., Achem B. A., Abdulquadri, A. F. (2014). Factors influencing adoption of agricultural processing technologies developed by National Centre for Agricultural Mechanization (NCAM) in Ifelodun Local Government Area, Ilorin Kwara State. *International Journal of Science and Research* 3: 413-417.
- Montagnac, J. A., Davis, C. R., Tanumihardjo, S. A. (2009). Nutritional value of cassava for use as a staple food and recent advances for improvement. *Comprehensive Review of Food Science and Food Safety*, 8 (3) 181-194.
- National Population Commission (NPC) (1991). National census report. Abuja: FGN
- Ogunsumi, L. O. (2011). Attitude of farmers towards improved agricultural technologies in south-west Nigeria. *African Journal of Biotechnology* 10(50): 10108-10115.
- Omonona, B. T., Lawal, J. O. and Oyinlana, A. O. (2010). Determinants of credit constraint conditions and production efficiency among farming households in Southwestern Nigeria. African Association of Agricultural Economists (A A A E). A A A E T h i r d Conference/AEASA 48th Conference,

- September 19-23, 2010, Cape Town, South Africa. <http://purl.umn.edu/95775>
- Oparinde A., Abdoulaye T., Manyong V., Birol E., Asare-Marfo D., Kulakow P. and Ilona P. (2016). A Technical Review of Modern Cassava Technology Adoption in Nigeria (1985–2013): Trends, Challenges, and Opportunities. HarvestPlus Working Paper.
- Osikabor B., Oladele I. O. and Ogunlade I. (2011). Worth assessment of information and their access points by small scale cassava farmers in Nigeria. *South African Journal of Agricultural Extension*, 39:2. Available: <http://www.scielo.org.za/scielo.php?script>
- Rehman, S. (2007). Adoption of improved technologies by the pig farmers of Aizawi district of Mizoram, India. *Livestock Research for Rural Development*, 19, Article #5. Retrieved from <http://www.Irrd.org/Irrd19/1/rahm19005.htm>
- Rezvanfar A., Eraktan G. and Olhan E. (2011). Determinant of factors associated with the adoption of organic agriculture among small farmers in Iran. *African Journal of Agricultural Research*, 6 (13), 2950, 2011.
- Root and Tuber Improvement Programme (RTIP) (2004). Cassava processing in Ghana: An information guide. Root and Tuber Improvement Programme, Ministry of Food and Agriculture. Ghana.
- Salum, A. K. (2016). Factors influencing adoption of improved cassava varieties in increasing farm yield. A Case of Magharibi District, Zanzibar, Tanzania. Dissertation for Award of MSc Degree at Sokoine University of Agriculture. Morogoro, Tanzania, 85pp.
- Wole-Alo F. I. Okunlola J. O. (2015). Utilization of modern cassava processing techniques among smallholder rural women processor in Ondo State, Nigeria. *Journal of Biology, Agriculture and Healthcare* 5 (12) 28-33.
- Wollni, M., Lee, D. R. and Thies, J. E. (2010). Conservation agriculture, organic marketing, and collective action in the Honduran hillsides. *Agricultural Economics*, 41(3-4), 373-384.
- Yekinni O. T., Adedeji A. R. and Hussain L. A. (2011). Contribution of cassava enterprises to household welfare in Ejigbo local government area of Osun State. *Nigerian Journal of Rural Sociology*. 12(1): 9-17. ISSN: 0189-7543. 12.

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