NIGERIAN AGRICULTURAL JOURNAL
ISSN: 0300-368X
Volume 53 Number 1, April 2022 Pg. 113-123
Available online at: http://www.ajol.info/index.php/naj
https://www.naj.asn.org.ng

Use of Agricultural Programmes' Technical Information on Adoption of Improved Technologies by Cassava Farmers in Ogun State, Nigeria

[1]*Adetarami, O., [2]Olagunju, O.O., [1]Adekola, A.O., [3]Johnson, S.B. and [1]Akintola, T.E.

[1]Department of Agricultural Extension and Rural Development,
College of Administration and Rural Development,
Federal University of Agriculture, Abeokuta, Ogun State, Nigeria
[2]Department of Agricultural Economics and Extension,
Faculty of Agriculture, Adekunle Ajasin University, P.M.B 001, Akugba-Akoko, Ondo State, Nigeria
[3]Department of Agricultural Extension and Management,
Rufus Giwa Polytechnic, Owo, Ondo State, Nigeria
*Corresponding Author's email: adetaramio@funaab.edu.ng

Abstract
The study on the use of agricultural programmes' technical information on adoption of improved technologies by cassava farmers was conducted in Ogun State. A two stage sampling procedure was used to select 205 respondents for the study. A well-structured questionnaire and interview guide were used to obtain primary data. The data were analyzed by descriptive (mean, frequency and percentage) and inferential (binary logistic regression and Spearman's rho) statistics. Based on agricultural programmes' technical information, 98.3% of respondents participated mainly in IFAD-assisted Cassava Multiplication Programme (ICMP). The improved technology utilized mainly was use of improved varieties of cassava stem for planting. The major effectiveness of agricultural programmes' technical information showed that respondents' cassava yields started increasing in quality and quantity with a mean value of $\overline{X}$ = 4.48. Also, the major factor affecting the respondents' poor adoption of improved cassava technologies was lack of sustainability from sponsors. Logistic regression showed that extension contact and monthly income at $p \leq 0.01$ with training experience at $p \leq 0.05$ were the major determinants that positively influenced the adoption of improved cassava technologies. Thus, Spearman's rho analysis showed that the relationship between the effectiveness of agricultural programmes' technical information and factors affecting adoption of improved cassava technologies was positive and significant ($r = 0.119$, $p = 0.000$) at $p \leq 0.05$. It was therefore recommended that those agricultural programmes' technical information that have high level of utilizations and gave high effectiveness should be developed and modeled for other cash and food crops in the study area.

Keywords**: Agricultural programmes, Cassava farmers, Improved technologies, Logistic regression, Technical information

Introduction

Cassava (*Manihot esculanta*) is a native of South America that is largely cultivated in the tropics for its starchy and tuberous roots, which are utilized as food (Osuafor *et al.*, 2020). Cassava's importance in the food and industrial sectors of the country (Nigeria) prompted the Federal Government and several State Governments to implement programmes and policies targeted at revamping the crop. Presidential Initiative on Cassava (PIC), Root and Tuber Expansion Programme (RTEP), Cassava Enterprise Development Project (CEDP), and Agricultural Transformation Agenda (ATA) are just a few of the policies and projects (Agricdemy, 2018). With an approximated 59 million tons of cassava production, Nigeria is the largest producer in West Africa, according to researchers. Nigeria's cassava production stands for 20.4% of the globe's total output since 2017 (Olutosin and Sawicka, 2019), Nigeria has become the world's largest producer of cassava as a result of this proportion. Besides some cassava varieties which are drought resistance and endurance on marginal soil, some of these cassava varieties can be kept in the ground for up to two years, making cassava a significant food security crop, particularly among farming dwellers who plant the crop on a small scale (Uchemba *et al.*, 2021). Cassava may be locally processed into several

types of food because to its long value chain, which has provided an alternative source of food, particularly among poor households during the peak of the Covid-19 pandemic, when food and life became extremely expensive. Cassava could be processed domestically in Nigeria as cassava flour, starch, chips, and other Nigerian delicacies such as *Gai* (*Eba*), *Akpu* (*Fufu*), and *Abacha*, among several others (Agricdemy, 2018). Considering Nigeria's prominence on the global map when it comes to cassava crop, cassava delicacies have become expensive in Nigeria as a result of the Covid-19 outbreak and escalating insecurity challenges, forcing many people to rely on alternate foods such as *Elibo* (cassava and maize flour). This shows that cassava output should be increased for both domestic and export markets (Uchemba *et al*., 2021). Agricultural programmes are projects or programmes that are specifically designed to address a specific issue in agriculture. It is a combination of coordinated agricultural practices that are all aimed at achieving specific cassava production targets like C:AVA (Cassava: Adding Value for Africa), IITA (International Institute of Tropical Agriculture), SASAKAWA, ACAI (Africa cassava agronomy initiative) and GAP (Good agricultural practices) (Ozoani, 2019).

Adoption of innovation is the final stage in a decision process to fully utilize an innovation after determining that it will have a favorable impact on the adopter's living. Intensification of better agricultural production systems is one method of boosting farmer welfare. This is possible if farmers use improved crop varieties such as cassava (Onyemma *et al*., 2020). Adoption of agricultural technologies, such as high-yielding varieties, could result in significant increases in agricultural productivity, accelerating the transition from low-productivity subsistence agriculture to a high-productivity agro-industrial economy (Onyemma *et al*. *ibid*). Policymakers must pay attention to studies on improved cassava production technologies and recommendations made in order to increase cassava production. There have been a few studies in this area, but the researchers' recommendations do not appear to have been effectively implemented. Disturbing, Nsoanya and Nenna (2011) reported that farmers continue to ignore the timing and method of fertilizer application, as well as the prescribed use of herbicides and insecticides. There is a necessity to increase the adoption of agricultural technology related to increasing cassava yield, which include; improved varieties, fertilizer application, planting time, intercropping, and the use of pesticides and herbicides, among other things (Ajieh, 2014). According to Lambrecht *et al*. (2014), the presence of agricultural programmes' technical information influences the adoption of any agricultural technology. The characteristics of this technical information may have influence on the effectiveness of improved technologies. Aker (2011) reported a significant relationship between adoption of improved technologies and effectiveness of agricultural programmes' technical information. Ajala (2010) noted that only when improved technologies are effective and widely adopted by farmers can high production be achieved. Statistics show that, despite the introduction of improved technologies, cassava yields have not increased significantly over the years (CBN, 2006), in addition to reported decreases in cultivated acreage (NBS, 2008). Could it be due to the interplay or inadequate influence of agricultural programmes' technical information on improved technologies? It is in view of the foregoing that this study was carried out to investigate the use of agricultural programmes' technical information on adoption of improved technologies by cassava farmers in the study area.

Cassava farmers in Ogun State are using old technologies and processes to cultivate cassava, indicating that they lack technical expertise on how to adopt upgraded technology and use new agricultural methods to attain high productivity. Cassava growers in Ogun State are in need of agricultural programmes' technical expertise, and methodologies and technologies for cassava production and processing (Balderama, 2009; Olaniyi and Adewale, 2014). The aim of this research was to identify the use of agricultural programmes' technical information in adoption of improved technologies by cassava farmers in Ogun State. The study also specifically identified cassava farmers' participation in types of agricultural programmes' technical information in the study area, found out respondents' utilization of adopted improved technologies of cassava production, determined the effectiveness of agricultural programmes' technical information on improved technologies by cassava farmers and examined the factor affecting respondents' adoption of improved technologies through agricultural programmes' technical information in the study area.

Hypotheses of the study

The study's hypotheses were stated in null form;

$\mathbf{H_{01:}}$ There is no significant relationship between the respondents' socio economic characteristics and factor affecting respondents' adoption of improved cassava technologies through agricultural programmes' technical information in the study area.

$\mathbf{H_{02:}}$ There is no significant relationship between the effectiveness of agricultural programmes' technical information on improved technologies by cassava farmers and factors responsible for the poor adoption of improved cassava technologies informed by agricultural progammes in the study area.

Materials and Methods

The study area

The research was carried out in Ogun State, Nigeria's southwestern area. It's a tropical rainforest zone with a land mass of 16,406,226 km^2 with latitudes of 70 01′ and 70 18′, longitudes of 20 45′ and 30 55′. The annual rainfall ranges from 1000 to 2599 millimeters. The 2006 Census projected the population of Ogun State to be 3,728,098 people (Britannica, 2022). The main source of income for the inhabitants in the study region is farming. Their main agricultural products include arable crops such as cassava, maize, and rice (Britannica,

2022). Ogun State is one of the leading cassava producing region in Nigeria and has benefitted from some cassava production interventions, such as the IFAD-assisted Cassava Multiplication Program (ICMP), Cassava: Adding Value for Africa (C:AVA) and Presidential Initiative on Cassava by Federal Government of Nigeria (Phillips *et al*., 2004; Odunaya, 2012). These interventions provided trainings for cassava farmers on improved agricultural technologies that enhance cassava production across the four agricultural zones.

Sampling techniques and sample size

Population of the study and sample frame

The population of this study comprises of all cassava farmers in Ogun State.

Sampling techniques and sample size

Two stage sampling procedure was used. Firstly purposive sampling was used to draw five Local Government Areas (LGAs) from the 20 LGAs that make up Ogun State. These are, Yewa South, Ipokia, Obafemi Owode, Odeda and Sagamu because C:AVA (Cassava: Adding Value for Africa), GAP (Good Agricultural Practices), ICMP (IFAD-assisted Cassava Multiplication Programme), ACAI (Africa Cassava Agronomy Initiative) and SASAKAWA agricultural programmes were fully established in these areas. Secondly, simple random sampling was used to draw 60 cassava farmers from Yewa, 50 from Ipokia, 40 from Obafemi Owode, 30 from Odeda, 25 from Sagamu, according to the number of those who participated in the agricultural programmes and lists of participation obtained from Ogun State Agricultural Development Projects (OGADEP)' headquarters to get a total of 205 respondents.

Data collection technique and instrument for data collection

Primary data was used for the study; a structured questionnaire and interview guide were used to obtain relevant information from the respondents (cassava farmers).

Description, measurement of variables and a priori signs

Socio-economic characteristics of the respondents

Age: Age of the respondents was measured in actual years (-),

Sex: measured at a nominal level as male (1) and Female (2),

Marital status: measured at a nominal level as: single (1), and married (2),

Educational level: measured as number of years spent schooling (+),

Religion: measured at nominal level as Christianity (1) Islam (2) and Traditional (3),

Farm size: based on farmland under cassava cultivation measured in hectare [Ha] (+),

Household size: measured as number of persons living under the same roof (+),

Extension contact: measured based on access to general agricultural extension services; Yes= 1, Otherwise = 0 (+),

Annual income: measured as net sales of cassava products realized annually in naira [₦] (+) and

Training experience: Training received from various agricultural interventions for years) (±).

Farmers' participation in various agricultural programmes in the study area: measured at nominal level as Yes (1) and No (2) on five (5) agricultural programmes.

Respondents' utilization of agricultural programmes' technical information on cassava production: measured at nominal level as Yes (1) and No (2) on eleven (11) technical information statements.

Respondents' utilization of adopted improved technologies on cassava production: measured at nominal level as Yes (1) and No (2) on ten (10) improved technological statements.

Effectiveness of agricultural programmes' technical information on improved technologies by cassava farmers: measured at ordinal level using 5-likert type scale such as; Strongly Effective (5), Effective (4), Moderately Effective (3), Less effective (2) and Not effective (1) on eight (8) variables.

Factors responsible for the poor adoption of improved cassava technologies informed by agricultural progammes: measured at ordinal level of 5-likert type scale such as; Strongly affected (5), Affected (4), Moderately affected (3) Less affected (2) Not affected (1) on ten (10) factors.

Data analyses technique

Descriptive statistics such as frequency distribution, mean and standard deviation were used to describe the independent variables, while, inferential statistics such as binary logistic regression was used to test Ho_1 and Speraman's rho analysis was used for Ho_2.

Results and Discussion

Socio economic characteristics of respondents

The results in Table 1 showed that 44.4% of the cassava farmers were between the ages of 21-40, with the mean age of 37.9 years. This indicates that many of them were within productive age range. Tosho (2004) reported that young farmers have higher aspiration to accept new technologies than conservative older farmers that always seem satisfied with their traditional methods. Also, the findings revealed that majority (73.2%) of the respondents were male. This was expected due to the involvement of women in other activities like processing and marketing. This is supported by the findings of Ajani and Onwubuya (2013), who stated that cassava farming is a male-dominated activity, due to the physical energy required. Thus, 86.8% of them were married with a mean household size of 7 people. They might employ family labour in cassava production processes as this may cut production costs and boost income in home. About 84.9% of cassava farmers were formally educated having a mean value of 2.5 years in cassava training experience, and there is likelihood to understand technical information contents, use new improved technologies and strategies that can boost

their cassava production. However, 45.7% had their farm size between 1-5 hectares with mean of 2.58 hectares, which implies that some of the respondents are mainly of medium-scale category. The result supported the findings of Okoruwa *et al*. (2020), who considered cassava farmers with 1-5 hectares as medium scale production. Thus, over 52.7% did not have access to general agricultural extension services in the study area. and this might likely limit the extent in which agricultural technical' information about improved technologies are being disseminated to potential cassava producers. Moreover, the results indicated that a significant proportion (38.5%) of respondents with mean annual income of ₦252,264 were within the range of ₦200,001 – ₦300,000 realized annually. This is an indication that cassava production is a profitable enterprise in the study area hence, farmers can use the income generated to acquire improved technologies that are costly in cassava production.

Participation of respondents in various agricultural programmes

Results in Table 2 showed various agricultural programmes that respondents have participated in the study area to receive technical information about improved technologies. The findings revealed that majority (98.5%) of the cassava farmers participated in ICMP (IFAD-assisted Cassava Multiplication Program), followed by 97.6% that participated in GAP (Good Agricultural Practices). The higher participations in ICMP and GAP programmes could be as a result of counterpart sponsors (Ogun State Government, Federal Ministry of Agriculture and Rural Development, German International Cooperation and European Union) that usually finance these agricultural programmes to carry out their activities and often modifying the programmes to suit farmers' purposes. The results further revealed that there were low participation in C:AVA II (57.6%) and SASAKAWA (25.9%). The low participation in these programmes might be associated with inadequate funds from the counterpart sponsors, as it would become a difficult task for these programmes to carry out their activities.

Respondent's utilization of agricultural programmes' technical information in cassava production

The rate of utilization of various agricultural programmes's technical information was determined by providing a list of various technical information and the cassava farmers were asked to indicate whether they utilized them or not. The results in Table 3 revealed that all the respondents (100%) utilized C:AVA programme's technical information that have to do with developed value chains for high quality Cassava flour (HQCF), with this, cassava farmers are now growing improved varieties in the study area like N-R 8082 and TME-419 with higher starch content and less fibre after participation. This serves as consistent supply of raw materials driving market demand and building market share for bakery industries, components of traditional foods or plywood/paperboard applications, confirmed by Odunaya (2012). About 47.7% and 27% of the respondents for ICMP and SASAKAWA respectively, utilized technical information on intercropping cassava as main crop, while, legumes and cereals as a component crops. This implies that the yield of planted cassava and cereal would be high, while, the legume would boost soil fertility and serve as a cover crop. The results also showed that all the respondents (100%) utilized SASAKAWA programme's technical information on cassava and maize should be planted at the same day, follow with thinning of maize to one seed per stand at two weeks after planting if necessary, and application of NPK 15:15:15 fertilizer at one bottle cap per stand beside the maize same day and spray herbicides (primextra) same day. Thus, application of two bottle cap doses of Urea fertilizer would be done first three weeks after planting and secondly, five weeks after planting at distance of five centimeters from maize (Sasakawa Africa Association, 2010). Furthermore, all the respondents (100%) utilized technical information of ACAI's cassava agronomy advice tool (AKILIMO) to provide site-specific recommendations for fertilizer application, intercropping, scheduled planting to produce high starch content, and weed control using the best agronomic practices. The results also indicated that some respondents (29.3%) utilized ICMP' technical information associated with right selection of improved cassava cuttings with good agronomic traits such as disease resistance, insect resistance, drought and stress tolerance, high yield, and high response to improved cultural practices. Moreover, 29.8% respondents utilized technical information of ICMP on benefits of good soil fertility management and effective land preparation. However, 25.8% of the respondent's also utilized timely date of planting within the season and optimum planting rate disseminated by ICMP. In addition, the results showed that 26.4% and 29.3% of the respondents utilized GAP' technical information on promotion of pest and disease control and effective utilization of fertilizers respectively. Nonetheless, 29.8% and 25.8% of the cassava farmers utilized ICMP' technical information on use of organic manure sources and practice of intercropping and crop rotation respectively; which offers a diversity of organic sources. The rate of use of one agricultural programme's technical information or the other would influence the level of adoption of improved cassava technologies in the study area.

Respondent's utilization of adopted improved technologies through agricultural programmes' technical information in cassava production

The results conducted on Table 4 showed that all (100%) of the cassava farmers utilized improved varieties of cassava stems during planting season, which they mainly adopted after receiving different agricultural programmes's technical information. This implies that they would have increased yield in terms of cassava production. This corroborates the findings of Afolami *et al.* (2015) who reported that the adoption of improved varieties of cassava would increase cassava farmers' yields. Thus, 92.2% utilized inter cropping with other arable crops. This signifies that the respondents would

utilize maximally the farm land put into cassava cultivation with the aid of fertilizer application as a means of diversification to increase their income. Moreover, 90.2% utilized modern cassava processing facilities to process cassava roots into different products. These findings corroborate the report of Yahaya and Olajide (2006), which claimed that cassava farmers in Nigeria had high level of utilization when it comes to improved technologies.

However, small proportion of the respondents (36.6% and 38.0%) utilized cover crops and ploughing and ridging respectively as improved technologies adopted through agricultural programmes's technical information in cassava production.

Effectiveness of agricultural programmes' technical information on improved technologies by cassava farmers

Results in Table 5 revealed the reactions of cassava farmers to a set of perceived effectiveness of agricultural programmes's technical information on improved technologies on a five-point Likert type scale. The grand mean is 4.09, therefore, the mean value equal to or greater than the grand mean is considered "high effectiveness of technical information" and otherwise is considered "low effectiveness of technical information". Technical information that were considered with high effectiveness were; cassava farmers ($\overline{X}$ = 4.48) yields had increased in quantity and quality as a result of different agricultural programmes's technical information received. This supports the findings of Abass *et al*. (2014), that technical information received on improved technologies like improved varieties of cassava stems, spacing, fertilizer application, weeding, insecticide application, ploughing and ridging, modern harvesting and processing had increased the yields of cassava farmers in quantity and quality. The results further revealed that the income of cassava farmers ($\overline{X}$ = 4.25) had increased due to the effectiveness of agricultural programmes' technical information on them. This implies the respondents would be able to take good care of their homes, manage their cassava farms in terms of purchasing inputs, and save money for labour and other activities ready for cassava production at the right time and even seize opportunities to diversify farm enterprise apart from cassava for more income. Also, effectiveness of technical information on adopting and utilizing improved cassava technologies has brought ease of technical knowledge ($\overline{X}$ = 4.11). This signifies that the respondents could now easily operate new cassava tools and implements, learn and interpret relevant information needed in cassava production and processing. Also, technical information that was considered with low effectiveness was; perspective of the respondents ($\overline{X}$ = 3.85) on the technical information. Based on this result, some of the respondents considered cassava production as mere crop that could be useful for home consumptions only and that did not bother about cassava economic importance. Also, the results showed that the agricultural programmes's technical information have low effectiveness on standard of living of cassava farmers ($\overline{X}$ = 3.91). This implies that apart from increase in income and ease of technical knowledge they have acquired, they still lacked behind in the level of material comfort enjoyed. Moreover, the results also revealed that the agricultural programmes's technical information have low effectiveness on ease access to labour ($\overline{X}$ = 3.93). This could imply that the respondents have not fully known the right number and source of labour needed for their farm size under cultivation and to every cassava processing and this could increase their cost of labour.

Factors responsible for the poor adoption of improved cassava technologies informed by agricultural progammes

There are some factors affecting respondents either to continue or discontinue the adoption of cassava technologies. The results in Table 6 showed the grand mean to be ($\overline{X}$ = = 3.92). The mean value equal to or greater than the grand mean is considered "highly affecting factor" and otherwise is considered "low affecting factor". Those factors that were considered highly affecting were; lack of sustainability from the sponsors ($\overline{X}$ = 4.88). Some of the five identified agricultural programme agencies (C:AVA, GAP, ICMP, ACAI and SASAKAWA) that were into partnerships with Ogun State government have stopped funding many agricultural activities in the State. Therefore, follow up visits or post training activities for the respondents, subsidized inputs, soft loans and grant supports have stopped or reduced. In addition, the results further revealed high cost of labour ($\overline{X}$ = 4.64) as highly affecting factor. This indicates that some of the respondents would not be able to perform all required good agricultural practices ranging from land clearing to harvesting and processing involving high tasking activities. However, lack of fund ($\overline{X}$ = 4.63), market structure ($\overline{X}$ = 4.52) that resulted from the exploitation of cassava product middlemen and scarcity of inputs ($\overline{X}$= 4.44) were other highly affecting factors hindering the respondents either to continue or discontinue the use of adopted cassava technologies. On the other way round, those factors that were considered lowly affecting were; illiteracy ($\overline{X}$ = 2.80), uncertainty and risk associated with cassava production ($\overline{X}$ = 3.20), lack of interest from the farmers with conservative mind of either to adopt cassava technologies or not ($\overline{X}$ = 3.31), and lack of crude implements ($\overline{X}$ = = 4.44).

Logistic regression showing relationship between respondents' socio economic characteristics and factors affecting adoption of improved cassava technologies

Results in Table 7 show the parameter and odds ratio estimates from binary logit model. The F-statistics with a value of 78.61 at $p < 0.01$ shows the goodness of fit of the model on respondents' socio economic factors affecting the adoption of improved cassava technologies. To further confirm the suitability of using logit model in this study, the log likelihood statistics of 153.09 estimated, indicating the robustness of the model was statistically significant ($p < 0.01$) and the

Hosmer and Lemeshow test (Chi-square) for the model with a value of 121.14 was also significant because the p-value is less than 5% probability level. Interpretation of findings in this study is based on their odds ratio since coefficient of logit model cannot be interpreted directly (Gujarati, 2003). The logit result showed that there was a negative and significant (p<0 .01) relationship between the education of cassava farmers and the adoption of improved cassava technologies. Education promotes adoption of innovation. This result is not consistent with stated *a priori* expectation, this implies that the negative coefficient means that with an addition of education to cassava farmers, the farmers will be less likely to adopt improved cassava technologies or education would reduce the probability of adopting cassava improved technologies. Extension service has a positive and significant (p < 0 .01) relationship with adoption of improved cassava technologies. This finding reflects the dependability of farmers on agricultural extension workers on information that are related to increase cassava production. A unit increase in cassava technical information to the farmers by the extension worker, farmers would be more likely to adopt improved cassava technologies. The odds ratio for adopting improved cassava technologies by cassava farmers will increase by 1.68 times than non-visited farmers in the study area. The logit result showed that farm size cultivated has a negative and significant (p < 0.05) relationship with adoption of improved cassava technologies. The negative sign for this variable is not theoretically and consistently agreed with the study *a priori* expectation. Therefore, the negative sign implies that an addition in farm size of cassava farmers decreases the likelihood of adopting improved cassava technologies. Monthly income was significant (p < 0 .01) and has positive relationship with adoption of improved cassava technologies. The result here agrees with *a priori* expectation that the higher the income of a farmer the higher the adoption of improved cassava technologies. This agrees with the findings of Anang *et al*. (2020) who confirmed that the increase in income of the cassava farmers has effect on adoption of improved technologies. The probability of adopting improved cassava technologies increased by 64 % compared to the odds of a non-adopter of the technologies. Training experience was significant (p < 0.05) and has positive relationship with adoption of improved cassava technologies. This shows that the higher the training experiences of the cassava farmers, the higher the adoption of improved cassava technologies. This supports the findings of Mondo *et al*. (2019) who reported that training experience in cassava farming promotes the adoption of improved technologies. The probability of adopting improved cassava technologies increased by 57 % compared to the odds of a non-adopter of the technologies.

Relationship between the effectiveness of agricultural programmes's technical information on improved technologies and factors responsible for the poor adoption of improved cassava technologies informed by agricultural progammes

From the analysis in Table 8, it is evident that spearman's rho is positive (r = 0.119, p = 0.000) at p ≤ 0.05 which implies that, there was a significant positive relationship between the effectiveness of agricultural programmes's technical information and factors affecting the adoption of improved cassava technologies. Therefore, the null was rejected.

Conclusion

The study shows that majority of the respondents did not have access to general agricultural extension services in the study area and this would limit the extent to which improved cassava technologies are being disseminated to them. Moreover, the findings revealed that the majority of the cassava farmers participated mainly in ICMP (IFAD-assisted Cassava Multiplication Program) and GAP (Good Agricultural Practices) because their counterpart sponsors financed these agricultural programmes. All the respondents utilized developed value chains for high quality cassava flour (HQCF), promoting higher-yielding technologies (cassava and maize are planted on the same day) and use of cassava agronomy advice tool (AKILIMO) as their major technical information in the study area. Improved varieties of cassava stems and inter cropping farming system were the major improved technologies adopted by the cassava farmer. Effectiveness of technical information on adoption and utilization of improved cassava technologies had increased in quantity and quality of cassava farmers' yields and also their income. The major factors responsible for the poor adoption of improved cassava technologies informed by agricultural progammes were lack of sustainability from sponsors and high cost of labour. Extension contact, monthly income and training experience were the major determinants that positively influenced the adoption of improved cassava technologies. The results therefore call for policies aimed at development of agricultural programmes that have high technical information and gave high effectiveness for other cash and food crops. There should be sustainability of adapted agricultural programmes in this study area by government, non-governmental organizations and other agricultural agencies that could come up with policies that would assist cassava farmers with adequate empowerment. Extension agents should sit up to their responsibilities of disseminating recent cassava technical information to the end users (farmers) and motivate them to adopt more improved cassava technologies. Government should give incentives, grants and soft loans to cassava farmers and subsidies pesticides in other to boost their cassava production.

Acknowledgements

This study acknowledges Ogun State Agricultural Development Project (OGADEP), Nigeria for providing physical resources for information gathering.

Table 1: Socio-economic characteristics of the cassava farmers (n=205)

Characteristics	Frequency	Percentage	Mean	SD
Age (years)				
Less than 20	10	4.9		
20-40	91	44.4	37.9	0.75
41-60	82	40.0		
60 and above	22	10.7		
Sex				
Male	150	73.2		
Female	55	26.8		
Marital status				
Single	27	13.2		
Married	178	86.8		
Household size				
1-5	15	7.3		
6-10	126	61.5	7	0.58
11-15	36	17.6		
Above 15	28	13.6		
Educational level				
No formal education	31	15.1		
Primary education	68	33.2		
Secondary education	68	33.2		
Tertiary education	38	18.5		
Farm size (ha)				
<1	76	37.4		
1-5	94	45.7	2.58	0.60
6-10	26	12.5		
Above 10	9	4.4		
General extension services				
Access	97	47.3		
No Access	108	52.7		
Annual income ₦				
≤ 100.000	47	22.9		
100,001 – 200,000	45	22.0	252,264.32	
200,001 – 300,000	79	38.5		
300,001 – 400,000	24	11.7		
4000,001 – 500,000	8	3.9		
Above 500,000	2	1.0		
Training experience in years				
≤ 1	26	12.7		
1-2	51	24.9	2.5	0.21
> 2	128	62.4		

Source: Field survey, 2021. SD= Standard deviation

Table 2: Respondent's participation in various agricultural programmes (n= 205)

Agricultural programmes (Participation)	Frequency **	Percentage
ACAI	138	67.5
SASAKAWA	53	25.9
C:AVA II	118	57.6
GAP	200	97.6
ICMP	202	98.5

Source: Field survey, 2021. ** Represents multiple responses

Table 3: Respondent's utilization of agricultural programmes's technical information in cassava production (n = 205)

Technical Information	CAVA Freq** (%)	ICMP Freq** (%)	SASAKAWA Freq** (%)	ACAI Freq** (%)	GAP Freq**(%)
Developed value chains for High Quality Cassava flour (HQCF).	205 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Intercropping cassava as main crop while, legumes and cereals as a component crops.	5 (2.4)	96 (47.7)	57 (27.0)	40 (19.5)	7 (3.4)
Promoting higher-yielding technologies (cassava and maize are planted on the same day).	0 (0.0)	0 (0.0)	205 (100.0)	0(0.0)	0 (0.0)
Usage of cassava agronomy advice tool (AKILIMO) to provide site-specific recommendations	0 (0.0)	0 (0.0)	0 (0.0)	205 (100.0)	0 (0.0)
Selection of improved cuttings with good agronomic traits	37 (18.0)	60 (29.3)	13 (6.3)	43 (21.0)	52 (25.4)
Benefits of good soil fertility management and effective land preparation.	32 (15.6)	61 (29.8)	33 (16.1)	30 (14.6)	49 (23.9)
Ensure timely date of planting within the season & optimum planting rate.	38 (18.5)	53 (25.8)	19 (9.3)	45 (22.0)	50 (24.4)
Promotion of pest and disease control.	30 (14.6)	51 (24.9)	32 (15.6)	38 (18.5)	54 (26.4)
Effective and efficient utilization of fertilizers, application rates.	25 (12.2)	59 (28.8)	20 (9.8)	41 (20.0)	60 (29.3)
Usage organic sources of manure.	32 (15.6)	61 (29.8)	33 (16.1)	30 (14.6)	49 (23.9)
Practice of intercropping & crop rotation which offers a diversity of organic sources of manure.	38 (18.5)	53 (25.8)	19 (9.3)	45 (22.0)	50 (24.4)

Source: Field survey, 2021. ** Represents multiple responses

Table 4: Respondent's utilization of adopted improved technologies through agricultural programmes's technical information in cassava production (n=205)

Improved technologies (Utilization)	Frequency**	Percentage
1. Ploughing and ridging before planting.	78	38.0
2. Usage of improved varieties of cassava stem for planting	205	100
3. Usage of chemical fertilizer to improve soil nutrients	135	65.9
4. Usage of herbicides to control weeds	180	87.8
5. Usage of pesticides to control pest and diseases	124	60.5
6. Usage of cover crops	75	36.6
7. Usage of inter cropping farming system	189	92.2
8. Usage of mechanized farming	98	47.8
9. Usage of modern processing facilities	185	90.2
10. Usage of farmers' cooperative	172	83.9

Source: Field survey, 2021. ** Represents multiple responses

Table 5: Effectiveness of agricultural programmes's technical information on improved technologies by cassava farmers (n= 205)

S/no	Effectiveness	SE Freq %	E Freq %	ME Freq %	LE Freq %	NE Freq %	Mean $\bar{}$	Rank
1.1.	Cassava yield (quantity and quality)	104(50.7%)	96(46.8%)	3(1.5%)	2(1.0%)	0(0.0%)	4.48	1st
2.2.	Income	58(28.3%)	140(68.3%)	7(3.4%)	0(0.0%)	0(0.0%)	4.25	2nd
3.3.	Technical knowledge	55(26.8%)	118(57.6%)	32(15.6%)	0(0.0%)	0(0.0%)	4.11	3rd
4.4.	Latest information	57(27.8%)	114(55.6%)	34(16.6%)	0(0.0%)	0(0.0%)	4.11	3rd
5.5.	Provision of implements	36(17.6%)	146(71.2%)	21(10.2%)	2(1.0%)	0(0.0%)	4.08	5th
6.6.	Ease access to labour	31(15.1%)	132(64.4%)	41(20.0%)	1(0.5%)	0(0.0%)	3.93	6th
7.7.	Standard of living	39(19.0%)	112(54.6%)	51(24.9%)	3(1.5%)	0(0.0%)	3.91	7th
8.8.	Perspective	32(15.6%)	113(55.1%)	56(27.3%)	4(2.0%)	0(0.0%)	3.85	8th

Source: Field survey, 2021. Grand mean = 4.09

Note: SE=Strongly Effective, E= Effective, ME=Moderately Effective, LE=Less Effective and NE= Not Effective

Table 6: Factors responsible for the poor adoption of improved cassava technologies informed by agricultural progammes (n= 205)

SN	Factors	SA Freq %	A Freq %	MA Freq %	LA Freq %	NA Freq %	Mean $\bar{}$	Rank
1.	Lack of sustainability from the sponsor	107(89.2%)	12(10.0%)	0(0.0%)	1(0.8%)	0(0.0%)	4.88	1st
2.	High cost of Labour	81(67.5%)	36(30.0%)	2(1.7%)	1(0.8%)	0(0.0%)	4.64	2nd
3.	Lack of fund	78(65.0%)	40(33.%3)	2(1.7%)	0(0.0%)	0(0.0%)	4.63	3rd
4.	Market structure	66(55.0%)	52(43.3%)	0(0.0%)	2(1.7%)	0(0.0%)	4.52	4th
5.	Scarcity of inputs	57(47.5%)	61(50.8%)	0(0.0%)	2(1.7%)	0(0.0%)	4.44	5th
6.	Inadequate awareness of programme	19(15.8%)	50(41.7%)	28(23.3%)	13(10.8%)	10(8.35)	3.46	6th
7.	Crude implements	7(5.8%)	44(36.7%)	54(45.0%)	12(10.0%)	3(2.5%)	3.33	7th
8.	Lack of interest from the farmers (conservative mind)	20(16.7%)	39(32.5%)	32(26.7%)	16(13.3%)	13(10.0%)	3.31	8th
9.	Uncertainty and risk associated with cassava production	5(4.2%)	42(35.0%)	48(40.0%)	22(18.3%)	3(2.5%)	3.20	9th
10.	Illiteracy	8(6.7%)	38(31.7%)	23(19.2%)	24(20.0%)	27(22.5%)	2.80	10th

Source: Field survey, 2021. Grand mean = 3.92
SA = Strongly affected, A = Affected, MA = Moderately affected, LA = Less affected, NA = Not affected.

Table 7: Results showing the odds estimate of the parameters from the logit regression model of factors affecting the adoption of improved cassava technologies.

Variable	( )Coeff.	Z(Wald)	Sig.	Exp( )
Constant	0.45	4.71***	0.002	1.56
Age of respondent	0.67	3.21	0.073	0.51
Level of education	-0.39	-3.71***	0.002	0.90
Household size	0.41	0.91	0.340	1.50
Extension contact	0.40	5.69***	0.000	1.68
Farm size	-0.43	-2.82**	0.036	0.65
Monthly income	0.15	4.37***	0.000	1.64
Training experience	0.92	2.75**	0.013	1.57
Model fit summary				
F-statistics	78.61***			
'% Correct classification	86.0			
McFadden' s Pseudo R^2	0.860			

FBS: -2Log likelihood: ^{2}= 153.088, Hosmer and Lemeshow test (Chi-square): = ^{2} = 121.143**. P = 0.001, ***, **, * Sig. at 1%, 5% and 10%, respectively. Source: Author's own estimation (2021)***

Table 7: Spearman's rho analysis showing the relationship between the effectiveness of agricultural programmes's technical information and factors responsible for the poor adoption of improved cassava technologies informed by agricultural progammes.

Variable	Spearman's rho correlation r-value	p-value	Decision
Factors responsible for the poor adoption of improved cassava technologies informed by agricultural progammes & effectiveness of the agricultural programmes' technical information	0.119	0.000**	Significant

***** P ≤ 0.05***

References

Abass, A., Towo, E., Mukuka, I., Okechukwu, R., Ranaivoson, R., Tarawali, G. and Kanju, E. (2014). *Growing cassava: a training manual from production to postharvest.*

Afolami, C. A., Obayelu, A. E. and Vaughan, I. I. (2015). Welfare impact of adoption of improved cassava varieties by rural households in South Western Nigeria. *Agricultural and Food Economics*, *3*(1): 1-17.

African Plant Nutrition Institute (APNI). (2019). *New Agronomic Advice Tool "AKILIMO" is Showing High Returns for Cassava Farmers*. Published by The African Plant Nutrition Institute (APNI) - research and education organization founded, Benguérir, Morocco.

Agricdemy (2018). *Cassava processing in Nigeria*. Accessed 17 February 2022 from https://agricdemy.com/post/cassavaprocessing-nigeria

Ajala, A. O. (2010). Evaluation of effectiveness of improved cassava production technologies in Osun State, Nigeria. Unpublished Ph.D Thesis, Department of Agricultural Extension and Rural Development, Obafemi Awolowo University, Ile-Ife. 267pp.

Ajani, E. N. and Onwubuya, E. A. (2013). Analysis of use of improved cassava production technologies among farmers in Anambra state, Nigeria. *Journal of Agricultural Research*, 2(12): 035 - 341.

Ajieh, P. C. (2014). Adoption of improved cassava production and processing technologies in Oshimili North Local Government Area of Delta State, Nigeria. Indian Research *Journal of Extension Education,* 14 (1): 21-30.

Aker, J. C. (2011). Dial "A" for agriculture: a review of information and communication technologies for agricultural extension in developing countries. *Agricultural Economics*, *42*(6):631-647.

Anang, B. T., Bäckman, S. and Sipiläinen, T. (2020). Adoption and income effects of agricultural extension in northern Ghana. *Scientific African*, *7*: e00219.

Balderama, O. F. (2009). The open academic of Philippine agriculture: Enhancing extension services to the farmers in Northern Philippines through ICTs. In: *Proceeding of World Congress of Computers in Agriculture and Natural Resources.* Reno, NV, USA. 22nd -24th June, 2009, Pp 423-429.

Britannica. (2022). *The Editors of Encyclopaedia. "Ogun"*. Encyclopedia Britannica, Invalid Date, https://www.britannica.com/place/Ogun-state-Nigeria. Accessed 17 February 2022.

CBN (2006). Central Bank of Nigeria. Annual Report and Statement of Accounts. Pp 22-23.

Ehinmowo, O. O. and Fatuase, A.I. (2016). Adoption of improved cassava processing technologies by women entrepreneur in South – West, Nigeria. *World Journal of Agricultural Research*, 4 (4): 109-113.

German International Cooperation (GIZ) (2017). *Doing good business with quality Cassava Producer's reference training notebook- Southern Nigeria*. Published by GIZ, 2017. Pp.5.

Gujarati, D. N. 2003. *Basic of econometrics fourth edition*. Published by McGraw Hill/Irwin International, Upper Saddle River, New Jersey.

International Institute for Tropical Agriculture (IITA) (2011). International Institute for Tropical Agriculture Ibadan, *Annual Report*.

Lambrecht, I., Vanlauwe, B., Merckx, R. and Maertens, M. (2014). Understanding the process of agricultural technology adoption: mineral fertilizer in eastern DR Congo. *World development*, *59*:132-146.

Mondo, J. M., Irenge, A. B., Ayagirwe, R. B., Dontsop-Nguezet, P. M., Karume, K., Njukwe, E. and Mushagalusa, G. N. (2019). Determinants of adoption and farmers' preferences for cassava varieties in Kabare Territory, Eastern Democratic Republic of Congo. *American Journal of Rural Development*, 7(2): 44-52.

National Bureau of Statistics (NBS) (2008). *Annual Abstract of Statistics.* Pp. 281 – 299.

National Root Crops Research Institute (NRCRI) (2006). National Root Crop Research Institute Umudike. *Annual Report*.

Nsoanya, L. N. and Nenna, M. G. (2011). Adoption of improved cassava production technologies in Anambra – East local government area of Anambra State, Nigeria. *Journal of Research in National Development*, 9 (2): 1596-8308.

Odunaya, A. A. (2012). *Contribution of the "Cassava: Adding Value for Africa" (C:AVA) Project to Income generation in Nigeria*: The case Cassava farmers and Processors in Ewekoro Area of Ogun State. A research project submitted to Larenstein University of Applied Sciences In Partial Fulfillment of the Requirements for the Degree of Master of Development, with Specialization in; Rural Development and Food Security. Wageningen, The Netherlands. Pp 1-49.

Okoruwa, V. O., Abass, A. B., Akin-Olagunju, O. A. and Akinola, N. A. (2020). Does institution type affect access to finance for cassava actors in Nigeria?. *Journal of Agriculture and Food Research*, *2*:100023.

Olaniyi, O.A and Adewale, J.G. (2014). Women farmers' perception and utilization of marketing information on cassava in Ogun State, Nigeria. *Journal of Agricultural Extension*. 18 (1): 25-37.

Olutosin, A. O. and Sawicka, B. (2019). Cassava, a 21st Century Staple Crop: How can Nigeria harness its enormous trade potentials? *Acta Agriculturae Slovenica*. 3 (8): 194-202.

Onyemauwa, C.S. (2010) Analysis of household consumption of cassava products in Ohaozara, Ebonyi State, Southeast Nigeria. *Res. J. Agric.,* 2(6): 1-6

Onyemma, J. O, Onyemauwa, N.C, Chioma, U. Q. and Nwafor, S.C. (2020). Determinants of adoption of improved cassava technologies among farmers in Benue State, Nigeria. *Archives of Current*

Research International, 20(8): 10-22.

Osuafor, O. O, Obianefo, C. A. and Dike, A.B. (2020). Food security and poverty status of cassava processors in Awka North Local Government Area of Anambra State, Nigeria. *The Bangladesh Journal of Agricultural Economics*, 41 (1): 1-16.

Ozoani, S.E. (2019). Appraisal of agricultural programmes in nigeria. *International Journal of Innovative Agriculture & Biology Research,* 7(1):86-94.

Phillips, T. P., Taylor, D. S., Sanni, L. and Akoroda, M. O. (2004). *The global cassava development strategy. A cassava industrial revolution in Nigeria, The potential for a new industrial crop*. International Fund for Agricultural Development & Food and Agriculture Organization of the United Nations, Rome, 200pp.

Sasakawa Africa Association (SSA). (2010). *Crop productivity enhancement: concepts and procedures*. Sasakawa Africa Association, Addis Ababa, Ethiopia.

Tosho, B. A. (2004). *Economics of tomato based cropping systems under small scale irrigation in Sokoto State, Nigeria*. Unpublished M.Sc. thesis Department of Agricultural Economics and Farm Management, University of Ilorin, Nigeria. Pp. 30- 31.

Uchemba, V.U, Nenna, G. M. and Obianefo, A. C. (2021). Adoption of improved cassava production technologies among small-scale farmers in Anambra State, Nigeria. *Journal of Plant Sciences*, 9(4): 119-127.

Yahaya, M. K. and Olayide, R. B. (2006). Perceived efficiency of indigenous media in agricultural information dissemination in Ihila Local Government Area of Anambra State. *Nigeria Journal of Rural Sociology*, 5 (1-2): 30 – 36.