FUDMA Journal of Agriculture and Agricultural Technology
ISSN: 2504-9496
Vol. 8 No. 1, June 2022: Pp.177-188

https://doi.org/10.33003/jaat.2022.0801.082

FACTORS INFLUENCING ADOPTION OF IMPROVED CASSAVA- GARRI PROCESSING TECHNOLOGIES AMONG RURAL WOMEN IN VANDEIKYA LOCAL GOVERNMENT AREA OF BENUE STATE, NIGERIA

Vihi, S. K[1*]., Chomini, E.A[2]., Tor, L.G[3]., Jesse B[1]., Dalla A.A.,[1] Bassey, E.A and Owa G.T[1].
[1]Department of Agricultural Extension & Management, Federal College of Forestry, Jos Plateau State, Nigeria
[2]Department of Forestry Technology, Federal College of Forestry, Jos Plateau State, Nigeria

[3]Department of Agricultural Technology, Federal College of Forestry Mechanization Afaka, Kaduna State, Nigeria
***Corresponding author: E-mail**: vihisam@gmail.com

ABSTRACT

The study assessed factors influencing adoption of improved cassava processing technologies: a case of cassava - garri processing among rural women in Vandeikya Local Government Area of Benue state, Nigeria. A multi-stage sampling technique was used to select 160 respondents for the study. Primary data were collected with the use of structured questionnaire instrument and were analyzed using descriptive statistics and multiple regression analysis. The result revealed that the mean age of the farmers was 39 years with majority (94%) of them married. The result further showed that more than half (53%) had primary education with a mean household size of 9 persons and mean garri processing experience of 10 years. The mean annual income of the women was ₦90953 with majority (82%) not belonging to any cooperative society. The result further showed that only 18% of the respondents have had visits from the extension agents in the last two years and only 16% of the respondents accessed credit for their processing enterprise. Mechanical grater had the highest adoption level of 88% followed by the screw press (54%). This level of adoption can be regarded as low. Age (-.0489), years of processing experience (.0581), membership of cooperative society (.0588) and annual income (.3359) of processors were the factors that influenced farmers' adoption of improved garri processing technologies in the study area. The major constraints to adoption of improved garri processing technologies were high cost of technology (83%), lack of awareness of some technologies (61%), lack of credit facilities (34%). The study recommends subsidization of these improved technologies so that processors could afford to purchase and make use of them. Awareness creation on the existence and importance of these technologies should be strengthened among cassava processors to enhance more adoption of the technologies.

Key words: Adoption, cassava, garri, factors, processing technologies.

INTRODUCTION

Cassava is among the six commodities defined by the African Heads of States as strategic crops for the continent, given its significant contribution to the livelihoods of African farmers and its potential for transforming African economies (Feleke *et al.*, 2016). Cassava (*Manihot esculenta* Crantz) is a root crop grown throughout the tropics by more than 800 million people (Nassar and Ortiz, 2010). It can grow with minimal inputs under marginal soil conditions and in regions prone to drought. According to Food and Agriculture Organization of the United Nations Corporate Statistical Database (FAOSTAT, 2020), Cassava is a perennial, versatile crop that adapts easily to different climates and soil conditions and can be cultivated all year round. Sub-Saharan Africa accounts for 61.1% of the world's cassava production. Nigeria currently produces about 54 million metric tonnes per annum (FAO, 2013), making her the highest cassava producer in the world, producing a third more than Brazil and almost double the production capacity of Thailand and Indonesia. It is virtually grown in all parts of Nigeria with rainfall greater than 100mm and accounts for over 70% of the total production of tuber crops in Africa. It is a dietary carbohydrate staple for most Nigerians, cutting across cultural and social divides. In Nigeria, 80% of the cassava cultivated is for consumption, primarily as garri (ground cassava roots), but it can also be used to make *fufu, tapioca,* chips, and cassava flour. Its average consumption surpasses 300 kg per person annually in Nigeria, and in some regions, (Omotayo *et al.*, 2016). Although its cultivation has traditionally been associated with subsistence farming, the crop is gradually becoming an industrial crop, which is processed into different products, including bread, pasta, and couscous-like products (Bechoff *et al.*, 2018; Mtunguja *et al.*, 2019). The crop has become a basic raw material for many small scale businesses such as cassava flour mills, bakeries, fast food firms, restaurants, garri processing

firms and is currently an income generating activity (Odii, 2012). The major area where the crop is grown extends from the coast in the south to the middle belt. By zone, the north central zone produces about 7 million tonnes of cassava a year. Benue and Kogi states in the north central Nigeria are the largest producers of cassava in the country (International Institute for Tropical Agriculture (IITA), 2004). The continued surge in interest and demand for cassava is driving local interest thereby slowly shedding its image as the 'food of the poor' and slowly developing into a multipurpose cash crop that has important food security and poverty alleviation implications.

The cassava value chain in Nigeria is primarily built upon the labor of women for both farm-level production and value addition. This is because majority of labor associated with cassava production and processing is carried out by women (Forsythe, Posthumus and Martin, 2016). As a result, cassava is viewed in some sense as a 'women's crop' (Ijigbade *et al*., 2014), though men are traditionally more involved in cash-crop activities, which gives them the advantage of higher income (Sell and Minot, 2018). As stated by Food and Agricultural Organization (FAO, 2013), the bedrock of the cassava value chain in Nigeria is the female small-scale farmers whose production methods are primarily subsistence in nature and therefore unable to support industrial level demands. Processing activities of cassava are widespread in the rural areas mostly among women who see it as a form of business or a way of generating income rather than a way of life. International Fund for Agricultural Development (IFAD, 2013) stated that in Africa about 600 million people are dependent on cassava for their food, of which garri is the major cassava product eaten by them on a daily basis. It is fine or coarse granular flour prepared from the roots, a product achieved when cassava is fermented, dried, and ground. The garri market is a continually growing market as every stratum of society eats it. There is high demand for garri mainly as a local and cheaper replacement for imported food products. The average consumption of garri in Nigeria ranges from 6-7 million tons annually, with demand being close to double the consumption average (Naziri *et al*., 2012). Despite the importance and high national demand for garri, the value chain remains underdeveloped. The current market is dominated by smallholder women farmers and processors and done with manual labor and crude tools that limit production capacity (Naziri *et al*., 2012).

Processing of agricultural produce requires both human and machine effort because of its complexity. According to Adiaha (2017), processing in agriculture involves the biological, physical, mechanical, and biochemical manipulation of agricultural produce in other to preserve it for further use. It involves the series of operations taken to change agricultural products into a consumer-finished product. Cassava is the most perishable of the roots and tuber crops and can deteriorate within two or three days after harvest. So there is need to process it within the shortest time after harvest. Technologies are technical skills or instrument used in carrying out an operation that could be tedious for manual operation. For instance processing involves transformation and preservation through physical or chemical alteration, storage, packaging and distribution (Okpeke and Onyeagocha, 2015). Kehinde and Subuola (2015) noted that the unit operations involved in cassava processing include harvesting, peeling, grating, de-watering or extracting water, sieving and frying. However, the manual operation of these processes is time consuming and very tiresome to carry out. It requires the use of various technologies in each of the unit operations for reduced human efforts. The production of garri involves the following component operations such as peeling which is the first operation and it is done immediately or 2 to 3 days maximum when the roots are received by the processor (Onyenwoke and Simonyan, 2014). This operation is carried out to remove the inedible thin and thick layers of the roots. The next operation is the washing of the roots to remove the dirt usually in form of sand particles on the body of the peeled roots. This is followed by the grating which is done to crush the fresh roots into pulpy form called mash for easy dewatering. The grated cassava roots is then dewatered or dried to about 10% moisture content and the starch is probably partially dextrinized (Osho and Dashiell, 2002). Next to this is fermentation which is an act of reducing the cyanide content of the starchy food. Dewatering accompanies the fermentation process to remove the excess water and cyanide in the food substance. Immediately after this operation is the pulverization, a unit process which aims at breaking the lump that occurred in the last process. After this, is the sieving operation which removes the uncrushed and hard fibres of the roots that were not broken down during the grating operation. This operation is followed by the frying which converts the mash into garri by moisture content reduction process through the application of heat. Cassava processing using the traditional methods is not too efficient because of tremendous losses during processing and high labour inputs. The improved methods of processing cassava conserves energy and are more hygienic.

Garri processing is labour intensive, often characterized by low quality, low output per unit of time and full of drudgery. Thus, this necessitated the need for advancement and upgrading to solve these issues usually experienced by the operators. Bello *et al*

(2016) noted that rural women are usually disadvantaged in their access to all factors of production and processing in spite of their involvement in farming generally. The Food and Agricultural Organization (2010) observed that in many developing countries, wide adoption of research results by farmers is quite limited. Emphasis is therefore required on appropriate technology for increasing food availability through increased processing and preservation. Innovative agricultural technologies exist in all facets and stages of agriculture; be it at production or at postharvest stages, and have played a major role in developing the agricultural industry. However, it has been observed that the farmers have mostly found it difficult to respond to the new technologies due to the fact that the technologies are costly to acquire and maintain and also that they are not properly educated and this has been a very big constraint, especially for the rural people. Though appreciable progress has been made in the development of processing technologies resulting in the successful mechanization of some of the laborious and time-consuming cassava processing operations such as peeling, grating, dewatering, frying etc, using mechanical peelers, mechanical graters, hydraulic press, granulators, dryers, fryers, sifters etc, the level of adoption of such technologies is not ascertained especially in Vandeikya Local Area of Benue State as majority of the processors depend on manual or traditional techniques. Preliminary investigation reveals that the use of improved technology has not been fully integrated into the processing of cassava into garri in the study area. In order to sustainably promote cassava-garri production and utilization, it is essential that more efficient (improved) processing technologies such as mechanical peeler, mechanical grater, hydraulic press, screw press, dryers, fryer (toaster), mechanical sifter and other improved technologies which are capable of reducing drudgery and enhancing better quality of cassava products be identified and made available to the end users for adoption. This will enable the processors to overcome the constraints militating against them and confidently adopt the improved processing technologies for optimum and better garri processing enterprise. Improved farm technologies are of little value until they are put to practical use (Muhammad *et al*., 2014). It is against this backdrop that this study seeks to investigate the adoption of improved garri processing technologies among women processors in Vandeikya Local Government Area of Benue State with the view to ascertain the level of use of these technologies. The specific objectives of the study were to; describe the socio-economic characteristics of the women cassava processors, assess the level of awareness of improved garri processing technologies in the study area, examine the level of adoption of improved garri processing technologies, determine the factors influencing the adoption of these technologies and identify the major constraints to adoption of improved garri processing technologies among women garri processors in the study area.

MATERIALS AND METHODS

Vandeikya LGA was carved out of Gboko LGC in 1976. It is located between latitude 7°5' and 7°15' north of the Equator and Longitude 9° and 9°6' east of Greenwich. The projected population of the local government from the 2006 National Population Census stands at 316,600 (National Population Commission, 2006). It has a landmass of 183,939 square metres (0.7 sq miles) with a population of well over 80,288. Vandeikya is in the South-Eastern part of Benue State and shares boundaries with Obudu and Bekwara in Cross River State to the East, Ushongo to the North and Konshisha LGA to the West. The local government has twelve administrative council wards namely; Mbadede, Mbagbam, Mbagbera, Mbajor, Mbakaange, Mbakyaha, Mbatyough, Mbayongo, Ningev, Nyumagbagh, Township and Tsambe. For ease of administration and proper representation, Vandeikya Local Government Area is divided in to two state constituencies namely; the Tiev and the Kyan constituencies. The Tiev constituency is made up of Mbakaange, Mbatyough, Mbayongo, Nyumagbagh, Township and Ningev wards while the Kyan constituency consists of Mbadede, Mbagbera, Mbakyaha, Mbagbam, Mbajor,and Tsambe council wards. Vandeikya Local Government area is dominated by undulating terrain with much of the area being below 183 m (600 ft) above the sea level. Agriculture is the mainstay of the people; with arable land for sheep, goats and cattle rearing. Over 80% of the population is directly engaged in the peasant farming of virtually all major food crops, with a concentration on yams, rice, sweet potatoes, cassava, sorghum, citrus, spices, pepper, groundnut and bambara nuts (Vandeikya Local Government Information Office).

Sampling Procedure and Sample Size

A multi-stage sampling technique was used to select respondents for the study. The first stage involved the purposive selection of Kyan constituency which comprises six wards of Mbadede, Mbagbam, Mbagbera, Mbajor, Mbakyaha, and Tsambe for the study. The second stage also involved a purposive selection of four (4) out of the six (6) wards namely; Mbadede, Mbagbam, Mbajor, and Tsambe for the study due to the predominant population of cassava producers and processors in these council wards. In

the third stage, a compiled list of women cassava processors from each of the selected wards was obtained from the association of cassava processors and sellers, a body responsible for the coordination and regulation of the affair of cassava processors in the study area. The last stage involved a simple random selection of forty (40) women cassava processors from the compiled list of each of the wards making up the sample size of one hundred and sixty (160) respondents for the study.

Data Collection and Analytical Techniques

The primary data was obtained through structured questionnaire instrument and household interviews. Descriptive statistics (frequency distribution, percentages and mean) were used to analyze the socio-economic features of the farmers while multiple regression model was used to analyze the factors influencing adoption of improved cassava-garri processing technologies.

Multiple regression model specification

The model was used to examine the factors affecting the number of technologies adopted by the processors in the study area. The socio-economic characteristics and cost factors were used as explanatory variables that explain the number of technologies adopted by the respondents. Adoption was calculated as the number of technologies adopted by a particular farmer as a percentage of the total number of technologies under study. In developing the adoption score a respondent scores one for each recommended practice adopted. To find the level of adoption of the technologies, the following implicit and explicit regression equation were applied

$Y= f (X_{1,} ,X_2, X_3, X_4 - - - - Xn + U)$ ---------- (1)

$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9+U$---------- (2)

Where;

Y = Adoption of improved Garri processing technologies in percentage (%)

Therefore, Y = Number of technologies adopted /Total number of technologies X 100

X_1..... Xn= Explanatory/Independent variables

X_1 =Age of the women processor (years)
X_2 = Marital status using dummy (if single = 0, married = 1)
X_3 = Education (years of formal schooling)
X_4 = Household size (number of persons in the household)
X_5 = Processing experience (years)
X_6 = Membership of cooperatives (Member =1, Non-Member = 0)
X_7 = Extension contact (Dummy, yes =1, No = 0)
X_8= Annual income (Naira)
X_9 = Access to credit (1 = yes, 0 = otherwise)
U = Error term
b_0 = Constant term
$b_1 – b_9$ = Regression Coefficients

RESULTS AND DISCUSSIONS

Socio-Economic Characteristics of Women Garri Processors

Result in Table 1 below shows that 51% of the respondents were between the ages of 31-40 years, 31% were between the ages of 41-50, 10% were between the ages of 20-30, while 7% were above 60 years. The mean age of the respondents was 39 years. This is an indication that cassava- garri processing in the area is dominated by women in their economically active age. This agrees with the findings of Oladeji and Thomas (2010), Folorunsho and Okoroji (2015) who reported that the population within this age group are productive, energetic and constitutes active work force. The implication is that farmers in this age category may be more likely to handle risks involved in adopting improved technologies in garri processing.

The result also showed that 94% of the respondents were married while only 6% were single. Marital status has implication for the adoption of improved garri processing technologies. Married people tend to have more responsibilities and hence they take new technology with seriousness to increases their productivity. This shows that there is great importance attached to marriage in the society especially in Africa where production largely depends on family labour. The married have advantage over the unmarried because members contribute to labour availability

The result in Table 1 further showed that about 53% had primary education, 26% had secondary education, 14% of the respondents had no formal education while 7% had tertiary education. This implies that most women garri processors in the area had primary education. This finding suggests that the women garri processors need more enlightenment from extension agents on the importance and usage of the improved technologies. Sofoluwe *et al.* (2011) confirmed that education influences people's perception and adoption of innovations.

Table 1 also showed that respondents with household size of 6-10 persons had the highest percentage (49%). This was followed by those with 1-5 persons (26 %), 11-15 persons (14%) and above 15 persons (11%). The mean household size of the respondents is 9

persons. This implies that garri processors in the area have considerable family labour. This is consistent with the findings of Dontsop Nguezet *et al*. (2011) and Onyeneke, (2017) who in their separate studies found the average household size of farmers to be 10 persons.

Table 1. Distribution of Respondents According to Socio-economic and Institutional Characteristics

Variable	Frequency	Percentage	Mean
Age			
20-30	16	10.0	
31-40	81	51.0	
41-50	50	31.0	
>60	13	8.0	39
Marital status			
Married	151	94.0	
Single	9	6.0	
Educational level			
Non formal	22	14.0	
Primary	85	53.0	
Secondary	42	26.0	
Tertiary	11	7.0	
Household size			
1-5	41	26.0	
6-10	79	49.0	
11-15	23	14.0	
>15	17	11.0	9
Garri processing experience			
1-5	26	16.0	
6-10	62	39.0	
11-15	51	32.0	
<15	21	13.0	10
Annual income from garri processing			
10,000.00-50,000.00	39	11.0	
51,000.00-100,000.00	41	83.0	
101,000.00-150,000.00	58	3.0	
151,000.00-200,000.00	18	2.0	
201,000.00-250,000.00	4	1.0	90953
Membership of cooperative			
Yes	29	18.0	
No	131	82.0	
Extension contact of the respondents			
Yes	29	18.0	
No	131	82.0	
Access to credit			
Yes	26	16.0	
No	134	84.0	

Source: Field survey (2022)

The result of the study in Table 1 further showed that 39% of the respondents had the highest processing experience of between 6-10 years, 32% had processing experience of between 11-15 years, 16% had processing experience of between 1-5 years while 13% had the processing experience above 15 years. The mean number of years of processing experience was 10 years. This result implies that the respondents had reasonable years of garri processing experience.

This implies that many of the women are quite "old" in garri processing. Experience, they say, is the best teacher. Long processing experience is an advantage for increased garri processing since it may encourage rapid adoption of improved processing technologies. Bakut (2013) asserted that farmers with long years of farming experience would be conversant with the constraints and this would increase their level of acceptance of new ideas as means of overcoming their production constraints.

The annual income of women garri processors in the study area reveals that 83% of the farmers earned between ₦51, 000.00 – 100,000.00, 11% earned between ₦10,000.00-50,000.00 while the remaining 6% earned above ₦100,000.00 as annual income. The mean annual income of the farmers was ₦90953. It can be seen from this result that the annual income of garri processors in the study area is not enough to enable them adopt improved garri processing technologies. With this result, it is likely that the adoption of improved garri processing technologies will not be favourable because income is very important in adoption process.

Table 1 shows that majority of the respondents (82%) do not belong to any association while only 18% belonged to associations. This implies that majority of the respondents do not belong to any associations. This is in agreement with the findings of Chikezie *et al*. (2012) in their study of factors influencing rural youth adoption of cassava recommended production practices where they found that 81% of the respondents do not belong to any associations. Membership of association is also very important because it is an avenue by which people come together to achieve in group what they cannot achieve alone. For example, membership of association can serve as a means to access credit, labour and information on techniques and enterprises.

The result presented on Table 1 shows that 82% of the respondents have not had any visit from the extension agents or to the extension agents in all their years of processing. Only 18% of the respondents have had visit from the extension agents in the last two years. This implies that the rate of extension visit is poor. This validates the findings of Ajala *et al.* (2013) who in an assessment of extension service delivery on improved cassava technology among cassava farmers in Osun State observed that half of the respondents did not have extension contact. As women get more contact with extension agents, they are likely to learn modern techniques of cassava production and processing and thus their involvement in them (Onyemauwa, 2012).

The result also showed that only 16% of the respondents received credit while 84% of the respondents did not receive credit. This implies that majority of the respondents did not have access to credit. Access to credit is also a very important factor in agricultural food processing enterprise. For women to fully participate in cassava processing there is need for access to credit. They should move beyond credit from friends and relatives to credit from cooperatives and banks. Credit is a very strong factor needed to acquire or develop an enterprise. Without credit most farmers cannot afford recommended inputs because the income of small scale farmers in Nigeria is very low.

Table 2: Distribution of Respondents according to Level of Awareness of Garri Processing Technologies

Awareness of technology	***Frequency**	**Percentage**
Peeling machine	39	24.0
Mechanical grater	160	100.0
Power screw dehydrating press	111	69.0
Mechanical sifter	33	21.0
Mechanical Fryer	11	7.0

*Multiple responses

Awareness of Improved Garri Processing Technologies

Result in Table 2 shows that 100% of the respondents were aware of the mechanical grater followed by power screw dehydrating press (69%). This implies that mechanical grater and the screw press were the most popular improved garri processing technologies among the women processors interviewed. Usage of

any technology is preceded by first hearing about the technology and then learning about it. Awareness of improved agricultural technologies is the first stage in the adoption process. It is the stage where an individual or group first learns about the existence of a technology. It is a very important stage in the adoption process because women cassava processors should be aware of a technology before they ever think of adopting it. Awareness and knowledge of a technology is a prerequisite for its use as farmers with firsthand information from research and extension agents have higher awareness and use in all introduced technologies (Abdoulaye *et al.*, 2014).

Adoption of Improved Garri Processing Technologies

The adoption of improved cassava processing technologies by women is presented in Table 3. The result showed that the mechanical grater had the highest adoption level of 88%. This was followed by the screw press which had the adoption level of 54%. The peeling machine, the mechanical sifter and the fryer (toaster) all had zero adoption. This level of adoption can be regarded as low. The low level of adoption could be attributed to lack of awareness of the improved technologies, poor extension education, high cost of the technologies and low level of formal education among the farmers. As a result of low adoption of improved technologies by most small scale farmers, the desirable level of increase in agricultural production has been difficult to achieve.

Table 3: Distribution of Respondents According to Level of Adoption of Garri Processing Technologies

Adoption of technology	*Frequency	Percentage
Peeling machine	-	-
Mechanical grater	141	88.0
Power screw dehydrating press	87	54.0
Mechanical sifter	-	-
Mechanical Fryer	-	-

*Multiple responses

Factors Influencing Adoption of Improved Garri Processing Technologies

Multiple regression was adopted to analyze the relationship between the levels of adoption of improved garri processing technologies by the farmers' and their socio-economic and institutional characteristics. The socio-economic factors considered include age, marital status, educational level, household size, and income per annum, cassava-garri processing experience and institutional factors which include; extension contact, membership of cooperative society and access to credit. The coefficient of multiple determinations, R^2 was 0.32, which indicated that the included independent variables (socio-economic and institutional) explained 32% of the total variations in the adoption of improved garri processing technologies (dependent variable). The F-value of 8.06 was significant at 1% (0.000) level of probability indicating that it accurately predicts the relationship between the dependent variable and its predictors. Nine variables were hypothesized to influence farmers' adoption of improved garri processing technologies in the study area as shown in Table (4). Out of these, only four (4) variables were statistically significant. They include; age, years of processing experience, membership of cooperative society and income of processors.

The coefficient of age (-.0489) was significant at 5% probability levels with a negative coefficient. The negative coefficient suggests a negative influence of the variable on the adoption decision indicating that the likelihood of adopting more improved garri processing technologies amongst the women in the study area decreases with age.. In other word, the likelihood of adoption decreases as the garri processors advances in age. This underscores the fact that older farmers are risk-averse and more conservative than the younger ones who are more innovative and receptive to new technologies. This is in consonance with findings by Mamudu *et al.* (2012) on adoption of modern agricultural production technologies by farm household in Ghana that old farmers tend to be less productive, and usually conservative and abhorring innovation information. The younger farmers are more innovative and enthusiastic to venture into new way of doing things. In the same vein, age has also been found to be negatively correlated with technology adoption level

in studies on adoption of land conservation practices in Niger. Older farmers, perhaps because of investing several years in a particular practice, may not want to jeopardize it by trying out a completely new method (Abubakar *et al.*, 2019)

The Coefficient of years of processing experience (.0581) was found to be positive and significant at 5% level of probability. This result implies that a unit increase in the number of years spent in garri processing by the women increases the likelihood of adopting improved garri processing technologies. Knowledge and experiences gained over time from working in an uncertainty production environment may help in evaluating the technologies thereby influencing their adoption decision. Farming experience increases the probability of uptake of innovations. Highly experienced women are likely to have more information and knowledge in garri processing technologies. The finding agrees with Abubakar *et al*. (2016) who also reported a positive and significant relationship between farming experience and adoption intensity of production technologies by lowland rice farmers in Niger state, Nigeria. Similar finding was reported by Mamudu *et al.* (2012) and Balarebe (2012) that experience improves farmers' skills in production which implies that a more experienced farmer may have a lower level of uncertainty about innovations performance and also be able to evaluate the advantage of technology being considered.

The coefficient of membership of cooperative societies (.0588) was found to have positive and significant relationship with adoption of improved garri processing technologies at 5% probability level. The result implies that women processors who actively participate in social organizations will tend to have increased likelihood of adopting improved garri processing technologies. Membership of cooperative societies significantly increased the probability of uptake of innovation. Generally, the more farmers are involved in farmer organizations' meetings and activities, the more they will access new information about improved technologies and the more they will easily develop positive attitude towards the adoption of production technologies.

The coefficient of annual income (.3359) of the respondents was found to have positive and significant relationship with adoption of improved garri processing technologies at 1% probability level. This implies that positive relationship exist between the farmers' annual income and their level of adoption of improved garri processing technologies. The *apriori* expectation was met because farmers with increased annual income are expected to adopt innovations more than those with lower annual income

Table 4**:** Multiple Regression of Factors Influencing Adoption of Improved Garri Processing Technologies

Variable	Coefficient	Std error	t	P>|t|
Constant	.4446721	.0469671	9.47	0.000***
Age (X_1)	-.0489164	.0234628	-2.08	0.039**
Marital status (X_2)	.0153187	.0161316	0.95	0.344
Education (X_3)	.0067779	.0109192	0.62	0.536
HH/size (X_4)	-.0149282	.0140832	-1.06	.0427323
Processing experience (X_5)	.0581246	.0250548	2.32	0.022**
Membership of assos (X_6)	.0588029	.0317087	1.85	0.065**
Extension contact (X_7)	-.0156508	.0113766	-1.38	0.171
Annual income (X_8)	.3359759	.0503712	6.67	0.000***
Access to credit (X_9)	-.0295492	.0254423	-1.16	0.247
No. of observations	= 160			
F-value	= 8.06*			
R-Squared	= 0.3668			
Prob > F	= 0.0000			
Adjusted R-Squared	= 0.3213			

Note: **, *** are significant at 5% and 1% respectively

Constraints to the Adoption of Improved Cassava Processing Technologies

The constraints to adoption of improved cassava processing technologies are shown in Table 4 below. The result revealed that lack of awareness (57%), high cost of technology (42%) and lack of credit facilities (7%) were the constraint to adoption of the peeling machine. On mechanical grater, the result shows that 53 % of the respondents comprising those who have already adopted the technology and the remaining fraction of the non- adopters indicated high cost of technology as a major constraint while 35% indicated lack of credit. On dehydrating press, the result shows that 72% of the respondents indicated high cost of the technology as an obstacle to its adoption while 57% blamed their inability to adopt this technology on lack

of credit. Result on mechanical sifter shows that lack of awareness of technology has 68%, high cost of technology 41 % and lack of credit 21%. The result also shows that the constraints to adoption of mechanical fryer include; lack of awareness (47.5%), lack of credit (40%) and high cost of technology (36%). From the overall result, it can be seen that cost of technology, awareness of technology and lack of credit were the major constraints militating against adoption of improved cassava processing technologies in the study area. Improved cassava processing machines are so expensive that most processors cannot afford it so they spend a lot of money in transporting their products to and fro the processing centers where they go in search of hired machinery. Awareness of any given technology facilitates adoption which translates to increased output and income of farmers. Inadequate credit is a major problem especially for women because without adequate credit the women cannot fully adopt technologies thereby leading to reduction in their productivity. The implication could be that the respondents could not have the purchasing power for necessary farm inputs, which could reduce the level of adoption of improved technologies among respondents. These problems need to be addressed in order to increase the level of adoption among the women entrepreneurs in order to accrue more profits and as well make the enterprise more attractive; and increase quality of the products.

Table 4: Distribution of respondents according to constraints to adoption of Garri Processing Technologies

Technology	Constraint	*Frequency	Percentage
Peeling machine	Lack of awareness of technology	91	57.0
	High cost of technology	67	42.0
	Complexity of technology	-	-
	Lack of credit	11	7.0
Mechanical grater	Lack of awareness of technology	-	-
	High cost of technology	85	53.0
	Complexity of technology	-	-
	Lack of credit	56	35.0
Dehydrating press	Lack of awareness of technology	-	-
	High cost of technology	115	72.0
	Complexity of technology	-	-
	Lack of credit	91	57.0
Mechanical sifter	Lack of awareness of technology	109	68.0
	High cost of technology	66	41.0
	Complexity of technology	-	-
	Lack of credit	33	21.0
Mechanical Fryer	Lack of awareness of technology	76	47.5
	High cost of technology	57	36.0
	Complexity of technology	-	-
	Lack of credit	64	40.0

Source: Field survey, 2022
*****Multiple responses

CONCLUSION AND RECOMMENDATIONS

From the findings of the study, it can be concluded that adoption of improved garri processing technologies amongst the women in the study area was low as only two of the technologies namely; mechanical grater and power screw hydraulic press were adopted. Age, years of processing experience, membership of cooperative society and annual income were the factors that influenced the women adoption of improved garri processing technologies in the study area. The major constraints to adoption of improved garri processing technologies were high cost of technology, lack of awareness of some technologies and lack of credit facilities.

Based on the findings from this study, the following recommendations were made:

i. The study revealed high cost of technologies as one of the major challenge to adoption of almost all the technologies under consideration. Therefore, it is recommended that affordable technologies should be

introduced to the respondents by the extension agents in the study area.

ii. The study also indicated lack of awareness of the technologies as one of the major challenge to adoption of these technologies. Extension agents in the study area should step up their visits and effectively disseminate these improved technologies and provide trainings that will influence the adoption of these improved technologies.

iii. Lack of credit facilities was also a major constraint of the respondents, it is therefore recommended that the women cassava processors should utilize their memberships in co-operative societies to assist themselves financially as people come together so as to meet collective needs that could not be resolved by individual efforts.

iv. Age is a key determinant of adoption rate, deliberate policy needs to be put in place to increase the influx of young people into agriculture as they are innovative, energetic and creative.

REFERENCES

Abdoulaye, T., Abbas, A., Maziya-Dixon, B., Tarawali, G., Okechukwu, R., Rusike, J., Alene, A., Manyong, V. and Ayedun, B. (2014). Awareness and Adoption of Improved Cassava Varieties and Processing Technologies in Nigeria. *Journal of Development and Agricultural Economics*. 6 (2): 67 – 75.

Abubakar H.N, Garba Y, Gana A.K (2019). Factors Influencing Adoption of Rice Improved Production Practices by Farmers in Adopted Villages, Niger state, Nigeria. *Adv Plants Agric Res.* 2019;9(1):183–189. DOI: 10.15406/apar.2019.09.00433

Abubakar H.N, Kolo I.N, Yabagi A.A (2016). Adoption of Production Technologies by Lowland Rice Farmers in Lavun Local Government Area of Niger state, Nigeria. *International Journal of Agricultural Extension*. 2016;4(1):7.

Adiaha S. (2017). Complete Guide to Agricultural Product Processing and Storage. World Scientific News; 81(1):1-52.

Ajala, A. O., Ogunjimi, S. I. and Farinde, A. J. (2013). Assessment of Extension Service Delivery on Improved Cassava Technology among Cassava Farmers in Osun State, Nigeria. *International Journal of Applied Agricultural and Apicultural Research* 9 (2): 71-80.

Apata, T. G. (2019). Analysis of Cassava Value Chain in Nigeria: Pro-poor Approach and Gender Perspective. *International Journal of Value Chain Management, 10*(3), 219. doi:10.1504/ijvcm.2019.10022069

Bakut, P. M. (2013). Factors Influencing Adoption of Recommended Cassava Production Practices by farmers in Bwari and Kuje Area councils, Abuja, Federal Capital territory. An unpublished M.Sc Thesis submitted to the Department of Agricultural economics and rural sociology, Ahmadu Bello University, Zaria, Nigeria. pp. 57.

Balarabe, I.Y. (2012). Rain fed Lowland Rice Production: Alternative for Food Security and Income Enhancement in Sokoto state, Nigeria. A PhD thesis Department of Agricultural Economics and Extension Usmanu Danfodiyo University, Sokoto, p 231

Bechoff, A., Tomlins, K., Fliedel, G., Becerra Lopez-lavalle, L. A., Westby, A., Hershey, C. (2018). Cassava Traits and End-user Preference: Relating Traits to Consumer Liking, Sensory Perception, and Genetics. *Crit. Rev. Food Sci. Nutr.* 58, 547–567. doi: 10.1080/10408398.2016.1202888

Bello, O. G., Orifah, M. O., Oladipo, F. O. and Ijeoma, M. C. (2016). Use of Improved Groundnut Processing Technologies among Women Processors in Jigawa State, Nigeria: *Nigerian Journal of Agriculture, Food and Environment* 12(4):62-67.

Chikezie, N. P., Omokore, D. F., Akpoko, J. G., and Thiakaire, J. (2012). Factors Influencing Rural Youth Adoption of Cassava Recommended production Practices in Onu-Imo Local Government Area of Imo State, Nigeria. *Greener Journal of Agricultural Science.* 2 (6): 259-258.

Dontsop-Nguezet PM, Diagne A, Okoruwa VO, Ojehomon V (2011). Impact of Improved Rice Technology on Income and Poverty among Rice Farming Household in Nigeria: A Local Average Treatment Effect (LATE) Approach. Contributed paper prepared for the 25th conference of the Centre for the Studies of African Economies (CSAE). St. Catherine College, University of Oxford, UK. 20-22, March 2011.

Food and Agriculture Organization of the United Nations (FAO) (2013). FAO Online

Statistical Database. Accessed on 01/07/2013. *http://faostat.fao.org*.

FAOSTAT (2013.)Online Statistical Database. Accessed on 01/07/2013. *http://faostat.fao.org*

FAOSTAT. (2020). *http://www.fao.org/faostat/en/#data/QC* (Accessed January 24, 2020).

Feleke, S., Manyong, V., Abdoulaye, T., and Alene, A. D. (2016). Assessing the Impacts of Cassava Technology on Poverty Reduction in Africa. *Stud. Agric. Econ.* 118, 101–111. doi: 10.7896/j.1612

Folorunsho, S. T. and Okoroji, E. O. 2015. Analysis of Factors Affecting the Performance of Samaz 15 Maize Variety among Farmers in Riyom Local Government Area of Plateau State, Nigeria. Proceedings of the 29th Annual Conference of *Farm Management Association of Nigeria* Dutse, 2015.

Food and Agricultural Organization (FAO) (2010). Corporate Document Repository, A Review of Cassava in Africa with Country Case Studies of Nigeria, Ghana, the United Republic of Tanzania, Uganda and Benin. Retrieved October 5 2014

Forsythe, L., H. Posthumus, and A. Martin (2016). "A Crop of One's Own? Women's Experiences of Cassava Commercialization in Nigeria and Malawi." *Journal of Gender, Agriculture and Food Security* 1 (2): 110–128.

Ijigbade, J.O., Fatuase, A.I. and Omisope, E.T. 2014. Conduct and Profitability of Gari Production for Increased Food Security in Ondo State, Nigeria, *IOSR Journal of Humanities and Social Science (IOSRJHSS)*, 19(7): 89-95.

International Fund for Agricultural Development (IFAD) (2013). Cassava: Turning a Subsistence Crop into a Cash Crop in Western and Central Africa, Rural Poverty *Portal*, *BreadcrumbsPortlet,PoweredbyIFAD.* (Retrieved on 27 June 2013*).*

International Institute for Tropical Agriculture (IITA) (2004). Nigeria's Cassava Industry: Statistical Handbook in global Cassava Development Strategy. A 68 Cassava Industry Revolution in Nigeria. The potential for a new industrial crop. P 37.

Kehinde T.T, Subuola B.F (2015). Women and Cassava Processing in Nigeria. *International Journal of Development Research.* 5(2):3513-3571.

Mamudu AA, Guo E, Dadzie SK (2012). Adoption of Modern Agricultural Production Technologies by Farm Households in Ghana: What Factors Influence their Decision? *Journal of biology, agriculture and healthcare*. 2012;2(3):34–68.

Mtunguja, M. K., Beckles, D. M., Laswai, H. S., Ndunguru, J. C., and Sinha, N. J. (2019). Opportunities to Commercialize Cassava Production for Poverty Alleviation and Improved Food Security in Tanzania. *African J. Food, Agric. Nutr. Dev.* 19, 13928–13946. doi: 10.18697/AJFAND.84.BLFB1037

Muhammad, H. U.; Tyabo, I.S.; Tsado, J.H.; Adebayo, C.O. and Mohammed, U (2014). Adoption of Improved Cassava Processing Technologies among Rural Women in Lapai Local Government Area, Niger State, Nigeria. *Journal of Sustainable Technology, Vol. 5, No. 2 (November 2014), ISSN: 2251-0680*

Nassar, N., and Ortiz, R. (2010). Breeding Cassava to Feed the Poor. *Sci. Am.* 302, 78–85. doi: 10.1002/9781118060995.ch3

Odii, O. C. (2012). Socio-Economic Evaluation of Cassava Production by Women farmers in Igbo-Eze North Local Government Area of Enugu State, Nigeria. *International Journal of Agricultural Science, Research and Technology*. 2 (3): 129-136.

Okpeke M.Y, Onyeagocha S.U.O (2015). Analysis of Processing Cassava Tubers into Garri in Isoko North Local Government Area of Delta State, Nigeria. *European Journal of Agriculture and Forestry Research*. 2015;5(3):15-25.

Oladeji, J. O., and Thomas, K. A. (2010). Social Marketing Approach as an Alternative Extension Delivery for Nutrition Intervention among Women in Osun State, Nigeria. *International Journal of Applied Agricultural Research, 5*(5): 657-667.

Omotayo A.O., A.J. Oladejo, Profitability of Cassava-based Production Systems, J. Hum. Ecol. 56(1, 2) (2016) 196-203.

Onyemauwa, C. S (2012). Analysis of Women Participation in Cassava Production and Processing in Imo state, South East Nigeria. *Journal of Economic and Sustainable development 3(5) pp 81-90*

Onyeneke, R. U(2017). Determinants of Adoption of Improved Technologies in Rice Production in Imo State, Nigeria. *African Journal of Agricultural Research*. Vol. 12(11), pp. 888-896.

Onyenwoke C. A. and Simonyan K. J. (2014). Cassava Post-harvest Processing and Storage in Nigeria: A Review. *African Journal of Agriculture Research.* DOI: 10.5897/AJAR2013.8261. Vol. 9(53), pp. 3853-3863, 31 December 2014.

Osho, S.M. and Dashiell, K.E. (2002). The Processing and Acceptability of Fortified Cassava-based Product (gari). *Discovery and Innovation*, 14: 186–191.

Sell, M., & Minot, N. (2018). What Factors Explain Women's Empowerment? Decision-making among Small-scale Farmers in Uganda. *Women's Studies International Forum*, *71*, 46–55. https://doi.org/10.1016/j.wsif.2018.09.005

Sofoluwe, N. A., Tijani, A. A. and Baruwa O. I. (2011) Farmers Perception and Adaptation to Climate Change in Osun State, Nigeria. *African Journal of Agricultural Research* 6 (20): 4789-4794.