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HOUSEHOLD CHARACTERISTICS AND MARKET PARTICIPATION COMPETENCE OF SMALLHOLDER FARMERS SUPPLYING CASSAVA TO STARCH PROCESSORS IN NIGERIA

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Abstract

The household head characteristics of smallholder cassava farmers supplying raw materials to the major commercial starch processors in Nigeria were examined alongside their market participation categories. A multi-stage random sampling technique was used to select 96 farmers working in clusters in the eight cassava producing states. Data were analyzed using a combination of descriptive and inferential statistics, including the use of independent sample t-test technique to compare farmer's characteristics for the farmers' market participation categories. Results revealed that majority of the farmers were farming for subsistence with only 19.80% selling up to 50% of their farm produce as against 80.20% who sold less. Average mean values were found to be higher for the high market participants compared with the low participants for the age, farming experiences, education, farm size, gender, marital status, household size, training, season of harvesting and fertilizer use, but lower for use of credit, improved cassava variety, harvesting method, farming time devotion, and road access. Only farm size, gender and harvesting season at $p<0.01$ level and training at $p<0.05$ level were found to be statistically significant in distinguishing the high and low market participation categories. Policies and programmes aimed at promoting market participation among cassava farmers in Nigeria should be more impactful if directed at these significant factors.

Keywords: Household Characteristics, Cassava, Smallholder Farmers, Market Participation, Starch Processors, Training, Nigeria

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Introduction

The transformation of agriculture and agribusiness sector from subsistence to a specialized and market-oriented system has been adjudged of great importance to the developing countries with a high degree of dependence on agriculture for livelihoods and economic development (Wickramasinghe and Weinberger, 2013). This identifies with the view elsewhere that commercial transformation of subsistence agriculture is an essential passageway to economic growth and development, especially for the agriculture-dependent developing countries (Boughton *et al*., 2007). The standard process of agrarian and rural transformation involves the transition of the households from a subsistence mode, where most inputs are provided and most outputs consumed internally, to a market engagement mode, where inputs and outputs are increasingly purchased and sold off the farm (Boughton *et al*., 2007; Staatz, 1994). Commercial agriculture is expected to bring about welfare gains through the realization of comparative advantages, economies of scale, and dynamic technological, organizational, and institutional change effects arising from the flow of ideas due to exchange-based interactions (Gebremedhin and Jaleta, 2012; Romer, 1994; 1993). It has been long-established that commercialization enhances the links between the input and output sides of the agricultural markets (Gebremedhin and Jaleta, 2012).

For the smallholder farmer to be a meaningful beneficiary of the commercial transformation of agriculture initiative, he/she should not only be market-oriented but should have a demonstratable market participation ability and willingness. The term market orientation is used widely in manufacturing to describe the extent to which a producer (including a producer of agri-based products) is able to make far-reaching decisions on the three basic economic questions:

what to produce, how to produce, and how to market, using his or her knowledge of the market, especially the knowledge of the customers and market prices (Gebremedhin and Jaleta, 2012). It is defined as the degree of allocation of resources (land, labor, and capital and human services) to the production of agricultural produce directed to the market. On the other hand, market participation is the degree to which a farmer transacts in the market as a supplier (Gebremedhin and Jaleta, 2012; Immink and Alarcon, 1993). In this study, market orientation and market participation are used synonymously for the smallholder farmers of cassava (*Manhihot esculenta* Crantz) supplying roots to starch processors in Nigeria. Smallholder farming and effective market participation is a sure pathway to pulling the rural people out of poverty through improving their income and food security (Rosegrant *et al*., 2005). It is both a cause and a consequence of economic development (Boughton *et al.*, 2007).

In Nigeria, the cassava industry serves as a reliable source of food, income and employment for the rural dwellers. It has a huge potential as a notable source of raw materials for the numerous agro-based micro, small and medium-scale enterprises (MSMEs). Livestock feed, starch, high-quality cassava flour (HQCF), glucose syrup, chips, glue, and ethanol are among the popular industrial products from cassava. However, the Nigerian cassava production system is still subsistent in nature, being primarily cultivated for the traditional food market, and less oriented towards realizing its numerous industrial market potentials (UNIDO, 2006). For example, (UNIDO, 2006) specifically observed that about 90% of the country's production was for subsistence and used domestically as food, leaving only 5-10% for processing into secondary industrial products, used mostly as animal feed. This is not surprising because cassava farming, like the case of most other value chains, was a rural-based occupation. Anazodo (1982) identified the characteristics of the Nigerian rural dwellers to include: having static and declining standard of living; generally engaging in agriculture as their main occupation, cultivating small plots of land with traditional hand tools, engaging in subsistence farming with capability of generating small marketable surpluses, inhabiting locations and areas poorly served by almost all public utilities, and of course, having family incomes unlikely to exceed a few tens of naira a year (this means that greater majority falls below the less than US$ 1.00 day^{-1} internationally-recognized poverty level cut-off). The implication of this is that the level of motivations to market-driven cassava production were still very low, thus hindering the smallholder farmers' meaning involvement in a competitive commercial scheme.

Evidence from literature has shown several documented works aimed at examining the factors influencing market orientation and participation among farmers in different crop value chains in Nigeria (Adenegan *et al*., 2013; Adesiyan *et al*., 2012; Agwu *et al*., 2013; Falola *et al*., 2013; Tiku and Ugbada, 2012). Apart from the externally determined factors outside the control of the farmers and household heads, there are several other household characteristics whose influence in the market participation competence of smallholders has been identified. In this study, a step is taken further to comparing these factors based on the farmers' market participation categories. The general objective of this study is to analyze the characteristics of smallholder cassava farmers by comparing them based on their market participation tendencies. The specific objectives are to examine the household characteristics of the smallholder cassava farmers, to characterize the farmers based on their market participation potentials, and compare farmers' characteristics for the different market participation categories. Following Rios *et al*. (2009), the authors had defined cassava market participation in terms of sales as a fraction of total output of cassava during the period under review. The authors then classified the cassava farmers into two categories based on their market participation status as: high market participants, if the farmers sold at least 50% of their total annual output; and low market participants, if they sold less than 50% of their total annual output.

Materials and Methods

Study area

The study was conducted in eight cassava-growing states that participated in the cassava starch value chain project implemented on behalf of Nestlé Foods Plc by the International Institute of Tropical Agriculture (IITA) from 2011-2015. Five of the states were classified into the south-east (SE) axis and the remaining three into the south-west (SW) axis. The SE axis comprised of Abia, Anambra, Delta, Enugu and Imo States. Abia State is located at latitude 5.41667^{o}N and longitude 07.5000^{o}E. It had a land area of 6,320 square kilometer, seventeen Local Government Areas (LGAs), and a population of 2,845,380 (50.27% male and 49.73% female) based on the 2006 National Population Census. The administrative headquarter of Abia was in Umuahia. Anambra State, located at latitude 6.33333^{o}N and longitude 07.0000^{o}E, had twenty-one LGAs, a land area of 4,844 square kilometers, and a population of 4,177,828 (50.70% males and 49.30% females. Its administrative headquarter was in Awka. Delta State with administrative headquarters at Asaba is located at latitude 6.2000^{o}N and longitude 6.7300^{o}E. It had a land area of 17,698 square kilometers, twenty-five LGAs, and a population of 4,112,455 (50.32% males and 49.38% females. Enugu State with administrative headquarter in Enugu is located at latitude 06.5000°N and longitude 07.5000° E. It had seventeen LGAs, a land area of 7,161 square kilometers, a population of 3,267,837 (48.84% males and 51.16% females), and a rainfall range of 1520–2030 mm/annum. The fifth state, Imo, is located at latitude 5.4800°N and longitude 07.0300°E. It had administrative headquarter in Owerri, twenty-seven LGAs, a land area of Imo State is 5,100 square kilometers, and a population of 3,927,563 (50.32% male and 49.68% female). The SW axis comprised of Ekiti, Ondo and Osun States. Ekiti State with administrative headquarter in Ado-Ekiti is located at latitude 7.6200°N and longitude 05.2200°E. The state had a land size of 6,353 square kilometers, sixteen LGAs, and a population of 2,398,957 (comprising of 50.67% male and 49.33% female. Ondo State is located at latitude 07.2500°N and longitude 5.1900°E. It had an area size of 15,500 square kilometers, eighteen LGAs, and a population of 3,460,877 people (consisting of 50.42% male and 49.58% female). Its capital and administrative headquarters was in Akure. The third SW State is Osun with capital city and administrative headquarters at Osogbo. Osun is located at latitude 7.7500oN and longitude 4.5610oE. It had a population of 3,416,959 (50.75% male and 49.25% female), thirty LGAs, and a land area size of 9,251 square kilometers.

One common feature of the Project States is that they had fertile lands that were good for the production of several foods and cash crops. Cassava and yams, maize, plantain and banana, cocoyam, and sweet potatoes are some of the food security crops produced in these states. Among the common cash crops are palm produce, kolanuts, and cocoa. In addition, these states are endowed with many other natural resources like rivers, lakes, coal, limestone, lead, zinc, fine sand, limestone and petroleum, which can be spotted moving from one state to another. These project locations fell within at most 150 kilometers to the processing centers they were being targeted to work with under the project.

Sample and data collection

This survey was conducted in the 8 project States, which were chosen because of their cassava growing status and involvement in the IITA-Nestlé Foods cassava starch project in Nigeria. The sample comprised of farmers selected from the farmers' clusters using a multi-stage random sampling technique. A cluster was made up of an average of 10 to 20 members and three clusters were randomly selected from each state. Four members were randomly selected and interviewed from each cluster. In all, 96 farmers were interviewed using a structured and pre-tested questionnaire. Data were collected on farmers' characteristics, farming practices, including fertilizer use status, harvesting methods and season and yield. The collected data relate to the 2010/2011 production season.

Analytical techniques

Descriptive and inferential statistics were used to analyze data in this study. The independent sample t-test technique provided by the IBM SPSS was used to compare the mean values of the farmer's characteristics based on the farmers' market participation categories.

Conceptual independent sample t-test

The independent sample t-test is used to test the null hypothesis (H_0) against the alternative hypothesis (H_1) of the independent samples as follows:

$$\begin{aligned} H_0 &: \mu_1 - \mu_2 = 0 \\ H_1 &: \mu_1 - \mu_2 \neq 0 \end{aligned} \qquad (1)$$

Where μ_1 is the population mean value for group 1, μ_2 is the population mean value for group 2.

The H_0 says that the difference between population means for the first and second groups is equal to 0 while H_1 says that the difference between the means is not equal to zero. The eventual output of the independent samples t-tests statistics will depend on whether the calculation method assumes the existence or non-existence of equal variances. If equal variances are assumed the calculation uses pooled variances and the actual degrees of freedom, but if equal variances are not assumed, the calculation uses un-pooled variances and corrected degrees of freedom.

Levene's test for equality of variances

One of the basic postulation of the independent sample t-test is the assumption of homogeneity or equality of variance for the groups being considered**.** SPSS provides the Levene's test that helps to guarantee that the homogeneity of variance assumption is not violated (test of equality of variances). The null and alternative hypotheses of the Levene's test are stated as:

$$\begin{aligned} H_0 &: \sigma_1^2 - \sigma_2^2 = 0 \\ H_1 &: \sigma_1^2 - \sigma_2^2 \neq 0 \end{aligned} \qquad (2)$$

Where σ_1^2 is the population variance for group 1 and σ_2^2 is the population variance for group 2. The H_0 says that the difference between population variances for the two groups is equal to 0 while H_1 says that difference between the variances is not equal to zero.

Empirical t-test statistics with equal variances assumed

The independent sample t-test technique was used to compare the mean values of the included farmers' characteristics on the basis of their market participation categories. The authors measured market participation as a dummy variable: low participation (0, if quantity of cassava sold to the market was less than 50% of total produce; and high participation (1, if quantity of cassava sold by farmer was 50% or more of the total produce).

Suppose it is assumed that two independent samples being analyzed were drawn from populations with identical population variances, t-test statistic is computed as:

$$t = \frac{\overline{x}_{HP} - \overline{x}_{LP}}{s_p \sqrt{\frac{1}{n_{HP}} + \frac{1}{n_{LP}}}} \quad (3)$$

$$df = n_{HP} + n_{LP} - 2 \quad (4)$$

with

$$s_p = \sqrt{\frac{(n_{HP}-1)s_{HP}^2 + (n_{LP}-1)s_{LP}^2}{n_{HP} + n_{LP} - 2}} \quad (5)$$

Where,

$\overline{x}_{HP}$ = Mean of the high market participating farmers

$\overline{x}_{LP}$ = Mean of the low market participating farmers

n_{HP} = Number of farmers observed to have fallen into the high market participation category

n_{LP} = Number of farmers observed to have fallen into the low market participation category

s_{HP} = Standard deviation of farmers in the high participating sample group

s_{LP} = Standard deviation of farmers in the high participating sample group

s_p = Pooled standard deviation (for both high and low participating farmers

df = Degrees of freedom.

The calculated *t*-value of equation (3) is compared to the critical *t*-value from the *t*-distribution table with the defined degrees of freedom ($df = n_{HP} + n_{LP} - 2$) and chosen confidence level. The decision rule is to reject the null hypothesis if the calculated *t*-value is greater than the critical *t*-value.

Empirical t-test statistics with equal variances not assumed

Suppose it is assumed that the two independent samples were drawn from populations with unequal variances (i.e., $\sigma_1^2 \neq \sigma_2^2$), the t-test statistic is computed as:

$$t = \frac{\overline{x}_{HP} - \overline{x}_{LP}}{\sqrt{\frac{s_{HP}^2}{n_{HP}} + \frac{s_{LP}^2}{n_{LP}}}} \quad (6)$$

$$df = \frac{\left(\frac{s_{HP}^2}{n_{HP}} + \frac{s_{LP}^2}{n_{LP}}\right)}{\frac{1}{n_{HP}-1}\left(\frac{s_{HP}^2}{n_{HP}}\right)^2 + \frac{1}{n_{LP}-1}\left(\frac{s_{LP}^2}{n_{LP}}\right)^2} \quad (7)$$

Where, $\overline{x}_{HP}$, $\overline{x}_{LP}$, n_{HP}, n_{LP}, s_{HP}, s_{LP}, s_p and as previously defined and df is the degrees of freedom.

The calculated *t*-value of equation (6) is compared to the critical t-value from the t-distribution table with degrees of freedom as defined in equation (7) and chosen confidence level. Like before, the decision rule is to reject the null hypothesis if the calculated t-value is greater than the critical t-value. All calculations and estimations were made using the IBM SPSS software.

The definition and measurement of the included households and household head characteristics is presented in Table 1.

Table 1. Description and measurement of households and household head characteristics.

Variable	Description and measurement
Age	Age of the farmer, measured in years
Experience	Farming experience of the farmer, measured in years
Education	Level of education attained by the farmer, measured as: 0=no formal education; 1=primary level of education, 2=junior secondary education; 3=senior secondary education; 4=tertiary education attempted; 5=tertiary education completed
Farm size	Land area cultivated by farmer during the period, measured in hectares
Credit Access	Whether or not the farmers received and used credit, measured as dummy: 1, if farmer received credit; 0, if otherwise
Improved type	Type of variety planted by farmer, measured as dummy: 1, if improved; 0, if local or quasi-improved
Gender	Gender of farmer, measured as a dummy variable: 1, if female; 0, if male.
Marital status	Farmer's marital status, measures as a dummy variable: 1, if farmer was "ever married", 0, if otherwise
Household size	Number of persons resident in the farmer's household, measured in numbers.
Training exposure	Farmer's exposure to training on cassava farm management practices, measured as a dummy variable: 1, if farmer had attended training; 0, if otherwise.
Harvesting season	Season of the year when farmer harvested the farm, measured as a dummy: 1, if harvesting was during rainy season; 0, if harvesting was during dry season.
Fertilizer use	The fertilizer application status of farmer, measured as a dummy: 1, if fertilizer was applied; 0, if otherwise.
Harvesting method	Method of harvested adopted by farmer, measured as a dummy variable: 1, if harvesting was mechanical; 0, if harvesting was manual.
Time devoted to farming	Devotion of farmer's time devoted to farming, measured as a dummy variable: 1, if full-time; 0, if part-time.
Road access	Farmer's description of the accessibility status of road to the major farms, captured as a dummy variable: 1, for accessible road; 0, if otherwise.

Results and Discussion

Household heads' characteristics

Farmers' age: The age of the farmers were measured in years. The farmers' age statistics is presented in Fig. 1. The average age are 48.06 years for all respondents. The respondents' ages ranged from 22-75 years. The average for the 48.92 years for respondents from the southeast and 46.64 years for their counterparts from the southwest axis. This shows that the average sampled farmer from the SE was about two years older than the counterpart from the south-west axis.

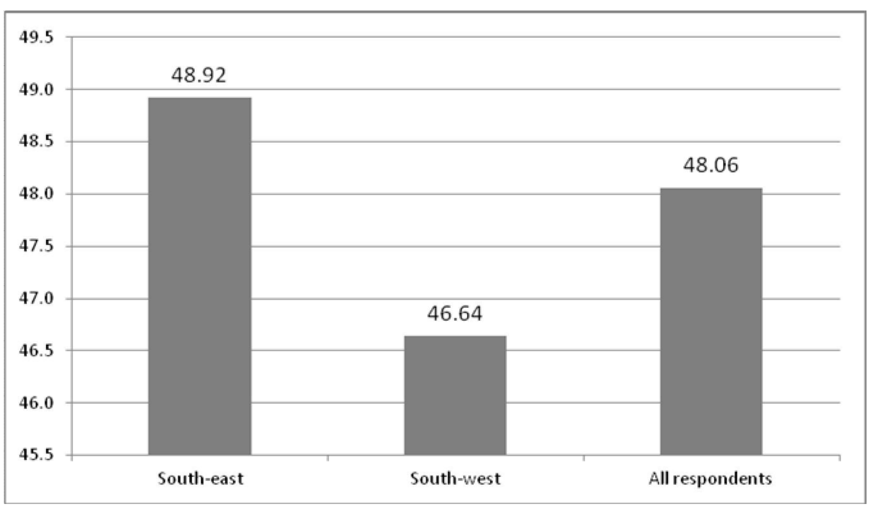

Fig. 1. Average age of respondents.

Farmers' gender: The gender of the farmer was measured as a dummy variable: 1, if farmer was a woman and 0, if farmer was a man. The breakdown of the gender statistics is presented in Table 2.

Table 2. Gender distribution of respondents.

Description	Abia	Anambra	Delta	Ekiti	Enugu	Imo	Ondo	Osun	South-east	South-west	Total
Male (%)	16.67	83.33	91.67	91.67	91.67	83.33	83.33	75.00	73.33	83.33	77.08
Female (%)	83.33	16.67	8.33	8.33	8.33	16.67	16.67	25.00	26.67	16.67	22.92

Breakdown of gender shows that 77.08% were men while the rest 22.92% were women. The men farmers constituted 73.33% of all southeast farmers (column 10) as against 83.33% in the southwest (column 11). It follows from the finding that male and female farmers play complementary roles in the cassava production and marketing activities in the axes as in most parts of rural Nigeria. Ezumah and Di Domenico (1995) corroborated this complementary responsibility while Anyakoha and Ozoh (1999) affirmed that the rural Nigerian women were actively involved in all aspects of primary food production.

Farmers' farm size: The area of land cultivated (farmer's farm size) was measured in hectares. The average farm area cultivated by respondents was 3.15 ha, which ranged from 0.2-20 ha minimum to 20 ha maximum values. The average farm area was calculated as 3.0 ha that ranged from 0.2–20 ha (with standard of 3.18) for the southeast and 3.42 ha that ranged from 1.0-11 ha (with standard deviation of 2.54) for the southwest. It means that variability was higher in the SE compared to the SW axis. As shown in Fig. 2, majority of the farmers (28.13%) planted 0-1 ha as against 23.96% who cultivated 1-2 ha, 18.75% with 2-3 ha, 9.38% with 3-4 ha and 7.29% with 4-5 ha. Invariably, over 70% of all farmers planted at most 3 ha showing that they were mostly smallholders. The farmers who planted above 5 ha represented 12.50% of the sampled farmers.

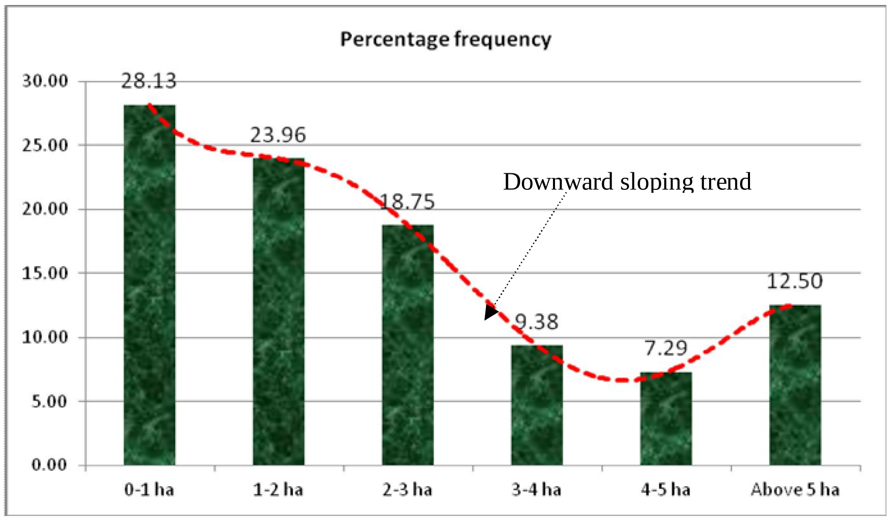

Fig. 2. Distribution of respondents by farm size.
Source: Field Survey Data, 2011.

The downward-sloping trend line reveals that as the number of hectares being considered increased, the proportion of farmers decreased. This is typical of most rural economies of the developing countries, where fewer farmers have the way withal to undertake large-scale farming operations. The implication of this is that such farmers will have less market participation capacity as often a greater proportion of the produce is used for household sustenance.

Farming experience: Farmer's farming experience was measured in years. The average farming experience was calculated as 15.87 years, showing that the respondents had many years of experience in growing cassava. Thus, they were also expected to appreciate the benefits of using the improved cassava varieties and modern technologies, including best farm management practices, and in turn were better equipped to operate more efficiently. Over 50% of all farmers had at least 14 years experience in cassava production and marketing (Fig. 3). Majority (22.92%) had experiences ranging from 20-25 years while 13.54% each had experiences of 14-19 years and above 25 years. Figure 3 shows further that 21.88% of respondents had 10-14 years of farming experience as against 17.71% with 5-9 years and 10.42% with 0-4 years' experiences.

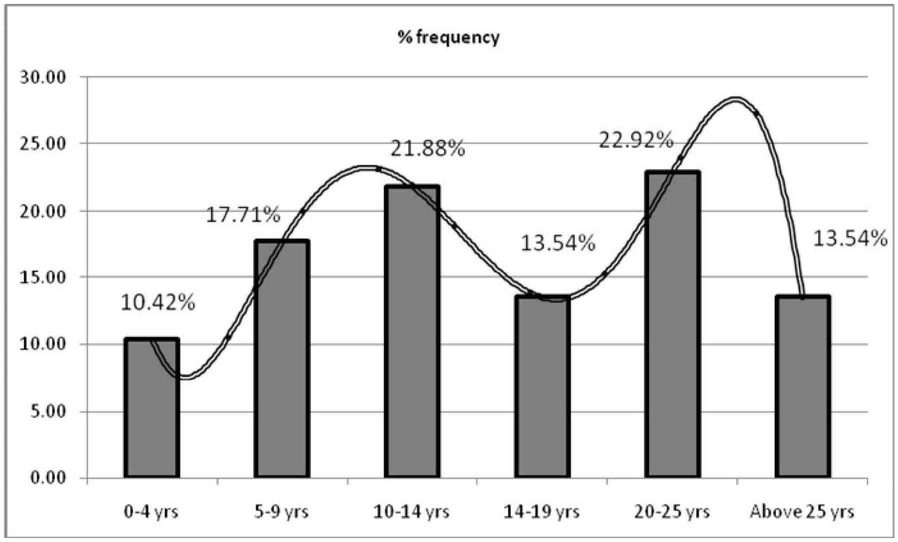

Fig. 3. Distribution of respondents by farming experience.
Source: Field Survey Data, 2011.

Farmers' levels of education: Level of education plays important role in increasing efficiency of cassava production and marketing. The higher the level of education the higher the capacity of the farmer to obtain credit, show positive attitude in terms of perception and adoption of new technology, show resilience towards further acquisition of needed skills to increase efficiency. The breakdown of respondents by levels of education is presented in Table 3.

Table 3. Breakdown of respondents by levels of education.

Level of education	Frequency	% frequency	Cumulative frequency (%)
No education	6	6.25	6.25
Primary education	26	27.08	33.33
Secondary education	45	46.88	80.21
Tertiary education (attempted & completed)	19	19.79	100.00
Total	**96**	**100.00**	**--**

Source: Field Survey Data, 2011.

The farmers having secondary educational qualification were highest and constituted 46.88% of the sample. Farmers with primary education were closet at 27.08%. Those having tertiary education constituted 19.79% of the sample while those with no formal education constituted 6.25%. Thus, a greater percentage of the farmers (93.75%) had at least primary education that was considered the basic of education in Nigeria (FME, 2015).

Farmers' exposure to farm management training: Farmer's exposure to training was defined and measured as a dummy variable: 1, if a farmer had been exposed to training and 0, if otherwise. Like the attainment of basic education, exposure to trainings and workshops on modern farming and best farming, harvesting and postharvest management practices are expected to have a big influence on farms productivity and general efficiency level. The distribution of farmers by their exposure to training on cassava best management practices is presented in Figure 4. It shows that only 28.1% of the farmers confirmed to have had previous exposure to training.

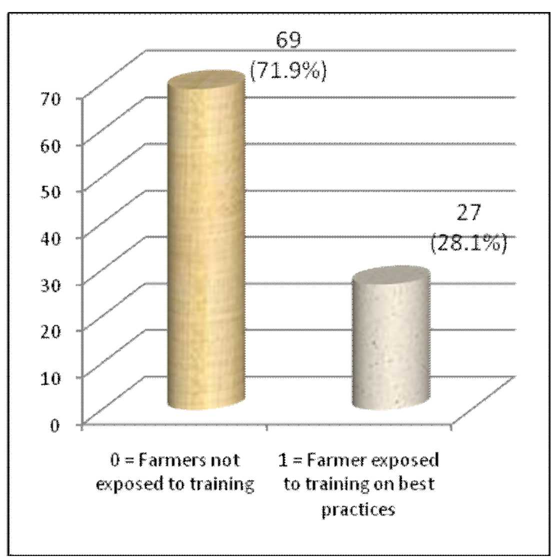

Fig. 4. Farmers exposed to farm management training.

Household size: The household size was measured as numbers of persons. The average household size was calculated as 7 persons for all respondents, 7.8 persons for the southeast and 6.75 persons for the southwest. This corroborates the finding elsewhere that the average household size in southeast Nigeria was about seven persons (Ibekwe *et al*., 2010). The household membership ranged from 1-15 persons with a standard deviation of 3.20. As shown in Fig. 5, majority of the farmers (37.5%) had from 4-6 persons resident in their households. Respondents having 1-3 resident household members constituted 8.3% while those with 7-9, 10-12 and 13-15 persons comprise of 20.8%, 19.8% and 6.3% of respondents, respectively.

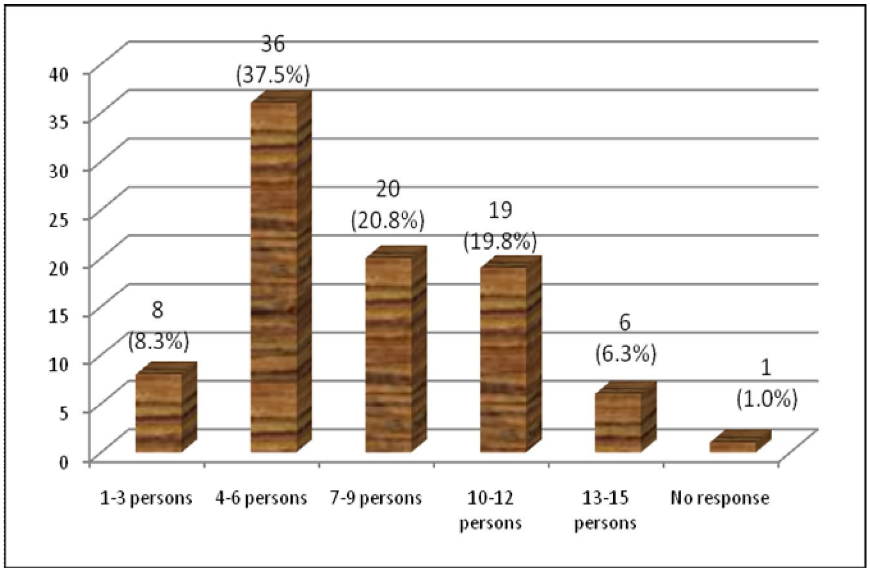

Fig. 5. Distribution of farmers by household size.

M***arital status of farmers:*** Marital status was captured as a dummy variable: 1, if a farmer had been ever married and 0, if otherwise. As reflected in Fig. 6, majority of the respondents (88.52%) were classified as ever got married. Eleven respondents (or 11.5%) did not fall into that category. The proportion compared favourably with the 82.0% and 83.8% of married farmers in other studies by Ibitoye and Onimisi (2013) and Obasi *et al*. (2013), respectively.

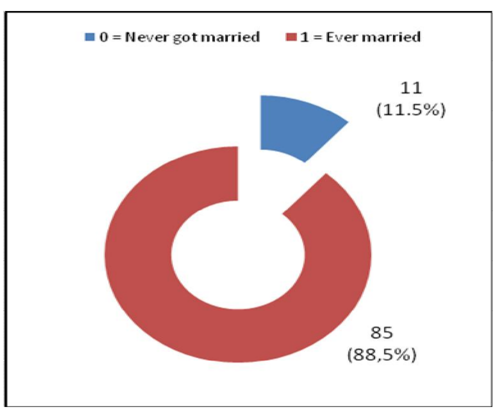

Fig. 6. Marital status of farmers.

Farmer's time devoted to cassava farming: The farmer's time devoted to farming was defined and measured as a dummy variable: 1, if a farmer works full-time and 0, if part-time. The analysis of respondents by whether they were full-time or part-time cassava farmers showed that only 32.29% was into cassava farming full-time (Fig. 7). The rest (67.71%) were actively involved in other occupations and means of livelihood while also owning cassava farms. The fact that such farmers were devoting less time and effort to cassava production could have affected negatively on both their output and efficiency.

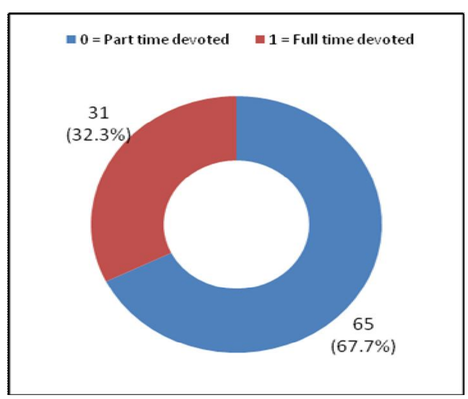

Fig. 7. Farming as primary occupation of respondents.

Among the other occupations and livelihood trades identified by the farmers were petty trading (buying and selling), civil service, general businesses, and contracts. This might result from the lack of motivation and poor returns from cassava production, which compelled most farmers to complement with other means of livelihood.

Use of improved cassava varieties: The farmers' use of improved cassava varieties was defined and captured as a dummy variable; 1, if improved varieties were planted and 0, if local or quasi-improved varieties were planted. The status of improved variety use is presented in Figure 8. It revealed that only 20.8% of farmers confirmed, they were using the improved cassava varieties. The remaining majority had relied either on the local or quasi-improved cassava species, which they had known and used for so many years. The improved cassava planting materials were cloned to be high-yielding, early maturing, and resilience to attacks of pests and diseases. The consequence of continued use of traditional varieties is low yield performance, low output, low income and waning household welfare.

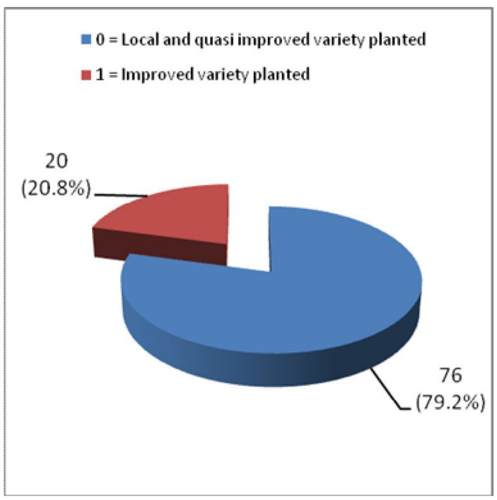

Fig. 8. Improved variety use among farmers.

Fertilizer application among farmers: In Fig. 9, the farmers' fertilizer use status is presented. Fertilizer use status was defined and measured as a dummy variable: 1, if farmer applied fertilizer and 0, if farmer did not apply. It shows that over one-half of the farmers (54.2%) confirmed use of fertilizer on their farms as against 45.8%. Like other crops, cassava benefits from the application of the right dosage of the elements of Nitrogen, Phosphorus and Potassium (NPK) fertilizer. In addition, in the absence of inorganic NPK fertilizers, farmers can use the organic fertilizer option (nutrients from plant and animal by-products, vegetable matter, including compost, manure, etc.) to immensely boost the yield of the cassava plant. Only the chemical fertilizer is captured in this study.

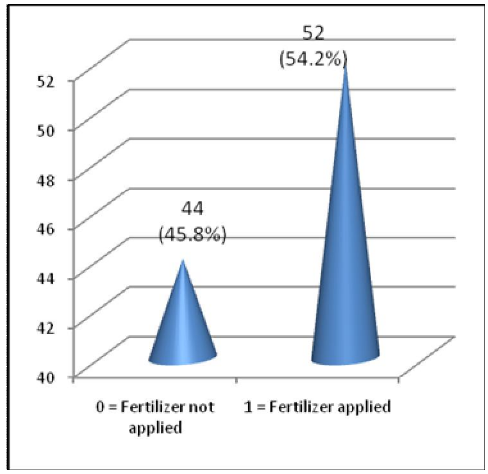

Fig. 9. Fertilizer application status of farmers.

Credit support: Ideally, agricultural credit plays an important role in the development of the agricultural sector and its use is justified by the limitations of self-finance, uncertainties associated with the levels of output and time lag between inputs and output (Kohansal and Mansoori, 2009). When not available or accessible, the capacity of the smallholders to scale-up its operations is limited and their development adversely affected. In this study, the credit support status of the farmer was measured as a dummy variable: 1, if farmer received and used credit and 0, if farmer did not receive credit. The percentage of farmers who received and used loan or credit support facility is shown to be only 6.2% (Fig. 10). Majority of the farmers were self-dependent. The implication is that most farmers were operating at low scale and on mere sustenance basis. This finding is highly correlated to the scale market participation and commercial orientation of the cassava farmers.

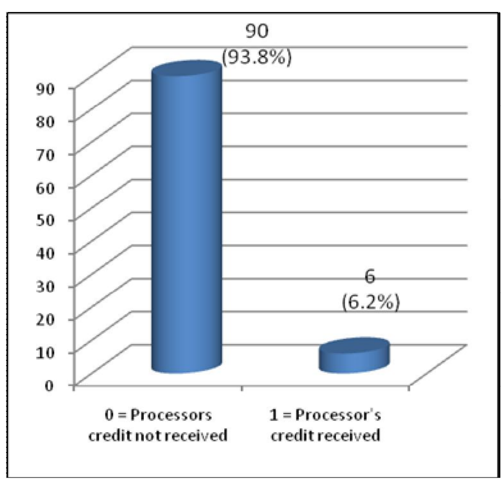

Fig. 10. Processor's credit facility to farmers.

Road access to farm fields: Also, a dummy was used to capture road access: 1, for farmers that the road to their farms was accessible and 0, if otherwise. It is shown in Fig. 11 that only 32.3% of farmers confirmed having farms that are accessible. Majority (67.7%) reported the problem of poor road network and bad terrain. This is expected to have negative effects on the production and marketing costs, farmer's income, household food security and by extension general household welfare. Describing some of the negative consequences of bad road and high transportation cost on profitability, Olukunle (2016) observed that it often cause majority of the farmers to resort to selling their products on the farm and as a result receive very low return on their investments.

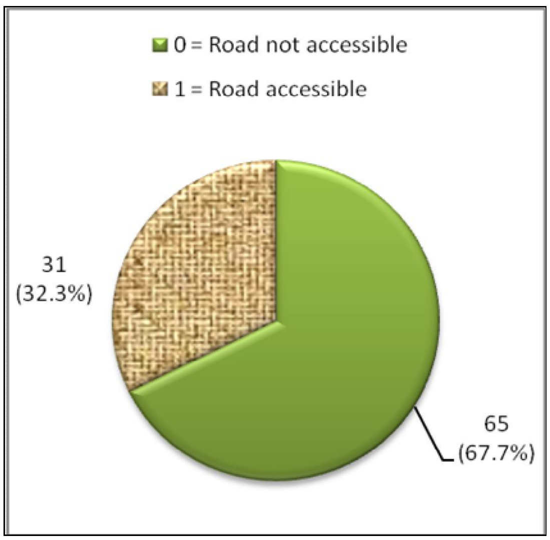

Fig. 11. Accessibility of roads to farmers' fields.

Season of harvesting: Finding on the season when cassava harvesting was done by farmers is shown in Fig. 12. Seasons of harvesting were captured dummy: 1, if farmer harvested during the rainy season, 0, if during the dry season. It shows that 45.8% of the farmers harvested their farms during the rainy season, while those that harvesting during the dry season constituted 54.2% of respondents. Generally, the choice of the time and season of harvesting cassava was a matter of convenience to the farmers. Depending on the type of variety planted and a combination of environmental and agronomic factors, the cassava plant could be harvested at 10-18 months after planting (MAP) to obtain good root yield, although it was advisable for the farmer to harvest only when there was a ready market for the roots to avoid roots deterioration and excessive loss. This has so far been proven that the best way to store cassava is to leave them on the ground because once uprooted deterioration process commences within 48-72 hours after harvesting.

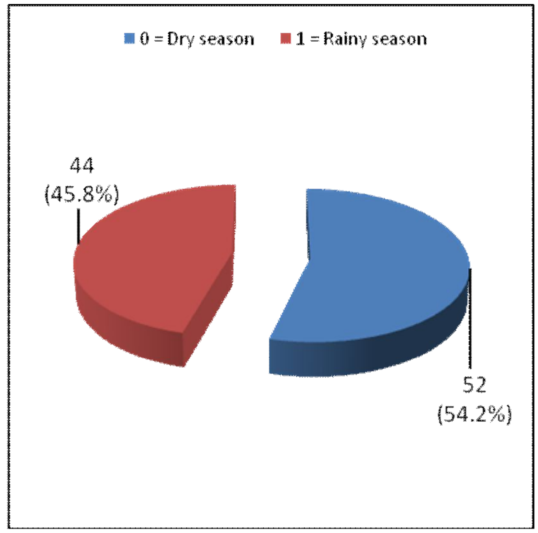

Fig. 12. Cassava harvesting seasons.

Harvesting method use by farmers: Similarly, the harvesting method was measured as dummy: 1, if harvesting was mechanical and 0, if harvesting was manual. Figure 13 shows that about 97% of the farmers did manual harvesting. This is expected considering that majority of the studied farmers are smallholders with low production scale. Except for very large farms, mechanical harvesting is often not considered a viable option.

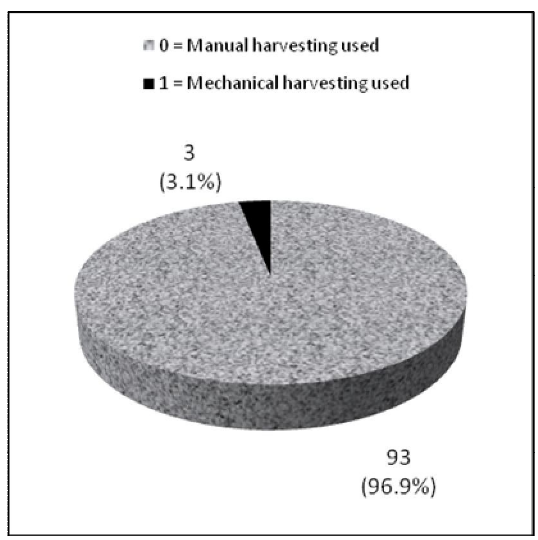

Fig. 13. Cassava harvesting methods adopted by farmers.

Market participation and farmers' characteristics

Farmers' market participation status: The market participation categories of the sampled cassava farmers are presented in Table 4. The authors classified the farmers according to whether they belonged to the high or low market participation category. High market participants were defined as farmers who sold at least 50% of their annual produce while low market participants were those that sold less than 50% of their produce.

Table 4. Distribution of farmers by market participation category.

Category	Frequency	% frequency
High participants	77	80.21
Low participants	19	19.79
Total	96	100.00

Table 4 shows that a total of 77 farmers (80.2%) make up the low participating groups while 19 farmers (19.8%) make up the high participating group. The correlation of the farmers' market participation status and farmer' characteristics is presented in Table 5.

Table 5. Correlation of market participation and farmers' characteristics.

Variables	Correlation coefficient	Probability
Age	-0.013^{ns}	0.913
Experience	0.066^{ns}	0.584
Education	0.051^{ns}	0.671
Farm size	-0.087^{ns}	0.468
Credit Access	-0.087^{ns}	0.469
Improved variety	-0.044^{ns}	0.716
Gender	-0.236^{**}	0.046
Marital status	-0.149^{ns}	0.149
Household size	-0.105^{ns}	0.382
Training	-0.184^{ns}	0.122
Harvesting season	0.073^{ns}	0.545
Fertilizer use	0.143^{ns}	0.232
Harvesting method	-0.089^{ns}	0.387
Time devoted to farming	-0.119^{ns}	0.247
Road access	-0.119^{ns}	0.247

***=significant at 1%; **=significant at 5%; *=significant at 10%; ^{ns}=not significant

Table 5 reveals the existence of positive association between market participation and farming experience, level of education, harvesting season and fertilizer use, but negative association between market participation and farmer's age, farm size, use of credit, use of improved variety, gender, and marital status. Also negative is the correlation of market participation with household size, training, harvesting method, time devoted to farming, and road access. However, only the correlation with gender was statistically significant ($p<0.05$). The coefficient is negative meaning that market participation level dropped as the consideration shifted away from considering women in favour of considering men. This was somewhat expected from the study since majority of the farmers (77.08%) were men. Another reason that may have accounted for this is the fact that an average Nigerian woman farmer will prioritize use of her farm produce for sustenance of the household that is for promotion of household food and nutrition security, before considering sale to the market. The enviable efforts of women as food producers, natural resource managers and workers and caretakers of household's food and nutrition security had been well documented (Olawoye, 1989; Quisumbing *et al*., 1995).

Comparing farmer's characteristics for the market participation categories

The output of the independent sample t-tests is presented in Table 6. The mean values of included variables are presented in column 2 for the group of the low market participants and in column 3 for the group of the high market participants. The differences in the mean values are presented in column 4.

Table 6. Comparing characteristics of high and low market participating cassava farmers.

Variables	Low Market Participants (Sales<50% of produce) (n=77)	High Market Participants (Sales≥50% of produce) (n=19)	Levene's equality of variance test		Mean difference	t-test of equality of means	
			F-value	Sig.		t-value	Sig.
Age	47.688 (9.782)	49.579 (8.520)	0.412	0.522	-1.891^{ns}	-0.773	0.442
Experience	15.857 (11.052)	15.947 (8.182)	1.312	0.255	-0.090^{ns}	-0.033	0.973
Education	2.855 (0.905)	2.947 (0.621)	4.129	0.045	-0.092^{ns}	-0.522	0.604
Farm size	2.031 (1.032)	7.711 (3.754)	45.553	0.000	-5.679^{***}	-6.534	0.000
Credit access	0.065 (0.248)	0.053 (0.229)	0.157	0.693	0.012^{ns}	0.196	0.845
Improved variety	0.221 (0.417)	0.158 (0.375)	1.646	0.203	0.063^{ns}	0.599	0.550
Gender	0.727 (0.448)	0.947 (0.229)	32.279	0.000	-0.220^{***}	-3.001	0.004
Marital status	0.870 (0.338)	0.947 (0.229)	4.134	0.045	-0.077^{ns}	-1.184	0.244
Household size	7.303 (3.323)	7.842 (2.672)	3.683	0.058	-0.539^{ns}	-0.656	0.514
Training	0.675 (0.471)	0.895 (0.315)	28.091	0.000	-0.219^{**}	-2.435	0.019
Harvesting season	0.390 (0.491)	0.737 (0.452)	6.426	0.013	-0.347^{***}	-2.945	0.006
Fertilizer use	0.519 (0.503)	0.632 (0.496)	4.900	0.029	-0.112^{ns}	-0.880	0.386
Harvesting method	0.039 (0.195)	0.000 (0.00)	3.277	0.073	0.039^{ns}	0.868	0.387
Time devoted to farming	0.351 (0.480)	0.211 (0.419)	8.260	0.005	0.140^{ns}	1.267	0.215
Road access	0.351 (0.480)	0.211 (0.419)	8.260	0.005	0.140^{ns}	1.267	0.215

***=significant at 1%; **=significant at 5%; *=significant at 10%; ^{ns}=not significant; values in parentheses are pooled standard deviation values.

It is revealed from Table 6 that the average mean values are higher for the high market participants compared with the low participants for the variables of age, farming experiences, education, farm size, gender, marital status, household size, training, season of harvesting and fertilizer use. To the contrary, lower values were recorded for credit use, improved variety use, harvesting method, farming time devotion, and road access. The mean values for the dummy variables reflect proportions of farmers in each category. For example, it is revealed for credit access and use that 6.5% of farmers used credit among the farmers in the low market participating group against 5.3% who used among those in the high market participating group. For marital status, it shows that whereas 87.0% were married among the low market participants, the proportion of married farmers among the high participants was 94.7%. Similar interpretation will go for all other dummy variables in Table 6.

However, the differences were statistically significant only for farm size, gender and harvesting season at $p<0.01$ level and training at $p<0.05$ level. They were not significant for other included characteristics. The implication is that these significant variables were relevant in distinguishing the two categories of cassava farmers in the study area. For the farm size, the results reveal that the 19 high market participants have an average farm size of 7.7 ha against the average of 2.03 ha for the 77 farmers in the low market participating group. The significance of farm size corroborates the expected high level of positive correlation between large-scale operation and market participation. As the farmers' scale of production expands, higher volumes of produce become available for sale making the farmer to be more involved in the market and marketing activities. In the same vein, similar positive correlation is expected between each of large production scale, farm size, farmer's age, and years of farming experience. As also revealed in Table 6, the average age is 47.69 years for the farmers in the low market participation category and 49.58 years for those in the high market participation categories. Although the emerging mean difference was not statistically significant, this finding observed that the older farmers have more market presence than the younger farmers could be explained on the grounds that the younger farmers might have been relatively more involved in cassava farming to meet the immediate food security needs of their households, hence they committed less proportion of their produce to the market. This could be possible when the younger farmers maintained more numbers of dependents and by implication household upkeep responsibility. Alternatively, it could have resulted from the fact that the younger farmers had relatively smaller farm sizes and needed higher proportion of their farm produce to meet up with immediate food needs of household members.

Significant difference was also found for the gender of the high versus low market participating group of farmers. The result revealed that 72.7% male farmers were in the low market participating group against 94.7% who were in the high market participating group. The finding strongly supports the generally held view that the women farmers give priority to catering for the household food security and household upkeep and will only think of selling to the market after these needs have been met. This means that almost always they have the propensity to supply below average share of total produce to the market, and usually selling at all is because they may have need to raise cash to attend to other basic needs of the household members. Evidence from literature point to the fact that play valuable role as food producers, natural resource managers and workers and caretakers of household's food and nutrition security (Olawoye, 1989; Quisumbing *et al*., 1995). In Nigeria, Anyakoha and Ozoh (1999) observed the rural Nigerian women were actively involved in all aspects of primary food production, producing up to 60 percent of the food consumed by their families while contributing significantly to the pre- and post-harvest food handling activities as producers, processors, preservers, arrangers, and distributors of food.

Result on training shows that 89.5% of the high market participants received training compared with 67.5% of the low market participants. This finding underscores the enviable role training and demonstration could have in agricultural development and cassava value chain promotion. Elsewhere, Adesoji and Farinde (2006) also found that training and demonstrations had significant positive influence on performance of arable crops farmers in Osun State, Nigeria. Constant training and retraining will continue to form part and parcel of the package of practices being delivered to farmers. The supply of improved cassava cuttings should be accompanied by rigorous but appropriate training and capacity enhancement programmes aimed at updating the farmers on modern issues on business-oriented cassava production and farm management best practices.

The last among the significant factors is the harvesting season, which indicated that 39.0% of farmers in the low market participating group harvested during the rainy season compared to 73.7% who harvested during the rainy season among the high participating group. It is normal for the soil to be softer during the rainy season, making harvesting operation less tedious, less time consuming and less expensive since the farmer pays less to hire labour. The finding was suggesting that farmers targeting the market carried out more of their harvesting activity during the rainy season thereby reducing the cost of harvesting to the barest possible minimum. Due to its unique nature as a susceptible crop, which once uprooted commenced process of deterioration within 48-72 hours after harvesting, the farmers' wisest and safest means of preserving the cassava plant was to leave it in the ground not harvested. Consequently, it was usual for the farmers to differ the harvesting of the portion needed for household use according to the household's convenience.

Conclusion

The characteristics of the smallholder cassava farmers affiliated to the two commercial starch processing factories in Nigeria were analyzed and compared on the basis of their market participation status. Results among other things revealed that although higher mean values were found for the high market participating farmers with respect to age, years of farming experience, level of education and household size, the recorded differences were not statistically significant in comparison to the low market participating group. Equally not significant differences were recorded in the relative ratios for marital status, use of fertilizer, use of improved stems, credit access, harvesting method, time devoted to farming, and road access. However, farm size, gender, attendance to trainings, and season of harvest returned significant differences. These significant variables were relevant in distinguishing the two categories of cassava farmers in the study area and should be highly emphasized in the effort to promote business-oriented cassava farming in Nigeria.

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