



Yuzuncu Yil University
Journal of Agricultural Sciences
(Yüzüncü Yıl Üniversitesi Tarım Bilimleri Dergisi)

<https://dergipark.org.tr/en/pub/yyutbd>



ISSN: 1308-7576

e-ISSN: 1308-7584

Research Article

Correlates and Determinants of Involvement in Sweetpotato Production among Farming Households in Niger-Delta Area of Nigeria

Ogheneakpobor OYIBO*¹, Stella O. ODEBODE²

¹Federal College of Education (Technical), School of Vocational Education, Department of Agricultural Education, Asaba, Nigeria

²University of Ibadan, Faculty of Agriculture, Department of Agricultural Extension and Rural Development, Ibadan, Nigeria

¹<https://orcid.org/0000-0002-5719-3486>, ²<https://orcid.org/0000-0002-3582-0768>

*Corresponding author: ooyibo3176@stu.ui.edu.ng

Article Info

Received: 30.01.2023

Accepted: 06.06.2023

Online published: 15.09.2023

DOI: 10.29133/yyutbd.1139973

Keywords

Constraints to Sweetpotato, Involvement, Niger Delta, Production, Rural Farming households

Abstract: Information on determinants of involvement in sweetpotato production (SPP) in Niger-Delta Area of Nigeria is scarce. Determinants of involvement in SPP among farming households in Niger-Delta Area of Nigeria were therefore assessed. Multi-stage sampling procedure was used to select 330 respondents. Data were collected through structured interview schedule and analysed using descriptive statistics, Chi-square, Pearson Product Moment Correlation-PPMC and logistic regression. Age and household size of respondents were 42.9 ± 11.9 years and 8.7 ± 5.5 persons, respectively. Most respondents were female (53.3%), while 94.5% had no extension contact. Farming experience and farm size were 21.1 ± 12.9 years and 5.4 ± 5.1 ha, respectively. Employed labour per sweetpotato (SP) production cycle, SP farm size and farming experience were 8 ± 6 persons, 2.6 ± 3.5 ha and 18 ± 12 years, respectively. Income from SP, other crops enterprises and non-crop livelihood activities were ₦2 637 552.0 \pm 3 362 512.0 yearly, ₦5 283 845.0 \pm 6 147 413.0 yearly and ₦1 733 562.0 \pm 2 175 223.0 yearly, respectively. Most respondents (56.4%) produced above one cycle per year. Limited knowledge on processing of SP ($\bar{x}=1.88$) was the major constraint to SPP. Above half (51.8%) of the respondents had low involvement in SPP. Gender ($\chi^2=6.79$), household size ($r=0.12$), farm size ($r=0.19$), farming experience ($r=0.12$) and income from SP ($r=0.19$) were significantly related to level of involvement in SPP. Government and other stakeholders should organise intervention (training and workshop) on increasing income from sweet potato production.

To Cite: Oyibo, O, Odebode, S O, 2023. Correlates and Determinants of Involvement in Sweetpotato Production among Farming Households in Niger-Delta Area of Nigeria. *Yuzuncu Yil University Journal of Agricultural Sciences*, 33(3): 377-388. DOI: <https://doi.org/10.29133/yyutbd.1139973>

1. Introduction

Sweetpotato (*Ipomoea batatas* [L.] Lam) is an important storage root crop that is widely grown as a vital staple food in many part of the tropical and subtropical regions of the world, which includes many developing countries (Odebode et al., 2008). Empirical analyses have established diverse advantage of sweetpotato (SP) over other root and tuber crops (Onumah et al., 2012; Olapade and Ogunade, 2014). These, among others, include low demand on soil nutrient, tolerant of drought; ability of producing reasonable yields in agro-ecological zones where other crops would fail; low external input

requirement; flexibility in planting and harvesting period; ability to be cultivated thrice per annum; and potential for being used as substitute for yam, Irish-potato and cocoyam.

Apart from its advantage over other root and tuber crops, SP has nutritional and therapeutic benefits as well as economic benefits. Meludu (2010) reported that its leaves, shoots and storage roots are valuable sources of complex carbohydrates; proteins; oil; vitamins; beta-carotene; minerals which are essential for human health and body functioning; dietary insoluble fibre which helps to prevent constipation; soluble fibre which plays a role in reducing cholesterol; dietary fiber; and low crude fibre. Akoroda (2008) noted that it supplies raw materials to industries in diverse developed and developing countries. Its production by low-income farmers has served as source of income for approximately 600 million people in developing countries of the world (CIP, 2005). The foregoing, makes SPP to play a big diet, food security, economic, and poverty reducing role to farming households as well as poor and undernourished people in developing countries. Thus, SP has the potential of playing an important role improving the economy of developing countries.

Nigeria, realising the potential of SP to her economy, has vigorously promoted improved production of the crop through several efforts (in form of policies, projects and programmes). The efforts among others include establishment of Root and Tuber Expansion Programme (RTEP) *vis a vis* National Root Crops Research Institute (NRCRI). However, in spite of these efforts by the Nigeria government, SPP status is still low in the country. According to Nwanebo (2012), SP is still grossly under-explored in the country due to fact that its production status is low. Also, Adewumi and Adebayo (2008) noted that its level of production still remain low in the country. Nigeria produce approximately 3.46 – 3.92 million tonnes of SP per annum, which accounts for 3.7 percent of world production (FAOSTAT, 2017). China, in contrast to Nigeria, produces 71-76 million tonnes of SP per annum and accounts for 67-74 per cent of the world SPP (Sugri et al., 2017). These are indications of inadequate production status of SP in Nigeria.

In Nigeria, Niger-Delta Area of Nigeria is known for good agricultural soil as well as tropical climate, suitable for high production status in root and tuber crops. The foregoing, suggests that the area possesses advantageous environmental, ecological and climatic factors required for high level production of SP. Empirical analysis has shown there is a direct relationship between good environmental, ecological and climatic factors with high level production of crops (Oyibo, 2015). Hence, it is expected that Niger-Delta Area of Nigeria should rank as the leading producer of SP in the country. However, empirical analysis has shown that Niger-Delta Area of Nigeria ranks second, surpassed by North-Central region of Nigeria (NFRA, 2007; Egeonu, 2011). The region produces approximately 520 thousand tonnes of SP per annum and account for 15 per cent of the country SPP. In contrast to Niger-Delta Area of Nigeria, North-Central region of Nigeria produces approximately 140 thousand tonnes of SP per annum and account for 40.6 per cent of the country's SPP. Niger-Delta Area of Nigeria account for 0.49 percent of the world SPP. Sichuan province of China, in contrast to Niger-Delta Area of Nigeria, accounts for 18.5 per cent of world SPP and produces 19.4 million tonnes per annum (Ogundele et al., 2009). These are indications of inadequate and/or low production level of SP in Niger-Delta Area of Nigeria. This suggests that the SPP in Niger-Delta Area of Nigeria demands scientific investigation. Empirical analysis has shown a positive correlation between level of involvement (intensity)-LI in SPP and SPP status (Nwanebo, 2012). Hence, to combat low level of SPP in Nigeria *vis a vis* Niger-Delta Area of Nigeria, cognizance should be given to other variables such as LI in SPP, constraints to SPP and determinants of involvement in SPP.

While there is a number of studies and literature on SP, the LI of farming households (FHs) in SPP and the consequent factors associated with involvement in SPP, particularly, in Niger-Delta Area of Nigeria have not been well explored. For example, Aboajah et al. (2018) assessed SPP for poverty alleviation in Nasarawa State, Nigeria. Ahmed et al. (2014) assessed efficiency of SP farmers in Nigeria: potentials for food security and poverty alleviation. Nwanebo (2012) assessed the factors associated with SPP among rural farmers in Imo State. These studies run short of the determinants of involvement of FHs in SPP. Thus, there is a gap in fathoming the exact determinants of involvement in SPP in terms of empirical predictors of involvement status (IS) in SPP of FHs. This study has attempted to fill the gap by assessing the level of farming households' involvement in SPP in Niger-Delta Area of Nigeria, constraints to SPP and determinants of farming households' involvement in SPP.

The general objective of the study is to ascertain the determinants of involvement in SPP among FHs in Niger-Delta Area of Nigeria. The specific objectives were to: describe the demographic

characteristics of SP farmers; examine the enterprise characteristics of SP farmers; ascertain the constraints to SPP; and establish the LI in SPP. Based on the objectives of the study, the following hypothesis were tested: there is no significant relationship between selected demographic characteristics and LI in SPP; there is no significant relationship between selected enterprise characteristics and LI in SPP; and there is no significant relationship between constraints to SPP and LI in SPP; there is no significant contribution of selected independent variables to IS in SPP.

2. Material and Methods

2.1. Study area

The study was carried out in Niger-Delta Area of Nigeria. The study area comprises nine coastal southern Nigerian states, namely: Edo, Delta, Bayelsa, Rivers, Akwa Ibom, Cross Rivers, Ondo, Imo and Abia (UNDP, 2006).

2.2. Population and sampling procedure

The population of the study comprised all SP FHs. Multi-stage sampling procedure was used to select respondents. The first stage involved random selection of 3 states out of the nine states in the study area, the states sampled were Bayelsa, Delta and Edo. Each of the states has three agricultural development programmes-ADPs zones. The second stage involved the purposive sampling of five ADPs zones out of the nine ADP zones in the selected states based on predominance of SPP. Thus, Delta-Central and Delta-South from Delta state; Yenagoa and Sagbama from Bayelsa state; and Edo-North from Edo State were purposively selected. The third stage involved stratification of the blocks in each of the selected zones into SP and non-SP producing blocks. The SP producing blocks were five and four in Delta-Central and Delta-South zones, respectively; seven and three in Yenagoa and Sagbama zones, respectively; and six in Edo-North zone.

The fourth stage involved random sampling of 40% of the SP producing blocks in the selected zones. The blocks sampled were Ughelli-South and Ughelli-North from Delta-Central zone; Patani and Bomadi from Delta-South zone; Atissa, Epie and Gbarain from Yenagoa zone; Sagbama from Sagbama zone; and Agenebode and Ekperi from Edo-North zone. The cells that are known for SP production in each of the selected block were identified. Altogether, 52 cells were identified in the selected blocks. The fifth stage involved random sampling of 25% of the SP producing cells in the selected blocks. The final stage involved the random sampling of 20% SP FHs from each of the selected cells to give a total of 330 SP FHs (111 from Bayelsa State, 114 from Delta State, and 105 from Edo State). The farmers responsible for SPP were interviewed in each of the selected households.

2.3. Data collection

Primary data were obtained through the use of interview schedule. The interview schedule captured information on demographic and enterprise characteristics, constraints to SPP and level of involvement (intensity) in SPP.

2.4. Measurement of variables

Constraints to SPP was measured at interval level. A list of 23 possible constraints which inhibit SPP was presented to respondents. The severity of the 23 possible constraints to SPP was measured. Response was rated using a three-point rating scale of “Severe constraint (2)”, “Mild constraint (1)”, and “Not a constraint (0)”. A minimum score of 8 and maximum score of 36 were obtained from the 23 constraint items. The mean value of each item was computed and used to rank the constraints in order of severity. In addition, an index of constraints to SPP was generated by adding all the responses. The mean (26.00±5.00) of the index of constraints to SPP was used to categorise respondents into high (26.00–36.00) and low (8.00–25.99) constraints categories using the above and below the mean score criterion.

Involvement (intensity) in SPP was measured at interval level. Sweetpotato farm size, number of employees, years of involvement and number of production cycles were used to derive involvement by adapting the involvement index of Samuel (2020). Involvement (intensity) in SPP was

operationalised by standardising and adding together scores from; SP farm size, years of involvement, number of employees utilised in SPP, and number of SP cycles operated per annum, to give a composite involvement index score. The minimum values of 0.00 and maximum values of 39.20 were obtained from the involvement index. The mean ($\bar{x}=15.15$) was used to categorise respondents into: high involvement in SPP (15.15-39.17) and low involvement in SPP (0.00-15.14) using the above and below the mean score criterion, respectively.

2.5. Data analysis

The data collected were entered into Statistical Package for Social Science-SPSS (version 20), and were analysed using descriptive statistics (frequency counts, percentages, means and standard deviation) and inferential statistics (Chi-square, PPMC and logistic regression model). Chi-square and PPMC were used to test hypothesis one (H_{01}). The PPMC was also used to evaluate hypothesis two (H_{02}) and hypothesis three (H_{03}). Binary logistic regression was used to ascertain the significant determinants of involvement status. The logistic regression model used is expressed as follow:

$$P_i = P [Y_i = 1/x_i] = \frac{\exp(\beta_1 + \beta_2 X_i)}{(1 + \exp(\beta_1 + \beta_2 X_i))^2} \tag{1}$$

Where, P lies between 0 and 1 ($0 < P_i < 1$).

The P_i is the dependent binary variable (1 for high involvement in SPP and 0 otherwise) and X_i is the independent variable. Where: $i = 1, 2, 3 \dots 10$.

X_1 = age of farmer (years), X_2 = sex (male = 1, female = 0), X_3 = household size (number of persons), X_4 = total farming experience (years), X_5 = total farm size (hectare), X_6 = income from SP, X_7 = income from other cultivated crops, X_8 = income from non-crop enterprise, X_9 = constraints to SPP, X_{10} = number of extension contact

3. Results

3.1. Demographic characteristics of respondents'

The result on age distribution of respondents reveals that the mean age was 43 ± 10 years (Table 1). A little above average (53.3%) of the respondents were female. The mean household size of respondents was 9 ± 6 persons. Also, only Few (4.4%) of SP producers had extension contact.

Table 1. Demographic characteristics of SP producers

Variables	Categories	%	Mean \pm SD
Age (years)	≤ 20	0.6	42.90 ± 11.94 years
	21 – 30	16.1	
	31 – 40	33.6	
	41 – 50	26.1	
	> 50	23.7	
Gender of respondents	Male	46.7	
	Female	53.3	
Household size (persons)	1 – 5 persons	30.0	8.7 ± 5.5 persons
	6 – 10 persons	50.0	
	> 10 persons	20.0	
Extension contact	Yes	4.4	

3.2. Characteristics of enterprise

The average farm size was 5.43 ± 5.10 ha as shown in Table 2. The respondents cultivated an average SP farm size of 2.60 ± 3.49 ha. The mean years of farming experience was 21 ± 13 years. The mean years of SPP experience was 18 ± 12 years. A larger percent (56.4%) of the respondents were able to do above one SP cycle per annum. The mean number of employees per production cycle was 8 ± 6

persons. The mean annual income realized from SPP was ₦2 637 552.0 ± 3 362 512.0. This translates to ₦219 796.0 income made by the respondents per month from SPP. The mean annual farm income from other crop production was ₦5 283 845.0 ± 6 147 413.0. The respondents had mean yearly income of ₦1 733 562.0 ± 2 175 223.0 from non-crop livelihood activities.

Table 2. Distribution of respondents according to enterprise characteristics

Variables	Categories	%	Mean ± SD
Farm size possessed (hectares)	≤ 1	3.0	5.43 ± 5.10
	1.01 – 2.00	15.5	
	> 2	81.6	
Farm size cultivated with SP (hectares)	≤ 1	34.5	2.60 ± 3.49
	1.01 – 2.00	29.7	
	> 2	35.8	
Farming experience (years)	1 – 10	26.4	21.07 ± 12.85
	11 – 20	35.5	
	> 20	38.2	
Sweetpotato growing experience (years)	1 – 10	40.6	18 ± 12
	11 – 20	32.4	
	> 20	27.1	
Number of SPP cycles per year	One	43.6	8 ± 6 person
	Two	50.0	
	Three	6.4	
Number of hired hands/employees per SPP cycle (persons)	None	4.2	8 ± 6 person
	1 - 10	79.4	
	11 – 20	12.7	
Income from SP (₦)	> 20	3.3	2 637 552.0 ± 3 362 512.0
	≤ 800 000.0	23.6	
	800 000.1 – 1 600 000.0	25.2	
Income from other crop cultivated (₦)	> 1 600 000.0	51.3	5 283 845.0 ± 6 147 413.0
	None	2.1	
	≤ 800 000.0	7.9	
Income from non-crop livelihood activities (₦)	800 000.1 – 1 600 000.0	13.9	1 733 561.5 ± 2 175 223.0
	Above 1 600 000.0	76.0	
	None	60.6	
	≤ 800 000.0	17.6	
	800 000.1 – 1 600 000.0	8.5	
	Above 1 600 000.0	13.2	

3.3. Constraints to SPP

The results (Table 3) reveal that on the overall, limited knowledge of processing of SP ($\bar{x}=1.88\pm 0.38$) ranked first as the most serious constraint. Inadequate capital ($\bar{x}=1.86\pm 0.40$) and lack of credit facilities ($\bar{x}=1.83\pm 0.41$) ranked second and third on the list of constraints, respectively.

Table 3. Constraints to SPP

Items	Mean	SD	Rank
Limited knowledge on processing of SP	1.88	0.38	1 st
Inadequate capital	1.86	0.40	2 nd
Lack of credit facilities	1.83	0.41	3 rd
Flooding	1.77	0.58	4 th
Sweetpotato pests	1.71	0.52	5 th
Low cash value per unit of weight	1.68	0.59	6 th
Poor extension services	1.65	0.73	7 th
Difficulties associated with transportation in tropical condition	1.61	0.70	8 th
Drought	1.57	0.74	9 th
Few markets	1.56	0.74	10 th
Poor storability	1.53	0.77	11 th
High susceptibility to disease	1.40	0.76	12 th
Lack of improved cultivars	1.19	0.87	13 th
Inadequacy of seedling at planting time	1.15	0.86	14 th
Low yield	1.13	0.81	15 th
Sweetpotato is being overlooked by consumer	1.03	0.87	15 th
Unavailability of land	0.79	0.89	16 th
Herders men attack	0.57	0.90	17 th
Lack of chemical	0.04	0.29	18 th
Inadequacy of labourers	0.03	0.25	19 th
Lack of machine	0.01	0.11	20 th
Lack of fertilizer	0.01	0.11	20 th
Lack of irrigation facilities	0.003	0.06	22 nd

3.3.2. Categorisation of respondents based on constraints to SPP

Result of analysis of the constraints to SPP, as seen in Table 4, reveals that 57.0% of the respondents had high constraints to SPP.

Table 4. Categorisation of respondents based on constraints to SPP

Constraints to SPP	Freq.	%	Minimum	Maximum	Mean	SD
Low (8.00 – 25.97)	142	43.0	8.00	36.00	25.98	5.24
High (25.98 – 36.00)	188	57.0				

3.4. Involvement in SPP

Table 5 indicates the result of SP farming variables pooled together to measure involvement of FHs in SPP. Table 6 shows that a little above average (51.8%) of the FHs had low involvement in SPP.

Table 5. Distribution of farmers' involvement in SP farming enterprise

Variables	Categories	Percentages
Farm size involved (hectares)	≤ 1	34.5
	1.01 – 2.00	29.7
	> 2	35.8
Years of involvement	1 – 10	40.6
	11 – 20	32.4
	> 20	27.1
Number of SP cycles	One	43.6
	Two	50.0
	Three	6.4
	None	4.2
Number of hired hands (persons)	1 - 10	79.4
	11 – 20	12.7
	> 20	3.3

Table 6. Categorisation of farmers based on their involvement in SP farming enterprise

Involvement	%	Minimum score	Maximum score	Mean	SD
Low (0.00 – 15.14)	51.8	0.00	39.17	15.15	6.73
High (15.15 – 39.17)	48.2				

3.5. Hypothesis one (H₀₁): There is no significant relationship between selected demographic characteristics and LI in SPP of FHs

Results in Table 7 show that respondents gender ($\chi^2=6.79$) and household size ($r=0.12$) were significantly ($p < 0.05$) related to involvement in SPP.

The relationship between gender of respondents and IS in SPP depict that SP producers' gender influence their IS. Table 8 shows that most (54.1%) of the male farmers had high involvement, while the female farmers (60.2%) had low involvement.

Table 7. Chi-square and PPMC analyses of selected demographic characteristics and involvement in SPP

Variables	Df	χ^2	r-value	p-value
Age	-	-	0.06	0.29
Sex	1	6.79*	-	0.01
Household size	-	-	0.12*	0.03
Membership of SP association	1	1.04	-	0.31
Extension contact	-	-	0.06	0.29

Note: df = Degree of Freedom, χ^2 = Chi-square Coefficient, r = Correlation coefficient. *Significant at $p \leq 0.05$.

Table 8. Crosstab analysis of selected demographic characteristic and involvement in SPP

Variable	Categories	Involvement		Total
		Low	High	
Gender of respondent	Male	68 (39.8)	86 (54.1)	154 (46.7)
	Female	103 (60.2)	73 (45.9)	176 (53.3)

Note: Values in parentheses are percentage scores.

3.6. Hypothesis two (H₀₂): There is no significant relationship between selected enterprise characteristics and involvement in SPP of FHs

Pearson Product Moment Correlation results in Table 9 shows that farm size ($r = 0.19$), farming experience ($r = 0.12$) and income from SP ($r = 0.19$) were significantly ($p < 0.05$) associated with involvement in SPP.

Table 9. Pearson Product Moment Correlation analysis of selected enterprise characteristics and involvement in SPP

Variables	r-value	p-value
Farm size	0.188*	0.00
Farming experience	0.120*	0.03
Income from SP	0.190*	0.00
Income from other cultivated crops	0.103	0.06
Income from non-crop activities	-0.066	0.46

Note: r = Correlation coefficient, *Significant at $p \leq 0.05$.

3.7. Hypothesis three (H₀₃): There is no significant relationship between the constraints to SPP and LI in SPP

The result in Table 10 indicates that there was no significant correlation between constraints to SPP and involvement in SPP ($r = -0.008$, $p > 0.05$).

Table 10. Pearson Product Moment Correlation analysis between constraints to SPP and involvement in SPP

Variable	r-value	p-value
Constraints	-0.01	0.88

Note: r = Correlation coefficient, Significant at $p \leq 0.05$.

3.8. Hypothesis four (H₀₄): Selected independent variables have no significant contribution to IS in SPP of FHs

Table 11 reveals that none of the selected independent variables had positive and significant relationship with the likelihood of high involvement in SPP at 5% level of significance.

Table 11. Factors determining farmers' high involvement in SPP

Predictors	Coefficient	Std. Error	z	P> z
Age	-0.04	0.03	1.83	0.18
Gender (Male)	0.58	0.41	1.95	0.16
Household size	-0.01	0.04	0.12	0.73
Number of extension contact	0.37	0.22	2.83	0.09
Total crop farm size	-0.02	0.08	0.03	0.86
Total years of farming experience	0.03	0.03	1.16	0.28
Income from SP	0.00	0.00	1.66	0.20
Income from other cultivated crops	0.00	0.00	0.02	0.90
Income from non-crop enterprises	0.00	0.00	0.92	0.34
Index of constraints	0.04	0.04	1.01	0.32

Significant at 5%.

4. Discussion and Conclusion

The SP farmers were middle aged, which implies that they were predominantly in their economically productive ages and have the energy to meet the labour demands of SPP. Hence, respondents can actively and/or energetically engage in SPP. This corroborates Eforuoku (2018) who asserted that middle-aged people are the most actively involve farmers in agricultural production, which is rooted in their agile and energetic nature. Middle and active aged people holds more promise for high involvement in agricultural production as most middle aged farmers are not only mature and having streams of income from diverse income generating activities which aids their timely inputs procurement, but also have the vigour to work on their farms (Alabi, 2019). This result is in tandem with the findings of Ahmed et al. (2014) that majority (61.7%) of SP producers were between the age range of 30 and 49 years. It was observed that farmers' dominance in SPP is slightly skewed towards female. The slightly dominance of female over male is similar to the findings of Mmasa (2014); he found relatively more dominance of female in SPP. The dominance of female over male may be partly due to the fact that SP is considered as a minor crop as it does not command a place over cassava, yam or plantain in the market, hence, most males are not farming SP. This is in line with Nwanebo (2012) who reported that SP is regarded agriculturally as a minor crop. Furthermore, the sex distribution of respondents is likely to affect involvement level (IL), as female are likely to have less energy to meet up with the labour demand of SPP *vis a vis* access to productive resources as well as control over decision, income, asserts and choices, hence, may have low IS. This corroborate Nwanebo (2012) who asserted that the physical demand in SPP discourage female from highly involving in SPP.

It could be deduced that the respondents have a large household size, which is considerably high when compared to the average Nigeria household size of 6 persons in rural communities (NBS, 2016). The result agreed with Mbanaso (2011) and Chinedu et al. (2022) who found large household size among SP and rice FHs in South-Eastern Nigeria, respectively. The implication is that more family labour would likely be available to meet the labour requirement for high involvement in SPP by the respondents. This is in line with Eforuoku (2018) who posited that the larger the family size, the more the number of family members utilised as source of farm labour. The large household size could be as a result of the likely need for large family size, which serve as source labour in the farm. Oyibo (2020) posits that the need for family labour as source of farm labour has led to large family size by FHs.

Household size could influence respondents' IS, because household size serves as source of family labour, which influence size of land cultivated. The SP farmers generally had less extension contact. This is consistent with Abdulkarim and Yunana (2015) who reported that 91.7% of SP producers had no extension contact. The implication is that respondents are likely not to be exposed to relevant SPP and processing technologies disseminated by extension agents. Extension contact exposes farmers to agricultural innovations and technologies (Mbanaso, 2011). The non-extension contact could likely be due to non-membership in farmers association. Agwu (2000) posits that farmers' organisations offer an effective medium for extension contact.

It was observed that the mean of total farm size is not above 6 ha. This implied that irrespective of the crops cultivated, the SP producers are generally small holder or small scale farmers. The result agrees with the finding of Nwanebo (2012) that SP FHs practice crops production on a small-scale level. Mbanaso (2011) classified farm holders in Nigeria into three categories of large, medium and small farm size holders, representing greater than 10 ha, 6 - 9.99 ha and less than 6 ha, respectively. The total farm size distribution of respondents is likely to affect IS in SPP, as small scale farmers are more likely to practice land fragmentation. Thus, higher likelihood of respondents to allocate small farm size to SPP, thereby decreasing/reducing their SPP potential or capabilities, hence, may have inadequate IS. Earlier study by Nwanebo (2012) found that small scale farmers were moderately involved in SPP. She further found that majority (74.1%) of small farm size holders did not cultivate SP as a main crop.

The SP farmers were relatively experienced in agricultural production having been in farming business for over two decades. This support Alabi (2019) who found that crop farmers in Nigeria are seasoned with mean farming experience of 20±13 years. The high presence of respondents with crops production experience, suggests that they would have amassed a relatively degree of crops production knowledge over time that would make them capable of determining necessary action to take as regard their crop farming activities. This corroborates the position of Olajide (2014) that experience contributes to farmers' ability to improve on their farm activities. Furthermore, the farming experience of respondents is likely to affect IS in SPP, as farmers with high farming experience are more likely to be broaden in knowledge and/or experience in their diverse crop production enterprises (including SPP), hence, have adequate involvement in SPP. Study by Ezeh (2013) found that farming experience is directly proportional to knowledge acquired in tackling farm production constraints, thereby, enhancing high involvement in farming. There was dominance of SP farmers with above one SP cycle per annum; implying considerable maximization of SP cycles possible for SPP in a year. There is dominance of SP farmers with at least 8 employees, suggesting and confirming the dominance of small scale operation of SP farming amongst the farmers. The monthly income from SPP suggests that most of the SP farmers earned above the monthly minimum wage (₦30 000.0) of civil servants in Nigeria. The implication is that SP farming can be a good source of income for FHs. Furthermore, the income earned from SPP is likely to affect involvement in SPP, as farmers earning considerably high income from SP are more likely to commit more effort and resources to SPP, hence, have high involvement in SPP.

The yearly income realized from other crops production is fairly high. This suggests that non-SP crops enterprises are good source of income for the SP FHs. The implication is that apart from SP enterprise, the respondents realized considerably income from other crops production. Income derivable by SP FHs from other crops production will not only serve to better enhance their living standards but also go a long way in determining if they will have adequate involvement in SPP. The yearly income from non-crop livelihood activities suggests that most of the SP producers were not involved in non-crop livelihood activities. The result also indicates that majority of the respondents were not involved in any livelihood activities except crop enterprises. The implication is that SP farmers were committed to SP and non-SP crop productions and took crop farming as their major livelihood activities.

The respondents cited limited knowledge of processing of SP, inadequate capital and lack of credit facilities as major barrier limiting their SPP. It has been observed that majority of the rural farmers lack alternative SP processing knowledge apart from boiling as well as the simple slicing and frying. This majorly constitute a huge hindrance in earning high income from SP as farmers are unable to add value to the crop. This finding is in consonance with Nwanebo (2012) who also emphasised lack of knowledge on processing of SP as one of the prominent constraints faced by SP farmers. Constraints to SPP due to limited knowledge of processing of SP could be as a result of no contact with extension agents. Contact with extension agents leads to more efficient transmission of information on improved practices and new technology or innovation to farmers (Adewumi and Adebayo, 2008) as well as

enhancing their knowledge level on processing technology. It is noted that inadequate capital and lack of credit facilities are among the constraints to respondents' SPP. The issues of inadequate capital and lack of credit facilities are consistently recurring constraints to SP farmers. Study by Odebo et al. (2008) pointed out that inadequate financial resources and lack of credit facilities are major hindrance to SP producers. Inadequate capital is expected to hamper respondents because high SPP required capital or money as farmers needed money to acquire large farm land and pay farm labourers, which is usually not available and they tend to seek for assistance from government and its agencies in this regard for funds. A closer look at the constraints to SPP showed that SP farmers had high constraints to SPP. The implication is that SP farmers in Niger-Delta Area of Nigeria had high constraints to SPP, which invariably might negatively affect involvement in SPP.

A closer look at the IS in SPP showed that SP farmers had relatively low IS in SPP in terms of SP farm size and employees. The result corroborates Nwanebo (2012) who found that more (59.7%) of SP producers were lowly involved in SPP. This suggest that the farmers were not channelling enough energy (committing themselves) and resources into their SP farming enterprise as they faced obstacles that prevent them from highly involving in SP farming business. This corroborate Samuel (2019) who reported that constraints faced by farmers affected their LI. The low involvement in SPP might be to poor access to extension service and poor demand of sweet potato (Nwanebo, 2012).

The relationship between gender of respondents and IS in SPP depict that SP producers' gender influence IS. It was also observed that more of the male respondents had high LI, while the female respondents had low LI, which suggests that male farmers were more involved in SPP than female farmers. This implies that the males are more poised to having high involvement in SPP. The result disagreed with Nwanebo (2012) who reported that female farmers had high LI in SPP than the male farmers. It is noted that males have more control over decisions, incomes, choices, assets and productive resources (such as land and credit facilities) than female farmers (Oyesola and Ademola, 2012), hence they will be more likely to have high IS in SPP. The positive correlation between household size and IS implies that the larger the household size, the higher the IS in SPP. Household size influence the cultivated size of SP farm, number of times SP is produced per annum, SPP experience and paid employees, which can shape IS. This may be due to the fact that household members supply available family labour on the SP farms, which can positively influence the SP hectrages as well as numbers of SP cycles per annum. Also, large household size increased the number of members of the household that is drawn as family labour to assist in SPP which could likely translates into more SP income, and by extension, more resources or ability to increase the number of paid employees. In addition, increase in household size make it easy for farmers to deploy family labour from their household size for SPP, hence, farmers will be able to engage in yearly production of SP, which can shape production experience. The result disagreed with Bawa et al. (2010) who observed no significant correlation between household size and IS.

The positive correlation between total farm size and IL in SPP indicates that the larger the total farm, the higher the LI in SPP. This implies that the total farm size which translates to scale of agricultural enterprise or production can affect the LI in SPP. It is expected that with increased total farm size, there is likely to be higher income from produced crops, which can shape IL in SPP. Furthermore, the total farm size determines the availability of land for SPP as well as size of land allocated to SPP which influence number of utilised paid labour, personal involvement in production activities and continuous production, hence, shape IL. The positive correlation between total farming experience and IS in SPP depicts that LI of SPP farmers increases as their total farming experience increases. The result supports Bawa et al. (2010), and Tijani and Sanusi (2019); they found a positive and significant correlation between farming experience and LI. The implication of this finding is that LI in SPP can be increased and/or enhanced through improvement in farming experience. Increased farming experience suggests increase in marketing and production experience, which increases derivable income from SPP that allows and motivates the farmers to have high involvement (by investing more time, energy and resources) in SPP.

The positive correlation between income from SP and LI in SPP implies that the IS of SP producers' increases as their incomes from SP increases. This suggests that an increase in SP income would result in an increase in LI in SPP. Income derivable from SPP can influence farmers IS in SPP as farmers deriving high income would likely be more motivated to highly involve than those with low income. Farmers earning low income from SP may for instance perceive the commitment and dedication

of resources into SP enterprise as an unprofitable venture. It is noted that as SP income increases, farmers will be motivated to address enterprise expansion and increase their personal involvement in production activities, which shape IS. More so, when farmers are assured of higher incomes following production, they will be more likely to highly involve in production. Farmers with high income from a particular farm enterprise, would be favourably poised to invest more time, energy and resources (farm size, farming experience and paid labour) in the enterprise, which can further sustain and/or improve their income.

The involvement in SPP was marginally low relative to high involvement, which can be improved upon. Factors that include gender, household size, farm size, farming experience and income from SP were features that influenced high involvement of farmers in SPP.

Based on the conclusion, the following recommendations are proffered for high level involvement in SPP Niger-Delta Area of Nigeria: Agricultural programme and policies oriented towards increasing involvement in SPP should be promoted to emphasize SP income *vis a vis* increased income from SPP. Special intervention programmes aimed at female producers of sweetpotato should be designed and implemented by various stakeholders to tackle the dominance of male over the female in IS in SPP. Sweetpotato farm size, production experience, cycle and number of labour should be rigorously targeted during intervention programmes for female producers of sweetpotato. All of these will increase the LI of the SP producers and increase the production of SP in Nigeria.

References

- Abdulkarim, Y., & Yunana, T. W. (2015). Economic Analysis of Small Scale Sweet Potato Production in Zaria Local Government Area of Kaduna State. *American Journal of Economics, Finance and Management*, 1(3), 171-178.
- Aboajah F N, Ejechi M E, Viashima, S. S., Adeyongu, S. K., & Muogbo P C. (2018). Sweet Potato Production for Poverty Alleviation in Nasarawa State, Nigeria. *International Journal of Environment, Agriculture and Biotechnology (IJEAB)*, 3(2), 380-387.
- Adewumi, M. O., & Adebayo, F. A. (2008). Profitability and Technical Efficiency of Sweet Potato Production in Nigeria. *Journal of Rural Development*, 31(5), 105-120.
- Agwu, A. E. (2000). *Diffusion of Improved Cowpea Production Technologies among Farmers in the North East Savanna Zone of Nigeria*. Unpublished Ph. D Thesis in the Department of Agricultural Extension, University of Nigeria, Nsukka.
- Ahmed, I. M., Makama, S. A., Kiresur V. R., & Amina, B. S. (2014). Efficiency of Sweet Potato Farmers in Nigeria: Potentials for Food Security and Poverty Alleviation. *IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)*, 7(1), 1-6.
- Akoroda, M. O. (2008). Sweet Potato in West Africa. *The Sweet Potato*. Loebenstein, G. and Thottappillay G. Eds. BV: Springer science and Business Media. pp 441-468.
- Alabi, K. M. (2019). *Determinants of Household Food Security among Microveg Project Beneficiaries in Nigeria*. Unpublished Ph. D Thesis in the Department of Agricultural Extension and Rural Development, University of Ibadan, Nigeria, pp. 1-172.
- Bawa, D., Donye, A., & Nuhu, H. (2010). Analysis of Involvement of Women in Seed Systems in Borno State, North-East Nigeria. *Agriculture and Biology Journal of North America*, 1(6), 1237–1242. <https://doi.org/10.5251/ABJNA.2010.1.6.1237.1242>
- CIP, (2005). Sweet potato Facts. Retrieved, Aug. 17, 2006, from www.cipotato.org.
- Eforuoku, F. (2018). *Determinants of Dietary Intake among Rural Farming Households in North Western, Nigeria*. Unpublished Ph. D Thesis in the Department of Agricultural Extension and Rural Development, University of Ibadan, Nigeria, pp. 1-150.
- Egeonu, I. N. (2011). *Characterization of Sweet Potato (Ipomoea batatas [L.] Clones for Different End-Uses*. Unpublished Ph. D Thesis in the Department of Agronomy, University of Ibadan, Nigeria, pp. 220.
- Ezeh, A. N. (2013). Access and Application of Information and Communication Technology (ICT) among Farming Households of South East Nigeria. *Agriculture and Biology Journal of North America*, 4(6), 605-616. <https://doi.org/10.5251/Abjna.2013.4.6.605.616>.
- FAOSTAT, (2017). Retrieved Feb. 28, 2018, from <http://www.faostat.org/en/#data/QC>.

- Mba, C. L., Ezeh, C., Madu, I. A., & Emeribe, C. N. (2022). Assessment of Climate Variability and the Determinants of Rice Productivity in Southeastern Nigeria. *Yuzuncu Yil University Journal of Agricultural Science*, 32(4), 805-824.
- Mbanaso, E. O. (2011). *Adoption and Disadoption of Sweet Potato (Ipomoea Batatas (L) Lam) Production and Processing Technologies by Farmers in South-Eastern Nigeria*. Published Ph.D. Thesis in the Department of Agricultural Extension, University of Nigeria, Nsukka, pp16-145.
- Meludu, N. T. (2010). Proximate Analysis of Sweet Potato Toasted Granules. *African Journal of Biomedical Research*, 13(1), 157-159.
- Mmasa, J. J. (2014). Market Potential for Processed Sweet Potato Products in Tanzania: A Case of Coast, Mwanza and Shinyanga Regions. Published Ph.D. Thesis in the Department of Agricultural Economics and Agribusiness, Sokoine University of Agriculture, Morogoro, Tanzania. pp4.
- NBS, (2016). General Household Survey- Panel Wave 3 (Post Planting) 2015-2016, Third Round. Nigeria: National Bureau of Statistics-Federal Government of Nigeria. Retrieved April 20, 2020, from <https://www.nigeriansstat.gov.ng/nada/index.php/catalog/51>.
- NFRA, (2010). National Food and Reserve Agency (NFRA) of the Federal Ministry of Agriculture and Water Resources, Nigeria. 2006 Crop Area and Yield Survey (CAYS) Report. Federal Ministry of Agriculture and Water Resources, Abuja, Nigeria. pp39.
- Nwanebo, C. O. (2012). *Factors Associated with Sweet Potato Production among Rural Farmers in Imo State*, Unpublished M.Sc. Dissertation in the Department of Agricultural Extension and Rural Development, University of Ibadan, Nigeria, pp. 1-112.
- Odebode, S. O., Egeonu, I. N., & Akoroda, M. O. (2008). Promotion of Sweet Potato for the Food Industry in Nigeria. *Bulgarian Journal of Agricultural Science*, 14(3), 300-308.
- Ogundele, G. F., Idowu, O. A., & Badmus, O. A. (2009). Utilization of Sweet Potato for Food Production and Other Industrial Products. *Sweet potato in Nigeria: Proceedings of the First National Sweet Potato Conference*. Akoroda, M. O. and Egeonu, I. N. Eds. pp55-57.
- Oke, M. O., & Workneh, T. S. (2013). A Review on Sweet Potato Postharvest Processing and Preservation Technology. *African Journal of Agricultural Research*, 8(40), 4990-5003.
- Olajide, B. R. (2015). Crop farmers' Utilisation of Agricultural Information from Agbe Afokosoro Radio Farm Broadcast in Ogun State, Nigeria. *International Journal of Agricultural Economics and Rural Development*, 7(1), 32-37.
- Olapade, A. A., & Ogunade, O. A. (2014). Production and Evaluation of Flours and Crunchy Snacks from Sweet Potato (*Ipomea batatas*) and Maize Flours. *International Food Research Journal*, 21(1), 203-208. <http://www.ifrj.upm.edu.my>.
- Onumah, G., Dipeolu, A., & Fetuga, G. (2012). Report on Sweet Potato Value Chain Study: Exploring Opportunities to Promote Greater Exploitation of the Benefits of Sweet Potato in Representative states of Nigeria. Nairobi, Kenya: International Potato Center (CIP). Unpublished report.
- Oyesola, O. B., & Ademola, A. O. (2012). Gender Analysis of Livelihood Status among Dwellers of Ileogbo community in Aiyedire Local Government Area of Osun State, Nigeria. *American Journal of Human Ecology*, 1(1), 2012, 23-27.
- Oyibo, O. (2015). *Determinants of Rural Farmers' Participation in Root and Tuber Crops Extension Sub-Programme in Delta State, Nigeria*. Unpublished M.Sc. Dissertation in the Department of Agricultural Economics and Extension, Delta State University, Abraka, Nigeria, pp. 1-72.
- Oyibo, O. (2020). Cassava Farmers' Attitude Towards Participation in Root and Tuber Expansion Programme in Delta State, Nigeria. *Yuzuncu Yil University Journal of Agricultural Science*, 30(3), 462-474.
- Sugri, I., Maalekuu, B. K., Gaveh, E., & Kusi, F. (2017). Sweet Potato Value Chain Analysis Reveals Opportunities for Increased Income and Food Security in Northern Ghana. *Advances in Agriculture*, 1(1), 1-14. <https://doi.org/10.1155/2017/8767340>.
- Tijani, S. A., & Sanusi, M. K. (2019). Level of Involvement of Shea Butter Processors in Processing Activities in North-Central, Nigeria. *Nigerian Journal of Rural Sociology*, 19(1), 55-60.
- UNDP, (2006). Niger Delta Human Development Report. Retrieved, Apr. 29, 2019, from <http://www.bebor.org/wp-content/uploads/2012/09/UNDP-Niger-Delta-Human-Development-Report.pdf>.