

FACTORS INFLUENCING GENDER PARTICIPATION IN THE ADOPTION OF VALUE ADDITION TO SWEET POTATO TECHNOLOGIES AMONG POST-HARVEST PROCESSORS IN IMO STATE, NIGERIA

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ABSTRACT

The study analyzed those factors influencing gender participation in the adoption of sweet potato value addition technologies among post-harvest processors in Imo State, Nigeria. It was guided by the following specific objectives: to determine the level of involvement of sweet potato processing activities by male and female processors and to identify those factors influencing gender in the adoption of sweet potato value addition technologies by the processors. Multi-stage random sampling technique was used in the selection of sweet potato processors. A sample size of 96 processors comprising of 48 male and 48 female processors were involved in the study. Data were collected with the aid of structured questionnaire. From the result, both processors were energetic and still in their productive age, and hence adopted sweet potato chips, flour, starch, and meat pie. The determinants of value addition to sweet potato by both processors were age, educational level, annual income, processing equipment, processing experience, extension contact, access to credit, membership of cooperative societies and household size. Inadequate finance and high cost of processing equipment were the major constraints encountered by both processors. The adoption of sweet potato value addition technologies had a significant impact on the livelihood and income level of both processors. Therefore, policies aimed at empowering processors through training and extension of new sweet potato value addition technologies should be made available to the processors in the study area.

Keywords: Factors, Gender, adoption, sweet potato and value addition

INTRODUCTION

Sweet potato is an important staple food crop traded locally and internationally. The high nutritive value of the crop makes it attractive to farmers for both domestic and commercial uses (Odendo et al, 2002; (Njoku, 2007; Kaguongo et al. 2010). Initially, utilization of sweet potato in western and eastern Nigeria was limited to boiling, roasting and chewing raw tubers but currently there are some value additions by processing the tubers into different products (Nungo *et al.*, 2007). There is limited range of ways and availability of adapted processing technologies for sweet potato utilization in Nigeria. This has seriously undermined potential benefits of the crop to farmers, consumers and other chain actors (Mmasa2013).). It is therefore, important to understand gender factors by considering their contribution to agricultural production. This understanding will ensure efficient allocation of scarce resources among competing enterprises in the households (Onyemauwa et al, 2008). .Despite the excellent qualities and potential of sweet potato in achieving household food security, levels of production, processing and consumption of sweet potato and sweet potato-based products in Imo States still remains very low. This is evidenced by the near absence of the crop in majority of farmers' farms

(FAOSTAT 2012). Understanding some of these value addition technologies by NRCRI Institute staff and transferring them to farmers from 2005 till date in Imo State and its environ in form of training and workshops has enable farmers explore wider uses of sweet potato in homes for income generation and exports purposes (Aniedu *et al.*, 2012). Gender factors are issues related to gender roles. Gender roles are culture specific, such that in the middle belt region of Nigeria women make ridges and mounds while in the eastern part of the country making of mounds is certainly a job for men (Walabai, 2005). Hence, it is both desirable and necessary to process sweet potato into storable products forms to add value to the crop and contribute significantly to food security, nutrition, income generation and enhanced livelihoods of the farmers (Ndunguru, 2003).

Value addition to sweet potato at the farm level in the context of this study is defined as undertaking one or more of the following activities; washing, sorting, packing, weighing, storage, and transportation..The decision to add value is influenced by market, institutional arrangements as well as farmer and farm circumstances. Poor access to markets is caused by high transaction cost brought about by lack of information on prices, demand, quality and other physical factors such as transport problems leading to

poor returns to the farmers as a result of asymmetric information (Westby *et al.*, 2003). Farmers who access credit for example can enhance their ability to practice value addition since they will be able to purchase the value addition equipment. Group participation helps in the choice and ability to practice value addition since group involvement ensures accessibility to credit, equipment and collective marketing which is more effective than individual marketing thus fostering value addition. According to studies done by Lemaga (2005) and Westby *et al.*, (2003), farmers who are organized into groups have better access to markets since they have higher bargaining power thereby increasing their marketing efficiency and institutions providing support in post harvest innovations than those who are not. On the other hand, farmers who have neither knowledge and skills nor access to information regarding value addition options resort to distress sale thus receiving very low prices due to perishability nature of their produce (Sadangi, 2005). Access to extension services also influences technology adoption. Extension agents supply farmers with important information and skills on production, management and marketing. The availability of relevant and adequate information reduces the risk associated with new technology. The reduction in the risk therefore provides an incentive to the farmers to embrace the technology.

Women have control over sweet potato value addition but men tend to make most major household decisions and exercise control over their family's land, other productive resources, and expenditures which have significant influence over sweet potato crops and its promotion. These differences have hardly given room to equality and have brewed problems in farm families. Women therefore put more effort in post-harvest activities than men but men are entitled to greater benefits of accrued earnings from farming (FAO, 2010).

METHODOLOGY

The study was carried out in Imo State Nigeria. Imo State has population of about 2,485,799 people, made up of 1,178,331 males and 1,307,468 females (NPC, 2006), with population density of 449 males and 256 females per square kilometer respectively (MSALS, 2002). A multistage random sample procedure was used for the analysis. The three agricultural zones (Orlu, Okigwe and Owerri) were chosen in the first stage. In the second stage 4 communities were purposively selected from each of the zones given a total of 12 communities. In the third stage 2 communities were selected from each of the selected communities to give a total of 24 communities. In the fourth stage 48 post harvest farmers comprising of male and female were randomly selected to give a total of 96 respondents with the aid of structural questionnaire. The data collected were analyzed with the use of descriptive

statistics such as frequency distribution tables, percentage, mean and multiple regression analysis.

MODEL SPECIFICATION

Mean Score

Mean score was used to realize (processing activities by male and female post harvest processors in Imo states Nigeria) using a 3-point Likert scale graded thus: often involved = 3, occasionally involved = 2, not involved = 1. The values of the responses were added and further divided by 3 to obtain a mean score of 2.0, which was regarded as mean level of involvement in sweet potato processing activities. Sweet potato processing activities with mean score of 2.0 and above were regarded as being involved by the respondents (males and females), while Sweet potato processing activities with mean scores of below 2.0 were regarded as not being involved by the respondents.

Thus, mean involvement in sweet potato post-harvest processing activities = \bar{X}

$$\bar{X} = \frac{\sum fx}{N}, \text{ (the mean score).}$$

Mean (\bar{X}) of each item was computed by multiplying the frequency of positive response to each question with its appropriate Likert nominal value and the sum was divided by the sum of the number of the respondents to the items. This is summarized with the equation below:

$$\bar{X} = \frac{\sum fn}{N}.$$

Where

\bar{X} = mean score;

\sum = summation sign;

F = frequency or number of respondents who responded positively;

n = Likert nominal value;

N = Number of respondents.

Multiple Regression Analysis

Multiple regression analysis was used to identify the factors influencing level of adoption of sweet potato value addition practices among post-harvest male and female processors as used by Alene *et al.* (2009).

Two Separate Multiple Regression analyses were carried out one for male and the other for female with the model expressed implicitly as follows:

$$Y = F(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8 \dots X_n, \dots) \quad (2)$$

Y = Level of Adoption of sweet potato value addition of Male/Female respondents.

X₁ = Age (years)

X₂ = Marital status (married = 1 otherwise = 0)

X₃ = Level of Education (years)

X₄ = Annual income (naira)

X₅ = Cost of processing (naira)

X₆ = Processing equipment (available = 1 otherwise = 0)

X₇ = processing experience (years)

X₈ = Extension contact (contact = 1 otherwise = 0)

X₉ = credit access (access = 1 otherwise = 0)

X₁₀ = Group membership (1=yes, 0= otherwise)

X₁₁ = Quantity produced (tones)

X12 = Household size (Number of people living and feeding from the same pot)

RESULTS AND DISCUSSION

LEVEL OF INVOLVEMENT IN SWEET POTATO PROCESSING ACTIVITIES BY MALE AND FEMALE SWEET POTATO POST-HARVEST PROCESSORS IN IMO STATE, NIGERIA

Table 1: shows the distribution of male and female postharvest sweet potato processors according to level of involvement in processing activities in Imo State. The Table shows that male and female sweet potato post-harvest processors in Imo state were involved in sweet potato processing activities like washing (\bar{X} 2.33 and \bar{X} 2.50), slicing (\bar{X} 2.21 and \bar{X} 2.23), drying (\bar{X} 2.50 and \bar{X} 2.17) and milling (\bar{X} 2.42 and

\bar{X} 2.27). The Table also showed that females were involved in cleaning (\bar{X} 2.47), and picking (\bar{X} 2.42). These processing activities are intended to improve shelf life, increase incomes and improve food security of the rural poor (Nungo *et al.* (2007). The grand mean for the male post harvest processors was (\bar{X} 2.15) while that of the females was (2.34). The posture of this result showed that in sweet potato processing activities, female post harvest processors were more involved than their male counterpart. The result gave credence to Olagunju (2008) who reported that compared to men, women especially those from small and marginal farming families perform over 60% of on-farm activities in sub-Saharan Africa and comprise a major driving force in the economic and social fabric of rural areas with major responsibilities in agricultural and non-agricultural business enterprises.

Table 1: Level of involvement in Sweet potato Processing Activities by Male and Female Sweet potato Post-Harvest Processors in Imo State, Nigeria

Level of involvement in Processing activities	Male					Female				
	Often Involved	Occasionally Involved	Not Involved	Total	Mean score	Often Involved	Occasionally Involved	Not Involved	Total	Mean score
Cleaning and trimming	21(14.58)	20(20.83)	31(64.58)		1.50	69(47.9)	50(52.1)	0	119	2.47
Washing	60(41.7)	48(50.0)	4(8.3)	112	2.33	72(50.0)	48(50.0)	0	120	2.50
Slicing	54(37.5)	44(45.8)	8(16.7)	106	2.21	57(39.5)	42(43.8)	8(16.7)	107	2.23
Drying	90(62.50)	24(25.00)	6(12.50)	120	2.50	66(45.83)	46(47.92)	5(10.42)		2.17
Milling	69(47.9)	44(45.8)	3(6.3)	116	2.42	57(39.6)	46(47.9)	6(12.5)	109	2.27
Packing	54(37.50)	24(25.00)	16(33.33)		1.96	81(56.25)	28(29.12)	7(14.58)	116	2.42
Grand mean					2.15					2.34

Source: Field Survey 2018

Decision rule $\bar{X} \geq 2.0$ and above = participation

Decision rule $\bar{X} < 2.0$ = non participation

Figures in parenthesis are percentages

FACTORS INFLUENCING LEVEL OF ADOPTION OF SWEET POTATO VALUE ADDITION PRODUCTS BY MALE POST-HARVEST SWEET POTATO PROCESSORS IN IMO STATE

The result on **Table 2** explained Ordinary Least Square (OLS) regression estimates of the factors influencing level of adoption of sweet potato value addition by male post-harvest sweet potato processors in Imo State. The Table further explained nine (9) variables out of the twelve (12) variables that were statistically significant (age, educational qualification, annual income, availability of processing equipment, processing experience, extension contact, access to credit, membership of cooperative societies and household size). Specifically, the coefficient (-0.040) of age was negative and statistically significant at 1.0% probability level. This implies that the older the male postharvest sweet potato processors, the less likely the adoption of sweet potato value addition. This is logical, as older individuals are likely to be less energetic and may therefore find it hard to engage in value addition activities which require quite some energy (Falola *et al.*, 2013). The coefficient (0.018) of education was positive and statistically significant at 1.0% alpha level. This implies that as the educational status of the processors increases, the probability of their decision to adopt sweet potato value addition increases also. Highly educated farmers also tend to adopt technology with greater intensity (Nzomo *et al.*, 2007). The coefficient (1.201E-7) of annual income was positive and significant statistically at 95.0% alpha level of confidence. This indicates that as the annual income of processors increases, their likelihood to adopt sweet potato value addition also increase. The economic status of postharvest sweet potato processors often times plays a significant role in their sweet potato value addition adoption processes. This is especially true when it involves the purchase of new implements which will usually be dictated by individual financial capability (Onyemauwa, 2012). The coefficient (0.095) of availability of processing equipment was positive related to adoption of sweet potato value addition and are statistically significant at 10.0% alpha level. This indicates that availability of processing equipment increases the ability of male postharvest sweet potato processors to adopt sweet potato value addition than those who have no equipment at all. The coefficient (0.007) of processing experience by male processors was positively related to sweet potato value addition

and significant at 1.0% alpha level. This indicates that male post-harvest sweet potato processors in Imo state stood better position to adopt sweet potato value addition and were established and knowledgeable about sweet potato value addition, because the number of years spent in processing may give an indication of the practical knowledge acquired on how to overcome certain inherent problems in sweet potato value addition (Omoare *et al.*, 2014).

The coefficient (0.948) of extension contact was positive and significant at 5.0% probability level. This implies that those who had access to extension services are more likely to adopt sweet potato value addition than those who do not. This might result from the fact that access to extension services can provide postharvest sweet potato processors with crucial information, such as how to transform their raw output into consumer-ready products. Extension service provides postharvest processors with information on availability and properties of sweet potato value addition technology and technical skills for using it. The coefficient (0.156) of access to credit was positive and significant at 5.0% alpha level. Credit access enables male postharvest sweet potato processors to purchase value addition equipment and expand their micro enterprises thereby facilitating adoption of sweet potato value addition. Adeyounet *et al.* (2016) reported that postharvest processors with better access to credit are more likely to be adopters of innovation. The coefficient (0.235) of membership of cooperative societies was positive and significant at 5.0% alpha level. Group membership ensures collective production, marketing, training, pooling of resources together and reduction of information asymmetry thus reducing transaction costs and ensuring economies of scale. Orinda (2013) found that groups can be very effective especially when it comes to pooling external inputs and disseminating information. Group membership enables male postharvest processors to access loans which will enable them to purchase value addition equipment and increase their adoption levels. The coefficient (0.111) of household size was positively related to level of adoption of sweet potato value addition and statistically significant at 5.0% probability level. This indicates that a large household accords the postharvest processor fewer labour shortages at peak times and hence improve their adoption rate. The result is in line with the findings of (Croppenstedt *et al.*, (2003) that household size had significant and positive effect on determinants of level of adoption and continued use of a new technology.

Table 2: Estimates of the Factors Influencing Level of Adoption of Sweet potato Value Addition by Male Postharvest Sweet potato Processors in Imo State.

Variables	Linear	Exponential⁺	Double log	Sem-log
Constant	40.234 (1.462)	20.585** (2.707)	153.854** (2.471)	238.236 (1.233)
Age	-0.112*** (-3.515)	-0.040*** (-3.747)	-1.564*** (-3.449)	-4.659*** (-3.281)
Marital status	-0.221 (-1.314)	0.058 (1.247)	-0.307 (-1.480)	-0.898 (-1.448)
Educational level	0.022** (2.050)	0.018*** (4.125)	0.178** (2.388)	0.467** (2.326)
Annual income	-2.259E-7 (-1.111)	1.201E-7** (2.176)	0.347* (1.607)	0.608 (1.340)
Cost of processing	-0.002 (-1.354)	0.000 (1.183)	-1.057 (-1.456)	-2.207 (-1.215)
Processing Equipments	0.405 (1.460)	0.095* (1.524)	0.689** (2.316)	2.285** (2.454)
Processing experience	0.158** (3.401)	0.007*** (3.200)	0.192 (0.383)	0.367 (0.234)
Extension contact	-0.010** (-2.035)	0.948** (2.069)	-1.239 (-1.314)	3.628 (1.229)
Credit access	0.252 (1.338)	-0.156** (2.236)	-0.661** (-2.343)	-0.517 (-0.086)
Membership of cooperative	0.450 (1.903)	0.235* (1.975)	3.854 (1.304)	-2.020 (-1.309)
Quantity produced	0.730 (0.625)	0.110 (0.282)	0.198 (1.170)	2.236 (0.987)
Household size	0.334 (1.325)	0.111** (2.320)	0.643** (2.159)	-2.020* (-1.915)
R ²	0.746	0.748	0.701	0.685
Adjusted R ²	0.728	0.731	0.658	0.621
F-ratio	437.761***	569.555***	292.032***	237.960***

Source: *Field Survey, 201*

+ indicates lead equation

***= Significant at 1% alpha level

**= Significant at 5% alpha level

*= Significant at 10% alpha level

FACTORS INFLUENCING SWEETPOTATO VALUE ADDITION BY FEMALE SWEETPOTATO POST-HARVEST PROCESSORS IN IMO STATE

The result on **Table 3** explained Ordinary Least Square (OLS) regression estimates of the factors influencing level of adoption of sweet potato value addition by female post-harvest sweet potato

processors in Imo State. Four functional forms (linear, exponential, double log and semi-log) of the regression model were tried out to determine the model with the best fit to the data. The linear functional form provided the best fit. The F-value (756.457) was statistically significant at 1.0% level implying that the model was a good fit and that the joint effects of all the included variables were

significant. The R^2 and adjusted R^2 values were 0.762 and 0.716 which implies that the variables in the model were able to explain 76.20% of the total variations of the level of adoption of sweet potato value addition by female postharvest processors in Imo state. From the Table, nine variables out of twelve variables were significant. The variables were age, education, income, processing experience, extension contact, access to credit, membership of cooperative societies, quantity produced and household size. The coefficient (-0.024) of age was negative and statistically significant at 5.0% probability level.

The coefficient (0.220) of education was positive and statistically significant at 5.0% alpha level. This implies that as the education of the female sweet potato postharvest processors increases, the decision to adopt and undertake sweet potato value addition also increases. The coefficient (1.802E-6) of income was positive and significant at 95.0% confidence level. This indicates that as the annual income of female postharvest sweet potato processors increases, their ability and willingness to adopt sweet potato value addition increases such that female postharvest sweet potato processors with high disposable income level would prefer to diversify their resources in less risky investments than to be fully embedded in value addition.

The coefficient (0.077) of processing experience was positively related to adoption of value addition by female postharvest processors and statistically significant at 1.0% probability level. This indicates that the number of years spent in postharvest sweet

potato processing may give an indication of the practical knowledge acquired on how to overcome certain inherent problems in sweet potato value addition (Omoare *et al.*, 2014).

The coefficient (0.031) of extension contact was positive and statistically significant at 1.0% probability level. This implies that access to extension services had direct relationship with the adoption of sweet potato value addition than those who do not. The coefficient (0.131) of access to credit was positive and statistically significant at 1.0% alpha level. This is in line with *a priori* expectation as credit access enables female sweet potato postharvest processors to purchase value addition equipment and expand their micro enterprises thereby facilitating adoption of sweet potato value addition. The coefficient (0.808) of membership of cooperative societies was positive and significant at 10.0% alpha level. This implies that group membership enhances adoption of sweet potato value addition.

The coefficient (0.605) of quantity of sweet potato produced is positively related to level of adoption of sweet potato value addition of female sweet potato postharvest processors and significant at 10.0% alpha level. This can be attributed to the fact that increased production ensures availability of surplus for value addition. The coefficient (0.265) of household size was positively related to level of adoption of sweet potato value addition and statistically significant at 10.0% probability level. This indicates that a unit increase in the size of household increases the probability of adopting sweet potato value addition.

Table 3: Estimates of the Factors Influencing Level of Adoption of Sweet potato Value Addition by Female Sweet potato Postharvest Processors in Imo State

Variables	Linear ⁺	Exponential	Double log	Semi-log
Constant	-1.650 (-0.207)	-3.489 (-0.337)	-2.159 (-0.217)	-1.579 (-0.183)
Age	-0.024** (-2.235)	0.005* (1.714)	-0.154* (-1.915)	0.791* (1.810)
Marital status	-0.004 (1.008)	-0.006 (1.061)	-0.057 (1.231)	-0.224 (1.194)
Educational level	0.220** (2.135)	0.033 (0.513)	0.081*** (2.657)	0.494*** (2.860)
Annual income	1.802E-6** (2.297)	-3.509E-7 (-1.178)	-0.154* (-1.739)	-0.807* (-1.830)
Cost of processing	-0.001 (-1.086)	-8.304E-6 (-0.013)	-0.420 (-1.411)	-1.048 (-1.230)
Processing Equipments	-0.036 (-0.384)	-0.008 (-1.173)	-0.124 (-1.295)	-0.566 (-1.387)
Processing experience	0.077*** (3.076)	0.017** (2.388)	0.059 (0.115)	0.288 (1.308)
Extension contact	0.031*** (3.804)	0.019** (2.220)	0.015*** (2.794)	-0.013** (-2.202)
Credit access	0.131*** (2.988)	0.029* (1.833)	0.288* (1.557)	1.308* (1.776)
Membership of cooperative	0.808* (1.810)	0.149 (1.852)	0.379 (2.403)	2.156* (1.679)
Quantity produced	0.605* (1.863)	0.015 (0.436)	0.069* (1.686)	0.262 (1.329)
Household size	0.265* (1.944)	-0.489 (-0.807)	-2.159 (-0.288)	1.579 (1.308)
R ²	0.762	0.733	0.719	0.677
Adjusted R ²	0.716	0.678	0.613	0.591
F-ratio	759.457***	406.618***	513.490***	193.519***

Source: *Field Survey*, 2018

+ indicates lead equation

***= Significant at 1% alpha level

**= Significant at 5% alpha level

*= Significant at 10% alpha level

CONSTRAINTS MILITATING AGAINST SWEET POTATO VALUE ADDITION BY MALE AND FEMALE SWEET POTATO PROCESSORS IN IMO STATE

The result on **Table 4** shows that both processors were constrained by high cost of sweet potato processing equipment (91.67), low farmers knowledge on sweet

potato value addition (72.92%), inadequate finance (87.50%), inadequate extension service (62.50%) and inadequate credit access (68.75%). Access to credit is an important input for expansion of agriculture, processing and marketing, not only in Imo State but Nigeria in general.

Table 4: Constraints Militating against Sweet Potato Value Addition by Male and Female Sweet Potato Processors in Imo State, Nigeria.

Variables	IMO STATE			
	Male		Female	
	Frequency	Percentage	Frequency	Percentage
Inadequate finance	33	68.67	42	87.50
Low farmers knowledge on sweet potato value addition	35	72.92	33	72.92
High cost of sweet potato processing equipment	44	91.67	44	91.67
Inadequate extension service support	35	72.92	30	62.50
Low consumer preference for sweet potato	25	52.08	28	58.33
Inadequate credit access	30	62.50	33	68.75

Source: field survey, 2018

Multiple responses recorded

CONCLUSION AND RECOMMENDATION

The study concluded that both farmers involved in sweet potato processing activities. More so Age, educational level, annual income, processing experience, extension contact, access to credit, membership of cooperative societies and household size were determinant of sweet potato value addition by both farmers in the study area. Training of farmers in form of workshops, seminars and farmer field days should be encouraged to aid adoption rate in the study area. All sweet potato value addition technologies should be made available and transferred to processors so as to encourage more processors in the business.

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