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# Differentials in Adoption of Cassava Post-Harvest Processing Technology among Farmers in South Eastern, Nigeria

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**ABTRACT**
The study examined factors influencing the adoption of cassava post-harvest processing technology among farmers in Abia North, Abia state, Nigeria. One hundred and fifty (150) farmers were randomly selected from five Local Government Areas of the state. Data analysis involved descriptive statistics and adoption model using logit regression. The results showed that majority of the famers were male who are still productive, married with large household sizes. Most of the farmers adopted cassava processing technologies and utilized the garri product. The results also indicated that income level of the farmer, number of processing equipment, household size and years of experience in farming business positively influenced the adoption of post-harvest processing technology among households in the study area and were each significant at 5 percent. The study call for policies aimed at increased awareness programmes and subsidies on processing machines to increase their adoption.
**Keywords**: Cassava, Adoption, Utilization, Post-Harvest Technology, Abia State

## 1.0 INTRODUCTION

Cassava is the second most important staple food in sub-Sahara Africa (IITA 1998). It is the main source of food for nearly 500 million people in the West Africa (Onokpise *et. al.*, 1999). In Nigeria, most household depends on cassava for source of food and income (Nweke *et al.,* 1996). Cassava food products are the most important staples of rural and urban households in southern Nigeria. Current estimates show that the dietary calorie equivalent of per capita consumption of cassava in the country amounts to about 238 kcal (Cock, 1985). This is derived from the consumption of *garri* toasted granules), chips/flour, fermented pastes and/or fresh roots, the principal cassava food forms. Cassava is processed into various forms that creates more market and attract better financial reward for the growers. Processing of cassava enhances storage and value, lowers transportation cost, and generates employment and market in food, feed and industrial sectors (Tewe, 1998). Wole-Alo and Okunlola (2015) stated that cassava processors used traditional techniques, modern techniques as well as combined both traditional and modern techniques processing in rural Oyo State. They explained that none of the respondents used only modern processing techniques. According to them 48 percent of the respondents did not adopt the use of modern techniques because it was not cheaper to acquire, and 43.0 percent of respondents in this category claimed that they lack fund to acquire modern processing equipment. They noted that few farmers do not have the skill to operate the machine for modern production; also the spare parts of the processing machines are not available. Wole-Alo and Okunlola (2015) in the study of the determinants of the use of processing technology stated that income was a strong determinant of the use of modern cassava processing techniques as the level of income determines the ability of the respondents to procure the required inputs to back up the adoption of new technologies. They also explained that majority of the farmers (88%) believed that farming experience had effect on the use of modern cassava processing techniques as some of the older farmers were reluctant to change their old practice while farm size also affected utilization of modern processing techniques as farmers with large farm size are eager to save time on their processing and reduce cost of labour. Women play a central role in cassava production, contributing about 58 percent of the total agricultural labour in the southwest, 67 percent in the southeast and 58 percent in the central zones with involvement in virtually all activities, hoeing, weeding, harvesting, transporting, storing, processing, marketing and domestic chores (IFAD, 1994). They are almost entirely responsible for processing agricultural commodities. Women also play a dominant role in marketing of cassava produce. Adebayo, (2009) stated that adopters of cassava grater were older, with larger household sizes and stayed longer in school than the non-adopters. They also have longer cassava processing experience and run larger cassava processing enterprises where more persons are also employed. Enitan, (2010) opined that education was an important variable that tends to influence adoption of modern technology, while also influencing choice of food commodities consumed by individuals and households. He stated that 45.2% of the women processors had no formal education; the remaining respondents had primary, secondary and tertiary education. He emphasised that age was an important variable that determines the nature of economic activities that can be undertaken by an individual, most especially women. According to him, younger and more energetic women may be involved in strenuous farm-based activities; older women are most likely going to be involved in less strenuous activities like trading.The cassava sub sector in Nigeria is presently given a serious attention by encouraging replacement of cassava product (flour) for cereal which is used for food and animal feeds. Cassava is consumed in various forms such as garri, flour, chip, starch, pellet which are convenient to prepare and comparatively easy to store and transport. The acceptability of other cassava processed product such as flour, starch, granules, paste, leaves, alcohol, and chips are slow. Nweke, 1998 reveals that the response of most Nigeria consumers who tasted cassava bread range from disbelief and admiration. Despite the diversification of cassava product in high quality cassava flour from root for production of bread, and biscuit, cassava peels and leaves for livestock feed, Iyayi and Tewe (1994) stated that many farmers are not able to process cassava root into safe levels especially in Abia State, Nigeria. This paper therefore sought to identify factors which influence the adoption of cassava post-harvest processing and utilization technology among farmers in Abia North, Abia State. The study identified the socio-economic characteristics, the level of adoption of post-harvest processing and utilization technology among farmers, as well as assessed factors influencing the adoption of cassava post-harvest processing technology in the study area.

## 2.0 METHODOLOGY

### 2.1 Study Area

The study area was carried out in Abia North zone in Abia State. Abia State is located in South Eastern part of Nigeria. The State lies on longitude 70 00E and 8 E and latitudes 40 45'N and 60 17'N of the Greenwich meridian. The climate is tropical and humid all the year round. It has an annual rainfall of between 2000mm – 2500mm and a temperature of between $22^0$C – $31^0$C (FOS, 1999). Abia State is divided into seventeen (17) administrative units called local government areas (LGA). These administrative units were further grouped into three (3) agricultural zones namely Aba, Ohafia and Umuahia or three political zones namely; Abia North, Abia Central. Abia north is made of five different local government areas namely; Arochukwu, Bende, Isiukwuato, Ohafia and Umunneochi, The vegetation of Abia is generally that of a rainforest however, Abia North is in the derived savannah part of the state (Ohaeri and Eluwa, 2007). The ecology of this zone favours mainly the growing of root and tuber crops, which are mainly grown in mixture or in an intercrop in small farm holdings across the zone (FOS, 1999, World Bank, 2000). Abia North is one of the densely cassava cultivated zone among the three (3) agricultural zone in Abia State.

### 2.2 Sampling Procedure and Sample size

This study used primary data generated from farmers from the five LGAs of Abia North. A well-structured questionnaire and interview schedules were the tools employed to generate data from each responding household. The questionnaire collected information such as farmer's socio-economic characteristics, adoption of post-harvest-processing and utilization technology and factors influencing the farmers in the adoption of cassava post-harvest technology. A multistage random sampling technique was used in selecting respondents for the study, and this method ensured unbiased representation of the respondents (Babbie, 1994). In the first stage of sampling, three densely cassava cultivating communities were randomly selected from each of the five LGAs. In the second stage, five villages were randomly selected from each of the three communities. In the third stage, ten households were randomly selected from the generated list of households in each community. Thus, a total of 30 households were selected and used for the study from each of the 5 LGAs. In all, 150 respondents were used for the study. The questionnaire was administered from November 15, 2010 to February 22, 2011

### 2.3 Analytical Techniques

Data analysis involved the use of descriptive statistics and logit regression model. The description statistics was used to estimate the socio–economic characteristics of the farmers, and adoption of post-harvest processing utilization technology. Logit regression model was used to estimate the factors influencing the adoption of post-harvest processing technology among the farmers. The dependent variables are dichotomous and equal 1, if the households used post-harvest technology input in the specified time period and 0 otherwise. Hence, ordinary least squares OLS estimation is inappropriate because some of the basic assumptions of OLS method such as normality and homoscedasticity of the error term many be violated. Moreover, the computed probabilities may be outside the 0-1 range (Greene, 1994). NB: Logit model is the most popular statistical model developed to analyze dichotomous response dependent variables.

### 2.4 Model Specification

Logit Model

$Y_i = Bx_i + u_i$

The implicit form of the adoption model for the analysis is specified thus;
$Y= f (x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8, x_9, x_{10})$
And explicitly thus;
$Y = bo + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7 + b_8x_8 + b_9x_9 + b_{10}x_{10} + ei$
Where Y = household I adopted the use of post-harvest technology = I if otherwise = 0
$b_0 =$ intercept
$b_1$-$b_{10}$ = estimated parameters
$x_1$ = Sex (dummy variable; 1=male, 0=female)
$x_2$ = Age (yrs.)
$x_3$ = Marital status (dummy variable; 1=married, 0=otherwise)
$x_4$ = Education (yrs.)
$x_5$ = Household size
$x_6$ = Occupational status (dummy variable; 1=full-time farmer, 0=part-time farmer)
$x_7$ = Farming experience (yrs.)
$x_8$ = Income level of the farmers (N)
$x_9$ = Number of processing machines
$x_{10}$= Farm size (ha)
Ei = Error term

**3.0 RESULTS AND DISCUSSIONS**

The results in Table 1 show the socio-economic characteristics of the farmers in the study area. Majority (56.67%) of the famers were males while 43.33% were females. Gender issues in agricultural production and technology adoption have been investigated for a long time, and most show mixed evidence regarding the different roles men and women play in technology adoption. Overfield and Fleming (2001) noted "effort in improving women's working skills does not appear warranted as their technical efficiency is estimated to be equivalent to that of males".The age distribution of farmers in the study area shows that 52 percent of them were between the age ranges of 41-60 years. The age range of 21-40 years was 36.67 percent while 60 years and above was 11.33 percent. This shows that the study area was dominated by farmers who were still strong and agile. Nwaru (2004) found out that the ability of a farmer to bear risk, and be innovative decreases with age.

About 79.33% of the farmers were married, 7.33% was single, 11.33% were widows and 2.0% were divorced, indicating the pre-dominance of married farmers in the study area. The study further showed that 38.0% of the farmers had secondary school education, 32.67% had primary school education while 14.67% had no formal education. Also 14.67% of the farmers had tertiary or university education. This implies that the study area was largely dominated by literate farmers. Educated farmers were expected to be more receptive to improved farming techniques (Okoye *et al*, 2004; Obinne, 1991).

Majority (56.0%) of the farmers had household size between 4-7 persons, about 6.67% and 37.34% had between 1-3 persons and 8-11 persons as family members respectively. The household size of 4-7 persons with the highest percentage of 56 confirms the report of the Federal Office of Statistics (FOS, 1999) that household size mean for Abia State was 7 persons per household. Larger households are more likely to provide the labor that might be required by improved processing technologies. Household size is usually used to proxy labour endowment (Pender and Gebremedhin, 2007), so that the larger the family, the more labour is available for product processing. The findings on the major occupation of the respondents showed that 54.0% of them were full time farmers, 41.33% comprises teachers and civil servant while 4.67% were engaged in trading and farming. Davis et al. (2009) reviewed a number of papers on the impact of off-farm income on agriculture. They generally conclude that off-farm income had positive effects on agriculture. Majority (86.00%) of the farmers had spent more than 6 years in farming business. 4.00% spent 3-4 years, 7.33% spent 5-6 years had farming experience while 2.67% had 0-2 years' experience in farming. With more experience, a farmer can become more or less averse to the risk implied by adopting a new technology; thus this variable may have a positive or negative effect on a farmer's decision to adopt an improved cassava processing technology. The result of the farm size shows that 69.33% of the farmers had farm land size above 3 ha, 15.33% of them had between 1.5-2.0ha, 12.0% had 2.5-3.0ha and only 3.33% had their farm size 0-1.0ha. This shows that they were small-holder farmers. Farm size affects adoption costs, risk perceptions, human capital, credit constraints, labour requirements, tenure arrangements and more. With small farms, it has been argued that large fixed costs become a constraint to technology adoption (Abara and Singh, 1993) especially if the technology requires a substantial amount of initial set-up cost, so-called "lumpy technology." In relation to lumpy technology, Feder *et al.* (1985) further noted that only larger farms will adopt these innovations. With some technologies, the speed of adoption is different for small- and large- scale farmers.

**Table 1: Distribution of farmers' socio-economic characteristics**

| Variables | Frequency | Distribution |
|---|---|---|
| Sex | | |
| Male | 85 | 56.67 |
| Female | 65 | 43.33 |
| Age in years | | |
| 21-40 | 55 | 36.6 |
| 41-60 | 78 | 52.00 |
| 60 and above | 17 | 11.33 |
| Marital Status | | |
| Single | 11 | 7.33 |
| Marriage | 119 | 79. 33 |
| Widow | 17 | 11.33 |
| Divorce | 3 | 2.00 |
| Educational Level | | |
| No formal education | 22 | 14.67 |
| Primary level | 49 | 32.67 |
| Secondary level | 57 | 38.00 |
| Tertiary / university | 22 | 14.67 |
| Household size in persons | | |
| 1-3 | 10 | 6.67 |
| 4-7 | 84 | 56.00 |
| 8-11 | 54 | 37.3 |
| *Farming Experience in years* | | |
| 0-2 | 4 | 2.67 |
| 3-4 | 6 | 4.00 |
| 5-6 | 11 | 7.00 |
| 6 and above | 129 | 86.00 |
| *Farm Size (Ha)* | | |
| *0-1.0* | 5 | 3.33 |
| 1.1 – 2 | 23 | 15.33 |
| 2.1- 3 | 18 | 12. 00 |
| 3 and above | 104 | 69.33 |
| *Occupation* | | |
| Farming | 81 | 54.00 |
| Teaching, civil servant | 62 | 41.33 |
| Farming and trading | 7 | 4.67 |
| Total | 150 | 100 |

Source: Field Survey 2007

The results in Table 2 show the adoption of post-harvest (cassava processed and utilized product) technology among farmers. Majority (92.67%) adopted processing and utilizing cassava in form of garri. Tewe (1998) noted that the most common cassava processed product is garri in Abia State. About 71.33% adopted fufu, 6.67% flour, 30.0% cassava roots, 20.0% tapioca while only 2.67% of the respondents adopted starch. Also 16.0% adopted utilizing cassava flour into cake making.

**Table 2: Distribution of Adoption of Post-Harvest (Cassava Processed) Technology**

| **Cassava product** | ***Adopters*** | | ***Non Adopters*** | |
|---|---|---|---|---|
| | No | % | No | % |
| Garri | 137 | 92.67 | 11 | 7.33 |
| Fufu | 107 | 71.33 | 43 | 28.67 |
| Flour | 10 | 6.67 | 140 | 93.33 |
| Root | 45 | 30.0 | 105 | 70.0 |
| Tapioca | 30 | 20.0 | 120 | 80.0 |
| Starch | 4 | 2.67 | 146 | 97.3 |
| Cake | 24 | 16.0 | 126 | 84.0 |

**Source: field survey 2007**

The result in Table 3 shows the utilization level of different cassava processed products among farmers in Abia north zone of Abia State. Many (34.00%) used cassava product in form of bread, 2.0% of the household surveyed utilized cassava in form of cassava biscuits, 22.0% consume cassava cake, 9.33% consume chin-chin made of cassava flour, 8.0% of the farmers participate in consumption of all the produced cassava added value product while only 24.67% had not tasted cassava product.

**Table 3: Utilization Level of Different Cassava Processed Products among Farmers in Abia North**

| Cassava product | Frequency | Distribution |
|---|---|---|
| Bread | 51 | 34.0 |
| Biscuit | 3 | 2.0 |
| Cake | 33 | 22.0 |
| Chin-chin | 14 | 9.33 |
| All the product | 12 | 8.00 |
| None consumers | 37 | 24.67 |

**Source: Field Survey, 2007**

The result on Table 4 shows the Logit model regression analysis of the factors influencing adoption of post-harvest processing technology among cassava farmers in Abia North zone in Abia State. The result indicated that income of the household head, number of processing equipment, household size and years of experience in farming business were significant at 5% and positively influenced adoption of post-harvest processing technology among households in the study area. The positive relationship between income and level of adoption of post-harvest processing technology conform to earlier expectation that increase in processors income is expected to ease financial constraint thereby enhancing the adoption of the processing technologies. This result agreed with that of Mundi and Ezenwa (2005) who found a positive relationship between income level of farmers and adoption of new technology. Programs that produce significant gains can motivate people to participate more fully in them (Bonabana-Wabbi, 2002).

The positive value on the household size coefficient indicates that larger households are more likely to provide the labour that might be required for processing technologies; a larger household size would be expected to increase the probability of adopting post-harvest processing technologies. The co-efficient of age was statistically significant at 5% but had negative influence on the adoption of technology. This implies that as the farmer increases in age, the tendency to adopt new technology decreases. This may likely be true that young individual appear to be more adventurous than older people completely for particular method. As farmers advance in age, risk aversion increases and adopting a new technology seems less likely. This variable is expected to negatively affect the adoption of most technologies (Bonbana-Wabbi, 2002). The co-efficient for occupational status was positive and highly significant at 1.0% level of probability. This implies that the higher the number of occupation a farmer engages in, the increase in the probability to adopt post-harvest technology. The co-efficient of sex and marital status were not significant factors on the adoption of the post-harvest cassava technology. Practices that heavily draw on farmer's leisure time may inhibit adoption (Mugisa-Mutetikka *et al.*, 2000). However, practices that leave time for other sources of income accumulation may promote adoption. In such cases, as well as in general, income from off-farm labor may provide financial resources required to adopt new technologies. The co-efficient for marital status was positive but not significant and education which was negative.

**TABLE: 4 Logit model regression analysis of factors influencing adoption of post-harvest processing among cassava farmers**

| Variable | Co-efficient estimate | Standard error | T value |
|---|---|---|---|
| Sex | -.03643 | .05852 | -.62249 |
| Age | -.04229 | .02056 | -2.05691** |
| Marital status | .05100 | .06365 | .80136 |
| Education | -.03593 | .03477 | -1.03324 |
| Household size | .000422 | .00203 | 2.07882** |
| Occupation | .16914 | .04583 | 3.69101*** |
| Farming experience | .00346 | .00157 | 2.20382** |
| Number of processing machine | .05883 | .02864 | 2.05412** |
| Income | .06453 | .02534 | 2.746457** |
| Intercept | -2.25071 | | |
| Goodness fit | 163.59 | | |
| Degree of freedom | 140 | | |
| P = | .084 | | |
| N = | 150 | | |

*** Significant at (1.0%) 0.01
** Significant at (5.0%) 0.05
* Significant at (10.0%) 0.10

**Source**: Survey data analysis using the SPSS 2007

## 4.0 CONCLUSION

The study examined factors that influenced the adoption of post-harvest processing and utilization technology in Abia North, Abia State. Most of the farmers adopted post-harvest processing and utilized cassava in form of garri. Household size, years of farming experience, number of processing machine and income level had a direct relationship with adoption of post-harvest processing technologies. The results call for policies aimed at increased awareness programmes to sensitize and train farmers especially on the advantages of adopting and utilizing modern cassava processing technologies. There is also need to subsidize the cost of processing machines and encourage young farmers to adopt improved post-harvest processing technologies.

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