

INVESTMENT DECISION AND LEVEL OF INVESTMENT IN MARKETING OF VALUE-ADDED PRODUCTS OF YAM AND CASSAVA IN BENUE STATE, NIGERIA

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ABSTRACT

The supply gap of value-added products of yam and cassava in Nigeria has continued to widen and modeling investment in marketing of these products using Double Hurdle model is non-existence in literature. The study thus investigated factors influencing investment decision and level of investment in the marketing of value-added products of yam and cassava in Benue State, Nigeria, using Double Hurdle model. Data were collected through structured questionnaire from 300 marketers of value-added products of yam and cassava, selected via multi-stage random sampling technique. The collected data were analyzed using descriptive statistics and Double Hurdle model. The results revealed that marketers of these products in the study area were mostly married females with moderate household size, literate, young, non-member of cooperatives, experienced, and had access to credit with akpu/fufu as the most marketed product among the marketers. Estimates of the Double Hurdle model revealed that sex, marital status, age, and membership of cooperatives were the factors influencing investment decision in the marketing of these products while sex, marital status, level of education, age, membership of cooperatives, return, and credit received were the factors influencing level of investment in the marketing of these products. In identifying factors that significantly influence investment decision and level of investment in the marketing of these products, this study provides an empirical contribution to the existing literature. It was recommended that policies geared towards increasing the level of investment in the marketing of these products should take into consideration the socio-economic characteristics of the marketers.

Key words: investment, marketing, value-added products, Double Hurdle

INTRODUCTION

Nigeria has not been able to close the supply gap of value-added products of yam and cassava which as a result has seen the prices of these products skyrocketed in recent times. In spite of billions of Naira voted by successive administration in Nigeria through different intervention programmes to improve the cassava and yam value chain, improve their productivity, and cut cost, this effort is yet to achieve the desired outcomes. The country has not been able to attain the status of self-sufficient in the production of these products as the supply gap of the products has continued to widen. For instance, the annual national demand for instant pounded yam flour according to Foraminifera (2018), was estimated at 165,000 tons per annum with the supply level at less than 25% of the estimated demand. The study also revealed that the annual national demand for cassava *fufu* in 2018 was estimated at 350,000 tons with the national supply estimated at about 300,000 tons.

A recently conducted survey showed that the national annual demand for *garri* was estimated at 3 million metric tons, while the supply gap was estimated at 2 million metric tons (Vanguard, 2021). The PWC (2020a) reported that in 2020, the supply-

demand gap for high-quality cassava flour stood at about 485,000 metric tons per annum while the gap for cassava starch was about 290,000 metric tons. The supply gaps of these commodities are expected to continue to widen as the population of the country which is estimated to be over 200 million continues to grow at the rate of 3.5% per annum.

In an effort to close the supply gap of value-added products of yam and cassava in the country, the Federal Government of Nigeria has resorted to importation. This has continued to fleece the country of foreign revenue in millions of US dollars. In 2019, the Central Bank of Nigeria reported that Nigeria imported \$600 million worth of cassava derivatives (PremiumTimes, 2021). PWC (2020b) reported that between 2018 and 2019, Nigeria imported about 18 million gallons (i.e., 68 million litres) of ethanol valued at about \$26 million from the United States. This scenario is same in the yam value chain as Sahel (2014) revealed that the level of yam processing in Nigeria is relatively low compared to substitute crops such as cassava.

There are several reports on the benefits that will be accrued to the nation in closing these supply gaps of various value-added products of yam and cassava

in the country. According to PWC (2020b), meeting the demand gap in the domestic cassava derivatives market could potentially yield \$427.3 million in revenue to the country. The report further revealed that an enhanced cassava value chain could generate total exports of \$2.98 billion, unlock about \$16 million in taxes to the government, eliminate the challenge of glut cycle, and facilitate growth of the agriculture sector as well as the overall economy.

Giving the foregoing, it is imperative to design policies and programmes that will address the supply gap of value-added products of cassava and yam in the country. In order to achieve this, empirical findings on factors that influence the investment decision and level of investment of marketers of these products are pertinent. Investment has been shown to be a two-step process i.e., decision of whether or not to invest and how much to invest (Oskam *et al.*, 2009; Worku and Mekonnen, 2012; Mutinda *et al.*, 2020). However, investment studies in Nigeria just to mention a few reviewed (Nwibo and Alimba, 2013; Nwibo and Mbam, 2013; Okeke *et al.*, 2015), modeled only one of these two processes in their works. Also, these studies did not take into cognizance the possibility of having a zero investment for investors who are willing to invest. According to Worku and Mekonnen (2012), in cases where the dependent variable takes positive values and a large proportion of zeros, adopting an ordinary least square (OLS) technique would result in biased estimates. In such cases, an alternative is to estimate the Tobit model.

The Tobit model which was developed to deal with the problem of zero observations has its shortcomings due to the restrictive assumption it makes in that any variable that increases the probability of a non-limit value must also increase the mean positive value, which is not always reasonable (Mutinda *et al.*, 2020). This model also assumes that all zero observations are standard corner solutions and, as such, those marketers who do not invest do so as a result of their economic circumstances (Worku and Mekonnen, 2012). Hence, given that in the present study the zeros in the level of investment were not due to what the marketers invested in the marketing of value-added products of yam and cassava, neither were they due to corner solution nor sample selection, the appropriate model was Double Hurdle model. The Double Hurdle model has been adjudged more efficient in dealing with zero cases compared to the Tobit model.

Assessment of the available studies (Akinbode and Dipeolu, 2012; Oladimeji *et al.*, 2015; Alabi *et al.*, 2020; Olutumise *et al.*, 2020) in Nigeria that adopted Double Hurdle model shows that no study has employed the model in modeling investment decision and level of investment in the marketing of value-added products of yam and cassava. This study therefore was aimed at modeling investment as a two-step process using marketers of value-added products of yam and cassava in Benue State,

Nigeria as a case study. The study sought to describe the socio-economic characteristics of marketers of value-added products of yam and cassava in the study area; examine the value-added products of yam and cassava marketed in the study area; identify and analyze the determinants of investment decision (first hurdle) in the marketing of value-added products of yam and cassava in the study area; and identify and analyze the determinants of the level of investment (second hurdle) in the marketing of value-added products of yam and cassava in the study area.

Modeling level of investment as a two-step process is expected to promote better understanding of the investment in the marketing of value-added product among marketers. Findings from this study will go a long way in providing necessary information for government agencies and bodies concerned with the development of cassava and yam value chain, in formulating policies aimed at improving marketing of cassava and yam derivatives in the country. In addition, information on the relative impact of various socio-economic factors on the level of investment will guide policy makers on the subsector of the population to focus on when designing policy that will influence the marketers' investment in the marketing of cassava and yam value-added products.

MATERIALS AND METHODS

Study Area

The study was conducted in Benue State, Nigeria, situated between latitudes 6° 25' N and 8° 8' N and longitudes 7° 47' E and 10° E. Benue State is the nation's acclaimed food basket because of the abundance of its agricultural resources. The State is a major producer of food and cash crops in Nigeria (Okeke *et al.*, 2015). Smallholder farmers who produce arable crops like rice, yam, cassava, sweet potato, maize, vegetables, soya bean, as well as livestock like poultry, goat, sheep, piggery, cattle, and fish including marketers/distributors and processors of these crops and livestock abound in the State.

Population of the Study

The population for this study consisted of marketers of value-added products of yam and cassava in Katsina-Ala, Ukum and Otukpo Local Government Areas of Benue State. These Local Government Areas were chosen because of the vast number of yam and cassava marketers in these areas.

Sampling Technique and Data Collection

Multi-stage sampling technique was employed to select a sample size of 300 marketers of value-added products of yam and cassava selected from six communities and three Local Government Areas.

The data for the study were collected using structured questionnaires. Data were collected on the socio-economic characteristics of the respondents; value-added products of yam and cassava marketed; and costs and returns in marketing cassava and yam value-added products in the study area.

Analytical Techniques

The data collected were subjected to descriptive and econometric analyses. Descriptive statistics such as mean, percentage, and frequency table were used to describe the socio-economic characteristics of marketers of value-added products of yam and cassava in the study area and examine the value-added products of yam and cassava marketed in the study area. The Double Hurdle model was used to identify and analyze the determinants of investment decision (first hurdle) in the marketing of value-added products of yam and cassava in the study area and to identify and analyze the determinants of the level of investment (second hurdle) in the marketing of value-added products of yam and cassava in the study area.

Double Hurdle Model Specification

The traditional approach to deal with data with many zeros (censored dependent variable) has been to use the standard Tobit model, originally introduced by Tobin in 1958. The Tobit model is appropriate when we think of investment decision and level of investment being made simultaneously. Using a Tobit model implies that factors affecting investment decision and level of investment are one and the same, affecting the dependent variable in the same direction. The Heckman model introduced in 1979 as opposed to the Tobit model, considers the zero observations to emanate mainly from the marketers' self-selection. In other words, it implies that all the zeros emanate from the marketers' deliberate choices.

The Heckman model addresses the problem related with the zero observations generated by non-participation decision by arguing that an estimation on a selected subsample (i.e., censored estimation) will give rise to sample selection bias. In order to overcome this sample selection bias, the model undertake a two-step estimation procedure called Heckit which involves a full sample Probit estimation followed by a censored estimation carried out on the selected subsample. The first step estimates the probability of observing a positive outcome (known as the selection or participation equation) while the second step estimates the level of participation conditional on observing positive values which is known as the conditional equation (Mignouna *et al.*, 2016). The Heckman model assumes that different covariates or variables could be used in the two-step estimations.

A shortcoming of the Tobit model is that it is too restrictive as it assumes all the zeros to be the respondents' deliberate choices. Cragg (1971) modified the Tobit model to address the restrictive assumption inherent in it by introducing the Double Hurdle model. The model addresses the problem of too many zeros in a survey data by giving attention to the participation decision. In Double Hurdle model, two hurdles have to be crossed in order to report participation and level of participation decisions.

The Double Hurdle model and Heckman models are similar as both models recognize that discrete (zero or positive) outcomes are determined by the selection and level of participation decisions. The two models also permit the possibility of estimating the first and second stage equations using different sets of independent variables. However, the Heckman model as opposed to the Double Hurdle model assumes that there will be no zero observations in the second stage once the first stage selection is passed. On the contrary, the Double Hurdle model considers the possibility of zero outcomes in the second stage arising from the marketers' deliberate choice or random circumstance. In this regard, the Double Hurdle model can be considered as an improvement both on the Tobit and Heckman models.

In estimating the Double Hurdle model, the first hurdle using binary (Probit) regression represents the investment decision equation and specified as follows:

$$y_i^a = \beta X_i' + \varepsilon_i \dots\dots\dots (1);$$

where $y_i^a = \begin{cases} 1, & \text{if } y_i^a > 0 \\ 0, & \text{otherwise} \end{cases}$. This y_i^a is a decision made by the marketers to invest in the marketing of value-added products of yam and cassava (marketers that made the decision were scored 1 and those that did not were scored 0). The second hurdle is a truncated regression model on the level of investment in the marketing of value-added products of yam and cassava. The level of investment equation is specified as follows:

$$y_i^b = r_i y_i^a = \beta X_i' + \omega_i \dots\dots\dots (2);$$

where y_i^b is the level of investment in the marketing of value-added products of yam and cassava, y_i^a refers the respondents that made investment decision, r_i stands for the level of investment by marketers of value-added products of yam and cassava, ε_i and ω_i are error terms associated with the investment decision and level of investment equations, respectively.

As stated in Olutumise *et al.* (2020), if the two decisions are independently made by the marketers, the error terms are assumed to be independently and normally distributed as shown in the above equations as: $\varepsilon_i \sim N(0, 1)$ and $\omega_i \sim N(0, \delta^2)$. This implies that there is no correlation between the two error terms. The maximum log-likelihood function which is a combination of the univariate Probit model and the truncated regression model, is used to estimate the independent double hurdle model as modeled by Cragg (1971) and it is specified as follows:

$$\log L = \sum_0 \ln \left[1 - \varphi(x, \alpha) \varphi\left(\frac{\beta X_i'}{\sigma}\right) \right] + \sum_{+1} \ln \left[\varphi(x, \alpha) \frac{1}{\alpha} \varphi\left(\frac{y_i^a - \beta X_i'}{\alpha}\right) \right] \dots\dots\dots (3).$$

If x_i , α is 1, it means no zero investment and then we have a Tobit model which estimates the level of investment; X_i' is the vector of explanatory variables that determine the decision to invest or not, and as well as the level of investment in the marketing of value-added products of yam and cassava in the study area. β is the parameters to be estimated. The Craggit command was used to carry out the analysis using STATA 14 software. The explanatory variables are defined in Table 1.

RESULTS AND DISCUSSION

Socio-Economic Characteristics of the Marketers of Value-added Products of Cassava and Yam

The socio-economic characteristics of marketers of cassava and yam value-added products are presented in Table 2. The show that majority (81%) of the marketers were females. The dominance of women in the marketing of value-added products of yam and cassava in the study area can be attributed to the dominance of women in value-addition activities in Africa including Nigeria (Ezedinma *et al.*, 2007). This find agrees with Uzuegbu *et al.* (2020) who revealed that majority of *garri* and *fufu* marketers in Umuahia, Abia State, Nigeria, were females.

The distribution of the marketers in Table 2 according to marital status and household size reveals that majority (85.3%) were married with mean household size of 5 persons. The increase in household size that comes with marriage implies availability of family labour which could be engaged in the marketing of these products and thus saving cost of hiring labour. Hence, the level of investment of these marketers in their marketing activities will be high owing to savings from hiring labour. This finding is in consonance with Isitor *et al.* (2019) who reported that majority (61%) of *garri* marketers in Kwara State, Nigeria were married with mean household size of about 6 persons.

The distribution of the marketers in Table 2 according to level of education reveals that the mean level of education of these marketers was 9 years. This implies that the marketers had at least primary education and thus more likely to be receptive to

improve marketing techniques that will translate to more profit. This is in congruent with Isitor *et al.* (2019) who opined that level of education plays an important role in business management as it determines the degree of adoption of innovation and new technologies as well as the degree of excellence of individual when performing business activities.

The distribution of the marketers in Table 2 according to their age shows that most (35%) were in the age bracket of 27-36 years with mean age of 43 years. The implication is that marketers of value-added products of cassava and yam in the study area are young and in their productive age in life, and so are likely to adopt innovations faster that will translate to more profit. This finding agrees with Uzuegbu *et al.* (2020) who reported a mean age of 43 years for *garri* marketers in Umuahia, Abia State, Nigeria.

Table 2 shows that majority (65.3%) of the marketers have been in the business of marketing of value-added products of cassava and yam for less than or equal to 10 years with mean marketing experience of 8years. The mean marketing experience of the marketers implies that there is prospect for the trade since people are moving into it in recent times. This also implies that the marketers of these products are well-experienced in the business of marketing value-added products of yam and cassava. This finding agrees with Isitor *et al.* (2019) and Uzuegbu *et al.* (2020) who reported that marketers of *garri* and *fufu* in Kwara and Abia States to be well-experienced in the trade.

Table 2 also shows that majority (55.3%) of the marketers were non-members of cooperative society. Studies (Nto *et al.*, 2011; Isitor *et al.*, 2019) revealed the importance of cooperatives in providing information that can enhance business management skills of members, assist members achieve higher marketing efficiencies, and provide credit access. Thus, it can be implied that majority of marketers of value-added products of cassava and yam in the study area have limited awareness of the importance of cooperative society. The finding of this study is in congruent with Isitor *et al.* (2019) who revealed that majority (65%) of *garri* marketers in Kwara State, Nigeria were not involve in any cooperative.

Table 1: Definition of variables included in the first and second hurdles of the Double Hurdle model

| Variable | Unit | Description | Expected sign | |
|--|------------|---|---------------|---------------|
| | | | First hurdle | Second hurdle |
| <i>Dependent variables</i> | | | | |
| Investment decision | Binary | 1 if a marketer invested, 0 otherwise | | |
| Level of investment | Naira | Amount in Naira spent in marketing | | |
| <i>Independent variables (X₁-X_n)</i> | | | | |
| Sex | Binary | 1 if a marketer is a male, 0 if female | + | + |
| Marital status | Binary | 1 if a marketer is married, 0 if single | + | + |
| Household size | Number | Number of people in the household | - | - |
| Educational level | Years | Years spent in formal education | + | + |
| Age | Years | Chronological age of the marketer | + | + |
| Membership of cooperative society | Binary | 1 if the marketer is a member, 0 if not | + | + |
| Marketing experience | Years | Years spent in marketing | + | + |
| Revenue | Naira | Amount in Naira realized from marketing | + | + |
| Access to credit | Binary | 1 if accessed credit, 0 if did not | + | + |
| Credit received | Naira | Amount in Naira of credit received | + | + |
| Interest rate | Percentage | Percentage of interest charged on loan | - | - |

Table 2: Socio-economic characteristics of marketers of value-added products of cassava and yam ($n = 300$)

| Variables | Frequency | Percentage (%) | Mean |
|-----------------------------------|-----------|----------------|-----------|
| Sex | | | |
| Male | 57 | 19.00 | |
| Female | 243 | 81.00 | |
| Marital status | | | |
| Single | 44 | 14.70 | |
| Married | 256 | 85.30 | |
| Membership of cooperative society | | | |
| Member | 134 | 44.70 | |
| Non-member | 166 | 55.30 | |
| Household size | | | 5 persons |
| ≤ 4 | 145 | 48.30 | |
| 5-9 | 132 | 44.00 | |
| ≥ 10 | 23 | 7.70 | |
| Level of education | | | 9 years |
| ≤ 3 | 12 | 4.00 | |
| 4-6 | 139 | 46.30 | |
| ≥ 10 | 149 | 49.70 | |
| Age | | | 43 years |
| ≤ 26 | 17 | 5.70 | |
| 27-36 | 105 | 35.00 | |
| 37-46 | 84 | 28.00 | |
| ≥ 47 | 94 | 31.30 | |
| Marketing experience | | | 8 years |
| ≤ 10 | 196 | 65.30 | |
| 11-18 | 63 | 21.00 | |
| 19-26 | 39 | 13.00 | |
| ≥ 27 | 2 | 0.70 | |
| Access to credit | | | |
| Did not access | 93 | 31.00 | |
| Accessed | 207 | 69.00 | |

Source: Field Survey Data, 2019

The distribution of the marketers in Table 2 according to credit access shows that majority (69%) of the marketers had access to credit for their enterprises. This implies the availability of credit sources other than personal savings in the study area. This finding contrasts with Isitor *et al.* (2019) who reported that majority of *garri* marketers in Kwara State, Nigeria sourced credit from their personal savings.

Value-Added Products of Yam and Cassava in the Study Area

The value-added products of yam and cassava in the study area are presented in Table 3. The data show that the most marketed value-added product among marketers of yam and cassava value-added products in the study area was *akpu/fufu*. The result shows that majority (63.66%) of the marketers were involved in the marketing of *akpu/fufu* in the study area. This is followed by *garri* in which 61.67% of the marketers were involved in its marketing.

According to the result in Table 3, the least marketed value-added product among marketers of yam and cassava value-added products in study area was yam flour. The result shows that 1.33% of the marketers were involved in the marketing of yam flour in the study area. Other value-added products of yam and cassava marketed in the area include fried yam, yam *fufu*, pottage yam, cassava flour, grilled yam, and *abacha* in which 28.67%, 27.00%, 26.67%, 8%, 5.33%, and 4.67% of the marketers respectively were involved in the marketing.

Akpu/fufu and *garri* top the list of the value-added products marketed in the study area due to the availability of the rudimentary tools used in their processing, the ready market for these products, and the high profit from marketing these products. This finding agrees with Ani *et al.* (2019) who in a study on the profitability of cassava processing in Benue State, Nigeria, revealed that *garri* and *fufu/akpu* to be the major value-added products of cassava produced in the study area.

Investment Decision and Level of Investment in the Marketing of Value-added Products of Yam and Cassava

The distribution of the marketers of value-added products of yam and cassava according to investment decision and level of investment are presented in Table 4. Analysis of Table 4 shows that 86% of the marketers invested in value-added products of yam marketing while 14% did not invest in the marketing of these products. 85.3% of the marketers invested in value-added products of cassava marketing while 14.7% did not invest in the marketing of these products. Also, Table 4 shows that 60.3% of the marketers invested between ₦10,000.00 and ₦12,000.00 in the marketing of value-added products of yam with a mean level of investment of ₦10,086.30. About 70% of the marketers invested more than ₦23,000.00 in the marketing of value-added products of cassava with a mean level of invest of ₦46,361.30

Determinants of Investment Decision and Level of Investment in the Marketing of Value-Added Products of Yam and Cassava

The determinants of investment decision and level of investment in the marketing of value-added products of yam and cassava in the study area are presented in Tables 5 and 6, respectively. The Wald Chi2 value of 44.67 and 47.72 in Tables 5 and 6, respectively were statistically significant at 1% level indicating that the independent variables in the model jointly explain both the probability to invest and the extent of investment. There is no theoretical guidance as to which variable to include in each hurdle. Thus, an attempt was made to include a number of socio-economic and economic variables in both hurdles.

Table 3: Value-added products of yam and cassava marketed in the study area ($n = 300$)

| Value-added products | Frequency | Percentage* | Rank |
|----------------------|-----------|-------------|-----------------|
| Yam flour | 4 | 1.33 | 9 th |
| Pottage yam | 80 | 26.67 | 5 th |
| Yam <i>fufu</i> | 81 | 27.00 | 4 th |
| Fried yam | 86 | 28.67 | 3 rd |
| Grilled yam | 16 | 5.33 | 7 th |
| Cassava flour | 24 | 8.00 | 6 th |
| <i>Garri</i> | 185 | 61.67 | 2 nd |
| <i>Abacha</i> | 14 | 4.67 | 8 th |
| <i>Akpu</i> | 187 | 63.66 | 1 st |

Source: Field Survey Data, 2019. *Multiple responses existed, hence percentage greater than 100

The coefficients in the first hurdle indicate how a given socio-economic variables affect the likelihood to invest in the marketing of value-added products of yam and cassava. Those in the second hurdle indicate how socio-economic and economic variables influence the extent of investment in the marketing of value-added products of yam and cassava. In the estimation process, 18 explanatory variables were included in the two hurdles (Tables 5 and 6). The decision to invest in the marketing of value-added products of yam and cassava were significantly determined by four of the seven explanatory variables. The result of the first hurdle (Probit model) indicates that, sex, marital status, age, and membership of cooperative status of the marketers significantly determined investment decision in the marketing of value-added products of yam and cassava.

The coefficient of sex was significant at 5% and 10% in Tables 5 and 6, respectively and positively

related to the probability of investing in the marketing of value-added products of yam and cassava. The positive sign of the coefficient conforms to the *a priori* expectation. Its marginal effect in Tables 5 and 6 imply that if a marketer is a male, he is 6.8 and 6.2 percentage points more likely to invest in the marketing of value-added products of yam and cassava respectively. Agripreneurs who are male usually have opportunity for investment capital compared to their female counterparts and thus, translating to more investment (Okeke *et al.*, 2015). This is in congruent with the finding of Mutinda *et al.* (2020) who revealed that being male increased the probability of investment and attributed it to male agripreneurs having better networks in society which place them in better positions to get more information and new production techniques compared to females.

Table 4: Distribution of marketers according to investment decision and investment level for value-added products of yam and cassava

| Variables | Frequency | Yam | | Mean | Cassava | |
|-----------------------------|-----------|------------|------------|------|------------|------------|
| | | Percentage | Mean | | Percentage | Mean |
| Investment decision | | | | | | |
| Invested | 258 | 86.0 | | 256 | 85.3 | |
| Did not invest | 42 | 14.0 | | 44 | 14.7 | |
| Investment level (₦) | | | | | | |
| ≤ 1.00 | 42 | 14.0 | ₦10,086.30 | 44 | | ₦46,361.30 |
| 1.01-12.00 | 181 | 60.3 | | - | | - |
| 12.01-23.00 | 52 | 17.3 | | 46 | | 15.3 |
| ≥ 23.01 | 25 | 8.3 | | 210 | | 70.0 |

Source: Field Survey Data, 2019

Table 5: Estimates of double hurdle model for decision and investment level in marketing yam value-added products

| Variables | First hurdle | | Second hurdle |
|---------------------------|------------------------------|-----------------|----------------------------------|
| | Coefficient | Marginal effect | Coefficient |
| Sex | 0.65** (0.45) | 0.068 | 13821.10 ^{NS} (8692.07) |
| Marital status | 1.48*** (0.52) | 0.38 | 15746.21* (8737.90) |
| Household size | 0.0015 ^{NS} (0.088) | 0.00021 | -2038.70 ^{NS} (2692.23) |
| Level of education | 0.019 ^{NS} (0.038) | 0.0027 | -354.43 ^{NS} (651.56) |
| Age | -0.026** (0.018) | -0.0037 | -463.18 ^{NS} (403.67) |
| Membership of cooperative | 1.42*** (0.40) | 0.20 | -16247.43** (6950.53) |
| Marketing experience | 0.0026 ^{NS} (0.026) | 0.00036 | -279.83 ^{NS} (616.20) |
| Return | | | 0.31*** (0.056) |
| Access to credit | | | 713.15 ^{NS} (8855.32) |
| Credit received | | | 0.068*** (0.021) |
| Interest rate | | | -1027.08 ^{NS} (1077.66) |
| Constant | 0.35 ^{NS} (0.77) | | 1702.19 ^{NS} (17151.63) |
| Sigma | | | 16044.82*** (2455.97) |

Source: Field Survey Data, 2019; ***, ** and * - significant at 1%, 5% and 10% prob. levels, respectively; NS - not significant; Wald chi2 (7) = 44.67. Log likelihood = -2704.07, Wald chi2 is significant at 1% prob. level. Values in parentheses are standard errors.

Table 6: Estimates of double hurdle model for decision and investment level in marketing cassava value-added products

| Variables | First hurdle | | Second hurdle |
|---------------------------|------------------------------|-----------------|-----------------------------------|
| | Coefficient | Marginal effect | Coefficient |
| Sex | 0.54* (0.44) | 0.062 | 11566.36** (5708.49) |
| Marital status | 1.43*** (0.53) | 0.37 | 1675.10 ^{NS} (6665.94) |
| Household size | 0.0064 ^{NS} (0.10) | 0.00094 | -1701.40 ^{NS} (1364.84) |
| Level of education | 0.013 ^{NS} (0.039) | 0.0019 | 899.82* (505.13) |
| Age | -0.028** (0.020) | -0.0041 | 429.94* (251.64) |
| Membership of cooperative | 1.62*** (0.44) | 0.23 | -17503.73*** (4989.15) |
| Marketing experience | -0.016 ^{NS} (0.026) | -0.0023 | -2.17 ^{NS} (349.71) |
| Return | | | 0.23*** (0.031) |
| Access to credit | | | 8120.78 ^{NS} (5031.80) |
| Credit received | | | 0.0082 ^{NS} (0.019) |
| Interest rate | | | 570.32 ^{NS} (564.30) |
| Constant | 0.54 ^{NS} (0.77) | | 11647.02 ^{NS} (10923.91) |
| Sigma | | | 22871.96*** (1629.17) |

Source: Field Survey Data, 2019; ***, ** and * - significant at 1%, 5% and 10% prob. levels, respectively; NS - not significant; Wald chi2 (7) = 45.72. Log likelihood = -3001.60; Wald chi2 is significant at 1% prob. level. Values in parentheses are standard errors.

The coefficient of marital status was significant at 1% both in Tables 5 and 6 and positively related to the probability of investing in the marketing of value-added products of yam and cassava. The positive sign of the coefficient agrees with the *a priori* expectation. Its marginal effect in Tables 5 and 6 imply that if a marketer is married, he/she is 38 and 37 percentage points more likely to invest in the marketing of value-added products of yam and cassava. The increase in the probability of investment decision among married marketers could be attributed to the difference in wealth between singles and married persons which is more on the side of married couples than single persons (Lyons *et al.*, 2011). There is a positive relationship between wealth and investment. This is corroborated by Oskam *et al.* (2009) who opined that a firm is more likely to invest if it has more wealth. Also, according to Nwibo and Alimba (2013), the combined ideas of male and female will result in proper decision to invest resources in agribusiness ventures as two good heads are better than one. Marriage helps in improving decision making as it provides wider human resource base for decision making. Dlamini and Huang (2019) opined that marital status is positively associated with sales decisions as marketers who are married are more exposed to a wider base of human resource for management and decision-making functions.

The coefficient of age was significant at 5% both in Tables 5 and 6 and negatively related to the probability of investing in the marketing of value-added products of yam and cassava. The negative sign of the coefficient is at variance to the *a priori* expectation. Its marginal effect in Tables 5 and 6 imply that as the age of a marketer increases, he/she is 0.37 and 0.41 percentage points less likely to invest in the marketing of value-added products of yam and cassava. Age is an important factor that can influence the level of efficiency and overall coping ability within the business (Isitor *et al.*, 2019). Thus, as agripreneurs advance in age, they develop better management skills and marketing strategies overtime thereby leading to higher profits which translate to increase level of investment. However, marketers whose probability of investment decrease and are advanced in age are those whose households are large and do not consist of economically active adults. Okeke *et al.* (2015) opined that such agripreneurs with large household size will likely channel more of his/her income to feeding expenditure and family upkeep rather than to save and invest. Similarly, Mutinda *et al.* (2020) opined that the number of people living with and depending on agripreneurs negatively influenced their decision to invest in their enterprises.

The coefficient of membership of cooperative society was significant at 1% both in Tables 5 and 6 and positively related to the probability of investing in the marketing of value-added products of yam and cassava. The positive sign of the coefficient conforms to the *a priori* expectation. Its marginal

effect in Tables 5 and 6 imply that if a marketer is a member of cooperative society, he/she is 20 and 23 percentage point more likely to invest in the marketing of value-added products of yam and cassava. The loan provided by cooperatives to their members as well as the awareness on improved marketing practices that cooperative society exposes their members to, positively influence their investment decision. According to Mossie *et al.* (2020), the positive effect of membership in local cooperatives on the decision to and intensity of participation in value chain can be attributed to the good information exchange platform of these cooperatives in enabling other actors in the chain to share experiences to increase production and marketing decisions. Similarly, Kehinde and Aboaba (2016) revealed that cooperatives help their members to increase their working capital through the loan they provide and thereby positively influencing their investment decision.

The level of investment in the marketing of value-added products of yam was significantly determined by four of the 11 explanatory variables (Table 5), while the level of investment in the marketing of value-added products of cassava was significantly determined by five out of the eleven explanatory variable (Table 6). The result in Table 5 of the second hurdle (Truncated normal regression) indicates that marital status, membership of cooperative society, return, and amount of credit received by the marketers significantly determined level of investment in the marketing of value-added products of yam while the result in Table 6 indicates that sex, level of education, age, membership of cooperative society, and return significantly determined level of investment in the marketing of value-added products of cassava.

The coefficient of sex was significant only in Table 6 at 1% and positively related to the level of investment in the marketing of value-added products of cassava. The positive sign of the coefficient conforms to the *a priori* expectation, implying that if a marketer is a male, his level of investment in the marketing of value-added products of cassava increases by ₦11,566.36. Male agripreneurs usually have opportunity for investment capital translating to more investment compared to their female counterparts (Okeke *et al.*, 2015). This is congruent with the finding of Mutinda *et al.* (2020) who revealed that being male increased the probability of investment and attributed it to male agripreneurs having better networks in society which place them in better positions to get more information and new production techniques compared to females.

The coefficient of marital status was significant only in Table 5 at 1% and positively related to the level of investment in the marketing of value-added products of yam. The positive sign of the coefficient conforms to the *a priori* expectation, implying that if a marketer is married, his/her level of investment

in the marketing of value-added products of yam increases by ₦15,746.21. The increase in the level of investment decision among married marketers could be attributed to the difference in wealth between singles and married persons which is more on the side of married couples than single persons (Lyons *et al.*, 2011). There is a positive relationship between wealth and investment. This is corroborated by Oskam *et al.* (2009) who opined that a firm is more likely to invest if it has more wealth. Also, according to Nwibo and Alimba (2013), the combined ideas of male and female will result in proper decision to invest resources in agribusiness ventures as two good heads are better than one. Marriage helps in improving decision making as it provides wider human resource base for decision making. Dlamini and Huang (2019) opined that marital status is positively associated with sales decisions as marketers who are married are more exposed to a wider base of human resource for management and decision-making functions.

The coefficient of education level was significant only in Table 6 at 10% and positively related to the level of investment in the marketing of value-added products of cassava. The positive sign of the coefficient agrees with the *a priori* expectation, implying that as the level of education of a marketer increases, his/her level of investment in the marketing of value-added products of cassava increases by ₦899.82. Formal education provides agripreneurs with a greater capacity to learn about new production processes and product design, offer specific technical knowledge conducive to business expansion and thus, increasing their level of investment in their enterprises. This is in consonance with Nwibo and Alimba (2013) who opined that educated individual has better potential to choose the area to invest as he/she knows the nitty-gritty of investment. Similarly, Okeke *et al.* (2015) reported a positive relationship between educational status and investment decision and attributed this to better understand of the risks and uncertainties found in business.

The coefficient of age was significant only in Table 6 at 10% and positively related to the level of investment in the marketing of value-added products of cassava. The positive sign of the coefficient conforms to the *a priori* expectation, implying that as the age of a marketer increases, his/her level of investment in the marketing of value-added products of cassava increases by ₦429.94. Age is an important factor that can influence the level of efficiency and overall coping ability within the business (Isitor *et al.*, 2019). Thus, older marketers develop better management skills and marketing strategies overtime thereby leading to higher profits which translate to increase level of investment. This agrees with Mutinda *et al.* (2020) who reported a positive relationship between age of agripreneurs and investment decision and attributed it to more experience and more resources that they are endowed with compared to younger agripreneurs.

The coefficient of membership of cooperative was significant at 5% and 1% in Tables 5 and 6, respectively and negatively related to the level of investment in the marketing of value-added products of yam and cassava. The negative sign of the coefficient is at variance with the *a priori* expectation, implying that if a marketer is a member of cooperative, his/her level of investment in the marketing of value-added products of yam and cassava decreases by ₦16,247.43 and ₦17,503.73 respectively. The loan provided by cooperatives to their members as well as the awareness on improved marketing practices that cooperatives expose their members, positively influence their investment decision. However, marketers whose level of investment decrease and are members of cooperative societies are those whose households are large and do not consist of economically active adults. Okeke *et al.* (2015) opined that such agripreneurs with large household size will likely channel more of his/her income to food consumption expenditure and family upkeep rather than to save and invest. Similarly, Mutinda *et al.* (2020) opined that the number of people living with and depending on agripreneurs negatively influence their decision to invest in their enterprises.

The coefficient of return was significant at 1% both in Tables 5 and 6 and positively related to the level of investment in the marketing of value-added products of yam and cassava. The positive sign of the coefficient is in consonance with the *a priori* expectation, implying that as return from marketing value-added products of yam and cassava increases by ₦1.00, the level of investment in their marketing increases by ₦0.31 and ₦0.23, respectively. Increase in the revenue level of the marketers will bring about increase in their savings and investment capacity as this will result in surplus that will be saved and invested after consumption expenditure has been made (Nwibo and Mbam, 2013). According to Oskam *et al.* (2009), a firm is more likely to invest if it has higher revenue and more wealth. Similarly, Babatunde and Qaim (2009) as well as Simtowe (2010) revealed that increase in the level of income facilitate the mobilization of productive resources and hence, level of investment.

The coefficient of credit received was significant only in Table 5 at 1% and positively related to the level of investment in the marketing of value-added products of yam. The positive sign of the coefficient is in congruent with the *a priori* expectation, implying that as the amount of credit received by a marketer increases by ₦1.00, his/her level of investment in the marketing of value-added products of yam increases by ₦0.068. Financial capital which includes cash income and/or credit, as well as non-liquid assets, enables agripreneurs to invest more (Worku and Mekonnen, 2012). Mutinda *et al.* (2020) attributed this increase in investment to the increase in the purchase of required inputs which access to credit enables.

CONCLUSION

Evidence from the study reveals the following:

- Marketers of value-added products of cassava and yam in the study area were mostly married females with moderate household size, literate, young and within productive age, non-member of cooperative society, experienced in marketing value-added products of cassava and yam, and had access to credit.
- *Akpu/fufu* was the most marketed value-added product among yam and cassava value-added products in the study area. This was followed by *garri*, fried yam, yam *fufu*, pottage yam, cassava flour, grilled yam, *abacha*, and yam flour.
- Investment in the marketing of value-added products of cassava and yam involved two hurdles; the decision to invest in the enterprise and the level of investment.
- Sex, marital status, age, and membership of cooperative society were the socio-economic variables that influenced investment decision in the marketing of value-added products of yam and cassava in the study area.
- Sex, marital status, level of education, age, membership of cooperative society, return, and credit received were the socio-economic and economic variables that influenced level of investment in the marketing of value-added products of yam and cassava in the study area.

This study makes the following contribution to the theoretical and empirical literature, as well as providing insight into agripreneurs investment in the marketing of value-added products of cassava and yam. First, though this study was focused on Benue State, Nigeria, it has implication for developing countries as well, with the agenda of improving the livelihood of marketers of value-added products of cassava and yam. Thus, the factors revealed in this study could be explored in formulating and implementing policies and programmes aimed at improving the livelihood of these marketers. Second, this study provides an empirical contribution to the existing literature. To the best of our knowledge, literature on factors influencing investment decision and level of investment in the marketing of value-added products of cassava and yam is not available. Hence, by identifying factors that significantly influence investment decision and level of investment in the marketing of value-added products of cassava and yam, this study provides an empirical contribution to the existing literature. Based on the findings in this study, the following recommendations were made:

- Policies and programmes targeted at increasing the level of investment in the marketing of value-added products of yam and cassava in the study area should take into consideration the socio-economic variables that influence both investment decision and level of investment in the marketing of these products during their formulation and implementation.
- The Benue State Government and other stakeholders responsible for the development of root and tuber crops sub-sector in the State should organize workshops/seminars aimed at promoting as well as disseminating innovations about the value-added products of yam and cassava.
- The Benue State Government should put in place policies to develop the local markets for these value-added products of yam and cassava targeting especially the less marketed products such as yam flour, cassava flour, and *abacha*.

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