Determinants Of Value Addition To Cassava In Kwara State, Nigeria

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Abstract

This study focuses on factors influencing value addition to cassava by farming households in Kwara State, Nigeria. The study emanated from the need to harness the benefits of value addition to cassava in Nigeria, being the world's

largest producer of the crop. Data were collected from 160 cassava farming households through a combination of purposive and random sampling techniques. The data were analyzed with descriptive statistics and two-stage Heckman model. Results showed that the farmers were still in their active age, married with an average household size of seven persons. Those who engaged in value addition among the farmers were 37.5%. The products of the value-adders were cassava flakes, flour, cassava paste, cassava chips and starch. Decision to add value to cassava by the farmers was significantly influenced by availability of processing equipment, cassava output, farm size, age and access to extension services. The study further revealed that the extent to which value addition is carried out is influenced by availability of processing equipment, being a female, age and hours spent on non-farm activities. The study therefore recommends encouraging the youths to engage in cassava farming, providing farmers with processing equipment, overhauling extension services and putting measures that will improve farmers' output in place.

Keywords: Value addition, cassava, factors, Nigeria

1. INTRODUCTION

Cassava (*Manihot spp*) is one of the most important root crops grown in Nigeria and most other countries of low land and sub-humid tropics. Cassava production is vital to the economy of Nigeria as the country is the world's largest producer of the commodity, with about 54 million metric tonnes (FAO, 2012). The crop is a major source of carbohydrate and third largest source of carbohydrate in the world (Alves, 2002; Akinpelu et al., 2011). It is also a competitive crop especially for the production of starch and animal feed (Fuglie, 2002). The crop can also be processed into flour which can further be used for food products like glucose for pharmaceutical products as well as food supplements to make alcohol and other beverages (Adebayo, 2010; Odunaya, 2013). All these emphasize the potentials of cassava in food security and poverty alleviation, through value addition.

Value addition is the transformation of raw agricultural commodities to consumer-ready food products. It includes local processing, packaging, cooling, drying, extracting or any other types of process aimed at improving the value of raw agricultural produce. Value addition has been identified as a pathway for farmers out of poverty. A study by Unterschultz *et al.* (2000) suggest that farmers would be better off with increased prices of their produce as a result of value addition. Lundy *et al.* (2002) observed that opportunities exist for rural households to improve their incomes and diversify their livelihoods through value addition. In the same vein, Ramirez (2001) found that value adding activities accounted for a 350% increase in household incomes. Lawal and Jaiyeola (2007) reported that value addition improves the shelf life of agricultural products and generates income for participants. Ukpongson (2011) observed that value adding activities to cassava can serve as useful tools for sustainable poverty alleviation in Nigeria. Olukunle (2013) noticed that cassava value addition stands the opportunity of generating employment and increased income to value-adders.

Despite the aforementioned importance of value addition, Nigeria still suffers from challenges which would have been overcome if the farmers had been engaging in cassava value addition. For instance, Awoyinka (2009) noted that Nigeria can earn about US$5 billion per annum from cassava and its by-products, making it a key foreign exchange earner and instrument for job creation and catalyst for development. The USAID (2013) records also reveal that Nigeria spends about USD 680 million annually on importation of flour, starch, glucose, and animal feed, most of which can be made from processed cassava. Meanwhile, while many studies have focused on the importance of value addition to cassava (Awoyinka, 2009; Ekwe *et al.*, 2008; Odunaya, 2013; Olukunle, 2013; Ukpongson, 2011), studies that specifically emphasize factors determining value addition to the crop are very dear. Therefore, the need to know the factors that are responsible for value-addition to cassava becomes imperative in order to inform policy-makers on issues that need to be addressed. In this vein, this study was conducted to determine factors responsible for value addition to cassava in Kwara State, Nigeria. The specific objectives are to describe the socio-economic characteristics of the farmers, determine factors responsible for their value addition status as well as factors that determine the extent of value added.

2. METHODOLOGY

The study was conducted in Kwara State, Nigeria. The state is situated in the northcentral Nigeria located in the middle belt of the country. Kwara State is located between latitude $8^0 5^l - 10^0 4^l$ N and longitude $4^0 55^l - 6^0 5^l$ E and covers an estimated land area of 36,825 square km, with a population of about 2.37 million (NPC, 2006). It shares local boundary with Niger, Oyo, Kogi and Osun states and international boundary with the Republic of Benin. The states is made up of sixteen (16) Local Government Areas (LGAs). The mainstay of the economy of the state is agriculture and this accounts for about 70% of the labour force.

A combination of purposive and random sampling techniques were used to select the respondents used for the study. First, three LGAs known for cassava production were purposively selected. Then by simple random sampling, 160 respondents were sampled based on the proportion of cassava farmers in each of the LGAs. Data were collected through the use of well-structured questionnaire augumented with personal oral interview

Data analysis was carried out with the use of descriptive statistics and Heckman two-stage selection model. The descriptive statistics were used to profile the socio-ecoonomic charateristics of the respondents. Following Berem *et al.* (2010), Heckman two-stage selection model was used to determine factors influencing decision to add value as well the extent of value addition by the respondents. The reasoning behind the two stage approach is that the decision on the amount of value added is usually preceded by a decision to engage in the process of value addition. In the first stage, the decision to add or not to add value was assessed using a probit model. The choice of this model is based on the fact that the decision to add value is discreet; it is either one adds value or not. Furthermore, the study assumes a normal distribution and hence the choice of the probit model. The probit model used in the first stage is specified as:

$$\text{Prob}(Y_i = 1 | X = \int_{-\infty}^{X'\beta} \varphi(t)dt = \varphi(X'\beta) \quad (1)$$

Where Y_i is an indicator variable equal to unity for households that add value and

0 if otherwise, $\varphi(.)$ is the standard normal distribution function, βs are the parameters to be estimated and *X*s are the determinants of the choice.

Emperically, the model can be respresented as

$$Y = \beta_j X_i + \varepsilon_i \quad (2)$$

where *Y* is the probability of a household adding value given farm and farmer characteristics $X_{i.}$ and ε_i is the error term.

In the second step the Inverse Mills ratio (IMR) is added as a regressor in the extent of value addition equation to correct for potential selection bias. After estimating the determinants of the decision to add value, then the mills ratio from the selected equation is used as an independent variable in the target equation to assess the determinants of the extent of value addition. This is expressed as follows:

$$E(Z_i \mid Y = 1) = f(x_i\beta) + \gamma\hat{\lambda} + u_i \quad (3)$$

where *E* is the expectation operator, Z_i is the (continuous) extent of value measured by the proportion of cassava output to which value was added, *x* is a vector of independent variables influencing the extent of value addition and β is a vector of the corresponding coefficients to be estimated, $\hat{\lambda}$ is the estimated IMR and $U_i \sim N(0, \sigma_u)$. So Z_i can be expressed as follows:

$$Z_i^* = \beta_i X_i + \gamma\hat{\lambda} + u_i \quad (4)$$

Z_i^* is only observed if the farmer is doing value addition (*Y*=1), hence $Z_i = Z_i^*$.

Empirically, this can be represented as:

$$Z_i^* = \beta_i X_i + \gamma\hat{\lambda} + u_i \quad (5)$$

where Z_i is the extent of value addition given the farm and farmer characteristics, $X_{i.}$ $\hat{\lambda}$ is the inverse Mills Ratio estimated in step 1 of the Heckman model and u_i is the error term.

The variables used in the model are presented in Table 1:

Table 1. Factors Hypothesized to Influence Value Addition to Cassava

Variable	Description	Unit of measurement
Valadd	Farmer adds value or not	1= adding value, 0=else
Amtvaladd	Amount of cassava value added	Proportion of cassava output to which value was added
Proequip	Availability of value addition equipment	Dummy (1=yes,0=No)
Hhsize	Household size	No of household members
Coopmem	Membership of cooperative	Dummy (1=yes,0=No)
Edulevel	Level of household education	Years
*Gender	Gender of household head	Dummy (1=female, 0 = male)
Credacess	Access to credit	Dummy(access=1,otherwise=0)
Nonfhrsda	Hours spent on daily non-farm activities	Hours
Output	Cassava output	Tons
Farm size	Total farm size owned by the household	Hectares
Age	Age of household head	Years
Extacess	Access to extension services	Dummy(access=1,otherwise=0)
Mktdist	Distance to the nearest local market	Kilometers

Note: * **Value addition is female-dominated in the study area**

3. RESULTS AND DISCUSSION

Socio-economic Characteristics of the Respondents

Table 2 shows the socio-economic attributes of the respondents. The majority of the respondents were female and this constituted 70%. This is in line with the observation of Ezedinma *et al* (2007) who reported that cassava processing is a female dominated activity. About 57.5% of the respondents were within the age range of 21-50 years. Further analysis of the results revealed that the mean age of the respondents was 43 years, indicating that they were still in their productive age and could actively engage in cassava value addition.

Table 2. Socio-economic Profile of the Respondents

Variable	Category	Frequency	Percentage
Sex	Male	48	30.0
	Female	112	70.0
Age (years)	21-30	3	1.9
	31-40	10	6.3
	41-50	79	49.3
	51-60	56	35.0
	>60	12	7.5
Marital status	Single	11	6.9
	Married	138	86.3
	Divorced	4	2.5
	Widowed	7	4.3
Household size	1-3	13	8.1
	4-6	63	39.4
	7-9	69	43.1
	>9	15	9.4
Educational level	No formal	35	21.8
	Primary	57	35.6
	Secondary	36	22.6
	Tertiary	16	10.0
	Arabic	16	10.0
Farming experience (years)	1-10	13	8.1
	11-20	75	46.9
	21-30	50	31.3
	>30	22	13.7

Farm size (hectares)	1.00 - 5.00	109	68.1
	5.01 – 9.00	45	28.1
	>9.00	6	3.8
Access to agricultural extension service	Have access	70	43.7
	No access	90	56.3
Access to credit	Have access	107	70.0
	No access	53	30.0
Cooperative Membership	Member	69	43.1
	Non-member	91	56.9
Value addition (VA) status	Involve in VA	60	37.5
	Not involved in VA	100	62.5

Source: Field Survey, 2014

In African society, the amount of family labour available to an individual is closely related to the marital status of the household head and the household size (Muhammad-Lawal et al., 2009). Also, all other beings being equal, an average farmer first exhausts all sources of labour in his family before hiring labour in order to reduce cost of labour. Distribution of the respondents according to their marital status shows that about 86% of the respondents were married. Most (91.1%) of the respondents had a household size of at least four persons. The mean household size was about seven persons. These results suggest availability of family labour that could be engaged in value addition, to save cost of hiring labour by the respondents.

About 78% of the respondents had one form of formal education or the other. However, just 32.6% of the respondents had at least secondary school education. As regards farming experience of the respondents, about 92% had been in cassava production for more than ten years. Analysis of the results further revealed that the mean farming experience of the farmers was 19.8years. This implies that cassava farming is an age-long venture in the study area.

The farm size of the majority (68.1%) of the respondents ranged from 1-3 hectares. The mean farm size was about 4.4 hectares. Fifty-seven percent of the respondents had no access to extesion services. Those that had access to credit accounted for 70% while those who were members of cooperative were 41.1%.

Meanwhile, 37.5% of the respondents engaged in value addition while 62.5% did not.

Table 3 shows the kinds of products produced by the value-adders in the study area. The major value-added products produced by the farmers were cassava flakes (locally called *garri*), cassava flour and cassava paste (locally called *fufu*). Other products of the value-adders were cassava chips and starch and these were produced by just 28% and 25% of the respondents respectively.

Table 3. Distribution of Value-adders by Products (n = 60)

Product	***No of Respondents**	**Percentage**
Cassava flour	45	75.0
Cassava starch	15	25.0
Cassava paste	39	65.0
Cassava flakes	55	91.7
Cassava chips	17	28.3

Note: *Multiple response was allowed

Source: Field Survey, 2014

Factors Influencing Value Addition and Amount of Value Added to Cassava

Table 4 shows the factors influencing value addition and amount of value added to cassava by the respondents. The Table shows that the practice of cassava value addition is significantly influenced by availability of processing equipment, cassava output, farm size, age and access to extension. The coefficient of processing equipment is positive and significantly related to the practice of value addition by the respondents. This indicates that farmers who have processing equipment are more likely to participate in value addition than those who have no equipment at all. Also, the quantity of cassava produced is positively and significantly related to the practice of value addition at 10% level of significance. This implies that the higher the quantity of cassava harvested the higher the

likelihood to participate in value addition and vice versa. *Ceteris paribus*, farmers with larger quantities of cassava are more likely to engage in value addition as they see it as profitable unlike their colleagues who harvest smaller quantities. In the same vein, those who have little output may view value addition as a waste of time and finances.

Table 4: Heckman Two-stage Results for the Factors Influencing Value Addition and the Amount of Value Added to Cassava

Variable	**Target Equation**				**Selection Equation**			
	Coefficient	**Std.Error**	**Z**	**P>|z|**	**Coefficient**	**Std.Error**	**z**	**P>|z|**
Proequip	4.7829***	1.426567	3.35	0.001	0.0491624***	0.0172935	2.84	0.004
Hhsize.	0.0000223	0.0002077	0.11	0.915	1.51e-06	3.42e-06	0.44	0.658
Coopmem	33.05634	26.60567	1.24	0.214	0.0893952	0.4064766	0.22	0.826
Edulevel	44.17746	27.17433	1.63	0.104	-0.5548738	0.4533529	1.22	0.221
Gender	2.19389	4.983209	0.44	0.660	0.1722963*	0.0893629	1.93	0.054
Credacess	12.80448	8.641496	1.48	0.138	0.1952634	0.1263146	1.55	0.122
Nonfhrsda	-7.092682	5.992139	-1.18	0.237	-0.1116662*	0.0665615	-1.68	0.093
Output	31.85491*	18.61243	1.71	0.087				
Farm size	-34.79722***	7.617322	-4.57	0.000	0.1167629	0.116069	1.01	0.314
Age	-11.63914*	6.919466	-1.68	0.093	-0.1601879***	0.0484667	-3.31	0.001
Extacess	33.01853***	6.015978	5.49	0.000	0.0815084	0.114802	0.71	0.478

Mktdist	0.7495221	0.5415882	1.38	0.166
Rho	0.46181			
Sigma	132.18526			
Lambda	61.044089	87.32305		

Note: *, ** and * = Figures significant at1%, 5% and 10% significant levels respectively.**

Source: Computation from field survey data, 2014

The farm size of the respondents was negatively and significantly related to the practice of value addition. This indicates that the larger the size of farm owned, the less likely a household will engage in value addition. This may result from the fact that owners of larger farm size may devote more of their time on farm production by focusing on production rather than value-adding practices.

Table 4 also shows that the practice of value addition is negatively influenced by the age of the respondents. This means that the older an individual is, the less likely he will practice value addition. This is logical, as older individuals are likely to be less energetic and may therefore find it hard to engage in activities which require quite some energy, such as value addition (Muhammad-Lawal et al., 2009; Falola et al., 2013).

Meanwhile, access to extension services by the respondents was positively and highly significant. This implies that those who have access to extension services are more likely to engage in value addition than those who do not. This might result from the fact that access to extesion services can provide farmers with crucial information, such as how to tranform their raw output into consumer-ready products.

Table 4 further reveals that the extent of value addition by the respondents was positively and significantly influenced by availability of processing equipment and being a female but negatively influenced by age and hours spent on daily

non-farm activity. This implies that the more available the processing equipment are (whether owned or rented) , the more likely the amount of value a farmer will be able to add. The positive relationship between amount of value added and being a female, however, could result from the fact that in Africa, including Nigeria, the female are more usually involved in processing of agricultural produce (especially raw cassava) than the male (Ezedinma *et al.,* 2007). The negative relationship between the age of the farmer and amount of value added might be because young individuals have more physical stength than their old counterparts (Daudu *et al.,* 2009; Muhammad-Lawal *et al.,* 2009; Falola *et al.*, 2013). Also, hours spent daily on non-farm activities has a negative influence on the amount of value addition to cassava implying that the higher the hours spent on non-farm activities per day the lower the amount of value addition to cassava in the study area.

4. CONCLUSION AND RECOMMENDATIONS

It can be inferred from this study that decision to add value to cassava in the study area is influenced by availability of processing equipment, cassava output, farm size, age and access to extension services. Also, the study reveals that the extent to which value addition is carried out is influenced by availability of processing equipment, female gender, age and hours spent on non-farm activities.

Based on these findings, therefore, there is need for agricultural development organizations to encourage farmers to part-take in value addition by providing them with processing equipment. This may be by including value addition in their agricultural intervention programmes. Also, agricultural institutes could fabricate more processing equipment in order to make it readily available to the farmers. In the same vein, cassava farmers could make some group or medium-term financing arrangements with local financial institutions on acquiring cassava processing equipment. Also, measures to increase cassava output by the farmers should be put in place by agricultural development agencies. This may include provision of high-yielding varieties to the farmers at no cost or subsidized rate. Besides, there is need to encourage the youths to engage in farming, as this will not only influence their decision to add value but also the

amount of value added. Moreover, strategies that will encourage more women to engage in agricultural processing should be put in place by the government, non-governmental organizations and other relevant agencies. This may include making value addition to agricultural produce an important part of their women empowerment programmes.

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