PROCESSING CASSAVA INTO CHIPS FOR INDUSTRY AND EXPORT: ANALYSIS OF ACCEPTANCE OF TECHNOLOGY AMONG SMALL HOLDER PROCESSORS IN IMO STATE, NIGERIA

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Abstract
The paper analyzed small holder processors' acceptance of the technology of processing cassava into chips for industry and export. The study was conducted in Imo State, Nigeria. A multi-staged random sampling technique was employed to select one hundred and Eighty (180) respondents across the three agricultural zones of the State who were interviewed with use of structured questionnaire. Data collected were analyzed with descriptive (such as frequency, percentage and means) and inferential statistics. Results of the study showed that more women(56.1%) were involved in cassava processing than men (43.9%) and that substantial proportion of the small holder processors were ageing ((59.1%) and no longer in the active age suitable for the rigors involved in cassava processing. Also, the level of income accruing from cassava processing to good proportion of respondents (35%) was considerably low (less than N2000/month). The study revealed a medium level of acceptance (3.52) of the technology among small scale processors in the area. Finally, the results of weighted least square regression analysis of influence of certain socio economic factors on small scale processors' acceptance of the technology revealed a significant F-Value of 8.295***which showed that goodness of fit was very appropriate. Again, an R^2 values of 0.395 indicated that 39.5% of variation in observation was accounted for by the selected variables in determining the levels of acceptance of the technology in the study area. Specifically, the results revealed that a range of socio economic variables such as monthly income, educational status, and membership of cooperative societies facilitated acceptance of the technology while processing experience and primary occupation hindered its acceptance among the small scale processors in the study area. Thus, it is recommended that extension agents should be given all necessary supports to reach small holder processors with the relevant technical information regarding the industrial and export market potentials of the cassava chips processing technology and its product.

Keywords: Cassava chips, small holder processors, acceptance, industry and export

Introduction

Cassava chips is the unfermented white dried products of cassava with average diameter of 3-5mm often used as a carbohydrate base in the animal feed industry particularly in Europe, or milled into flour for other uses such as in the production of ethanol, cakes, dough-nut and biscuits. The traditional method of processing cassava chips was inefficient and usually characterized with undesirable smell, colour, irregular shapes and extraneous contaminations. But research efforts by the Federal Institute of Industrial Research Oshodi has led to successful development of a processing technology for converting freshly harvested cassava into dried cassava chips with at least 18 months shelf life and containing cyanogenic glucosides within the permitted safe limits suitable for export and other uses Cassava chips are in large scale demand by agro allied industries in the United Kingdom, Taiwan, Asia and United States of America. The local demand in Nigeria has been on an increase making the total demand for cassava chips to be well over 10 million metric tonnes annually. These facts show that there is a huge investment opportunity that is yet to be fully maximized (FIIRO 2016).

Cassava chips are used in these industries mostly as a partial substitute to the regular raw materials. Wheat prices have been increasing and they are likely to continue increasing. The current price of wheat is about US$945/ton. If quality is improved and the price is competitive, cassava dry chips milled into flour can be a viable partial raw material substitute for wheat in major food items that are mainly prepared by women such as snacks, bread and biscuit. Similarly, it can also, completely replace imported starches and flours in plywood, paperboard and textile manufacture, in addition to 10%maize bran in animal feed rations, (Abass et al., 2001)

The traditional processing practices for cassava chips have two major constraints, coming from: a) the peeling operation prior to chipping and drying, and; b) the mechanical pressing operation to remove excessive water in the grating method introduced by IITA (Abass, 2006). Thus the need to design and develop efficient and cost effective machines and equipment for cassava chips processing and handling operations has been strongly emphasized, given the present global status of the products as foreign exchange earners, for food security and an important industrial raw materials (Adetan *et al.,* 2003). The more technologically complex the innovation appears the less acceptable it may be to many end-users. The decision to accept or reject an innovation will depend on a careful evaluation of a large number of technical, economic and social factors associated with the technology. Similarly, end users' felt needs, cost incurred and benefits accruing from use of a technology would be the major factors for the acceptance or rejection of a particular technology (Karl 2004).

In view of the foregoing, the novel technology of processing cassava into chips for industry and export developed by FIIRO was disseminated to small scale processors in Imo State by the State Agricultural Development Programme to enable them participate in the huge processing and marketing enterprises opportunities which the technology offers to the potential end users. Since the technology was introduced to the small holder processors a couple of years ago, the extent of acceptance of the technology is not yet known. It is thus pertinent to investigate the acceptance of the technology of processing cassava into chips for industry and export among small scale processors in Imo State.

Methodology

This study was conducted in Imo State of Nigeria. It is basically an agrarian State and lies within the tropical rain forest ecological zone. Administratively, Imo State is divided into twenty-seven local Government Areas (LGA) and three agricultural zones namely, Owerri, Orlu and Okigwe. Multistage random sampling procedure was used in selecting the respondents. In the first stage all the 3 agricultural zones (Owerri, Orlu and Okigwe) were selected. In the second stage one local Government Area was selected, from each of the three Agricultural zones by simple random sampling technique. In the third stage, six communities were randomly selected making a total of 18 communities. The last stage involved the random sampling of ten (10) respondents from each of the communities which gave a sample size of 180 persons. With of use structured questionnaire, current and relevant data for the study were collected from the respondents and analyzed using both descriptive (such as frequency, percentage, mean) and inferential (especially weighted least square regression) statistics.

Specifically, a 7-steps Hedonic measurement scale was employed to capture the extent of acceptance of the cassava chips processing technology as employed by Maduekwe *et al*, 2000 and Agwu, 2000. The following scaling procedure was modified and employed thus: Technology fully accepted and practiced = 7, accepted but discontinued the technology = 6; Still testing the technology = 5; mentally evaluating gains of the technology = 4, Getting interested in it = 3, Just aware of the technology = 2, Not aware= 1. The values of the seven responses were calculated and pooled together to obtain general acceptance mean score for the technology. The status of the acceptance mean score was established in a 3-category frame by dividing the maximum response

value (7) by the 3 to obtain class mark of 2.33 which successively delineated the categories thus 0.00-2.33=low; 2.34- 4.67=medium; 4.67-7.00 high. Furthermore, the weighted least square regression model was employed to estimate the socioeconomic determinants of acceptance of cassava chips processing technology among small holder processors in the study area.. The model as used is specified thus;

$Y = f(x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8, x_9, x_{10}, x_{11}, x_{12} + ei)$ ……..

Where

Y = extent of acceptance of cassava chips processing technology (measured by respondent's score for technology acceptance)

X_1 = Age of the farmer (years)

X_2 = Level of education (number of years spent in School)

X_3 = Household size (number of household members)

X_4 = Processing experience (years)

X_5 = Cassava monthly Income (N)

X_6 = Extension contact (number of visits by extension agent in one year)

X_7 = Primary Occupation (Dummy variable, 1 if Processing is major occupation , 0 if otherwise).

X_8 = Marital Status (Dummy variable, 1 if married, 0 if otherwise)

X_9 = Sex (Dummy variable, 1 if male, 0 if female)

X_{10} = Social organization membership/cooperative (Dummy variable, 1 if member of a cooperative or Processors group, 0 if otherwise).

e = Error term.

Results and Discussion

Description of the Socio-Economic Characteristics of Respondents

The results in Table 1 below represent the distribution of selected socio-economic characteristics of the respondents which includes: sex, age, marital status, educational status, extension contact, and monthly income from processing cassava, household size membership of organization, and respondents' involvement in cassava processing. The results showed that 56.1% of the respondents were female while the remaining 43.9% were male implying that cassava processing in the area was dominated by women. The results were in contrast with Otitoju and Arene (2010) which reported that Nigerian agricultural activities are dominated by men. On the marital status of the respondent, the results indicated that majority (82.2%) of the cassava processors were married, while only 17.8% were single. The results also showed that large number of the respondents (59.1%) belonged to the age brackets of 41 – 60years of age. Only 10.0% of the respondents were below 30 years of age. The results implied that there was a relatively high proportion of old cassava processors in the area and this differed from Agwu(2008) who observed that most farmers in Nigeria are still at the active stage of life and not relatively old.

The results further indicated that more than half of the respondents (52.8%) had secondary education, while 15.6% and 29% had primary school education and tertiary education respectively. Only 2.8% of the total number of respondents had no formal education. The implication was that most of the farmers were literate and this would likely make them more responsive to new innovations. Apu and Nwachukwu (2008) had earlier reported that increase in educational statuses of farmers positively influenced their adoption of improved technologies. On their contact with extension agents, most of the respondents (65.0%) had contact with extension every 2 weeks while 16.8% and 13.3% had no contact at all with extension and once every month respectively. The results showed a moderate level of contact with extension agents by the processors, given the dwindling situation of extension services delivery in Nigeria.

Table 1: Distribution of Respondents according to their socio-economic characteristics

Variable	Frequency	Percentage	Variable	Frequency	Percentage
Sex			**Marital Status**		
Male	**79**	43.9	Married	148	82.2
Female		56.1	Single	32	17.8
Age (Years)			**Educational Status**		
≤ 30	18	10.0	No formal education	5	2.8
31-40	28	15.6	Primary education	28	15.6
41-50	51	28.5	Secondary education	95	52.8
51-60	55	30.6	Tertiary education	52	29.0
≥ 60	28	15.6			
Average					
			Monthly income from cassava processing		
Extension contact					
No contact at all	30	16.8	≤ 2000	64	35.6
Once per week	9	5.00	2100-5000	59	32.8
Every two weeks	117	65.0	5100-10,000	39	21.9
Every month	24	13.3	≥ 10,000	18	9.9
Every Quarter	0	0.00			
			Membership of organization		
Household size					
0-5	**99**	**55.0**	**Yes**	**114**	**63.3**
6-10	**76**	**42.2**	**No**	**66**	**36.7**
Above 10	**5**	**2.8**			
Average	4.9				
Farm size (Ha)			**Involvement in cassava processing**		
0-2	**154**	**85.6**	Active	108	60
2.1-5.0	**24**	**13.3**	Passive	72	40
Above 5	**2**	**1.10**			
Average	**1.2**				

Source: Field survey 2015

The monthly income distribution of the processors in the area revealed that most (35.6%) of the processors earned less than ₦2, 000 monthly from cassava processing. Also 21.7% earned ₦5100 – ₦10, 000 monthly while 9.9% of the processors earned above ₦10,000 monthly from the venture. The results indicated low cash return to investment and high poverty likelihood among the processors in the rural area. The low cash return was most likely as result of low level of investment by the small holder processors. The household size distribution of the respondents showed more than half (55.0%) of the respondents had 0 – 5 persons in their households while 42.2% had 6-10 members. An average size of 5members/household was recorded in the study area implying a moderate household size that could support farm labour.

Furthermore, the distribution of the processors according to membership of social organizations revealed that majority (63.8%) belonged to one social organization or the other while the remaining (38.7%) were not members of any social organization. This reported high level of association membership among the processors may positively engender high innovativeness among the processors as a result of group dynamics effects as opined by Adisa (2005) that membership of social associations create avenues for sharing of experience and information among members. Again, distribution of the respondents according to their involvement in cassava processing indicates that majority (60%) of the processors were actively involved in cassava processing while the remaining (40%) are passively involved in cassava processing. The level of involvement may likely affect their responsiveness to technological innovation

Respondents 'Acceptance of Cassava Chips Processing Technology

Results in Table 2 show respondents' rating of extent of acceptance of the technology of processing cassava into chips for industry and export. Specifically, over one-tenth (13.9%) of the respondents have fully accepted the technology and were already practicing it for business, 7.8% of respondents had once accepted the technology but discontinued it while 13.3% of the respondents were still trying their hands on the technology. However, 22.8% of the respondents indicated that they just recently knew about the technology while19.4% said they never heard about the technology before the study. In general, the pooled mean score (3.2) of responses showed that there was medium extent of acceptance of the technology among small scale processors in Imo State. The emerging trend of acceptance of the technology is indeed a welcome development towards eliciting the participation of rural small scale processors in the new business opportunities of supplying domestic industries and export markets with cassava chips. Furthermore, the results imply that acceptance of the technology has also facilitated processing of cassava to industrial raw material and export product like the chips, thereby adding value to the cassava crop and enhancing the processors' livelihoods. In a similar study, Ekwe and Nwachukwu (2011) had reported that good proportion of farm households in Southeast Nigeria have actively embraced the use of improved processing cassava technologies to obtain wide range of products in order to optimize the gains of vast opportunities in the products to earn meaningful livelihoods.

Table 2: Distribution of the respondents according to their levels in the acceptance of the Technology

Variable	Hedonic type scale (1…7)	Frequency	percentage	score
Never knew of the technology	1	35	19.4	0.19
Just aware of the technology	2	41	22.8	0.46
Developing interest in the technology	3	27	15.0	0.45
Mentally evaluating the technology	4	14	7.8	0.31
Still testing the technology	5	24	13.3	0.67
Tested and dropped the technology	6	14	7.8	0.47
Fully accepted and practicing the technology	7	25	13.9	0.97
Pooled mean score				**3.52**

Key for categorizing pooled mean score: 0.00-2.33=low; 2.34- 4.67=medium; 4.67-7.00 high

Factors Influencing Respondents' Acceptance of the Cassava Chips Processing Technology

The results of weighted least square analysis of socioeconomic determinants of acceptance the technology of processing cassava into chips revealed R^2 value of 0.395 thus indicating that of 39.5% of the variables considered in the study contributed to determining the level of acceptance of the cassava chips processing technology in the study area. Specifically, monthly income from cassava (5.301***), educational status ((3.301***) as well as membership of cooperative societies (2.482***) were significant and positively related to respondents' acceptance of the cassava chips processing technology at 1% level of significance while years of cassava processing experience (-5.462***) and primary occupation (-1.773*) were significant and negatively related to acceptance of same technology among the small scale processors in Imo State at 1% and 10% levels of significance respectively. The results imply that while increase in cassava monthly income, respondents' educational statuses and membership of cooperatives societies facilitated the acceptance of the technology among the small scale processors, factors such years of cassava processing experience and primary occupation deterred the acceptance of the technology among small holder processors in the study area. These results are similar to report by Wole-Alo and Olaniyi (2015) who indicated that socio economic variables like age, education, household size had significant influence on the use cassava processing technologies in Ondo State. Similarly, Ekwe, et.al (2016) reported that sex of respondents, years of processing experience, contact with extension

agents as well as primary occupation significantly influenced the use of cassava processing technologies among rural households in Imo State.

Table 3: Weighted least square regression estimate of socioeconomic factors influencing processors'acceptance of the cassava chips processing technology in the Imo State, Nigeria

Socioeconomic Variables	Beta-value	Coefficient	T-Value
Constant	0.274	0.752	(2.747)***
Sex	0.064	0.034	(0.527)
Age	-0.005	-0.003	(-0.689)
Marital status	-0.084	-0.105	(-1.248)
Processing experience	-0.008	-0.024	(-2.944)***
Cassava monthly income	0.000	5.77	(5.301)***
Extension contact	0.018	0.030	(1.650)
Educational status	0.149	0.491	(3.301)***
Primary occupation	0.051	-0.091	(-1.773)*
Household size	0..019	-0.002	(-0.123)
Membership to cooperative	0.048	0.118	(2.482)***
F-value		8.295	
R^2 value		0.395	
Adjusted R^2 value		0.348	
Log likelihood		-270.90	

Conclusion

The study indicated that large proportion of small holder processors in Imo State were ageing and no longer in active age suitable for the rigors involved in cassava processing. Also, most the processors derived income from cassava processing although the level of accruing income was substantially low which indicates high incidence of poverty likelihood. The study revealed that extension services delivery in the area was effective as evidenced by the results which showed most respondents accessing information on the cassava chips processing technology disseminated through agents of the State's agricultural extension agency and the mass media. The results further showed medium level of acceptance of the cassava chips processing technology among the processors in the study area. Finally the results revealed that a range of socio economic variables such as monthly income, educational status, and membership of cooperative societies facilitated acceptance of the technology while processing experience primary occupation hindered its acceptance among the small scale processors in the study area. Thus, it is recommended that extension agents should be given more logistic support to reach the processors with all relevant technical information regarding the industrial and export market potentials of the cassava chips processing technology and its product. Furthermore, the extension agents should encourage the processors to join cooperative organizations as that would enable them to be better organized to explore the business opportunities which the technology is offering in the industries and export markets.

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