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PERCEIVED ATTRIBUTES OF CASSAVA CHIPS PROCESSING TECHNOLOGY AMONG SMALL HOLDER PROCESSORS IN IMO STATE, NIGERIA.

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ABSTRACT

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The paper examined perceived attributes of cassava chips processing technology among small holder processors in Imo State, Nigeria. A multi-staged sampling technique was used to select one hundred and eighty (180) respondents across the three agricultural zones of the State who were interviewed with structured questionnaire. Data collected were analyzed with descriptive statistics, chi square and Probit regression analysis. Results of the study showed that more women (56.1%) were involved in cassava processing than men (43.9%) and that substantial proportion ((59.1%) of the small holder processors were no longer in the active age required for cassava processing. Also, all the processors derived income from cassava processing although the level of accruing income of large proportion of respondents (35%) was considerably low (less N2000 per month). The study generally, revealed a 'positive' perception of the technology (3.16) among small scale processors in the area. Finally, the results of Probit regression model estimate of influence of perceived attributes of the technology on the its utilization among small scale processors indicated that the perceived attributes considered in the study contributed 28.7% of factors that influence the level of utilization of the cassava chips processing technology among small holder processors in the study area. Specifically, respondents' perceptions of the technology as being cost saving; providing high quality products; safe to use are positively and significantly related to the level of utilization of the technology in the study area. The results also indicate a positive significant relationship between use of the technology and its perceived attribute of being pollutant to the environment. This could probably be as results of respondents' resolve to use the technology despite its obvious negative environmental attribute. On the other hand, the technology perceived as similar to local practices negatively influenced its utilization among small holder processors in the study area.

Keywords*: Small holder processors, Cassava chips, Perceived attributes, Cost saving*

INTRODUCTION

Cassava chips are the unfermented white dried products of cassava with average diameter of 3-5mm often used as a carbohydrate base in animal feed industry, or milled into flour for other uses such as in the production of ethanol, cakes, dough-nut and biscuits. Traditionally, cassava is processed into chips by peeling, cutting into chunks and drying on the floor or by the roadside. The traditional method of processing cassava chips was inefficient and usually characterized with undesirable smell and colour, irregular shapes as well as extraneous contaminations. But research efforts at the Federal Institute of Industrial Research Oshodi, Nigeria 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. This technology is called Cassava chips processing technology (FIIRO, 2016).

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 (FIIRO, 2016). Supply of the product on the other hand is inadequate and falls short of the above demand figure. Precisely, supply of cassava chips and pellets is just 30 per cent of the total demand. This is because presently there are very few companies producing these products in Nigeria and world-wide. The demand for cassava chips is intensified in Nigeria as a result of the Government directive to Flour Millers some years ago to increase the inclusion of cassava flour to 10 per cent in the manufacture of their products. Cassava chips are the main raw materials for production of cassava flour. These facts show that there is a huge investment opportunity that is yet to be fully maximized (FIIRO 2016).

Cassava chips processing is an important stage that influences the quality of the final product i.e., cassava flour. It serves as a source of cash income for rural growers and processors, majority of who are women (Abass *et al.*, 2001). Demand for cassava is expected to increase as consumer preference changes with the development of new cassava products (Alacho *et al.*, 2013). The drivers of this market expansion include population and income growth, urbanization, and new technologies that enable the substitution of some imported food items and industrial raw materials in food production. 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. The price of wheat is about US$945 per 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 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*).

However, low quality chips result in low profitability, less savings and difficulty to connect with more profitable market channels that pay higher prices. The traditional processing practices for cassava chips have two major constraints. They include the peeling operation prior to chipping and drying, as well as the mechanical pressing operation to remove excessive water in the grating method introduced by IITA (Abass, 2006). But the new cassava chips processing technology uses less time and energy, and involves labour-saving processing steps and could provide the much needed quality, volume, eco-efficiency and cost saving advantages required for sustainable supply of cassava chips in Nigeria. 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. This is certainly due to the present global status of the products as foreign exchange earners and important industrial raw materials (Adetan *et al.,* 2003).

The more technologically complex the technology appears the less acceptable it may be to end-users. The decision to accept or reject an innovation depends on a careful evaluation of a large number of technical, economic and social factors associated with the technology. Concerning the situation of rural small scale processors, acceptance and use of the modern cassava chips processing technology are urgently required to increase productivity so as to meet the increasing demand of cassava chips for industry and export. However, acceptance of modern technologies especially in subsistence farming would be determined by relative attribute of the technologies as perceived by the end users. Similarly, their needs, cost incurred and benefits accruing to use of a technology, would inform end-users' perceptions a particular technology (Karl, 2004). In view of the foregoing, the technology of processing cassava into chips for industry and export developed at FIIRO, Nigeria was disseminated to small scale processors in Imo State by the State's Agricultural Development Programme to enable them participate in the processing and marketing 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, end-users perceptions of the technology are not yet known. It is thus pertinent to investigate how small scale processors in Imo State perceive the cassava chips processing technology. This paper therefore, seeks to describe the socio economic characteristics of the small scale processors ascertain their perceptions and utilization levels of the cassava chips processing technology as well as determine effects of perceived attributes of the cassava chips processing technology on processors' utilization of the technology.

METHODOLOGY

This study was conducted in Imo State of Nigeria. The State is located in the South Eastern part 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. The major occupation of the people is agriculture especially in the rural areas. Multistage 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. They were Ikeduru, Isiala Mbano and Ohaji/Egbema Local Government Areas from Owerri, Okigwe and Orlu agricultural zones respectively. In the third stage, six communities were randomly selected making a total of 18 communities. The last stage involved the selection of ten (10) respondents from each of the communities which gave a sample size of 180 persons. Structured questionnaire was used to collect data relevant to the study and analyzed using both descriptive and inferential statistics.

Specifically, a five-point Likert weighting scale was use to derive respondents mean perception ratings regarding the cassava chips processing technology. The scale is delineated as strongly agree (5), agree = (4), undecided = (3), disagree = (2) and strongly disagree = (1). The values of the five responses were summed up and divided by five to obtain a benchmark of 3.00. The scored responses were calculated and pooled to obtain perception mean scores for both specific individual attributes and the technology in general. The perception status of the individual technology attributes was established in a 2-category frame by use of the benchmark score whereby mean scores of 3.00 and below were categorized 'negative perception' while those above the benchmark were categorized 'positive perception'.

Again, a 7-steps Hedonic measurement scale was employed to capture the level of utilization of the cassava chips processing technology as employed by Madukwe *et al.* (2000) and Agwu (2000). The following scaling procedure was modified and employed. They include 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 scored responses were also calculated and pooled to obtain general utilization mean score for the technology. The status of the utilization 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 as low, 2.34 - 4.67 as medium and 4.67 - 7.00 as high.

Furthermore, the Probit regression model was employed to estimate the effects perceived attributes of cassava chips processing technology on the use of the technology among small holder processors in the study area. The model as used is specified thus;

$P_i = F(Z_i) = \frac{1}{1+e^{-(\Lambda_0+\sum \Lambda_n \beta_n)}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 1$ Where as

$Z_i = f(x_1, x_2, x_3, x_4, x_5, x_6, x_7, and\ ei) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 2$

The same model is explicitly given as:

$Z_i = \Lambda_0 + \Lambda_1 x_1 + \Lambda_2 x_2 + \Lambda_3 x_3 + \Lambda_4 x_4 + \Lambda_5 x_5 + \Lambda_6 x_6 + \Lambda_7 x_7 + Ei \ldots 3$

Where:

Z_i = Respondents' level in Utilization of cassava chips processing technology.

Xn= Respondents' perception status of specific attributes of the technology categorized and measured as dummy variable whereby positive perception =1 and negative perception = 0

X_1 = cost saving potentials of the technology

X_2= simplicity of the technology to use

X_3 = similarity of the technology to local practice

X_4 = Technology gives high quality produce

X_5 = Technology is safe to use

X_6 = Technology is time saving

X_7 = Technology pollutes the environment

ei = Error term.

RESULTS AND DISCUSSION

Description of the socio-economic characteristics of the study area

The results in Table 1 below represent the distribution of selected socio-economic characteristics of the processors which include sex, age, marital status, education status, extension contact, and monthly income from processing cassava, household size membership of organization, farm size and respondents involvement in cassava processing. The results showed that 56.1% of the processors were females while the remaining 43.9% were males implying that cassava processing in the area was dominated by women. On the marital status, the results indicated that majority (82.2%) of the cassava processors were married, while 17.8% were single. The results also showed that large population of the processors (59.1%) belonged to the age brackets of 41 – 60 years. Approximately 10.0% of the processors were below 30 years. The result 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 and not relatively old.

The results further showed that more than half of the processors (52.8%) had secondary education, while (15.6%) and 29% had primary school and tertiary education respectively. Only 2.8% had no formal education. This implied that most of the farmers were literate and this would likely make them more responsive to innovations. Apu and Nwachukwu (2008) had earlier reported that increase in education of farmers positively influence their adoption of improved technologies. On the contact with extension agents, most (65.0%) of the processors 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 moderate level of contact with extension agents by the processors, given the dwindling situation of extension services delivery in Nigeria.

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 result implies low cash return to investment and high rate of poverty and low level of livelihood 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 processors showed that more than half (55.0%) of the processors had 0 – 5 persons in their household while 42.2% had 6-10 members. An average size of 5 members per household was recorded 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 high level of association membership among the processors indicate that they are readily disposed to share innovative ideas that may be presented to their groups as opined by Adisa and Jibowo, (2005) that membership of social organizations create avenues for sharing experiences 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.

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 school	5	2.8
31-40	28	15.6	Primary school	28	15.6
41-50	51	28.5	Secondary school	95	52.8
51-60	55	30.6	Tertiary school	52	29.0
≥ 60	28	15.6			
Average Extension contact			Monthly income from cassava processing		
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			
Household size			Membership of organization		
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

Respondents' perceptions of processing cassava into chips

Results in Table 2 show that smallholder processors in Imo State has positive perception of the cassava chips processing technology as indicated by the grand mean score of 3.16 which was higher than the 3.00 benchmark. The overall perception status suggests that the processors were favourably disposed to the technology which is a veritable condition for its acceptance. Regarding the specific attributes, the processors had positive perceptions towards the technology's cost saving potentials (3.03), simplicity of the technology to use (3.30), high quality produce from the technology (3.67), its time saving attribute (3.49) as well as the technology being safe to use (3.58). On the contrary, the processors had negative perceptions regarding similarity of the technology to local practices (2.54) as well as its tendency to pollute the environment (2.53). The negative perceptions towards the two attributes stem from their opinion that the technology was new and not similar to their local practices and maintained that it has the tendency to pollute the environment.

Table 2: Distribution of respondents according to their perceptions of attributes of cassava chips processing technology

Perceived attributes	Strongly agree	Agree	Undecided	Disagree	Strongly disagree	Mean score	Perception Status
The technology is cost saving	2	34	120	16	8	3.03	positive
Technology is simple to use	17	52	82	26	3	3.30	positive
Technology is similar to local practice	2	16	80	62	20	2.54	negative
Technology gives high quality produce	41	51	79	7	1	3.67	positive
Technology is safe to use	25	60	90	5	0	3.58	positive
Technology is time saving	17	71	76	15	1	3.49	positive
Technology pollutes the environment	3	29	80	27	39	2.53	negative
Grand mean						3.16	positive

Source: Field survey 2015

Processors' level of utilization of cassava chips processing technology in Imo State

Results in Table 3 showed the distributions of respondents according to their stages in utilizing the cassava chips processing technology. Specifically, 13.9% of the processors have fully accepted the technology and were already practicing while7.8% of the processors 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 processors indicated that they only recently knew about the technology while19.4% said they never heard about the technology before the study. In general, the pooled score of responses (3.52) showed that there was medium level of utilization of the

technology among small scale processors in Imo State. The utilization of cassava chips processing technology is indeed an emerging trend that elicits participation of rural small scale processors in the new business opportunities of supplying domestic industries and export markets with cassava chips. 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 cassava processing technologies to obtain wide range of products in order to optimize the gains of vast opportunities in the products to earn meaningful livelihoods.

Table 3: Distribution of the respondents according to level of utilization of the technology

Variable	Hedonic type scale	Frequency	Percentage	Score	Remark
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	
Practically 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 scores		180	100	3.52	medium

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

Influence of perceived attributes on Processors' utilization of the technology

Table 4 shows the results of Probit model estimate of influence of perceived attributes on utilization of the cassava chips processing technology among small scale processors in Imo State. The results of Chi Square test indicated that goodness of fit was very significant and the R^2 reveals that the perceived attributes considered in the study contributed 28.7% of factors that influence the level of utilization of the cassava chips processing technology among small holder processors in the study area.

Specifically, respondents' perceptions of the technology as being cost saving (3.310); providing high quality products (4.159); safe to use (3.421) are positively and significantly related to the level of utilization of the technology in the study area at 1% significance level. This trend of relationship is in line with *apriori* expectation and promotes the thriving of the technology among the end-users. The results also indicate a positive significant relationship between use of the technology and its perceived attribute of being pollutant to the environment (3.379). This could probably be as results of respondents resolve to use the technology despite its obvious negative environmental attribute. On the other hand, there was negative significant relationship between respondents' perception of the technology as similar to local practices (-2.244) and its utilization in the study area at 1% level of significance. Though these results were contrary to *apriori* expectation they still showed that such perceived attribute of the technology negatively influenced its use by the respondents in the study area. In a related study, Ekwe and Osuagwu (2016) reported that farmers use innovations based on common observation that they are simple, affordable safe as well as economically gainful. They authors posit that if farmers are doubtful of these attributes, they become conservative and in many instances refuse to use such innovations.

Table 4: Probit regression model estimate of relationships between small holder processors' perceptions of cassava chips processing technology and level of utilization of the technology in Imo State

Perceived Technology Attributes	Coefficient	Std. Error	Z-Value
Constant	-1.410	409	(-2.565)***
The technology is cost saving	0.263	.021	(3.310)***
The technology is simple to use	-0.267	.026	(-2.683)***
The technology is similar to local practice	-0.213	.024	(-2.244)***
The technology provides high quality Products	.0348	.038	(4.159)***
The technology is safe to use	0.267	.033	(3.421)***
It is time saving	0.108	.041	(0.961)
It pollutes the environment	0.311	.033	(3.379)***
Chi Square-value	446.225***		
R^2 value	0.287		
Adjusted R^2	0.258		
Log likelihood	-285.44		

Calculated from field survey data 2015

CONCLUSIONS

Results of this study on a general scale showed that small holder processors' in Imo State had positive perceptions of the cassava chips processing technology. They particularly showed positive perceptions (indicating favourable disposition) towards some attributes of the technology such as being cost-saving, simple to use, providing high

quality products, safe to use as well as time saving. However, they had negative perceptions towards such attributes as being similar to local practices and pollutant to the environment. Furthermore, in view of the prevailing perceptions therefore, there was medium level of utilization of the technology among small scale processors in Imo State. The results further established that processors' perceptions of the technology such as being cost-saving, safe to use and providing high quality products has significant positive influence on the level of utilization of the technology while its similarity to local practices had negative significant influence on use of the technology. It is therefore recommended that agricultural extension agencies in the State should step up promotion of the cassava chips processing technology as a conscious effort geared mustering small holder processors interests and participation in the business opportunities of supplying cassava chips to industries and export market through use of the technology.

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