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Awareness of Cassava Peel Utilization Forms among Cassava Processors in Rural Communities of Southwest, Nigeria

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Abstract

Significant quantities of generated peels are been thrown on dumping sites in southwest, Nigeria thereby constituting a source of environmental pollution. This study assessed the awareness of cassava peel utilization forms among cassava processors in rural communities of southwest, Nigeria. Interview guide was used to elicit information from 200 cassava processors through a multistage sampling technique. Data were analyzed with both descriptive and inferential statistics. Result revealed that majority of the cassava processors were women (76.5%), married (75.0%), and members of cassava processing associations (89.5%) with 73.0% having at least primary education. The mean age and cassava processing experience were 53.01 and 22.76 years respectively. About 23.0% of the processed cassava tubers constituted peels. The study also revealed that 50% of the cassava processors discarded peels as waste, 26% sold generated peels while 24% fed the peels to their livestock. Also 93.5% of the cassava processors were not aware of any cassava peel utilization technology. Chi-square analysis revealed that significant association existed between existing practice on cassava peel utilization ($\chi^2=17.341$, $p<0.05$) and cassava processors' awareness of cassava peel utilization forms. The study concluded that substantial quantity of peel been generated is discarded as waste due to lack of awareness of cassava peel utilization technologies in the study areas. The study therefore recommended that improved technologies on the utilization of cassava peel should be popularized through result demonstration among cassava processors in southwest, Nigeria.

Key words: *Akitan*, Cassava flour, Improved technology, Mushroom, Value addition

Introduction

Cassava is one of the most important agricultural food crops in West Africa.According to Mehari, Amsalu and Tewedros (2015), Africa contributed about 57% (149.5 mt) of the total world production of cassava in 2011. Nigeria was found to be the largest producer at this time. This is because almost all rural households cultivate farmlands ranging from small plots to large hectares of land for cassava production. Cassava contributes immensely to human nutrition and livelihood of the world (Lebot, 2009) as varieties of products such as starch, *gari*, cassava flour, and *fufu*are commonly processed from cassava tubers.Cassava silage as cattle feed and fibrous waste-based broiler feed are value added products for feed sector and this can aid wealth creation. Industrial products for mini-agricultural business include wafers, gums and liquid adhesives. Immense scope also exists in bio-technological intervention to produce chemicals, enzymes and eco-friendly detergents the developmental

elasticity of cassava can be enhanced through wide awareness of these potential in value addition processes.

During the processing of cassava tubers into these essential products, an enormous quantity of cassava peels (about 30% of processed cassava tubers) are generated as waste (Adebayo and Sangosina 2005) and only an insignificant proportion is usually fed to livestock such as goats. The remaining, usually heaps are thrown along roadsides in places where cultivation and processing of cassava tubers is a common livelihood activity.The peels and other wastes such as chaffs are been considered as an "inconvenience" rather than a potential resource in West Africa (Adebayo, Anyanwu & Osiyale, 2003).

The failure or inability to salvage and reuse such materials economically results in the unnecessary waste and depletion of natural resources (Selke, 1990; Tchobanoglous*et al.*, 1993).

The potential of these peels to be used in the production of other products such as biogas, mushroom and improved animal feed has also been established by scholars in literature (Adebayo *et al.*, 2009; Onuoha*et al.*, 2009; Agwu and Anyaeche, 2007; Kortei, Dzogbefia & Obodai, 2014; Adelekan, 2012). However, most of the cassava processors and farmers are neither aware of the technologies that can be used to add value to cassava peels neither were they knowledgeable about the procedure of these different technologies. This informs why most cassava processors still throw away the peels instead of either converting it to usable forms or selling the peels as an additional source of income.

Aside from not getting additional source of income from adding value to cassava peels, the environmental nuisance constituted by cassava peels on dumping sites "*Akitan*"cannot be overlooked. According to Smith *et al.* (1987), the disposal of agricultural wastes on land and into water bodies are common, and have been of serious ecological hazards and are of serious health hazards. This is because it results in the pollution of both water and land resources, increases rodents and insect vector diseases thereby creating public health nuisance. This study therefore aimed at assessing the awareness of cassava peel utilization forms among cassava processors in rural communities of southwest, Nigeria. The awareness of improved cassava peel utilization technologies among cassava processors has the potential to increase rural farm income through livelihood diversification as well as reduce environmental pollution caused by waste disposal.

To achieve the broad objective, this study specifically determined the level of cassava peel generated as waste per processing; investigated the existing practice on the management of the cassava peels; determined whether the cassava processors were aware of any improved cassava peel utilization forms; and also identified the utilization forms that the cassava processors were aware of.The study tested the hypothesis that no significant association exist between existing practices on the management of cassava peels and cassava processors' awareness of cassava peel utilization forms.

Methodology

Description of the study area

The study was conducted in Southwest, Nigeria. The region is comprised of Lagos, Ekiti, Oyo, Osun, Ondo and Ogun states which are mainly dominated by Yoruba ethnic group which is the largest and longest established ethnic group in West African Coast and African continent with a total population of about 27,581,992, the majority being in Lagos State. Southwest NigeriaNigeria is home to the International Insitute of Tropical Agriculture (IITA), Ibadan; the Federal University of Agriculture, Abeokuta (FUNAAB); eight conventional Universities with Faculties of Agriculture and 4 National Agricultural Research Institutes. Each state also has the Agricultural Development Programmes (ADPs) responsible for field level agricultural extension services.

Sampling technique and sample size

Multi-stage sampling technique was used to select the cassava processors for this study. A total of 200 cassava processors were selected from processing households in the rural communities of Southwest Nigeria as discussed below:

Stage 1: Two states (Lagos and Ogun) were randomly selected from the South West geopolitical zone of Nigeria.

Stage 2: Ten percent of the Local Government Areas (LGAs) from the selected states were purposively selected based on the prevalent cassava farming and processing activities in the areas. These Local Government Areas are Ikorodu and Imota, Yewa South and Ijebu East from Lagos and Ogun states respectively.

Stage 3: This stage entailed the purposive selection of 4 communities each from the Local Government Areas selected based on the number of cassava processing households in each of the communities as observed on the list obtained from OGADEP and LASADA

Stage 4: The final stage involved the random selection of 25% of the cassava processinghouseholds from the selected communities who were registered with the Agricultural Development Agency/Programmes in the states.

Validity and Reliability of data collection instrument

Interview guide was the primary instrument used in collecting data from the cassava processors. Participant observation and in-depth interview was also used in complimenting the information obtained with the interview guide. The interview guide was subjected to face validity with the assistance of experts in rural development, value addition, adoption and technology transfer. This was then subjected to test-re-test reliability technique and the instrument was found to be reliable because the correlation coefficients of 0.76 and 0.75 were calculated for the scales on levels of waste generated and awareness of cassava peel utilization forms among the cassava processors in Southwest, Nigeria.

Data analysis

Collected data were subjected to both descriptive and inferential statistics. The descriptive statistics used include frequency count, percentage and mean while Chi-square was used as the inferential statistics to test the study hypothesis at 5% level of significance.

Results and Discussion

Socio-economic characteristics of cassava processors

Results in Table 1 showed that 71.5% of the cassava processors were between 41 and 60 years of age while 10.5% of them were 40 years old or younger. The mean age of the cassava processors was found to be 53.01 years which implies that the respondents were aging. This could be as a result of the urban drift prevalent in Nigeria, where many young people seek a more lucrative job in the cities rather than farming in the rural areas (Nwokocha, 2008). Table 1 also indicated that about 18% of the respondents were older than 60 years old. According to Ande (2008), persons between 16 and 60 years old constitute the labour force of the nation while those above 60 years were considered as the elderly and dependent population. Also, Henri-Ukoha*et al.* (2011) stated that people within the labour force of any nation are usually active, dynamic, energetic and creative. This is likely to enhance their adoption of new technologies aimed at reducing cassava wastes and increasing their farming income.

Table 1 also reveals that 50% of the cassava processors were Christians while 46.5% and 3.5% were Muslims and traditionalists respectively. This means that the rural households practiced Christianity and Islam and further implies that very few of the rural households still practice the traditional

religion and also proves that Christianity and Islam were the major religions of the rural cassava processors in Southwest Nigeria. This finding is however in line with the finding of Adamu*et al.* (2008) which reported that over 80% of rural women farmers in Southwest Nigeria were Christians with about 2.4% being traditionalists. This contradicts Jibowo (1992) who noted that the practice of traditional religions is prevalent among rural inhabitants of the various states in Nigeria.This change in religious affiliation is an implication that the practice of traditional religions has been diffused with the introduction of Christianity through western education and Islam through the introduction of *Shari'ah* into the Constitution of the Federal Republic of Nigeria in 1999.

As also shown in Table 1, majority (76.50%) of the cassava processors were women. This implies that cassava processing is primarily dominated by the women and supports the findings of Adebayo*et al.* (2008) which reported that about 63.77% of the cassava processors in Southwest Nigeria were females. About75% of the respondents were married while the rest were either single (4%), divorced (7%) or widowed (14%). This showed that majority of the respondents were married. It would be expected that named people are more stable, have family responsibility and experience to make decisions in their homes and businesses. This result confirms the findings of Fakoya (2000) and Oladoja*et al. (*2008) who asserted that marriage confers some level of responsibilities and commitment on individuals who are involved. Also those who are married need to generate additional income to sustain members of their household. It also corroborates the findings of earlier researches on rural households and cassava farming and processing within the region. For instance, Adebayo*et al.* (2008) reported that over 80% of cassava processors were married while Adamu*et al.* (2008) reported that 79.8% of women farmers were also married.

Table 1: Socio-economic characteristics of cassava processors (n = 200)

Characteristics	Frequency	Percentage	Mean
Religion			
Christianity	100	50.00	
Islam	93	46.50	
Traditional	7	3.50	
Sex			
Male	47	23.50	
Female	153	76.50	
Marital status			
Married	150	75.00	
Single	8	4.00	
Widowed	28	14.00	
Divorced	14	7.00	
Highest Educational level attained			
No formal education	54	27.00	
Primary education	100	50.00	
Secondary education	28	14.00	
Tertiary education	18	9.00	
Enterprise type			
Cassava farming	19	9.50	
Cassava processing	60	30.00	
Both	121	60.50	
Age (years)			
≤ 30	8	4.00	53.01 years
31-40	13	6.50	
41-50	50	25.00	
51-60	93	46.50	
Above 60	36	18.00	
Cassava farming/processing experience (years)			
1-10	30	15.00	
11-20	56	28.00	22.76 years
21-30	71	35.50	
31-40	35	17.50	
41-50	8	4.00	
Estimated annual income from cassava processing (Naira)			
≤ 100000	7	3.50	N473290
100001-500000	115	57.50	
500001-1000000	70	35.00	
Above 1000000	8	4.00	
Membership of cassava farmers/processors' association			
Members	179	89.50	
Non-members	21	10.50	
Years of membership of association			
1-10	81	45.25	13.57 years
11-20	68	37.99	
21-30	22	12.29	
31-40	8	4.47	

Source: Field survey (2013)

It was also found from this study that half (50%) of the cassava processors had primary education. Table 1 further shows that 14% and 9% had secondary and tertiary education respectively while about 27% had no formal education at all. Adamu*et al.* (2008) also reported that at least 25% of the women farmers in Oyo State had no formal education. Education is an important variable that determines the adoption of innovation and as such might affect their rate of adoption of the cassava waste utilization technologies. This is because education has been found to affect adoption of technologies. For instance, Adebayo *et al.* (2008) found that level of education is a significant factor that determines the adoption of cassava grater (a technology) by cassava processors in South west, Nigeria.

Table 1 further reveals that majority (60.50%) of the respondents were both cassava farmers and cassava processors while 30% and 9.5% of the respondents were exclusively cassava processors and cassava farmers respectively. This implies that most of the processors do not depend primarily on other cassava farmers for cassava tubers. The highest proportion (35.5%) of the cassava processors had between 21 and 30 years of cassava farming/processing experience while about 15% had 1-10 years of experience. Table 1 also reveals that 28%, 17.5% and 4% of the cassava farmers had 11-20 years, 31-40 years and 41-50 years of experience respectively. The mean processing experience (22.76 years) also indicated that the cassava processors were highly experienced in their profession and hence, this may hinder their adoption of any technology. The implication is that for any technology to gain the interest of these respondents, it must be well packaged, simple and compatible with their familiar practices.

According to the result of the findings on Table 1, close to 60% of the respondents earned between N100,001 and N500,000, 3.5% earned lesser than N100,000 while 39% earned more than N500,000 on annual basis. The mean estimated annual income as also presented in Table 1 is N473,290. This places majority of the respondents above the poverty threshold of $1.25 per day and may be as a result of the World Bank interventions present in some of the selected study areas. About 89.5% of the cassava processors belonged to one or more cassava farmers' or processors' associations while the remaining (10.5%) were not members of any of these associations. This is in agreement withOladele and Afolayan (2005) who indicated that high levels of social participation and linkages can give rise to high level of innovation dissemination, mass adoption and increased productivity due to group dynamism. Being a member of association enables the farmers to have access to agricultural information, credit and other inputs as well as enhanced ability to adopt innovations. The mean year of membership of associations of the respondents is 13.57 years with the highest proportion (45.25%) having between 1 and 10 years of membership while 37.99% had spent 11-20 years as members of these associations.

Cassava peelgeneration in cassava processing

Table 2 reveals that 75.70% of the cassava processors processed between 1.00 and 2.50 tonnes of cassava tubers per processing period (a week) while 15.50% processed between 2.51 and 5.00 tonnes. The mean quantity of processed tubers per processing was 1.53 tonnes. Table 2 also shows that the mean quantity of peels generated per processing is 351.60Kg. This implies that 23.00% of the processed tubers constitute peels and in turn waste. Ekundayo (1980) submitted that peels constitute 20-35% of the total weight of cassava tubers. This finding is also in line with the position of Nwekee*t al.* (2002) and Adebayo*et al.* (2008) that huge amount of waste are generated from agricultural production.

Table 2: Cassava waste generated (n = 181)

Variables	Frequency	Percentage	Mean
Quantity of tubers processed per processing (tonnes)			
<1	16	8.80	1.53 tonnes
1-2.50	137	75.70	
2.51-5.00	28	15.50	
Quantity of waste generated per processing (Kg)			
≤ 100	8	4.40	351.60 Kg
101-500	147	81.2	
501-1000	24	13.3	
>1000	2	1.1	

Source: Field survey (2013)

Existing practices on the management of cassava peelby cassava processors

Based on the existing practices, Figure 1 showed that 100 (50%) of the cassava processors discarded the wastes. Up to 52 (26%) of the processors sold the waste as additional source of income while 48 (24%) made use of cassava wastes to feed their animals like goat, cattle and sheep. Of those who fed the waste to their animals, majority (58.33%) sun-dried the wastes before been fed to the animals. Others either feed the animals with wet wastes or cook the wastes before the animals were fed with the wastes.

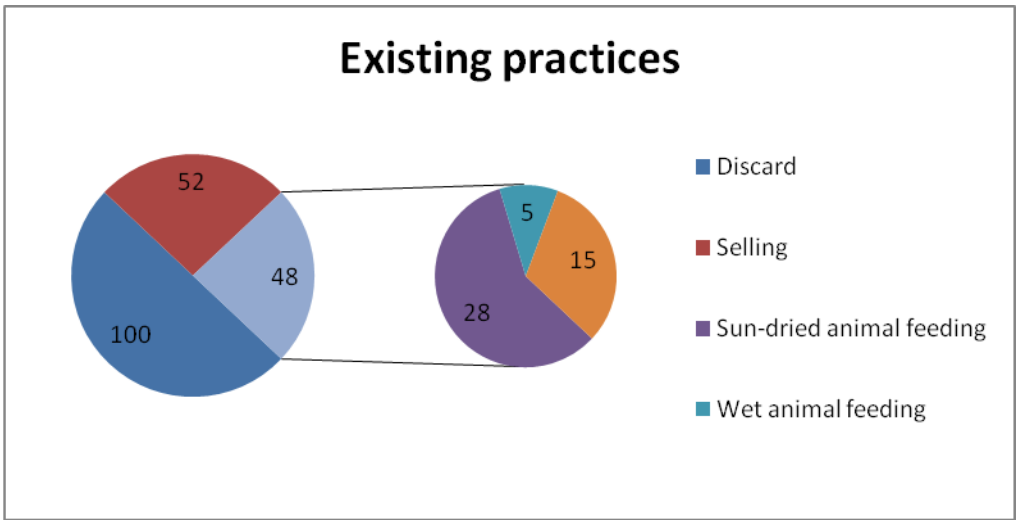

Figure 1: Existing practices on cassava peel utilization by processors
Source: Field survey (2013)

Awareness of cassava peel utilization forms by cassava processors

As presented in Figure 2, about 93.50% of the cassava processors were not aware of any improved form of utilizing cassava peel. This implies that almost all the cassava processors were not aware of cassava peel utilization forms and explains why cassava peels were being disposed as waste by majority of the cassava processors.

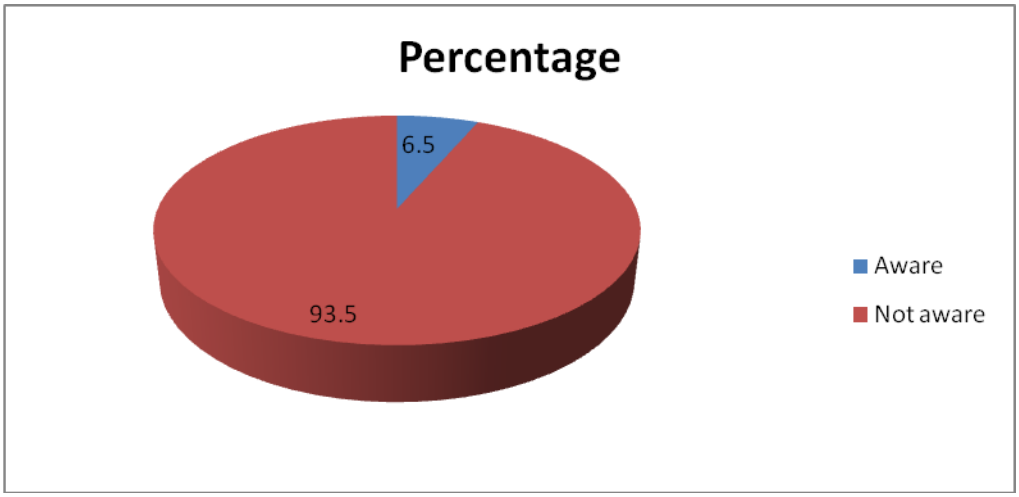

Figure 2: **Awareness of cassava peel utilization technologies by cassava processors**
Source: Field survey (2013)

Cassava peel utilization forms that the cassava processors were aware of

Table 3 reveals that out of the 13 cassava processors who were aware of improved cassava peel utilization forms, 6(46.15%) were aware of the use of cassava peels for mushroom production, 2 (15.38%) were aware of the fact that biogas can be produced from cassava peels while majority (84.62%) were aware of the fact that improved animal feedscan be produced from cassava peels. This implies that more of those who were aware of forms of utilizing cassava peels were aware that it can be used for improved animal feeds after value is added to cassava peels.

Table 3: Distribution of cassava processors based on the cassava peel utilization forms they were aware of (n=13)

Technologies used for	Frequency	Percentagee
Mushroom production	6	45.15
Animal feed	11	84.62
Biogas production	2	15.38

Association between existing practices on the utilization of cassava peels and cassava processors' awareness of cassava peel utilization forms

Table 4 shows that significant association existed between the cassava processors' existing practice on cassava peel utilization and their awareness of cassava peel utilization forms(χ^2=17.341, $p<0.05$). This implies that most of those who were aware that there were forms through which cassava peels can be utilized will not discard them as waste but rather are likely to sell cassava peels or feed them to their livestock.

Table 4: Result of Chi-square analysis showing association between existing practices on the use of cassava peels and cassava processors' awareness of cassava peel utilization forms

Variables	χ^2-value	df	p-value	Decision
Existing practices and Awareness	17.341	2	0.024	Significant at 0.05 significant level

Conclusion and Recommendations

This study found that substantial quantities of cassava peels were been generated per processing of cassava tubers and that the enormous peels generated as waste were been discarded along roadsides. Almost all the cassava processors in southwest, Nigeria were found not to be aware of any improved form of utilizing cassava peels. The study therefore concluded that cassava processors' unawareness of improved cassava peel utilization forms was the reason why they discard cassava peels as wastes on dumping grounds.

On this basis, this study recommended that technologies that encourage the utilization of cassava peels for beneficial uses to both human and animal should be popularised by research institutes. Training workshops should also be organised in order to train the cassava processors on the use of cassava peels for the production of mushroom, biogas and improved animal feed through value addition.

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