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ANALYSES OF AGRICULTURAL WASTE DISPOSAL AMONG CASSAVA PROCESSORS IN AFIJIO LOCAL GOVERNMENT OF OYO STATE

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ABSTRACT

Agricultural waste, if not properly managed can raise a significant challenge and contribute largely to environmental pollution. Therefore, proper management of agricultural waste is necessary to ensure sustainable environment. This study analysed method of waste disposal among cassava processors and evaluate the decision to embrace waste value addition option with a view of cutting down environmental pollution. A multi-stage sampling technique was used to select 80 cassava processors across communities in Afijo Local Government Area of Oyo State. Primary data were obtained with the use of structured questionnaire. Data were analysed using descriptive statistics and logit regression model. The result of socioeconomic characteristics showed that women dominate cassava processing. About 72% of the respondents were below 41 years of age. About 77% of the processors used to dry cassava peel, packaged it and sell to livestock farmers. Those that sell the freshly peel directly constitute 73.8%. About 83% of the respondents agreed to adopt improved cassava waste value addition. The logit regression showed that age, education, processing experience and income were the socio-economic factors influencing decision to adopt improved waste value addition. These four socioeconomic factors were positively significantwith estimated coefficient of 0.849, 0.799, 0.126 and 0.005 respectively. The study concludes that value addition to wastes is likely to be adopted by the older people as an alternative income generation activity. It is therefore recommendsthat a workable approach incentive scheme for the improved waste management and recycling system.

Keywords: Agricultural waste, Cassava, Processors, Waste disposal, Sustainable environment

Introduction

One of the greatest problem facing sub-Saharan African countries is indiscriminate waste disposal (Orhorhoro and Oghoghorie, 2019). Waste generation and its management has become a major issue in Nigeria as it contributes greatly to deterioration of the environment resulting in pollution of the atmospheric space where the products are processed (Orji *et al.,* 2006). It is therefore, not strange to see heaps of agricultural and municipal solid wastes dumped in un-developed plots of land, roadside, uncompleted buildings and open fields (Oghenejoboh *et al.,* 2017).Agricultural wastes especially, has been on the increase in Nigeria and improper handling of these waste has raised a significant challenge in the past decades with cassava processing contributing a greater percentage to the total agricultural waste generated annually (Solomon, 2009).

Cassava (*Manihot esculenta* MANES) is a perennial vegetative propagated shrub and the second most consumed staple food crop after

maize in Africa (Nweke, 2004). The crop is mostly cultivated by peasant farmers who operate on a small land holding. Despite the scale of production, Nigeria is still the highest producer in the world; three times more than the production level in Brazil and almost double the production level in Thailand and Indonesia (FAO, 2007). The large harvest in Nigeria is attributed to rapid population growth, internal market demand, availability of high yielding improved varieties of cassava tuber, resilience to adverse weather and drought, its ability to grow in almost all types of soil and increase in hecterage of farm land allocated to cassava in the country (IITA, 2005). Cassava has a vast contribution to human nutrition and livelihood of people (Oyewole and Eforuoku, 2019). Although, more than 60% of cassava produced in Africa is used for human consumption in form of processed products such as *Garri* (a dry cereal that can be consumed raw), *Fufu* (a cassava paste which requires cooking before consumption), *Pupuru* (fermented smoked dried flour which requires cooking before consumption) *Lafun* (fermented sun-dried flour), other processed products like cassava chips, pellets (can be used as livestock feed) and many other products. (Fawole and Adelodun, 2022).

Cassava processing according to Ohimain *et al.* (2013) generates a huge variety of residues in form of peels, bagasse (solid waste) and effluent (liquid waste). Only a small proportion of peels is used as livestock feed while the remaining heaps of peels and effluent are thrown on the roadsides and water bodies causing environmental pollution and aesthetic nuisance (Adebayo and Sangosina, 2005). These wastes contain highly polluting bio-materials which have been identified to be toxic to the environment (Omilani *et al.,* 2015). Improper disposal of cassava peels and effluents distorts ecological systems and also pose serious threat to human health. Its impacts could result in unhealthy environment, discomfort, anxiety, mosquito infestation and frequent illness (Ero and Moses, 2001). These wastes are often not properly disposed due to the huge financial cost associated with handling and disposal of these wastes (Ero and Moses, 2001). Hence, there is need for a more sustainable practice that transforms cassava waste into value added products that is beneficial to man.

Value addition is the transformation of raw materials into forms of products with higher value and diversified utilities (Popoola *et al.,* 2015). Therefore, it offers the possibility of creating marketable products from waste. Cassava waste is enormous and can be further converted into useful products such as methane (biogas), ethanol, starch, fertilizer and even feed for livestock. (Oghenejoboh *et al.,* 2017). Specifically, cassava peel can be utilized as a medium for mushroom cultivation (Odediran and Ojebiyi, 2017).Utilization of cassava wastes has the potential to increase farm income and reduce all forms of environmental pollution (air, water and soil pollution) caused by effluents and peels. It will also eliminate most of the animal, human health and environmental hazards associated with contamination (Ubalua, 2007).Considering the aforementioned, it is imperative as envisioned by this paper to further analyze agricultural waste disposal among cassava processors and its implication for sustainable and pollution free environment in Afijio Local Government

of Oyo State. Furthermore, this study examined the methods of waste disposal among cassava processors' and also identified the factors influencing the processors' decision to adopt improved waste value addition strategies.

Methodology

The study was conducted in Afijio Local Government Area of Oyo State. The area is located within latitudes 4° 45'' N and 5° 23''S and Longitudes 5° 15''E and 6°45''E. The estimated population of the area was 188,900 with population growth rate of 2.3%. (NPC, 2006) and lies within the rainforest zone, with a humid equatorial climate and mean annual rainfall ranging from 2,000 to 4,000mm and alternating rainy (March-November) and dry (December to February) seasons, featuring a short dry period between July and September (August break). Maximum average temperature is 30°C with a relative humidity between 55-90 percent, depending on season and location. The major occupation of the people are fishing, farming and trading. The indigenous people of Afijio Local Government grow a wide range of agricultural goods such as maize, yam, cassava, groundnut, fruit, cocoa and oil palm. (https://old.oyostate.gov.ng/afijio-local-government)

Sampling procedure and sample size

Multi-stage sampling technique was used to select the respondents for this study. The first stage involves purposive selection of 4 wards out of the 10 wards in Afijio Local Government Area. The selection is due to concentration of cassava processors in the area. In the second stage 2 villages were selected from each of the selected wards. The third stage includes selection of 10 processors each from the selected villages given a total of 80 respondents for the study since the total population of the cassava processors in the selected areas was not known.

Method of Data collection

Primary data were collected from the field survey through the administration of well-structured questionnaire which was used to solicit information from the respondents on issues that centers on the set objectives of the study.

Analytical technique

The analytical techniques used in this study include descriptive statistics such as frequency counts and percentages. Logit regression model was used to identify factors influencing respondents decision to adopt improved management strategy.

Logit Regression Model

Logit regression is one of the useful ways to describe the possible relationship between one or more outcomes (Seifouri *et al.,* 2018). In this study decision to adopt improved waste value added was measured using binary logistic model. This was indicated as:

$$\frac{P_i}{(1-P_i)} = \frac{1+\exp(Z_i)}{1+\exp(-Z_i)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ 1$$

Where,

$\frac{P_i}{(1-P_i)}$ refers to the ratio of the probability that a respondent will be willing to adopt improved waste management to the probability that cassava processors will not be ready to adopt. The response variable is binary and it has two values 1 and 0. If a processor is willing to adopt it takes the value of one and zero value implies that the

processor is not ready to adopt. The equation (1) above is non linear. Thus equation can be made linear by applying the natural log. The model is then specified as

$$L_i = Ln\left[\frac{Z_i}{1-P_i}\right] Z_i \ldots\ldots\ldots\ldots\ldots\ldots 2$$

The explicit form of the equation for the dichotomous choice of improved waste adoption is specified as:

$$Y = \beta_0 + \beta_1 X_1 + \cdots \ldots\ldots\ldots\ldots\ldots\ldots\ldots \beta_7 X_{7+} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3$$

Y is the adoption of improved waste management. It is dichotomous variable Xi's represent independent variables. These are:

X_1= Gender (dummy, male=1; female=0)
X_2= Age (years)
X_3= Education (years of formal schooling)
X_4= Household size (number)
X_5= Income (naira)
X_6= Processing experience (years)
X_7= Marital status (dummy, married=1; single =0)
$\beta_1 - \beta_7$ are coefficients, β_0 = is intercept while the e_i represent the error term

Results and Discussion

Socio-economic profile of the respondents

Result in Table 1 showed the socio economic characteristics of the respondents in which 65.0% of the respondents are females while 35.0% are males which indicates cassava processing in the study area is female dominated due to the activities involved in processing that are household related such as use of knives for peeling, making fire etc while male are majorly involved in production and this resonates with Omilani, *et al.*(2015) that cassava processing are dominated by females due to the nature of work done. The implication of this is that women are mostly found in the processing unit of production process. The age distribution shows 23.8% of the respondents are between the age range of 20-30 and 48.8% are between the age range of 31-40 years indicating that most of the processors are young and within their active and productive age. This age range will help them to be more productive, receptive to new ideas and will further influence them in decision making processes. regarding waste management according to Ayoade *et al.* (2012) who reported that cassava processors in their study area were mostly young and productive. The marital status of the respondents indicates that 61.2% of the respondents are married and which implies most of the respondent have the potential to use household members for labour as married members tends to reproduce according to Muhammed *et al.,* (2019) that reported that processors are married for use as family labour during processing.

The distribution by educational background shows 41.3% of the respondents are having tertiary form of education while 36.2% are having secondary form of education which means most of the respondents are literate and this will influence their decision making, adoption and use of improved processing practices among others. This supports Nsoanya and Nenna (2011) that education is an advantage for innovation adoption and transfer. There was record of about 55% of the respondents having between 1-5 householdmembers followed by 32% having between 6-10 householdmembers which show that farmers are having enough persons to use as labour. This implied that respondents could have access to family labour especially where

the household members are within the working age group. Also, 51.2% of the respondents have years of farming experience between 4-6 years and by implication means the respondents have little experience in cassava processing and this could make processors to adopt waste management options lately which is in line with the findings of Ogunyinka and Oguntuase (2020) that farmers choose to adopt waste management options based on their years of experience.

Table 1: Socioeconomic characteristics of the respondents

Variable	Frequency	Percentage
Gender	38	47.5
Male	42	52.5
Female		
Age (years)		
21-30	39	48.8
31-40	19	23.8
41-50	21	26.3
>50	1	1.3
Marital Status		
Single	34	42.5
Married	46	57.5
Level of Education		
No formal education	5	6.3
Primary education	13	16.3
Secondary education	29	36.3
Tertiary education	33	41.3
Household size (number)		
1-5	44	55.0
6-10	32	40.0
11-15	4	5.0
Years of processing experience		
4-6	43	53.8
7-9	15	18.8
10-13	22	27.5
Perceived scale of production		
Small	41	51.3
Medium	37	46.3
Large	2	2.5

Table 2 shows 77.5% of respondent use drying of peels and packaged for sale as waste management option while 22.5% do not use it which implies that processors expose the cassava peels to sun drying for people that use

it for livestock feeds due to the nutrient content which is rich in fiber. In addition to that 73.8% of the respondents engage in selling of fresh peel while only 26.2% of respondents do not and this also could be attributed to the multiples uses that could e derived from cassava peels. This findings support Olukanmi and Olatunnji (2018) who found out 97.3% of the respondents use the cassava peels as feed (both in fresh and dried forms) and also sell to those that use them as animal feed and Odediran *et al,* 2015 who noted that majority (58.33%) of the processors sun-dried the wastes before been fed to the animals while others either feed the animals with wet wastes or cook the wastes before the animals were fed with the wastes.

Furthermore, 68.8% of respondentsdispose the treated waste water safely intodesignated ponds and 31.2% of the respondents do not use such methods. About 65% of the respondents also disposed waste water in constructed underground tanks while only 35% do not engage in disposal of water. By implication, this indicates that respondents are aware of the potentials and negative consequence of wastewater in the environment and are therefore making use of disposal into containers which are specifically designed for wastewater disposal and can also allow for recycling for herbicide, insecticide, fertilizer, production of biogas and so on. This falls in line with several studies such as Barana, (2000) who indicated that attempts such as proper disposal into designated ponds have been made to liquid residue of cassava (wastewater) by considering its utilization as a fertilizer and production of biogas. However, 61.2% of respondents do notdump the cassava wastes into uncompleted buildingor undeveloped plots of land which shows that farmers are aware that such act could lead to environmental pollution and health hazards.

Table 2: Method of waste management option used by the respondents

Variables	*Frequency	Percentage	Rank
Selling of fresh peels	59	73.8	2
Drying of peels and packaged for sale	62	77.5	1
Dumping of peels on dumpsites	37	46.2	7
Use of wastewater repeatedly	31	38.8	8
Peels use as land fillings	39	48.8	5
Burning of peels when dried	38	47.5	6
Safe disposal of treat waste water into designated ponds	55	68.8	3
Waste water disposal in constructed underground tanks	52	65.0	4
Dumping in uncompleted building/ undeveloped plots of land	31	38.8	8

*** Multiple responses were allowed**

Awareness and decision to adopt improved waste value addition strategy

The result presented in Table 3 revealed the distribution of cassava processors by their awareness of value added wastes management practices and their decision to adopt waste value addition strategies. Entries in Table 3 shows that majority (80.0%) of cassava processors are aware of the value added wastes management practices. Similarly, majority (82.5%) of the processors are willing to adopt waste value addition strategies. The higher percentage (80.0%) in the number of respondents who were aware of value addition to waste management practicesis an advantage to the adoption of these value addition strategies as awareness is an indispensable and preceding step towards the adoption of any improved practice (Simtowe *et al.*, 2012). This implies that with more knowledge on cassava wastes value addition strategies, there will be higher utilization and adoption of cassava wastes management strategies.

Table 3: Awareness and decision to adopt improved waste value addition strategy among the respondents

Variables	Yes	No
Awareness of value added wastes management practices	64(80.0)	16(20.0)
Decision to adopt waste value addition strategies	66(82.5)	14(17.5)

Figures in parentheses are percentages

Factors influencing respondents' decision to adopt waste value addition

The results presented in Table 4 revealed that age, education, level of income and experience in cassava processing were statistically significant based on the dichotomous response concerning decision to adopt improved waste cassava value addition strategy. The estimated coefficient obtained for age (β= 0.8491; P<0.010) was positive and significant at 10% level of probability. This implied that there is higher probability and tendency that older people will be more willing to adopt waste value addition strategy. This is similar to the report of Awuyo-Victor *et al.* (2013) who opined that people that fall within the older category will be willing to pay for improved waste management system. According to Adzawla *et al*. (2019), older people are more disciplined than the youths who may likely take things for granted and seek easy ways of life. The coefficient estimated for education (β= 0.7990; P<0.010) exert positive relationship with respondents' decision to adopt waste value addition strategy. This indicates that the probability of adopting waste value addition strategy would increase with increase in years of education among the respondents. This is expected because education is capable of increasing understanding and negative effect of poor waste disposal on the environment. Respondents with higher level of education would advance reason for improved waste management strategy. Alhassan and Mohammed (2013) in their study noted that people with high level of education were

more willing to pay for improved management strategy. Similarly, Troschinetz and Mihelcic (2008) revealed that one of the major factors associated with sustainable management system is education especially in developing countries. Other variables influencing the decision of cassava processors to accept waste value addition strategy were income and processing experience. These variables were positive and significantly related to respondents' decision. This indicates that as respondent earn more income the probability of adopting improved waste value addition will increase. This is not unexpected because the respondents envisaged that they would be able to pay for this improved option in case there is any cost implication.

Table 4: Factors influencing decision to adopt improved waste value addition among the respondents

Variable	Coefficient	St. Error	t-value
Constant	3.8297	2.8584	1.34
Sex	-0.1148	0.7055	0.16
Age	0.8491	0.5127	1.66*
Education	0.7990	0.4612	1.73*
Household size	0.3414	0.6967	0.49
Income	0.0054	0.0026	2.01**
Processing experience	0.1269	0.0379	3.30***
Marital status	0.2166	0.0994	1.22
LR chi2	16.47		
Log likelihood	-28.75		

***P<0.01 **P<0.05 *P<0.05

Conclusion and Recommendations

.In this study it has been discovered that disposal of cassava waste by majority of the respondents were been previously managed by the processors. The waste particularly the peels were being sold directly or sundried and packaged for another users such as livestock farmers. About two third of the respondents were willing to embrace waste value addition strategy. The findings further showed that decision to embrace waste value addition option largely depend on level of income and education. Also, waste value addition strategy is likely to be adopted by the older people who may consider this as an alternative income generation activity. This study therefore recommends that routine inspection of processing areas should be mandated for the sanitation officers, regulations should also be made for processors and they should be monitored for compliance to the regulations for improvement in waste management and recycling system.

References

Adebayo, K. and Sangosina, M. A. (2005). Processors' Perception of the Effectiveness of some Cassava Processing Innovations in Ogun State, Nigeria. Paper Presented at the 19th Farm Management Association of Nigeria (FAMAN) National Conference.

Adzawla, W., Tahidu, A. Mustapha, S. and Azumah, S. B. (2019). Do socioeconomic factors influence households' solid waste disposal systems? Evidence from Ghana. *Waste Management and Research*, 37:51-57

Alhassan M and Mohammed J (2013). Households' demand for better solid waste disposal services: case study of four communities in the New Juaben Municipality, Ghana. *Journal of Sustainable Development* 6: 16–25.

Awunyo-Vitor D, Ishak S and Jasaw GS (2013) Urban households' willingness to pay for improved solid waste disposal services in Kumasi Metropolis, Ghana. Urban Studies Research Article ID 659425, 8 pages. Available at: https://www.hindawi.com/journals/usr/2013/659425/ (accessed 20 May 2018)

Ayoade, A. R., Akintonde, J. O. and Oyelere, G. O. (2012).Factors affecting adoption of appropriate technologies on cassava production in Orire LGA, Oyo State, Nigeria.*International Research Journal of Agricultural Science and Soil Science*, 2 (3): 89 – 93.

Barana AC (2000). Avaliacao de tratamento de manipueiraembiodigestoresfaseacidogenica e metanogenica.Botucatu: UNESP/FCA, p. 95 (TESE-Doutorado).

Ero, N. R. and Moses, O. (2001). The Effect of Cassava Wastes on the Environment and its Implications on the National Economy. Paper delivered at the First National Conference, Adeyemi College of Education, Ondo. https://www.globalacademicgroup.com

FAO (2007).FAOSTAT Statistics Division of the Food and Collections.Subset Agriculture.Food and Agricultural Organization. http:/faostat.fao.org

Fawole, A. and Adelodun, K. (2022).Optimization of Cassava (*ManihotesculentaCrantz*). Fermentation Process for Food Secured Twenty- First Century Africa. DOI: http://dx.doi.org/10.5772/intechopen.104870

IITA (2005). Report on new cassava varieties. International Institute of Tropical Agriculture annual report

Lebot, V. (2009). Tropical Root and Tuber Crops: Cassava, Sweet Potato, Yams and Aroids. CABI. Cambridge, MA., USA., ISBN-13: 9781845936211, Pages:443.

Muhammed Y., Akpoko J. G., Musa W. M, Ajayi O. J., Muhammad H. U. (2019). Factors Influencing Participation of Cassava Farmers in Survival Farming Intervention Programme in Kogi State, Nigeria. *Journal of Agricultural Extension*, Vol. 23 (2) April, 2019.

NPC. (2006); national Population Commission Survey Reports in 2006

Nsoanya, L. N. and Nenna, M. G. (2011).Adoption of improved cassava production technologies in Anambra-East Local Government Area of Anambra State, Nigeria.*Journal of Research for International Development*, 9 (2): 36 – 43.

Nweke, F. (2004).New Challenges in the Cassava Transformation in Nigeria and Ghana. EPTD Discussion Paper No. 118. Washington, DC: International Food Policy Research Institute, Environment, Production, and Technology Division.

Odediran, O. F., Ashimolowo, O. R., Sodiya, C. I., Sanni, L. O., Adebayo , K., Ojebiyi, W. G. and Adeoye, A. S. (2015). Awareness of Cassava Peel Utilization

Forms among Cassava Processors in Rural Communities of Southwest, Nigeria. *International Journal of Applied Agricultural Research, Faculty of Agricultural Sciences, LAUTECH, Ogbomoso, Nigeria. IJAAAR II (1 & 2): 93-102*

Ogunyinka O. and Oguntuase A. (2020) Analysis of cassava production and processing by various groups in support of cassava value chain in the south west of Nigeria. *Journal of Food and Agricultural Sciences*Vol.9(1), pp. 11-19.

Plevin, R. and Donnelly, D. (2004). *Converting Waste to Energy and Profit: Tapioca starch power in Thailand.* Renewable Energy World. Spetember – October Edition, 74-81

Odediran, O. F. and Ojebiyi, W. G. (2017).Cassava processors' willingness to utilise cassava peel for mushroom production in Southwest, Nigeria.*International Journal of Agricultural Policy and Research,* 5(4): 86-93.

Ohimain, E. I., Silas-Olu, D.I and Zipamoh, Y. T (2013).Biowastes generation by small scale cassava processing centres in Wilberforce Island, Bayelsa State, Nigeria.*Greener Journal of Environmental Management and Public Safety*. 2 (1), pp. 51-59.

Oghenejoboh, K.M., Igbagara, P.W., Oghenejoboh, U.M., (2017). Contamination of agricultural soils by selected heavy metals from municipal solid waste dumpsites –a case study of Ole town in Nigeria's Niger Delta.*Nigerian Journal of Technological Research.* 12 (2): 1–7.

Olukanmi, D.O. and Olatunji, T.O. (2018).Cassava Waste Management and Biogas Generation Potential in Selected Local Government Areas in Ogun State, Nigeria.*Recycling,* 3(58):1-12.

Orhorhoro, E. K. and Oghoghorie, O. (2019). Review on Solid Waste Generation and Management in Sub- Saharan Africa: A case study of Nigeria. *J. Appl. Sci. Environ.Manage.* Vol. 23(9) 1729-1737

Orji, M.U., Nwokolo, S.O. and Okoli, I. (2006). Effects of palm oil mill effluent on soil Microflora. *Nigerian Journal of Microbiology,*20(2):1026-1031.

Omilani, O., Abass, A., Okoruwa, V.O. (2015).Willingness to Pay for Value-Added Solid Waste Management System among Cassava Processors in Nigeria.*Journal of Sustainability,* 11 (1), 1759-1763.

Oyewole, M.F., and Eforuoku, F. (2019).Value Addition on Cassava Wastes among Processors in Oyo State, Nigeria.*Journal of Agricultural Extension*, 23 (3): 135-146.

Popoola, T. O., Adebayo, K., Sodiya, C. I., Adebowale, A. A. and Adeoye, A.S. (2015). Utilisation of cassava peels value addition strategies by cassava processors in southwest Nigeria. *Journal of Sustainable Development,* 12(1): 44-51.

Seifouri, V.,Babalhavaeji, F.,Nooshinfard, F. and Matlabi, D. (2018). Analysis of Factors that Influence Users' Willingness to Pay for the Services of Iranian Academic Libraries by Using the Contingent Valuation Method .*Library Philosophy and Practice* (e-journal). 1755 When was it accessed?

Simtowe, F., Muange, E. Munyua, B. and Diagne, A. (2012). Technology awareness

and adoption: The case of improved pigeon pea varieties in Kenya

Solomon, U.U. (2009). The state of solid waste management in Nigeria. *Journal of Waste Management (New York)*. 29(10):2787-2788.

Troschinetz A. M and Mihelcic J. R (2008). Sustainable recycling of municipal solid waste in developing countries. *Waste Management,* 29: 915–923

Ubalua, A.O., (2007). Cassava wastes: treatment options and value addition alternatives. *African Journal of Biotechnology.* 6: 2065–2073.