NIGERIAN AGRICULTURAL JOURNAL
ISSN: 0300-368X
Volume 52 Number 3, December 2021 Pg. 358-363
Available online at: http://www.ajol.info/index.php/naj
https://www.naj.asn.org.ng
Creative Commons User License CC:BY

PERCEIVED ENVIRONMENTAL EFFECTS OF CASSAVA WASTE MANAGEMENT ON THE RESIDENTS OF IDO LOCAL GOVERNMENT AREA OF OYO STATE, NIGERIA

[1]Ajanaku, A. O., [1]Olayemi, O. O., *[2]Oyelami, B. A. and [1]Ugege, B. H.
Federal College of Forestry Ibadan, Oyo State
[2]Federal College of Forest Resources Management, Fugar, Edo State
Corresponding Authors' email: *oyebusayomi@gmail.com

Abstract
This study was carried out to assess the perceived environmental effects of cassava waste management on the residents of Ido Local Government Area (LGA), Oyo State. A multistage sampling technique was used to select respondents from four purposively selected communities for this study. A total of 115 structured questionnaires were randomly administered to the selected respondents who are cassava processors residing within the community based on the population of processors in each community to determine their waste management practices. The objectives were addressed using descriptive statistics and inferential statistics. The results showed that most (93.0%) cassava processors were females and had primary education as highest (42.6%) level of education. Majority (61.7%) has been living in the vicinity for more than 20 years; thus can be said to have good understanding of the area. No fewer than 80.9% generate over 40kg of cassava peels, with 82.6% discharging more than 100 liters of wastewater into the environment daily. Many (57.4%) noted severe soil mobility in the area, with high erosion of topsoil as reported by 84.3% of the respondents. However, majority disagree with other environmental effects of the waste, while 98.2% and 89.6% indicated that the water bodies and air are not severely polluted respectively. Cassava peels was not considered to be a nuisance to their environment as 93.9% of the respondents sell it off to livestock farmers. The result of the hypothesis showed a P value of 0.101 which is not significant, while considering the relationship between their waste disposal methods and the perceived effects of such on the environment. The findings from this study recommended that educational programs should be made available for the processors on how to properly manage the waste water from cassava by processing it for other purposes and proper channeling of waste water in order to stop further erosion of topsoil in the study area.

Keywords: Cassava, Environmental, odour, Waste, effluents

Introduction

Cassava is a perennial vegetatively propagated shrub and one of the most important food crops that are commonly grown in Africa. Nweke (2004) noted that cassava (*Manihot esculenta* Crantz) is the second most consumed staple food crop after maize in Africa and is the main food security crop after maize in Zambia. But more interestingly, cassava is not only considered a staple crop in many countries, but also an industrial and cash crop (Reincke *et al*., 2018). Cassava root is very rich in starch and contains significant amount of calcium (500mg/100g), phosphorus (40mg1 00g), and vitamins (25mg/100g), the leaves are a good source of protein if supplemented with amino acid and methionine despite containing cyanide (FAO, 1997). According to Oyewole and Eforuoku (2019), although cassava is used in animal feed and industrially for production of starch and ethanol, majority of cassava produced in Africa is used for human food, with not less than 50% been used in the form of processed products. It can be processed into local foods like *gari* (a dry cereal that can be consumed raw), *fufu* (a cassava paste which requires cooking before consumption), *pupuru* (fermented smoked dried balls) *lafun* (fermented sun-dried flour), while other processed products like cassava chips and pellets that can be used to feed livestock (Nwokoro *et al*., 2007). The processing of cassava into the products mentioned above comes with a lot of environmental as well as occupational challenges to the processors, and even the consumers (Oboh, 2004). Ohimain *et al*. (2013) stated that during the processing of cassava tubers into these essential products, an enormous quantity of waste is produced which come in form of solid waste, pulp and peelings sieviates, liquid waste and gaseous emissions consisting of moisture and cyanide. High polluting bio-materials are present in these wastes and can affect the environment in different ways. For example, water from cassava processing is particularly toxic and makes surface waters poisonous, while improper disposal of cassava peels and effluents pose series of threats to the

environment and human health (Olukanni and Olatunji, 2018). In the process of pressing and washing, the water released from cassava can have potentially harmful effect on the environment especially if generated in large amounts. The waste water from cassava processing if released directly into the environment before proper treatment, is a source of pollution. In traditional method of processing which is the most common one, waste water is normally discharged beyond the factory wall into roadside ditches or fields and allowed to flow freely, setting in shallow depression. Eventually this will percolate into the subsoil or flow into the streams. Processors, while processing gari are exposed to smokes generated during toasting. Another major threat to the environment by gari and starch processing is the generation of hydro cyanide acid which when broken down produce toxic and acidic effects, toxic to the soil, soil organisms, water bodies and plants. The safety of the processors, food product and the environment should be considered in crop processing activities. It has been proven that the well-being of man does not only depend on the food he eats but also on his environment (Omueti, 2004). Therefore, the interaction between the environment and man's activities should be of concern and be adequately addressed. The main objective of the study is to examine the perceived environmental effects of cassava waste management among processors who are also residents of Ido Local Government Area of Oyo State, Nigeria.

Hypothesis

Ho1: There is no significant relationship between the constraints faced by respondents and the perceived environmental effects of cassava waste management in the study area.

Methodology

This study was carried out in Ido Local Government Area (LGA) of Oyo State, Nigeria. This LGA shares boundaries with Iseyin and Afijio LGAs in the North, Akinyele LGA in the East, Ibarapa East LGA in the West and Ogun State in the South. It has a landmass of 756.6 square kilometers with an estimated population of 146,200 people using a growth rate of 3.5% from 2006 census with the population density of 116 persons per square kilometer (NPC, 2016). There are ten 10 wards in the LGA. The residents are mostly farmers, traders, transporters and civil servants. The target population of the study was cassava processors. Multistage sampling procedure, with four wards (Ilaju, Akufo, Omi and Ido) purposively selected, because of the predominance of cassava processing activities in the area. One community each from the selected ward was also identified for high cassava processing activities. Random selection was used to select 115 respondents from four purposively selected communities in the study area according to the population of cassava processors in each community selected. A well-structured questionnaire with interview schedule was used to collect data on socio economic characteristics, waste management methods and its effects from the respondents. Descriptive statistics such as frequency distribution and percentages, and inferential statistics such as Chi-square and Pearson product moment correlation (PPMC) were used thus;

$$X^2 = \sum \frac{(o - E)2}{E} \ldots\ldots\ldots (1)$$

Where,
X^2 = chi - square
Σ=summation
O= observed values
E-theoretical or expected values

Pearson Production Moment Correlation

$$= \frac{\sum(x)(y)}{\sqrt{\sum(x)^2 \sum(y)^2}} \ldots\ldots\ldots\ldots (2)$$

Where,
P=Pearson product moment correction
Σ=Summation of the frequency
$X = X - \bar{X}$
$Y = Y - \bar{X}$
$\bar{X}$ = Mean of the frequency
$\bar{Y}$ = Mean of the frequency

Results and Discussion

Socio-economic characteristics of respondents

Table 1 shows the results of the socio-economic characteristics of the respondents. The results show that men and women were involved in cassava processing but females dominated (93.0%) in this activity. This underscores the role of women as critical stakeholders in agricultural production particularly, along its value chain; The result corroborates the study of Adebayo *et al*. (2003) and Okpeke and Onyeagocha (2015) who reported women to be above 95% of their respondents in similar studies. The table also reveals that majority (73.9%) of the respondents were married and a greater proportion (36.5%) within the age range of 41-50years This result reveals that cassava processors in the study area are in their middle age and it can be implied that they have a greater tendency to generate more waste due to ability to have higher output during active years. This finding agrees with the earlier findings of Ume *et al*. (2020).Table 1 further showed that about 42.6% of the cassava processors attained primary level of education; about 31% had secondary education, while 27% had no formal education. This result shows that a higher percentage of the respondents are literates, thus they are expected to have an idea of how unhealthy waste management practices can affect man and his environment. This is in line with the study of Ume *et al*. (2020) which submitted that 76.6% of their respondents had western education.

Various Cassava Processed Products among the Respondents

Table 2 shows that gari was the dominant product (81.7%) from cassava processing among the respondents. This result corroborates the finding of Adekanye *et al*. (2013) and Ume *et al*. (2020). Gari is a

staple food that is widely accepted and consumed in Nigeria. It is very portable and convenient to carry with longer shelf life, and its final preparation into food is highly flexible and delicious to eat (Oghenejoboh, 2015). As such, there is always unprecedented demand for gari. These could have influenced the participation in the processing of cassava into gari by majority of the respondents.

Distribution of respondents according to waste generated by cassava processors

Table 3 shows various wastes generated in the study area. The table revealed that 100% of the respondents generated peels and effluents which are the major wastes from cassava processing which is in line with the findings Njukwe *et al.* (2014) and Ume *et al*. (2020) who reported peels as the major waste generated from cassava processing activities.

Perceived environmental effects of cassava waste management on the respondents

From Table 4, a great percentage of the respondents (84.3%) reported a severe erosion of top soil in the immediate environment of their factories which comes from indiscriminate disposal of large volume of cassava wastewater into the environment. All the respondents (100%) reported that eutrophication (a process by which an entire body of water or a part of it, becomes progressively enriched with minerals and nutrients) is not severe in the area as their factories especially in Ilaju, Akufo and Ido are very far from water bodies. This is contrary to the study of Oghenejoboh, (2015) on the effects of cassava wastewater on the quality of water body intended for fish farming. In the same vein, majority (98.3%) of the respondents submitted that they were not exposed to cyanide, which means that cyanide does not pose any threat to them. This is also contrary to Ume *et al.* (2020) who reported that cyanide posed great environmental challenge to majority (70%) of the respondents in their study. Results showed that 84.3% of the respondents reported the foul odour in their environment as being mild. This contradicts the submission of Ume *et al.* (2020) that odour emanating from uncontrolled fermentation of the organic matter in cassava processing waste was reported by 83.4% of their respondents to be very distasteful, thus making the environs very unpleasant for the inhabitants and passersby. Moreso, majority (98.2%) of the respondents indicated that effect of cassava processing effluent on water bodies is not severe and submitted that their source of water is not close to the factory

Methods of Disposing Cassava Peels and Effluents

Result shows the method of disposing cassava peels and effluents (Table 5). The result revealed that majority (52.2%) of the respondents do not sundried their peels for another purpose nor allows the peels to rot (86.1) as it can cause offensive odor to the environment, most especially during raining season. Further results showed that majority (93.9) of the respondents sold cassava peels to livestock farmers fresh. This is line with the findings of past studies (Ofuya and Obilor, 2009; Montilla, 2014; Ume *et al*., 2020) who stated that cassava peel could be sundried for livestock or ensiled to reduce the cyanide content from the fresh peel for animal consumption. Although, largest percentage (96.5%) of the respondents do not burn cassava peels to make local (black) soap to mitigate climate change and prevent air pollution. Meanwhile, none of the respondents (0%) channel the waste water into tanks or streams but rather allow it to percolate into the soil. This agrees with the submission of Ehiagonare *et al*. (2009), who reported that cassava waste water is usually released untreated in the environment in most rural areas where cassava is been processed. This actually acts as source of pollution with attendant negative effects on man, soil, animal and environment at large.

Constraints militating against Effective Cassava Waste Disposal

Table 6 shows constraints militating against effective cassava waste disposal in the study area. Result shows that majority (58.3%) of the respondents noted that inadequate water was not a constraint as they have enough water to wash away effluents. Further results showed that lack of credit facilities from the government was a constraining factor to effective cassava waste disposal to majority (71.3%) of the cassava processors. This finding is in agreement with Ume *et al*. (2020) who indicated that lack of funds and poor power supply are constraints militating against women processors prompting them to form cooperative groups to access loans.

Relationship between Constraints in Cassava Waste Disposal and Perceived Environmental Effects

Table 7 shows relationship between constraints in cassava waste disposal and perceived environmental effects among the respondents in the study area. Result shows no significant relationship between constraints in cassava waste disposal among the respondents and the perceived environmental effects of cassava waste disposal in the study area. This implies that the nature of constraint does not affect the effect of cassava waste disposal on the environment in the study area.

Conclusion

The study showed that the processors who were mostly women had low level of education and little understanding of how the wastes generated during their cassava processing activities affect the environment at large. Inadequate water supply was not indicated as constraint to proper disposal of cassava waste, though very clear in their processing sites. It is therefore recommended that adult education and regular training should be put in place in most of our study areas as this will improve the knowledge and awareness on safe environment. It is also recommended that proper channeling be made by stake holders for cassava effluents either to tanks or reservoirs where it would be processed for another purpose. Furthermore, for the benefit of those that reported inadequate water as constraint, government and other stakeholders should provide borehole or a deep well as this will improve

cleanliness of the environment. Government on the other hand should make credit facilities and extension resources available for the cassava processors in the study area to enhance environmental friendly processing.

References

Adebayo, K., Anyanwu, A. C. and Osiyale, A. O. (2003). Perception of Environmental Issues by Cassava Processors in Ogun State, Nigeria – Implications for Environmental Extension Education. *Journal of Extension Systems,* 19: 103-112.

Adekanye, T. A., Ogunjimi, S. I. and Ajala, A. O. (2013) An assessment of cassava processing plants in Irepodun Local Government Areas, Kwara State, Nigeria. *World J. Agri. Res.,* 1: 14-17.

Food and Agricultural Organization (FAO) (1997). Food and nutrition for Africa: A resource book for teachers of agriculture. FAO, ROME, ITALY, (Chapter 6).

Montilla, J. J. (2014). Cassava in the nutrition of broiler In: B. nelstel and M. Graham (Eds) Cassava as animal feed. IDRC. Ottawa, Canada, 2014. Pp 43-50.

National Population Commission (NPC) (2006). Provisional 2006 Nigeria Census Figures.

Njukwe, E., Hanna, R., Sarr P. S., Shigeru, A., Kirscht, H., Mbairanodji, A., Ngue-Bissa, T. and Tenkouano, A. (2014). Cassava value chain development through partnership and stakeholders' platform in Cameroon. *International Journal of Agricultural Policy and Research*, 2 (11):383-392.

Nweke F. (2004). New Challenges in the Cassava Transformation in Nigeria and Ghana. EPTD Discussion Paper No 118. International Food Policy Research Institute. www.ifpri.org.

Nwokoro S. O., Orheruda, A. M. and Ordia, P. I. (2007). Replacement of maize with cassava peel in cockerel starter diets, effects on performances and carcass characteristics. *Tropical Animal Health and Production*, 37 (6):495 -501

Ofuya, C. O. and Obilor, S. (2009). The suitability of fermented cassava peel as a poultry feed stuff. *Bioresource Technology*, 44:101-104.

Oghenejoboh K. M. (2015). Effects of cassava wastewater on the quality of receiving water body intended for fish farming. *British Journal of Applied Science and Technology,* 6(2): 164-175.

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

Okpeke, M.Y. and Onyeagocha, S.U.O. (2015). Analysis if Processing Cassava Tubers Into Garri in Isoko North Local Government Area of Delta State, Nigeria. *European Journal of Agriculture and Forestry Research,* 3(5): 15-25.

Omueti, O. (2004). Traditional cassava processing and improved management practices. In: Proceedings of a workshop on promotion of improved management technologies aimed at reducing occupational and environmental hazards associated with cassava processing in Ogun, Ondo and Oyo States 2004: Pp. 1 -5.

Oyewole, M.F. and Eforuoku, F. (2019). Value addition on cassava waste among processors in Oyo State. Nigeria. *Journal of Agricultural Extension,* 23(3):135-146.

Reincke, K., Vilvert, E., Fasse, A., Graef, F., Sieber, S. and Lana, M.A. (2018). Key factors influencing food security of smallholder farmers in Tanzania and the role of cassava as a strategic crop. *Food Security*, 10(4):911-924.

Ume, S.I., Onwujiariri, U.J. and Nwaneri, T.C. (2020). Effect of Cassava Processing to the Environment in South East, Nigeria- Implication on Adoption of Cassava Processing Technology. *Sustainable Food Production*, 9:1-14.

Table 1: Frequency distribution of the respondents according to their Socio -economic characteristics

Variables	Frequency	Percentage (%)
Gender		
Male	8	7.0
Female	107	93.0
Age of respondent		
> 20 years	2	1.7
20-30years	11	9.6
31-40 years	37	32.2
41-50 years	42	36.5
Above 50 years	23	20.0
Marital Status		
Single	8	7.0
Married	85	73.9
Divorced	8	7.0
Widow	14	12.1
Educational status		
No education	30	26.1
Primary education	49	42.6
Secondary education	**36**	**31.3**

Source: Field survey, 2020

Table 2: Frequency distribution of the respondents according to cassava processing products

Cassava products	Yes Frequency (%)	No Frequency (%)
Fufu	58(50.4)	57(49.6)
Lafun	54(47.0)	61(53.0)
Starch	11(9.6)	104((90.4)
Garri	94(81.7)	21(18.3)
Alcohol	1(.9)	109(94.8)
Tapioca	6(5.2)	109(94.8)
Cassava flour	44(38.3)	71(61.7)
Abacha	4(3.5)	111(96.5)
Cassava chips	4(3.5)	111(96.5)

Source: Field survey, 2020

Table 3: Frequency distribution of the respondents according to waste products generated from cassava processing

Wastes products	Yes Frequency (%)	No Frequency (%)
Peels	115(100)	0(0)
Effluents	115(100)	0(0)
Dust	95(82.6)	20(17.4)
Fumes	109(94.8)	6(5.2)
Starch waste	14(12.2)	101(87.8)
Particles	108(93.9)	7(6.1)

Source: Field survey, 2020

Table 4: Frequency distribution of the respondents according to perceived environmental effects of cassava processing wastes

Environmental effects	Severe Frequency (%)	Mild Frequency (%)	Not severe Frequency (%)
Erosion of top soil	97(84.3)	8(7)	10(8.7)
Eutrophication	0(0.0)	0(0.0)	115(100)
Exposure to cyanide	0(0)	2(1.7)	113(98.3)
Foul odour	8(7)	97(84.3)	10(8.7)
Pollution of water bodies	1(0.9)	1(.9)	113(98.2)
Effect on soil and plant	95(82.6)	10(8.7)	10(8.7)
Infestation of pest	1(0.9)	0(0)	114(99.1)
Health hazards	37(32.2)	45(39.1)	33(28.7)
Air pollution	0(0)	12(10.4)	103(89.6)

Source: Field survey, 2020

Table 5: Frequency distribution of the respondents according to their methods of disposing cassava peels and effluents

Disposal methods	Yes Frequency (%)	No Frequency (%)
Sun drying the peels for another use	55(47.8)	60(52.2)
Allowing the peels to rot	16(13.9)	99(86.1)
Selling of fresh peels to the livestock farmers	108(93.9)	7(6.1)
Burning heaps of cassava peels to make local (black) soap.	4(3.5)	111(96)
Washing away of the effluents	110(95)	5(4.3)
Construct channel for effluent into tanks or stream	0(0)	115(100)

Source: Field survey, 2020

Table 6: Frequency distribution of the respondents according to factors that constrain their effective cassava waste disposal

Constraining Factors	Severe Freq. (%)	Mild Freq. (%)	Nil Freq. (%)
Inadequate water to wash away effluents	44(38.3)	4(3.5)	67(58.3)
Poor channel for cassava effluent	105(91.3)	2(1.7)	8(7.0)
High cost of labor	15(13.0)	12(10.4)	88(76.5)
Insufficient marketing of waste products generated		8(7.0)	107(93.0)
Poor access to credit and technical resources	82(71.3)	2(1.7)	31(27.0)
Cost of purchasing modern equipment too high	38(33.0)	2(1.7)	75(65.2)
Inadequate incinerators to convert waste	14(12.2)	2(1.7)	99(86.1)
Shortage of waste disposing pits in the processing area	4(3.5)	2(1.7)	109(94.8)
Inadequate knowledge and access to Extension agents	10(8.7)	4(3.5)	101(87.8)

Source: Field survey, 2020

Table 7: PPMC showing relationship between constraints in cassava waste disposal and perceived environmental effects

Variables	r-value	p-value	Decision
Constraints involved in cassava waste disposal Perceived environmental effects of cassava waste	0.154	0.101	NS