Original Research Article

Utilisation of cassava waste among processors in Akoko Southwest, Ondo State, Nigeria

Oluwatoyin Bukola **Chete**

Department of Agricultural Extension and Rural Development, Adekunle Ajasin University, Akungba Akoko, Ondo State, Nigeria

Correspondence to:
O. B. Chete, Department of Agricultural Extension and Rural Development, Adekunle Ajasin University, Akungba Akoko, Ondo State, Nigeria, e-mail: cheteob@yahoo.com

Abstract

There is a considerable gap in knowledge about cassava waste management among small-scale processors in Nigeria. This study investigated the utilisation of cassava wastes among processors in Akoko southwest, Ondo State, Nigeria. Two hundred processors were sampled in four communities, using a multistage sampling procedure. Data were analysed using frequency counts, and percentages and Pearson Product Moment Correlation (at $\alpha_{0.05}$). The majority of the processors were males (53.5 %), married (49.0 %), Christians (49.0 %), and with secondary education (22.0 %). Most respondents had knowledge that cassava waste could be sold to generate income (81.0 %), used to produce chemicals (78.5 %) and utilised as a source of energy (78.5 %). The major constraints to cassava waste utilisation included high cost of cassava waste processing (82.0 %) and the lack of processing equipment (82.0 %). The correlation analysis shows a significant correlation between the ages of respondents and cassava waste utilisation (r = –0.538 $p < 0.05$), years of education, and cassava waste utilisation (r = –0.073, $p < 0.05$). However, marital status (r = –0.087, $p < 0.05$) and income (r = –0.048, $p < 0.05$) had hypothesised a positive relationship with cassava waste utilisation, but not significant. The study concluded that the majority of the respondents had a positive attitude towards cassava waste utilisation, but were constrained by inadequate finance, lack of processing equipment, high cost of hired labour, and high cost of processing. The biogas properties of cassava waste have transformational potential in addressing energy poverty in developing economies like Nigeria.

Keywords: attitude; cassava peels; constraints; knowledge; processing; socio-economic characteristics

INTRODUCTION

Cassava is an important food crop in Nigeria that produces 59 million tonnes (approximately 20 % of global production); making it the world's largest producer of the commodity (Ikuemonisan et al., 2020). Cassava provides nutrition and livelihoods across countries through products such as starch, gari, cassava flour, and *fufu* which are derivatives of cassava tubers (Bamidele et al., 2015). Moreover, cassava value-added products such as silage are useful in the feed sector for cattle and broilers. Cassava can also be transformed into agro-industrial products such as wafers, gums, and liquid adhesives. Furthermore, through biotechnological intervention, cassava can be converted to chemicals, enzymes, and eco-friendly detergents. Unfortunately, during the processing of cassava tubers into these products, a massive volume of cassava peels (about 50 % of processed cassava tubers) are generated as waste (Odediran et al., 2015), and only a minute fraction is typically fed to livestock such as goats. Popoola et al. (2015) reported 13 % peels and 7 % discarded roots and barks from every cassava processing activity. Apparently, there is a need for better management and utilisation of these wastes

and residues, and for processors to cultivate the right attitude to managing cassava wastes.

A considerable number of scholarly works have established the potential to utilise these peels to produce biogas, mushroom, and improved animal feed (Adelekan, 2012). However, many cassava processors are either ignorant of the cassava waste utilisation possibilities or lack the knowledge of mechanics for optimising it. This knowledge gap underpins the indiscriminate disposal of cassava peels by processors in place of converting them to usable forms or selling them off to augment their incomes.

The main objective of this study is to examine the utilisation of cassava waste among processors in Akoko Southwest, Ondo State. Nigeria. Specifically, the study describes the socio-economic characteristics of cassava processors, determines their attitudes to waste utilisation, assesses their knowledge of waste utilisation; and identifies the constraints to waste utilisation in the study area.

MATERIALS AND METHODS

This study was conducted in Akoko Southwest local government area of Ondo State. The area is located within the geographical coordinates of Latitude 7°27′30″N and 5°48′0″E and Longitude 7°27′20″N and 5°48′30″E. The study population comprises 15,487 farmers, disaggregated into Oka 3,050, Akungba 2,420, Iwaro 1,520, Uba 1,078, Oba 1,800, Supare 1,859, Aiyegunle 1,130, Okia 800, Aiyepe 1,090 and Etioro 740 farmers that make up Akoko Southwest Local Government of Ondo State. The respondents were engaged predominantly in activities such as farming and trading. The major crops cultivated included cassava, yam, maize, cocoa, and palm oil.

The questionnaire was prepared using open and closed-ended and subjected to face and content validity by experts in the field of Agricultural Extension and Rural Development.

A multistage sampling technique was employed for the study. The first stage involved purposively selecting four (4) communities in the Local Government Area, (Akungba, Oka, Supare and Ayegunle), due to intense cassava processing activities in these communities. In the second stage, ten percent of processors in each of the communities were randomly selected, making a total of 200 respondents.

The data collected were analysed using descriptive and inferential statistics. Descriptive statistics such as frequencies and percentages were used to demonstrate the socio-economic characteristics, knowledge, attitude, and constraints of the respondents. Inferential Statistics

Table 1. Socio-economic characteristics of respondents

Variables	Frequency	%
Age		
15–25	30	15.0
26–35	45	22.5
36–45	55	27.5
46 Above	70	35.0
Gender		
Male	107	53.5
Female	93	46.5
Marital status		
Single	31	15.5
Married	98	49.0
Divorced	38	19.0
Widowed	33	16.5
Religion		
Christian	98	49.0
Islam	64	32.0
Traditional	38	19.0
Educational attainment		
Primary	31	15.5
Secondary	44	22.0
Tertiary	38	19.0
No formal education	33	16.5
Vocational training	54	27.0
Income		
Below US$26.30	31	15.5
US$26.30–US$52.60	98	49.0
US$55.23–US$102.56	38	19.0
Above US$105.19	33	16.5
Processing experience (yrs)		
Below 5 years	33	16.5
6–10 years	98	49.0
11–19	38	19.0
Above 20 years	31	15.5
Access to information		
Yes	150	75.0
No	50	25.0
Sources of information		
Radio	60	30.0
Television	80	40.0
Extension agent	60	30.0

Source: Fieldwork 2021

was used to determine the relationship between the socio-economic variables and cassava waste utilisation.

RESULTS

Table 1 reveals that 25.0% of the respondents were based in Akungba, 25.0% were residents in Oka, 20.0% live in Ayegunle, and 25.0% were domiciled in Supare.

Table 2. Knowledge of cassava waste utilisation by respondents

Knowledge	Agree		Disagree		Total	
	F	%	F	%	F	%
I use it to control weeds	137	68.5	63	31.5	200	100
I know it can be used for cloth starch	138	69.0	62	31.0	200	100
It can be used as livestock feed	148	74.0	52	26.0	200	100
I know that it can be used to produce chemical	157	78.5	43	21.5	200	100
It can be used as a source of energy	157	78.5	43	21.5	200	100
I know it can be sold to generate income	162	81.0	38	19.0	200	100
I know it can be used for producing mushroom spawn	57	28.5	143	71.5	200	100

Note: F = Frequency;
Source: Fieldwork 2021

The distribution of respondents by gender shows that 53.5 % of them were male, and 46.5 % were female.

The age distribution of the respondents shows that 15.0 % were between 15–25 years of age, 22.0 % were aged from 26 to 35 years, 27.5 % were within the age bracket of 36 to 45 years, and 35.0 % were aged from 46 and over. Almost half (49.0 %) of the respondents were married, 15.5 % were single, 19.0 % were divorced, and 16.5 % were widowed. Almost half (49.0 %) of the respondents were Christian, 32.0 % were Islamic faithful, whereas (19.0 %) were traditionalists. This finding aligns with Olagunju and Akinbile (2020) who reported that rural farmers in Southwest, Nigeria were predominantly Christians.

The educational status of the respondents reveals considerable literacy as 15.5 % had primary education, 22.0 % had secondary education, 19.0 % had post-secondary education, and 27 % acquired vocational training, and 16.5 % did not have formal education.

Monthly income from cassava processing was below US$26.30 for 15.5 % of the respondents; from US$26.30 to US$52.60 for 49.0 % of the respondents; from US$55.23 to US$102.56 for 19.0 % of the respondents, and above US$105.19 for 16.5 % of the respondents.

About half (49.0 %) of the respondents had 6–10 years of experience in cassava processing, 16.5 % had below 5 years of experience, 19.0 % had 11 to 19 years of experience, and 15.5 % had over 20 years of experience. This indicates that the majority of the respondents have ample experience with the nuisance posed by cassava waste and should generally be inclined to embrace techniques and skills for waste management and utilisation.

Three-quarters of the respondents had access to information regarding cassava waste utilisation, 30 % of these respondents sourced such information from radio, 40 % did from television, and 30 % from extension agents.

The knowledge of waste utilisation by cassava processors reported in Table 2 shows that most of the respondents (68.5 %) were aware that cassava waste could be used to control weeds; 69.0 % were aware that cassava waste could be used as cloth starch, 74.0 % were cognisant of the use of cassava waste as feed for animals; while 78.5 % were aware that cassava waste could be used to produce chemicals. Moreover, 78.5 % of the respondents were mindful of the use of cassava waste as a source of energy, 81.0 % of the respondents knew that cassava waste could be sold to generate income, while only 28.5 % had prior knowledge that cassava waste could be used in the production of mushroom spawn. These findings suggest that the cassava processors generally had considerable awareness of potential utilisation channels for cassava wastes.

The attitude of cassava processors to waste utilisation in the study area reported in Table 3 shows that 42.0 % of the respondents strongly agreed with the statement "Cassava wastes are thrown into dustbins", 31.5 % strongly disagreed with the statement "I don't know cassava wastes are useful", suggesting some knowledge level of the usefulness of cassava wastes; 39.5 % strongly disagreed with the statement "I have never used cassava wastes for anything" indicating that a reasonable fraction of the respondents had utilised cassava waste for some purpose. Meanwhile, 35.5 % of the respondents strongly disagreed with the statement that "wastes from cassava could be dangerous", suggesting some degree of ignorance about the dangers posed by cassava wastes; 73.5 % of the respondents either disagreed or strongly disagreed with the statement "cassava wastes had not been useful to me" indicating awareness of the positive properties of cassava wastes. Finally, 76.0 % of the respondents agreed with the statement "cassava waste pollutes my environment" signaling their concurrence with the polluting attribute of cassava wastes.

Table 4 analyses constraints to cassava processors in utilising cassava wastes. Most (76.0 %) of the respondents agreed that inadequate finance was a constraint to the utilisation of cassava wastes. Similarly, the majority

Table 3. Attitude of respondents to cassava waste utilisation

Attitude	SA		A		D		SD		Total	
	F	%	F	%	F	%	F	%	F	%
Cassava wastes are thrown into a dustbin	84	42.0	73	36.5	15	7.5	28	14.0	200	100.0
I ensure that I wash it away	37	18.5	25	12.5	66	33.0	72	36.0	200	100.0
I have never used it for anything	15	7.5	21	10.5	85	32.5	79	39.5	200	100.0
Wastes from cassava could be dangerous	26	13.0	22	11.0	80	40.0	71	35.5	200	100.0
Cassava has not been useful to me	25	12.5	28	14.0	84	42.0	63	31.5	200	100.0
Cassava waste pollutes my environment	85	42.5	67	33.5	29	14.5	19	9.5	200	100.0

Note: SA = strongly agree, A = agree, D = disagree, SD = strongly disagree, F = Frequency;
Source: Field Survey, 2021

(82.0%) of the respondents contend that lack of processing equipment hampered the utilisation of cassava wastes. Moreover, 82.0% agreed that the high cost of cassava waste processing constrained utilisation of cassava wastes, as did the lack of government support indicated by 77.0% of the respondents. In the same vein, 80.0% of the respondents considered unavailability of labour as a constraint, while 79.5% regarded lack of requisite skills and technical know-how as a constraint. Finally, 73.5% of the respondents deemed the lack of extension agents as constraining. In summary, inadequate finance, lack of processing equipment, high cost of hired labour, high cost of cassava waste processing, etc. were major constraints to utilisation of cassava wastes.

The result of Pearson's Product of Moment Correlation (PPMC) analysis of the relationship between respondents' socio-economic characteristics and cassava waste utilisation reported in Table 5 shows a significant correlation between the ages of respondents and cassava waste utilisation ($r = -0.538$ $p < 0.05$). Similarly, there was a positive significant relationship between years of education and cassava waste utilisation ($r = -0.073$, $p < 0.05$). However, marital status ($r = -0.087$, $p < 0.05$) and income ($r = -0.048$, $p < 0.05$) had the hypothesised positive relationship but were not significant.

DISCUSSION

The gender distribution of involvements in cassava processing reveals a decent participation of women in these activities despite their traditional role as home-keepers, dispelling the myth that cassava processing is an exclusively female activity. Oladejo et al. (2011) revealed that beyond being homemakers, women are actively involved in agriculture including the manual processing of food crops and other farm produce. The age distribution of respondents indicates that the majority of them fall into the economically active age groups. The involvement of people in their productive ages has ramifications for the volume of waste generated and signals the likely inclination of these adventurous age groups to explore waste utilisation ventures to enhance their earnings.

The preponderance of married people among the respondents signifies higher household obligations,

Table 4. Constraints of respondents to utilisation of cassava wastes

Constraints	SA		A		D		SD		Total	
	F	%	F	%	F	%	F	%	F	%
Inadequate finance	79	39.5	74	37.0	22	11.0	25	12.5	200	100.0
Lack of processing equipment	85	2.5	79	39.5	20	10.0	16	8.0	200	100.0
High cost of hired labour	92	46.0	72	36.0	15	7.5	21	10.5	200	100.0
High cost of cassava waste processing	87	43.0	69	34.0	26	13.0	18	9.0	200	100.0
Lack of government support	80	40.0	80	40.0	18	9.0	22	11.0	200	100.0
Unavailability of labour	100	50.0	80	40.0	8	4.0	12	6.0	200	100.0
Lack of requisite skills and technical know how	80	40.0	71	35.5	26	13.0	22	11.0	200	100.0
Lack of extention agents	84	42.0	63	31.5	25	12.5	28	14.0	200	100.0

Note: SA = strongly agree, A = agree, D = disagree, SD = strongly disagree, F = Frequency;
Source: Field Survey, 2021

Table 5. Relationship between selected respondents' socio-economic variables and cassava waste utilisation

Variables	N	r	p-value
Age	200	−0.538*	0.025
Years of education	200	−0.073*	0.032
Marital status	200	−0.087	0.168
Income	200	−0.048	0.444

Note: N = No. of observations, r = correlation coefficient
* = significant at a 5 % level

demanding greater financial commitments, which is an additional impetus for exploiting the income-earning prospects of cassava waste utilisation. This result validates Titus et al. (2015) who submitted that agriculture is primarily practiced by married people in rural Nigeria.

The high literacy level among the respondents indicates that they were likely to relate with and possibly be more receptive to innovations and improved practices for managing cassava waste. This finding is upheld by Lawal et al. (2019) that rural dwellers in their study areas were literate.

The modest income from cassava processing accruing to the respondents would likely make waste utilisation an attractive proposition for them to ramp up their total earnings. A share of their current incomes could be channeled as capital investments into waste utilisation technology to enhance aggregate incomes and improve livelihoods. Mbam and Nwibo (2013) surmised that a combination of farm and nonfarm activities constitute sources of income for farmers which helps to lessen poverty among farm households.

It is instructive that a high proportion of the respondents had access to information regarding cassava waste utilisation. Moreover, the majority of the cassava processors had appreciable knowledge of potential utilisation opportunities for cassava wastes. The elevated awareness level, coupled with the implicit readiness of the respondents to explore those possibilities, suggests that the likely impediments are the constraints identified by the respondents.

The alleviation or removal of constraints of inadequate finance through the provision of credits, grants, and other forms of financial empowerment to cassava processors is pivotal in utilisation of cassava wastes. Similarly, in-kind support such as the provision of processing equipment and other facilities and infrastructures that lessen processing costs could also be instrumental in fostering the utilisation of cassava wastes.

CONCLUSION AND RECOMMENDATIONS

This study established that the majority of the respondents had knowledge of cassava waste utilisation opportunities and evince a positive attitude towards cassava waste utilisation. They are, however, constrained by inadequate finance, lack of processing equipment, high cost of hired labour, and high cost of cassava waste processing. The study also confirmed a significant relationship between the socio-economic characteristics of the respondents and cassava waste utilisation. It is recommended that the relevant agencies should institutionalise and propagate a deliberate policy, discouraging cassava processors from indiscriminately disposing wastes, but rather utilising or transforming the wastes into useful products. This might require the government providing grants or loans to those willing to invest in transforming cassava wastes to wealth. Similarly, relevant agencies should provide support in form of equipment and machinery for interested entrepreneurs to drive this initiative.

CONFLICT OF INTEREST

The authors declared no conflicts of interest with respect to the research, authorship, and publication of this article.

ETHICAL COMPLIANCE

The authors have followed ethical standards in conducting the research and preparing the manuscript.

REFERENCES

Adelekan B. A. (2012): Recent Advances in Renewable Energy: Research, Applications and Policy Initiatives. Physical Review & Research International 2: 1–21.

Bamidele O. P., Fasogbon M. B., Oladiran D. A., Akande E. O. (2015): Nutritional composition of fufu analog flour produced from Cassava root (*Manihot esculenta*) and Cocoyam (*Colocasia esculenta*) tuber Food Science & Nutrition 3: 597–603.

Ikuemonisan E. S., Mafimisebi T. E., Ajibefun I., Adenegan K. (2020): Cassava production in Nigeria:

trends, instability and decomposition analysis (1970–2018). Heliyon 6: 1–9.

Lawal N. S., Ogedengbe K., Olasoju S. A., Odugbose B. D., Opeagbe S. O. (2019): Characteristics and Waste Management Practices of Cassava-Based Processing Clusters in Ibadan Oyo State, Nigeria Nigerian Research Journal of Engineering and Environmental Sciences 4: 658–666.

Mbam B. N., Nwibo S. U. (2013): Entrepreneurship Development as a strategy for poverty alleviation among farming households in Igbo-Eze North Local Government Area of Enugu State Nigeria: Greener Journal of Agricultural Sciences 3: 736–742.

Odediran O. F., Ashimolowo O. R., Sodiya C. I., Sanni L. O., Adebayo K., Ojebiyi W. G., Adeoye A. S. (2015): Awareness of Cassava Peel Utilization Forms among Cassava Processors in Rural Communities of Southwest, Nigeria; International Journal of Applied Agricultural and Apicultural Research (IJAAAR) 11: 93–102.

Oladejo J. A., Olawuyi S. O., Anjorin TD. (2011): Analysis of Women Participation in Agricultural Production in Egbedore Local Government Area of Osun State, Nigeria: International Journal of Agricultural Economics and Rural Development 4: 1–11

Olagunju O., Akinbile L. A. (2020): Farmers' perceptions of the effect of rural transportation systems on farming income in Ondo State, Nigeria. Sarhad Journal of Agriculture 36: 985–994. DOI | http://dx.doi.org/10.17582/journal.sja/2020/36.3.985.994

Popoola T. O., Adebayo K., Sodiya C. I., Adebowale A. A., Adeoye A. S. (2015): Utilization of Cassava Peels Value Addition Strategies by Cassava Processors in Southwest Nigeria. Journal of Sustainable Development 12: 44–51.

Titus O. B., Adebisola O. A., Adeniji A. O. (2015): Health-care access and utilization among rural households in Nigeria. Journal of Development and Agricultural Economics 7: 195–203.