Farm waste utilization among farmers in Irepodun Local Government Area, Kwara State, Nigeria: Implication for extension education service delivery

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Abstract. The study examined the utilization of farm waste among farmers in Irepodun Local Government Area of Kwara State, Nigeria. Structured interview schedule was used to elicit data from 120 farmers in the study area. Results revealed that more than half (58.4%) of the respondents were crop farmers who grow majorly maize and cassava on a subsistence scale. The major farm wastes generated in the area were maize cobs, husk and stalk (62.5%) and cassava stalk and peels (60%). Majority of the farmers got rid of their farm waste through burning while more than half of the respondents do not utilize the waste they generate from their farms. The major constraints militating against farm waste utilization includes inadequate access to extension services, inadequate awareness of benefits of farm waste, inadequate facilities for processing of farm wastes to other products and low knowledge on usage of farm waste. Logistic regression modelling results revealed that farmers who are more likely to utilize their farm waste efficiently are those with higher level of education and more years of experience in farming. It was therefore recommended that extension agencies should embark on enlightenment campaigns and trainings of farmers on various innovative ways of farm wastes utilization in order to facilitate more efficient and environmental friendly farm waste utilization initiatives in the area.

Keywords. Assessment, Farmers, Farm Waste, Kwara State, Utilization.

1 Introduction

One of the main features of agriculture today is waste, which is inevitable on farmlands. Globally, 140 billion metric tons of waste is generated every year from agriculture. This volume of waste can be converted to an enormous

amount of energy and raw materials (UNEP 2009). As defined by Shaban and Omaima (2010), farm wastes are residues produced as a result of various agricultural operations. Household farms in rural communities generate solid organic wastes such as manure, tree trimmings, grass clippings, and crop residues such as rice husk, rice straws, maize stalk, maize husk, maize cobs, cassava peels and stalk, groundnut shells and straws, soy beans pods, sugarcane bagasse and leaves, and cotton stalk. Organic wastes can amount up to 80 percent of the total solid wastes generated in any farm household. Also, livestock generate large amounts of wastes. Manure production can amount up to 5.27 kg/day/1000 kg live weight, on a wet weight basis (Mbam and Nwibo 2013).

Farm waste contains many reusable substances of high value but it seems that they are most of the time taken next to nothing by a majority in Nigeria farmers. These large volumes of biomass can be converted to an enormous amount of energy and raw materials depending on the availability of adequate technology. They can be converted into commercial products either as raw material for secondary processes, as operating supplies or as raw materials of new products (Gunther *et al.* 2003). This process can be termed creativity in agriculture, 'creativity is making marvellous out of the discarded', i.e. creating "wealth" from "wastes". Wealth can be created from wastes when they are recycled or further utilized (Auke and Japp 1997).

A case of Songhai farm in port novo is a show case of the system that produces almost zero waste by recycling waste into biogas used for cooking, electricity, fertilizers etc. The abundant farm residues in the rural communities can also be converted into resources for generating wealth. For instance, cocoa pods are generated on cocoa plantation and it has been estimated that about 150 kg dry pods per hectare are left in the field as it provides a valuable source of potash fertilizer (Lim, 1986). Also, palm kernel shell, wood chippings that are left in the fields or burnt off in Nigeria have the capacity to generate over 750MW of electricity (Egun 2012). Okey *et al.* (2014) also reported that plant material and animal wastes used primarily as domestic energy source are naturally abundant in rural communities and present a renewable energy opportunity that could serve as an alternative to fossil fuel.

Composting agricultural and other types of wastes can be a useful process for recycling nutrients and maintaining or restoring levels of organic matter in the soil (Solano *et al.* 2001). Composting of farm and organic waste can be an attractive, low-cost technology for farmers. Utilization of the finished product on the farm can help the farmer avoid some of the costs associated with the purchase of organic matter, fertilizer and soil conditioners (Romeela 2007). Livestock wastes are used as soil conditioner (Hermanson 2005), fuel source either by direct combustion or converted to biogas (Jones *et al*. 2005), and livestock and fish feeding (Sevilleja *et al.* 2005). Livestock wastes could also constitute nuisance through environmental pollution especially the liquid component which seep into the ground contaminating both surface and ground

water, and this is why many legislations have been made to protect the environment while various improved methods of waste management have been prescribed towards ameliorating the impact of wastes on the environment (Anon. 2005; Nebraska Department of Environmental Quality, 2005).

Agricultural wastes have been reported to be a large and an underexploited resource, almost always underestimated (Rosillo-Calle 2007). Wastes can be used as fuel, fodder, manure, fibre, feedstock and further uses; this establishes the slogan waste-to-wealth which means moving waste from a platform of exhausted utility to valuable and desirable level. It has been observed that rural farmers have little knowledge about wastes utilization and are not well informed about modern economically viable waste utilization innovation. Farm wastes depending on utilization could either be assets in improving the living standards of farmers, if their benefits are maximized, or potential hazards to the environment where they are generated.

This study, in a bid to provide information and insight for extension agencies and policy makers in ensuring that better waste utilization strategies are extended to farmers aims to assess farm wastes utilization among farmers in Irepodun Local Government Area of Kwara State, Nigeria. Specifically, the study sought to describe the socio-economic characteristics of the farmers in the study area, identify the types of farm wastes generated on the farms, examine the methods of farm waste management on the farms in the study area, determine the utilization of the farm wastes generated, identify the constraints militating against farm waste utilization in the study area and identify the determinants of farm waste utilization in the study area.

2. Materials and Methods

The study was carried out in Irepodun Local Government Area in Kwara state, Nigeria. Farmers of the area cultivates food crops such as yam, maize, guinea corn, cocoyam, cassava, rice, locust bean as well as shea butter and cash crops such as cocoa, kola and oil palm. The population for the study consists of both crop and livestock farmers in Irepodun Local Government Area of Kwara State. Structured interview schedule was used to collect information from one hundred and twenty farmers (120) sampled in the area. Two-staged sampling procedure was used in the study. First, was a purposive sampling of six wards from the eleven wards in the Local Government Area based on their farming population base, namely; Esie, Omu-aran, Oko, Ajase-ipo, Ipetu and Arandun wards. This was then followed by a random selection of 20 farmers from each of the selected wards carried out with the aid of a list of registered farmers/sampling frame gotten from the Kwara State Agricultural Development Project (ADP).

Socio-economic characteristics of the respondents, the types of waste generated, their method of waste management and the constraints they face in utilizing waste generated from their farms were the key data groups. These variables were measured as follows.

'Constraints to farm waste utilization' was measured on a 3-point Likert-type scale of Very severe (3), Severe (2), and Not severe (1).

'Farm waste utilization': Respondents were asked to indicate whether they utilize the waste generated from their farms and this was measured on Yes (1) or No (0) basis.

Data analysis was carried out using descriptive statistics such as frequency counts, percentages, means and ranks. Logistic regression was used in modelling the determinants of farm waste utilization of the respondents. Logistic regression model is widely used to analyze data with dichotomous dependent variables.

The binary logistic regression model is stated as:

$$Yj = \beta_0 + \beta_1 X_1 + \beta_2 X_2 \ldots + \beta_6 X_6 + \varepsilon$$

where,
Yj is the binary variable with value 1 if farmers utilize the waste generated from their farms and 0 if otherwise (if farm waste is not utilized). $\beta 0$ is the intercept (constant), and $\beta 1$, $\beta 2$, to βn are the regression coefficients of the predictor variables, $X_1, X_2, \ldots\ldots X_6$ respectively, and ε is the independent and normally distributed random error, and

X_1 = age (in years)
X_2 = gender (measured as a dummy variable 1 for male, 0 if otherwise)
X_3 = marital status (measured as a dummy variable 1 for married, 0 if otherwise)
X_4 = Household Size (measured in number of persons)
X_5 = educational level (measured as 1 for formal educated ranging from adult, primary, secondary and tertiary education and 0 if otherwise)
X_6 = Years of Experience (measured as number of years in farming profession).

3 Results and Discussion

3.1 Socio-economic characteristics of the respondents

Results from Table 1 revealed that majority (72.5%) of the respondents were male, while less than one-third (27.5%) are female, showing that, the women in Irepodun LGA are less involved in farming activities. This result affirms that, traditionally, women are regarded as homemakers, who oversee and coordinate the affairs and activities at home. However Oladejo *et al*. (2011) revealed that beyond being homemakers, women are still very relevant in agriculture as they engaged in manual processing of food crops and other farm produce in addition to their housekeeping duties. Majority (74.2%) of the farmers are within 45-65 years of age, which means that they are still in their economically active years indicating a high degree of prospects to be more receptive to ideas and innovations as regards farm waste utilization and management. Majority (85.8%) of the respondents were married, which shows they have family responsibilities ties that will require more financial commitment which may serve as an impetus for them to exploit the prospects in farm waste utilization. This is in consonance with Titus *et al.* (2015) who stated that agriculture is primarily practiced by married people in the rural areas of Nigeria.

Findings in Table 1 further revealed that most of the respondents (79.2%) had one form of formal education or the other and this attribute might enhance the farmers' information seeking behaviour on farm waste management and utilization thus facilitating their high rate of adoption of new technology relating to waste usage and disposal. The mean household size of the respondents was 7 persons. This finding on household size implies that the respondents could draw some level of family labour from their household as regard management of waste generated from their farms. Findings also revealed that a little above average (51.7%) of the farmers engaged in trading as a form of secondary occupation while only a handful (11.7%) of them were not involved in any secondary occupation but solely depend on farming. The finding is in agreement with Mbam and Nwibo (2013) who reported that farmers engaged in various farm and non-farm activities as a way of income diversification which helps in reducing poverty among the farming household. Table 1 further showed that more than half (58.4%) of the farmers in the area are crop farmers implying that majority of the waste generated in the study area will be crop related as only few (35.8%) of the farmers are into livestock farming. The mean years of farming experience in the area was 15 years. This indicates that majority of the respondents are highly experienced and this is supposed to enhance the acquisition of their knowledge and skills in the area their farming enterprise and waste management and utilization.

Table 1. Socio-economic characteristics of respondents.

Characteristics	Percentage
Gender	
Male	72.5
Female	27.5
Age	
< 25	3.3
26-45	14.2
45-65	74.2
>65	8.3
Marital status	
Single	5.9
Married	85.8
Widowed	8.3
Education Level	
No formal education	20.8
Primary education	45.8
Secondary education	31.7
Tertiary education	1.7
Household Size	
1-5	49.0
6-10	38.3
11-15	12.7
Secondary Occupation	
Teacher	8.3
Trader	51.7
Civil servant	5.0
Craft work	23.3
None	11.7
Type of Farmer	
Crop	58.4
Livestock	35.8
Both	5.8
Years of Experience	
1-10	23.3
11-20	54.4
> 21	22.3

Source: Field survey; N = 120

3.2 Types of farm waste generated

Table 2 reveals the profile of solid wastes generated in the area. The findings showed that husk, stalk and cobs of maize, and cassava stalks and peels were the major waste generated in the area while animal related waste was only generated in small quantities. This confirms the earlier finding that majority of the respondents in the area were crop farmers and indicates that they were

mostly involved in maize and cassava farming as wastes from these crops were the predominant solid waste generated in the area.

Table 2. Distribution of the respondents based on the types of farm wastes generated.

Type of wastes	Percentages
Grasses (weed)	55.8
Leaves	44.2
Cassava stalk & peels	60.0
Maize cobs, husk & stalk	62.5
Yam peels	15.0
Vegetable wastes	15.8
Soybeans straw & pods	32.5
Poultry droppings	36.7
Livestock manure	27.5
Poultry feathers	35.0
Egg shells	33.3
Fruits (droppings)	7.5
Livestock mortalities	32.5
Wood shavings	22.5
Oil palm fronds	5.0
Kernel shafts	5.0

Source: Field survey; N = 120

3.3 Techniques of waste disposal

Findings from Table 3 revealed that majority of the farmers got rid of the waste generated from their farms which they consider not useful to them through burning and only a few of them used compost pit or dump sites. It was further revealed that some of the farmers still got rid of their farm waste by depositing them in nearby streams and rivers. This indicates that majority of the respondents still do not know the implications of improper disposal of farm wastes on the environment and the resultant negative effects the constant waste disposal techniques like burning and stream dumping have on their health and their immediate and global environment.

Table 3. Distribution of respondents based on their technique of farm waste disposal management.

	Percentages
Waste disposal	
Dump site	21.7
Compost pit	19.2
Burning	55.8
Stream	3.3

Source: Field survey; N = 120

This implies that there is a need to enlighten the respondents on the environmental hazards that improper waste disposal and burning of farm waste can cause, and to teach them better waste management and utilization techniques that will benefit them socio-economically and be more sustainable for their environment.

3.4 Farm waste utilization

Findings from the study showed that more than half (53.3%) of the respondents were not utilizing the waste generated from their farms while the remaining 46.7% stated that they use their farm waste. This implies that majority of the farmers have little or no knowledge about the benefits and socio-economic potentials they can derive by utilizing the waste generated from their farms. This points out the need for farmers to be enlightened by extension agents on the various farm waste management and utilization initiatives which include utilization as manure, mulching, compost, dried as feed and sale to other farms and recycling agencies they can leverage upon for better economic livelihoods and sustainable agricultural practice in the study area.

3.5 Constraints to farm waste utilization

From the findings in Table 4, it was observed according to the mean scores that the major/severe constraints militating against the utilization of farm waste indicated by the respondents include inadequate access to extension services, inadequate awareness of benefits, inadequate facilities for processing some waste, and low knowledge on usage. The implication of this finding is that the famers need access to more effective extension services that will help improve their knowledge on the benefits and farm waste utilization techniques they can adopt for better waste management and usage in the study area.

Table 4: Constraints to farm wastes utilization.

Constraints	Mean score
Low knowledge on usage	2.37
Bad odour from wastes	2.23
inadequate of awareness of benefits	2.53
Stress of transportation	2.32
Inadequate facilities for processing some wastes	2.53
Alternative products	2.03
Inadequate access to extension services	2.64
Limited labour	2.10

Source: Field survey; N = 120

3.6 Determinants of respondents' farm waste utilization

Logistic regression results of determinants of respondents' farm waste utilization revealed that the coefficient of educational level and years of experience were significant at 5 percent level of significance indicating that these two variables significantly influence the utilization of farm waste by the farmers (Table 5). The variables of age, gender, marital status and household size were not significant even at 10 per cent indicating that these variables do not significantly influence the respondents' farm waste utilization in the study area.

The coefficients of educational level (0.321) positively and significantly ($p<0.05$) determine the utilization of farm waste by the respondents in the study area. This implies that an increase in the educational level of the farmers in the study area is going to lead to an increase in the way they will adopt farm waste utilization initiatives. Furthermore, the parameter of the respondents' years of farming experience (0.523) was also seen to positively and significantly ($p<0.05$) influence the farm waste utilization of the respondents'. This indicates that an increase in the years of experience of the respondents' increases their likelihood to adopting and utilizing more farm waste innovation.

Thus the overall summary implication for the findings from the logistic model reveals that the characteristics of farmers that are more likely utilize the waste generated from their farms efficiently are those with higher level of education and with more years of experience in the farming profession.

Table 5: Logistic regression results of the factors influencing respondents' farm waste utilization.

Variables	Coefficient	Standard Error	t-value
Gender	0.129	0.042	0.81
Age	0.423	0.089	0.56
Marital Status	0.023	0.035	1.25
Educational Level	0.321**	0.219	2.42**
Household Size	0.457	0.271	0.18
Years of Experience	0.523**	0.034	2.16**

Model Chi-square = 186.234
-2 log likelihood = 59.233
Overall case corrected predicted = 89.5%

**significance level at 5%; Source: Analysis of Field Survey Data

4 Conclusion

The findings of the study revealed that the majority of the farmers in the study area are not utilizing the waste generated from their farms and they result to

disposing them predominantly through burning. The major constraints highlighted by the respondents inhibiting their efficient use of farm waste were inadequate access to extension services which results in them having inadequate awareness of the benefits they can derive from utilization of farm waste and low knowledge of its usage.

5 Recommendations

The study therefore recommended that the government should look into providing some modern waste processing facilities in the area that will assist the farmers convert the waste from their farms into more durable and useful products. Also, extension agencies and other relevant stakeholders should embark on enlightenment campaigns and trainings of farmers in the areas of socio-economic prospects and benefits of waste utilization and the various innovative ways through which they can use them. These will result in the farmers adopting more efficient and environmental friendly farm waste utilization initiatives that will enhance proper farm waste management systems and leveraging on the socio-economic potentials derivable through their use of these innovative farm waste management.

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