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# FARM WASTES UTILISATION AMONG RURAL DWELLERS IN OSUN STATE, NIGERIA

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**ABSTRACT**

*The study investigated farm wastes' utilisation for wealth generation among rural dwellers in Osun state, Nigeria. Specifically, farm waste items in the study area were identified and their economic potentials for utilisation were documented. Multi-stage procedure was used to select 364 respondents sampled for the study. Primary data were collected through interview schedule, Focus Group Discussion and Key Informant interview. Frequency counts and percentages were used to describe data collected while chi-square and correlation analysis were used to make deductions. Result showed that cassava and yam peels, maize stalks and cobs, cowpea husk, palm kernel shell, empty palm fruit bunch, cocoa pods, poultry droppings, sheep and goat faeces were amongst farm waste items with economic potentials in the study area. Results of Chi-square analysis show that there was significant association between extent of farm waste utilisation and gender ($\chi^2$ = 10.38), farm land acquisition ($\chi^2$ = 51.00), ethnicity ($\chi^2$ = 19.67) and nativity ($\chi^2$ = 10.40) of respondent at $p \leq 0.05$. Also, results of correlation analysis show that total farm size (r = 0.135), total herd size (r = 0.198) and income (r = 0.158) had positive and significant relationship with extent of farm waste utilisation at $p \leq 0.01$ while information sources (r = -0.262) had negative but significant relationship with extent of farm waste utilisation at $p \leq 0.01$. It was concluded that there were varieties of farm waste items with good economic potentials for utilisation in the study area which if well utilised could be harnessed to empower rural dwellers economically thereby enhancing their livelihoods.*

**Keywords**: Farm waste utilisation, Rural dwellers, Economic empowerment, Sustainable livelihoods.

## INTRODUCTION

The concept of waste as a material "which has no use" is changing to that of "a resource" by converting into useful materials with necessary modifications (Kumar and Grover, 2007). The idea that waste is actually a misplaced resource is slowly gaining recognition. It is becoming increasingly recognised that waste materials can be a valuable resource, whilst there is debate as to how this value is best realized. Venkateswaran (1994) noted that there are various forms of resource recovery from waste that can take place and are currently being practiced in varying degrees. Kumar and Grover (2007) noted further that the utilisation of waste is necessary for ecological sustainability, environmental safety, economic stability and wellbeing of human society.

The rural environment is replete with abundant resources, utilisation of which is not only significant to rural development, but overall national development. This includes waste materials generated during rural dwellers' livelihood pursuit, but often discarded without utmost regards for their wealth generating potentials. In conventional farming practices, the farm wastes or residues are generally treated in an uncontrolled manner and either burned in open-air fires or thrown away to decay. This burning or decomposition, apart from amounting to a colossal waste of resources, contributes to environmental degradation and pollution which is hazardous to

both human and ecology (Jekayinfa and Omisakin, 2005; Oyeleke and Jibrin, 2009). Despite the invaluable potentials, abundance and availability of waste items generated during rural dwellers livelihoods pursuit, many, conventionally, made their livelihood choices without considering a full utilisation of these waste items. They often focus more on major produce/product of their cultivation/processing. Most of the materials usually regarded as wastes could constitute part of natural asset base within the rural environment that are convertible to important local resources by the rural inhabitants, which exploitation could enhance sustainable livelihood diversification and facilitate economic empowerment of the rural populace. However, they are often discarded with their vast potentials left untapped or underutilised.

An example is cited from the cassava industry. Due to efforts to transform Nigeria's agriculture, cassava production have risen to more than 50 million tons per annum, with several factories now processing cassava to products such as flour, gari, glucose, and ethanol, which in turn is churning out cassava residues including cassava peels en masse to the environment (IITA report, 2013). Also, under the cassava transformation plan of Nigeria's agricultural transformation program, it is estimated that over 2 million tonnes of additional cassava by-products would be produced each year (IITA report, 2013). This will undoubtedly increase the availability of cassava peels which can be converted to important resources by the rural inhabitant who would be engaged to produce the cassava. However, how much of the enormous cassava peels already being produced in the rural environment even before the anticipated increase in production have been efficiently converted to useful local resource is an important question to ask.

International concerns on the need to exploit potentials of waste materials for wealth generation is increasingly emerging. From developed economy in the United States to the developing ones in Africa, like Egypt, Uganda, Tanzania, South Africa and Nigeria, the focus on 'waste to wealth generation' have been on the increase in recent times. However, much attention has been paid to the urban cities only, due to colossal amount of wastes generated that are already posing environmental threats to the urban populace. As Taboada-González *et al*. (2010) rightly noted, there is inadequate knowledge about waste generation and composition in rural areas globally because these types of studies have been conducted mainly in big cities. The foregoing, thus, necessitated this study on assessment of farm waste utilisation among inhabitants of rural Nigeria.

The study investigated farm wastes' utilisation among rural dwellers in Osun State, Nigeria, through the following specific objectives:

i. Describe personal and socio-economic attributes of respondents
ii. Determine extent of utilisation of farm wastes by rural dwellers

**METHODOLOGY**

The study was conducted in Osun state situated in the southwestern part of Nigeria. Multi-stage sampling procedure was used to select respondents for the study. At the first stage, 20 per cent of the total number of Local Government Area (LGA) in each Agricultural Development Project (ADP) zone was sampled giving a total of 6 rural LGAs. At the second stage, proportionate sampling method was used to select five per cent of the total number of communities in each LGA giving a total of 28 communities. Finally, 13 respondents involved in farm waste utilisation were purposively selected from each of the communities, giving an overall sample size of 364 respondents. Interview schedule

was used for quantitative data collection while Focus Group Discussion (FGD) and Key Informant Interview (KII) were used to elicit qualitative data. Frequency counts, percentages and weighted mean scores were used to describe data collected while chi-square and correlation analysis were used to make inferential deductions.

The dependent variable of the study was 'extent of farm waste utilisation' and was measured on a four-point response scale. Respondents were required to indicate how many of the identified farm wastes they make use or have ever made use of for the purpose indicated as compiled during preliminary survey and from literature. Each of the waste identified by the respondent was scored 1 point each. Then, on a 4 point response scale, they were required to indicate the extent of their utilisation of these farm wastes, and were scored as follows: Never utilised (0 point), rarely utilised (1 point), sometime utilised (2 points), and always utilised (3 points). Independent variables, such as age, household size, years of formal education and farm size were measured by recording absolute values given by respondents while other variables such as sex, marital status, religious affiliation and method of land acquisition were measured at nominal level.

**RESULTS AND DISCUSSION**

**Personal characteristics**

***Sex*** - Results of analysis in Table 1 show that more than half (50.8%) of the respondents were male while 49.2% were female. The results indicate that almost equal proportion of male and female respondents were involved in the study. The inference is that the study equally focused on both male and female gender that are major components of rural farm family and therefore information peculiar to each gender as regards ways of utilising farm waste items for enhancing rural dwellers' livelihood would be documented.

***Age -*** About 30% and 29% of the respondents were aged between 35 – 49 years and 50 – 64 years, respectively. While, 23.6% were within 65 – 79 years age range, few (11.3%) were within 20 – 34 years range, and very few (6.8%) were aged above 80 years. Mean age of respondent was 52.7 years with a standard deviation of 14.7. The findings agreed with Jibowo (2003) assertion that the rural areas in most countries have higher proportion of its population aged above 45 years. These results indicate that the respondents were vibrant, within their productive age range and in a period where they might have more financial obligation to meet towards household members and therefore faced with more economic challenges. The findings imply that respondents could still actively engage in waste utilisation and should be encouraged to derive economic benefit from waste items emanating from their daily livelihood pursuits in order to improving their standard of living.

***Religion*** **-** About 57% and 41% of the respondents were Christians and Muslims, respectively, while very few (1.1%) were adherents of traditional religion. The results indicate that all the respondents had one religious affiliation or the other, although higher proportion belonged to Christian faith. The implication is that religious affiliation could be a useful indicator in identifying and mobilizing rural inhabitants for meaningful participation in development programmes relating to waste management and utilisation.

***Marital status*** **-** Majority (82.1%) of the respondents were married, while about 9% and 7% were widowed and single, respectively. This was not unexpected given respondents' age profile, since rural inhabitants are generally known to marry at early ages. This may not be unconnected with the desire to have children to help with the family's economy on one hand and perpetuating

family's lineage on the other. With over four-fifths of the respondents married, the implication is that they would have more responsibility to meet as household members increase through procreation. This may necessitate the need for respondents to diversify their sources of livelihood which may be achieved through judicious use of waste items emanating from their livelihood pursuits.

***Major and minor occupation -*** Majority (81.3%) of the respondents engaged in farming as major occupation. While 34.1% and 29.7% engaged in agro-processing and petty trading as major occupation; 23.4% and 15.7% primarily engaged in livestock rearing and hunting, respectively. Also, few proportions amongst the respondents engaged in these various occupational activities as minor means of livelihood. The results, which concur with the findings of Yusuf (2011), indicate that rural dwellers engaged in a variety of activities as occupation with agriculture usually the prime. They engaged in these varieties of activities including non-farm in order to make ends meet and spread their risks better. The implication of the findings is that rural inhabitants multi-task and are likely to engage in supplementary activities that will fetch them additional income. This situation may be explored and exploited through sensitizing rural dwellers and drawing their attention to potentials and opportunities that abound in utilisation of farm waste items available within the rural environment as useful resources.

***Arable crop cultivated by respondents with mean acreage of cultivation -*** Majority (89% and 84%) of the respondents cultivated cassava and maize crops, respectively, using 2.7 and 1.9 acres of land. Also, 72%, 64.6%, 62% and 59.1% cultivated yam, vegetable, cowpea and cocoyam, respectively, on 3.4, 1.5, 1.8 and 1.8 acres of land. Few (18.7% and 19.5%) cultivated soybean and rice, using 1.8 and 1.7 acres of land, while 51% cultivated sweet potatoes on 0.5 acres of land. The results indicate that respondents cultivated a variety of arable crops, amongst which cassava and maize were most prominent, followed by vegetable, yam and cocoyam. The implication of the findings is that farm waste items generated from these crops after harvest, such as cassava peels, maize husk, cob, and shaft, cocoyam corm, cowpea and soybean husk and vine, etc, which have economic potentials for utilisation that may be judiciously put to use by the rural dwellers abound in the study area.

***Permanent crop cultivated by respondents with mean acreage of cultivation -*** About 71% and 67% of the respondents cultivated oil palm and cocoa, on 5.0 and 8.5 acres of land, respectively. Also, 52.7% and 53% cultivated citrus and banana/plantain crops, using 2.2 and 1.8 acres of land, while 39% cultivated cashew crop on 2.8 acres of land. Others (48% and 43%) cultivated coconut and kola nut on 1.5 acres and 0.8 acres of land, respectively.

***Livestock reared by respondent -*** More than half (58.5%) of the respondents raised poultry birds. Also, 28.8%, 50% and 22.5% reared sheep, goat and cattle, respectively, while about 21% each reared fish and rabbit. Average number of poultry bird raised was 12, while average number of sheep, goat and cow reared was 6, 8 and 4 respectively. Furthermore, about 25% of the respondents were involved in piggery with average number of pig as 12. The results indicate that respondents engaged in rearing of livestock too, apart from crop cultivation, and poultry birds and goats were most prominent amongst these livestock. However, scale of production of livestock was low. It may be inferred from the findings that farm waste items generated from rearing of livestock such as poultry droppings, goat and sheep faeces, and cow dung which have economic potentials for utilisation, although available within the study area, might be

inadequate for utilisation. The implication of the findings is that respondents may be encouraged to increase their scale of livestock production and with adequate training opportunities they may be empowered on various ways of converting the livestock wastes into useful resources that can generate wealth and translate to additional income for them.

**Table 1: Distribution of respondents by personal and socioeconomic characteristics, n = 364**

| Variable | Frequency | Percentage |
|---|---|---|
| **Sex** | | |
| Male | 185 | 50.8 |
| Female | 179 | 49.2 |
| **Age (Years)** | | |
| 20 – 34 | 41 | 11.3 |
| 35 – 49 | 108 | 29.7 Mean = 52.7 |
| 50 – 64 | 104 | 28.6 SD = 14.7 |
| 65 – 79 | 86 | 23.6 |
| 80 and above | 25 | 6.8 |
| **Religion** | | |
| Christianity | 209 | 57.4 |
| Islam | 151 | 41.5 |
| Traditional | 4 | 1.1 |
| **Marital status** | | |
| Married | 299 | 82.1 |
| Widowed | 34 | 9.3 |
| Single | 27 | 7.4 |
| Divorced | 2 | 0.5 |
| Separated | 2 | 0.5 |
| ***Major occupation** | | |
| Farming | 296 | 81.3 |
| Agro-processing | 124 | 34.1 |
| Petty trading | 108 | 29.7 |
| Livestock rearing | 85 | 23.4 |
| Hunting | 57 | 15.7 |
| ***Minor occupation** | | |
| Farming | 36 | 9.9 |
| Agro-processing | 39 | 10.7 |
| Petty trading | 32 | 8.8 |
| Livestock rearing | 49 | 13.5 |
| Hunting | 6 | 1.6 |

* Multiple responses

**Source: Filed survey, 2013**

**Farm waste utilisation**

***Cassava peels for livestock feeding and mushroom production -*** Results as presented Table 2 show that 84.1% of the respondents utilised cassava peels for livestock feeding. Amongst these, 78.6% always used it while 15.9% had never used cassava peels for this purpose. Utilising cassava peels for feeding livestock recorded very high weighted mean score value (2.5). Also, majority (62.6%) of the respondents utilised cassava peels for mushroom production. However, while 14.6% always did this, 33% rarely made mushroom from cassava peels and 37.4% had never done this. Weighted mean score recorded here was low (1.1).

The findings suggest that majority of the respondents utilised cassava peels for both livestock feeding and mushroom production. However, using it as livestock feed was more preponderant than utilising it for mushroom production, judging by the weighted mean values

obtained. These findings agreed with Onwuka *et al.* (1996) and Asaolu *et al*. (2006) who reported that using cassava peel as livestock feed was very common way of utilising it among cassava producers and processors.

It could be implied from these findings that given the preponderance of cassava peels generated amongst rural dwellers, utilising them for mushroom production may be a viable and alternative income and protein sources for the respondents. The mushrooms may be cooked into special delicacies and also sold for cash. This submission concurs with the assertions of Fasidi *et al*. (1993) and Hussain (2001) that cultivation of mushroom serves as one of the most efficient and economic viable option for the conversion of waste materials to high protein food which will naturally open up new job opportunities especially in the rural areas. Miles and Chang (2004) and Biosciences Africa (2014) also attested to the nutritional value, medicinal effect, environmental impact of mushroom cultivation and its potentials to enhance income diversification among rural dwellers.

Therefore, with adequate capacity building workshop and training opportunities, rural dwellers already involved in mushroom production may be empowered to acquire skills in modern mushroom production, while others that had never utilised cassava peels for mushroom production (37.4%) might become interested in considering it as alternative and additional income source. On the other hand, those that had never utilised cassava peels for livestock feeding (15.9%) may be encouraged to go into livestock production whereby they can use the cassava peels to feed their livestock, or may be encouraged to process them by sun drying and sell as feed to those keeping livestock. By doing these, better ways of utilising cassava peels to enhance sustainable livelihood among rural inhabitants may be enhanced.

***Yam peels for flour production -*** Majority (90.7%) of the respondents used yam peels for flour (*èlùbó*) production (see Table 2). Also, majority (62.4%) always utilised yam peels for this purpose, while 9.3% had never utilised yam peels for making flour. Utilising yam peels for *èlùbó* production recorded second highest weighted mean score of 2.2. The findings which indicated the widespread utilisation of yam peels agreed with Onwuka *et al.*'s (1996) submission that yam peels were amongst most utilised household wastes and crop residues. The implication of the findings is that respondents not used to utilising yam peels may be encouraged to convert it to livestock feed, rather than throwing it away as waste items.

***Maize stalks for yam staking -*** Majority (66.2%) of the respondents utilised maize stalks for yam staking out of which few (17.3%) always used it. About 30.2% rarely used it while 33.8% had never used maize stalks for yam staking. Using maize stalks for yam staking recorded low weighted mean score of 1.2. Despite the preponderance of maize stalk on the maize field after harvest, the results indicate that few proportions amongst the respondents regularly utilised maize stalk for yam staking.

The respondents although realised usefulness of maize stalk for yam staking, however, they believed that this practice was not necessary in the study area. Rather, that is only applicable to northern part of the country where there are insufficient wooden materials, such as bamboo stem, for yam staking. The common practice in the study area was to leave maize stalk standing on the field after harvest only to be cleared by next planting season. FGD excerpts below buttress this point.

> "*(Maize stalk) is only common in the northern region (ilè papa); they do not have*

*trees to use for staking there, but we have more than enough trees to use for that purpose here*''

*"(Maize stalk) is not strong and doesn't last long before collapsing".*

**Table 2: Distribution of respondents by farm waste utilisation**

| Items description | Utilised | Extent of utilisation | | | | Weighted mean score |
|---|---|---|---|---|---|---|
| | | Always | Sometimes | Rarely | Never | |
| Cassava peels for livestock feeding | 84.1 | 78.6 | 4.1 | 1.4 | 15.9 | 2.5 |
| Cassava peels for mushroom production | 62.6 | 14.6 | 15.1 | 33.0 | 37.4 | 1.1 |
| Yam peels for flour production (*elubo*) | 90.7 | 62.4 | 9.1 | 19.2 | 9.3 | 2.2 |
| Maize stalks for yam staking | 66.2 | 17.3 | 18.7 | 30.2 | 33.8 | 1.2 |
| Maize cob (*shuku agbado*) for livestock feeding | 62.3 | 18.7 | 28.0 | 15.7 | 37.7 | 1.3 |
| Maize cob as fuel for household cooking | 86.5 | 58.0 | 20.3 | 8.2 | 13.5 | 2.2 |
| Guinea corn bran for livestock feeding | 65.9 | 12.6 | 15.1 | 38.2 | 34.1 | 1.1 |
| Cowpea husk for livestock feed | 69.2 | 11.5 | 44.8 | 12.9 | 30.8 | 1.4 |
| Rice husk and bran for livestock feed | 56.9 | 28.8 | 9.3 | 18.7 | 43.1 | 1.2 |
| Oil palm kernel shell as household fuel for cooking | 88.2 | 68.4 | 18.1 | 1.6 | 11.8 | 2.4 |
| Oil palm kernel shell for prevention of soil erosion | 82.4 | 43.1 | 32.7 | 6.6 | 17.6 | 2.0 |
| Oil palm fronds for broom production | 89.6 | 45.1 | 42.9 | 1.6 | 10.4 | 2.2 |
| Cocoa pods + oil palm fruit bunch left over for black soap production | 82.7 | 36.3 | 21.7 | 24.7 | 17.3 | 1.8 |
| Poultry dropping as fish feed | 54.1 | 18.4 | 27.5 | 8.2 | 45.9 | 1.2 |
| Sheep and goat faeces as manure | 69.2 | 29.2 | 39.8 | 3.6 | 30.8 | 1.6 |
| Animal bones for bone meal production | 67.0 | 19.0 | 39.0 | 9.1 | 33.0 | 1.4 |

***Maize cob as livestock feed and as fuel for household cooking*** **-** About 62% of the respondents utilised maize cob (*shùkú àgbàdo*) for feeding livestock like pigs, out of which 18.7% always used did that (see Table 2). About 37.7% had never used maize cob to feed livestock. A low weighted mean score of 1.3 was obtained here. Also, majority (86.5%) of the respondents made use of maize cob as fuel for household cooking, out of which 58% always used maize cob for this purpose. 13.5% had never made use of maize cob as fuel for household cooking. However weighted mean score recorded here was high (2.2). In addition, it was gathered from field during data collection that hundreds of maize cobs litter the rural environment after maize shelling.

The results indicate that utilising maize cobs as household fuel for cooking was more prevalent than using it for feeding livestock. The results corroborate the findings of Onwuka *et al*. (1996) who reported underutilisation of maize cobs with majority left to rot away or burnt. With increasing cost of livestock feed, so much so that pig rearer had to abandon rearing pigs due to inability to break even as a result of increasing cost of feeding material (see excerpt of key informant interview below), utilisation of maize stock for livestock feeding becomes a very important and economically viable option for consideration.

*'Our scenario is a very pathetic situation. The major market for our pigs is in the eastern part of the country, particularly Benin, Edo state. Middle men from the area come to buy from us at extremely ridiculous prices, yet cost of feeding the pigs kept increasing and we are unable to break even. The most unfortunate thing is that these middle men would not allow the final buyers or consumers of the pig to buy from us when we take the products directly to them (in the east).These middlemen are really exploiting us and it became a case of 'we doing the*

*job, they making the money'. I had to stop rearing pigs altogether as a result'.*

The implication of these findings is that the rural dwellers, most of whom cultivate maize, need to be sensitised on the utility potentials of this item wasting away in the rural environment. Those that raise livestock such as pigs may be empowered and taught how to convert them into pig feed, while others not engaged in livestock rearing may be encouraged to keep some livestock whereby they would be able to utilise the maize cobs as feed or even sell to others who might need them even at token price.

***Guinea corn bran, cowpea husk, rice husk and bran as livestock feed -*** About 66% utilised guinea corn bran for livestock feeding. 38.2% amongst these rarely used it while 34.1% had never used guinea corn bran as livestock feed. Weighted mean score was 1.06. Also, 69.2% of the respondents utilised cowpea husk for livestock feeding, of which 44.8% sometimes did, while few (11.5%) always used it. 30.8% had never utilised cowpea husk as livestock feed. Weighted mean score was low (1.4). In the same vein, while about 60% utilised rice husk and bran for livestock feed, only 28.8% always did this. While 18.7% rarely utilised rice husk and bran as livestock feed, 43.1% had never utilised these farm wastes. Weighted mean score was also low (1.2).

The results indicate low utilisation of guinea corn bran, cowpea husk, rice husk and bran which have a very good potential for feeding livestock. In other parts of the country, from North Central upwards, it is a common practice to gather these items, dry and sell them at the market for buyers to use as livestock feed. This was not very common in the study area. The findings underscored the need for utilisation of these waste items as important resource by using them as livestock feed.

***Palm kernel shell (ésan) as fuel for household cooking and for prevention of erosion -*** Majority (82.4%) utilised palm kernel shell (see Table 2) for prevention of soil erosion. Of this proportion 43.1% always and 32.7% sometimes used it. Weighted mean score was very high (2.0). Similarly, 88.2% utilised oil palm kernel shell as household fuel for cooking, 68.4% of this proportion always used it. Few (11.8%) had never used oil palm kernel shell as household fuel for cooking. This item recorded highest mean score (2.4) in this category. Oil palm kernel shell was very much in abundance in the study area and most commonly used as household fuel for cooking, as indicated by the results above.

However, other uses of this item were discovered during KII. Some respondents noted that people from cities used to come to buy the oil palm kernel shell (PKS) in large quantities paying meagre amount which they (the buyers) use as part of house building materials. Some other respondents prefer to use the oil palm kernel for cooking and leave the remaining to rot away rather than selling to the buyers at such ludicrous amount. Excerpts below were obtained through key informant (KI) interview during field survey:

"*We used to mix it with gravel and use it as building material in Delta area where I come from"*

"*Primarily, we use it (PKS) for cooking; of late some people started coming with vehicle to buy them, but we didn't sell to them because they are useful to us, otherwise, we won't have something to cook again. Besides, indiscriminate buying made us not to sell to them; they wanted to pay just N60 for a full 50 kg bag. We declined and told them we won't sell even if they offer N200. They came back about twice and offered to pay more (about N100), but we still declined, since we consider them of immense use to us".*

*"...blacksmith also used to come and pack them from within and outside the village; we did not use to collect any money from them, but give them as gift; they are in excess, and we consider it better to give them as gift, who*

*knows, one might also at other time need the help of the blacksmith".*

It could be deduced from the above excerpts that rural inhabitants would not mind to sell items they have in excess of their needs that waste away in their environment. However, when they perceive the buyers as being exploitative, particularly when they come from outside the rural areas, they may decline to sell. Also, giving them as gift was another way they disposed such items, as they believe that gift is reciprocal; the one giving today, may be the one receiving at other times. The implication of the findings is that rural inhabitants need to be sensitised on the need to appreciate the economic potentials of this farm waste item and the need to reach a fair bargain with interested buyers. Since they have the palm kernel shell in abundance and in excess of their needs, selling them to willing buyers will augment their earnings.

***Oil palm fronds for broom making, basket weaving and shed construction -*** About 89% of the respondents utilised oil palm fronds for making brooms. Amongst this proportion, 45.1% and 42.9% always and sometimes utilised oil palm fronds for broom production, respectively. A very high weighted mean score of 2.2 was recorded with respect to utilisation of oil palm fronds for broom production. Similarly, 89.6% utilised oil palm fronds for roof of shed from which 50.3% always did that. 30.2% rarely used oil palm fronds for shed construction while 10.4% had never used oil palm fronds for this purpose. Low weighted mean score (2.0) was however recorded here. In addition, majority (66.2%) utilised oil palm fronds for basket weaving. 17.3% and 18.7% always and sometimes utilised oil palm fronds for basket weaving, respectively, 30.2% rarely did so, while 33.8 % had never done so. Weighted mean score was also low (1.2).

It was also gathered from respondents during field survey that some part of the oil palm fronds called *fùlù* in local parlance is used to make cages for housing of birds. These results show variety of things oil palm fronds were used for in the study area. It was a general believe among the respondents that no part of the oil palm tree is regarded as un-useful. This perhaps informs the variety of things several parts of the oil palm trees are used for, starting from the fronds. The findings indicated that utilisation of oil palm fronds for broom production was more prevalent than using it as roofing material for shed construction and basket weaving.

Although, utilisation of oil palm fronds for broom production was very common practice, yet brooms are still being brought in to the south-western part of the country from the eastern part. This is an indication that the ones produced down south alone could not meet the demand for it. When asked about bringing brooms from the east for sale down south, a key informant responded as below:

*"People only engaged in these (broom making) as pastime, no one will leave their farming work and face squarely broom production. It is only when the children are on holiday that they engage actively in broom production".*

The implication of this is that rural inhabitants need to be sensitised on the need to engage more intensively in broom production and not considering it only as amusement. By doing this, there will be increase in broom production, which will not increase rural inhabitants' earnings but also serve as diversified income source for them.

***Cocoa pods plus left over of empty palm fruit bunch for local black soap production -*** Majority (82.7%) utilised cocoa pods (*pádì kòkó*) plus left over of oil palm fruit bunch (*soso*) for local black soap (*ose dúdú*) production. More than one-third (36%) always used it, 21.7% sometimes used it and

24.7% had never used combination of cocoa pods and left over of oil palm fruit bunch for black soap production. Weighted mean score was 1.8. Although the extent of utilisation of these items for producing local black soap was high, however comparing the proportion that indicated they used these items for said purpose and those always using it, it may be inferred that larger fractions of the respondent were yet to embark on the production of local black soaps for business venture. This is another area of economic potentials for income diversification for the rural dwellers. Local black soaps are fast selling locally, and could also provide potential raw materials for industries manufacturing black soaps in the cities.

***Poultry droppings as fish feed and sheep and goat faeces as manure -*** About average (54.1%) of the respondents indicated they utilised poultry droppings as fish feed, out of which 18.4% always did. 27.5% sometimes utilised it, while 45.9% had never utilised poultry droppings as fish feed. Weighted mean score was 1.2. About 69.2% of the respondents utilised sheep and goat faeces as manure. From this proportion 25.2% regularly did, while 30.8% had never utilised it. Weighted mean score was 1.6. The findings indicated low extent utilisation of poultry droppings as fish feed, while utilisation of sheep and goat faeces was high. The poultry droppings can be used as substrate to grow maggot which can then as serve as feed for fish and other livestock.

Asides the above, it was revealed during field survey that rural inhabitants use faeces of sheep and goat to protect their cocoa beans from being eaten by these livestock. The smell of the faeces when soaked in water and sprayed over the cocoa beans prevent the sheep and goat from eating them. While this may affect the quality and subsequently lower the grade of the cocoa bean, some rural inhabitants consider this a viable option for protecting their produce. Also, revealed during field survey was that these livestock were not tethered and therefore difficult to collect their faeces since they were kept on free range.

***Animal bones for bone meal production for livestock feed -*** About 67% utilised animal bones for producing bone meal, out of which 19% always did. 33% had never utilised animal bones to make bone meal. The bone meal is vital component of the fish feed. Weighted mean score was low (1.4). The results indicate low extent of utilisation of animal bones. There are lots of animal bones across several slaughter slabs in the rural communities. The implication is that rural inhabitants may be empowered about processing of animal bones for making bone meal which they can subsequently sell to feed mill industries to produce livestock feed. Alternatively, rural youths may be sensitised to gather slaughtered animal bones from various slaughter slabs and sell them at feed mill industries.

**Results of Chi-square analysis**

Results of Chi-square analysis in Table 3 show that there was significant association between gender of respondent ($\chi^2$ = 10.38) and farm land acquisition ($\chi^2$ = 51.0) and extent of farm waste utilisation at $p \leq 0.01$, respectively. Also, there was significant association between ethnicity ($\chi^2$ = 19.67) and nativity ($\chi^2$ = 10.40) at $p \leq 0.05$, respectively. The results agreed with those of Babayemi and Daudu (2009), Agwu (2012) and Adedayo (2012) whose findings indicated significant relationship between gender and ethnicity and waste management behaviour.

The relationship between gender of respondents and farm waste utilisation suggest that utilisation of farm waste items may be gender-specific. This is not unexpected given that respondents' engagement in various occupational pursuits, from which farm waste items are generated, is gender-specific. For instance, women

are known to be more engaged in processing of agricultural produce than male rural inhabitants. Using oil palm processing as an example, utilisation of oil palm kernel shell as fuel for household cooking, and empty bunch of oil palm fruit as a constituent for local black soap production were peculiar to the female folk. The implication of the findings is that in empowering rural dwellers in rural enterprise that will facilitate judicious utilisation of farm waste items, consideration should be given to each gender based on extant extent of utilisation of these farm waste items.

**Table 3: Results of Chi-square analysis establishing relationship between selected socioeconomic characteristics and farm waste utilisation**

| Variable value | $\chi^2$ | p-value |
|---|---|---|
| Gender | 10.38 | 0.006 |
| Religion | 2.15 | 0.709 |
| Marital status | 11.30 | 0.186 |
| Family type | 0.99 | 0.91 |
| Farm land acquisition | 51.00 | 0.00 |
| Ethnicity | 19.67 | 0.03 |
| Nativity | 10.40 | 0.03 |

**Source: Field survey, 2013**

Results of correlation analysis in Table 4 show that total farm size (r = 0.14), total herd size (r = 0.20) and income (r = 0.16) had positive and significant relationship with extent of farm waste utilisation at $p \leq 0.01$. Also, there was negative but significant relationship between information sources (r = -0.26) and extent of farm waste utilisation at $p \leq 0.01$. The results agreed with the findings of Adedayo (2012) who reported that income of respondent influenced poultry waste management techniques adopted by poultry farmers.

The results indicate that those who cultivate more acreage of land or have large herd size may generate more farm waste items, thus having more of them available for utilisation. With respect to information source being negatively related to farm waste utilisation, the result indicate that the fewer and better quality information rural dwellers have access to about farm waste utilisation, the higher the tendencies that they put these information to use, which may translate to increased utilisation of farm waste items. This submission is in accordance with that of Friedman and Hechter, as cited from Heckathorn (1997), who opined that quality information is a variable that highly has profound effect on actors'.

The implication of this is that proliferation of avenue through which information are made available to rural dwellers about farm waste utilisation may not be helpful on the long run; rather, reliable and robust information source even though few, may be adequate in increasing awareness amongst rural dwellers about the economic potentials of farm waste items for utilisation.

**Table 4: Results of correlation analysis establishing relationship between selected socio-economic characteristics and farm waste utilisation**

| **Variables** | **r – value** | **p-value** |
|---|---|---|
| Age | 0.04 | 0.442 |
| Years of formal education | 0.02 | 0.709 |
| Total farm size | 0.14 | 0.010 |
| Total herd size | 0.20 | 0.000 |
| Years of farming experience | -0.05 | 0.324 |
| Association membership | 0.02 | 0.682 |
| Household size | 0.02 | 0.710 |
| Income | 0.16 | 0.002 |
| Length of residency | 0.04 | 0.455 |
| Information sources | -0.26 | 0.000 |

**Source: Field survey, 2013**

**CONCLUSION AND RECOMMENDATIONS**

Based on the major findings of the study, it was concluded that respondents were vibrant and within their productive age range. Majority had religious affiliation and engaged in a variety of activities as occupation with agriculture as the prime. Cassava and yam peels, maize stalks and cobs, cowpea husk, palm kernel shell, empty palm fruit bunch, cocoa pods, poultry droppings, sheep and goat faeces were prominent farm waste items with economic potentials in the study area. There was significant association between gender, farm land acquisition and extent of farm waste utilisation. Also, total farm size, total herd size and income had positive and significant relationship with extent of farm waste utilisation whereas information source had significant but negative relationship.

From the foregoing, it was recommended that state ADP, Non Governmental Organisations (NGOs), Community Based Organisations (CBOs) and media outfit should explore and exploit the multitask ability of the rural inhabitants through sensitising and providing them with reliable and robust information on the vast potentials and opportunities inherent in utilisation of farm wastes available within the rural environment as useful local resources. This could engender sustainable livelihood diversification and economic empowerment of the rural populace. Secondly, religious affiliation should be leveraged on in identifying and mobilizing rural inhabitants for meaningful participation in development of programmes relating to farm waste management and utilisation. Thirdly, gender-specific nature of farm waste utilisation should be given considerable attention in such development initiatives.

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