Recyclable Wastes: Knowledge and Perceptions of Women in Selected High, Medium and Low Density Households in Ibadan, Nigeria

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Abstract

Modern household solid wastes are heterogeneous mixture of biodegradables and non-biodegradables. These wastes pose a great problem for municipal authorities in hygienically disposing them. They remain in the environment leading to its degradation and thus affecting community health. At the dump sites, these wastes are often sorted out by itinerary scavengers not minding their exposure to hazards. An assessment of the nature and type of wastes inselected communities stratified according to high, medium and low population densities, the knowledge and perceptions of women in the household as managers of waste management are reported here. This study was carried out in Ibadan, south-west Nigeria with an estimated population of 3.5 million. A sample size of200 from high density area (Agbeni), 150 from medium density (Eleyele), and 100 from low density (Bodija) were randomly selected and senior women in the households were involved in the study. Focus Group discussions and semi-structured interviewer administered questionnaires were used to determine the knowledge, perceptions and practices of women in the households. In addition, selected women in the communities were trained to sort their wastes at source for five weeks and the various components were quantified by volume and weight. Standard methods were followed as described by Wahab and Sridhar (2014). The waste composition showed (high, medium and low density areas respectively) the following composition: Kitchen wastes; 38.5%, 53.9% and 90.4%, reusable and recyclables (plastics, metals, nylon, rubber, glass) 66.2%, 66.1%,and 62.8%.Further, various components of biodegradable and non-biodegradable wastes showed their potential for revenue generation through segregation and sale in recycle markets. Women exhibited a higher level of knowledge on the nature of components, their use and possible derivable benefits if properly segregated and sold for reuse/recycling. The knowledge is ore among medium and low socio-economic groups. The respondents showed keen interest in segregation training provided during the study. The study concluded that for effective waste management women may be involved for resource recycling.

Introduction

Modern household solid waste is a heterogeneous mixture of biodegradables (food residuals, grass, leaves and others) and non-biodegradables (plastics, aluminum and ferrous metals , glass, cardboard etc.) which have recycling potential. Heterogeneity of waste is a major complication for waste

management in modern times. As the world population grew so did household solid waste. For example, in 1991 it was estimated that Nigerians produced 2.2million tonnes of solid waste per annum (Nigerian Environment Study/Action Team, NEST, 1991). This increase was due largely to the increase in population growth, urbanization, industrialization, and general economic growth. This has led to various government efforts/programmes aimed at environmental sanitation and food security such as 'Operation Feed the Nation', 'War Against Indiscipline (WAI)', and the monthly 'National Environmental Sanitation Exercise' on the last Saturday- of every month and others. In spite of all these, the problems of waste disposal continued to plague the country unabated. Reports abound on various government Waste Disposal Boardsthat could not cope with the volume of waste generated in the country (NEST,1991; Noibi, 1992; and Nwokoh,1993).

Wastes that are generated in Nigerian cities are the products of household activities and consumption pattern. The major components included food residuals, fuel residues, various forms of food packaging e.g. leaves and paper, plastics, empty cans and containers, rags, bottles, and unserviceable household appliances. A study by Anyakoha and Igboeli (1993),among other things, ranked (according to quantity generated) six groups of household solid wastes in two Nigerian urban towns, Enugu and Nsukka: plant and vegetable materials (ranked highest) 65.1% and 71.6%, plastics and related goods 39.7% and 44.1%, then paper, rags and related materials. There were also animal remains (22.4% and 38.3%), and broken bottles, plates, cans and related objects trailing behind (1.6% and 1.4%). This is encouraging in that the wastes are mostly recyclable.

The non-biodegradable wastes that are commonly generated today in Nigerian households are plastic wares, bags, wrappers and containers. These come in various makes, size, shapes and colours and have virtually replaced green leaves as wrapping materials for such steamed local foods as *moimoi, amala and iyan*'. Plastics are also the commonest shopping bags for households which trend never changed till date. There are also plastic kitchen and table

wares e.g. buckets, jerry cans, basins, baskets, plates, cups and spoons. Most of these are locally affordable and not so durable for long term usage (Anyakaoha *et al.* 1993) which favours recycling.

In Ibadan with a population of over 3.5 million people, the yearly generation of solid waste is estimated to be about 634,998.4 tonnes (Olowe, 2012) contributing to blockage of highways, pollution of water, land and air. Several studies in the past on wastes in Ibadan have shown a changing pattern of the waste reflecting the living conditions of people The "affluent societies" produced more and more bulky wastes containing paper and packaging materials such as , cardboards, plastics, empty tins, glass and metal. The proportion of the different components in waste of a particular community varied according to the standard of living, customs and traditions, food habits, climatic conditions and other factors. A good knowledge of the waste compsition helps in the selection of appropriate disposal method (Oluwande, 1983). Solid wastes found in the residential areas and roads of the city were mostly domestic in nature, originating from foods that were processed and consumed by the people. However, the waste in the dumps varied widely depending on the socioeconomic groups contributing to it. Waste from the high socioeconomic group has a greater biodegradable and paper component. The generation was high on Saturdays and Sundays.

Wastes in middle socioeconomic groups are dominated by garbage, paper and leaves. In low socio economic group, the major components are garbage followed by grit or dust and paper and leaves. The quantities produced by this group are considerably less than the other two groups (Sridhar *et al,* 1985). By mid 1990s there was dramatic change in the waste components. Plastics replaced metal and some consciousness has started creeping into the attitude of people to reuse and recycle some of the dominant waste components. Jenpar (1998b), a Consulting Company reported that the composition of solid wastes in Ibadan varied from leaves constituted highest percentage (40-50%) and was closely followed by food remnants (30-45%), paper, rags, plastics, metals, bottles,

ash/dusts. A survey carried out by Owolawi (1994) indicated that the industries have realized the cost reduction potential through the use of scrap. The cost differences between the recyclable wastes and virgin materials were strikingly high with a profit margin of 5.3% to 700.0%. But recycling was practiced to a limited extent with low profit margins to the generators. In the new millennium, however, more changes on the waste as a resource have emerged in that recycling of plastics, metal and paper has gone into the minds of generators and more people went into the waste business activities (Adedipe et al, 2005; Wahab and Sridhar, 2014).

This paper focuses on assessing the recyclable constituents of household solid wastes in Ibadan, Nigeria in three predominant socioeconomic groups and the knowledge and perceptions of women on segregation of recyclables and possible utilization for revenue generation.

Materials and Methods

Study sites and study population

Ibadan is the capital of Oyo stateand is one of the 36 states (in addition to Federal Capital Territory) in Nigeria. It is located near the forest grass land boundary of south western Nigeria at a distance of 145km North East of Lagos.Ibadan has an estimated population of over 3.5 million (3,565,108) They are distributed in 11 Local Government Areas.(LGAs). The annual growth rate is around 2.8 per cent since the census in 2006. In this study, Ibadan North West (Population 152,834) and Ibadan north (Population 306,795) were selected. Oyelese (1970) estimated the total area of the city, as approximately 103.8sq km. It has 11 Local Government Areas (LGAs), 5 within the metropolis (Ibadan North, Ibadan North East, Ibadan North West, Ibadan South East and Ibadan South West), and 6 LGAs, which form the peripheral with urban, semi-urban, and rural settlements (Ido, Lagelu, Oluyole, Ona-Ara, Egbeda and Akinyele LGAs).

The metropolitan area of Ibadan has one of the highest population densities and the most densely settled areas which remain the central and indigenous core of the city. According to

Ayeni (1982), it is possible to classify residents in Ibadan into high, medium and low density areas based on their socio-geographical characteristics. Ibadan was therefore stratified into 3-high medium and low density areas for the purpose of the study:

(i) **Agbeni** community was selected to represent High Density area. It is situated in Ibadan North west LGA; it is considered as core area. It has an estimated population of about 8,622 from National Population Commission 1996 projection and covers a total area of 0.51km^2. The current population is estimated to be 11,087. It is predominantly a Yoruba community with lower educational and socio economic class. It is divided into 8 zones and 69 compounds. The residents are mostly Muslims and occupation is trading. Here, the environmental sanitation is poor and is poorly managed.

(ii) **Eleyele** community represented the Medium Density area and is located in Ibadan North West LGA. It has an estimated population of 21,872 from National population commission 1996 projection. The current population is estimated to be 27,996. Generally the residents here belong to middle educational and socio economic class. The predominant ethnic groups here are Yoruba (dominant), Hausa, Igbo, Ijaw and several others. Majority of the people here are Christians while some are Muslims.

(iii) **Bodija** community represented the Low Density area. They are also tagged as high income group. It is located in Ibadan North local government area and has an estimated population of 27,447 from national population commission 1996 projection. The current population is estimated to be 35,132. The residents here belong to high educational and socio-economic class. It is essentially a Yoruba community but other tribes

like Igbo, Hausa and expatriates. Islam and some Christianity are the religions practiced.

Study population

The population of the study comprised of 450 housing units, 200 from Agbeni, 150 from Eleyele and 100 from Bodija communities. The target population included the most senior women in each housing unit. In the absence of the most senior woman available at the time of interview, the next senior woman was selected. The study was cross sectional in design in which information was collected on the knowledge, attitudes and practices of women towards source separation from the three communities.

Sampling Procedure

Multi stage purposive sampling technique was used. All the streets in each of the communities were identified and450 were chosen as a sample size to minimize error due to attrition. Using proportionate sampling technique, the 450 women (respondents) were selected by dividing the community in the ratio of 2:1.5:1 to make 200, 150, and 100 i.e. 200 from Agbeni, 150 from Eleyele and 100 from Bodija. For data collection and sampling purposes, these communities were zoned conveniently.

Agbeni community was divided into 8 zones. The community has about 69 compounds (approximately 9 compounds in each zone). From each zone, 5 streets/lanes were selected randomly and 5 housing units were selected from each street to make a total of 25 housing units in each zone and 200 in the whole area and the most senior woman in each house was interviewed.

Similarly, Eleyele community was divided into 3 zones and from each zone, 10 streets /lanes were selected randomly and housing units were selected from each lane to make a total of 50 in each area and 150 from the 3 areas. However, 150 respondents were interviewed. Bodija was divided into 5 zones, from each area 10 streets/lanes were selected and 2 housing units were selected from each lane to make a total of 20 from each zone and 100 from the five

zones and the most senior women were interviewed.

For segregation of waste, the respondents from low density area (Bodija) did not cooperate as the respondents had primary jobs which did not permit them to participate. Therefore a subsample of volunteers were included- 20 women from High Density area and 16 women from Medium Density area. The wastes were segregated under supervision by the women and quantification was carried out by the authors with the help of Field Assistants over a period of 5 weeks and computed.

Data collection

Data collection was spread over a five month period. Collection began early in the morning on each day and continued until afternoon. Two methods of data collection were employed. These were:
(a) *Quantitative methods:* (a) these involved the use of semi structured interviewer administered questionnaire, and (b) observational checklist and volume and weight assessment of the wastes generated in the households.
(b) *Qualitative method*- which involved the use of Focus Group Discussion (FGD) Guide.

The study was carried out in four phases:
Phase 1: This included FGD. A group of 8 to 10 women were gathered in each community at a convenient point and discussions were held which took not more than one hour.
Phase 2: Questionnaire survey and observational checklist and this phase lasted for 2 months. The Questionnaire was structured so as to make it simple, and contained both open ended and close ended. The questions covered socio-economic aspects, and information on knowledge, attitude and practices. Further, the nature of wastes being generated and methods of collection, transportation and management as practiced, health effects, economic gains and where they take their recyclable wastes for revenue generation were assessed.
Phase 3: This stage involved quantification of various components in the household solid wastes generated in each house; two sacks were

given to the respondents to deposit separately recyclables (dry) and the kitchen wastes (wet) for five weeks. The deposited wastes were then weighed every week (dry waste once in a week and wet waste twice weekly to avoid odour and fly nuisance) and the weight and volumes were recorded.

Phase 4: involved the training of the women in the high and medium density communities; the low density respondents did not participate. After the training, the communities were asked to continue segregation for additional 4 weeks so that they could be monitored for accuracy of the procedures and make them imbibe the culture. In the training aspect, 2 Field Assistants were recruited in each of the locations, trained and retained them throughout the period.

Data analysis

At the end of each day, the data was checked for consistency and validated by the investigator. Data was entered using EPI-INFO on a microcomputer (Dean, Dean, Burton and Dicker: EPI INFO version5:1990). Validation was done manually and by evaluation of the frequency of distribution of all variables. The relationship between the independent and outcome variables were explored. Association was tested using the chi-square test.

Results and Discussion

Perceptions of the Nature of Household Wastes Generated

Perceptions of the respondents on the nature of solid wastes they produced in the selected communities in the high, medium and low density areas are shown in Table 1. The results indicated that the wastes in high density area were leaves, plastics/nylon, paper, rubber (shoes) and ash. In medium density area, majority of them generated plastics/nylon, paper, glass, and leaves, while in low density area, the dominant wastes were kitchen wastes, paper, glass and plastics/nylon.

Segregation of Wastes by the Respondents at the Point of Generation

Based on the results obtained from the composition of wastes, selected respondents from high (n=20) and medium density (n=16) areas were trained on segregation of wastes they generated. The major components in high and medium density areas were kitchen wastes (79.3%) and (83.2%), respectively but the quantity was more in medium density area probably because of their upper socioeconomic status and lifestyle. The proportion of non-biodegradable wastes were, paper 2.3% and 1.9%, metals 5.8% and 5.4%, Glass 7.1% and 2.3%, Nylon 2.1% and 1.7% plastic 1.0% and 2.0% and rubber 2.4% and 3.6%. Among the recyclables, glass ranked the highest in high density area (7.09%), followed by metals (5.8%). In medium density area, metals ranked highest (5.37%) followed by rubber (3.59%) (Table 2).

Table 1: Respondents' perceptions on the composition of the waste they generated

Respondents ─────────── Components	High Density Area % n=200	Medium density Area% n=150	Low density Area % n=100
Leaves	96.5	78.9	32.8
Kitchen wastes	38.5	53.9	90.4
Paper	97.5	98.7	98.0
Metals	48.8	50.0	64.6
Plastics (HDPE)	52.8	60.4	83.0
Nylon(LDPE)	97.1	99.0	24.6
Glass	55.0	79.2	89.8
Rubber	95.0	58.1	50.0
Ash	58.0	51.3	50

Table 2: The composition of wastes generated in high and medium density areas (Mean of 5 weeks)

Components	High Density Area Mean/Household/week/kg Mean±SD,n= 20	%	Medium Density Area Mean/household/week/kg Mean±SD, n=16	%
Kitchen wastes	181.58±8.18	79.3	169.0±14.8	83.23
Glass	16.23±10.8	7.09	5.73±3.3	2.26
Metal	13.28±14.5	5.8	10.9±7.5	5.37
Rubber	6.82±7.1	2.38	7.28±10.3	3.59
Paper	5.24±1.2	2.29	3.91±1.59	1.93
Nylon (LDPE)	4.86±1.1	2.12	3.36±1.66	1.65
Plastics (HDPE)	2.22±3.0	0.97	4.00±3.97	1.97
Total (Mean±SD)	230.23 (32.89±60.9)	-	204.18 (29.2±57.14)	-

The total amount of biodegradables (decomposable) and recyclables generated in high and medium density areas are shown in Table 3. It is seen from the table that the medium density area contributed maximum quantity of decomposable wastes while high density area had more non-biodegradable recyclables.

Table 3: Weekly Generation Pattern of Biodegradable and Non-Biodegradable Wastes in High and Medium Density Areas (Per Household/Week)

Weeks	High Density Area (kg) n=200		Medium Density Area (kg) n= 150	
	Decomposable	Recyclables	Decomposable	Recyclables
Week 1	8.48	5.71	9.78	5.08
Week 2	9.52	1.72	10.03	2.05
Week 3	8.80	1.75	10.00	0.71
Week 4	9.08	1.50	10.69	0.47
Week 5	9.53	1.14	12.31	2.33
Total	45.41	11.82	52.1	10.64
(Mean±SD)	(9.08±0.41)	(2.364±1.69)	(10.562±0.93)	(2.13±1.64)

Further, the rate of weekly generation pattern of various components in the wastes per household in high and medium density areas is shown in Figure 1. The rate of generation of recyclables was the highest in the 5th week. This trend indicates that the households have a periodic schedule in cleaning the houses as part of housekeeping and remove all those that are not important for their immediate needs.
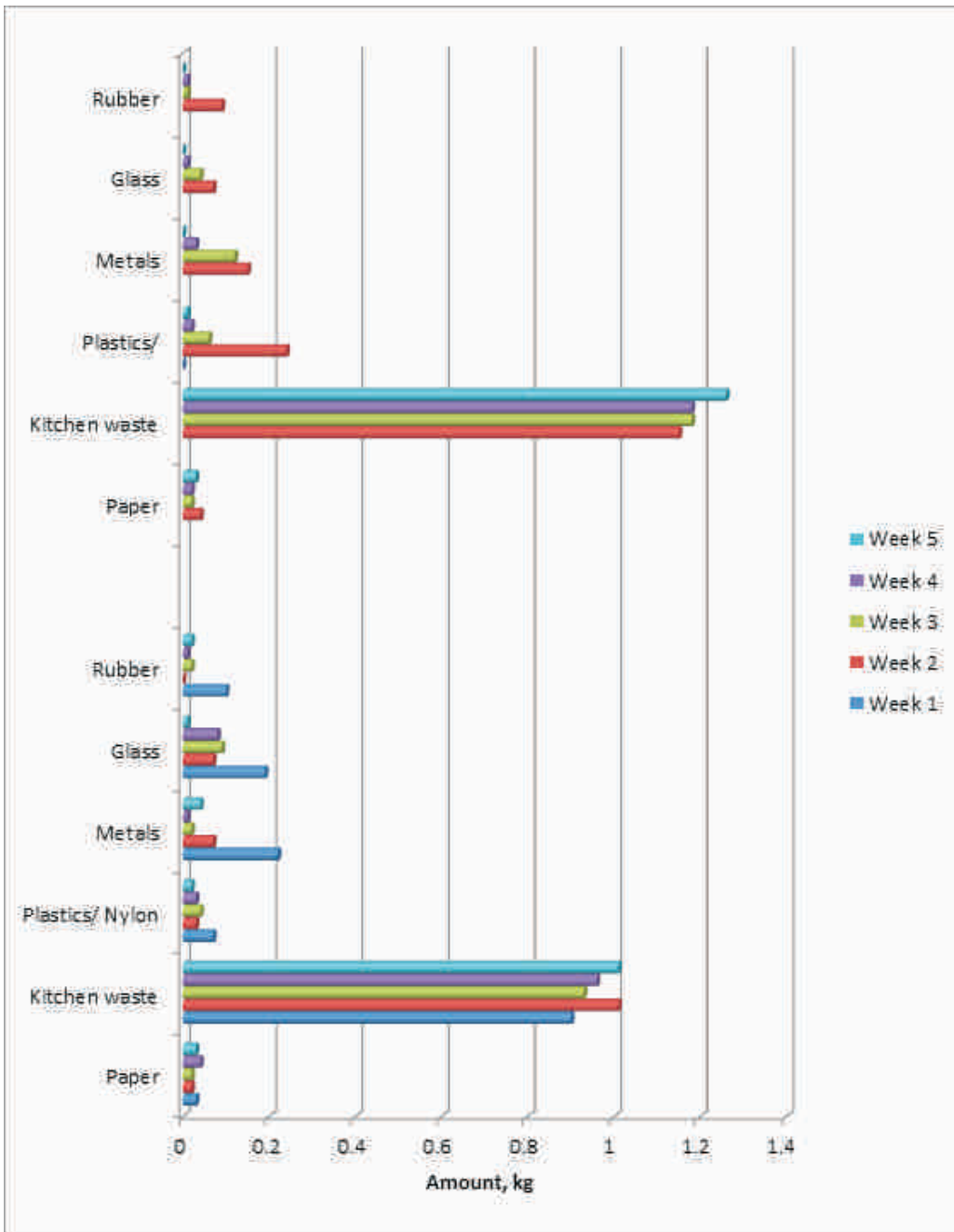
Figure 1: Components of the wastes generated weekly from high and medium density areas

Perceptions of Women on Types of Solid Wastes Generated

The uniqueness of this work is that women responded to the waste management issues, which is a deviation from previous reported studies. This information was obtained from the FGDs. Respondents from the three study communities had a good knowledge of what constitutes wastes and the components in solid wastes they generate. They described waste as "anything useless". The group also listed the various kinds of wastes generated in their homes. Very few of the discussants in high density area knew what recycling was all about. However, some of the respondents confessed and said that

they "did not know". However, some of the discussants in medium and low density areas knew what recycling is all about.

Further, the respondents answered satisfactorily on the uses of household solid wastes, giving some of the common examples from their houses, benefits of recycling with examples such as waste to compost / manure and other income generation activities), management of rubber / shoes, bones. The respondents' perceptions are shown in Box 1 and Table 4.

Waste generated in homes is as a result of periodic housekeeping activities and consumption. These include food waste and scraps, leaves, paper, bottles, plastics, tins and cans, rags and unserviceable household appliances. Assessment of the nature of solid wastes revealed that refuse in the three study communities generally contained fairly high quantities of kitchen wastes (38.5%, 53.9% and 90.4%),and reusable and recyclables (66.2% ,66.1% and 62.8%). This is similar to the findings by Maclaren International ltd (1970) and Oluwande (1974) who showed that 65.3% and 41.6% of the waste were biodegradables. Adebayo, Sridhar and Hussain (1990) reported that leaves which are biodegradable formed the major component of waste but the trends changed later as plastics replaced some of the traditional

practices by women in wrapping foods. Plastics also found their way in day to day life. Most of these are cheap but non-durable so they are soon discarded and become wastes which pose disposal challenge for households. The higher the income level of the respondents, it was observed the more the generation of recyclables.

In many urban centres including Ibadan, recycled or reuse markets exist. These markets deal with goods which are recycled or meant for reuse. Once the wastes are segregated in the households, women will have an immediate outlet for their recyclable components. Results of a quick appraisal survey by Sridhar (1997) involving 14 traders in Ibadan indicated the following.

(i) These traders deal with a variety of goods or materials: clothes, papers, glass, rags, metal containers, scrap, tin/cans, bottles, shoes, rubber or plastic slippers, nylon bags, spring beds and many others.

(ii) They have an association registered as "Scraps Association of Oyo state". Most of the recycled materials are procured from mechanic workshops (21.4%, mostly Scrap), collected from recycled markets (14.3%, slippers, plastics, tins, bottles, mattresses and springs), Badagry, Yaba and Aba markets (21.4% clothes, shoes and

Box 1: Perceptions of the respondents on recycling

–   …"using old things to produce new ones like using old rubber slippers or plastics to make new ones".
–   Few of the discussants in high density area that knew what recycling was together with the group of discussants in medium and low density areas gave examples: rubber slippers/shoes, plastics and kitchen wastes.
–   Discussants in low density area added that Bones can be recycled to produce plates.
–   A few of the discussants in high density area disclosed the following as the benefit of recycling: "One can make some money through sales of recyclables"; " some wastes like kitchen wastes, animal feces and leaves can be recycled to make manure for our farms".
–   The views of the discussants in the medium and low density areas were not different. However, they added that recycling "generates income to the community".

Table 4: Perceptions of the Respondents on Solid Wastes in their Homes

Perceptions	High Density	Medium Density	Low Density
On type of solid wastes:			
▪ Waste "Anything that is useless"	+	+	+
▪ Solid wastes include bottles, tins, plastics etc.	+	+	+
Types of solid wastes generated at home:			
▪ Tins/cans	-	+	+
▪ Shaft from beans	+	+	-
▪ Battery	-	+	+
▪ Bottles	-	+	+
▪ Leaves	-	+	+
▪ Plastics	+	+	+
▪ Dust	+	+	+
▪ Animal faeces	+	+	-
▪ Paper	+	+	+
▪ Nylon	+	+	+
▪ Slippers	+	+	-
On Recycling:			
▪ "using old things to produce new ones"	+	+++	+++
▪ Do not know	+++	-	-
Things that can be recycled:			
▪ Slippers	+++	+++	+++
▪ Tin	+++	+++	-
▪ Kitchen wastes	+++	+++	+++
▪ Bottles	+++	+++	+++
▪ Bones	+++	-	-
Benefits of recycling:			
▪ Making of fertilizer	+++	+++	+++
▪ Income generation	+++	+++	+++
Uses of household solid wastes			
▪ Broken bottles can be put on top of walls that surround building	++	-	-
▪ Biodegradables (Decomposable) can be used to make organic fertilizer/manure	+++	+++	+++
▪ Some solid wastes can be sold to generate income	+++	+++	+++
▪ Some can be recycled	-	-	+++
▪ Some like tins and bottles can be reused	++	-	+++
▪ Bones can be used to make plates	-	-	++

+ Very few; Some; ++; +++ Majority;   - No idea

belts), from industries (14.3%, bags from sugar, cement, flour, salt and guinea feed, glass), office premises (14.3% paper etc.) and dumping sites (14.3%, nylon, plastic, polythene bags, tins, bottles, slippers, lanterns).

(iii) These materials are either bought or procured by the dealers directly (57.1%) or through their agents, relatives, employees or others (42.9%).

(iv) The aluminum scrap is sent to Shaki where there are over 1,340 well organized scrap recycling industries that make cooking pots, cutlery and other domestic utilities. For glass, Toyo Glass industry at Agbara industrial estate near Lagos is popular. Plastics are recycled in many small scale recycling industries at Ibadan, Lagos, Sango-Ota and others.

In high density area, animal wastes were also found among the household wastes because most families rear animals like goat, sheep and poultry. This implies that if sorting continues and the wastes are disposed separately, the final amount/bulk of wastes that gets to the dump will be drastically reduced as most of the recyclables would have been removed for economic gains. This also suggests that a possible method of disposal is through resource recycling such as composting, biogas generation and others. As most of the respondents are traders and farmers, one of the possible methods of waste management at community level is conversion of organic waste into compost and foods grown on compost are recommended as "health foods" (Davis 1979, Kafaru,1994).

Conclusions

The outcome of investigations carried out in this study revealed the nature and amount of solid wastes generated in households. The characteristic nature of the wastes in the households showed that the wastes have high proportion of biodegradable organic materials (79.4% and 83.2%) that can be useful for composting. Household solid wastes in Ibadan contain a variety of valuable materials which have reusable and recyclable value. These materials include plastics, paper, metals, glass, kitchen wastes and rubber. Separation of these valuable materials at source will facilitate reuse, recycling, waste minimization as well as composting as the resources may promote recycling entrepreneurships particularly involving women as they are the managers of waste at household level.

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