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An Examination of Various Wastes Emanating from Poultry Rearing in Kibera Informal Settlement, Nairobi, Kenya

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Abstract
Poultry rearing is largely depended on by informal settlement residents as a source of their livelihood. Unfortunately most of the farmers rearing poultry are not aware of the types of waste generated from the poultry. The purpose of this study was therefore to examine the waste emanating from poultry rearing (indigenous chicken, broilers and layers), in Kibera informal settlement in the city of Nairobi, Kenya. Kibera is the biggest informal settlement in Kenya thus forms an important case for studying the types of waste emanating from poultry rearing. The various types of waste emanating from poultry rearing in Kibera informal settlement are: (1). manure (2) containers used for poultry drugs (3). waste from plastic paper bags for carrying commercial poultry feeds (4). dead birds (5). extra building materials for the birds housing (6). wood shavings and sawdust used as bedding waste for poultry and (7). waste from slaughtered poultry. Despite these various types of waste emanating from poultry rearing in Kibera, the study found out that the majority of the farmers are mainly aware of three types of wastes namely: (1). poultry droppings/Excreta (2) saw dust and (3) manure. It is recommended that, there is need for awareness creation on the various sources of wastes emanating from poultry.

1. Introduction

Many of the informal settlement dwellers largely depend on manual jobs, and the majority of them earn less than one dollar per day (Hope, 2004). As such, they depend on poultry rearing as a strategy for supplying them with cash through sales particularly during the emergency times (e.g. sickness or school fees), or a source of food for consumption on special festival days (Yasmeen, 2001). The Kenyan Ministry of Agriculture has data that indicate that urban farming can play a crucial role towards improved livelihoods of the urban poor, since urban farmers cultivate a wide range of crops and rear a large number of livestock with substantial yields. For example in Nairobi the city farmers cultivate crops such as kale (Sukuma Wiki), tomatoes, beans, cowpeas, maize, Irish potatoes, sweet potatoes, arrow roots and bananas amongst many

others (Ayaga *et al.,* 2004). In contrast to this benefits from urban agriculture, the major challenges facing the urban farmers are contamination from pathogens and toxic chemicals from the waste materials used in urban farming systems, and from livestock raring such as poultry (Ayaga *et al.,* 2004 Thorne, 2007; Heederik *et al*., 2007; Gilchrist *et al*., 2007). As Arvanitoyannis and Ladas (2007) put it, poultry by-products and waste may contain up to 100 different species of micro-organisms, including pathogens, in contaminated feathers, feet and intestinal contents. Waste is a by-product of human activity (McDougall *et al*., 2008). It contains the same material as are found in the useful products and only differs from useful products by its lack of value (McDougall *et al*., 2008). According to this definition, products turn into waste when they no longer provide the service they were planned to provide. Waste can be classified into different categories based on different attributes including the physical state, original use, material type, physical properties, origin and safety level (McDougall, 2008).

In the city of Nairobi in Kenya, about 55% of the total populations live in its 78 informal settlements, comprising 5% of the total land area of Nairobi (Ishani *et al*., 2002). Kibera alone which is the largest informal settlement in sub-Sahara Africa (Zarina, 2006) has a human population exceeding 170,070 (GOK, 2010) and a poultry population of more than 33,720 (GOK, 2012). Thus the purpose of this paper is to discuss the various types of waste emanating from indigenous chicken, broilers and layers chicken in Kibera informal settlement guided by the waste management theory (Pongracz, 2002).

2. Study Methods

The study was carried out in Kibera informal settlement in Langata sub County of Nairobi, Kenya, which lies between longitude 36° 40' and 36° 55' East and latitude 1° 18' and 1° 25' south of equator with a Mean altitude is 1550m above the sea level. It has arable land of about 67 km square, with about 33 km square cultivated. Kibera annual average rainfall is 600-1200mm/year. The major occupation of the residents include casual labour; small scale businesses and urban livestock keeping amongst other agricultural activities and many of them earn less than one dollar per day (Hope, 2004). The poverty incidence in the study area is estimated at 73% and the majority of households are food insecure (Gulyani and Talukdar, 2010). The informal settlement covers an area of approximately 250 square Kilometres and it is comprised of twelve villages namely: (i) Kianda (ii) Soweto west (iii) Raila (iv) Gatwekera (v) Kisumu Ndogo (vi) Lindi (vii) Makina (viii) Mashimoni (ix) Laini Saba (x) Siranga (xi) Kambi Muiru (xii) Soweto East (Zarina, 2006) (Figure 1).

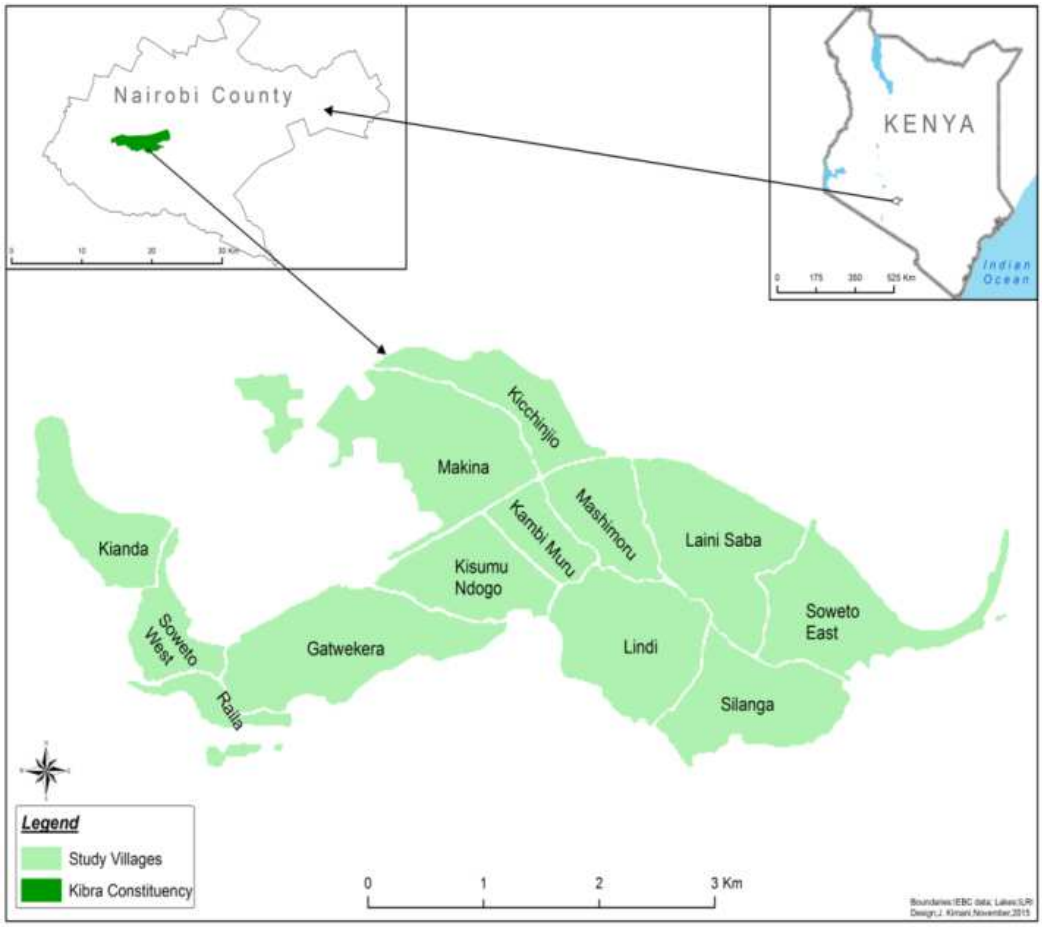

Figure 1. *Map showing the Kibera informal settlement villages.*

For the study to address its objectives a total of 120 farmers were purposefully selected from the twelve villages. The other respondents were 5 key informants. These include 3 Agricultural officers, a chief and a village herdsman with the help of livestock production officers working in the study area (Marshall 1996). The reason for doing this kind of sampling was that the poultry farmers are spread across the informal settlement which is difficult to access.

Questionnaires were used to collect data from the poultry farmers, while interview schedules were used to collect information from all the key informants. Both qualitative and quantitative data were collected from the study. The quantitative data collected emanated from the farmers closed questions. While the qualitative data emanated from the open ended questions and the interview schedules from the key informants. The quantitative data was analyzed using the Statistical Packages for Social Sciences (SPSS). While the qualitative data was analyzed through coding the various sources of information, grouping similar themes that were emerging from the findings and using them to answer the study objectives. The codes used for the farmers were indicated as HH01…HH120. While those used for the key informants were indicated as KI01…KIO5.

3. Results and Discussion

The objective of this paper was to examine the various wastes emanating from poultry rearing in Kibera informal settlement. Thus we asked the farmers to identify the various types of wastes emanating from rearing poultry. About 63.5% of the farmers considered the poultry droppings/excreta as the only waste emanating from poultry rearing. A study by Tao and Mancl, (2008), found that the daily droppings/excreta produced by a broiler to be about 0.09 kg and 0.18kg for a laying hen. The knowledge of quantity of poultry waste produced in a farm is essential for designing of a proper management programme (FAO 2012). Another 35% of the poultry farmers mentioned manure which was a mixture of droppings and the bedding for the birds mostly wood shavings and about 2.5% mentioned sawdust as waste (Table 1). It was apparent from the farmers that the amount of beddings (wood shavings or sawdust) used in poultry house remained constant for some time, the droppings or excreta kept on increasing with feeding of the birds. A study carried out in Botswana on poultry waste management by (Moreki and keiaikitse, 2013), found that poultry waste include both solid waste such as excreta, bedding material, feathers and wastewater.

Table 1. *Type of waste emanating from poultry rearing.*

Type of waste	Frequency n	Percentage
Poultry droppings/Excreta	75	62.5
Manure	42	35
Sawdust	3	2.5
Total	120	100

We thus wanted to further understand if the farmers were aware of the other sources of waste emanating from poultry rearing. We therefore probed them further by asking them if they considered the following as sources of poultry waste: containers of veterinary drugs used for poultry health, plastic paper bags for carrying commercial poultry feeds, dead birds and extra building material for the birds' housing as waste (Table 2).

Table 2. *Types of waste emanating from poultry.*

Types of waste emanating from poultry	Percentage n=120 Yes	Percentage n=120 No
The containers of veterinary drugs used for poultry health as waste	60.8	39.2
Waste from plastic paper bags for carrying commercial poultry feeds	59	39.2
Dead birds	83.3	16.7
Extra building material for the birds housing	42.5	57.5
Wood shavings and sawdust as bedding waste for poultry	52.5	47.5
Waste from slaughtered poultry	89.2	10.8

About 60% of the farmers reported that they consider containers of veterinary drugs as waste while 39.2% did not consider them as waste because they were reusing them for other purposes. One of the key informants reported that the containers of veterinary drugs were thrown away haphazardly after use as some of the farmers did not consider them as valuable (KI05).

Majority of the farmers in the study area (59%) felt that plastic paper bags for carrying commercial poultry feeds contributed the list of waste emanating from poultry rearing. While about 39.2% of the respondents did not consider the plastic bags as waste because they were reusing them for carrying household items. About 83.3% of the respondents indicated that dead birds during rearing were indeed waste emanating from poultry rearing but about 16% of the respondents did not consider dead birds during rearing as waste because they ate the birds instead of disposing them. Although data on amounts of dead birds generated in poultry production are scarce, a 4% mortality rate over a production cycle is considered normal for most poultry operations (Edwards and Daniel 1992). It is however imperative that those rearing poultry should put in place measures to ensure proper disposal of dead birds as required by environmental regulatory authorities.

When the respondents were asked whether they considered extra building material for poultry housing as waste (figure 2), about 42.5% agreed and 57.5% disagreed as indicated in Table 2 above. They reported that the extra building material can be used for other purposes and may not really be considered as waste (HH17, HH23, and HH101).

Figure 2. *Extra building material/Land degradation due to dumping of poultry manure.*

When asked whether they considered wood shavings and sawdust used in poultry houses usually referred as litter as waste, about 52.5% reported that it was the main waste generated from their poultry houses while 47.5% of the respondents reported that they do not necessarily use the sawdust or wood shavings in their poultry houses because they keep the birds on bare ground without any form of beddings. The majority of the respondents (89.2%) indicated that some of the parts of chicken when slaughtered such as intestines are thrown away as waste but 10.8% of the respondents disagreed and reported that intestines are a delicacy and they usually eat them (HH53, HH57).

4. Conclusion and Recommendation

The purpose of this study was to examine the various types of wastes emanating from poultry rearing in Kibera informal settlement in Nairobi, Kenya. Even though eight types of waste were found to emanate from poultry rearing in the informal settlement namely: (1) manure (2). containers used for poultry drugs (3). waste from plastic paper bags for carrying commercial poultry feeds (4). dead birds (5). extra building material for the poultry housing (6). wood shavings and sawdust used as bedding waste for poultry (7). waste from slaughtered poultry and (8). poultry droppings/Excreta, no farmer was able to identify all of these types of wastes. It is recommended that, there is need for awareness creation to the residents of the informal settlements on the various sources of wastes emanating from poultry rearing.

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