

## **Challenges of Abattoir Waste Management in Jalingo Metropolis, Nigeria**

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**Abstract:** *The upsurge in the prevalence of communicable and zoonotic diseases makes abattoir waste a disease surveillance points. Abattoir operations generates numerous waste and microbial organisms that pollutes the environment. This pose serious threat to human health and quality of life. Most abattoirs in Nigeria are characterized by poor design, obsolete facilities and deteriorating environment. The challenges posed by poor abattoir waste management on public food safety and quality of life in Taraba state and Nigeria has become a source of concern. This paper examined the challenges posed by the poor waste disposal from the abattoir in Jalingo metropolis. Investigative approach to data collection was employed along with secondary desk review of relevant data. The Jalingo main abattoir was considered as the study site. Data on the number of animals (cattle, goats and sheep) slaughtered daily was collected from records on abattoir operations. Additional information was collected through interviews with key informants (veterinary experts and meat inspectors) using interview schedule. The data collected were analyzed using descriptive statistics. The result of the study shows that after over 35years of its establishment, the abattoir has not expanded to accommodate the increasing population and demand for meat. This resulted in overstretch and deterioration of the facility and poor waste disposal. The findings of this study shows that the daily slaughter of animals ranges between 50 – 55 cows and 125-130 goats/sheep. The poor abattoir waste disposal affect air quality (stench), pollutes agricultural land, potable water supply source and aquatic life. The challenges of abattoir waste in the area include poor abattoir designs and obsolete facilities, location of the abattoir in residential areas, apathy by the state government over responsibilities of establishment and management of abattoirs, poor funding and lack of effective abattoir waste disposal equipment. The study recommended the regulation of animal waste disposal system which is better than the present dumping regime, legislative measures on landuse zoning and waste regulation to control the location and management of abattoirs in the state and country.*

**Keywords:** *Abattoir, Challenges, Jalingo, Waste Management and Zoonotic diseases.*

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### **1. INTRODUCTION**

The upsurge in the prevalence of communicable and zoonotic diseases such as tuberculosis in our communities today makes abattoir waste as disease surveillance points (Nwanta et al, 2008). Abattoir operations result in the generation of numerous waste and microbial organisms that pollutes the environment and pose serious threat to human health and quality of life. Sadly enough, most abattoirs in Nigeria are characterized by poor design, obsolete facilities and deteriorating environment. The challenges posed by poor abattoir waste management on public food safety and quality of life in Nigeria has become a source of concern in recent times. So many studies have been carried out on the poor state of abattoirs in developing countries (Nigeria and Africa inclusive) (Nwanta et al, 2008, Fearon et al, 2014 etc). The numerous wastes produced by abattoir operation not only pose a significant challenge to effective environmental management but also are associated with decreased air quality of the environment, potential transferable antimicrobial resistance patterns, and several infectious agents that can be pathogenic to human (Nwanta et al, 2008). Abattoir waste consists mainly of bones, undigested ingest and occasionally aborted fetuses (solid waste) while the liquid wastes comprise of blood, urine, water, dissolved solids and gut contents (Fearon et al, 2014). So many studies exist in the literature which have documented a variety of contaminants, microbial agents and health effects in those occupationally or accidentally exposed to improperly managed abattoir waste (Adelegan, 2002; Adeyemo, 2002; Abiade et al 2006, Nwanta et al, 2008). Studies have also shown that poor abattoir waste disposal are responsible for the pollution of surface and underground waters as well as air quality which indirectly affect the health of residents living within

the vicinity of abattoirs (Odoemelan and Ajunwa, 2008; Patra et al., 2007; Raymond, 1977). Aina and Adedipe, (1991) cited in Fearon et al (2014) observed that primary producers in affected water bodies may be destroyed by such pollutants, which may directly affect fish yield, with serious consequences on diet. Wrongful discharge of blood and animal faeces into streams may cause oxygen-depletion as well as nutrient over enrichment of the river system which could cause increased rate of toxin accumulation (Nwachukwu et al., 2011).

The increase in population of Jalingo town in recent times has led to increase demand for meat and associated products with its attendant waste generation effects. The growth of Jalingo town has led to the spread of settlement round about the Jalingo abattoir. Residents around the abattoir have over the years complained of the unbearable stench from the abattoir. Government has over the years assured residence in the area of its plan to relocate the abattoir to the new site further away from residential areas. Contract for the construction of a new modern abattoir was awarded by past government in the state. The new modern abattoir is about 60percent completion but abandoned due to change of government (Plate 8). At the moment, the abattoir has not been relocated. This development notwithstanding, no study has been carried out to examine the challenges posed by the waste disposal from the abattoir and the threat it posed to residents in the neighborhood. This study is intended to fill this knowledge gap.

## **2. OBJECTIVES OF THE STUDY**

- To investigate the various methods of abattoir waste disposal in the area.
- To examine the challenges of waste disposal at the abattoir.
- To estimate the volume of effluent/waste generated (solid and liquid)

## **3. RELEVANCE OF THE STUDY**

- The outcome of the study is expected to raise the level of awareness and consciousness of the adverse effects of waste generation at the abattoir on the environment.
- The study would provide insights into the opportunities inherent in abattoir waste materials and how best to harness it.
- The findings of the study will document the challenges of effective abattoir waste management in the area.

## **4. DESCRIPTION OF STUDY AREA**

Jalingo LGA is roughly located between latitudes 8°47' to 9°01'N and longitudes 11°09' to 11°30'E. It is bounded to the North by Lau Local Government Area, to the East by Yorro Local Government Area, to the South and West by Ardo Kola Local Government Area. Jalingo town was founded in 1893, as a convenient and suitable site for the relocation of the administrative capital of the Muri emirate. The town developed as a war camp established eight miles south of Kona village (Oruonye, 2014). It was a military base for the operation of the Emir of Muri. It was renamed Jalingo following the successful relocation of the capital from the old Muri. An European, L.H. Moseley described Jalingo in 1895 as a settlement of about 1000 people built in a circle with four gates at the N.S.W.E. aspect respectively (Fremantle, ND). The name Jalingo means 'the victorious', following the nature of the struggle that led to the establishment of the town. Hamman (2007) observed that since its establishment in 1893, Jalingo has continued to witness phenomenal growth as a result of its being the seat of the new Muri Emirate government and a trading centre. The present day Jalingo Local Government Council was an offshoot of the abolished native authority system. It was designated a Local Government headquarter in 1976 under the defunct Gongola state. Following the creation of Taraba State in 1991, it was made the state capital. It has a total land area of about 195km<sup>2</sup>. Jalingo LGA has a population of 139,845 people according to the 2006 population census, with a projected growth rate of 3% (Shawulu et al, 2008). Presently, it has a projected population of 165,774 in 2014 (Oruonye, 2014).

## **5. MATERIAL AND METHODS**

In carrying out this study, the investigative approach to data collection was employed along with secondary desk review of relevant data. The Jalingo main abattoir was considered as the study site. Data on the number of ruminants (cattle, goats and sheep) slaughtered daily was collected (through participant observation) and interview method. Supplementary data was obtained from records on

abattoir operations. Additional information was collected through interviews with key informants (veterinary experts and meat inspectors) using interview schedule.

The waste materials generated from abattoir operations was estimated based on calculations by Aniebo et al, (2009). The computations were done using average data on body weight for the respective ruminants and carcass weight per 1,000 kg (Fearon et al, 2014) as shown in Table 1. This study assumed that volume of waste generated from the slaughter of sheep is equal to that for goat. The estimated figures from Aniebo et al. (2009) were therefore applied to sheep. The data collected were analyzed using descriptive statistics.

**Table1.** Basis for estimating abattoir waste

S/NO	Waste category	Cow	Goats/Sheep
1	Blood per head (kg)	12.6	0.72
2	Intestinal content per head (kg)	8.0	1.25
3	Waste tissue per head (kg)	6.4	0.80
4	Bone per head (kg)	11.8	2.06

Source: Aniebo et al, 2009.

## 6. RESULT OF THE FINDINGS

### 6.1. The Management of Abattoir

Abattoir waste can be defined as waste or waste water from an abattoir which could consist of the pollutants: condemned organs, carcasses, animal faeces, blood, fat, hides, carcass trimmings, paunch content and urine. The findings of the study shows that there were serious challenges with the management of the Jalingo abattoir from its inception under Jalingo Local Government Authority to its present condition under a state capital. The government has not paid attention nor fund the facility. This situation has been reported by Nwanta et al, (2008) which observed that the establishment and management of abattoirs and wastes in Nigeria have always been regarded as social services by all the three tiers of government. Each of these government authorities has for many years neglected its function and has been apathetic about taking over responsibilities (Nwanta et al, 2008). The findings of the study show that the Jalingo main abattoir was constructed in 1979 by Late Abubakar Barde, the then Governor of the defunct Gongola state. It was commissioned for use in 1980. The abattoir was constructed when the town was a Local Government head quarter. Despite the growth of the town to the status of state capital, the abattoir has not expanded to accommodate the increasing pressure and demand for meat and meat resources.



**Plate. 1.** Jalingo abattoir slaughter slab

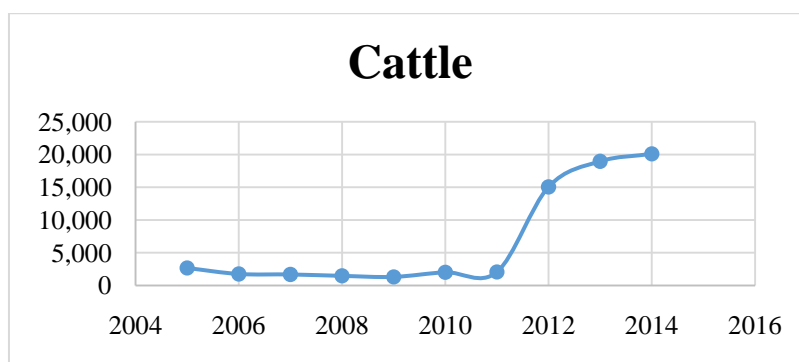
The abattoir was initially under the Jalingo Local Government Authority (LGA). The LGA handed over the abattoir as concession to a contractor. The contractor could not manage the facility effectively especially in the areas of sanitation (Plate. 1). This development resulted in deterioration of the slaughter house, improper meat inspection, poor environmental hygiene and waste management and compromise of public interest. This resulted in crises and intervention of the state government. The State Government handed over the collection of revenue at the abattoir and management of the facility to the butchers association. The butchers association collects the revenue and use it in managing the abattoir facility by providing sanitary materials, buying water from water tankers,

employ casual laborers to clear the surroundings and general sanitation of the environment. The findings of the study shows that the daily slaughter of animals ranges between 50 – 75 cows and 90-150 goats/sheep (Table 1). The number of animals slaughtered varies according to the season. At the end of the farming season, the farmers concentrate on sales of farm produce (mainly grains and yam tubers). This result in the reduction of supply of animals and slaughter. At the beginning of farming season on the other hand (mainly between February to May) the farmers bring out their animals for sale so as to raise money for farming activities. This results in increase in the number of animals supplied and slaughtered. The increase could be up to 300 goats/sheep daily. In terms of revenue, the butchers collect ₦100 on each cow and ₦50 on each goat/sheep slaughtered in the abattoir. This gives an estimated revenue of about ₦4million (\$18,000) per annum.

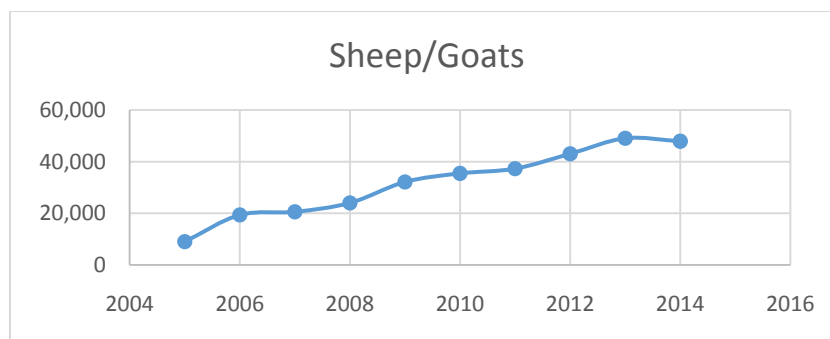
**Table2.** *Animals Slaughtered in Jalingo Abattoir (2005-2014)*

S/NO	Year	Male Cattle	Female Cattle	Total Cattle	Male Sheep	Female Sheep	Male Goats	Female Goats	Total Goat/Sheep
1	2005	1195	1,467	<b>2,662</b>	1,343	2,689	2,011	2,964	<b>9,007</b>
2	2006	853	895	<b>1,748</b>	1,519	3,113	8,240	6,483	<b>19,355</b>
3	2007	779	896	<b>1,675</b>	2,887	1,651	8,124	7,912	<b>20,574</b>
4	2008	897	563	<b>1,460</b>	3,161	2,913	8,814	9123	<b>24,011</b>
5	2009	812	491	<b>1,303</b>	4,308	3,614	11,617	12,603	<b>32,142</b>
6	2010	1,043	964	<b>2,007</b>	3,165	4,309	13,179	14,813	<b>35,466</b>
7	2011	959	1,094	<b>2,053</b>	3,016	5,095	13,091	16,094	<b>37,296</b>
8	2012	8,918	6,139	<b>15,057</b>	4,191	3,913	16,196	18,741	<b>43,041</b>
9	2013	4,891	14,075	<b>18,966</b>	4,613	4,832	24,347	15,267	<b>49,059</b>
10	2014	6,461	13,642	<b>20,103</b>	3,714	5,831	25,216	13,162	<b>47,923</b>

**Source:** *Veterinary Service Department, Ministry of Agric. and Natural Resources, Jalingo.*



**Fig1.** *Cattle Slaughtered in Jalingo Abattoir (2005 - 2014)*



**Fig2.** *Sheep/Goats Slaughtered in Jalingo Abattoir (2005 - 2014)*

## 6.2. Abattoir Waste Generation in the Study Area

The animals slaughtered in the abattoir ranges between 50 – 55 cows and 125-130 goats/sheep daily which lead to the generation of about 0.7 ton of blood, 0.5 ton of gut contents, 0.4 ton of waste tissues and 0.7 tons of bone (Aniebo et al, 2009). These translate into annual total of 11,072 tons of blood, 17,280 tons of gut contents and 13,824 tons of waste tissues discharged directly into the environment (Table 3). A greater portion of the 25,488 tons of bone that would otherwise have been part of the annual waste generation was often sold together with the meat and crushed for bone meal.

**Table 3.** Waste generation at Jalingo main abattoir

S/NO	Type of waste	Cattle/day	Goat and Sheep/day	Total/day	Total/year
1	Blood	756	166.7	922.7	11,072
2	Intestinal content	480	960	1,440	17,280
3	Bones	708	1,416	2,124	25,488
4	Waste tissues	384	768	1,152	13,824

**Source:** Field data, 2015

The type of abattoir waste generated and method of disposal in the study area are presented in Table4.

**Table 4.** Type and Method of Waste Disposal in the Study Area

S/NO	Type of Waste	Methods of Waste Disposal
1	Blood	Drained into surrounding areas and collected for blood meal and animals feed
2	Intestinal content	Heaped within premises, composting and washed in surrounding area
3	Bones	Burning/crushing for animal feed preparation
4	Waste tissues	Burning and disposal into depression within premises

**Source:** Field data, 2015

## 7. CHALLENGES OF ABATTOIR WASTE MANAGEMENT

- Poor abattoir designs and obsolete facilities.
- Inconsistent government policies.
- Apathy of state government over responsibilities of establishment and management of abattoirs.
- Poor funding and nonexistence of insurance scheme for butchers are among the challenges.
- Deterioration of slaughter houses and facilities.
- Lack of effective abattoir waste disposal equipment.
- Location of abattoir in residential areas.

## 8. EFFECTS OF POOR WASTE MANAGEMENT

Abattoirs are one of the industries that contribute to the problem of possible food-borne diseases and potential health hazards associated with food, especially meat in developing countries like Nigeria (Adeyemi and Adeyemo, 2007). Abattoir waste affect air quality, agriculture, potable water supplies, and aquatic life. These all pose risks to human health (Adeyemi and Adeyemo, 2007). The common disease causing organisms have been reported by researchers in slaughtered animals and abattoir wastes in Nigeria. Heaps of abattoir waste are common sight in most abattoirs in Nigeria as well as the study area which constitute serious environmental and public health hazards. The seriousness of environmental and health problems have been reported by so many scholars who isolated species of pathogenic bacteria from the solid waste and effluents from abattoirs (Adetosoye, et al, 1976; Litchfield, 1980; Oboegbulem and Muogbo, 1981; Elder et al, 2000; Callaway et al, 2004; Abiade-Paul et al, 2006). Abattoir waste has been reported to contaminate and increase the level of nitrates in ground water and cause methaemoglobinaemia (Meadows, 1995). It has also been reported that abattoir waste piled up within the environment not only caused pollution but also produced methane gas that intensifies greenhouse effect (Adeyemo, 2002). The waste could be washed away by surface runoff to contaminate ground and surface waters including market places and streets (Meadow, 1995; Abiade- Paul et al, 2006). Apart from been unpleasant and the stench it generates, abattoir wastes contain bacteria, high levels of ammonia and a very high Biological Oxygen Demand (BOD) which strip essential oxygen from water bodies and can cause serious harm to aquatic life and water quality (Adeyemi and Adeyemo, 2007).

## 9. USES OF ABATTOIR WASTE IN THE STUDY AREA

Despite the inherent dangers associated with abattoir waste, there are some potential uses that abattoir waste could be put to which at the moment is not been maximized in the study area. Findings from the study shows that some of the waste generated from the abattoir are put to uses as follows;

- **Blood** – Animal blood in the study area are collected by some of the local people and used in the preparation of animal feeds. The blood are collected during animal slaughter. They blood are boiled and dried. After that, the dried blood are grounded and used in preparing animal feed.

Some other women collect the animal blood (Plate 3), take it home, where it is cooked and ingredients added to it to prepare blood meal. The prepared blood meal is sold to people in beer parlors within the town.

- **Bones** – The bone components of the abattoir waste are not wasted in the study area. They are rather collected, burnt and crushed (Plate 2). It is later packaged and taken to animal feed mill where it is processed into different forms of animal feed.
- **Animal faeces:** the faecal matters are collected in a dump within the premises (Plate 4). Farmers around come from time to time to collect these waste and apply it to their farms.



**Plate 2.** Bone waste burnt, crushed and bagged for shipment to feed mill



**Plate 3.** Blood waste from animal slaughter and collected animal blood for blood meal



**Plate 4.** Abattoir sewage drain and heap of paunch content

## 10. DISCUSSION OF FINDINGS

Field investigation by (Nwanta et al, 2008) shows that there are about 30 abattoirs, 132 slaughter houses and 1,077 slaughter slabs in Nigeria with a total annual slaughter capacity of 14,127,868 animals. The report shows that Taraba State has one abattoir, two slaughter houses and 13 slaughter slabs with annual slaughter of 420,074 animals per annum. The findings of this study show that Jalingo town has the main abattoir and a private abattoir with an estimated 70,000 animals slaughtered annually.

To meet the increasing demand and number of animals slaughtered daily in the abattoir, the butchers union constructed additional slaughter slabs just beside the main slab within the premises. To improve the management of the Jalingo abattoir waste, water well was dug within the premises. This was further complemented with the drilling of borehole, overhead tank and ground water reservoir (Plate 5 and 6). This allows for adequate water supplies to flush the abattoir waste daily and cleanup the slaughter slabs. Information gathered from the respondents interviewed reveals that when there is shortage of water supplies, it affects the cleanup of the abattoir resulting in stench from the improperly flushed animal blood and faecal matters. The effluents (blood and liquid intestinal contents) are flushed into a drain that empties into a shallow depression within the abattoir premises. This shallow depression has been over grown by plants. The sight is an eyesore and a breeding ground for rodents and parasitic insect pest.



Plate 5. Overhead tank at abattoir and small generators for pumping water



Plate 6. Water reservoir pump from borehole and Ground well in the abattoir.



**Plate 7.** *Meat in the Abattoir Coldroom*

The quality of management of abattoirs and slaughter slabs, particularly, the adherence to standard practice of meat inspection and sanitation is a key to sound public health standard (Nwanta et al, 2008). An efficient abattoir operation and meat hygiene programme is a service for healthy living of the public. The union of the butchers procured a cold room (Plate 7) within the premises through partnership with people of goodwill.



**Plate 8.** *New Modern Jalingo Abattoir Under Construction and Abandoned*

## **11. ABATTOIR WASTE MANAGEMENT**

The abattoir waste materials are entirely organic that can either be composted or recycled and used for various activities, yet they are left to degrade, producing bad stench (Fearon et al, 2014). Degrading heaps of gut contents at the site serve as breeding grounds and sanctuary for pests that become a nuisance for abattoir workers, visitors as well as residents around the facility. Bone waste is currently not a problem because they are often sold together with the meat (Fearon et al, 2014) and processed into animal feed. Although abattoir waste carries high levels of microorganisms that may be harmful to humans, they are an excellent substrate for generating biogas (Rabah et al, 2010). This study revealed that about 11,072 tons of blood, 17,280 tons of gut contents and 13,824 tons of waste tissues are generated and disposed annually. This volume of waste when properly managed (composted or digested) will in addition to reducing the sanitation and health challenges round the facility, produce other benefits (for example, manure) for farmers and biogas for home and other uses (Fearon et al, 2014). It has been estimated that 1 kg of fresh animal waste produce about 0.03 m<sup>3</sup> of gas (methane) per day (FAO, 1996 cited in Fearon et al, 2014). This theoretically implies that about 525,000m<sup>3</sup> of biogas can be produced annually from the 17,280 tons of gut contents alone generated in the study area. It is popularly believed that the potential to generate biogas from abattoir waste is a good opportunity to enhance their activities (HDR, 2010 cited in Fearon et al, 2014). If this opportunity presented by the abattoir waste is fully harnessed in the study area, it would lead to improvements in efficiency of waste management in the area.

## **12. CONCLUSION**

The establishment and management of abattoirs and waste is supposed to be a social service by the various tiers of government in Nigeria especially because of its health implication on the general



public. Unfortunately the abattoirs are one sector that have not attracted the attention of the government over the years probably as a result of the perceived low revenue generation in the sector. The findings from this study shows that despite the inherent dangers associated with abattoir waste in the study area, the increasing volume of such waste in recent times present numerous economic opportunities for providing employment opportunity, increasing agricultural production and reduction of harmful wastes discharged into the environment. There is therefore the need to scale up the present local uses of the abattoir waste through empowerment of the local people and enlightenment campaign.

### 13. RECOMMENDATION

Based on the finding of this study, the following recommendations are suggested.

- The completion of the modern abattoir under construction will go a long way in solving the present challenges of abattoir waste in the study area. The new abattoir under construction is about 7km away from the present abattoir (also away from residential areas).
- There is need to enforce the design criteria and siting restriction which include setbacks from neighbors and buffers to protect against encroachment by property developers.
- Rules requiring odour abatement plans and provision of environmental impact assessment for abattoirs should be enforced in the area.
- There is need to regulate animal waste disposal system in the study area by introduction of alternative waste disposal method that is superior to the present dumping regime which will be properly enforced.
- Public awareness and enlightenment campaign on possible impact of pollution from abattoir wastes should be embarked upon by relevant agencies in the study area.

### ACKNOWLEDGEMENT

With a deep sense of gratitude I acknowledge the kind support I received from Mr. Appollos Tobi, the secretary of the Butchers Association in Jalingo metropolis and Dr. Inuwa G. Musa, Veterinary Doctor for assisting me with some useful information and taking me round the old and new abattoir premises. I am equally indebted to Dr. Ika Danjuma, the former Director of Veterinary Service and Dr. Nuhu M. Zaku, present Director of Veterinary Service and Dr. Dauda Abubakar all of Veterinary Service department, Ministry of Agriculture and Natural Resources Jalingo for sharing their experience and availing me the necessary data for this study. I also appreciate the contribution of colleagues at the Germany Expert Alumni Seminar 2015 for their input and useful contributions to this study.

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