

ASSESSMENT OF ABATTOIR WASTE MANAGEMENT IN HADEJIA METROPOLIS, JIGAWA STATE, NIGERIA

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ABSTRACT

Nigeria, as a developing nation, has been characterised by inadequate waste disposal, treatment, and management technologies, leading to pollution. The high production of meat and meat products for human consumption has led to high waste generation from abattoirs. Hence, the study was conducted to assess the abattoir waste management in Hadejia Metropolis, Jigawa State. A structured questionnaire, personal observation, and one-on-one interviews were used to gather data for the study. Data on the number of animals (cattle, goats, and sheep) slaughtered daily was collected from records on abattoir operations. The data collected were analyzed using descriptive statistics. Results show that waste generated includes blood, dung, rumen fluid, carcasses, and bones. It is also revealed that the animals slaughtered in the abattoir range between 26 – 33 cows and 80-100 goats/sheep daily, which lead to the generation of about 0.34 tons of blood, 0.2 tons of gut contents, 0.14 tons of waste tissues, and 0.3 tons of bone. These translate into an annual total of 141.255 tons of blood, 77.562 tons of gut contents, and 78.48 tons of waste tissues discharged directly into the environment. Furthermore, the study revealed there is no proper strategy put in place for the management and treatment of abattoir waste within the study area, and the recycling potential of the waste products is not explored. The current disposal method utilised in the abattoir was unsatisfactory, not hygienic, contributed to global warming, and does not meet global standards. The study, therefore, recommends that Stakeholders, individuals, and government agencies need to explore the recycling potentials of animal waste for the production of valuable products, job creation, sustainable environment, wealth creation, a reduced waste product, and economic growth.

Keywords: Abattoir, Waste Management, Challenges, Environment, Waste Disposal

INTRODUCTION

In recent years, urban environments in Nigeria have experienced significant challenges regarding waste management, particularly in abattoirs, where the disposal of animal by-products presents unique health and environmental concerns. These facilities, essential for the supply of meat to growing populations, generate considerable organic waste, including blood, bones, and offal, all of which must be managed effectively to minimize pollution and public health risks. The lack of adequate infrastructure and institutional frameworks in many Nigerian cities exacerbates the problem, allowing for improper waste disposal methods that threaten urban ecosystems. As urbanization continues to escalate, it is crucial to address the systemic issues associated with waste management in abattoirs, incorporating modern technologies and

community engagement to create sustainable solutions. By understanding the complexities of this issue, stakeholders can work towards effective policies that promote environmental health and public safety in Nigeria's urban landscapes.

Management of abattoir wastes has been of great concern in Nigeria. Almost every day in all the urban and rural markets in Nigeria, animals are slaughtered while the meats are sold to the public for consumption (Ezeohaa and Ugwuishiwu, 2011).

The constant dumping of abattoir waste without adequate treatment in our markets has led to the outbreak of diseases in the society. The upsurge in the prevalence of communicable and zoonotic diseases such as tuberculosis within the society today makes abattoir waste as disease surveillance points (Nwanta *et al.*, 2008). Studies have also shown that lack of proper 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). Abattoir waste disposal in many developing countries like Nigeria has been challenging over time. Mostly, waste materials are discarded with no concern to sound environmental management practices and thus pose harm to aquatic and terrestrial life including humans. Many studies in developing nations including Nigeria have shown that many abattoirs either deposit waste materials in the direct environment or dispose their wastes directly into water bodies. Some also argued that the practice is majorly due to lack of or inadequate waste recovery and treatment facilities (Okpala *et al.*, 2021). In Nigeria, increasing demand for animal products especially meat has led to increase in the volume of abattoir waste generation and the concerns about this situation is growing rapidly. Thus, the major aim of the study was to assess the waste management practices in Hadejia Metropolis abattoir, Jigawa State, Nigeria.

Overview of Waste Management Issues in Urban Abattoirs

In addressing the waste management issues faced by urban abattoirs in Nigeria, it becomes evident that inadequate infrastructure and planning profoundly exacerbate health and environmental concerns. Many abattoirs are situated within residential areas, as highlighted by the conflicts arising from their proximity to housing developments, where the lack of adherence to waste disposal regulations contributes to significant pollution problems ((Azi *et al.*, 2023). The situation is further complicated by the prevailing food safety culture in Nigeria, which underscores deficiencies in public awareness and regulatory oversight regarding safe waste disposal practices. As urbanization increases and food production intensifies, the challenge of managing organic waste becomes critical. This waste, if not properly handled, can produce harmful by-products that not only threaten public health but also pollute the surrounding environment, necessitating urgent

reforms in both policy and practice to ensure effective waste management at urban abattoirs ((Aleke *et al.*, 2021).

MATERIAL AND METHODS

Study Area

The study was conducted in Hadejia Metropolis in Jigawa state. It lies approximately between Latitude 12°.45' 06 N and Longitude 10°04'04 E. It is bounded on the immediate south by the Hadejia River. The climate of Hadejia is semi -arid. It is characterized by a long dry season and a short wet season. The mean annual temperature is about 25°C but the mean monthly values range between 21°C in the coolest month and 31°C in the hottest month and total annual rainfall ranges from 600mm -762mm. Based on 2006 census Hadejia LGA has a total population of 104,286 people with growth rate of 2.5%. The area is famous with massive cultivation of crops such as rice and wheat and vibrant trade sector hosting several markets (Gambo *et al.*, 2018)

Methodology

A structured questionnaire, visual observation, and one-on-one interviews were used to gather data for the study. Data on the number of animals (cattle, goats and sheep) slaughtered daily was collected from records on abattoir operations for three months (June – August, 2024). Additional information was collected through interviews with key informants (veterinary experts, Hadejia Emirate Butcher's Association and meat inspectors) using interview schedule.

Interview

Also a face-to-face interview using semi structured questionnaire was conducted with people involve in the abattoir activities, which include the slaughter men, veterinary unit, Hadejia Emirate Butcher's Association and meat buyers (Dealers). Data was collected on the types of waste generated and their corresponding effect on people and the environment in general.

Visual observation

This procedure of collecting data involved regular visits early morning to Hadejia abattoirs every day (form 6:00 am-10:00 am) over a period of 3 months (June August, 2013) at ruminants' slaughter houses when animals are brought on to slaughter slabs continuously. Their numbers were recorded and other relevant information was also obtained using visual observation such as the number animals being slaughtered and how they remove and disposed their waste after slaughter.

Method of Data Analysis

The data collected was analysed using descriptive statistics which include percentages and tables. The Data presented was based on the response of the people interviewed.

Table1. Basis for estimating Abattoir Waste

S/NO.	Waste category	Cow/Camel	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)	5.4	0.80
4.	Bone per head (kg)	11.8	2.06

Source: Aniebo *et al.*, 2009.

RESULTS AND DISCUSSION

The Management of Abattoir

Findings from the study show that, the abattoir was constructed by Governor Sule Lamido in 2009 and handed over to the Hadejia Local Government Council. The Local Government Council handed over the abattoir to the Department of Agriculture and Natural Resources in the Local Government. The Department could not manage the facility effectively especially in the areas of sanitation. This development resulted in deteriorationof the slaughter house, improper meat inspection, poor environmental hygiene and waste managementand compromise of public interest. This resulted in handing over the facility to the Hadejia Emirate Butcher's Association as rent. The Local 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 uses it inmanaging 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.

Number of Animals Slaughtered Daily

Thefindings of the study show that, the daily slaughter of animals' ranges between 26 – 33 cows/camels and 80-100 goats/sheep (Table 2). The number of animals slaughtered varies according to the season. At theend of the farming season, the farmers concentrate on sales of farm produce (mainly grains). At the beginning of farmingseason on the other hand (mainly between July to August) the farmers bring out their animals for~~so~~ as to raise money for farming activities. This result in increase in the number of animals supplied and slaughtered. The increase could be up to 200 goats/sheep daily. In terms of revenue, thebutchers' collect ₦100 on each goat/sheep and₦1000 on each Cow/camel slaughtered in the abattoir. This gives estimated revenue of about ₦22million per annum.

Table 2. Animals Slaughtered in Hadejia Abattoir per Year

Animal	Daily	Weekly	Annually
Cattle	20 – 25	140 – 175	7,280 – 9,100
Sheep	30 – 40	210 – 280	10,920 – 14,560
Goat	50 – 60	350 – 420	18,200 – 21,840
Camel	6 – 8	42 – 56	2,184 – 2,912

Source: Field data, 2024

Abattoir Waste Generation in the Study Area

The animals slaughtered in the abattoir ranges between 26 – 33 cows and 80-100 goats/sheep daily which lead to the generation of about 0.34 ton of blood, 0.2 ton of gut contents, 0.14 ton of waste tissues and 0.3 tons of bone (Aniebo *et al.*, 2009). These translate into annual total of 141.255 tons of blood, 77.562 tons of gut contents and 78.48 tons of waste tissues discharged directly into the environment (Table 3). A greater portion of the 18.87 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 Hadejia Main Abattoir

SNO.	Type of waste	Cattle and Camel/day	Goat and Sheep/day	Total/day	Total/Year
1.	Blood (kg)	315	72	387	141,255
2.	Intestinal content (kg)	200	12.5	212.5	77,562
3.	Waste tissue (kg)	135	80	215	78,475
4.	Bone (kg)	295	206	501	182,865

Source: Field data, 2024

Abattoir Waste Management

This study revealed that about 141.255 tons of blood, 77.562 tons of gut contents and 78.475 tons of waste tissues are generated and disposed annually (Table 3). This volume of waste when properly managed 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 m³ of gas (methane) per day (Fearon *et al*, 2014). This theoretically implies that about 2326.86m³ of biogas can be produced annually from the 77,562 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 (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.

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. 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). Bone waste is currently not a problem because they are often sold together with the meat and processed into animal feed.

Challenges of Abattoir Waste Management

- i. Poor abattoir designs and obsolete facilities.
- ii. Deterioration of slaughter houses and facilities.
- iii. Lack of effective abattoir waste disposal equipment.
- iv. Location of abattoir in residential areas.

Effects of Poor Waste Management

Heaps of abattoir wastes are common sight in most abattoirs in the study area which constitute serious environmental and public health hazards. The waste could be washed away by surface runoff to contaminate ground and surface waters including market places and streets. Apart from being unpleasant and the stench it generates, 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).

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 show that some of the wastes 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 is collected during animal slaughter. The blood is boiled and dried. After that, the dried blood are ground and used in preparing animal feed.

Bones – The bone components of the abattoir waste are not wasted in the study area. They are rather collected, burn and crushed for animal feed.

Animal faeces: the faecal matters are collected in a dump within the premises (Plate 1). Farmers come from time to time to collect the waste and apply it to their farms.



Plate 1. Abattoir sewage drain and heap of paunch content

Conclusion

The study assessed abattoir waste management in Hadejia Metropolis, Jigawa State. According to the results waste generated includes blood, dungs, rumen fluid, carcasses and bones. In addition, the animals slaughtered in the abattoir ranges between 26 – 33 cows and 80-100 goats/sheep daily which lead to the generation of about 0.34 ton of blood, 0.2 ton of gut contents, 0.14 ton of waste tissues and 0.3 tons of bone which translates into annual total of 141.255 tons of blood, 77.562 tons of gut contents and 78.48 tons of waste tissues discharged directly into the environment. Furthermore, the study showed that, there is no proper strategy put in place for the management and treatment of

abattoir waste within the study area and the recycling potential of the waste product are not explored. The current disposal method utilised in the abattoir were unsatisfactory, not hygienic, contributes to global warming, and does not meet up to global standard. Finally, the establishment and management of abattoirs and waste management are supposed to be a social service by the various tiers of government in Nigeria especially because of its health implication to the general public. Unfortunately the abattoir is one sector that has not attracted the attention of the government over the years probably as a result of the perceived low revenue generation in the sector.

Recommendations

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

- 1- There is need for relocation and construction of a modern abattoir outside the city away from residential area which will go a long way in solving the present challenges of abattoir waste in the study area.
- 2- The slaughter house is small and dirty. Poor supervision by the local government worsened the situation of the abattoir. Government should try and update the facilities in the abattoir and employ trained and qualify staffs. The Butchers Association should also increase the charges paid by the butchers for the processing of animals to enable them maintain the abattoir. The government should ensure that effluents are evacuated regularly to ensure the good sanitary condition of the abattoir environment.

REFERENCES

- Abiade–Paul CU, Kene IC & Chah KF (2006). Occurrence and Antibiogram of Salmonellae in Effluent from Nsukka Municipal Slaughterhouse. *Nigerian Veterinary Journal*, 27(1): 48-53.
- Adetosoye AT, Willinge HT, Award M (1976) Enterotoxigenicity of hemolytic E. coli isolated from diarrhetic piglets. *Niger Vet J* 5:3334 23.
- Adeyemi, I. G. and Adeyemo, O. K. (2007). Waste management practices at the Bodija abattoir, Nigeria. *International Journal of Environmental Studies*, 64(1), 71 – 82. 22.
- Adeyemo O.K. (2002). Unhygienic operations of a city abattoir in South Western Nigeria: environmental implication. *AJEM/RAGEE* 2002, 4(1): 23-27.
- Aleke, J., Chionuma, J. O., Ekwebelem, O. C., Eze, U. A., Nwaiwu, O. O., Queeneth I. and Onyeaka, H. (2021). Improving Food Safety Culture in Nigeria: A review of practical issues', 'MDPI AG',
- Aniebo AO, Wekhe SN, Okoli IC (2009). Abattoir Blood Waste Generation in River State and its Environmental Implications in the Niger Delta. *Toxicol. Environ. Chem.* 91:619-625
- Azi, M. B., Shehu, P. T., Wazhi, T. and Wapwera, S. D. (2023). Assessment of the Compatibility of Abattoir and Residential Land Uses in Jos Metropolis, Nigeria, 'Scholink Co, Ltd.',
- Callaway TR, Anderson Edrington TS, Genovese KJ (2004) What are we doing about Escherischia coli 0157: H7 in cattle? *J Anim Sci* 82:E93–E99
- Elder RO, Keen JE, Siragusa GR, Barkocy- Gallaghen GA, Koohmaraie M, Lagreid WW (2000) Correlation of entero

- haemorrhagic E. coli 0157 prevalence in faeces, hides and carcasses of beef cattle during processing. *Proc Natl Acad USA* 97:2999–3003
- Ezeohaa, S. L. and Ugwuishiwu, B. O. (2011). Status of abattoir wastes research in Nigeria. *Nigerian Journal of Technology*, 30(2): 143-148
- Fearon, J., Mensah, S.B. and Boateng, V. (2014). Abattoir Operations, Waste Generation and Management in the Tamale Metropolis: Case study of the Tamale slaughterhouse. *Journal of Public Health and Epidemiology*, 6(1), pp. 14-19.
- Gambo J. Garba A., Hadiza, Z. , Ahmad M. I, Bashir S. B, Yusuf A.Y (2018): Assessing the impacts of improper medical waste disposal and residents perception of their disposal practices in Hadejia Metropolis, Jigawa state, nigeria. *Nigerian Research Journal of Chemical Sciences*, Vol. 4, 2018.
- Litchfeld JH (1980) Salmonella food poisoning. In: *Safety of food* (2nd edition). AVI Publishing Company, Inc., Connecticut, pp120–122 24.
- Meadows, R., 1995, Livestock legacy. *Environmental Health Perspectives*, 103(12), 1096–1100
- Nwanta, J. A., Onunkwo, J. I., Ezenduka, V. E., Phil-Eze, P. O. and Egege, S. C. (2008). Abattoir operations and waste management in Nigeria: a review of challenges and prospects. *Sokoto J Vet Sci* 7(2).
- Oboegbulem SI, Muogbo EN. A survey of salmonellae in trade cattle slaughtered at Nsukka abattoir. *Int J Zoonoses*. 1981 Dec;8(2):107-10. PMID: 7045001.
- Odoemelan SA and Ajunwa O. (2008). Heavy Metal Status and Physicochemical Properties of Agricultural Soil Amended by Short term Application of Animal Manure. *J. Chem. Soc. Niger*. 20:60-63
- Okpala, C. O. R., Nwobi, O. C. and Korzeniowska, M. (2021). Assessing Nigerian Butchers' Knowledge and Perception of Good Hygiene and Storage Practices: A Cattle Slaughterhouse Case Analysis. *Foods* 10, 1165.
- Rabah AB, Baki AS, Hassan LG, Musa M, Ibrahim AD (2010). Production of Biogas using Abattoir waste at Different Retention Time. *Sci. World J.* 5(4).
- World Medical Association (WMA). (2013). World Medical Association Declaration of Helsinki: Ethical principles for medical research involving human subjects. *J. Am. Med Assoc.* 310, 2191–2194.