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EFFECTS OF LOCATING ABATTOIR TO THE NEIGHBOURING COMMUNITIES IN KANO STATE, NIGERIA

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Abstract

For years, abattoir solid waste disposal in many developing nations has been a major problem. Many abattoirs in Sub-Saharan Africa especially Nigeria deposit their wastes within the immediate locations or dispose them into water bodies which causes effects to the people living close to abattoirs. On the other hand, locating abattoirs in urban center furnishes many advantages to the people therein. Though, the impact of abattoir practice poses threat to the physical and man-made environment. The aim of this study was to determine the environmental as well as socio-economic effects of location of abattoir to the neighbouring people. A mixed method of quantitative and qualitative approach was employed. A multi-stage sampling technique was used to sample 400, 44 and 44 of respondents living proximity to abattoir, traditional head of butchers (Sarakunan-Pawa) and chairman of butchers' association respectively. Quantitative data were collected from people neighbouring abattoir. While the qualitative data were derived from in-depth interview conducted to traditional heads of butchers (Sarakunan pawa) and Chairman of butchers' association. This research used statistical tools, frequency count, bar and pie charts for data analysis and presentation. Findings of this research revealed that more than 25% of people living very close to abattoir do not been disturbed by bad odour produced by the abattoir. It is also revealed that there are both positive and negative effects of abattoir set by locating abattoir in an area, but the negative effects outweigh its positive ones. This research concluded that appropriate planning should be put in place to avoid encroaching by people close to abattoir or establish new abattoir close to residential area. And also proper drainage and modern methods of abattoir solid waste management should be designed

Keywords: Abattoir solid waste, Environmental effects, Socio-economic effects, Kano State, Nigeria

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INTRODUCTION

Abattoir industry is an important component of livestock industry in Nigeria, providing domestic meat supplies to over 150 million people and employment opportunities for the teeming population both males and females (Nafarnda *et al.*, 2012). Abattoir is a source of revenue to the government as any animal to be slaughtered revenue is derived from. For that abattoir should have its own independent budget from national, state or local government due to its contribution given to the socio-economic and environmental development positively or otherwise. The revenue generated should be set aside purposely for salary and wage attached to their social maintenance, operation and maintenance of the plants (Fasanmi, 2002).

In the same vein, the Fourth Schedule of the 1999 Constitution of Nigeria, subsection 1(e), states amongst others that the main functions of the Local Government Councils should be “establishment, maintenance and regulation of slaughter houses, markets, motor parks and public conveniences”. Though, the only interest most local government agencies have shown in this regard seems to be revenue collection from these establishments (Nwanta *et al.*, 2008). Similarly, in metropolitan area, local government authorities have the responsibility of generating revenue from residential and institutions and also take care of non-hazardous waste. Generators of non-hazardous waste for industrial and commercial waste are controlled and managed by; subject to local, state, national or even international organizations. Though, the mood of waste management practice is quite different from urban to rural areas as well as from developing to developed nations or economies.

The main reasons behind establishing abattoir facilities are: to provide cleaner and hygienic animal slaughtering services; to ensure proper utilization of animal by-products including blood, hide, skin, hooves, horns, bones; to establish and control standards, to generate revenue for the services rendered; and to improve impact on the environment by controlling the waste disposal system (LMA, 2000). Apart from covering environmental problems by converting abattoir waste to biogas, still it acts as fertilizer, as available nitrogen and other substances remain in the treated slurry (Alvarez and Lide'n, 2008).

Some researchers conducted their researches on effects of abattoir to the surrounding people such as Oruonye (2015) conducted his research work on challenges pose by the poor abattoir waste disposal in Jalingo metropolis. The researcher used qualitative research using observation method where exploratory approach was used for data collection as well as secondary source of literature. Interview as well as abattoir record on daily operation was used as source of data which analyzed using descriptive statistics. One of the findings shows that there is poor waste disposal, which affects the quality of air, water and land. Moreover, the method of solid waste management in this study area is burning, crushing for animal food and disposal into depression within premises. Most of the researches did not consider social and economic effects of locating abattoirs to the neighbouring society which this study aimed at determining the environmental as well as socio-economic effects of location of abattoir to the neighbouring people.

Literature Review

Waste and Forms of Waste

Waste does not have worldwide standard definition. For example, in Russia, they do not have precise word to use for waste; but the usage is that “a material waiting to be reused” Waste can be regarded as the amalgamation of four wrongs (4-W); a wrong substance, in a wrong quality, in a wrong place at a wrong time. Additionally, waste is also seen as an object or substance that is intended to be disposed of or required to be disposed of by the provision of national law (Basel Convention, 2015). Similarly, it is any unavoidable materials generated from industrial and domestic activities that do not have economic value or demand and must be rid of (Sridhar, 1996).

Shah (2012) stated that according to the United Nations Statistics Division waste is any materials that does not have prime value to the generators and has no longer use these materials in terms of their own purposes of production, transformation, or consumption. Based on its physical appearance; liquid, solid and gaseous wastes.

a. Liquid waste

So, wastewater is a material that is dissolved, suspended, or transported in water (including sediment) which is spilled or deposited on land or into a water resource in such volume, composition or manner which to be reasonably likely to cause, the water source to be polluted. Such pollutants include animal fat, urine, blood, faeces, animal trimmings, paunch content, ash, sediment, among others.

Moreover, wastewater produced in animal slaughter areas typically has a high biochemical oxygen demand. It is also very saline and has high levels of nutrients, suspended solids and bacterial contamination. Abattoir effluent has a complex composition and can be very harmful to the environment (DARD, 2015).

b. Solid waste

Solid waste is the term used to describe non-liquid unwanted materials generated from domestic, agricultural, industrial, trade and commercial activities as well as from public services. Eight major activities generate solid waste. These are residential, industrial, agricultural, commercial, institutional, construction, municipal services and process. They comprise of different materials: dust, food waste, fat, bones, paunch, cartilage, packaging in form of paper, plastic, metal, glass, discarded clothing, garden waste, hazardous waste and radioactive waste (Pruss, Giroult and Rushbrook, 1999).

Equally, solid waste is the integrated or collected remaining of food, collated blood, bones, hooves, horns, dead animals, human and animal excreta, biomedical regolith, paper, ash, textile, leaves, electronic appliances, rock regolith, among others that do not have value to be kept by the owner (Babatunde *et. al.*, 2013; Sha'Ato *et al.*, 2007; Bello, 2021).

c. Gaseous waste

The gaseous wastes are generated into environment mainly due to human activities. Animals produce methane gas during the process of digestion which is released to the atmosphere during processes such as defecation. Chlorofluorohydrocarbons (CFCs) may be used in refrigeration and freezer plants. Carbon dioxide is released from stunning equipment. Goats are roasted with kerosene and condemned tyres in the course of processing the meat for marketing leading to the emission of carbon monoxide into the atmosphere. Dust is emitted during unloading of animals in the slaughterhouse (Central Pollution Control Board [CPCB], 2017; Fearon, Mensah and Boateng, 2014; EPA, 2001; and WHO, 2005).

Abattoir

Abattoir is regarded as any building that is approved and registered by the controlling authority in which animals are slaughtered and prepared for human consumption (Alimentarius, 1993; Bello, Kwaga and Raji, 2011). Similarly, abattoir is an authorized place for receiving and holding of livestock; butchery and dressing of carcass animals; chilling of processed carcass product; carcass boning and packaging; freezing of finished carcass and cartooned products; rendering processes; drying of skins; treatment of wastewater; and distribute processed materials. EPA (2001) defines an abattoir or slaughterhouse as a building for butchering. It specifies that an abattoir is a house where animals are slaughtered; dress, cut and inspect meats; refrigerate, and take care of its by-products.

Abattoir Waste

Abattoir wastes often contain blood, fat, organic and inorganic solids, salts and chemicals added during processing operations (Ezeoha& Ugwuishiwu, 2011). Therefore, abattoir waste materials are entirely organic that can either be recycled or composted and used for various activities, yet they are left to degrade the environment and produce bad stink. Degrading heaps of gut contents at the area serves as breeding grounds and asylum for pests that become a nuisance for abattoir workers, visitors as

well as residents around the facility. Bone as a waste is currently not a problem because they are often sold together with the meat or burn off for industrial uses. This burning also has its own effects to the environment; as it increases carbon dioxide and monoxide to the area around which cause air pollution (Fearon *et al.*, 2014).

EFFECTS OF ABATTOIR SOLID WASTE

Negative Effects of Abattoir Solid Waste

Indiscriminate disposal of abattoir solid waste contains many diseases induced organisms. These organisms cause diseases such as headache, asthma, heart burn, dysentery, general body weakness, fever and typhoid fever pneumonia, respiratory and chest diseases, coughing, burning eyes, skin rash or irritation, wool sorter diseases, nausea or vomiting, foot, mouth diseases and dengue (Robert, De jager, Blight, 2009; Wing and Wolf, 2000). Besides, reduces life expectancy in most developing countries especially in Africa it has been associated with inadequate and hazardous waste management, among other factors (WHO, 2005). Similarly, despite animal dung could be served as manure, but it contains viruses, bacteria, microorganisms and salt which could impair quality of water in an environment when washed into river or stream (Adewumi, Babatola and Adejuwon, 2016).

Pathogens existing from poor abattoir waste management pollute water on or/and close to surface which affects environment and public health negatively and causes diseases and loss of lives (Coker, Olugasa & Adeyemi, 2001; Ezeoha and Ugwuishiwu, 2011; Nafarnda *et al.*, 2012; Nafarnda, Yaji and Kubkomawa, 2006; Osibanjo and Adie, 2007; World Bank, 1998). Moreover, it is reported that the water inside local wells in the locality where abattoir is located is extremely contaminated by abattoir dissolved waste (Adeoye, Dauda, Musa, Adebayo and Sadeeq, 2012; Chukwu, Adeoye, and Chidiebere, 2011; Magaji and Chup, 2012; Nwanta *et al.*, 2010; Ogbonnaya, 2008).

More so, the air near abattoir is polluted as a result of dumping solid waste. This indiscriminate dumping of abattoir solid waste gives room for flies, mosquitoes breed and other microorganisms which cause problem to human health (Salvato, 1992; Ezeoha, 2000). As abattoir waste is a room for bacteria and viruses.

Positive Effects of Abattoir Solid Waste

As matter of fact, AW could be divided into two based on usage; primary or principal and secondary. Primary by-products are derived directly from animals without processing such as paunch, bones, hooves, fat, among others. On the other hand, secondary abattoir waste or by-products are extracted from primary by-products. For example, gelatin and marrow are extracted from bone. Therefore, secondary by-products are economically valuable. Nevertheless, some categorized the abattoir waste based on where it goes; that is final usage or what to be done with it. Based on this, some abattoir wastes go to industry such as glue, gelatin, etc; pharmaceutical by-products like hormones, bio-chemicals and for agricultural purpose such as fertilizers, etc (Wani, Gazalli and Sohi, 2014).

Similarly, animal blood is used as animal feeds especially chickens. Blood collected is boiled and dried then mixed up with other ingredients to make animal feed. Some use blood in preparation of meal that becomes so tasteful especially to people in beer parlors or bar. Additionally, bone is also another useful ingredient for animal feeds. The bones are collected, burn and make coarse and sell to animal feeds industries. The industries mix it up with grounded grains and other ingredient to make animal food. Moreover, animal defecate: the faecal matters are collected in a dumped area within the premises which farmers around come from time to time to collect these wastes and apply it to their farms (Oruonye, 2015).

In addition, waste materials are almost completely organic that can either be converted to composting or recycled and used for various activities; hitherto they are left at abattoir premises. Degrading heaps of organic waste serves as breeding grounds

and sanctuary for pests that become a nuisance for abattoir workers, visitors as well as residents around the facility (Fearon et al., 2014).

MATERIALS AND METHODS

This section presents the types of data used, the sources, method of data collection presentation and analysis.

Types and Sources of Data

Types of data

Two types of data were used; that is the primary and the secondary data. The primary data include the environmental and socio-economic effects of abattoir location to the neighbouring people. On the other hand, the secondary data includes the following:

- Number of abattoirs in Kano State and their locations.
- Number of traditional head of butchers (Sarkin-pawa) and chairman of butchers' association.

Sources of data

Primary source of data was sourced from people neighbouring abattoirs. The quantitative source of data is questionnaires. On the other hand, the secondary data were sourced from the following institutions:

- Kano State Butchers Multipurpose Enterprise (2019): number of abattoirs and their locations
- Kano State Ministry of environment (2019): name and phone number of each traditional head of butchers and chairman of butchers' association

Methods of Data Collection

Quantitative types of data and method of data collection were used. It is divided into method of quantitative (Secondary and primary) data collection as follows:

Methods of quantitative data collection

Based on primary source of data, data on effects of location of abattoirs to the neighbouring people was collected from the respondents living within the range of 1 – 1000 meters from abattoir.

More so, regarding secondary data, the number of abattoirs was collected from Kano State Butchers Multipurpose Enterprise (2019) register. The summary of the register contains local government area and town where abattoir is located.

Sample and Sampling Population

There are fifty (50) abattoirs in the whole Kano State distributed in both metropolitan and non-metropolitan local government areas. Purposive sampling technique was used in selecting the respondents from all these abattoirs living close to (1000 meters). Based on Krejcie and Morgan (1970), 44 abattoirs were selected using stratified sampling technique. However, disproportionate sample was used for questionnaires administered to people neighbouring abattoirs. Nine (9) questionnaires were administered to people living close to each abattoir except large abattoirs where ten (10) were given out where of 400 sample were used.

Instruments used for quantitative data collection

Questionnaires used in this research for data collection comprises of two sections: bio-data of the respondents and subject matter. Furthermore, the questions are open-ended and closed ended. Another instrument used for data collection was interview conducted to traditional head of butchers (Sarkin-pawa) and chairman of butchers' association.

Methods for Data Analysis and Presentation

This research work employed simple statistical bunch such as tabulation, percentage, bar chart and so on; to analyse the data collected mostly from questionnaire. Tables, pie charts and bar chart (both composite and multiple) were used in presenting data collected related to environmental as well as socio-economic implication of abattoirs' location.

RESULT AND DISCUSSION

Bio-Data Description

Based on the questionnaires distributed to 400 respondent proximity to abattoir, more than two-third (2/3) of the respondents are married (table 1). Only 22% are not engage in any business (12% housewives and 10% students), but the remaining are in economic production. On the other hand, educational level of the respondents indicated that only 4.5% did not attend western education but majority of them have Senior Secondary Certificate of Education (SSCE) with more than 25% having A-Level certificates. However, in terms of age, majority of the people living around abattoir are young between 18 – 39 years old. Only 6.5% are recorded between 50 years to above living proximity to abattoir (1 – 1000 meters).

Table 1: Showing description of Gender, Marital status, Occupation, Education level and Age of the respondents

Variables	Frequency	Percent
Gender		
Male	329	82.3
Female	71	17.8
Total	400	100.0
Marital Status		
Married	313	78.3
Single	87	21.8
Total	400	100.0
Occupation		
Civil servant	20	5.0
Self-employed	120	30.0
Farming	31	7.8
Housewife	48	12.0
Business	96	24.0
Student	40	10.0
Employed by private	45	11.3
Total	400	100.0
Education Level		
Islamiyya	18	4.5
Primary School	86	21.5
Secondary School	193	48.3
Diploma/NCE	98	24.5
Degree	5	1.3
Total	400	100.0

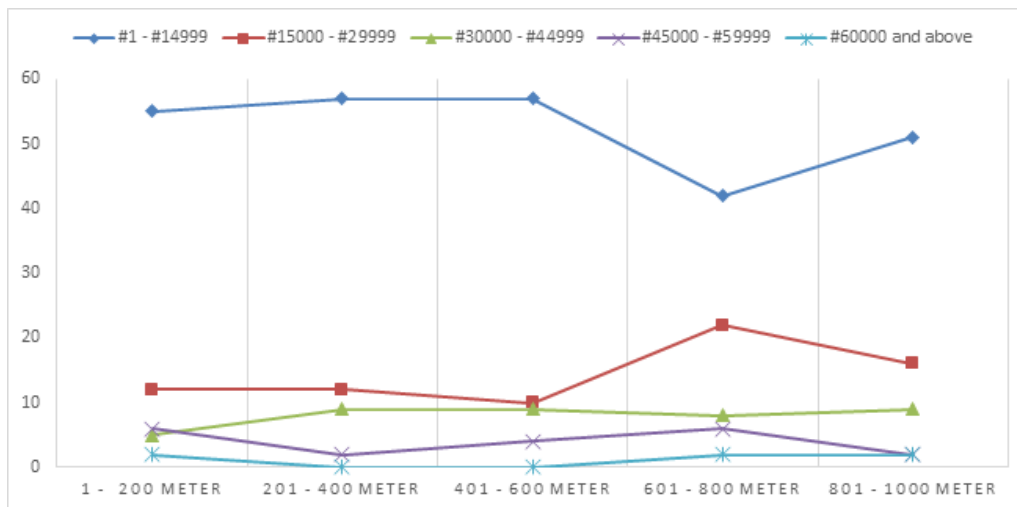
Age

18 – 28	99	24.75
29 – 39	163	40.75
40 – 50	112	28
51 – 61	24	6
Above 61	2	0.5
Total	400	100

Source: Field questionnaire, 2020

Monthly income distribution

The rationale behind this is to show the relationship between location of abattoirs and the calibre of people that suffer the impact of abattoir location. Majority of people living proximity to abattoir in Kano state are fall under poverty level (Figure 1). Based on the income received by people neighbouring abattoirs, it is indicated that they are poor. Their monthly income received fall under poverty level set by World Bank (2020) which says those living under US\$1.90 (conversion level \$1 = #360, i.e. $1.90 * #360 = #684$) per day. Those receive less than US\$57 (#20520) per month as said to be in poverty level and mostly poverty goes hand-in-hand with environmental problem (Incekara & Abubakar, 2014). This indicated that 82.5% of the people living proximity to abattoir (within 1km) is fall under extreme poverty level. While those receive between # 21000 to #100000 per month constitutes only 17.5% respondents. This validates the Hoyt Sector model which states that poor people settle proximity to industry. This is so due to presence of environmental problems presence which makes land becomes very cheap. This corroborates the finding of Emeka and Onyema (2017) which indicates that the land around abattoir is very cheap due to pollution and other environmental challenges presence therein.



Source: Field questionnaire, 2020
 Figure 1: Distribution of monthly income around abattoir

Social Benefit and Distance of Nearest Abattoir to the Residence

Based on the qualitative data generated (through interview conducted), more than 70% of abattoirs in Kano state proceeded any settlement close to it now. People prepare to move close to where they reduce the cost of production which later on even

non-butchers occupied the place since it is low cost area. This section provides positive effects of locating abattoir proximity to residential areas. This indicates that abattoir is one of the factors of attracting settlement especially low-income earners. As one of interviewee at non-metropolitan local government area identified:

“... one of the advantages of slaughterhouse to us is providing low cost settlement”.

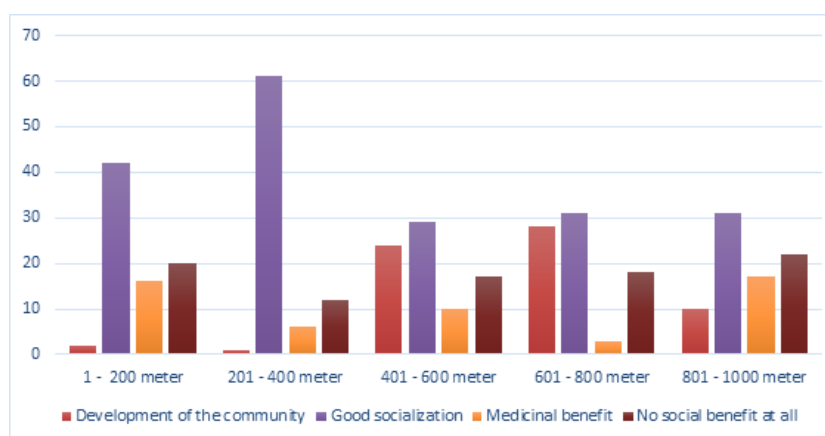
Abattoir develops the town by attracting people to settle in a bare or unoccupied land (where abattoir is established). As one of the respondents at non-metropolitan local government area expressed that:

“... that is why we have old and new towns, mostly strangers settle in new town close to slaughterhouse which is out of the town; later on, our children build their houses at the area”.

We can say boldly that abattoir attract settlement to their presence location (proximity to abattoir).

On the other hand, quantitative data generated through questionnaire administered indicated that there is difference in terms of social benefit derived from abattoir by the residents close to abattoir based on the distance. This result has showed that those far away (800 – 1000 meters) from abattoir indicated that 7.8% respondents have good socialization with the butchers. This socialization includes honouring & respecting each other, jokes, sensitivity, entertaining using different Hausa vocabulary, poking, among the others 5.5% respondents do not get any social benefit from abattoir. Medicinal benefit and development of the community have 17 (4.3%) and 10 (2.5%) respondent respectively (Figure 2). This medicinal benefit using camel’s urine for curing typhoid and malaria, dung for kwashakwo, horn for hair increment and removing for waste blood, milk of camel is used for curing hypertension just mentioned a few.

More so, respondents in the closest zone to abattoir (1-200 meter) believe that ‘good socialization’, ‘not benefit at all’, ‘medicinal benefit’ and ‘development of the community’ have counting as: 42 (10.2%), 20 (5%), 16 (4%) & 2 (0.5%) respectively. While in the second zone (201 – 400 meter), good socialization has the highest score (f = 61, 15.3%) and has recorded less in term of ‘not benefiting’. This has indicated that those are very far away from abattoir and the closest residents have higher score of ‘not benefitted at all’ from abattoir 22 and 20 respondents respectively. This indicates that the best buffer zone for socialization is the second zone (201 – 300 meter). Moreover, the summary of the social benefit derived from being neighbour to abattoir has development of the community with 65 respondents (16.3%), good socialization has 194 (48.5%), 52 (13%) responses for medicinal benefits and 89 respondents (22.3%) has indicated no social benefit derived from being a neighbour to abattoir.



Source: Field observation, 2020

Figure 1: Showing social benefit from being neighbour to abattoir

Economic Benefit of Abattoir to the Surrounding Area

The figure 2 indicated that 67.8% respondents earn income from abattoir through selling sachet water, minerals, food selling, charcoal picking and sale it, groceries, rendering service at abattoir such as abattoir operation (bleeding, splitting carcass), roasting, sanitizing abattoir premises, transporting meat, just mentioned few. This is in convergence with finding of Kehinde and Abiodun (2014); Koh (2007) which indicated that recycling method is used in disposing bones, hooves and horns which make owners of the ASW earning money and make the environment safe. Since there are no agro-allied industries mostly close to the abattoir in Kano state, this is among the possible reasons for recording lowest responding to source of raw materials ($f = 6, 1.5\%$).

On the other hand, spatially respondents closest to abattoir have the highest score of not benefited economically from abattoir followed by third zone (401 – 600 meter). Third and 4th buffer zones recorded the highest score of income generation and income generation together with cheap meat & milk ($f = 57$ each). This indicate that the closest buffer zone (1 – 200 meter) do not benefit much economically compare to those are far away from abattoir.

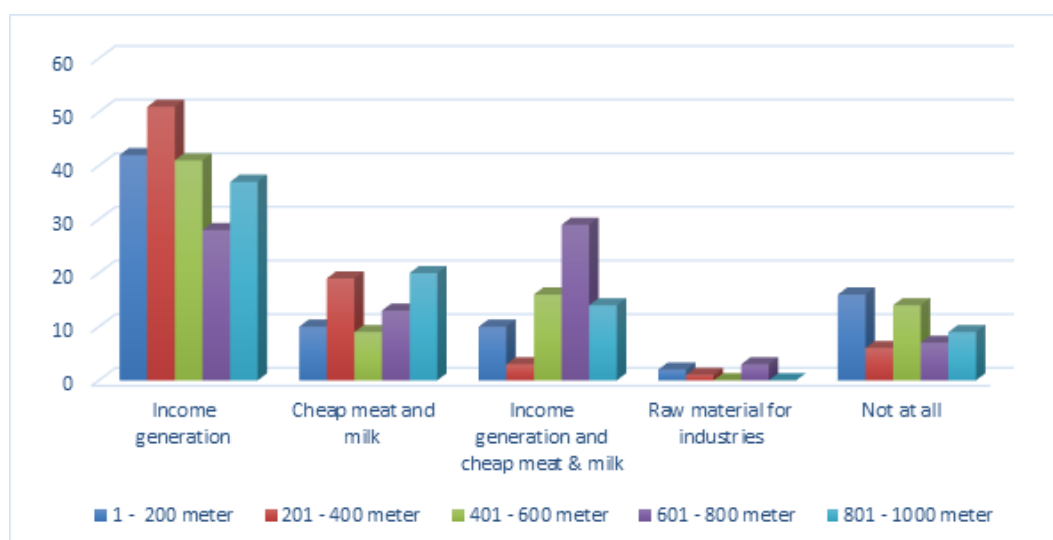
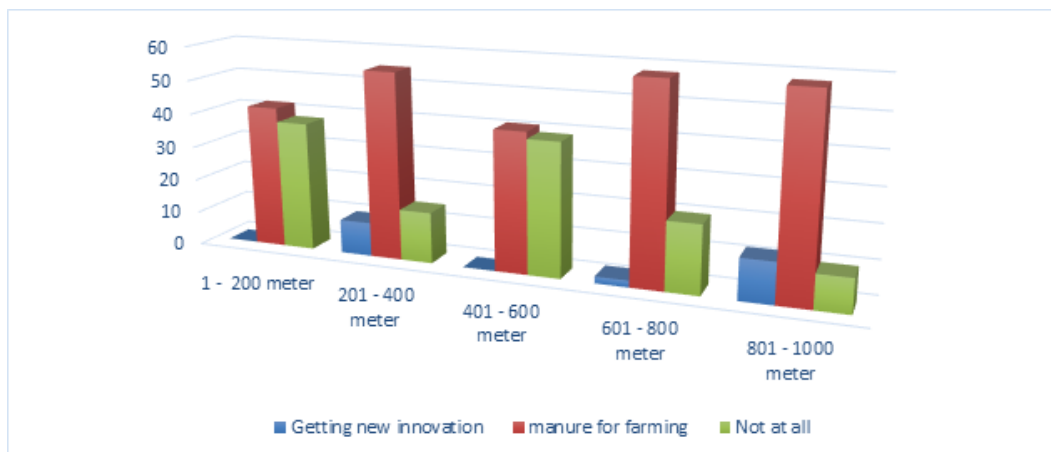


Figure 2: Showing economic benefit derived from abattoir by the respondents.

Source: Field observation, 2020

Environmental Benefit of Abattoir to the Surrounding Area

From the figure 3, the result has indicated that manure has gotten the highest responses 63.5% followed by not benefit environmentally from abattoir 30.5%. The least score is recorded from getting innovation for being neighbour to abattoir 6%. However, spatially, 4th and 5th zones recorded the highest score 14.5% each for answering that abattoir furnishes manure for farming to them. The closest zone is the second zone of recording not benefiting environmentally for being neighbour to abattoir after third zone (401 – 600 meter). This indicates that the farthest away from abattoir, the more the environmental benefit derived from and vice-versa.



Source: Field observation, 2020

Figure 3: Environmental benefit people living close to abattoir derive from abattoir

NEGATIVE EFFECTS OF ABATTOIR TO THE PEOPLE LIVING NEARBY

As the research utilized both qualitative and quantitative data, here qualitative data were used which were generated from interview conducted. The following result indicated the negative effects of locating abattoir close to residential areas as:

3.4.1 Less value of land

The location of abattoir in any place can have an implication to the surrounding area. Based on findings of this research it was identified that these abattoirs affect the environment, social and economic aspects of the people living proximity to them. This result indicated that despite the socioeconomic benefits which abattoir renders to the people living nearby, though it furnishes poor sanitary condition, foul smelling and noise pollution which decrease the property value of the environs (Dada *et al.*, 2020) especially value of land. As one of the respondent states that:

“Now, there are many plots unsold due to their closeness to abattoir; even the value of the land here is very low compare to other places”

This low value of land is attached to foul smelling which causes epidemics. Most of the people occupied immediate environment to abattoir is poor people some are tenant (Figure 1). The structure of building is substandard. This agrees with Hoyt’s model where poor people tend to dominate industrial and lower-class residential sector. Housing is cheap due to its proximity to industry (abattoir is included) where pollution, traffic, railroads, and environmental hazards make living conditions miserable. Those who live in this sector do so to reduce the cost to travel to work since they are poor. To emphasize on this, Wudil Sarkin Pawa stated that:

“I relocated to where abattoir is now from old city in order to monitor abattoir’s activities and reduce the cost of daily transportation ... I do not leave this abattoir until after Salatullsha’i even if I left to home, I come back when another animal is brought”

This finding corroborates with what Emeka and Onyema (2017) stated in their result that, the land close to abattoir is unoccupied due to less value of land which makes the owner unable to build houses in the area. Even the tenants pay less as rent.

Abattoir is light industry which should be located at the edge of industrial sector. This finding testified Hoyt segment theory which say that mostly poor people occupied immediate environment to the industry (slaughterhouse) due to cheapness of the land without considering environmental challenges presence. While middle class people are living far from abattoir; with higher class residents living farthest away from slaughterhouse.

3.4.2 Foul smell

It is unanimously agreed by butchers that no abattoir can exist without any foul smell as one of them is quoted below:

“Ai ba yadda za a yi mayanka ba tare da an ji wari ba duk wankin da za a yimata. Ballantana mu da ba mu da rowan famfo ko borehole kuma sannan sai an dauki lokaci ake debe mana wannan sharar ...” (there cannot be a slaughterhouse without foul smell; as we do not have pipe borne water or borehole for sanitation and the evacuation of the waste is seldom).

There is agreement between people living neighbouring abattoir and butchers themselves in terms of major environmental problem produced as a result of abattoir operation as foul smell which constitutes the highest percentage (Figure 4). One of the respondents stated that

“Jaki ma baya biyo nan layin saboda warin da mayankar nan take yi musamman ma lokacin Karamar Sallah da Babbar Sallah” (even donkey cannot follow this line due to bad odour this slaughterhouse produces as a result of its operation especially during Edil Fitr and Adha).

This result validates the finding of Abdullahi, Hassan, Kadarman, Junaidu, Adeyemo, and Lua (2016); Bello and Odeyemi (2009); Dada *et al.*, (2020); Fearon *et al.* (2014); FAO, (2014); Istifanus and Bwala (2017); Nwanta *et al.* 2008); which say that abattoir solid waste produces bad odour to vicinity of abattoir.

3.4.3 Air pollution

Moreover, the air in and around abattoir is polluted due to daily abattoir operation (Figure 4). This activity as observed include bone burning for industrial purposes (which include animals' food such as dog, cat, chicken, etc.) horns and hooves of large animals sometimes are burnt (Plate I) and mixed it with bone for exportation to Europe as slated by one of the bone sellers at abattoir Kofar Mazugal that:

“... we do not use hooves and horns of cattle and camels, we burn them and mix it up with burned bone where we bring it to Lagos for exportation to Europe”.

This operation causes air pollution also. Apart from this operation, roasting of carcasses, legs, heads and hide causes air pollution to the environment. This affects not only environment, but people's health. Sometime inorganic materials found in stomach content is burn within the abattoir premises which spray carbon monoxide & dioxide to neighbouring people living near the abattoir. This coincides with result of many researchers such as Istifanus and Bwala (2017); Oruonye (2015) who observed air pollution as a result of abattoir operation in developing countries.



Source: Fieldwork. 2020

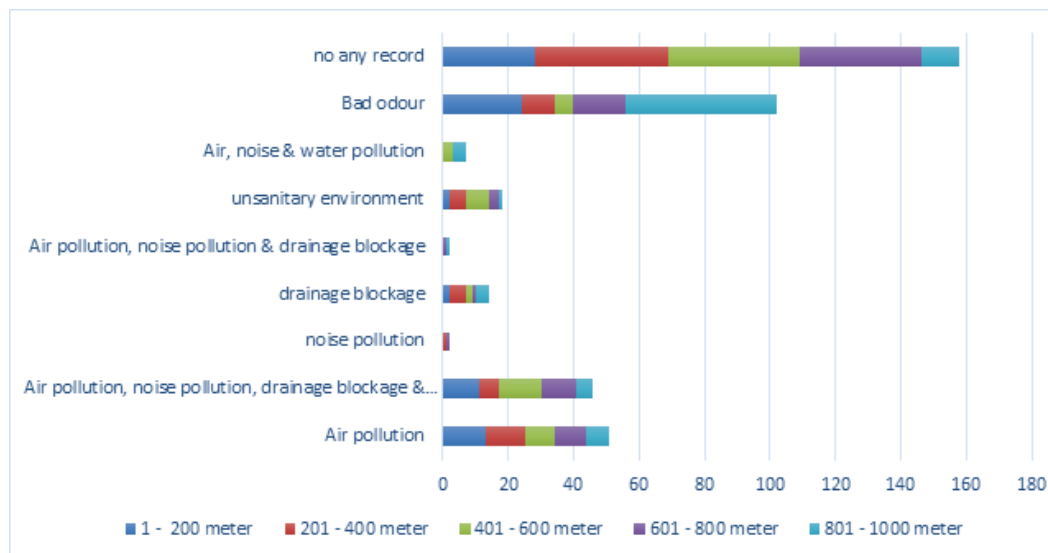
Photograph 1: Bone burning at Kofar Mazugal abattoir

Blockage of drainage

More so, another environmental problem recorded in the area where abattoir is located is drainage blockage especially around Kano main abattoir, Danbatta, Unguwa uku (Tarauni and Kumbotso) as well as Gezawa abattoirs (Figure 4). This problem may lead to flooding around the area. This is because most abattoirs in Kano sitting close to main drainage in the area for easy draining abattoir effluent into. This substantiates the findings of Dada *et al.*, (2020) which found that settlement closest to abattoir have blockage of gutter as the most recorded environmental hazard in Ibadan.

Noise Pollution

Few of the respondents living around abattoir slated that noise is another environmental menace especially those living around Kwankwaso, main Kano abattoir around Koki and Mazugal wards, Unguwa Uku (both abattoirs Tarauni and Kumbotso local government area) (Figure 4). This validated the result of Abdullahi *et al.* (2016); Ahmad *et.al*, (2021) which says that noise pollution is common environmental problems around abattoirs in Malaysia and Kano metropolitan.



Source: Field observation, 2020

Figure 4: Showing major environmental problem in relation to distance

CONCLUSION AND RECOMMENDATIONS

From this study, it is revealed that there are both positive and negative effects of abattoir set by locating abattoir in an area, but the negative effects outweigh its positive ones. So, the most negative effects set by abattoir to the proximity people are environmental followed by economic and social effects. Among the environmental problems, bad smell is found to be worst in the area as compare to other environmental effects. The study concluded that most of the people living close to abattoir are fall under poverty level with moderate level of higher education. The recommendations are suggested as follow:

1. Appropriate planning should be put in place to avoid influx of people close to abattoir or establish new abattoir close to residential area.
2. Proper drainage and modern methods of abattoir solid waste management should be designed
3. Regular sanitation should be adopted to avoid dumping of ASW at abattoir premises which might disturb people living close to abattoir.
4. Research center should be established to deeply investigate the environmental and socioeconomic benefits of ASW apart from the one identified by this research work.

CONTRIBUTIONS

Ahmad Said Abubakar formulate research topic and review the related literature on the subject matter while Nura Isyaku Bello help in data collection, data analysis and general editing of the article

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