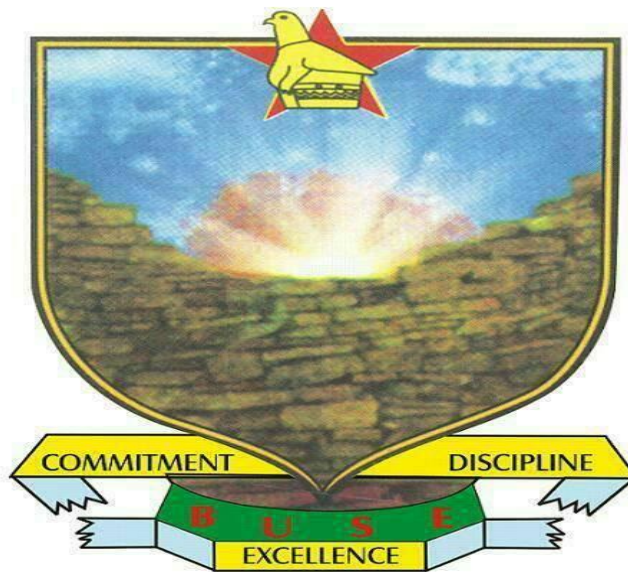**BINDURA UNIVERSITY OF SCIENCE EDUCATION**

FACULTY OF AGRICULTURE AND ENVIRONMENTAL SCIENCE

DEPARTMENT OF ENVIRONMENTAL SCIENCE

ASSESSING THE OCCUPATIONAL, SAFETY AND HEALTH HAZARDS ASSOCIATED WITH LARGE SCALE PIG FARMING. A CASE STUDY AT TRIPPLE C PIGS

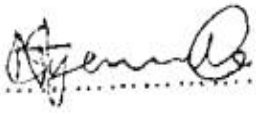

TAKUNDA S NYAMANDE

B192048B

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS OF A BACHELOR OF ENVIRONMENTAL SCIENCE HONOURS DEGREE IN SAFETY, HEALTH AND ENVIRONMENTAL MANAGEMENT

SUBMITTED: JUNE 2023

RELEASE FORM

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Project Title	:	Assessing the Occupational, Safety and Health Hazards associated with Large Scale Pig Farming. A Case Study at Tripple C Pigs

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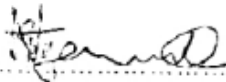
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DECLARATION

I Nyamande Takunda, do hereby declare that this research project report is my original work and it has not yet been submitted to any other examination body. No part of this research project should be produced without my consent or that of Bindura University of Science and Education.

Signature..

Date: 30-05-2023

DEDICATION

This project is dedicated to my mom and my dad for support and believing in me. God bless my family.

ACKNOWLEDGEMENT

ABSTRACT

The study aims to asses' occupational hazards associated with pig farming at Triple C Pigs by determining the characteristics of hazards and the effectiveness of control measures installed to curb the hazards. Observations, interviews and questionnaires were employed in the study to obtain information. Information on the characteristics of hazards and measures installed was obtained through field observations. Questionnaires were administered to a selected sample of employees working at Triple C Pigs using stratified random sampling technique, to explore occupational hazards at the company. Information on the effects of hazards found at Triple C Pigs was obtained from the SHEQ Officer and Clinic Sister through interviews. Data was analysed using Chi-squared tests contained in the Statistical Package for Social Sciences, (SPSS) version 20. Pearson's Chi-squared tests were used to analyse any relationship concerning common occupational hazards and age, any influence between causes of accidents and measures and relationship between workers age and effects from hazards. The findings of the study contributed to the existing literature on occupational hazards in the pig farming industry, and to inform policy and practice aimed at reducing the risk of occupational hazards for workers in this sector. By highlighting the potential health risks faced by workers in the pig farming industry, the study aims to promote greater awareness and understanding of the importance of occupational health and safety in this sector. Furthermore, the top 5 ranked hazards were identified which are physical injuries, machinery, chemical exposure, respirable dust and ergonomics. Findings revealed that these hazards are mainly contributing to the hazardous environment at the company. Suggested control measures for the findings include provision of training programs on safety protocols and best practices, regular employee health check-ups and improve excess to adequate PPE.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

SHE   Safety Health and Environment

CDC   Centre for Disease Control

MSDs   Musculoskeletal Diseases

PPE   Personal Protective Equipment

OSH   Occupational Safety and Health

dB   Decibels

ODTS   Organic Dust Toxic Syndrome

HIRA   Hazard Identification and Risk Assessment

ILO   International Labour Organisation

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Agricultural sector has its specific Occupational Health and Safety hazards encountered across the world (Kumie, et al., 2016). Large herds of pigs have been reared at small confined spaced land which has caused increment in occupational health and safety hazards in many countries, (Edwards el at, 2006). Industrial accidents are problematic in nature (Hämäläinen , Takala, & Saarela, 2006) and most agricultural sectors have implemented reactive monitoring which address hazards after an accident. Corrective measures are implemented at the company but still accidents are occurring. However, assessment of occupational hazards will help to identify effects and to curb repetitive occurrences of accidents.

Large or small industries identify hazards associated with the company's operations in pig farms using different types of methods. Occupational hazards have caused a third of accidents that resulted at workplaces (ILO, 2010). Moreover, deep research is needed to be conducted on risks, hazards and the importance of safe keeping employees in the course of conducting work in farms. The Factories and Works Act of 1976 has 8 regulations, which are (RGN 262), (RGN 263), (RGN264), (RGN 278), (RGN 279), (RGN 302), (RGN 303), and (RGN 304), to effectively address and control occupational hazards.

In the United States animal production has increased (Miltoehner, 2008) hence; the increase ratio of animal to worker changes the mechanisation which causes exposure to hazards. One hundredth and ninety six thousand (43.3%) LTIs were recorded in industries of United States and most of the injuries took place at beef, pork and sheep farms in 2007 (Miltoehner, 2008). Lacerations injuries caused by machinery were at 21.3% and pig run-over injuries at 20% in United States of America (Miltoehner, 2008). Doing tasks in a rush and reckless way in pig farms was observed as one of the cause of injuries to workers in farms (Kallioniemi , Raussi, Rautiainen, & Kymalainen, 2011).

Triple C Pigs rears pigs and supplies to Colcom foods. There are hazardous environments at the company on which employees are exposed to. Mitigation

measures are implemented to reduce incidents and accidents from occurring but they are still occurring. The company is certified to ISO 45001:2018 which safeguard all the employees from accidents. Along every stage of the process continual improvement is considered at Triple C Pigs. Proactive monitoring measures are then adhered at the company to protect employees before accidents occur (Hallowell, Hinze, Baud, & Wehle, 2013). Investigation of accidents will help to identify the immediate root cause of accidents. The study aims to assess hazards which are found in workplaces at Triple C Pigs.

1.2 Problem statement

Workplace hazards are the obstacle to achieve zero harm at Triple C Pigs. The company has implemented Occupational Health and Safety Management System and Procedures that curb incidents from becoming accidents at Triple C Pigs. From 2011 to 2016 three hundred and twenty cases of accident were recorded and from 2017 to 2022 three hundred and fifty cases of accidents were also recorded, and the rate of accidents increases from 1 to 1.09375 every year. Due to the recorded increase of accident cases, the need to investigate on the hazards at Triple C that led to accidents arises.

1.3 AIM

To assess workplace hazards at Triple C Pigs farm.

1.4 Research Objectives

1. To determine main hazards at the company

2. To determine employees' perceptions after exposed to hazards at Triple C Pigs farm

3. To examine effectiveness of mitigation measures which curb the hazards at Triple C Pigs

1.5 Research Questions

1. What are characteristics of hazards at Triple C Pigs?

2. What are the chronic and acute effects of exposure to hazards at Triple C Pigs?

3. How effective are the implemented measures at Triple C Pigs?

1.6 Justification of the Study

Health effects after exposure to animal rearing farms were found to be increasing in farms in the United State of America (Miltoehner, 2008). Loopholes in the Occupational Health and Safety Management Systems and work procedures are both targeted. The study will assist the company to identify significant hazards and effects to improve Safety systems and prevent re-occurrences. Reduced number of Lost Time Injuries will increase productivity and reduce cost due to medical aid given to the injured. Implementing improved factors in the Occupational Health and Safety Management Systems will result in a completely changed stakeholder safety culture at Triple C Pigs.

CHAPTER 2: LITERATURE REVIEW

2.1 Occupational Hazards associated with pig farming

This section of the study covers major hazards in large Pig farms and their effects after exposure. The effects can be classified as chronic and acute. Furthermore, it reviews how the Occupational Health and Safety legislation in Zimbabwe has addressed hazards and their effects. Hazards found in pig farms include noise, machinery, chemical hazards, respiratory hazards and fatigue.

2.1.1 Noise

About 10% of the pig farmers are exposed to noise levels that exceeds 85 dB (Fallon Jr, 2006). These thresholds values are not to be reached at workplaces since they lead to adverse effects and produce loses or bad image to the company. This study is carried out to see if threshold levels are breached in conducting work at the premises. Most farms have equipment which are categorized into farm vehicles, conditions regulators and farm animals (Kifle A & Atilaw , 2016). Tractors produce noise which exceed 100 dB especially old-models (Fallon Jr, 2006). Large herds of pigs are capable of producing noise which exceeds threshold levels (Parker , et al., 2010). Other researchers argued that hearing loss cases are higher in Agriculture (Themann & Masterson, 2019). Exposure effects manifest at early stages in humans (Ehlers , Connon, Themann, Myers, & Ballard, 1993) and these exposures recorded 15% to 20% students have partial hearing loss.

2.1.2 Machinery

Reckless operation of agriculture machinery is the leading cause of deadly injuries in farms in Africa (Das, 2014) hence, has caused 18% injuries in workplaces (Dimich-Ward, Guernsey, Rennie, & Hartling, 2004). Sixth nine percent deaths from 1980 to 1985 were caused by farm tractor and contributed to 2,216 work related death in farms in Africa (Etherton , Myers, Jensen, Russell, & Braddee, 1991). Most accidents were caused by human interactions with farm-vehicles, roll-overs and agriculture machinery in farms (Ehlers , Connon, Themann, Myers, & Ballard, 1993). Yearly about 18% entanglements occur and only notification injuries were recorded (Ehlers , Connon, Themann, Myers, & Ballard, 1993). Yearly, about 115 fatal cases are linked

with agriculture transportation activities which are crushes on public roadways and 10% of these deaths are from agriculture mobile equipment (Ayob, Shaari, Zaki, & Munaaim, 2018).

2.1.3 Chemical Hazards

Workmen in farm activities are engaged with aspects and impacts which left them vulnerable health-wise (Maczulak, 2009). Chemical agents in farming include all pesticides are causing bad health effects to employees in farms in Africa (Maczulak, 2009). When chemical exposure at farms was above threshold value, neurobehavioral changes were discovered on workers and on their families in farms in Africa (London, Beseler, C., Bouchard, Belinger, & Colosio, 2012). Chemical exposures have acute effects and pesticides cases are more familiarized in agriculture workmen and effects are usually not recognized (Gilbert, 2004). Most exposures to farm chemicals result from spillages when conducting operational activities that are done manually for example, harvesting. Exposure to chemicals are more experienced due to factors which include, eating, skin contact, wearing of clothes which have been exposed, aerosols breathing and touching mouths when smoking.

2.1.4 Respiratory Hazards

Dust effects on humans are relative to types and size of dust particles and distance from the source (Torres, 2022). Particles of size 2.5 micrometers are able to reach human respiratory vital organs responsible for breathing making gaseous exchange difficult (Wang , et al., 2022) however, stock-feeds cause dust particles which are less than 10 micrometers in diameter. Chemicals, gases and dust cause most respiratory hazards (Linaker, 2002). In Brazil, respiratory incident cases are about 84, 3% and 5.1% bronchitis (Costa, Teixeira, & Freitas). Animal fibre, insects and plants contribute to organic dust and other micro-organisms (Linaker, 2002). The prevalence of ODTS is not known and aerosols exposure is another hazard (Ehlers , Connon, Themann, Myers, & Ballard, 1993) and their sources include manure pits, running machinery, welding and silos.

2.1.5 Fatigue

Manual handling of machinery and carrying a load on the head or shoulder at work in farms in Africa is known to be the cause of fatigue in workers (Cecchini, et al.2017) Lifting, pushing and pulling heavy loads has been known to lead to lower back-pain in workers. Manual handling and repetitive activities are most common in pig farms for example in Brazil country sides (Costa, Teixeira, & Freitas, 2007). These activities include, manual handling, teeth trimming, tail cutting and they cause ergonomics hazards (Silveira, 2005). In USA pig farming is impeded manually and is mostly done by migrants (Omoniyi, Trask, Milosavljevic, & Thamsuwan, 2020) and their daily tasks include, manual feeding, clipping pig's teeth and tags, castrating and washing pig houses. Furthermore, 31% of migrants lift or move pigs (Amy L. Hafer, 2006) and they reported that they are suffering from back-pains.

2.2 Occupational Safety and Health Laws in Zimbabwe

These are regulations or laws that are set by the government in order to manage occupational hazards and risks at workplaces in Zimbabwe. Failing to comply to these regulations will lead to penalties or fine given to those who breach the laws.

2.2.1 NSSA Act

The Act is mandated in Zimbabwe to cater for social security. Based on the idea of social solidarity and risk sharing, it consists of using savings from the period of unemployment, old age, disability and death. Pension and the accident prevention schemes are the most important programs. They regulate accident prevention at work and are covered through NSSA.

Workers are provided safety measures in different languages so that measures are understood clearly by each individual in compliance with NSSA of 1990. It requires employees to comply with all programs done at work which aids their safety.

2.2.2 Factories and Works Act

Fatal accidents are reported together with major injuries before three days or if machinery is involved. It is against the law not to notify the inspector about re-portable incidents. The benefits of obeying the law outweigh the costs of not complying. Anyone in the working premise must be aware of the law and the 8 provisions contained within. Provisions include general regulations (263 of 1976) which states that the employer must provide and maintain, free of charge, the

appropriate protective clothing and equipment that the employees may require. These include headgear, eye protection, gloves, footwear and work-suits which are approved by inspector to be adequate. Equipment for any worker who is exposed to moisture or dust, cold or heat or toxic substances should be provided with protective clothing as a part to control working conditions in factories.

2.2.3 Pneumoconiosis (15.08) Act of 1971

The Act mention problems and it manages and regulates working in dusty environments. It also prohibits the employment of people with pneumoconiosis to work in dusty areas. It is an offense to employ someone who has pneumoconiosis to work in dusty workplaces.

2.3 Hierarchy control of Hazards

Hazard identification is the first step which identifies all potential hazards associated with large-scale pig farming. This can be done through a combination of literature review, observation of the farm, and interviewing workers (Suhardi, Laksono, Rohani, & Ching, 2018). Risk assessment is the second stage, to hazard identification; followed by risk ranking. To archive the process objective methods are used (Suhardi, Laksono, Rohani, & Ching, 2018). The final step is hazard control, once hazards are identified and assessed controls are implemented as shown in figure 2.1.
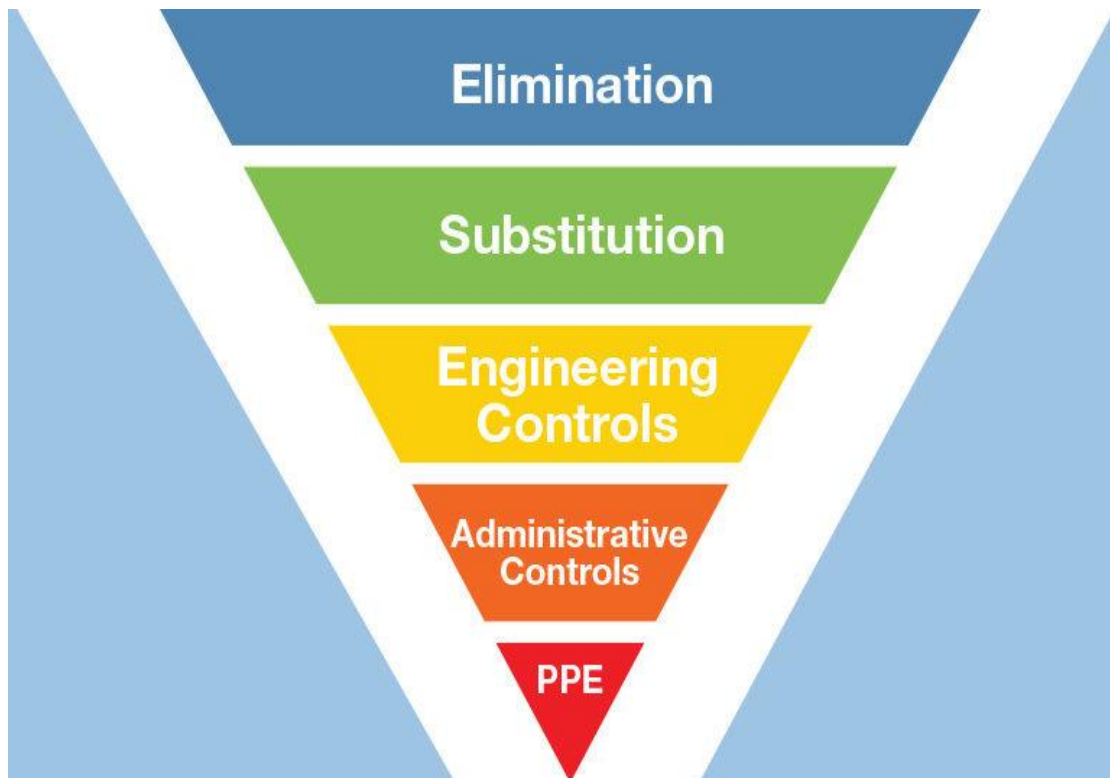
Figure 2. 1: Hierarchy of Control

1. **Elimination:** Removes the source of hazard
2. **Substitution:** Replacement of a hazardous material or equipment
3. **Engineering controls:** Involves altering the source of the hazards using guarding methods.
4. **Administrative controls:** These include training or observations and these are installed for employees by employers.
5. **Personal protective equipment (PPE):** Least measure which cannot be implemented alone.

CHAPETR 3: METHODOLOGY

3.1 Description of the study area

The study area is Triple C Pigs Company and it is located in Norton Mashonaland West Province, 49km from Harare Zimbabwe. The location is 1340m above sea level (altitude) with coordinates 30.64106º East and 17.95010º South as shown in figure 3.1. The main goal of this company is pig farming for pork production. Pig slaughtering is done at Colcom Foods which manufacture different products such as sausages and pie. The company has over 332 total employees at sites which include Main-site; Grower; Weaner; Mill and Workshop and Maintenance.
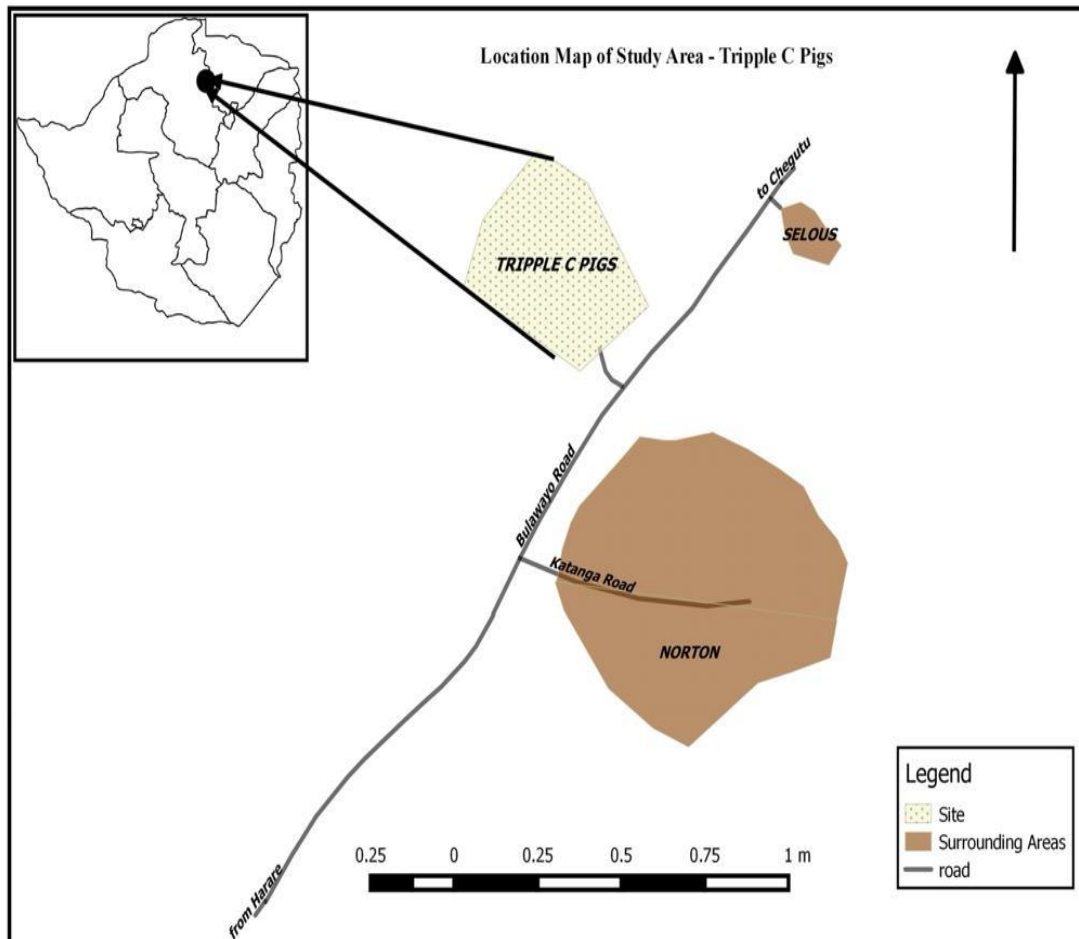
Figure 3. 1: Study area at Triple C Pigs

3.2 Research design

Cross-sectional descriptive study was done using questionnaire, interview and field observation which involves collecting data from selected employees at Triple C Pigs, in order to analyse and assess health hazards at the farm. A cross-sectional study is designed to bring participants' view in form of data at specific time. It reviews participants' points which are not voiced out in decision making.

3.3 Study Population and Sampling

The study population comprised of 332 workers employed at Triple C Pigs farm. Stratified random sampling was adopted to select participants in the following strata: Main Site, Grower, Weaner, Mill, and Workshop and Maintenance. Only two departmental managers were selected for interviews which are Clinic and Safety Health and Environmental departments' respondents from the study population because there are the ones' that assist anyone who have been exposed to health hazards at the company. The population was categorized into five distinct strata based on their departments, namely Main Site, Grower, Weaner, Mill, and Workshop and Maintenance. Stratified random sampling was employed to minimize the likelihood of systematic errors as every individual in the stratum had an equal opportunity to participate.

3.3.1 Sample size[i]

Both men and women were involved in the sample to ensure fair participation through the departments. Rule of thumb was used in calculation of the sample size (Chen, 2019). The rule is a representative of the population which comprises of 10% from each selected departments (see table 3.1 below).

Table 3. 1: Sample sizes for the questionnaire respondents

Department	Total Number of Employees	Sample Size
Main site	60	6
Grower	45	5
Weaner	35	4

| Mill | 105 | 11 |
| Workshop and Maintenance | 20 | 2 |

3.4 Research instruments

Three instruments were used to carry out the study which include interviews, questionnaire and field observations.

3.4.1 Closed-ended questionnaire

The questionnaire gather data about occupational safety and health hazards, effects of exposure to hazards, personal protective equipment offered and implemented measures at Triple C Pigs. The questionnaires were given to workers from Main-site, Grower, Weaner, Mill and Workshop and Maintenance. Questionnaires helped in finding effects of exposure to hazards and identify measures that curb hazards in workplaces at Triple C Pigs. Participants in the study were told that their responses will be kept confidential. The data was collected when they have finished filling their responses in the research questionnaire (see research questionnaire in Appendix 1).

3.4.2 Interviews

In order to have full information on health hazards at Triple C Pigs, the management members were targeted to give the main characteristics of the top five ranked hazards through interviewing them (see interview guide in Appendix 2). The Clinic and Safety Health and Environment departments were selected because they deal with all Occupational Health and Safety systems and with disease prevalence at Triple C Pigs. Thirty minutes interviews were conducted in-person to the SHEQ Officer and Clinic sister.

3.4.3 Field Observation

Field observation is an approach to research that involves observing and documenting the activities and behaviors of participants in their natural surroundings (Queirós ,

Faria, & Almeida, 2017). This study employed field observation to identify and record the occupational safety and health hazards linked to large-scale pig farming at Triple C pigs from 2022 to 2023. The hazards and risks in pig farming will be observed and pinpointed. A structured observation checklist (see observation checklist in Appendix 3) will be used to guide the field observation process. It was designed based on the review of literature and feedback from occupational safety and health experts.

3.5 Data analysis and presentation

Data analysis involves the use of logical thinking to comprehend the available data, identify recurring patterns, and provide a summary (Ball, 1965). Data was analyzed using Chi-squared tests contained in the Statistical Package for Social Sciences, (SPSS) version 20. Pearson's Chi-squared tests were used to analyse:

i. Any relationship concerning common occupational hazards and age.
ii. Any influence between causes of accidents and measures effectiveness.
iii. Relationship between workers age and effects from hazards.

Findings were presented in tables and graphs drawn using both descriptive statistics from SPSS package and Microsoft excel.

3.6 Ethical considerations

The study was approved by Bindura University of Science Education through the Department of Environmental Science. The permission to study was granted in writing from the Human Resource at Triple C Pigs. Ethical considerations were adhered in this study (Arifin, 2018). These ethical principles included obtaining informed consent from participants, maintaining confidentiality, considering risks and benefits, addressing participant vulnerability, avoiding conflicts of interest, being culturally sensitive, ensure the integrity of the study and protect the participants' welfare. These ethical principles were considered, addressed and participants were informed verbally about the study's purpose and their rights as participants. Participants volunteered and were free to withdraw at any point in the research. Information from the research was confidential and solely purposed for educational use only.

CHAPTER FOUR: RESULTS

4.1 Characteristics of Hazards at Triple C Pigs

The reviewed records from questionnaires, interview and field observation at Triple C Pigs from period (2017 to 2022), shows that workers in the age group 18-25 indicated that noise hazard has the highest number of hazards (8) at the company, followed by age group 26-35 which indicated that number of hazards (6) were caused by respiratory dust exposure and age group 36-45 indicated that ergonomics (musculoskeletal) hazard has the third highest number of hazards (3) which is shown in figure 4.1.
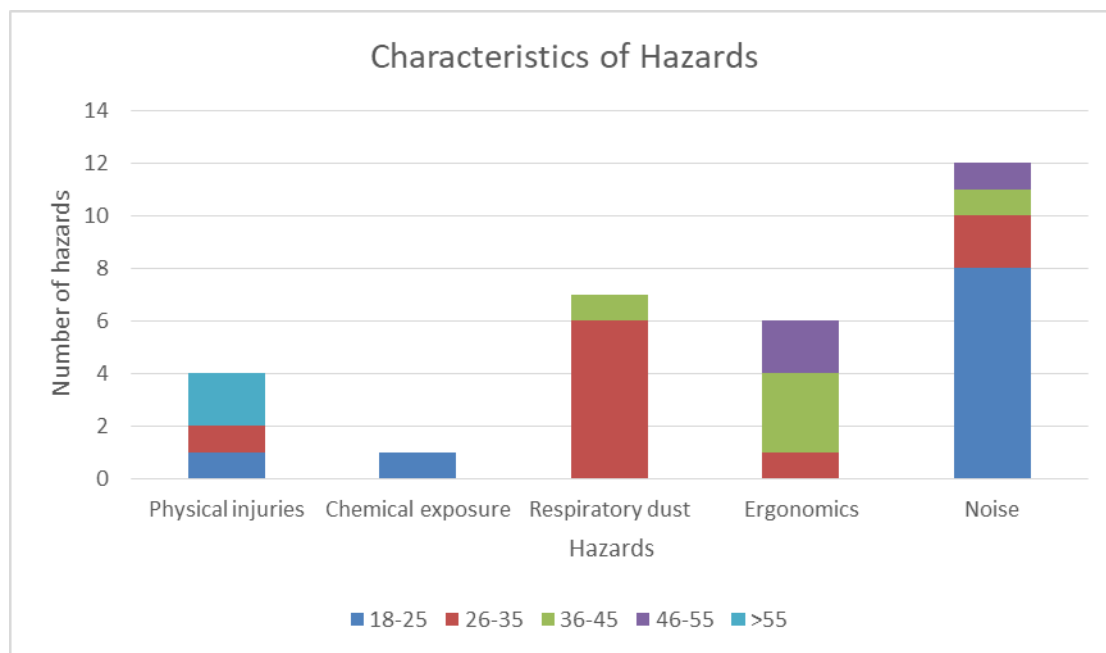
Figure 4. 1: Hazard effects analysis by Age

The analysis of hazard exposures showed that there is a significant difference (p<0.05) between the most exposed age groups mentioned above and other age groups which include 46-55 and >55 (see Probit Regression Results on hazards in appendix 4).

4.2 Analysis of exposure effects by hazards

The analysis of effects which arise from 5 hazards groups in figure 4.1, shows that number of hazards (4) result in physical injuries such as lower back pain to workers in the age groups: 18-25, 26-35 and >55. Employees in the age group 26-35 have the highest number of hazards in the respiratory dust category as shown in figure 4.1. Number of hazards (8) result from noise and affect workers in the age group >55. The analysis of effects arising from exposure to hazards showed that there is no significant difference ($p > 0.05$) between effects from hazards exposure with age (see Probit Regression Results on effects of hazards in appendix 5).

4.3 Employees' perceptions on mitigation measures at Triple C Pigs

The analysis of mitigation measures which are installed to curb accidents at working places shows that, 11 employees see them as less effective, 18 employees value them as moderate and 1 employee see them as effective as shown in figure 4.2.
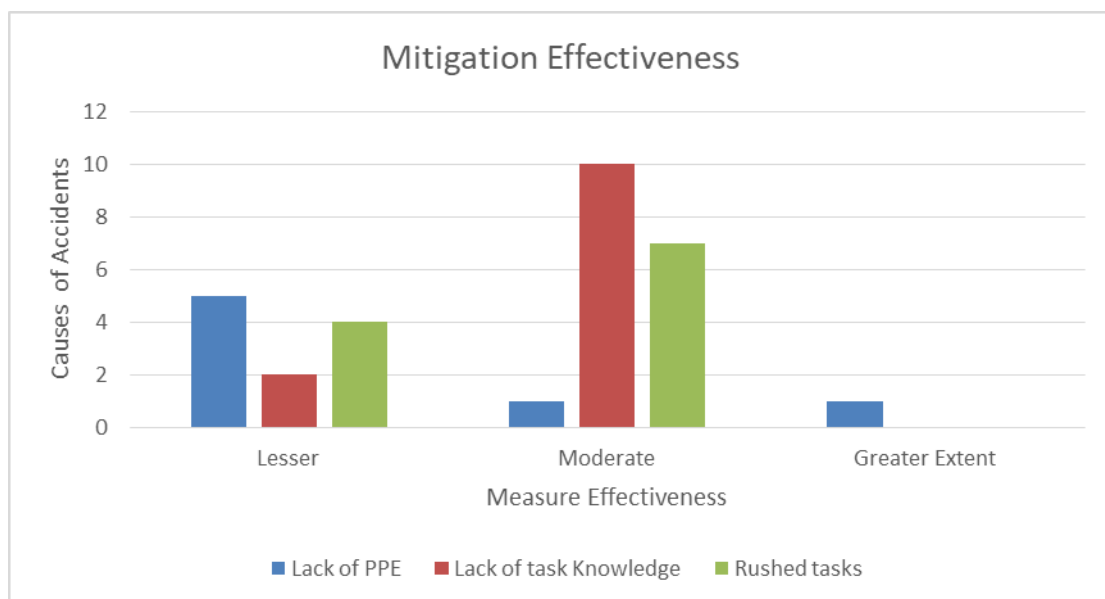

Figure 4. 2: Mitigation measures by effectiveness

The analysis of measures and their effectiveness showed that, there is significant difference ($p < 0.05$) between causes of accidents and measures installed at Triple C Pigs (see Probit Regression Results on measures effective in appendix 6).

CHAPTER FIVE: DISCUSSION

5.1 Characteristics of Hazards at Triple C Pigs

The discussion of results in this section is based on the analysis of the results of health hazards at Triple C Pigs. The results determine the characteristics of hazards at Triple C Pigs. Furthermore, the results help in identifying measures to reduce or eliminate hazards at Triple C Pigs.

5.1.1 Noise

Noise exposures constituted to a largest proportion in health hazards that employees are exposed to at Triple C Pigs (see Figure 4.1). This may be due to reckless use of equipment and vehicles which may lead to injuries and infections from pigs at the premises. This is also supported by (Donham, 2017), noise levels in production facilities are usually extremely high resulting in gradual hearing loss. Noise sources at Triple C pigs are: processing mills and other machinery which may cause harm in the working environment (Mijinyawa and Chuwufumnanya, 2012). Noise levels produced in feed mills is above 115 dB at Triple C pigs.

5.1.2 Dust

Respiratory dust reflected to be the second largest proportion hazard that employees are exposed to, at Triple C pigs. This is because stock-feed and heavy vehicles operation releases heavy mass of dust particles into the air. The regular movement of the ingredients from stock-feeds cause air pollution in working environment resulting in silicosis in humans (Sharma, Maind, Kelkar, Knox, & Bhalerao, 2013).

5.1.3 Ergonomics

Musculoskeletal disorders contributed the third largest proportion hazard that employees are exposed to, at Triple C Pigs. This is due to the manual hard tasks such as offloading feed ingredients, loading feed bins and physically handling dead pig carcasses for disposal (Weerdmeester, 2001). Ergonomics risk arises when there is lack of machinery and over-reliance on manpower. Exposure to musculoskeletal disorders results when employees are engaged in hard work that is above legal limits for example, when lifting feed-stocks sacks above 50kgs.

5.2 Analysis of exposure effects by hazards

This section focus on the analysis of effects such as hearing loss, lower back pain and eye irritation which result from hazards exposure.

5.2.1 Hearing Loss

The study reviewed that hearing loss is highly affecting employees at Triple C Pigs (see Figure 4.2). It resulted from the noise of heavy equipment's, vehicles and pigs which produce noise exceed 85dB at the company. This is also supported by (Chirwa, Mlatotho, 2019), milling machinery was measured and noise levels were above the maximum permissible amount of 90 decibels and such exposure over time makes employees prone to suffer from induced hearing loss. Interviews showed that noise most come from machines in the workshop department at Tripe C.

5.2.2 Lower Back pain

Results from the study in figure 4.2 showed that back pain is the second largest effect to employees at Triple C Pigs (see Figure 4.2). Employees at the company are engaged in manual work and repetitive tasks at the mill and pig sites which cause back pain. There are no auto feeders at the sites, the only option of feeding require hard human labour which cause back pain. Two employees in the age group 46-55 shown in figure 4.2 indicated that major sources of these lower-back pains are from work which is done manually for example, lifting more than 50 kilograms of stock feed. This is supported by (Osborne, et al., 2012), who obtained 57% back pains in Swedish commercial pig farms in 2012. Furthermore, four employees in figure 4.2 in the age group 18-25, pointed out that carrying heavy load results in lower-back pains to employees carrying them.

5.2.3 Eye Irritation

An analysis on effects from hazards indicates that eye irritation contributed the third largest effect to employees at Triple C Pigs (see Figure 4.2). In addition, the effects may be due to feed-dust which mainly came from mixing feeds and cause irritation of eyes. Feed-dust concentrations lead to blurred vision and chronic effects for example, conjunctivitis, which results to watery eyes (Sharma, Maind, Kelkar, Knox, & Bhalerao, 2013) and this can affect one's vision.

5.3 Analysis of Mitigation measure by causes of accidents at Triple C Pigs

Lack of task knowledge and lack of personal protective equipment are the main causes of accidents at Triple C Pigs.

5.3.1 Lack of task knowledge

Lack of knowledge has the largest proportion because most uneducated employees are affected by occupational hazards at Triple C Pigs (see Figure 4.2). There is poor culture towards the use of Standard Operating Procedure (SOP) at the company.

(Bush, 2021) defines SOP as written guidelines outlining how a specific task is done. At Triple C Pigs machine training and procedure training are conducted regularly in order to educate workers on how to use machinery safely. Furthermore, SOPs aims to engage employees into safe working culture and practices that maintain a safe environment. SOPs at Triple C pigs are more detailed on occupational safety and health to minimize hazards impacts.

5.3.2 Lack of PPE

Lack of personal protective equipment (PPE) contributed the second largest proportion as a result of accidents to employees at Triple C Pigs (see Figure 4.2). This may be due to inadequate PPE provision by the management and improper use by the employees at the company. This is also supported by (Danaj and Zolyomi, 2019), some of the companies do not educate employees to wear protective equipment at workplace and most of their employees are injured at work due to lack of protective clothing such as safety shoes. Furthermore, adequate PPE provision is the least measure at Triple C Pigs to mitigate impacts of OSH hazards. Despite that it is the least measure, SHE representatives and SHE officer pointed out that some employees end up not receiving PPE. Protective clothing provided at Triple C pigs includes: work suits, gumshoes and dust muffs. The protective clothing protects the employee from direct exposure to health hazards for example; gumboots reduce chances of trip and fall while working in pig slippery houses.

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

6.1 Conclusions

The research was successfully done and it pin out the top ranked hazards that are found at Triple C Pigs. These hazards include physical injuries, respiratory dusts, machinery, chemical exposures and ergonomics. The occupational hazards associated with pig farming are significant and can have several consequences on the health and well-being of employees. The effects of these hazards to employees were identified and analysed. These effects include, hearing loss, eye irritation, cuts and lower back pain. Effects of the hazards found at Triple C Pigs are hearing loss from excessive noise rising from heavy machinery and pigs and eye irritation from the feed dust. Furthermore, measures that are installed at Triple C Pigs to curb the effects of hazards associated were identified. These measures include machinery training, Standard Operating Procedure training, provision of Personal Protective Equipment to mention a few. However, the control measures are moderately effective in controlling hazards at the company. Factors and variables above should be addressed to curb accidents occurrences at Triple C Pigs.

6.2 Recommendations

Based on the results in the study, the top five hazards at Triple C Pigs were identified. Mitigation to hazards are discussed below:

1. The company should provide training programs more frequent for employees on safety protocols and best practices during all process.
2. Ensure that every employee has access to adequate PPE that address specific hazards at specific working environment.
3. Triple C Pigs should conduct regular health check-ups for employees who are exposed to hazardous environments for example workers who works in dusty areas should be regularly checked for pneumoconiosis.
4. The company should implement engineering controls such as improving ventilation to reduce the risk of respiratory problems for instance the Mill ventilation systems should be improved to protect employees on the risk of feed dust.

5. Administrative control is another important measure that should be adhered for example job rotations which reduce the exposure time of employees to hazards at Triple C Pigs.

6. Triple C Pigs is recommended to penalize using fines to employees who breach the safety protocols at the company for example failing to proper use or wearing PPE if provided.

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APPENDICIES
APPENDIX 1: RESEARCH QUESTIONNAIRE

Questionnaire No.

BINDURA UNIVERSITY OF SCIENCE EDUCATION

DEPARTMENT OF ENVIRONMENTAL SCIENCE

RESEARCH QUESTIONNAIRE

Department: …………………………………….…… Date: ………………….…..

Introduction

I am **TAKUNDA NYAMANDE,** a fourth-year undergraduate student from Bindura University of Science Education's Department of Environment Science. My research project is tittled "*Assesing the Occupational Safety and Health hazards associated with pig farming. A case study at Triple C Pigs.*

The aim of this study is to identify the occupational safety and health hazards that workers may be exposed to and to evaluate the measures in place to mitigate these hazards.

Your participation is simply by responding to the questionnaire. I promise to maintain confidentiality and anonymity for the information shared. You are free to end your participation if you feel you can no longer continue at any time of the interview. Information shared will only be used for academic purposes without tracing it back to you. No names shall be used. I shall assist in filling out the questionnaire. Your cooperation is greatly appreciated.

By agreeing to participate in the study I will assume you have understood it and thus given your informed consent. The questionnaire will take about 15 minutes to answer.

INSTRUCTIONS

Indicate the number corresponding to your response by ticking it.

SECTION A: DEMOGRAPHIC DATA

1. Gender   **1**. Male   **2**. Female

2. Age group (years)   **1**. 18 - 25   **2**. 26 - 35   **3**. 36 - 45   **4**. 46 - 55   **5**. > 55

3. Marital status   **1**. Married   **2**. Widowed   **3**. Divorced   **4**. Never married

4. Religion   **1**. Christian   **2**. Traditional   **3**. Moslem   **4**. Other

   If other, please specify
   ……………………………………………………………………………….

5. Highest educational level attained   **1.** None formal   **2**. Primary   **3**. Secondary   **4**. Tertiary

6. How many years of experience do you have in the pig farming industry?

1. Less than 1 year

2. 1-5 years

3. 6-10 years

4. 11-15 years

5. More than 15 years

SECTION B: Safety and health hazards

7. Have you ever experienced any of the following occupational hazards in your work on a pig farm? (Select all that apply)

1. Physical injuries (cuts, bruises, fractures, etc.)

2. Chemical exposure (pesticides, disinfectants, etc.)

3. Respiratory problems (asthma, bronchitis, etc.)

4. Musculoskeletal disorders (back pain, joint pain, etc.)

5. Noise exposure

6. Being stepped by pigs

7. Other

   If other, please specify

………………………………………………………………………

8. In your opinion, which of the following occupational hazards are the most common in the pig farming industry? (Select up to three)

1. Physical injuries

2. Chemical exposure

3. Respiratory problems

4. Musculoskeletal disorders

5. Noise exposure

6. Other

If other, please specify …………………………………………………………………………

9. What are the main causes of accidents in your department?

1. Lack of PPE

2. Lack of knowledge of the task/job

3. Rushed tasks

4. Other

If other, please specify …………………………………………………………………………

10. What measures are currently in place on your farm to prevent occupational hazards from occurring? (Select all that apply)

1. Personal protective equipment (PPE)

2. Safety protocols and training programs

3. Regular equipment maintenance and repair

4. Regular health check-ups for workers

11. Have you received any training on how to prevent or deal with occupational hazards?

1. Yes

2. No

12. If yes, please indicate the type of training you have received. (Select all that apply)

1. PPE use and maintenance

2. Chemical handling and storage

3. Safe equipment operation

4. First aid and emergency response

13.To what extent have these measures been effective in addressing the impacts of occupational safety and health hazards within your department?

   1. Lesser   2. Moderate

3. To a greater extent

14. What are the challenges being faced in implementing these measures?

1. Low commitment by management

2. Training intervals widely spaced

3. Lack of Commitment by employees

SECTION C: Recommendations

15. In your opinion, what steps could be taken to improve the safety and health conditions of pig farming workers? (Select all that apply)

1. Improved training programs

2. More safety and health regulations

3. Improved access to personal protective equipment

4. Better waste management and disposal systems

5. Improved ventilation and air quality control

6. Other

If other, please specify ………………………………………………………………………….

16. What resources would be helpful in implementing these recommendations? (Select all that apply)

1. Funding for equipment and infrastructure improvements

2. Technical assistance from industry experts

3. Access to educational materials and training programs

4. Government support and incentives

5. Other

If other, please specify …………………………………………………………………………

APPENDIX 2: INTERVIEW GUIDE

BINDURA UNIVERSITY OF SCIENCE EDUCATION

DEPARTMENT OF ENVIRONMENTAL SCIENCE

RESEARCH: INTERVIEW GUIDE

Department: …………………………………….……   Date: ……………………..

My name is Takunda Nyamande and I'm conducting research on the *ASSESSING THE OCCUPATIONAL, SAFETY AND HEALTH HAZARDS ASSOCIATED WITH LARGE SCALE PIG FARMING AT TRIPLE C PIGS.* This project is part of my studies, and I would appreciate your honest answers. Please be assured that any information you provide will be kept confidential. Thank you for taking the time to meet with me today.

Demographic data

A. Gender

1. Male   2. Female

B. Age

1. Below 25   2. 26-40   3. Above 40

3. Work experience (Years)

1. $5\leq$ 2. 5 – 15   3. ≥15

4. Department:

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INTERVIEWEE AND QUESTIONS ASKED

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SHEQ OFFICER

1. What are the characteristics of hazards at Triple C?

    1. Noise
    2. Chemicals
    3. Machinery
    4. Dust
    5. Stepped by Pigs
    6. Others

    If other, please specify

    …………………………………………………………………………

2. Are there any initiatives that you carry as SHEQ Officer at the company?

    1. Monthly SHEQ meetings
    2. SHEQ NSSA board meetings
    3. First-Aid Trainings
    4. Machinery pre-checks trainings
    5. Production Meetings
    6. Others

    If other, please specify

    …………………………………………………………………………

3. As a management representative do you think you are doing enough in terms of OHS?.

1. Yes
2. No

If NO, please specify

………………………………………………………………………….

CLINIC SISTER

1. What are the main occupational hazards at this company, from your own point of view?
    1. Noise
    2. Dust
    3. Chemicals
    4. Machinery
    5. Stepped by Pigs
    6. Others

If other, please specify……………………………………………………………………….

2. What are common injuries that are recorded at your office faced by many workers?
    1. Cut
    2. Sprain/strain
    3. Fracture
    4. Dislocation
    5. Amputation
    6. Contusion
    7. Foreign body
    8. Others

If other, please specify …………………………………………………………………………………

3. How often occupational injuries occur?
    1. Daily
    2. Weekly
    3. Monthly
    4. Quarterly
    5. Occasionally

SHEQ REPRESENTATIVE

1. As a SHEQ representative, what is your view concerning characteristics of hazards at this company?
    1. Noise
    2. Dust
    3. Chemicals
    4. Machinery
    5. Stepped by Pigs
    6. Others

    If other, please specify

    ……………………………………………………………………………

2. Do you think management is doing enough to safeguard employees at the company?
    1. Yes
    2. No

If NO, please specify …………………………………………………………………………………

3. What should be done in your own view to mitigate hazards?
    1. Trainings
    2. Induction
    3. SOPs
    4. Use of MSDS
    5. Signage

6. Adequate PPE

7. Others

If other, please specify

……………………………………………………………………………….

APPENDIX 3: Observation Guide

Score alternative: 1 low compliance, 2 medium compliance, 3 high compliance, 4 very high compliance

Item	Factor	Legal requirement	Score				Remark
			1	2	3	4	
1	Provision and wearing of PPE	RGN 262					
2	Step by step sequence of doing work	Factories and Works Act					
3	Measures installed in workplaces	RGN 302					
4	Observed hazards	Factories and Works Act					
5	Repetitive tasks	Ergonomics(REBA and RULA)					
6	Supervision	Factories and Works Act					

APPENDIX 4: Probit Regression Results on hazards

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	40.286[a]	16	.001
Likelihood Ratio	36.719	16	.002
N of Valid Cases	30		

The mean difference is significant at the 0.05 level.

APPENDIX 5:Probit Regression Results on effects of hazards

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	22.030[a]	16	.142
Likelihood Ratio	27.668	16	.035
Linear-by-Linear Association	.160	1	.690
N of Valid Cases	30		

The mean difference is significant at the 0.05 level.

APPENDIX 6: Probit Regression Results on measures effective

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.453[a]	4	.033
Likelihood Ratio	10.882	4	.028
N of Valid Cases	30		

The mean difference is significant at the 0.05 level.

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