IJEAST

INTERNATIONAL JOURNAL
OF ENGINEERING APPLIED SCIENCE
AND TECHNOLOGY

VOLUME : 10 ISSUE : 02 Print / Issue Publication Date: 11-Aug-2025

ISSN : 2455-2143

DOI : 10.33564/IJEAST.2025.v10i02.001

Indexed In

Google SCHOLAR OPEN ACCESS doi Crossref

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International Journal of Engineering Applied Sciences and Technology, 2025
Vol. 10, Issue 02, ISSN No. 2455-2143, Pages 01-08
Published Online June 2025 in IJEAST (http://www.ijeast.com)

AN ANALYSIS OF THE MAINTENANCE MANAGEMENT CHALLENGES OF GRAIN STORAGE FACILITIES IN ZAMBIA: A CASE OF THE FOOD RESERVE AGENCY (FRA)

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Abstract—**Maize is the main staple food in Zambia and it is produced seasonally. This entails that its storage must always be in the best possible condition for sustained supply all year round. Grain storage facilities in Zambia, managed primarily by the Food Reserve Agency (FRA), face a myriad of challenges that significantly impact the nation's ability to ensure food security. Among the major challenges being the lack of adequate financing for regular and structured maintenance. The article provides a succinct overview of the key challenges associated with grain storage facilities in Zambia, drawing on a variety of sources ranging from government reports to academic studies. Mixed methods approach, with explanatory case study were used as the main approach in this article. The scope of the study covered all the silos and twelve depots managed by the FRA across Zambia drawing study participants from within the FRA holding different portfolios that include marketing, standards and quality, warehousing, property management and monitoring and evaluation.**

The main results of the study show that one of the major challenges in the maintenance of grain storage facilities by the FRA is the aging infrastructure, with many of these structures having been established several decades ago and not regularly maintained. The findings also indicate that most of the facilities exhibit clear signs of wear and tear, including cracks, leaks, and compromised foundations. Additionally, inadequate funding for grain storage facility maintenance emerges as a persistent problem, hindering the FRA's capacity to conduct regular maintenance and essential upgrades. As a result, pest infestations also pose a constant threat to the quality and safety of stored grains. In Zambia, the FRA struggles with managing pests due to inadequate resources for comprehensive monitoring and preventive measures. Technological obsolescence further compounds the challenges, with the FRA facing difficulties in keeping pace with modern storage technologies and lack of a computerised system. Addressing the multifaceted challenges facing grain storage facilities in Zambia requires a comprehensive approach involving financial investments, technological innovation, capacity and staff training, and adherence to regulatory standards.

Keywords: **Strategic Grain Storage, Maintenance Management, Silos, Storage Sheds, Depots Maintenance Planning and Scheduling, Preventive Maintenance, Computerized Maintenance Management System (CMMS), Predictive Maintenance, Reliability Engineering Maintenance**

I. INTRODUCTION

Grain storage facilities play a crucial role in ensuring food security by preserving and storing surplus harvests during favorable growing seasons for use during times of scarcity. Globally, Food Reserve Agencies are mandated to manage and maintain grain storage facilities in order to prevent spoilage, contamination, and the loss of valuable food resources. However, maintaining these facilities poses several challenges that can jeopardize the efficacy of food reserve systems particularly if the maintenance of the grain storage facilities is poor. In this extensive analysis, we will explore the maintenance challenges faced by the FRA in maintenance of their grain storage facilities.

Storage of staple crops and grains in good condition is very important for food security as it prevents wastage. Various studies (Ekpa et al., 2018; Nukeine, 2010; World Bank, 2011) indicate that between 30% and 50% of stored maize grain is lost in Southern Africa due to poor post-harvest management particularly as a result of inadequate and ineffective storage facilities and substandard handling practices. Therefore, maintenance among other aspects plays a critical in ensuring that grain storage facilities are constantly maintained in good condition so that the grains are not affected. According to David, (1999) maintenance of buildings, constant and regular inspections is very significant in ensuring that the condition of the buildings is maintained to an optimal standard.

Maintenance management of grain storage facilities is largely affected because of poor planning, ineffective management approaches to maintenance management and lack of capacity. Vikash, (2018) submits that good maintenance management facilitates for efficient and satisfactory service delivery because the services and products are in good state and quality.

A number of researches on grain storage facilities (Ekpa et al., 2018, Nukeine, 2010 and World Bank, 2011) emphasise the importance of keeping grains in a conducive and good environment and regularly maintaining the grain storage facility in good condition. Grain storage facilities need to be regularly monitored and maintained because they are highly exposed to hazards such as fire and explosions. For instance, according to Al Jazeera (2023) at least 12 people were injured due to an explosion from a grain silo near the port of Derince in Western Turkey whilst in France, AFP (2023) also reported of French firefighters who were dealing with a major blaze in grain storage silos in the western port of La Rochelle.

In Zambia, the FRA is the national grain marketing agency established in 1995 deriving its mandate from the Act of Parliament of 1995. The agency has storage facilities throughout the ten provinces of Zambia in the form of grain silos, closed sheds, slabs and office space meant for its use. These facilities are used to store agricultural produce such as maize the national staple food as well as rice, soya beans, cassava, and other crops as recommended by the Ministry of Agriculture (FRA, 2019). However, according to a report by the Ministry of Agriculture (2018) the grain storage facilities are old and not regularly maintained**.** An FRA report (2018) indicates that only 898,500 metric tonnes out of the total 1,964,212 metric tonnes of storage capacity representing 45.74% are considered secure and safe. As a result, the FRA is compelled to rent additional storage space from private companies, a practice that incurs significant costs.

The FRA faces several challenges in maintaining grain storage facilities which include aging infrastructure and inadequate funding to technological obsolescence and environmental factors, the hurdles are diverse and interconnected. In dealing with these challenges, there is need to take a holistic approach which includes bringing in financial investments, technological innovation, capacity building and putting policies that strengthen maintenance management practices. Therefore, it is crucial for policymakers and authorities to collaborate in finding sustainable solutions to enhance the resilience and efficiency of grain storage facilities operated by food reserve agencies as well as improve maintenance management.

The rest of the paper is organized as follows. Section II is a presentation of the existing literature with a focus on environmental and pest management, financial constraints, technology, institutional and administrative rigidities, capacity and skills and FRA's approach to storage management. The methodology is presented in Section III. Analysis and results are in section IV of the article with Section V being the conclusion

II. LITERATURE REVIEW

According to FAO (2021), one third of the food produced globally for human consumption is lost or wasted along the supply chain due to poor conditions of the storage facilities. Issues such as humidity, heat, pests and aeration on storage conditions are observed as key factors that have adverse effect on the quality and quantity of grains. Kimenju et al, (2009) argue that the ability to store grain in good conditions helps to maintain food reserves throughout the season or until such a time that it can be sold or consumed.

A. Environmental control and pest management

Successful grain storage requires a dry, aerated area which is high off the ground and protected from the rodents and other hazards (Othira et al., 2009). Other factors such as temperature, relative humidity and air flow also play a significant role in the product's quality. Farnworth and Colverson (2016) observed that adopting technology in grain storage has been very important in controlling pests and insects within grain storage facilities because it has enabled the reduction of hazardous use of pesticides in grain storage thus lessening environmental impacts and avoiding exposure of workers to different toxic products. These issues identified by different studies have tended to create challenges in grain storage management for many food reserve agencies. For instance pest infestations pose a constant threat to the quality and safety of stored grains.

Insects and rodents can rapidly proliferate in grain storage facilities, leading to contamination and spoilage. Martinez and Johnson (2018) argue that effective pest control requires vigilant monitoring, regular inspections, and the implementation of preventive measures. They further highlight the efforts needed against pests in grain storage, emphasizing the need for proactive maintenance strategies to prevent infestations. In Malawi, in order to prevent possible losses the Food Reserve Agency puts efforts to manage high moisture, pest damage, fungal and bacterial infections, and rodent damage by using grain protectants against storage insect pests (Farnworth et al., 2014). Researchers such as Kimenju et al., (2016), found that facilities for grain storage require creativity, novelty, development, technology and innovation. Solutions have been anchored on grain storage systems that are characterized by good management practices, improved environmental conditions, fumigation and other integrated pest management practices.

Additionally, maintenance of grain storage facilities require that they are adaptive to resilience and sustainable maintenance practices to mitigate environmental risks and climate change dynamics. In Zimbabwe, mechanical damage linked to poor maintenance of storage facilities, excessive

exposure to high storage temperatures, relative humidity, contamination by fungi or bacteria and rapid invasion by birds, rodents and pests was identified as a major challenge (WFP, 2014).

B. Financial constraints

Many food reserve agencies are faced with financial constraints which often hinder the regular maintenance and upgrading of grain storage facilities. According to a study by Anderson et al. (2020), inadequate funding is a prevailing issue, leading to deferred maintenance and the postponement of essential upgrades, ultimately compromising the efficiency and reliability of storage facilities. Additionally, this has led to maintaining of aging infrastructure which is poorly maintained due to inadequate funding towards maintenance. Many of these structures were built several decades ago, and the passage of time has taken a toll on their structural integrity. Smith and Brown (2019), identify the structural deterioration of grain storage facilities as a significant concern, with a direct correlation between the age of the infrastructure and the frequency of maintenance issues.

C. Technology

A pervasive challenge in grain storage facilities, particularly in developing countries such as Zambia, is the reliance on outdated technology. While the rapid advancement of technology has introduced modern solutions such as sophisticated monitoring systems and automated control mechanisms many facilities continue to operate without these innovations, compromising storage efficiency and grain quality. However, many food reserve agencies still rely on outdated technologies due to the costs associated with upgrading and staff retraining. Brown and White (2021) buttress the foregoing and argue that it is very important to adopt technological innovation in maintaining grain storage facilities, whilst emphasizing the potential benefits in terms of efficiency, safety, and resource conservation.

Technology is even more necessary considering that grain storage facilities are exposed to diverse environmental conditions, including extreme temperatures, humidity, and natural disasters. This necessitates adaptations to technology, facility design and maintenance practices (Green et al., 2017). In Ethiopia, there have been direct efforts that have prioritized technology in maintenance of grain storage facilities. For instance, Bachewe et al., (2018) argue that airtight and hermetic bags that are much cheaper have been adopted as part of grain storage facilities. Upgraded hermetic bags, storage silos, and pesticides are sold at relatively reduced prices to enable farmers afford them. Ethiopia has also adopted policies that improve grain storage facilities. In Benin, government has put up measures to support producers of grains to access and adapt to better storage technology. For example, the introduction of plastic cans, bags and improved silos fitted with drainage valves. This form of preservation facilitates destocking and pest control. New storage technologies are being introduced although many people especially in rural parts of Benin still use traditional storage structures (Gbénou-Sissinto et al., 2018).

D. Capacity and skills

Johnson and Smith (2019) observed that among the major challenges of grain storage facilities pertain to lack of capacity and skills necessary for the effective maintenance of grain storage facilities. Maintenance of grain storage facilities relies on the knowledge and skills of the personnel overseeing these facilities and if expertise in modern storage technologies is limited, food reserve agencies may struggle to provide comprehensive maintenance of grain storage facilities. Staff or those who manage grain storage facilities should be fully equipped to handle the complexities of modern grain storage facilities.

E. Institutional and administrative rigidities

Institutional rigidities and bureaucratic administrative structures within the Food reserve agencies also pose a challenge. For instance, FRA report (2021) indicated that the institution encounters delays in funding, exigencies in decision making due to political encumbrances considering that it is a Governments funded entity. Muntanga (2021) observed that there are also procedural and administrative hitches which affected decisions pertaining to effective execution of maintenance management. Lack of proper maintenance management, the grain storage facilities are not regularly maintained to those standards that ensure that grain is kept at optimal quality. The literature shows that various challenges associated with how the grain storage facility is maintained tend to have impact on the quality of the grains stored. Thus key is the maintenance management framework which must guide how the storage facilities should be managed. Another related observation which is very important consideration borders on issues of compliance with safety and hygiene regulations. Food reserve agencies must adhere to local and international standards to ensure the quality and safety of grain storage facilities. The Regulatory Watch (2022) observed that regulatory requirements for grain storage facilities were not adhered to because of poor maintenance management.

F. FRA approach to grain storage facilities

The FRA has a structured approach when it comes to property management and maintenance with a well-functioning property management department (FRA, 2022). According to FRA (2021), the institution has continued sourcing funds from government to rehabilitate and upgrade its storage facilities. With the need to increase capacity, it is reported that the FRA (2021) has previously tried to scale up storage facilities by seeking concession loans and also maintain some of the bigger silos. For instance, there were efforts towards rehabilitating the grain silo located in Lusaka. Grain stored in a silo can remain in good condition for a longer period because fumigation and grain management is more effective as

compared to sheds. In addition, silos are desirable and appropriate for bulk transportation of grain. However, it was established that the FRA has a weak enforcement of the maintenance management philosophy because of the absence of policy and legislative backing to fully implement it (FRA, 2021).

Kangwa and Olubodun (2003) argue that effective maintenance management is premised on regular and scheduled inspections to determine the state of the building. Cloete (2001) identifies three major categories of maintenance inspections such as routine or day-to-day inspections which are specifically intended to identify defects needing immediate repairs and to identify some of the key routine inspections. Then there are also annual inspections which are carried out once a year to assess the buildings and project the planning for the subsequent year. The third type is special inspections which is carried out to determine the feasibility of replacing the existing components of the building and services which would have deteriorated due to ageing of the building or which would be caused by functional obsolescence. According to Muntanga (2021) the FRA does not follow nor adhere to any of the above stated inspections when it comes to its grain storage facilities. This is due its technical and financial constraints.

In mitigating these challenges discussed, the maintenance management of grain storage facilities is a priority particularly in reducing and leveraging unnecessary costs incurred from run down facilities and losses resulting from wasted grains. Maintenance management as an overall framework to efficiency of grain storage facilities therefore invariably contributes to the long-term durability, long lifespan and efficiency of the storage facilities. Maintenance as a framework for efficiency averts possible degradation, dilapidation and damage of grain storage facilities and helps to preserve the grains to remain in good condition. Poor conditions of the storage facilities can have adverse impact on the grain in various ways including deterioration which leads to loss in quality and quantity of the grain. This has financial ramifications. Navarro and Donahaye (2005) indicated that poor conditions of the storage facilities can lead to heat damage, discoloration, off-odour, rancidity, caking, mold growth, pest and insect infestation, loss in nutritive value and contamination. These changes can render the grain unfit for end use applications and create stock shortages and inadequacies.

III. METHODOLOGY

A. Research design

The study adopted both quantitative and qualitative approaches in its data collection which enabled the gathering of both primary and secondary data. Creswell (2013) asserts that qualitative data involves gathering, evaluating and analysing data to reach objective conclusions that produce findings that are well theorized. The use of mixed methods approaches in this study further enhanced its reliability and validity. Bryman (2012) argues that reliability is very important especially when a study is of a qualitative nature. Creswell (2013) also states that the use of mixed methods creates the possibility for triangulation of both qualitative and quantitative data thereby making it more reliability as the data is backed with statistical information and vice-versa. Use of mixed methods in this study further provided access to multiple types of data which strengthened its validity. Marshal and Rossman (2011) observed that a researcher can be much more confident about the validity of the findings when they are supported by multiple and complementary types of data. The research specifically used the explanatory study approach which facilitated for investigating the maintenance challenges that exist in strategic grain storage facilities in Zambia under its scope.

B. Sample size, choice and rationale for the interviewees

This article analysed the challenges faced by the FRA's main sheds and silos in the six provinces of Zambia namely Lusaka, Monze, Choma, Kabwe, Ndola, Chambishi and Kasama because these are high grain storage areas with a hive of activities throughout the year. The relevance of the positions of the interviewees to the study and staffing levels within the FRA was ascertained and 73 staff were identified. The sample size of interviewees targeted 73 respondents within the FRA who hold different portfolios. Among those interviewed are Provincial Marketing Coordinator, Marketing Assistant, Standards and Quality officer, Warehouse Supervisor, Caretaker/provincial foremen, Regional Marketing Coordinator, Regional Property Coordinator and Monitoring and Evaluation Officer.

C. Sampling techniques and instruments

The study deployed purposive sampling also referred to as judgmental or expert sample for in-depth face to face interviewees. The main data collection instruments used were questionnaires with semi-structured open ended questions and a survey questionnaire with close ended questions. The interview guide was used for face to face interviews to gather qualitative data whilst a survey questionnaire with close ended questions was used to collect quantitative data from purposively sampled respondents. According to Bernard (2002) data collection is crucial in conducting any study because the data contributes to a better comprehension of the theoretical framework and sampling techniques form an integral component of research. Kumar (1999) defines sampling as that part of statistical practice which deals with the selection of an unbiased or random subset of individual observations within a population intended to yield some knowledge about the targeted population for the purpose of making predictions based on statistical inference.

International Journal of Engineering Applied Sciences and Technology, 2025
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D. Data Collection methods

Primary data for the study was gathered using face to face interviews targeting officials from the FRA officials who hold different positions. This type of interview guide was used in order to draw appropriate responses from interviewees and proffer them an opportunity to comprehensively give enough details when providing responses. This enriched the data collected and provided complete perspectives, explanations and accounts from relevant respondents. Marshal and Rossman (2011) justify the use of semi-structured interview guide with open ended questions in qualitative studies and argue that its application supports the conveyance of the contextual nuances of the interviewee's reactions and rejoinders. Furthermore, secondary data mainly through desk study review of literature was also analysed. The specific categories for secondary data that were used were drawn from various sources such as the internet, grain storage maintenance reports, publications, journals, articles, books, YouTube, earlier research and mass media reports. The literature review was framed within the framework of the main research question.

E. Data Analysis

The triangulation technique for analysing the data was deployed because triangulation is an appropriate method in analysing data drawn from mixed methods (Creswell, 2015). Data processing and analysis was conducted using the thematic approach by identifying the main themes that emerged from the interviews and quoting them extensively in verbatim format in relation to the aim of the study. Codes were assigned to the main themes to classify the responses before the integration was eventually done. Once the data were sorted, they were put into several categories. The core dependent variables were divided into different categories in line with the objectives of the study. The categorizing of the data and placing it in themes for analysis was based on the three theories that underpin the research. In analysing data from surveys, the excel software was used to develop different charts. Additionally, the study deployed categorical aggregation, a widely applied technique used to generate undeviating and controlled analysis for the data collected. In this technique, data are sorted while interpreting relevant meanings from them. Furthermore, themes from the data was framed and then theorised. Creswell (2013) suggests that this type of technique in research is very informative as it establishes significant denotations across copious cohorts of the data. Afterwards both the qualitative and quantitative data was triangulated to make empirical conclusions.

IV. ANALYSIS AND RESULTS

The core objective of this study was to analyse the challenges of the FRA pertaining to grain storage facilities. The following section is the presentation of the findings and analysis of the study.

A. Lack of appropriate staff, training, capacity and expertise

The findings established that 4.8% of the staff were civil engineers whilst mechanical engineers were at 19%. Electricians were at 38%, whilst carpentry stood at 4.8%. Bricklayers were at 0%, metal fabricators were at 4.8% whereas unskilled staff accounted for 28.6%. These findings show that the FRA has many unqualified caretakers who have been entrusted to do the daily maintenance works in its various grain storage facilities. The labour distribution according to skills is also unbalanced with more electricians and mechanics than other trades as the labour distribution is not systematized and doesn't identify staffing according to needy areas such as maintenance of grain storage facilities. Furthermore, the results have indicated that the caretakers have no specialized training in relation to grain storage facilities which means that a lot of maintenance personnel are not well equipped with maintenance skills. Figure 1 illustrates the results

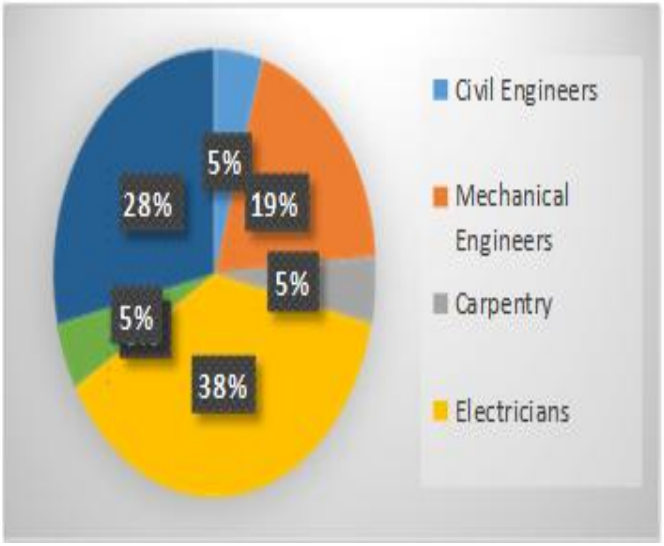

Figure 1: Distribution of staff & expertise in FRA

The findings further demonstrate that 18% of the respondents indicated that there was training of staff related to grain storage facilities whilst 82% indicated that there was no training related to storage facilities. This is an indication that the caretakers did not have specific grain storage maintenance training as they only relied on a single trade or skill. The maintenance personnel in the depots and sheds must have basic maintenance skills in electrical, welding, bricklaying and carpentry because these are the skill sets required on the daily maintenance works at the depots and sheds. Figure 2 illustrates the results below.

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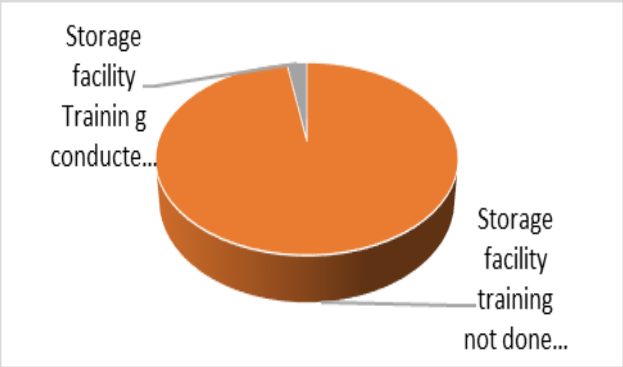

Figure 2: Training in maintenance of grain storage facilities

According to ZITR (2018), operational and effective maintenance of grain storage facilities is contingent on the knowledge and skills of personnel. Thus emphasis must be placed on the importance of continuous capacity building and training programs for staff working in grain storage facilities. Johnson and Smith (2019) also allude to the foregoing and argue that continuous capacity building helps to ensure that personnel are well-equipped to deal with the intricacies of maintaining grain storage facilities. The study, however observed that among the challenges at FRA are gaps in terms of skills particularly among caretakers when it comes to various aspects of effectively executing maintenance of the depots, sheds, silos and other storage facilities. The deficiency of adequate appropriate expertise for maintenance of grain storage facilities is also compounded by the fact that the majority of the staff had only trade certificates whilst there were also very few technicians and engineers in the storage facilities. The results from the study show that technologists and engineers were at 3%, Technicians represented 5% whilst tradesmen where the majority at 55%. 5% did not respond and 32% were unclassified. Figure 3 shows the results below

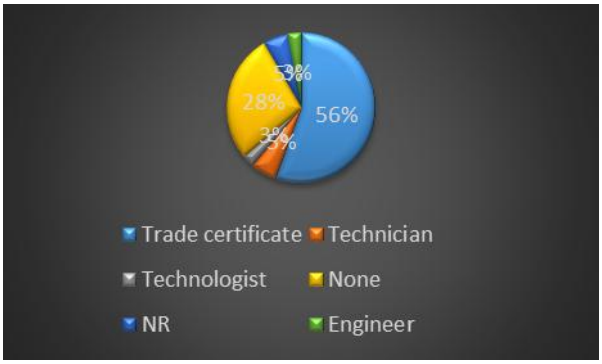

Figure 3: Skills and qualifications of staff

B. Inadequate financial, material and technical support towards maintenance of grain storage facilities

From the study, financial constraints towards maintenance of grain storage were observed to be a major problem hindering the regular maintenance and upgrading of grain storage facilities by the FRA. Inadequate financial allocation towards maintenance of grain storage facilities pose a significant challenge for FRA in dealing with repairs, inspections, and the implementation of modern technologies. According to Anderson et al. (2020), inadequate funding is a prevailing issue, leading to adoption of deferred maintenance and the postponement of essential upgrades instead, ultimately compromising the efficiency and reliability of grain storage facilities.

The study shows that as a result maintenance works are not given adequate support particularly in the form of materials for repairs, maintenance and transport to enable them attend to breakdowns and any other maintenance related works on time. Inadequate financial resources has also led to unavailability of needed materials to conduct various maintenance works. The results of the study support the above assertion and show that 75% of the respondents of the study indicated that there was inadequate support towards maintenance work whilst only 25% believed that there was adequate support towards maintenance works. The figure 4 below illustrates the inadequate support towards maintenance by FRA

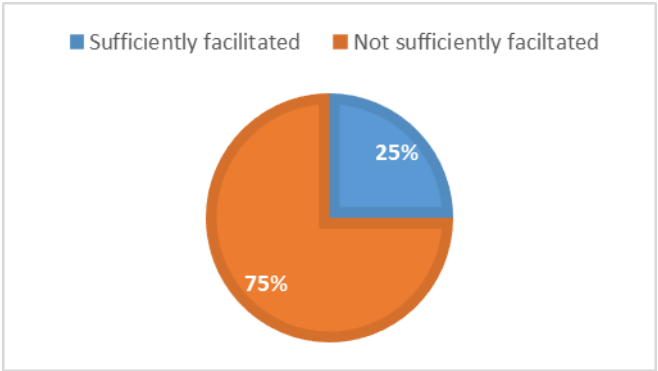

Figure 4: Inadequate support towards maintenance of grain storage facilities

C. Technological challenges

83% of the interviewees indicated that there was no computerized system pertaining to maintenance management within the FRA whilst 17% indicated that there was a computerised system within the FRA. The results in figure 4.5 show that FRA does not have a robust computerized system for maintenance management work and their records may not be regularly updated through a regular data base. The rapid advancement of technology has increased the importance of computerised systems because it introduces modern solutions for grain storage, including sophisticated monitoring systems and automated control mechanisms. Therefore, it is a necessity that must be prioritised and financed.

Nonetheless, the FRA still depend on outdated technologies due to the costs associated with upgrading, buying software and staff training. Brown and White (2021) underscore the importance of embracing technological innovation in maintaining grain storage facilities, emphasizing the potential

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benefits in terms of improving efficiency, safety, and resource conservation. Figure 5 shows the results below

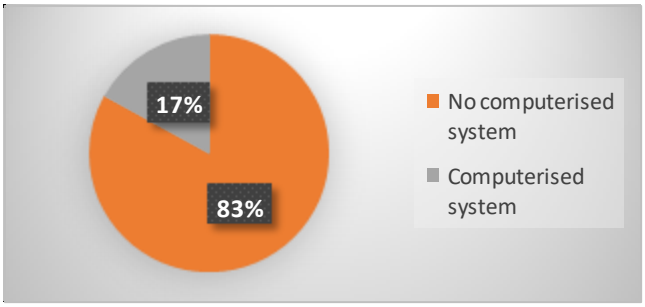

Figure 5: Lack of a computerised system for maintenance work

D. Ineffective and irregular Monitoring and inspections of the grain storage facilities

It was established that 25% of the interviewees indicated that grain storage facility inspections were done three times a year by FRA, whereas 22% indicated four times, 18% stated that there were no inspections, 12% indicated twice and 10% stated that its once. From the results above most people who indicated that inspections were consistently carried out are caretakers from the depots who do not generate reports of their findings. However, the decision makers at head office responded that inspection were not being done. This means that the Engineers and Technicians do not go out to inspect and generate reports on the works to be done and the conditions of the facilities.

Whilst there is some form of inspection that is done on grain storage facilities by FRA, however these are sporadic and unscheduled. The foregoing, explains why the frequency of inspections, monitoring and maintenance may vary from depot to depot. The variations in number of times as demonstrated by the respondent could explain the spontaneity with which FRA conducts its inspections, monitoring and maintenance. Additionally, there is no structured guide as to how often FRA conducts these inspections so that they are uniform in all storage facilities. The idea is to ensure that these inspections help to proffer an effective maintenance strategy which will consequently optimise equipment uptime and facility performance at a cost effective rate and ensure that FRA gets sufficient return on investment. Furthermore, FRA deploy a reactive maintenance approach. The agency does not use Planned Maintenance Optimization which is specifically designed towards existing maintenance programs (Ahire, 2000).

Lack of inspections and regular monitoring can render the grain storage facilities to pest infestations which pose a constant threat to the quality and safety of stored grains. Insects and rodents can rapidly proliferate in grain storage facilities, leading to contamination and spoilage. Thus, effective pest control requires vigilant monitoring, regular inspections, and the implementation of preventive measures. Martinez and Johnson (2018) argue that a more proactive maintenance strategy is very vital in prevention of infestations. Additionally, due to lack of regular inspections and maintenance, the FRA's grain storage facilities, often face challenges associated with aging infrastructure. Many storage structures were established several decades ago, and the wear and tear over time result in structural weaknesses. Cracks, leakages and compromised foundations become prevalent issues, exposing stored grains to environmental elements (Ministry of Agriculture report, 2018). According to a report by the Ministry of Agriculture in Zambia (2018), the aging infrastructure of grain storage facilities has been identified as a significant challenge, with a direct impact on the facilities' reliability and efficiency. Figure 6 below shows the result

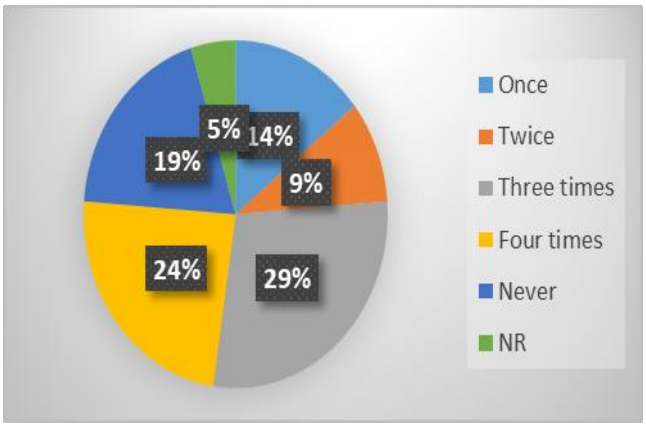

Figure 6: Inspections and monitoring of grain storage facilities

V. CONCLUSION

Generally, the major problems that FRA faces in terms of grain storage facilities revolve around financial, administrative, operational and staffing concerns which could be addressed by planning ahead and having cost effective systems in place. In order to understand the best and cost effective maintenance management strategies, one has to have a good knowledge of maintenance management principles and best practices. The study established that the major challenges faced by FRA in the maintenance of its strategic grain storage facilities include capacity gaps, technical and financial inadequacies.

Other challenges identified are ineffectiveness in responding to maintenance by the property management department and poor provision of the required tools to the caretakers. Maintenance work is also centralized and only done once the personnel from head office are assigned to go to locations to do the repairs even when on many instances some repairs could be done by caretakers.

Additionally, there are transport challenges which affect effective monitoring and inspections. There is lack of consistent transport to effectively monitor maintenance programmes in a timely and effective manner. Furthermore,

there are gaps in terms of skills, particularly among caretakers with regard to several aspects necessary to effectively execute maintenance management programmes of the sheds and storage facilities of FRA.

The study also established that whilst inspection is done sporadically on grain facilities by FRA it is not within any structured framework but rather ad hoc. Additionally, the numbers of times these inspections and monitoring are conducted vary from depot to depot. The variations in number of times could explain the spontaneity with which FRA conducts its inspections and also shows a lack of a well-planned schedule.

Overall, the FRA deploys a reactive maintenance approach which responds to reported incidents and breakdowns or damages. FRA also does not use Planned Maintenance Optimization which is specifically designed towards existing maintenance programmes but they are rather prompted by reported damages and needed repairs. The study established that FRA places more emphasis on conducting defect elimination which is a maintenance strategy that particularly focuses on the design of the property to prevent defects being introduced at the early stages of the property life span thus eliminating the defects during the operational stage of the property life cycle.

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