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Mitigating Labour Shortages in Zimbabwe: A Case Study of Green Feathers Farm (Pvt) Ltd, and the Design of an Effective Labour Management System.

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A Dissertation Submitted in Partial Fulfilment of the Requirements for the Bachelor of Agricultural Science Honours Degree in Agricultural Economics and Management

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DECLARATION

I, Munashe Gumbo, declare that this dissertation titled "**MITIGATING LABOUR SHORTAGES IN ZIMBABWE: A CASE STUDY OF GREEN FEATHERS FARM (PVT) LTD, AND THE DESIGN OF AN EFFECTIVE LABOUR MANAGEMENT SYSTEM**" is my original work and has not been submitted elsewhere for any degree or qualification. I acknowledge that I have received guidance and support from my supervisor, **Dr A.C MUJEYI**, and other academic staff during this research, but the intellectual content and presentation of this dissertation are entirely my own. I have followed the guidelines and regulations of the Bindura University of Science Education regarding plagiarism and academic integrity, and I have properly cited and referenced all sources of information used in this dissertation.

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DEDICATION

This study is dedicated to the Almighty who is the Alpha and Omega of my life. Moreover, I dedicate this work to my family and friends whose unwavering support played an instrumental role in my academic journey.

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ABSTRACT

This research investigates the impacts of labour shortages and their effects on agricultural productivity and profitability in Zimbabwe, focusing on a case study of Green Feathers Farm (Pvt) Ltd. The study intends to explore how these shortages affect crop yields and farm income, as well as the design of an efficient labour management system (LMS) to mitigate the effects and causes of labour shortages. The foundation of this study is the vital role that Zimbabwe's agriculture sector plays in the country's economy, which is currently in jeopardy because of a declining labour force. This study aims to determine and examine the underlying causes of Green Feather Farm's labour shortages. It also seeks to determine the possible mitigating measures farmers and policymakers should take to address the labour shortage issues. The final goal of the research is to design, develop, and pilot test a digital platform that connects Green Feathers Farm with available labourers. A mixed-methods approach was used to quantify the impacts of labour shortages on crop yields and farm income by integrating qualitative interviews with farm management and employees with quantitative data analysis from farm records. The findings show a strong correlation between labour shortages and lower crop yields, which lowers farm profitability. A good example is maize yield, which was expected to be 4489.05 kg/ha, which is lower than the standard yields for Seed Co maize varieties like SC727 and SC659, where farmers record averages of 13400 and 13500 kilograms per hectare, respectively. Similarly, the mean yield for tobacco for GFF was 1147.26 kg/ha, which is lower than the national average yield of approximately 2.3 tonnes (2,300 kg) per hectare. The LMS was designed with techniques for labour force optimisation, training programs, and flexible labour arrangements to mitigate the effects of labour shortages. Lastly, the study highlights how urgently the Zimbabwean agricultural sector needs creative labour management techniques and interventions. To sustain agricultural productivity, it is advised to implement customised labour management systems and fund employee training and retention initiatives, among other things. This study contributes to knowledge and better understanding of labour dynamics in Zimbabwe's agricultural industry and provides practical recommendations for improving labour management and farm productivity.

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LIST OF ACRONYMS AND ABBREVIATIONS

GFF	**Green Feathers Farm (Pvt) Ltd**
LMS	**Labour Management System**
GDP	**Gross Domestic Product**
HA	**Hectare**
KG	**Kilogram**
SDG	**Sustainable Development Goals**
US$	**United States Dollars**
ZIMSTAT	**Zimbabwe National Statistics Agency**
FTP	**Total Factor Productivity**
SPSS	**Statistical Package of Social Sciences**
MLRA	**Multiple Linear Regression Analysis**
HR	**Human Resource**
ANOVA	**Analysis of Variance**
TRB	**Tobacco Research Board**
SC Gadra	**Sugar Bean Variety**
UA45	**Sugar Bean Variety**
SC Ukulinga	**Sugar Bean Variety**
SC727	**Maize Variety**
SC659	**Maize Variety**
T78	**Tobacco Variety**
T79	**Tobacco Variety**
US	**United States**
PPP	**Purchasing Power Parity**
FAO	**Food and Agricultural Organisation**
ZIDA	**Zimbabwe Investment Development Agency**

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Over the years, the agricultural sector has faced many challenges, primarily because of labour shortages. This situation is intensified by various social and economic conditions, which have far-reaching consequences for crop yields and farmer revenue (Mishra and Pradhan, 2023). These long-term labour shortages will likely disrupt the agricultural supply chain, productivity, value addition, and food security in Zimbabwe and other developing countries. Having this in mind, this study puts forth the groundwork for an analysis that is all-inclusive of the impact of labour shortages on crop yields and farm income, specifically focusing on Green Feathers Farm (Pvt) Ltd (GFF), a prominent case study that demonstrates these labour shortage dynamics. Green Feathers Farm (Pvt) Ltd, in Mashonaland East, Wedza district, with abundant agricultural potential, is a perfect case study for understanding the complex consequences of labour shortages. Green Feathers Farm (Pvt) Ltd has experienced a decline in the availability of the labour force. This has directly affected its operational capacities. The farm relies heavily on manual labour for tasks such as planting, weeding, harvesting, and grading. This reliance on manual labour puts more emphasis on the importance of human capital in producing optimum levels of crop yields, sustainability, and preserving profitability agricultural sector.

Green Feathers Farm is privately owned and operates a diversified agribusiness concern with interests in field crop production, horticulture, livestock production, and agro-tourism. Its field crops include mainly tobacco, maize, sugar beans, soya beans and wheat. Horticultural cultivation is undertaken in open fields and greenhouses. The main crops grown are tomatoes, peas, onions and vegetables. This study seeks to explore the consequences of labour shortages on crop yields and farm income, focusing on Green Feathers Farm (Pvt) Ltd as our case study, and the design of an effective labour management system to mitigate these effects.

1.2 BACKGROUND OF THE STUDY

Agriculture remains the oxygen of the global economy, and it continues to support the livelihoods of millions and significantly contributes to the national GDP of many African countries. However,

this sector is constantly dealing with many complex challenges, like the deterioration of the labour force. This phenomenon is driven by factors such as urbanisation, demographic shifts, and ever-changing labour market dynamics. As a result, farms struggle to recruit a sufficient workforce to meet the demands of current agricultural practices. This affects the sustainability and production efficiency in the agricultural sector. First-world countries record high agricultural productivity and efficiency due to their competitive advantage in technological advancements. These developed nations are characterised by high growth in agricultural production and increased technical efficiency. However, Zimbabwe and other African nations are faced with low agricultural productivity and inefficiency, resulting in consistently low output and food insecurity (Mugenyi, 2013). From 2008 to 2018, the agricultural sector's contribution to total output declined by a margin of close to 14%, from 19.02% to 5.07% in Zimbabwe (Setoboli et al., 2024). To achieve Zimbabwe's Vision 2030, growth in the agricultural sector is important, and the country must enhance productivity and efficiency in farm operations.

Investigations have revealed that the decline in crop yield and farm income is the result of an increased labour shortage. Many complex factors, classified into physical, economic, environmental, and social contributing factors, affect farm productivity and efficiency (Setoboli et al., 2024). For example, Malawi faces a dilemma despite extremely small landholding sizes. Research suggests that many smallholders neglect their fields to find employment as casual workers at low wages for money or food. This neglect of fields results in low yields on their farms since critical farming tasks are delayed or not performed. The consequent poor labour and land returns contribute to household food insecurity and a downward spiral of poverty. Labour shortages significantly affect crop yields and farm income by inducing these determinants. The migration of labour force from rural areas to cities is followed by labour shortages in agricultural production (Quan et al., 2021). To improve crop yields and farm income, the study endorses several efforts. First, allocate more farming land area to farmers to increase cultivation and stimulate the adoption of climate-smart agricultural practices, such as optimal water resource utilisation. This is efficient for farmers who already have a large portion of productive land at their disposal. Second, consider free trade with other countries to facilitate the importation of essential agricultural raw materials. Third, ensure reliable access to fertiliser through subsidies. Additionally, supplementary revisions should explore the factors influencing crop yields and farm income among both smallholder and large-scale commercial farmers.

Zimbabwe is an agrarian economy, and the agricultural sector occupies a very important spot in the global food system. It is the major source of food for the world population (Setoboli et al., 2024). Given this continuous demand for food, farmers are pressured to increase crop and animal production. This goal can be achieved by either expanding cultivated land or improving productivity and efficiency (Setoboli et al., 2024). Agricultural productivity refers to a measure of effectiveness, given as the ratio of outputs to inputs of a production system (Capalbo and Antle, 2015). According to Borodina and Prokopa (2019), growth in agricultural productivity is a necessary condition for rural poverty eradication, industrialisation and promotion of inclusive growth prospects. More specifically, labour shortages can affect the timing of field operations, such as weeding, fertiliser application, and pest control. Overuse of fertiliser will result in degraded soil fertility, due to insufficient manuring and composting, which can reduce long-term yields (Prasad, 2017).

Labour shortages can have a significant influence on agricultural productivity and farm income. First, labour shortages can delay critical farming operations such as planting, weeding, and harvesting, resulting in decreased yields (Huet et al., 2022). Second, insufficient labour may delay machinery and infrastructure maintenance, leading to inefficiencies and increased downtime (Patel, 2021). Third, increased costs to attract workers may necessitate farmers to pay higher wages, rising overall production costs and diminishing profit margins (Zahniser et al., 2018). Labour shortages also reduce output levels, threatening the economies of scale that farmers rely on for cost savings (Bowman and Zilberman, 2013). In addition, labour shortages may encourage farmers to invest in mechanisation or technology to compensate for a lack of available labourers. This can increase efficiency but also demands an initial expenditure (Liao et al., 2022). However, farmers may lack the labour required to integrate new technologies effectively. Even if technology is accessible, productivity increases may be lost due to a lack of competent workers. Furthermore, with fewer personnel available, farmers may overlook techniques like crop rotation and cover cropping that promote soil health, resulting in long-term production decreases (Carlisle, 2016). Labour shortages can also lead to ineffective pest and weed control, compromising crop health and production. Finally, labour shortages may limit community participation in agricultural operations, diminishing information sharing and collaboration among farmers (Zarei et al., 2020). Frequent labour shortages result in farmers filling gaps with less experienced or unskilled workers, which can harm farm management techniques and overall production.

1.3 STATEMENT OF THE PROBLEM

In Zimbabwe, the agricultural sector has historically been the oxygen of the economy, providing livelihoods for many populations and contributing to food security. Similar to how human beings cannot survive without oxygen for a minute, so likewise, without agriculture, any economy will collapse. Over the past years, Zimbabwe has been regarded as the breadbasket of Africa due to its food security policy; it has dominated agricultural production over the years. However, in recent years, it has seen a pronounced labour shortage in this vital sector, influenced by a combination of factors, including economic instability, rural-urban migration, health challenges and limited job opportunities in the agricultural sector. This labour shortage puts crop yields and farm income in danger, leading to increased production costs, reduced agricultural output, and operational inefficiencies. Farmers are struggling to maintain timely planting and harvesting schedules, manage crops effectively and adopt modern farming practices due to labour shortages. This collectively jeopardises the sustainability of agricultural production and the profitability of farmers. However, the specific effects of agricultural labour shortages on crop yields and farm income in Zimbabwe remain unclear, making it difficult to establish effective policies and interventions to address the issue.

Despite the role played by labour in guaranteeing farm productivity and efficiency, there is a considerable information vacuum in Zimbabwe about the effects of agricultural labour shortages on crop yields and farm income. Existing research has concentrated on the causes of agricultural labour shortages, but few have investigated the precise effects of these shortages on crop yields and farm profitability. Previous studies do not provide localised information on specific farms such as Green Farmers Farm. In addition, previous studies have made an insufficient assessment of the causes of labour shortages, which are unique to a particular region or farm type.

Moreover, existing research has limited data on how different crops are affected by labour shortages on a single farm or in different regions. There is a need to investigate the long-term impacts of labour shortages on crop yields and farm income. Furthermore, previous studies lack a broader economic or financial analysis of farms' income regarding labour shortages. Therefore, a need arises to analyse how qualitative and quantitative labour force data affect crop yields and farm income. Few studies have focused on the design and practical implementation of labour management systems in local contexts, custom-made to a specific farm, such as Green Feathers Farm (Pvt) Ltd. This lack of localised research restricts the applicability of existing labour management systems and

models. Etiquette HR Consultancy was designed, tailored for specific farms or enterprises. The digital platform is meant to address individual farm needs, whilst existing labour management systems lack evaluation of their effectiveness in mitigating the impact of labour shortages. Likewise, previous research has limited exploration on how unique challenges faced by Green Feathers Farm can be addressed by technology. There is a need for practical case studies that demonstrate the successful implementation of the labour management system.

Similarly, there is an inadequate understanding of how local socioeconomic conditions affect labour availability in the agricultural sector. Previous studies have not examined the relationship between farm labour dynamics and community well-being. Therefore, this study seeks to investigate the impact of labour shortages on crop yields and farm income basing on a case study of Green Feathers Farm (Pvt) Ltd (GFF), and design and the development an effective labour management system, aiming to identify the underlying factors contributing to labour shortages and their impacts on agricultural performance. The findings will provide valuable insights for policymakers, farmers and stakeholders to develop effective strategies to mitigate these challenges and promote sustainable agricultural development in the country.

1.4 RESEARCH QUESTIONS

a) What is the nature, extent and causes of agricultural labour shortages at Green Feathers Farm?
b) What are the effects of labour shortages on crop yields and farm income on Green Feathers Farm?
c) What is the impact of a digital platform connecting Green Feathers Farm to available labourers on labour market efficiency, farm productivity, and labourer income, during a single agricultural season?

1.5 OBJECTIVES OF THE STUDY

1.5.1 Main Objective

The main objective of this study is to assess agricultural labour shortages and its effects on crop yields and farm income in Zimbabwe, and to design and develop a labour management system to mitigate these effects.

1.5.2 Specific Objectives

a) To identify and analyse the underlying causes of labour shortages at Green Feathers Farm.
b) To quantify the impact of labour shortages on crop yields and farm income at Green Feathers Farm, and identify potential mitigation strategies.
c) To design, develop and pilot test a digital platform that connects Green Feathers Farm with available labourers.

1.6 SIGNIFICANCE OF THE STUDY

With this background, investing in the agricultural labour force in Zimbabwe would be an efficient strategy for reducing hunger and poverty while promoting sustainability (González-Esteban et al., 2022). There has been a growing concern about the performance of the agricultural sector in Zimbabwe, to improve the conditions of poor people, especially the fact that the majority of them live in rural areas (Dzvimbo et al., 2017). Concerns have also been raised to address the hunger-stricken communities and malnutrition regarding the recent food price spikes (Von Grebmer et al., 2011). This study is relevant following the approach it has taken in assessing the consequences of labour shortages on crop yields and farm income. The study focuses on investigating the trends and patterns of labour shortages for over 2 decades from the year 2000, by showing how agricultural productivity and profitability have deteriorated in Zimbabwe. The study may increase awareness of the consequences and impact of labour shortages in farm productivity; therefore, the need to implement corrective measures to keep and attract the correct labour force in the agricultural sector in Zimbabwe, and to reduce operational costs whilst optimising farmers' profits. The study could also form a basis for future studies on the trend of the current state of labour force availability in the Zimbabwean agriculture sector. Researchers and students who wish to do future research may find the deductions more useful at the outset.

This study will contribute to the existing body of knowledge on agricultural labour shortages and their impact on crop yields and farm income in Zimbabwe. The study will provide insights into the consequences and coping strategies used by farmers to mitigate these effects. The findings of the study will inform policy and practice on agricultural labour management and farm productivity improvement in Zimbabwe.

1.7 DELIMITATIONS AND LIMITATIONS OF THE STUDY

1.7.1 Limitations of the study

The study was criticised because it relied heavily on printed sources for data. This suggests that the researcher was restricted to only this information. Second, the study's drawback is insufficient data. The study was limited by a lack of or insufficient data on agricultural policies, farm productivity, farm profitability, labour efficiency and investment information from previous years. The majority of the reliable data on farm productivity was undocumented. This article is based on a systematic review of secondary data sources, which include journals, policy publications, and reports from national and international organisations. The study relied on self-reported data from farmers, which may introduce bias or mistakes in measuring labour shortages and their consequences. The study focused on a single farm (Green Feathers Farm), which does not reflect the national reality due to regional differences in farming techniques and labour availability. Furthermore, changes in economic conditions during the study period may have had an impact on labour availability, farm production, and efficiency, making it difficult to distinguish the effects of labour scarcity. Finally, unforeseen occurrences such as natural disasters and political instability may have an impact on agricultural productivity and profitability, as well as change the environment of labour shortages during the study.

1.7.2 Delimitations of the study

This research largely focuses on a single farm (Green Feathers Farm in Wedza North District), which is involved in commercial farming. The study investigates labour shortages and their implications on crop yields and farm income over close to two decades, but the case study (GFF) only existed for sixteen years. While the study will acknowledge other factors influencing farm productivity, such as climate and technology, labour shortages will be the primary focus to maintain a clear focus on the problem. To conclude the relationship between labour shortages, crop yields, and farm income, the study will use a mixed-method approach, with a focus on quantitative and qualitative data. According to the FAO, agriculture includes fishing and hunting in addition to crops and livestock. This study largely employed crop information to refer to agriculture; except as noted, the majority of the references to agriculture are synonymous with crop production. The study focused on the efficacy of the components and factors that directly transfer into high agricultural production as productivity drivers. Thus, for the sake of

convenience and due to the identified research problem, the study only examined a few major agricultural productivity indicators and metrics.

1.8 DISPOSITION

The study is organised in five chapters. Chapter one (**1**) is the introductory chapter, and in this, the background of the study, the problem of the study is formulated, the objectives of the study and the research questions are clarified. Still in the same chapter, highlights of the significance of the study, the limitations and delimitations of the study are given. Chapter two (**2**) is the literature review and the theoretical background. In this chapter, we provide an overview of the literature review of existing research that corresponds to the identified research problem. In addition, under this chapter, the guiding theories are explained, the limitations of the theory are stressed, and the importance of the theory in the study is outlined.

Chapter three (**3**) is the methodological framework of the study. In this chapter, the research design, description of the study area, data collection and analysis methods, as well as the reliability and validity of the study are spelt out. Data collection and data analysis tools, as well as data sources, are clarified. Chapter four (**4**) of the research presents the results and discussion of the study. The results are presented according to specific objectives that correspond to research questions. Each research objective is satisfied, and each objective has subcategories. In addition, findings on each specific objective are laid out. Chapter five (**5**) presents the conclusion and recommendations. In this chapter, recommendations, together with lessons learnt from the entire study and suggestions for policy implementation, are presented.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

This section lays down a complete literature review on the impact of labour shortages on crop yields and farm income from both theoretical and observed studies from various perspectives. It reviews the existing literature, focusing on the background of agriculture and the impacts of low productivity, the context of labour shortages in Zimbabwe, the composition and gender dynamics of the labour force in the agricultural sector, as well as key theoretical frameworks.

2.2 BACKGROUND

The agriculture sector faces a series of threats that threaten food security, sustainability, and farmers' livelihoods worldwide. From 2019 to 2020, Zimbabwe faced acute food insecurity (Moyo, 2024). Globally, millions of poor and vulnerable people continue to suffer from severe hunger and malnutrition due to food shortages. While estimates vary, up to 250 million people in Africa are acutely food insecure, with the number of malnourished growing exponentially than anywhere else in the world (Moyo, 2024). Some of the most food-insecure countries are located south of the Sahara, including the Democratic Republic of Congo, Ethiopia, Zimbabwe, South Sudan, and northern Nigeria, where 15.6 million people continually suffer from.

A variety of interrelated socioeconomic, political, security and environmental variables explain this state of famine in a world saturated with surplus food (Tilzey, 2017). They include, among other things, economic recessions, which affect food production and prices, chronic poverty and food price inflation, which affects food entitlement (Moyo, 2024), imbalances in the food system value chain, climate shocks that affect food production and prices, armed conflicts, and forced internal displacement (Kemmerling et al., 2022). This more intense state of acute hunger and malnutrition in some sub-Saharan African nations shows inadequate progress toward reaching some of the interrelated aims of the Sustainable Development Goals (SDGs) (Tshiyoyo, 2014). The fact that an estimated 250 million Africans, and even more, do not currently have access to adequate, safe, and nutritious food (Moyo, 2024) means that achieving food security and ending hunger in sub-Saharan Africa by 2050 and as envisioned by Zimbabwe’s Vision 2030, is an unattainable goal. While the situations in each African country vary, Zimbabwe is an excellent case study for addressing the

ongoing national and household exposure to challenges that limit the achievement of food security. Most of the developing countries, especially in Africa, rely heavily on agriculture for their economies (Giller et al., 2021). Agriculture accounts for up to 50% of GDP, more than 80% of value-added trade, and more than half of raw materials utilised by industries. It employs the majority of Africa's population (Woldemichael et al., 2017).

Despite this dominance and the fact that strong policy papers and statements support agriculture, its investment remains low in the majority of African countries. A large portion of about 30% to 40% of agricultural produce is recorded as a loss due to post-harvest inefficiency, storage, and processing (Kiaya, 2014), which is a result of labour shortages. Engineering technology inputs revolutionise agriculture and food production systems; however, their scarcity in Africa has been identified as a major barrier (Gashu et al., 2019). According to Sakho-Jimbira (2020), Sub-Saharan Africa's population accounts for over 60% of the population in rural areas, and agriculture is still the primary source of employment in the majority of the region's countries; hence, this industry is heavily deteriorating due to labour force shortages.

Production levels measured are quite low due to the seriousness of labour challenges (Herrendorf and Schoellman, 2015). The following two considerations alone point to an insufficient agricultural arithmetic for Africa: if agricultural output is low and a big part of the population is dependent on agriculture, aggregate incomes will also be low (Block, 2010). However, sectoral productivity discrepancy worsens this problem; value added per worker in African agriculture appears to be much lower than similar labour productivity in other sectors, even after controlling for differences in input quantity and quality (McCullough, 2017). Gollin (2010) argues that increasing agricultural output is a critical requirement for economic growth. Without agricultural reform, it will be hard to achieve the objectives of long-term poverty reduction and economic progress (Mellor, 2017). Agriculture's contribution to economic change is mainly dependent on the availability of agricultural land and fertility, as well as population dynamics (Boserup, 2014). To fuel economic growth in the early stages of transformation, countries with rich and fertile agricultural land and high birth rates must prioritise increasing agricultural production.

Since 2015, the Command Agriculture programme has become at the forefront of the Zimbabwean government, placing further emphasis on the importance of agriculture (Setoboli et al., 2024).

Additionally, efforts were intensified to improve agricultural productivity in the country (Setoboli et al., 2024), as prescribed by the National Agricultural Policy Framework (NAPF 2019-2030) to achieve Zimbabwe`s Vision 2030. However, investments in Zimbabwe's agricultural sector have generally focused on income support and subsidies, rather than long-term finance for sustainable growth. Short-term interventions may fail to address the root causes of agricultural productivity challenges in the end. According to Setoboli et al., (2024), Zimbabwe's farming industry faces major difficulties due to low production. Policy uncertainty, foreign exchange shortages, land rights difficulties, environmental shocks, and macroeconomic instability have all hampered private investment in Zimbabwe's agricultural sector. This paper investigates the influence of labour shortages on agricultural yields and farm income. Inefficiencies in human resource allocation, as well as uncertainty, can standoff efforts to increase efficiency in the Zimbabwean agricultural sector. Understanding agricultural production and its drivers is therefore important.

During the COVID-19 pandemic, labour shortages impeded Zimbabwe's agricultural supply lines and marketplaces, not to mention that the sector already experienced low farm production and efficiency, threatening livelihoods (Bhanye et al., 2023). Using secondary sources and the broader agriculture supply chain as guides, the findings show that unless safeguards are put in place to protect farmers, particularly smallholder farmers in Zimbabwe, labour shortages have the potential to have the same negative consequences as those witnessed during COVID-19. The study indicated that labour shortages caused by the COVID-19 epidemic pose serious threats to Zimbabwe's already fragile food security situation, which stems mostly from the country's bad macroeconomic conditions and historic years of drought.

Productivity is an efficiency metric that emphasises the use of inputs in the production of a specific level of output in an economy (Setoboli et al., 2024). It is a synthetic expression of how efficiently factors of production are used, and it is substantial because it highlights the competitiveness of economic systems. Typically, productivity is defined as the ratio of outputs to inputs used in production. For a long time, economists have been particularly interested in measuring agricultural productivity. As a result, there are numerous ways for assessing agricultural production, with the choice mostly determined by the availability of data and the objective. Total Factor Product is more useful since it assesses agricultural output from a combination of inputs such as capital, labour, land,

and material resources. It reflects the overall rate of technological and efficiency change (Setoboli et al., 2024).

Labour supply pressures raise agricultural wages, escalate the need for labour-saving technologies, and shift production to nations with cheaper labour costs (Villoria et al., 2014). Zimbabwe's increased reliance on imports exposes the country to food security concerns in the event of a major crisis and may result in new social costs (Muqayi and Manyeruke, 2016). These social costs include transportation-related carbon emissions, exposure to less stringent food safety and production standards, and inferior food quality. The farming of fresh food in Zimbabwe is at a crossroads that may determine whether fruits and vegetables are grown on Zimbabwean soils in the future (Gapa, 2024). Gono (2020) argues that if policy remedies are not enacted immediately, Zimbabwean farmers will continue to lose market share to foreign producers, reducing the agricultural landscape's diversity.

2.2.1 Context of labour shortages in Zimbabwe

The agricultural sector in Zimbabwe faces significant challenges in productivity and economic growth due to labour shortages (Setoboli et al., 2024). Zimbabwe has experienced economic instability, which has resulted in a decline in agricultural productivity (Madebwe, 2017). Research by Moyo (2024) and Marima (2020) shows that migration, low wages, poor working conditions, urbanisation and inadequate training programmes worsen labour shortages. These factors bear witness to a workforce that is frequently unskilled and incapable of meeting the demands of modern agricultural practices.

Labour shortages in Zimbabwe`s agricultural sector threaten food security, economic growth, and rural livelihoods (Rukasha et al., 2021). The farming industry accounts for a large share of GDP and employment in Zimbabwe, and it faces increased labour shortages because of urbanisation, ageing farmers and limited job opportunities (Giller et al., 2021). Labour shortages affect crop yields and farm income, thereby compromising the sector's potential. This study investigates the impact of labour shortages on crop yields and farm income on GFF, exploring causes and effects. It also focuses on designing and developing a labour management system as a potential mitigation strategy for these effects. By examining existing research and empirical

data, this research aims to inform policymakers, agricultural stakeholders and farmers on addressing labour shortages to ensure sustainable agricultural development.

Agriculture's contribution to Zimbabwe's GDP growth rate was expected to decline by 2% in 2024 due to El Niño-induced droughts (Chidarikire, 2024). According to the Zimbabwe Investment Development Agency (ZIDA), the agricultural sector contributed around 15% to the country's Gross Domestic Product (GDP) (Dannaoui et al., 2024). The sector contributes to the livelihood of over 60% of the country's population, 23% of formal employment, 63% of raw material required by the manufacturing sector, and 30% of export earnings. The success of agriculture plays a crucial role in promoting development. Currently, in Zimbabwe, the services sector is becoming the major contributor to the country's Gross Domestic Product (GDP), surpassing vital sectors like agriculture and mining. Agriculture accounted for approximately 20% of Zimbabwe's GDP in 1991 and 19% in 1999. In 1980, the agricultural industry contributed 14% of GDP, which improved to 20.4% in 2001, but dropped to 12.5% in 2015 and 12.2% in 2016 (Matandare, 2017).

The forestry sector contributes about 4% to the GDP and employs around 14,600 people (Hlongwana, 2021). In 2023, the sector contributed 11.1% to GDP, despite challenges from climate change, while in 2024, the total agricultural output was expected to contract by 2% due to the worst drought in the past 40 years (Ali, 2024). World Economics estimates Zimbabwe's 2024 GDP at $116 billion in PPP terms (Purchasing Power Parity) and an initial estimate of $123 billion for 2025 (Duarte Santos, 2021). The sector employs approximately 67% of the labour force engaged in agriculture, with the majority being subsistence farmers on communal lands (Hajjar et al., 2020). However, the overall employment rate in Zimbabwe is not explicitly stated in the available data. The key agricultural contributions to GDP are crop production, livestock production and forestry. In crop production, the leading commercial crops grown are tobacco, maize, cotton and horticultural crops, while in livestock production, the primary livestock species are cattle, goats and poultry (Profile, 2010).

2.2.2 Composition of agricultural labour force in Zimbabwe

The bulk of the agricultural labour force in Zimbabwe comprises unskilled labourers who carry out manual tasks such as harvesting, planting and weeding (Setoboli et al., 2024). These workers

often have inadequate formal education and training, thus making them dependent on old-style knowledge or job teaching (Melash et al., 2023). Areas such as irrigation management, pest control and technology application are important for improving productivity and sustainability in the agricultural sector. These tasks require a skilled labour force such as agronomists, farm managers and technicians.

It is important to note that many agricultural jobs in Zimbabwe are seasonal, associated with the planting and harvesting cycles of different crops. This leads to fluctuation of the labour force demands during the peak season (Feuerbacher et al., 2020). Job insecurity and inconsistency in income are the main challenges for seasonal workers, affecting their livelihoods and ability to plan (Davies, 2016). The Agricultural labour force also consists of permanent positions, typically found on larger commercial farms or in agricultural enterprises such as Green Feathers Farm. These require ongoing labour for maintenance and year-round production. Permanent employees enjoy more job security, benefits and access to training opportunities compared to seasonal workers, especially when the farm maintains a stable labour force. Figure 1 shows the composition of agricultural labour statistics published by ZIMSTAT from 1995 to 2024.

The graph shows a broad analysis of the agricultural labour statistics, emphasising key and notable observations across different categories. The data spans from 1995 to 2024, showing measurements such as economically active and inactive populations, employment distribution by sector (only agriculture was included), and job losses. The graph also shows that there was missing information, which the researcher did not manage to gather from ZIMSTAT and other secondary sources. From the information given, gaps exist, especially from 2020 to 2024, for the economically active population and inactive population distribution. Job loss data is irregular, missing entirely for 1995 to 2001 and 2012 to 2017. The peak in 2009 (51.30%) and decline to 20.30% by 2024 imply that there was a sectoral shift away from agriculture. In addition, there is a sharp fall of female participation after 2016 (5.67%), slightly getting better by 2024 (19%). In 2020, data show an unusual spike of 58.81% in agriculture, and job losses peaked in 2003 (24%) and 2024 (23%), pointing out that there was economic instability in these years. The graph shows long-term declines in agricultural employment and inconsistencies in data reporting.

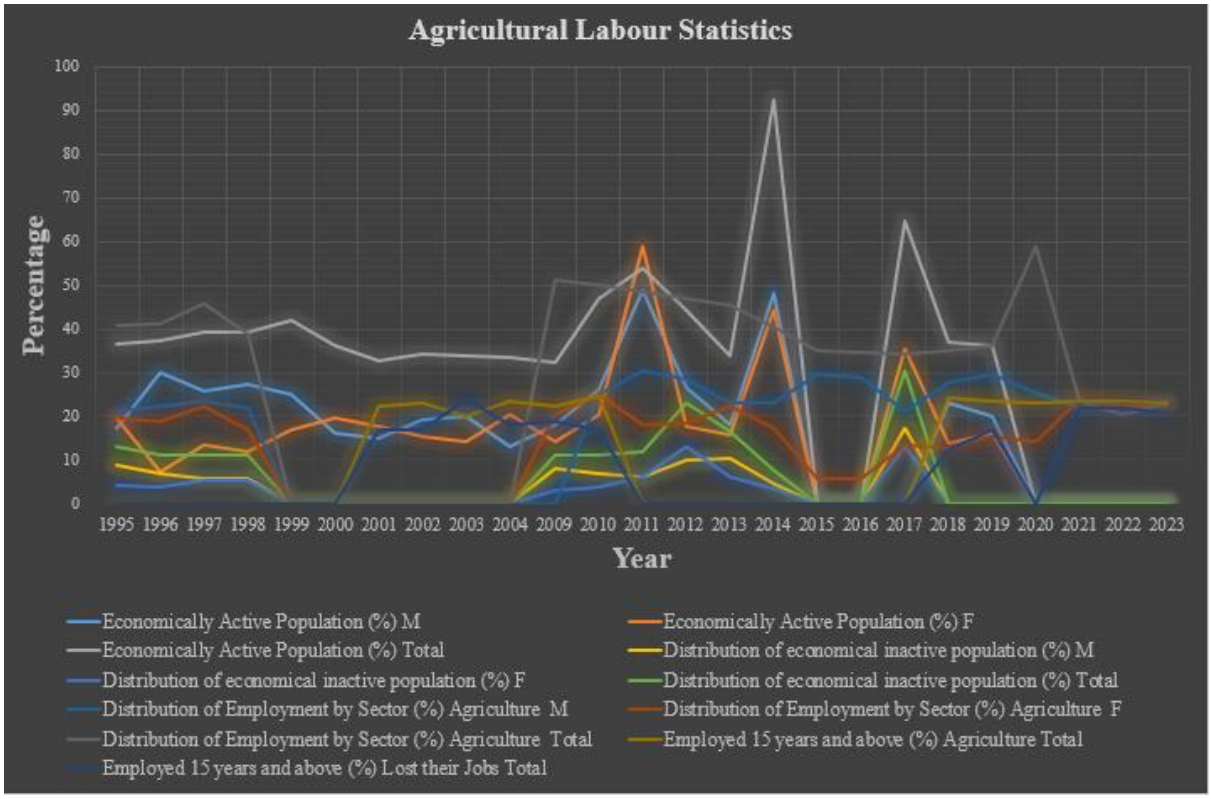

Figure 1: Agricultural Labour Shortages in Zimbabwe from 1995 to 2024

2.2.3 Gender dynamics of the agricultural labour force in Zimbabwe

In Zimbabwe, women play an important role in agriculture, often engaged in both formal and informal sectors (Mudzengerere, 2012). They largely contribute to food production and household food security (Adepoju et al., 2015). Regardless of their contribution in agriculture, women often face obstacles such as limited access to resources, land ownership and power in decision-making (Baba et al., 2015). Types of agricultural tasks performed by men and women are often dictated by traditional gender roles, with men typically involved in more labour-intensive tasks and decision-making roles. There is growing recognition of the need to empower women in agriculture through access to credit, training and leadership opportunities.

2.2.4 Theory of Production

The theory of production seeks to observe the physical relationships between inputs and outputs. Physical in the sense that these relationships are in terms of variables in which inputs and outputs are measured, for example, hectares of land, number of workers, and barrels of oil (Setoboli et al., 2024). The production function is usually used to present such relationships. According to

Ishikawa (2021), the Cobb-Douglas production function, which uses labour and capital as inputs, is probably the most used in economic production theory;

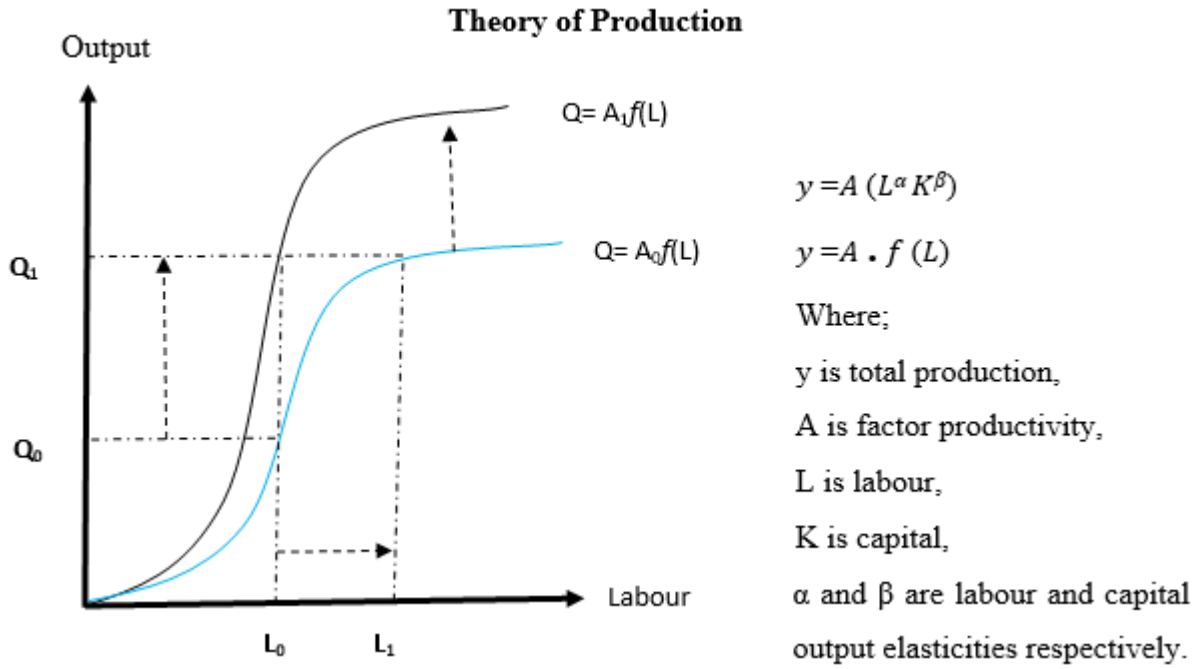

Figure 2: Theory of Production

Although there are numerous inputs in the production system, usually a two-input case is assumed (at ceteris paribus) for simplicity, of which, in the short run, capital is assumed constant.

Farm productivity refers to the measure of how efficiently farms produce agricultural goods. It is a crucial factor in ensuring food security and economic growth in Zimbabwe, as a major contributor to the GDP. The key factors that influence farm productivity include;

- **Crop yield**: The amount of crops produced per hectare of land. Zimbabwe's average national yield for maize, for example, is 1.39 metric tonnes per hectare and GFF has over 120 hectares of arable land.
- **Fertiliser use**: The application of fertilisers can significantly boost crop yields. In Zimbabwe, fertiliser use is around 120 kg per hectare of tobacco.
- **Tractor use**: Mechanisation can greatly improve farm efficiency.
- **Irrigation**: Access to reliable water sources is vital for crop growth. Zimbabwe has the potential to irrigate 366,000 hectares of land, but currently only utilises 124,000 hectares. GFF get water for irrigation from the Fair Adventure Dam, in addition to electric boreholes.

- **Livestock production**: The number of livestock produced, such as cattle, goats and poultry, also contributes to overall farm productivity. Zimbabwe has a significant livestock sector, with over 5 million cattle and 3 million goats.

Farm efficiency refers to the optimal use of resources (inputs) to produce maximum outputs, minimising waste and costs while maintaining or improving crop or livestock quality. **Table 1** shows key aspects of farm efficiency.

Table 1: Farm Efficiency

Key Aspects	**Description**
Energy efficiency	Reducing energy consumption and environmental impact
Time management	Optimising farm operations and tasks
Cost management	Minimising expenses without compromising productivity
Productivity	Maximising yield per hectare or unit of resource
Resource optimisation	Land, labour, water, fertilisers, equipment and capital

Table 2 shows how labour shortages significantly affect farm productivity and efficiency.

Table 2: Impact of Labour Shortages on Farm Productivity and Farm Efficiency

Productivity impacts	▪ Reduced crop yields: Insufficient labour for planting, weeding, harvesting, and crop maintenance. ▪ Decreased livestock production: Inadequate labour for animal care, feeding, and health management. ▪ Lower quality produce: Rushed or incomplete harvesting, leading to reduced quality.
Efficiency impacts	▪ Labour scarcity forces farmers to inefficiently allocate resources prioritise tasks, potentially neglecting critical operations. ▪ Farmers may hire temporary or overtime labour, raising costs. ▪ Labour shortages limit the effectiveness of farm equipment and technology. ▪ Labour constraints disrupt timely farm operations and delay or miss planting and harvesting dates. ▪ Unharvested or spoiled crops due to labour shortages increase waste.

Long-term consequences	▪ Reduced farm size or diversification ▪ Decreased competitiveness ▪ Lower profitability ▪ Increased reliance on costly external labour ▪ Potential farm abandonment

Due to reduced productivity and efficiency, farmers may implement strategies to mitigate labour shortages. These may include;

- Mechanisation and automation
- Labour-saving technologies (e.g., drones, precision irrigation)
- Training and development programmes
- Attracting and retaining labour (e.g., better wages, benefits)
- Cooperative farming or labour sharing
- Seasonal or migrant labour programmes

2.2.5 Implications of Farm Labour Shortages

2.2.5.1 Farm labour shortages create production losses for Zimbabwean farmers

Farm labour shortages highly affect agricultural productivity in Zimbabwe, resulting in lower crop yields and total farm income. Gwanongodza (2020) and Runganga (2021) write that the agricultural industry is critical to Zimbabwe's economy, accounting for around 17% of GDP and employing nearly 70% of the population. The farming sector relies largely on human labour for a variety of tasks, including planting, weeding, and harvesting (Vasconez et al., 2019). When labour is scarce, farmers struggle to manage these labour-intensive tasks, which leads to low output (Amare and Endalew, 2016), especially during peak seasons, when timely work is required to maximise productivity. Farmers may face production losses because of human capital shortages. This will directly influence their income. Failure to harvest crops on time can result in spoiling and lower quality; further reducing market value (Kasso and Bekele, 2018). Furthermore, because the agricultural sector is highly dependent on seasonal labour, shortages during important periods can have a negative influence on productivity. Likewise, to attract available labour, farmers may need to raise wages, which might add to the financial burden of

farmers. Raising wages will cause wage inflation, which will further raise production costs, making it difficult for farmers to remain profitable.

Many crops require intensive labour for planting, maintenance, and harvesting. Therefore, labour shortages lead to delays or incomplete tasks, resulting in reduced yields. In addition, insufficient labour compromises the quality of crops, because timely interventions such as pest control and irrigation practices are neglected. When farmers are unable to engage all the personnel they need, their harvesting capacity suffers, and their harvests may fail to reach the market. This issue has caused enormous economic losses for Zimbabwean farmers who have invested their money and efforts. This dilemma jeopardises the capacity of Zimbabwean farmers to continue producing, limiting Zimbabwe's ability to feed itself and its global partners. Furthermore, when farmers go out of business, rural communities suffer. When row crops replace high-value crop cultivation or other land uses, the local infrastructure that supports these industries (such as packinghouses and trucking companies) may disappear. Consequently, the negative effects of high-value output losses extend beyond the farm to neighbouring populations.

Farmers who experience labour shortages must also adjust their production and labour management strategies, which affect how they farm and what they can cultivate (Win, Rutledge and Maredia, 2023). To demonstrate this point, the University of California, Davis and the California Farm Bureau Federation conducted a 2019 study of 1000 California farmers, which revealed that producers made major changes to deal with labour shortages (Zahniser et al., 2019). According to the survey results, 39% had to change their cultivation practices, 37% experimented with labour-saving technologies, 27% hired farm labour contractors for the first time, and 5% switched some acreage from labour-intensive crops to non-labour-intensive crops, such as nuts. The most commonly used technology was mechanical harvesters and customised tractor attachments. Harvesting, pruning, and weeding procedures were often reduced or delayed.

2.2.5.2 Farm Labour Supply Pressures Drive Farm Wages Up

When farm labour becomes scarce, supply is reduced forcing wages up. As a result, this will potentially create a negative cycle of economic distress. While rising salaries may seem to

benefit workers at first, it may also severely raise farmers' production costs. This dynamic can create a difficult situation for both producers and consumers because farmers will pass on these expenses to customers in the form of price hikes. As a result, this might contribute to inflationary pressures within the agricultural sector, affecting general economic stability.

According to a fundamental labour economics principle, when labour supply diminishes, employment decreases and wages increase. The black LD line marks a downward-sloping labour demand curve as illustrated below, while the gold LS1 line prior to the decline in labour supply and the green LS2 line after the decline represents the upward-sloping labour supply curves. As shown in the graph, the reduction in labour supply from LS1 to LS2 results in decreased employment (a drop from e1 to e2) and an increase in wages (a rise from w1 to w2).

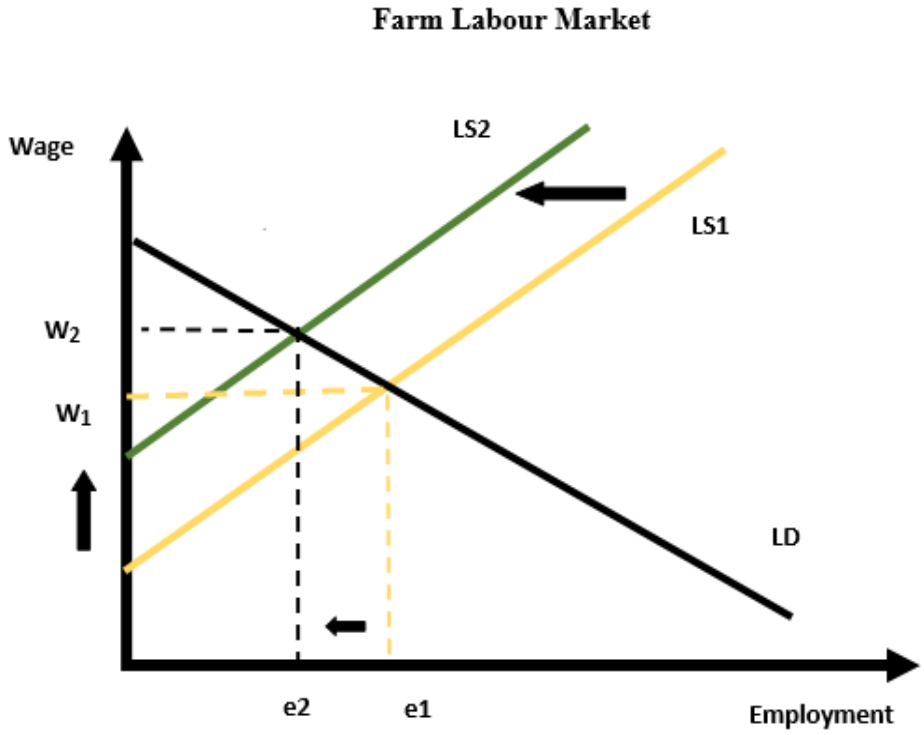

Figure 3: Farm Labour Market

Farm wages in Zimbabwe have largely increased because of continuous labour shortages over the years. However, farmers continue to face challenges in attracting and maintaining employees, putting upward pressure on wages as they compete for available labour. Despite the pay hikes, labour shortages remain. Many farmers still experience problems that are labour-related during peak agricultural seasons.

2.2.5.3 Farm Labour Shortages Create Economic and Societal Problems

Farm labour shortages have far-reaching effects on the economy and society in general as they extend beyond individual farms (Charlton et al., 2021). Labour shortages can negatively affect rural economies reliant on agricultural employment, leading to population decline and reduced local services (Zhang and Quan, 2023). Reduced agricultural output can affect food availability and raise prices, affecting food security, while worsening poverty for consumers, particularly the vulnerable people who spend most of their income on food. When agricultural production declines, food security becomes a big concern. Additionally, labour shortages may cause the development of rural communities to suffer. This is because many rural towns rely on agriculture for economic viability. When agriculture is crippled by labour shortages, job losses and reduced economic activity become prevalent. This situation may increase migration from rural to urban areas as individuals seek better opportunities, further destabilising rural economies. The social consequences include potential exploitation of remaining workers, since farmers may require longer hours or lower wages to compensate for labour shortages. This can result in employee dissatisfaction and high turnover rates, complicating labour management even further.

Many other issues are related to farm labour shortages and their effects on domestic production activities. For example, Mexico was undergoing economic upheaval, and its workforce was shifting away from agricultural labour (Zahniser et al., 2018). The agricultural transition in the United States was practically complete by the mid-twentieth century when Mexican immigrants who had entered the country through the World War II Bracero Programme (Gonzalez, 2023) dominated the farm workforce. As of 2023, agriculture employs around 1.4% of the US labour force. This percentage indicates a long-term trend of decreased agricultural employment as the sector becomes more mechanised and efficient. Agriculture, on the other hand, continues to be an important sector of the US economy, supporting a wide range of industries. Mexico lags behind the United States in terms of agricultural transformation, but it is swiftly catching up, similarly, this also goes for Zimbabwe. Over time, fewer people will work on farms, as farmers turn to technology and automate labour-intensive tasks.

2.2.5.4 Increased Production Costs

To attract more workers, farms may need to raise wages or hire temporary or seasonal labour, this will increase the overall production costs (Zahniser et al., 2018). Farmers may invest in advanced technology or automation to compensate for labour shortages. The shift from manual labour to mechanisation is highly expensive, leading to higher initial costs (Jack, 2013). In addition, compensating for overtime may raise labour costs; farmers may wish to avoid these costs, exploiting the available labour in the end. Reduced agricultural yields or quality owing to insufficient labour will result in lower revenues. These increased costs affect the overall profit margins, making it difficult for farmers to sustain their businesses. In the end, farmers will choose to either absorb these costs or pass them on to consumers, consequently affecting market competitiveness.

2.2.5.5 Economic Impact on Farm Income

The total farm income is seriously affected by labour shortages. Lower yields and higher operational costs directly influence and reduce profit margins, making it harder for farms to continue operations (Hartman, 2015). Farms may engage in financial credit to finance operational needs, jeopardising long-term financial stability. Consequently, an insufficient labour force makes farmers decide to reduce acreage or the number of livestock at a farm, resulting in reduced profit (Bowman and Zilberman, 2013). Furthermore, labour challenges reduce crop yields and quality, lowering farm income and farmers may be forced to sell their products at lower rates due to poor quality and limited demand (Giller et al., 2021). Farm income may become more erratic, making it difficult for farmers to plan.

2.2.5.6 Shifts in crop choices

Farmers to switch to less labour-intensive crops or types that demand fewer resources to cover labour shortages. This influences crop selection, potentially affecting biodiversity and market dynamics (Bowman and Zilberman, 2013). Labour shortages can jeopardise conventional crop rotation systems, affecting soil health and sustainability (Rosenberg et al., 2022). Labour shortages influence the choice of crops, farmers may opt for longer shelf life crops, minimising the requirement for speedy harvesting and processing. Furthermore, farmers may choose crops that can be cultivated using efficient farming technologies, like precision agriculture, or ones that can be picked mechanically, making them less subject to labour shortages. This shift in

crop selection may have far-reaching complications on the agriculture business, for example, changes in market demand and supply chains.

2.2.5.7 Labour Relations and Workforce Dynamics

Farmers can exploit workers due to competition for available labour, resulting in terrible working conditions (Barnay, 2016). High turnover rates may develop as employees seek better opportunities elsewhere, as the working conditions will no longer be favourable (Nwokocha and Iheriohanma, 2012). This practice may affect labour relations and workforce dynamics. On the other hand, competition for available labour may positively influence improvements such as better working conditions and higher earnings, but it may also increase expenses and complexity for farmers. Farmers may need to invest in training and development programmes to upskill their current employees. Farmers may also seek labour force from non-traditional sources, such as metropolitan areas or migrant worker programmes, to increase the diversity of their workforce.

2.2.5.8 Environmental Consequences

Due to labour shortages, farmers may resort to unsustainable and less environmentally friendly options, such as the overuse of chemicals (Demi and Sicchia, 2021). Adoption of sustainable practices, such as crop rotation and organic farming that require more intensive labour can be hindered by labour shortages (Gamage et al., 2023). This results in decreased soil health and long-term productivity, whilst creating a cycle of dependency on chemical inputs. Moreover, to deal with labour shortages, there may be increased pressure to convert natural areas into agricultural land, which could harm ecosystems.

2.2.5.9 Technological Advancement

Labour shortages can amplify the drive towards technological innovations. It may hasten the introduction of automation and precision agriculture technologies, transforming the landscape of agriculture. In response to technological adoption, farmers may call for effective tools to manage labour. Even though this can help alleviate some labour demands, the initial cost can many smallholder farmers in Zimbabwe.

2.2.6 Policy options for addressing farm labour shortages

Farm labour shortages pose serious challenges to agricultural productivity and economic stability. Various policy solutions can be used to effectively solve these shortages.

2.2.6.1 Migration Policy

Interventions such as the migration policy can play an important role in addressing labour shortages in agriculture. By developing paths for seasonal and temporary migrant workers, Zimbabwe can ensure that farms can access the labour they require during peak seasons. These interventions should accommodate the implementation and expansion of programmes such as the guest worker programme that enables farmers to engage foreign labour legally. Such programmes can be structured to simplify the application process and reduce the bureaucratic complexities, ensuring that labour demands are met quickly while maintaining migrant workers' rights and safeguards. Zimbabwe can also participate in regional agreements to facilitate the migration of agricultural workers across borders. This technique can help to stabilise labour supply in locations experiencing labour shortages, creating a more adaptable workforce capable of responding to seasonal demands.

2.2.6.1.1 Migration patterns and their effects on labour supply in Zimbabwe's agricultural sector

- **Rural to urban migration**: Most young people migrate from rural areas to urban centres for education, better living conditions, and better job opportunities (Zago, 2016). This can lead to labour shortages in agricultural zones as younger and more skilled workers leave for cities, leaving an ageing labour force in rural areas. This cripple chance of future agricultural productivity and innovation.
- **Seasonal migration**: Workers temporarily move to different regions during peak agricultural seasons, such as planting and harvesting. This seasonal migration benefits farmers to meet their demands in receiving areas, whilst creating gaps in labour in giving regions. While some areas may experience labour shortages, others may take advantage of an influx of seasonal workers during harvest times, helping to improve labour supply in certain regions. Migration can lead to increased wages, which may not always be affordable to farmers.
- **Cross border migration**: Most skilled and semi-skilled Zimbabweans often migrate to neighbouring countries such as South Africa in search of better job opportunities

(Crush, Chikanda and Tawodzera, 2015). These movements of agricultural workers reduce the availability of the labour force for local farms. The end effects of the outflow of the workforce deteriorate rural societies, leading to an ageing populace left behind who lack the physical ability to manage farms successfully. Migration of the labour force out of Zimbabwe significantly reduces agricultural production and sustainability.

2.2.6.2 Subsidies or Tax Credits

Union groups and other lobby groups, their representative farmworker advocates, have made noise for better wages and working conditions on farms. To achieve this, the government subsidise or gives tax credits to employers, which will lift the financial burden on farms and offset higher employment costs while ensuring that employees receive a fair wage. Options along these lines could include housing reimbursements for employers, overtime wages, tax credits, or tax write-off expenses, such as transportation or meals. Subsidies and tax credits can be powerful tools for encouraging workforce retention and recruitment in agriculture. Wage subsidies can encourage farmers to hire more staff by reducing labour expenses. This is especially useful for small and medium-sized farmers who struggle to compete with larger businesses. Tax breaks for farms that invest in worker training and development could boost labour productivity and retention. Improved training can make agricultural jobs more enticing, resulting in higher job satisfaction and lower turnover.

2.2.6.3 Technology Development Policy

To mitigate labour shortages and minimise production costs, farms must invest in labour-saving technologies. The government should promote labour laws that increase the wage limit. Rising wages in a labour-scarce economy encourage the development of labour-saving technologies. The view is that producers adopt new technologies when the predicted cost savings outweigh the expenditure. In an economy that has a comparative advantage of labour, wages are typically low compared to capital and land rents. This scenario provides little incentive for public and private entities to invest in labour-saving technologies. It then follows that, if technology lags, domestic crop yields will be more sensitive to rising salaries and the declining labour supply. If the policymakers implement a policy that forces farm wages up and limits the access of the labour force, it may create an incentive for farms to move less labour-intensive crops to those that can be harvested by machines like combiner harvesters. However, if these technologies are

not available, labour shortages will drive up food prices for consumers, increasing reliance on imports. Governments can encourage the development and use of automated labour solutions by offering grant monies to groups, developing low-interest loan programmes for farmers, or providing other incentives to support their growth, such as tax credits for businesses.

Adoption of new technologies can lessen the burden generated by labour shortages in agriculture. Automated planting, harvesting, and monitoring technologies enable farmers to remain sustainable and productive even during periods of labour shortages. The government should therefore encourage farmers to practice precision farming to enhance resource utilisation and crop management, substituting the need for labour-intensive procedures.

2.2.6.4 Education and Workforce Development

The government can promote human resource development through education and skill building to increase a more skilled workforce. GFF and another farm should approach vocational training centres tailored to offer agricultural skills and recruit labour, who have a basic knowledge about farming. These programmes can provide training in machinery operation, crop management, and sustainable farming practices, making agricultural careers more appealing.

2.2.6.5 Enhancing Working Conditions

Improving working conditions in the agricultural sector such as health and safety regulations, better remuneration and other welfare issues can help to retain the existing labour force and attract new ones. This can enhance job attractiveness in the agricultural sector and reduce high labour turnover rates.

2.3 THEORETICAL FRAMEWORKS

This study employed various theorems such as labour economics, human capital hypothesis, total factor productivity and production function to examine the effect of agricultural labour shortages on crop yields and farm income at Green Feathers Farm. These frameworks will lead the research by demonstrating the linkages between labour availability, production, and income, as well as the elements that influence the agricultural setting.

2.3.1 The Cobb-Douglas Production Function

The Cobb-Douglas production function, invented by Paul Douglas and Charles Cobb, depicts the relationship between inputs such as labour, land, and capital and outputs, for example, crop yields and livestock production (Hlongwa, 2015). The researcher finds the model useful in determining the effect of fluctuations in labour input on aggregate farm output due to labour shortages (Vasyl'Yeva, 2021). The Cobb-Douglas function is straightforward and easy to understand and interpret, making it a prevalent empirical examination of the relationship between inputs and outputs (Chen and Yao, 2024). It serves as a basis for more complex models and helps economists to understand the relationship between inputs and outputs. In theory, a reduction in labour input because of shortages consequently leads to reduced output when other factors remain constant. The function highlights the importance of labour input in achieving maximum output levels. Understanding the correlation between labour input and output helps measure the potential decrease in crop yields and income. However, the frameworks have some limitations. The Cobb-Douglas function assumes that there is constant elasticity of substitution between labour and capital, which may not reflect the true context. The function may also not include enough complexities of the production processes in the agricultural sector, where inputs are not perfectly substitutable. Farmers cannot perfectly substitute labour input with machinery. The model also assumes the principle of constant returns, which states that an increase in the number of workers may increase output. This may not apply universally in different production contexts.

2.3.2 Labour Supply and Demand Theory

The labour supply and demand theory by Adam Smith explores how labour shortages affect the supply and demand dynamics in the agricultural sector (Feist, 2024). The theorist states that a decrease in the availability of the labour force can lead to higher labour expenses, which may reduce the total farm productivity and profitability (Ucak, 2015). The theory provides the basis for understanding how wages are determined in the labour market, which is important for both employees and employers (Haanwinckel, 2023), as shown in **Figure 4**.

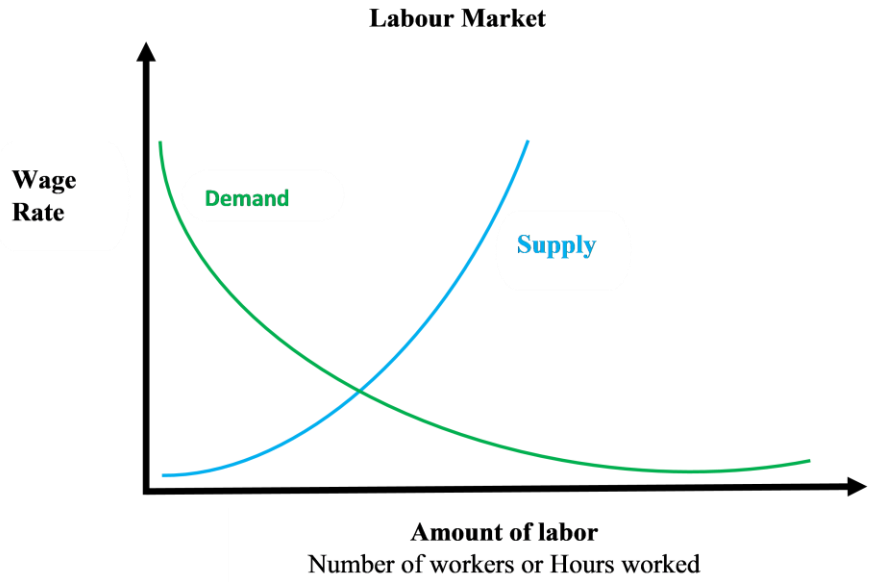

Figure 4: Labour Market

The model seeks to understand the underlying forces between the availability of labour and the demand for it within the agricultural sector. It posits that, if demand for labour exceeds its supply, it will result in labour shortages. The factors will can worsen this imbalance may include: immigration, low wages and poor working conditions. For farmers to have informed strategies to attract workers, they should understand the dynamics of supply and demand for the agricultural labour force. These strategies may include improving compensation or working conditions, and directly mitigating labour shortages. The theory provides the policymakers with insights about the potential effects of policies such as minimum wage laws, labour regulations and employment policies. These insights will assist in creating effective labour market interventions. In addition, the model serves as a fundamental instrument for analysing labour market conditions, aiding economists and researchers to evaluate issues such as labour force participation rates, underemployment and unemployment. By investigating how labour supply and demand interact, stakeholders can better understand the consequences of efficiency in the labour market, productivity and aggregate economic growth. Understanding the underlying forces on labour supply and demand dynamics, farmers and policymakers can predict employment trends and make informed decisions regarding labour force planning and resource allocation.

The Supply and demand theory faces the following challenges: Firstly, the theory often assumes perfect competition within labour markets, which is hardly the case in real-world situations. In an agricultural setup, sometimes a single employer in a town or region, one farm or state-owned farms may characterise labour markets, affecting wage determination and employment levels. Furthermore, labour supply and demand theory may also employ static models that do not account for dynamic changes in the labour market, such as technological advancement and the seasonality of the agricultural labour force (Hill et al., 2021). In addition, the theory ignores the differences in experience, skills and productivity among workers and assumes that all labour is consistent, which can lead to overgeneralised assumptions about wage determination.

2.3.3 Human Capital Hypothesis

The human capital hypothesis by Gary Becker and Theodore Schultz highlights the value of education and training in increasing labour productivity (Nadezhina and Avduevskaia, 2021). This concept argues that investments in education and training increase employee productivity. It also argues that investing in skilled development can help reduce the effects of labour shortage by increasing the efficiency of the available workers (Powell, 2016). According to Kuzminov et al., (2019), investing in education is necessary to obtain skills and training, which will contribute to the growth of individual human capital. Farmers who invest in training and development can rectify labour shortages that come because of an insufficiently skilled workforce. Education will then improve the skills of available labour, thereby mitigating the effects of labour shortages. Odhon'g and Omolo, (2015) argue that human capital is one of the organisation's tangible assets, where employees' skills, talents, and knowledge are closely related to the organisation's strategies and performance. Human capital theory, shown in **Figure 5**, illustrates that investment in human capital through education, skills development, and training increases an individual's productivity and earnings, eventually improving economic growth. This model underlines the significance of training programmes aiming to increase production and compensate for labour shortages, leading to better crop yields.

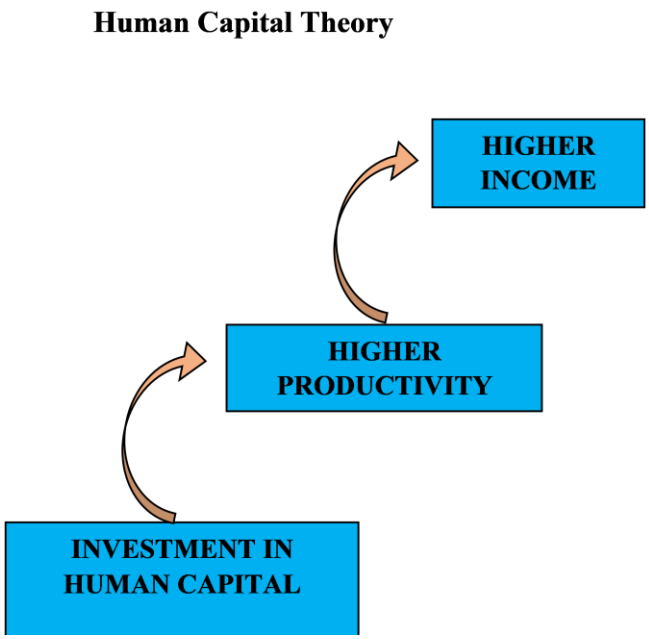

Figure 5: Human Capital Theory

Labour training is one of many complex human resources that have been consistently proven to have a major impact on the success of organisations. This has been necessitated through channels such as learning, creativity, employee motivation, and many more (Nassazi, 2013). Training methods use learning events, programmers and instructors to modify behaviours in a systematic and planned manner (Yildiz Durak, 2018). This allows people to execute their jobs more efficiently since training allows individuals to obtain a degree of knowledge, skills, and competency. In essence, training and development produce real results like increased productivity, superior products, quality services, and resource optimisation (Yertas, 2024).

There are various benefits linked to training, which include job performance, increased job satisfaction, higher customer satisfaction and a reduction in operational costs (Huang, 2019). Training has been recognised as one of the most important human resource management strategies. It improves the quality of work and workers' knowledge and abilities, resulting in great employee performance on the job (Elnaga and Imran, 2013). Investigations have shown that many farmers do not devote much effort to implementing effective training strategies and programmes. The unwillingness of management to invest in training programmes has resulted in a never-ending cycle of high labour turnover, poor job satisfaction, low productivity and poor farm efficiency. This follows the lack of enthusiasm and dedication of workers. Using unskilled workers will result

in low capital returns and low investment, limiting growth. The solution is to invest more in education.

However, the human capital hypothesis overemphasises the value of formal education whilst underestimating the importance of experience, informal learning and social networks, which are a to farm productivity. It also overlooks the external factors like economic conditions and labour dynamics that influence returns on human capital investments. In addition, quantitative measurement of human capital can be difficult since it includes intangible factors like motivation and social skills.

2.3.4 Total Factor Productivity (TFP)

Total factor productivity (TFP) was developed by Robert Solow to assess the efficiency when all inputs employed in the manufacturing process are transformed into outputs (Van Beveren, 2012). Understanding FTP can assist in analysing how labour shortages affect overall farm efficiency. The total factor productivity is an essential indicator and measure of economic efficiency and productivity growth at a farm. It fosters the assessment of how well the farm utilises its resources (Coomes et al., 2019). It offers insights into the elements that drive economic growth other than increases in labour and capital, such as innovation, technological advancements and improvements in efficiency (Sairmaly, 2023). The FTP sanctions the comparison of productivity across diverse farms, assisting in detecting best practices and areas of improvement (Bureau and Jesus, 2022). The limitations of FTP may include that inputs (labour) and outputs (crop yields and farm income) are difficult to accurately measure, leading to potential errors in TFP estimates. For example, if maize is grown on a 30-hectare piece of land, it is difficult to measure the plant population equivalent to 30 hectares. In addition, total factor productivity mainly focuses on labour and capital, overlooking other important inputs such as energy, and natural resources like sunlight. Moreover, the FTP is mostly viewed as an outstanding measure of efficiency; this may not reveal the exact contributions of many other factors that may affect farm productivity.

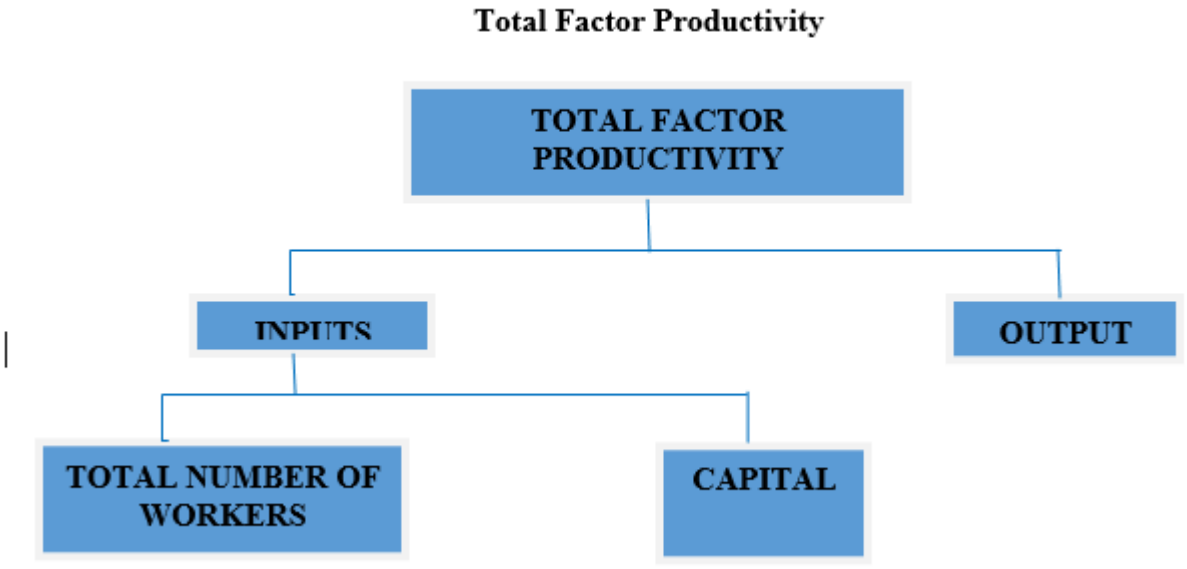

Figure 6: Total Factor Productivity

Figure 6 shows total factor productivity, which is determined by dividing the output by the weighted geometric average of labour. The labour input represents the total hours worked by employees in a year. The capital stock is a measure and value of all equipment, buildings, and machinery divided by the price of those items. High FTP can cushion the impacts of labour shortages by demonstrating that the remaining hour is used more competently, possibly leading to constant or improved outputs regardless of fewer workers. Focusing on improving FTP through better practices or technology can address the negative effects on farm income.

These conceptual frameworks aid in understanding relationships in labour dynamics. Green Feathers Farm (Pvt) Ltd can adopt an effective labour management system that mitigates labour shortages through enhanced labour demand methods, investing in human resources, and increasing production through technology and efficient practices. This cohesive method will help farmers and policymakers to assess and mitigate the negative impacts of labour shortages on crop yields and farm income, consequently guaranteeing the sustainability of farms in Zimbabwe.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter seeks to lay down the methodology used in the research. The research acknowledges the challenges faced by farmers, such as low productivity and unsustainable farming practices. The challenges are predominantly present in developing countries like Zimbabwe due to labour shortages. To understand the underlying causes of these labour shortages, the researcher conducted a mixed-methods approach, guided by the need to combine both qualitative and quantitative techniques. Using both methods is important to capture the multidimensional nature of labour shortages caused by various economic, social, and environmental factors. By incorporating diverse data collection methods and merging numerical data with personal narratives, this aims to provide a comprehensive understanding of the labour dynamics at Green Feathers Farm and identify actionable solutions.

3.2 DESCRIPTION OF STUDY SITE

This study will focus on Green Feathers Farm, which is located in Wedza North District, Mashonaland East Province. Wedza is situated 127 kilometres south of Harare and 50 kilometres south of Marondera. It is climatically distributed into two halves; the upper Wedza, which is cooler, with average to high rainfall distribution patterns. The lower Wedza is classified as warmer to hotter temperatures and low rainfall. Crops like cotton and sorghum/millet perform better in lower Wedza; however, the same crops yield less in upper Wedza. Green Feathers Farm (Pvt) Ltd is situated in the upper Wedza, flanked by Bolton and Fair Adventure shopping areas, with unique characteristics that can influence labour variations, productivity and profitability. This part of Wedza is in Region 2 and is ideal for intensive farming, with moderate rainfall (800 to 1200 mm/year) and good soils. Soil pH ranges from 5,3 to 5.5. It has medium loamy sands with pockets of sand originating from granite mafic rock. Wedza is one of Zimbabwe's most productive agricultural districts, particularly maize, tobacco, cotton, soybeans, and horticultural products under large-scale irrigation. It contains a mix of commercial farmer and smallholder farms, with a heavy reliance on seasonal labour for planting, weeding and harvesting. The region is dealing with workforce migration to metropolitan regions, which worsens labour shortages during peak agricultural seasons.

Map of Wedza/Hwedza

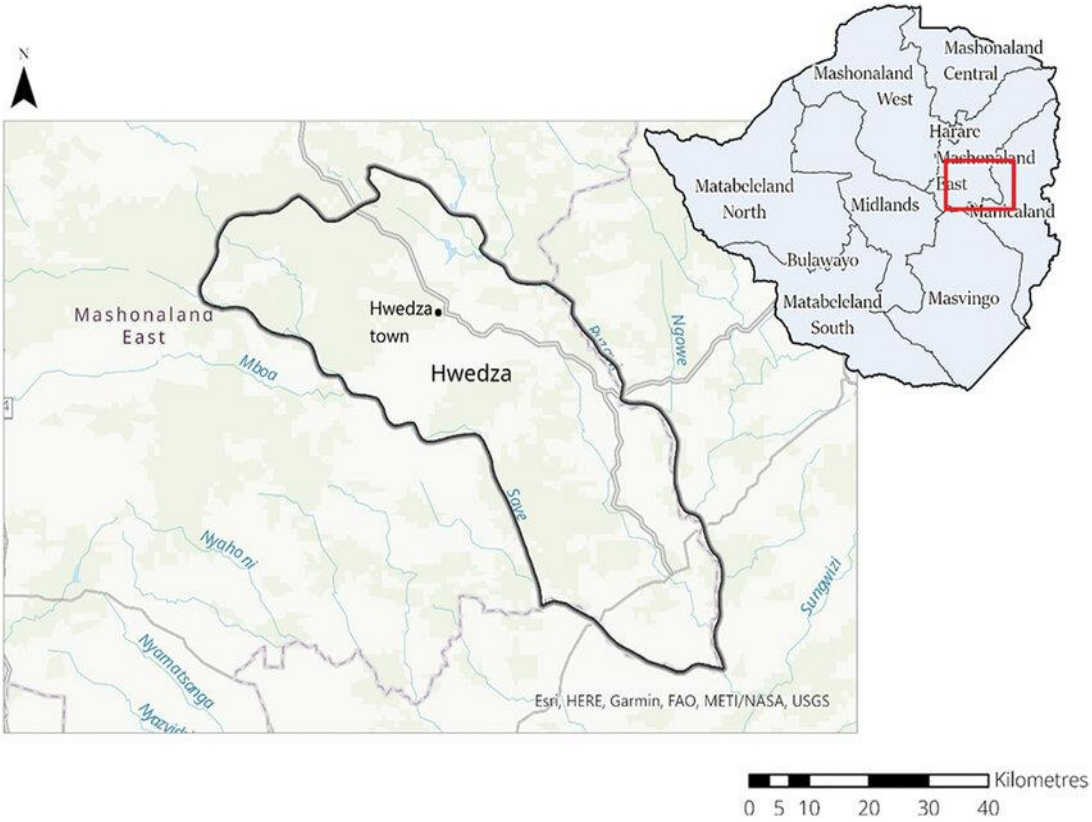

Figure 7: Wedza District Map

Green Feathers Farm's unique location offers a massive range of agricultural opportunities. This area is known for tobacco, maize, and paprika production during the warm wet season (October to March). Presently, tobacco is the most dominant field crop grown, next to groundnuts, which are grown in every homestead, particularly in the Zviyambe area. Tobacco production has expanded significantly, giving an average output of 1300 kg/ha.

3.3 RESEARCH DESIGN

This study used a mixed-methods approach, incorporating both quantitative and qualitative research methods. This approach enables a full investigation of the intricate links between labour shortages, crop yields and profitability. The study is descriptive in nature, offering a full description of the current labour conditions in the agricultural sector. Data was collected from various factors that may have contributed to labour shortages, such as demographic trends, economic conditions and migration patterns. In addition, the study is analytic, examining the effects on productivity and profitability. This involves examining the relationship between available labour, crop yields and the financial

performance of GFF. Primary data was collected through surveys and interviews with GFF managers, GFF farm workers, local government officials, and the surrounding communities. The researcher also utilised existing data from labour statistics to supplement primary data.

By combining descriptive and analytical methods, the study offers a more comprehensive understanding of the complex effects of labour shortages on agriculture. The findings will be useful to policymakers, farmers, and stakeholders, providing them with solid insights to address labour shortages and increase efficiency and success. This dual approach will set a concrete foundation for further research, possibly exploring resolutions to identified challenges in the agricultural labour market.

3.4 DATA COLLECTION METHODS

A mix of qualitative and quantitative data collection methods was used to ensure a thorough grasp of the topic. Surveys were intended to gather both qualitative and quantitative data from various respondents. Using both approaches allows corroboration, where findings from one method can authenticate and enhance the results of the other. The mixed methods approach provides flexibility in research design. It permits the researcher to realign the strategies based on the initial findings.

3.4.1 Quantitative Data

Quantitative data is information that allows numeric measurements and representations. It is used to measure traits, enabling statistical analysis and comparisons. The characteristics of quantitative data are numeric, including discrete and continuous data (Bergin, 2018). The researcher used a structured questionnaire to collect numeric data from GFF management, adjacent communities, and GFF farm workers. Closed-ended questions were also used for quantitative data metrics. The survey facilitated the collection of quantitative aspects related to labour force metrics such as labour availability(the number of workers and seasonal variations), farm productivity metrics (crop yields and livestock production), operational efficiency (cost and time spent on farm activities), employees turnover rates, demographic distribution and recruitment cost. The survey was conducted using online platforms (Google Forms). Secondary data was obtained through a study of government reports and agricultural statistics to examine labour trends and agricultural productivity levels in Zimbabwe. Access to the national agricultural database provided historical crop yield, labour statistics, and economic indicators.

3.4.2 Qualitative Data

Qualitative data is descriptive in nature and aims to comprehend concepts, thoughts or feelings rather than to quantify them. It is regarded as non-numeric data that describes characteristics or qualities (Hay, 2016). The qualitative element captures complex experiences and perceptions of employees and management regarding labour shortages, such aspects include factors influencing labour shortages (low wages, working conditions, and high labour turnover rate), mitigation strategies and plans for GFF. Semi-structured interviews were performed with important stakeholders such as farmers, agricultural extension workers, and policymakers to gain a thorough understanding of the impact of labour shortages in Zimbabwe. Flexible subjects such as personal experience with labour shortages, farmer coping mechanisms, and insights into policy affecting the labour dynamic were discussed. Surveys permitted the collection of data from a large sample size, which improves the trustworthiness and depth of the findings.

Table 3: Quantitative Data Analysis

Specific Research Objective	Data concepts and variables/indicators	Data collection methods/tools	Respondents/subjects
To identify and analyse the underlying causes of labour shortages at Green Feathers Farm.	Perceptions of labour shortages and their impacts, Insights into underlying causes of labour shortages and Working conditions **Labour force data** Number of employees, Employee turnover rates, Age and demographic distribution **Recruitment and hiring data** Cost of recruiting and hiring, Time to hire metrics **Employee retention data** Reasons for employee turnover **Farm operation data** Crop yields and productivity metrics, Equipment and technology usage metrics	Surveys (Online or paper based), Interviews(semi-structured), Focus groups and Secondary data	Management, employee/ HR personnel, Local labour market experts
To quantify the impact of labour shortages on crop yields and farm income at Green Feathers Farm, and identify potential mitigation strategies.	**Crop yield data** Historical crop yield and current crop yield, Crop yield data by season and Crop yield data by labour input **Farm income data** Historical and current farm income data, **Labour shortages data** Frequency and duration of labour shortage, Reasons for labour shortages, Impact of labour shortages on crop yield and farm income and Mitigation strategies used to address labour shortages **Farm Management data** Farm size, Crop rotation and planting schedules,	Surveys (Online or paper based), Interviews(semi-structured), Focus groups and Secondary data	Management, employee/ HR personnel, Local labour market experts
To design, develop and pilot test a digital platform that connects Green Feathers Farm with available labourers	Farm location and farm size, Crop type and yields, Labour requirements and schedules, Demographic Information, Wages expectations and payment preferences, User feedback and ratings and Platform usage metrics	Surveys and questionnaires (Online or paper-based), Interviews, Focus groups, Platform analytics and Pilot testing	Management, employee/ HR personnel, Local labour market experts

Semi-structured interviews involved a set of prearranged questions that allowed flexibility in response, were conducted. This enabled deeper insights into individual experiences and perceptions of labour shortages. This method was effective in understanding the potential solutions from a collective perspective. The concept of developing a digital platform and pilot testing involved Green Feathers Farm employees and another group of users who provided feedback on its functionality and usability. Pilot testing was critical for identifying any problems before a full rollout. It allowed for modifications based on the user experiences and guaranteed that the platform met the needs of both the farm and the potential labourers.

3.5 SAMPLING PROCEDURE AND SAMPLE SIZE

The sample technique for analysing the effects of agricultural labour shortages on crop yields and income on GFF was designed using the following criteria. The study's target population consisted of:

- Agricultural extension officers, local government officials, and agricultural organisation members to gain insight into labour dynamics and productivity challenges.
- GFF management and employees who have experienced the impact of labour shortages on the farm.
- Communities around GFF that may have witnessed the impacts of labour shortages at GFF.

3.5.1 Stratified random sampling

Stratified random sampling is a sampling approach that divides a population into distinct subgroups called strata and then selects samples at random from each stratum (Nguyen et al., 2021). The techniques ensure that diverse parts of the population are sufficiently represented in the sample. This method was used to ensure representation from all segments of the agricultural community, taking into account characteristics such as management (GFF managers), status at work (GFF farm workers), and geographical location (Communities around GFF). Following stratification, random sampling within each stratum was used to select participants. This approach reduces the chances of bias while ensuring that the agricultural sector’s diversity is adequately represented. The population was separated into strata based on the level of employment at GFF and proximity to GFF. The sample size was selected according to the following considerations:

- A confidence level of 95% was used, with a margin of error of 5%.
- The total number of employees at GFF.
- The sample size was then calculated using the formula:

$$n = \frac{N.\ Z^2.\ p(1 - p)}{(E^2\,(N - 1) + Z^2\,p(1 - p))}$$

Where:

n = required sample size

N = population size

Z = z-score (1.96 for 95 % confidence)

P = estimated proportion of the population (if unknown, 0.5 is used for maximum sample size)

E = margin of error (0.05)

To determine an appropriate sample size from a population size of 50 employees (N=50), the above formula was employed based on a confidence level of 95% (Z-score=1.96), a margin of error of 5% (E=0.05).

$$\textbf{Required sample size (n)} = \frac{50\ .\ (1.96)^2\ .\ 0.5\ .\ (1 - 0.5)}{(0.05)^2\ .\ (50 - 1) + (1.96)^2\ .\ 0.5\ .\ (1 - 0.5)}$$

$$n = \frac{48.02}{1.0829} = 44.3$$

Rounding **44.3** to the nearest whole number, the required sample size (n) is approximately **44** employees who participated in the survey.

To investigate the impacts of agricultural labour shortages on crop yields and income at Green Feathers Farm, a structured approach using stratified random sampling was followed. The target population was identified which included local government officials (individuals who are involved in community development and agricultural policy), communities surrounding GFF (residents who have observed the effects of labour shortages at GFF), GFF management and employees (workers who are directly in one way or the other experienced the impacts of labour

shortages). Stratification conditions were based on management level, employee status and geographical location. GFF managers were separated from farm workers, full-time workers were also distinguished from part-time workers and communities surrounding GFF were identified and categorised based on proximity. The number of individuals in each stratum was recorded to determine the population size of each stratum. Random sampling within strata was conducted by listing the participants in each category identified above.

3.5.2 Lottery Method

The lottery method is a straightforward technique for choosing numbers at random. Individuals are selected from a pool using a physical drawing method (Grimmett and Stirzaker, 2020). Fairness is promoted by the lottery method, which guarantees that every person has an equal chance of being chosen. Based on the appropriate sample size, which came from a total sample size of 44, participants were chosen at random using a lottery method. The sample size for this stratum was 0.5 x 44, or 22 participants, meaning that GFF managers made up 50% of the population. Thirty (30%) are GFF farm workers, both seasonal and full-time (sample size from this stratum = 0.3 x 44 = 13 participants), 5% are local government representatives (sample size from this stratum = 0.05 x 44 = 2 representatives), and 15% are members of the communities surrounding GFF (sample size from this stratum = 0.15 x 44 = 7 participants). The lottery method is a simple and traditional random selection technique. It involves writing the participant's name or other distinctive identifier on paper and putting it in a container. To ensure randomness, the slips were thoroughly mixed in the container before being removed until the required sample size for that stratum was achieved. Because stratified random sampling reduces bias and ensures that all pertinent subgroups are adequately represented, it is appropriate for this study. The diversity of the agricultural community is captured by this method, which is crucial for comprehending the complex impacts of labour shortages on crop yields and farm income.

3.6 DATA SOURCES

Throughout the study, the student incorporated both primary and secondary data. According to Ajayi (2017), secondary data is data that has already been collected, analysed, and published by someone other than the individual conducting the research. It comes from documentation or literature not originally collected (Ajayi, 2017). Such data is available in academic journals, books, government reports and statistics, online databases, and even market research reports. For

example, the academic journals agricultural. Other sources of secondary data include internal GFF farm records and labour statistics. Using secondary data indeed provided a significant historical context that, which was later added to with primary data collection efforts. For instance, at Green Feathers Farm, secondary data revealed how major trends and patterns regarding labour shortages were perceived.

3.7 RESEARCH TOOLS

The researcher employed the methodology of a survey that includes using questionnaires. Questionnaires are focused on collecting specific information. A questionnaire contains many questions of different forms and types. The researcher used a combination questionnaire with twelve sections and a total of 60 questions that comprised both open-ended and closed-ended questions. The study's author sent the questionnaires through email to the GFF-relevant population. The respondents needed to send these to the researcher via email which took a minimum of three months.

3.8 DATA ANALYSIS METHODS

The analysis of data collected from both qualitative and quantitative sources was conducted using the following methods:

3.8.1 Quantitative Data Analysis

Descriptive statistics are a set of approaches for summarising and describing key properties of a dataset, such as its central tendency, dispersion, and form, providing an overview of workforce availability, productivity levels, and operational efficiencies throughout the sample (Choudhry et al., 2024). These strategies allow researchers to get insights into the data's distribution and features without drawing inferences about the entire population. Common descriptive statistics measurements include mean, median, mode, standard deviation, range, skewness, kurtosis, and correlation coefficients (Alabi and Bukola, 2023). Descriptive statistics are used to describe and clarify the characteristics of the dataset by providing summaries of the sample and data measurements. It aids in comprehending numeric data's central tendency and distribution, making it easy to identify trends. However, descriptive statistics do not deduce relationships or causation and may overgeneralize complex data.

3.8.1.1 Multiple linear regression analysis

A multiple linear regression analysis develops a statistical model for the relationships between one dependent variable and two or more independent variables (Keith, 2019). The aim is to specify how the dependent variable will vary or change when one or more of the independent variables alter while the remaining variables are held constant. In this case, multiple linear regression analysis was also applied in the regression analysis to determine the relation between the inputs of labour and the outputs of productivity. This helped assess how changes in the provision of labour would influence agricultural output and operational efficiency of agriculture. Statistical correlation formulas were applied to ascertain the strength and direction of the relationships among the various levels of labour deficits and productivity indicators. Accuracy and sophisticated statistical calculations were undertaken using the SPSS program, which is an acronym for Statistical Package for the Social Sciences. SPSS is one of the imperative statistical programs that are used widely by researchers and analysts of different fields in analysing data, constructing graphs, and managing data to help in the realization of success in their data-driven decisions. SPSS is capable of making reliable predictions based on various assumptions, which aid in understanding how several factors affect labour shortages.

Multiple Linear Regression Analysis (MLRA) carried out the analysis of data due to its ease of use for interpretation as well as the straightforward, flexible, and simple approach as it presumes linear relationships among variables. In addition, it encompasses many other purposes like trend identification and outcome prediction, among others. Nonetheless, regression analysis has some sensitivity to outliers (although boundaries can be dealt with the noise and outlier in the dataset) as well as multicollinearity, which may bias the results regarding the effect of labour shortages on crop yields and farm income. Some of the methods utilized in hypothesis testing are inferential statistics such as ANOVA and t-tests, which allow the testing of the hypotheses formulated regarding population parameters using the sample data acquired. ANOVA is appropriate for comparing means of more than two groups. For example, the yield on three different crops most commonly grown at Green Feathers Farm is comparatively analysed. A t-test is used to evaluate differences in one variable between two groups, in this case, casual and permanent workers.

The dependent variables are crop yields (measured as tonnes harvested per hectare) and income level from agricultural sales annually. The independent variables are full-time workers, seasonal workers, age of labourers and the average level of education. The econometric model is as follows; $\mathbf{Y = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + e}$

Where,

Y: is the dependent variable

$\mathbf{B_0}$: is the constant

$\mathbf{B_1}$; $\mathbf{B_2}$; $\mathbf{B_3}$; and $\mathbf{B_4}$ are parameters

$\mathbf{X_1}$; $\mathbf{X_2}$; $\mathbf{X_3}$; and $\mathbf{X_4}$ are independent variables

3.8.2 Qualitative Data Analysis

The process of examining non-numerical data to comprehend concepts, topics, or trends is known as qualitative data analysis (Olanrewaju and Ifeduba, 2025). Thematic analysis was used to examine the data from qualitative interviews that were transcribed. To find recurrent themes and patterns related to labour shortages and their effects, data must be coded. Group coding was use to identify more general themes that represent the experiences and viewpoints of the participants. Using content analysis, textual data from interviews was examined systematically, yielding valuable insights into productivity and labour dynamics.

Table 4: Qualitative Data Analysis

Specific Research Objective	Data concepts and variables/indicators	Data Analysis methods/tools	Respondents/subjects
To identify and analyse the underlying causes of labour shortages at Green Feathers Farm.	Perceptions of labour shortages and their impacts, Insights into underlying causes of labour shortages and Working conditions	Descriptive statistics (Mean, Medians, modes), Inferential Statistics (ANOVA and t-tests), Multiple Linear Regression analysis and Data visualisation (graphs)	Management, employee/ HR personnel, Local labour market experts
To quantify the impact of labour shortages on crop yields and farm income at Green Feathers Farm, and identify potential mitigation strategies.	**Crop yield data** Historical crop yield and current crop yield, Crop yield data by season and Crop yield data by labour input **Labour shortages data** Reasons for labour shortages, Impact of labour shortages on crop yield and farm income and Mitigation strategies used to address labour shortages **Farm Management data** Crop rotation and planting schedules,	Descriptive statistics (Mean, Medians, modes), Inferential Statistics (ANOVA and t-tests) and Multiple Linear Regression analysis	Management, employee/ HR personnel, Local labour market experts
To design, develop and pilot test a digital platform that connects Green Feathers Farm with available labourers	Farm location and farm size, Crop type and yields, Labour requirements and schedules, Demographic Information, Wages expectations and payment preferences, User feedback and ratings and Platform usage metrics	Descriptive statistics (paired sample test), Inferential Statistics (ANOVA and t-tests), and	Management, employee/ HR personnel, Local labour market experts

3.9 RELIABILITY AND VALIDITY OF RESEARCH INSTRUMENTS

A research instrument's consistency and stability over time are referred to as its reliability (Mohamad et al., 2015). The researcher investigated the results' stability and consistency with other measures of the same concept across various populations and occasions. The survey made it possible to gather information from a sizable sample, which improved the findings' representation and dependability. Participants were able to respond to the online survey more readily, in the comfort of their own homes, and with a thorough comprehension of the questions.

The degree to which an instrument measures what it is supposed to measure is known as its validity (Clark and Watson, 2019). By contrasting the instrument's findings with those of other validated assessments of the same idea, the researcher was able to assess its validity. While quantitative data adds objectivity and projects more solid conclusions that can direct policymaking and decision-making, qualitative data provides depth and richness.

3.10 ETHICAL CONSIDERATIONS

This study adhered to the following ethical guidelines:

- Participants were fully informed about the study's purpose, methodology, risks, and rewards. To preserve the privacy of participants, written authorisation will be necessary prior to participation.
- All collected data were kept confidential. Participant identities will be protected by anonymising identifiable information.
- Study participation was voluntary. Participants had the option to withdraw at any time without penalty.
- The study ensured participants do not cause physical, psychological, or social harm to others. Sensitive topics that could disturb participants was avoided.
- The research proposal was reviewed and approved by an ethics committee or review board to ensure ethical standards are met.

CHAPTER 4

DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.1 INTRODUCTION

Through the insights of GFF's top management and supervisors, this chapter considers the findings of the research project, specifically the effects of labour shortages on crop yields and farm income at Green Feathers Farm (Pvt) Ltd. GFF is situated in Mashonaland East, Wedza District, Fair Adventure. This chapter also shows a discussion of the results of the study. This investigation also exposes critical insights into the unending difficulties faced by agricultural enterprises in a dynamic and changing labour market as revealed by this study. In addition, this study does not only enlighten the negative and detrimental consequences of a diminished labour pool but also looks at potential solutions to solve these problems by creating a Labour Management System (LMS). The results presented here are drawn from comprehensive data analysis, questionnaire interviews with farm management and supervisors, and evaluation of production metrics and farm records over several growing seasons. The findings will be interpreted to emphasise the implications that can be made from GFF's labour shortages through the discussion that follows the results that are displayed.

4.2 EXPECTED RESULTS

The study examines the impact of labour shortages on crop yield and farm income in Zimbabwe. It is therefore expected to produce numerous significant conclusions. These results will shed light on the relationship between labour availability and agricultural performance. The projected outcomes include:

- A detailed understanding of the magnitude and type of labour shortages at GFF.
- Quantitative research shows that labour shortages reduce crop yields, especially for labour-intensive crops. The study may disclose particular percentages or averages that indicate yield reductions owing to insufficient labour.
- Insights into how labour shortages decrease operational efficiency, including longer planting and harvesting times, increased dependency on overtime, and higher production costs.

- Data demonstrating the economic impact of labour shortages on farmers, such as decreased profitability, higher operational expenses, and prospective changes in market competitiveness.
- Identify the techniques used by farmers to alleviate the effects of labour shortages, such as investing in labour-saving technologies, changing crop selections, or shifting planting and harvesting dates.
- Insights into how labour shortages affect different geographies and types of farming, with a focus on the issues that smallholder farmers confront in comparison to commercial farmers.
- Developing focused recommendations for policymakers and agricultural stakeholders to address labour shortages, improve labour conditions, and boost production.
- The study will add to the corpus of information on agricultural labour dynamics in Zimbabwe, providing a resource for future research and policy development.

4.3 RESULTS

4.3.1 Descriptive Analysis on the Nature, Extent and Causes of Labour Shortages.

To identify and analyse the underlying causes of labour shortages at Green Feathers Farm.

A descriptive statistical analysis was conducted, which included analysis of frequency, mean, and medians for the following variables: total yield harvested, area cultivated for sugar beans, yield for tobacco, and average yield in previous seasons, full-time workers, seasonal workers and average age of labourers. **Table 5** shows a descriptive statistical representation of agricultural yields, area cultivated, labour metrics and farm income, summarised as mean, mode, median, standard deviation and variance of the variables.

Table 5: Descriptive Statistics

	Mode	Median	Mean		Std. Deviation	Variance
			Statistic	Std. Error		
Yield for Maize (kg/ha)	5000.00	4900.00	4489.05	303.66	2014.25	4057188.70
Yield for Tobacco (kg/ha)	500.00	1175.00	1147.26	125.00	829.20	687575.42
Yield for Sugar Beans (kg/ha)	1400.00	1412.50	1594.50	105.52	699.91	489872.48
Area cultivated for sugar beans (Ha)	30.00	30.00	30.91	1.83	12.12	146.83

Area Cultivated for Tobacco (Ha)	80.00	80.00	79.55	2.01	13.33	177.70
Area cultivated for maize (Ha)	50.00	50.00	46.93	1.48	9.84	96.76
Ave. Tobacco Yield in the Previous Season (kg)	1300.00	1275.00	1226.22	103.590	687.140	472162.03
Ave. Maize Yield in the Previous Season (kg)	5000.00	5000.00	4241.89	304.637	2020.732	4083359.78
Ave. Sugar Beans Yield in the Previous Season (kg)	1800.00	1687.50	1718.31	130.37	864.75	747796.81
Fulltime workers	50.00	50	60.55	4.705	31.21	974.02
Seasonal workers	55.00	60	70.91	5.93	39.36	1549.15
Average age of labourers	25.00	25	25.41	.507	3.36	11.32
Ave. level of Education	1.00	1.00	2.48	.55	3.64	13.23
Annual farm income (US$)	$1.50m	$1.50m	$1.45m	$0.10m	$0.65m	.43

4.3.1.1 Yield Metrics

A comparison of current yields for tobacco, sugar beans, and maize against past yields, the following was noted. The current average tobacco yield (1147.26 kg/ha) is slightly lower than the previous average yield of 1226.22 kg/ha. Likewise, the current average yield for sugar beans (1594.50 kg/ha), is lower than its previous yield of 1718.31 kg/ha. This could be a sign of inconsistency in labour maintenance, which bears a direct effect on output. Reduced output could be a result of unsustainable farming practices at GFF, which reduces soil fertility. Unsustainable practices may include overuse of chemicals and synthetic fertilisers, and neglecting crop rotation. The results show significant lags that exist between current and previous yields. A higher variance suggests that inconsistent crop management techniques at GFF caused substantial variations in yield across various observations. Additionally, it shows considerable variability in yields, indicating that factors such as reduced planting area, post-harvest losses, reduced crop yields due to pests and diseases, delayed planting and harvesting may have caused the outcome due to labour shortages at GFF.

Yield by Crop Type

Maize: The average yield; of 4489.05 kg/ha and the median yield of 4900 kg/ha indicate some discrepancy that could have originated from labour shortages which affected the

timings of planting and harvesting. According to Abbas et al. (2019), a shortage of labour force leads to inconsistency in planting schedules, which causes crops to mature at different stages. Also, late planting disturbs crop growth stages, potentially reducing crop yield and quality. Among the three primary crops cultivated at GFF, maize has the highest mean yield, indicating that maize is a crucial crop, which has the potential for greater yields. The results show a high degree of variability in maize yield as indicated by a standard deviation of 2014.25 kg/ha, which could be caused by fluctuations in labour availability throughout the seasons. Variance 4057188.70 kg^2 demonstrates that although maize is a productive crop, its yield can vary greatly because of unstable labour availability. The mean area for maize (46.93 hectares) reflects a consistent and balanced approach to food production and economic viability at GFF.

Tobacco: The mean yield of 1147.26 kg/ha does not correspond to the area under cultivation (80 Ha), suggesting inefficiency, perhaps as a result of a labour shortage or the land is no longer productive. In comparison to national standards, the tobacco yield is lower. The average yield per hectare in Zimbabwe ranges from 1,500 to 5,000 kg, depending on the seed variety. Some climate-smart varieties, such as T78, T79, T80, and T81, developed by the Tobacco Research Board (TRB) are designed to thrive in harsh conditions like heat and drought. These varieties are capable of producing between 4,500 and 5,000 kg per hectare, while the national average is approximately 2.3 tonnes (2,300 kg) per hectare. The mean yield for tobacco is moderately lower than maize, highlighting some notable differences in farming efficiency. According to the focus group discussions, delayed weeding, pruning, and deflowering led to reduced tobacco yields. Failing to attend to these important practices leads to reduced leaf quality and weight. Despite having a lower standard deviation and variance than maize, tobacco yields are consistently high. Paralleling a mean area of 79.55 hectares with its yield, tobacco cultivation appears to be more profitable when larger investments are made.

Sugar Beans: The average yield (1594.50 kg/ha) appears relatively stable but low compared to the standard of 3000 kg/ha for sugar bean varieties in the Seed Co vegetables basket such as SC Gadra, SC Ukulinga and UA 45. At GFF sugar beans were cultivated on a smaller area (30 Ha), which limited potential output. The mean yield of sugar beans was matched with that of maize and tobacco, sugar beans are significantly lower than maize but

higher than tobacco in both current and previous seasons. This indicates potential challenges in growing sugar beans, although the current labour force has the potential for higher output. These challenges may be because of the shortage of labour at GFF. A lower standard deviation of 699.91 kg/ha indicates that there is less variability in sugar bean production as compared to maize and tobacco. Less variability suggests a uniform yield but still indicates lower productivity. A mean area for sugar beans of 30.91 ha, with a slim range of 25 to 30 hectares, indicates that GFF allocates a consistent area for sugar beans. The cultivated areas, compared to their yields, indicate inconsistent levels of investment and productivity among different crops. The cultivated area for tobacco and sugar beans was moderately low, which may suggest an inadequate workforce or resources, resulting in poorer yields and increasing labour shortages.

4.3.1.2 Labour Metrics

a) **Seasonal Workers**: The seasonal workers show a larger average number of (70.91) compared to full-time workers (60.55), suggesting that GFF depends on seasonal labour, which is frequently less reliable and unstable. A large standard deviation (39.36) and variance of 1549.15 indicate that while GFF hires many seasonal labourers during peak seasons (which is typical in agriculture), these workers do leave the farm once they are dissatisfied with the working conditions that do not improve. High standard deviation also indicates that there are significant differences in the number of seasonal workers employed, which may reflect seasonal demand and labour market conditions. This difference may indicate a reliance on fewer seasonal workers during off-peak periods, adding to labour shortages. This variability is due to labour shortages during important planting and harvesting seasons, particularly if labour is unavailable when needed.

b) **Full-time Workers**: Although the standard deviation (31.21) indicates notable fluctuations in the number of full-time workers across various observations. Correspondingly, the average number of full-time workers is high at 60.55. The number of full-time workers spans from 20 to 150 indicating that, while there may be instances when GFF hires 150 full-time employees, the farm occasionally retains as few as 20 full-time employees. This fluctuation might suggest and reflect

inconsistency in operational demands of labour at GFF, indicating changes in workforce availability or recruitment.

Figure 8 shows a bar graph that compares the mean number of full-time and seasonal workers at Green Feathers Farm for a period of 6 months from September to February. The graph illustrates a gradual increase in full-time workers from September to January. The graph shows a peak in January, which suggests that GFF hires many seasonal workers during this period for activities such as tobacco harvesting, curing and grading. However, during this peak period, the number of full-time workers slightly dropped in February, suggesting a possible cyclical variation or reduced need for full-time labour during this month. This may also indicate that the experienced worker left GFF due to disincentives like poor remuneration and poor working conditions. In January, seasonal workers demonstrate a pronounced increase, where their count surpasses that of full-time workers. This fluctuation suggests that peak agricultural activities such as tobacco harvesting, tobacco curing and maize crop protection are prevalent during this period. January is an important month for seasonal labour. The number of full-time workers is consistently higher than seasonal labour in September and October, indicating a more stable workforce for routine operations. However, seasonal workers start to catch up in November and eventually exceed full-time workers in January and February, signifying a shift in labour needs as seasonal labour demands increase for critical tasks.

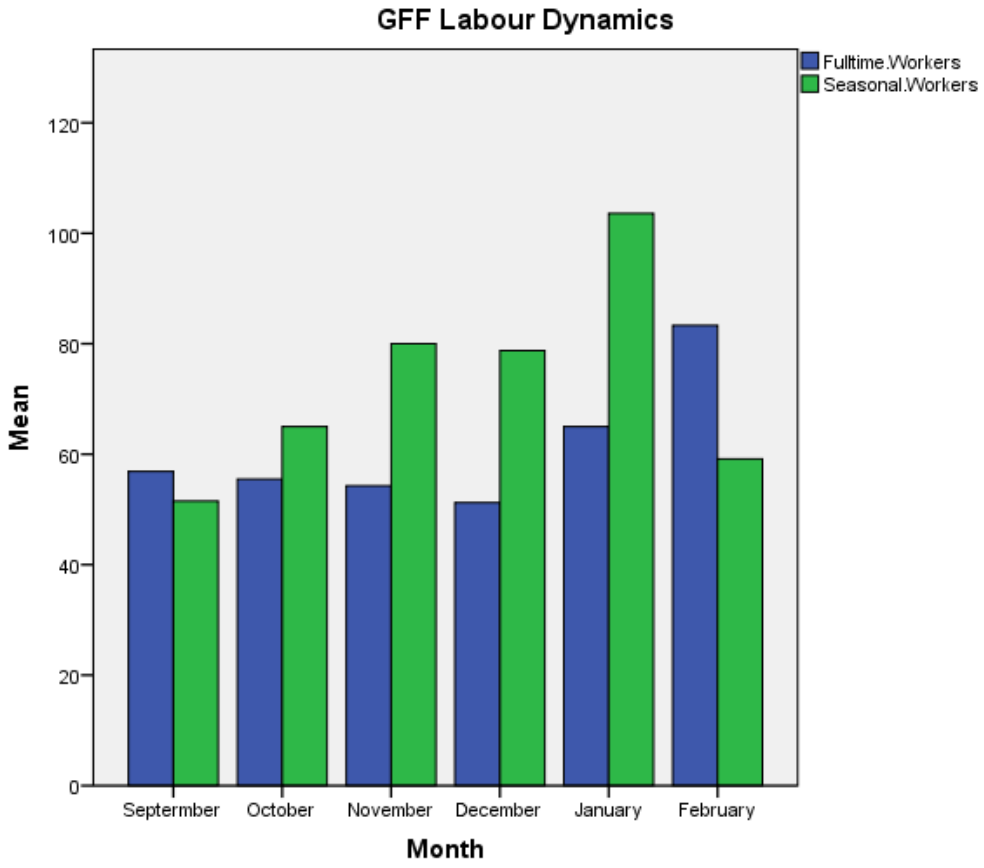

Figure 8: GFF Labour Dynamics

c) **Average Age of Labourers:** The average age of GFF workers is reasonably young (25.41), indicating a potentially active workforce. However, the narrow age range of 20 to 33 suggests a lack of age diversity, which may have an impact on the workforce's physical capability and experience, contributing to operational inefficiencies. This inefficiency may lead to reduced productivity and profitability. Labour shortages are made worse by a youthful labour force, which lacks experience in managing complex and innovative agricultural tasks effectively. Moreover, a younger workforce may be more mobile and inclined to seek work elsewhere. **Figure 9** shows the distribution of the average age of labourers, with a clear peak at 25 as represented by the red bar with the highest frequency.

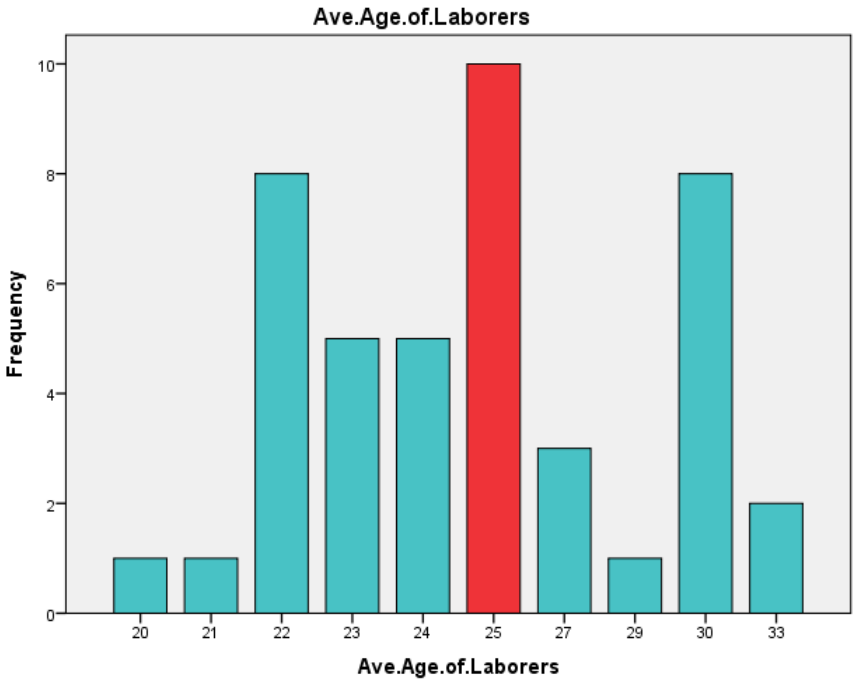

Figure 9: Frequency for the average age of labourers

d) **Average level of education**: The average educational attainment score stands at 1, which appears to be an Ordinary level in the assessment scale, thus indicating limited agricultural training, which could hamper productivity and operational efficiency. This low level raises the possibility that many workers lack the requisite training and skills. A poorly educated workforce creates a fundamental labour shortage because it fails to meet modern agricultural operational demands, thus making it challenging to hire suitable workers.

Implications

- **Labour management**: The concentration of seasonal workers around the 55 mark demonstrates that GFF periodically requires a similar level of labour, possibly during peak periods like tobacco planting, weeding, and harvest. This might indicate a labour requirement or a GFF standard procedure. The large influx of seasonal workers, particularly in January, indicates that GFF needs to concentrate on recruitment methods, which guarantee sufficient workforce availability during peak seasons.
- **Workforce Management**: The data reflects a need for seasonal workers in agricultural operations, highlighting the importance of balancing full-time staff for ongoing tasks with seasonal labour for peak periods.

- **Planning and resources**: GFF management should understand labour distribution that could help in workforce planning, resource allocation, and budgeting for labour costs. |The farm should also put in place strategies to evaluate its labour shortages.
- **Growth potential**: Higher worker counts (120 and 200) show low frequencies. This suggests that at some point, GFF tries to maximise the labour force, which indicates opportunities for growth or expansion in labour needs during peak periods.

4.3.1.3 Financial Metrics

GFF's financial strength is reflected by the average yearly income of US$1.45 million, but the broad range (US$0.45m to US$2.50m) reveals major income discrepancies. The lower-income periods may cause difficulties for GFF to attract and retain its workers. This lower income causes poor wages and poor work conditions, which intensify labour shortages. The income variation reveals obvious discrepancies in the farm's economic performance across different years, which are likely influenced by substandard farm product quality affecting crop yields and market access.

The provided data reveals valuable insights about agricultural productivity together with labour dynamics and financial outcomes. The variation in crop yields and farm income demonstrates the necessity for interventions to enhance agricultural practices and crop management. Furthermore, the dependence on seasonal labour highlights the cyclical nature of agricultural work, and farmers need to develop strategies for workforce retention.

4.3.1.4 Extent of Labour Shortages at GFF

4.3.1.4.1 Labour Distribution across Enterprise

Table 6, accompanying a graph, shows the distribution of full-time workers and seasonal workers across three agricultural enterprises: field crops, livestock, and horticulture during peak labour seasons such as planting, weeding, tobacco curing, pruning, grading, herbicide application, plant counting, and pest and disease scouting at GFF from September to February.

Table 6: Labour Distribution

Month	Enterprise					
	Field Crop		**Livestock**		**Horticulture**	
	Fulltime workers	Seasonal workers	Fulltime workers	Seasonal workers	Fulltime workers	Seasonal workers
September	28.00	42.00	4.00	8.00	12.00	16.00
October	24.00	38.00	4.00	8.00	8.00	12.00
November	24.00	40.00	4.00	8.00	10.00	14.00
December	23.00	35.00	4.00	7.00	10.00	15.00
January	17.00	26.00	3.00	5.00	8.00	13.00
February	17.00	32.00	4.00	8.00	10.00	11.00

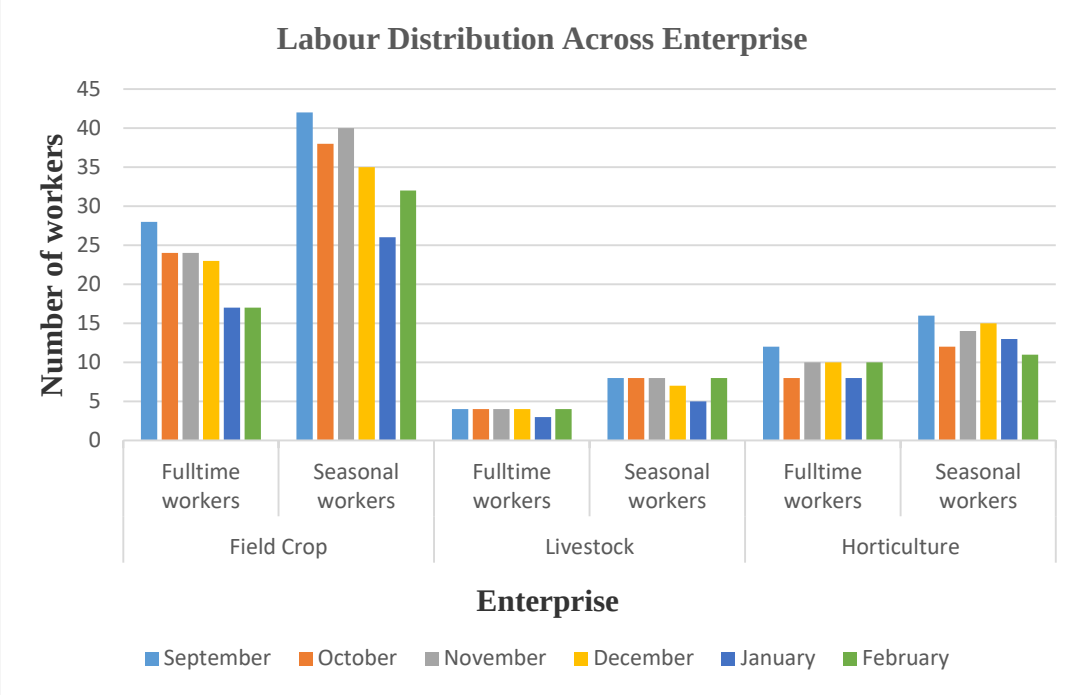

Figure 10: Labour Distribution across enterprises

The graph visually signifies the labour distribution trends across the months for each enterprise. Consistency in the highest number of seasonal workers is represented in field crops enterprise, reflecting the seasonal characteristics of this farming enterprise. On the contrary, full-time workers exhibit the least variations in livestock farming, indicating a more stable labour requirement compared to the other enterprises. Horticulture had moderate fluctuations in both full-time and seasonal workers, signifying variable labour demands based on the farming cycle and labour availability.

Labour Trends

The trend indicates that there is a decline in the number of full-time workers in all the enterprises during the transition from peak work periods between September and January. The elevated employee turnover at GFF is brought about by dissatisfaction and poor motivation in their roles. Seasonal field crop workers reached their highest numbers during this period demonstrating the labour-intensive nature of crop farming at peak seasons like weeding, scouting, plant counting, pruning, etc. Livestock employment remained steady, suggesting a more stable labour requirement for this sector. The consistent employment rates in livestock farming show investment potential, which could develop reliable labour sources. The data provides evidence that demonstrates the need for GFF to develop plans to maintain its seasonal workers post-peak times, especially in its field crop operations.

4.3.1.4.2 Labour Distribution across Skills

Table 7 reviews the distribution of labour across diverse skill levels, including full-time and seasonal workers, the shortfall, and the required workforce for each category.

Table 7: Labour Distribution across Skills

	Fulltime workers	**Seasonal workers**	**Required Labour Force**	**Shortfall**
Supervisor	12.00	0	30.00	18.00
Technicians	10.00	2.00	20.00	8.00
General workers	40.00	55.00	120.00	25.00
Total	**62.00**	**57.00**	**150.00**	**51.00**

The data shows that there is a high shortage of supervisory posts, demonstrating a need for more experienced or qualified workers to manage and direct operations. This may affect the efficiency and quality of work and is reflected by low yields and unprofitability. The data also reveals a shortage in technicians' role, though not as severe as supervisors do. The reliance on an insignificant number of seasonal labour points out that demand for technicians during peak seasons may be lower. The general workers has the highest number of workers, regardless of a severe labour shortage. General labourers are crucial to carry out day-to-day operations, and the shortage indicates the likelihood of failing to meet labour demands, particularly during peak seasons. During the period, most agricultural activities need a massive number of

workers to manage operations. An aggregate shortfall of 51 workers across all skill levels represents a significant gap in satisfying labour force requirements at GFF. The most important shortages are in supervisory and technician positions, which are required for successful task management and execution. Insufficient supervisory staff may result in decreased production due to a lack of control and advice for the general workers.

Table 8 presents summary statistics for three variables related to the impact of labour shortages on crops: the type of crop most affected due to labour shortages, reduced income due to labour shortages, and changes observed in crop yields during peak periods. Forty-four (44) respondents were interviewed and agreed to give their responses, valued as 1 under the type of most affected, representing the tobacco crop and yes on the remainder, indicating that there was a reduction in income and changes in yields.

Table 8: Frequency of the Impact of Labour Shortages on Crops

Statistics			
	Type of most affected crop	**Changes in crop yields during peak periods**	**Reduced income due to labour shortages**
Mean	1.00	1.00	1.00
Median	1.00	1.00	1.00
Mode	1.00	1.00	1.00
Variance	.00	.00	.00

The results show consistent responses indicating that respondents agree that tobacco was the most affected crop due to labour shortages. The unanimous response suggests that all respondents noticed changes in crop yields during peak labour shortage periods; this indicates a significant and widespread impact on productivity. Again, the consistent response implies that all respondents experienced a reduction in income because of labour shortages, underlining a serious economic concern for the farm.

The cross-tabulation on **Table 9** shows data on the relationship between labour shortages and their impact on the quality and quantity of crop yields during peak periods.

Table 9: Effects of Insufficient Labour on Crop Quality and Quantity

		Effects of Labour Shortages on Quality and Quantity of Yields					
		Not Severe	**Severe**	**None**	**Harvesting and planting**	**Greatly reduced quality and quantity**	**Total**
Changes in crop yields during peak periods	Yes	3.00	13.00	1.00	9.00	18.00	44.00
Total		3.00	13.00	1.00	9.00	18.00	44.00

The majority of responders (18 out of 44, or 41%) specified that significant labour shortages resulted in the reduction of quality and quantity of agricultural output. This shows that labour shortages significantly reduce agricultural output and crop quality. Only a small proportion of respondents (3) stated "Not Severe" effects on quality and quantity, though they still experienced problems with yield quality and quantity. The existence of respondents who answered "None" (1) shows that some were unaffected by labour constraints, indicating potential diversity in management skills or resilience. The findings demonstrate a clear association between increased severity of labour shortages and a higher chance of worse yield quality and quantity. This supports the concept that managing labour shortages is important to preserving crop quality and total agricultural output.

Table 10 provides a cross tabulation results illustrating the relationship between labour shortages and the impact on crop yields during peak periods.

Table 10: Severity of Labour Shortages on Crop Yields

		Labour Shortages vs Farm Yields				
		Minor Impact (Yields reduced by < 10%)	**Moderate impact (yields reduced by 10 – 20 %)**	**Significant impact (yields reduced by 21-30%)**	**Severe impact (yields reduced by >30%**	**Total**
Changes in crop yields during peak periods	Yes	2.00	11.00	14.00	17.00	44.00
Total		2.00	11.00	14.00	17.00	44.00

Most respondents reported considerable impacts on crop yields due to labour shortages during peak periods. A combined 62% of respondents experienced significant to severe impacts. Only 5% reported minor impacts, indicating that labour shortages have a

pronounced effect on crop yields. The table shows that as the impact severity increases, the number of respondents also increases, with the largest group reporting severe impacts. This suggests that labour shortages significantly disturb agricultural productivity, especially during critical peak periods such as planting, weeding, herbicide application and harvesting.

Table 11 provides cross-tabulation results to illustrate the relationship between changes in farm income during peak labour periods and their impact on crop yields due to labour shortages.

Table 11: Relationship between Changes in Farm Income during Peak Labour Periods

		Labour Shortages vs Farm Yields				
		Minor Impact (Yields reduced by < 10%)	**Moderate impact (yields reduced by 10 – 20 %)**	**Significant impact (yields reduced by 21-30%)**	**Severe impact (yields reduced by >30%**	**Total**
Changes in farm income during peak labour periods	No	0	2.00	0	1.00	3.00
	Yes	2.00	9.00	14.00	16.00	41.00
Total		2.00	11.00	14.00	17.00	44.00

A majority of respondents (41 out of 44) who reported changes in farm income also experienced changes. In contrast, the small group of only three responders reported that no change in income had a limited impact. The data indicate a clear correlation between changes in farm income and the severity of yield impacts. Those experiencing changes in income are more likely to report severe reductions in crop yields.

4.3.1.5 Possible Causes of Agricultural Labour Shortages at GFF

- **Inconsistent yields and crop viability**: A significantly lower yield of tobacco with a mean of 1147.26 kg/ha compared to other crops like maize and sugar beans may affect the viability and attractiveness of tobacco as a crop, which will result in less investment in labour for its cultivation. GFF management may waver to hire more labour if they are indeterminate about the yield, leading to labour shortage during peak seasons.

- **Labour demand vs. supply**: An insufficient average number of seasonal workers (70.91) cannot meet labour demand during peak agricultural periods. If the demand for labour exceeds the available supply, it can result in shortages. The array of seasonal workers (20 to 200) suggests that while at some point GFF may require a large workforce, at some instances it might not, potentially leading to fluctuations in labour availability at GFF and across the farming community. The high standard deviations and ranges for both full-time and seasonal workers suggest that labour demand fluctuates, which might lead to shortages if workers are not kept during off-peak seasons.
- **Demographic factors**: GFF exhibited a relatively young workforce with an average age of labourers at 25.41 years. However, if younger workers are not attracted to agricultural work due to low wages and poor working conditions or lack of career development, this can exacerbate labour shortages. The demographic shift away from farms towards urban areas in search of new jobs may affect the availability of labourers willing to work on farms. In addition, the youthful workforce of GFF indicates the scarcity of experienced personnel. Younger labourers may lack the requisite skills or expertise to efficiently manage complicated agricultural activities, thus resulting in operational inefficiencies.
- **Economic factors**: Farms with lower income may struggle to offer competitive wages to attract and retain the correct labour, leading to shortages. The mean annual income for GFF is US$1.45m, with the possible lowest income recorded as US$0.45m, which shows a large variance, which suggests significant economic inconsistencies. The financial instability in the farming sector, worsened by fluctuating yields, can discourage potential workers from engaging in seasonal agricultural labour or maintain a large pool of workforce.
- **Working conditions**: Seasonal agricultural work can be physically difficult and may not offer an attractive working conditions compared to other job opportunities, leading to reluctance among potential workers to engage in farm labour. GFF may be struggling to provide adequate amenities, safety measures or incentives, which put itself in a difficult position to retain or attract labourers.
- **Low Educational Levels**: The low average level of education points to insufficient skills required for modern agricultural operations, making it difficult to attract and retain skilled labour.

- **Seasonal nature of work**: The seasonal nature of agricultural work means that labour needs can fluctuate dramatically throughout the year. This inconsistency in the need of labourers can make it difficult for farms to retain a stable workforce, contributing to shortages during peak seasons. The unstable financial stability of agricultural sector makes difficult for farms keep up with the stable workforce, hence forced to lay off part of workforce during low peak seasons.
- **Reliance on Seasonal Labour**: The high average number of seasonal workers may imply a reliance on temporary labour, which can be unpredictable. Seasonal labour shortages may emerge if workers seek steadier jobs elsewhere.

4.3.1.6 Solutions to Agricultural Labour Shortages at GFF

The analysis of data revealed that multiple interconnected factors contribute to labour shortages at Green Feathers Farm, which may include economic disparities, demographic shift, and poor working conditions, as they all play a role in labour challenges. To address these shortages, GFF may need to consider strategies such as;

Improving working conditions

- **Safe and healthy environment**: GFF could comply with safety regulations and provide a healthy work environment, which may include proper equipment like gumboots, overalls and access to clean facilities.
- **Comfort and amenities**: GFF could provide basic amenities such a clean dining areas, drinking water and restroom facilities that can improve the overall work experience, making the job more attractive.
- **Work and life balance**: The farm management can implement flexible working hours or shifts that accommodate workers' obligations, which can help attract a wider pool of labourers.

Offering competitive wages

- **Incentives and bonuses**: GFF could consider implementing performance based pay, bonuses to workers who attain high output, or referral bonuses for workers who bring in new labourers. GFF may also consider offering incentives to seasonal workers to transition into full time duties.
- **Benefits packages**: GFF could provide additional benefits such as health insurance, welfare fund programmes, allowances and financial assistance to workers, such as

paying school fees for dependents. This can make positions more appealing, especially for seasonal workers.

- **Market research**: GFF could understand the wage rate in the agricultural sector and offer wages that are more competitive or above the market rate to attract more labourers.

Ensuring consistent crop viability

- **Crop planning and diversification:** GFF could implement crop rotation and diversify approaches to improve soil health and yield stability, reducing dependence on tobacco, as it were the most affected crop.
- **Investing in technology**: Advanced technologies such as precision farming, irrigation systems may enhance productivity at GFF and ensure more consistent yields thereby building more stable work environment.
- **Research and development**: GFF could engage in research and development to discover more resistant crop varieties that can survive climatic fluctuations, ensuring that labour needs remain steady even during varied conditions and peak seasons.

Enhances labour recruitment efforts

- **Targeted outreach**: GFF could develop targeted recruitment promotions that reach out to specific demographics or communities that are likely to be attracted to agricultural work, such as job fairs, collaboration with local schools and outreach to community organisations.
- **Digital platforms**: To adopt a digital platform Etiquette HR Consultancy that connect with potential workforce. This could entails labour management systems (digital platforms) or website where labourers can easily find job vacancies and apply directly.
- **Training programmes**: GFF could offer training programmes that prepare individuals for agricultural work and enhance their skills, making them more valuable to GFF and build a loyal workforce. This may include sponsoring individual to colleges or universities and allow graduates to work for GFF on bonding .contracts for specific periods.

4.3.2 Descriptive Analysis on Dependent Variables

To quantify the impact of labour shortages on crop yields and farm income at Green Feathers Farm, and identify potential mitigation strategies.

4.3.2.1 Regression Analysis

4.3.2.1.1 Impact of Labour Shortages on Crop Yields

Impact on Maize Crop

To investigate the impact of labour shortages on maize yield, a linear regression analysis was conducted to evaluate its effect of various labour-related factors on the crop. The dependent variable, maize yield, measured in kilograms per hectare, was analysed to find its relationship with the independent variables (full-time workers, seasonal workers, average age of labourers and average level of education. **Table 12** shows the results of the analysis.

Table 12: Regression Analysis (Maize Yield, kg/ha)

Coefficients[a]							
Model 1	**Unstandardized Coefficients**		**Standardized Coefficients**			**Collinearity Statistics**	
	B	**Std. Error**	**Beta**	**t**	**Sig.**	**Tolerance**	**VIF**
(Constant)	5921.68	2699.74		2.19	.03		
Fulltime Workers	3.85	11.76	.06	.33	.75	.74	1.36
Seasonal Workers	5.88	9.37	.12	.63	.53	.73	1.37
Ave. Age of Labourers	-87.59	99.37	-.15	-.88	.38	.89	1.13
Ave. level of Education	57.56	93.45	.10	.62	.54	.86	1.17

Model Summary				
Model 1	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
	.22a	.05	-.05	2063.56

a. Predictors: (Constant), Ave. level of Education, Fulltime Workers, Ave Age of Labourers, Seasonal Workers

An econometric model as depicted by the table is presented as:

$$Y = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + e$$

Where,

Y: is the dependent variable (maize yield in kg per hectare)

B_0: is the constant

B_1; **B_2**; **B_3**; and **B_4** are parameters

X_1; **X_2**; **X_3**; and **X_4** are independent variables (fulltime workers, average age of labourers, seasonal workers, and average level of education).

e; represents errors that may be found in the regression model.

Therefore, the econometric model is denoted as;

$$\mathbf{Y = 5921.68 + 3.85X_1 + 5.88X_2 - 87.59X_3 + 57.56X_4 + e}$$

Maize Yield = 5921.68 +3.85 Fulltime workers **+ 5.88**Seseanal workers **– 87.59**Average age of labourers **+ 57.56**Average level of education **+ e**

The constant (**B_0**) is statistically significant at 5% (p = 0.03), however, an expected maize yield is 5921.68 kg/ha when all other independent variable are zero, which is lower than the standard yields for Seed Co maize varieties like SC727 and SC659 which are known for high yields, with farmers recording averages of 13400 and 13500 kilograms per hectare respectively. Even though under best management, these and other varieties can yield up to 21000 kg/ha in irrigated areas. The unstandardized coefficient (**B_1**) has a positive value, which suggests that each additional full-time worker influences an increase in maize yield by approximately 3.85kg/ha. Nevertheless, this relationship is statistically not significant ($p > 0.05$), indicating that the effect is not reliable. An increase of one seasonal worker results in an increase of around 5.88 kg in maize yield per hectare (**B_2**). Similarly, this effect is not statistically significant (p = 0.534), signifying confirmation weak association between maize yield and seasonal workers.

As the average age of labourers increases by one year, maize is expected to decrease by around 87.59 kg/ha (**B_3**), resembling a negative relationship between age and maize yield. However, this outcome is not statistically significant at 5%, demonstrating that age does not have a dependable impact on yield. Each unit increase in average education level corresponds to an increase of around 57.59 kg/ha (**B_4**) in maize production. However, this conclusion is not statistically significant ($p > 0.05$), suggesting that education level is not a good predictor of yield. All tolerance values are above 0.1, and VIF values are below 10, indicating that there is no multicollinearity among the independent variables.

The correlation coefficient (**R**) has a value of 0.20. This shows that, regardless of the positive correlation between independent variables and the dependent variable, the relationship is weak. It suggests that, although the increase in predictors corresponds with the increase in the dependent variable, the relationship is not strong. The coefficient of determination (**R^2)** has a value of 0.05, signifying that only 5% of the proportion of variance in the dependent variable can be explained by the independent variables. This shows that most of the variability in maize yield is not accounted for in the model. The Adjusted R Square corrects **R^2** for the number of predictors in the model. The model has a negative value of -0.05, which suggests that the model may be overfitting or that the independent variable (predictors) does not provide a significant explanation of the dependent variable; adding the predictors leads to a decline of the explanatory power of the model. The error term (**e**) in the model captures unobserved influences that may have influenced maize yield, model specification errors, assumptions in estimation and random noise. Unobserved influences that may have contributed to low maize yield but were not included in the model include: environmental factors such as climate, soil quality, and water availability. Biological factors that could have influenced low yield, such as maize variety, pests and diseases, and weeds, were not properly addressed by GFF. In addition, poor management practices could have contributed to low maize yield, including improper fertiliser application, less irrigation practices, poor agronomic practices, and delay in pest and weed control. Moreover, lack of technological factors such as zero agricultural technology, and less research and development may have contributed to low maize yield compared to the standard yields.

The results show that none of the labour-related variables (full-time workers, seasonal workers, average age, or average education level) has a statistically significant effect on maize yield at Green Feathers Farm. The constant term represents a baseline yield, although the labour components do not appear to have a significant influence on this yield according to the current model. The lack of significant connections shows that labour constraints may not be directly related to maize yields in this study. However, it is important to review other unmeasured factors that may influence yield and improve the model with more variables. Other factors influencing yield, such as soil quality, pest management, and climatic conditions, could help to explain the variability in maize yields. GFF should undertake methods to attract seasonal workers, which might boost production and yields. It should

also fund training programmes to improve the efficiency and abilities of present workers, which could increase yields. GFF would benefit from researching technology that could assist in alleviating labour shortages by enhancing planting and harvesting efficiency. Furthermore, the farm should evaluate how market access and prices affect agricultural income, which in turn influences labour availability.

Impact on Tobacco

A linear regression analysis was run to assess the impact of various labour-related factors on tobacco yield at Green Feathers Farm. The aim is to have a deeper understanding of how labour dynamics affect agricultural productivity to enable farm owners to improve efficiency and crop yields. The regression model investigates the relationships between tobacco yield and major independent factors such as the number of full-time and seasonal workers, labourers' average age, and level of education. By evaluating the findings of this study, we can discover major elements that influence tobacco output and devise solutions to reduce labour shortages, ultimately increasing farm profitability and productivity. **Table 13** shows the results of the analysis.

Table 13: Regression Analysis (Tobacco Yield in kg/ha)

Coefficients[a]					
Model 2	**Unstandardized Coefficients**		**Standardized Coefficients**		
	B	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	1573.29	987.45		1.59	.12
Fulltime Workers	-1.40	4.30	-.05	-.32	.75
Seasonal Workers	10.72	3.43	.51	3.13	.00
Ave. Age of Labourers	-47.80	36.35	-.19	-1.32	.20
Ave .level of Education	45.49	34.18	.20	1.33	.19
Model summary					
Model 2	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**	
	.50a	.25	.17	754.76	
a. Predictors: (Constant), Ave. level of Education, Full-time Workers, Ave. Age of Labourers, Seasonal Workers					

An econometric model, as depicted by the above table, can be noted as:

$$Y = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + e$$

Where,

Y: is the dependent variable (Tobacco Yield in kg per hectare)

B_0: is the constant

B_1; **B_2**; **B_3**; and **B_4** are parameters

X_1; **X_2**; **X_3**; and **X_4** are independent variables (full-time workers, average age of labourers, seasonal workers, and average level of education).

e; represents errors that may be found in the regression model.

Therefore, the econometric model is denoted as;

$$\mathbf{Y = 1573.29 - 1.40X_1 + 10.72X_2 - 47.80X_3 + 45.49X_4 + e}$$

Tobacco Yield = 1573.29 – 1.40 Fulltime workers **+ 10.72**Seseanal workers **–**
47.80 Average age of labourers **+ 45.49**Average level of education **+ e**

From the regression equation above, the constant (**B_0**) represents the expected yield of tobacco when all independent variables are zero. This scenario is not practical in the real world since it is impossible to have yield without labour to operate machinery in both labour-intensive and mechanised operations. This baseline estimate lacks reliability; it is not statistically significant at 5% ($p = 0.12$). The negative coefficient of full-time workers (**B_1**) shows that if additional full-time workers increase by one unit, it influences the decrease in tobacco yield by 1.40 kg/ha. However, this association is not statistically significant ($p > 0.05$), suggesting that the presence of full-time workers does not significantly affect yield. Likewise, each additional seasonal worker is associated with an increase in tobacco yield by 10.72 kg/ha (**B_2**). This effect is statistically significant ($p = 0.00$), indicating the importance of seasonal workers and their positive role in enhancing tobacco yield. On the contrary, as the labour force became older, it negatively affected productivity. An increase in the age of workers by one unit is associated with a decline in tobacco yield by 47.80 kg/ha (**B_3**). However, this relationship is not statistically significant at 5% ($p = 0.20$), showing that age does not constantly influence yield. Again, each unit increase in the average level of education influences an increase in tobacco yield by 45.49 kg/ha (**B_4**). However, this effect is also not statistically significant ($p = 0.19$), signifying that education level may not have a strong impact on yield.

The analysis's most notable finding is that seasonal workers have a substantial, favourable effect on tobacco yield. This shows that increasing the number of seasonal workers can

boost yield, making it an important consideration for farm management. This considerable positive correlation between seasonal workers and tobacco output emphasises the need for having enough seasonal labour during important periods such as planting, weeding, herbicide application, harvesting, and other crop protection tasks. This assumption implies that workforce shortages in this category could contribute to lower yields, underlining the importance of good recruitment and management tactics. In contrast, the presence of full-time staff appears to reduce yield, though this effect is not statistically significant.

The average age and education level of labourers have no significant impact on yield, indicating that these factors may not be as influential as labour availability. However, the negative coefficient for full-time workers is unexpected and warrants further investigation. This could indicate inefficiencies in full-time labour utilisation at GFF or that the farm's reliance on full-time workers does not align with the peak demands of tobacco cultivation. The lack of substantial connections between age and education implies that just having older or more educated personnel does not inevitably result in higher returns. Other elements, such as practical experience, motivation, and management techniques, may have a greater impact on productivity. GFF management should understand these dynamics for better decision-making. Focusing on increasing seasonal labour availability at GFF would increase tobacco yields, while full-time workers' roles and efficiency may need to be re-evaluated.

Impact on Sugar Beans

Table 14 is a presentation of a regression analysis results aimed at understanding the effects of various labour related aspects on sugar bean yield at GFF, measured in kilograms per hectare. All values are rounded off to two decimal places.

Table 14: Regression Analysis; Yield of Sugar Beans (kg/ha)

Coefficients[a]							
Model 3	**Unstandardized Coefficients**		**Standardized Coefficients**			**Collinearity Statistics**	
	B	**Std. Error**	**Beta**	**t**	**Sig.**	**Tolerance**	**VIF**
(Constant)	738.34	890.38		.83	.41		
Fulltime Workers	3.63	3.88	.16	.94	.36	.74	1.36
Seasonal Workers	5.12	3.10	.29	1.66	.11	.73	1.37
Ave. Age of Labourers	9.50	32.77	.05	.29	.77	.89	1.13

Ave. level of Education	13.11	30.82	.07	.43	.67	.86	1.17

Model Summary				
Model 3	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
	.38a	.14	.06	680.57

a. Predictors: (Constant), Average Level of Education, Full-time Workers, Average Age of Labourers, Seasonal Workers

$$\mathbf{Y = 738.34 + 3.63X_1 + 5.12X_2 + 9.50X_3 + 13.11X_4 + e}$$

Sugar Bean Yield = 738.34 + 3.63 Fulltime workers **+ 5.12**Seseanal workers **+ 9.50**Average age of labourers **+ 13.11**Average level of education **+ e**

The constant (**B_0**) is 738.34 kg/ha, representing the yield for sugar bean without labour input. This outcome is not statistically significant and not reliable; it does not represent the real-world scenario. It is not possible to obtain yield without any involvement of labour to plant, operate machines and so on. The coefficient for full-time workers, **B_1**, shows that for each additional full-time worker, sugar bean yield is predicted to increase by 3.63 kg/ha. At a 5% confidence level, this effect is not statistically significant ($p > 0.05$), pointing out that the relationship is not strong enough to be certain. **B_2** shows that each additional increase in seasonal workers is linked to an increase in sugar bean yield by 5.12 kg/ha. Although it is not statistically significant, it is closer to significance ($p = 0.11$), signifying a potential effect even though it does not meet predictable significance levels. The coefficient of the average age of labourers (**B_3**) suggests that each additional increase in the age of labourers is associated with an increase in sugar bean yield by 9.50kg/ha, however, this notion is statistically not significant ($p = 0.77$) representing that the age of labourers does not influence yield. Similarly, an increase in one unit of the level of education influences the increase in sugar bean output by 13.11 kg/ha (B4), although it is not statistically significant ($p > 0.05$). A test for multicollinearity was conducted, and both Tolerance and Variance Inflation Factor (VIF) values show that there is no collinearity between independent variables (tolerance > 0.1 and VIF < 10).

The lack of sufficient labour, particularly seasonal workers, led to lower production and yield. The positive coefficients for seasonal workers suggest that increasing this type of labour may improve results. The existence of unmeasured factors such as management practices, technology use, or operational scale could also influence yield, but are not included in the model. Other aspects not included in the regression model include: soil fertility and health, variability in weather patterns, control of pests and diseases, ability to sell farm produce, which significantly influences productivity.

4.3.2.1.2 Impact of Labour Shortages on Farm Income

To determine the impact of labour shortages on farm income, a multilinear regression analysis was modelled to establish the extent to of the effects of farm-related costs on farm income. The farm-related costs faced by Green Feathers Farm include various cost factors.

Model 1

Table 15 shows model 1, dependent variable as annul farm income, whilst independent variable include additional cost, labour cost incurred by GFF during a single year and effect of labour costs on revenue or profits.

Table 15: Effects of Labour Related Costs on Annual Farm Income

Coefficients					
Model 1	**Unstandardized Coefficients**		**Standardized Coefficients**		
	B	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	1.30	.16		8.05	.00
Additional Costs	.03	.02	.18	1.20	.24
Effect of Labour Costs on Income	-.00	.00	-.15	-.99	.33
Labour Costs per annum	5.95	.000	.19	1.25	.22
Model of Summary					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	
1	.35[a]	.12	.05	$0.64	
a. Predictors: (Constant), Additional Costs, Effect of labour Costs on Income, Labour Costs per annum					

$$Y = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + e$$

Where,

Y: is the dependent variable (Annual Farm Income in US$)

B_0: is the constant

B_1; **B_2**; and **B_3**; are parameters

X_1; **X_2**; and **X_3**; are independent variables

Therefore, the econometric model can be represented as below;

$$\mathbf{Y = 1.30 + 0.03X_1 - 0.003X_2 + 5.95X_3 + e}$$

Annual Farm Income = 1.30 + 0.03 Additional Costs **- 0.003**Effects of Labour Cost on Income **+ 5.95**Labour Cost per Annum **+ e**

The constant (**B_0**) has a value of US$1.30m, which represents the estimated income when all independent variables are zero. GFF is expected to record an annual income of US$1.30 million when other costs (independent variables) are zero. For each unit increase in additional costs, the annual farm income is expected to increase by 0.03 units (**B_1**) when other variables are constant. The effect of additional cost is not statistically significant ($p > 0.05$), indicating that these costs do not have a dependable impact on farm income. The effects of labour costs on income have a negative coefficient (**B_2**), which suggests that labour costs correlate with a slight decrease in income by 0.003 units. Again, labour costs are not statistically significant, demonstrating that labour costs do not have an important impact on income in this model. As each unit of labour costs per annum increases, it influences an increase of farm income by 5.95 units (**B_3**). This effect is not statistically significant at 5% ($p > 0.05$).

The model fit **R** (0.35), indicating a moderate correlation between the independent variables and farm income. R Square has a value of 0.12, which means that 12.0% of the variance in income can be explained by the model, which includes the three predictors. This suggests that there are likely many other factors affecting income that are not included in this analysis. Adjusted R Square (0.05) shows that when accounting for the number of predictors, only approximately 5.0% of the variance in income is explained. This indicates a very limited explanatory power of the model. The standard error of estimates (US$0.64) indicates that the average distance that the observed values fall from the regression line reflects the variability of income predictions.

According to the above linear regression analysis, none of the independent variables (additional costs, effects of labour costs on income, and labour costs per annum) had a statistically significant influence on farm income, implying that these cost components are not the key drivers of income variability. The regression analysis reveals minimal correlation between labour costs and farm income. This could indicate that, while rising labour costs could boost yields, the current labour shortages cause underutilisation of available land and resources. The comparatively low R-squared value suggests that the model does not account for a large percentage of the revenue fluctuation, showing that other major factors are likely affecting income levels at Green Feathers Farm. Given the non-significant results, farm management may want to investigate other variables that influence revenue, such as market pricing, crop yields, operational efficiencies, or external economic issues. The regression analysis shows that the components in this model do not significantly predict farm revenue at Green Feathers Farm. The findings indicate the need for further study to identify other potential income factors and to improve the model by integrating more relevant variables. Understanding these dynamics may aid in formulating effective measures to increase agricultural profitability.

Model 2

Table 16 shows model 2's dependent variable as annual farm income, while the independent variables include available land for crop cultivation, the effect of labour laws, the aggregate yield of the three crops, the quality and quantity of yields, and labour costs.

Table 16: Model 2; Effects of Yield Related Variables on Farm Income

Coefficients[a]					
Model 2	**Unstandardised Coefficients**		**Standardised Coefficients**	**t**	**Sig.**
	B	**Std. Error**	**Beta**		
(Constant)	1.12	.60		1.88	.07
Size of Farm	.00	.00	.13	.79	.44
Total Yield Harvested (kg)	1.91	.00	.01	.05	.96
Effects of Labour Shortages on Quality and Quantity of yields	.00	.00	.18	1.072	.29
Other Labour Costs	-.00	.00	-.23	-1.31	.20
Changes in Labour Laws	-.01	.04	-.06	-.39	.70
Model Summary					
Model 2	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**	

	.34a	.11	-.01	$0.59
a. Dependent Variable: Annual Farm Income (US$) b. a. Predictors: (Constant), Changes in Labour Laws, Total Yield Harvested (kg), Size of Farm, Effects of Labour Shortages on Quality and Quantity of yields, Labour Costs				

Values in **Table 16** were rounded off to two (2) decimal places. For clarity, values which does not give meaning, for example 0.00, were excluded in the regression equations as well as in interpreting results. Only their original values were considered for better understanding.

$$\mathbf{Y = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + e}$$

$$\mathbf{Y = 1.12 + 0.003X_1 + 1.91X_2 + 0.002X_3 - 0.004X_4 – 0{,}01X_5 + e}$$

Annual Farm Income = 1.30 + 0.003 Farm Size **+ 1.91**Total yields harvested + **0.002**Effects of Labour Shortages on quality and Quantity **- 0.004**Other Labour Costs – **0.01**Changes in labour Laws **+ e**

GFF is expected to get US$1.12 million at the end of the agricultural season when all other predictors are zero. However, although this notion is close to significance ($p = 0.069$), it is not practical in the real world since it is impossible to receive any income when the land and yields are zero. The coefficient $\mathbf{B_1}$ shows that for each additional unit of farm size, farm income increases by US$0.003 million (US$3000.00). Nevertheless, the high p-value ($p > 0.05$) indicates that this relationship is statistically not significant. This may be a result of poor soil quality, which led to reduced yields and ultimately low income. For $\mathbf{B_2}$, each additional kilogram of total yield harvested influences negligibly to annual farm income negligibly by US$1.91 million; however, it is not statistically significant ($p = 0.963$). This may be for the reason that yields were reduced due to delays in pest control, weeding and post-harvest losses because of inefficient labour. $\mathbf{B_3}$ implies that a slight positive influence on annual farm income was as resulted from the quality and quantity outcome due to labour shortages, which is also statistically not significant and impractical. However, the positive influence may be a result of reduced cost since GFF is now paying fewer workers. Other labour-associated costs negatively affect annual farm income. As these labour costs increase, US$0.004 million (US$4000.00) reduces annual income. Similarly, changes in labour laws may negatively affect farm income by US$0.01 million. The value for **R**, 34%, indicates a weak positive correlation between the independent variables and annual farm

income. The $\mathbf{R^2}$ value suggests that the model can explain at least 11% of the variance in annual farm income, and the adjusted R Square of -0.01 shows that the model may not fit the data well when accounting for the number of independent variables.

Results from **model 2** show that the independent variables have low coefficients and high p-values, demonstrating that they do not strongly affect farm income. This outcome could be because of multicollinearity or other underlying factors not included in the model. In addition, the variables may not correctly capture the complexities of farm income dynamics. For example, yield may not account for crop type or market circumstances. Furthermore, exterior influences such as market demand, inconsistency in climate conditions, and economic conditions could dominate the effects of the considered variables. Likewise, the labour market may be influenced by factors not included in the analysis, such as the availability of skilled labour or seasonal employment trends.

Model 3

Table 17 shows model 3, dependent variable as annual farm income, whilst the independent variables include daily wages for permanent workers, daily wages for casual workers, other benefits to workers and other contributing factors.

Table 17: Model 3: Effects of farm related costs on Farm Income

Coefficients[a]					
Model 3	**Unstandardized Coefficients**		**Standardized Coefficients**		
	B	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	.66	.45		1.45	.16
Ave. wage for Permanent labourers	.00	.01	.06	.40	.69
Average Daily Wage for casual labourers	.14	.13	.17	1.09	.28
Other Benefits	.00	.00	.24	1.50	.14
Labour Costs per Year	5.78	.00	.20	1.31	.20
Model Summary					
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**	
3	.36a	.13	.04	$0.60	

a. Dependent Variable: Annual Farm Income (US$)
b. Predictors: (Constant), Labour Costs per Year, Average wage for Permanent labourers, Average Daily Wage for casual labourers, Other Benefits

Likewise, values in **Table 17** were rounded off to two (2) decimal places and values that do not give meaning were excluded from the regression equations, as well as in interpreting results.

$$\mathbf{Y = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + e}$$

$$\mathbf{Y = 0.66 + 0.003X_1 + 0.14X_2 + 0.003X_3 + 5.78X_4 + e}$$

Annual Farm Income = 0.66 + 0.003 Daily wage for permanent workers **+ 0.14**Daily wage for casual workers **+ 0.003**Other Benefits **+ 5.78**Labour Cost per year **+ e**

The constant $\mathbf{B_0}$ suggests that Green Feathers Farm is estimated to receive US$0.66 million when all other predictors are zero. However, this result is statistically not significant (p = 0.16). As the average wage of permanent workers increases, annual farm income is expected to increase by a minimal positive US$0.003 million (US$3000.00). However, this notion is not practical since high wages reduce income, and it is therefore statistically not significant. The coefficient for average daily wage for casual workers $\mathbf{B_3}$ supports that an increase in wages for casual workers is associated with a minor increase in farm income by 0.14 units. Other benefits that are received by GFF workers, such as housing, meals and monthly hampers, show a positive impact on income, but again, it is statistically not significant. The R-value of 0.36 suggests a moderate positive correlation between the independent variable and annual farm income. The R Square value (0.13) shows that the model can explain nearly 13% of the variance in annual farm income. The adjusted R Square of 0.04 suggests that the model does not fit the data well after adjusting for the number of predictors.

4.3.2.2 Implication of Labour Shortages

Impact on crop yields

The findings showed that labour shortage led to reduced crop yields and farm productivity at GFF. The farm only afforded a few workers to plant, manage, and harvest crops; output was reduced, especially for labour-intensive crops like tobacco and maize. The analysis conducted suggests that increasing the number of seasonal workers could lead to higher crop yields, and subsequently improve farm income.

Impact on farm income

The data presented highlights that while the number of full-time workers did not show a significant positive impact on income, the presence of seasonal workers is crucial in the agricultural sector. Lower income due to decreased yields was an outcome of fewer seasonal workers hired by a farm. Crop yields and farm income are therefore directly affected by labour shortages, with potential economic consequences for sustainability and growth.

4.3.2.3 Mitigation Strategies

Enhancing recruitment and retention

GFF should implement strategies to attract seasonal and permanent workers, such as putting in place competitive wages, improved working conditions, improved workers' welfare concerns and improve on employee benefits such as housing, meals, bonuses, medical care, and funeral policy programmes. GFF should collaborate with a local educational institution to create a pipeline of skilled labour.

Training and education programmes

GFF should increase the average level of education among labourers through investing in training programmes, as this has shown a strong and positive correlation with farm income. Both full-time and seasonal workers should undergo skill development through ongoing training and educational programmes.

Automation and technology

GFF should consider more on investing in agricultural technology and automation to reduce reliance on manual labour, especially during peak seasons. This could alleviate the impact of labour shortages on yields and reduced operational costs in the end.

Flexible labour arrangements

GFF should make use of flexible labour arrangements that allow for part-time or temporary contracts, which make it easier to scale the workforce up and down as needed throughout all seasons.

4.3.3 Descriptive Analysis on the Impact of LMS on Labour Market Efficiency, Farm Productivity and Labourer Income

To design, develop and pilot test a digital platform that connects Green Feathers Farm with available labourers.

GFF previously did not have any digital platforms that they used. They depended on the traditional way of recruitment, where labourers used the referral approach. In addition, GFF used manual paper-based methods to schedule and assign tasks to workers. It also used paper-based time sheets to track employee hours, attendance and productivity. We designed a digital platform that enables farmers to track employees, assign and manage tasks, monitor attendance, as well as schedule shifts. The digital platform designed for GFF is a comprehensive web and mobile application that modernises and streamlines labour management processes within the agricultural sector and other industries such as mining and tourism. The key features and functionalities of the digital platform include the following;

a) **Employee tracking**: The system allows farmers to track their employees' locations and activities in real-time, ensuring responsibility and efficiency. Each employee has a digital profile that includes personal details, skills, and employment history, which enhances skill matching.
b) **Task assignment and management**: Using the platform, supervisors easily allocate and assign tasks to workers based on their skills and availability, optimising labour distribution. In addition, the platform allows for tracking the status of tasks, enabling hands-on management and adjustments as needed.
c) **Attendance monitoring**: Employees can log their hours (in/out) through the app, reducing the need for manual time sheets and enhancing precision. The automated attendance reports from the platform provide insights into workforce attendance and absenteeism.
d) **Shift scheduling**: The platform permits easy creation and adjustment of shift schedules, accommodating the changing needs of agricultural work throughout the agricultural season. Employees receive alerts for upcoming shifts or changes, ensuring they prepare and are informed for the task.
e) **Productivity tracking**: The application can also analyse output levels based on tasks completed and hours worked, helping managers assess worker efficiency. Managers can produce reports to evaluate labour performance over specific periods.

Etiquette HR Consultancy modernises traditional labour management by offering a user-friendly digital platform that improves productivity, responsibility, and communication in

workforce management. Its capabilities meet the unique demands of agriculture while being adaptable enough to service multiple industries, instituting GFF for greater operational success.

4.3.3.1 Paired Sample Statistics

A comparative paired samples statistical analysis was conducted to evaluate the potential impact of a digital platform developed to connect Green Feather Farm with the available workforce. The analysis utilises statistical data to assess the usefulness of current labour management systems and ascertain areas for improvement. Operations in agricultural setups are increasingly relying on the efficient use of labour management systems to comprehend the current labour market efficiency, farm productivity and labour income. The researcher used paired sample statistics to compare several agricultural parameters at Green Feathers Farm. Each pair has two related variables, and the results in **Table 18** show their means, sample sizes (N), standard deviations, and standard errors of the mean. Moreover, the researcher explored how these changes could transform into tangible benefits for labourers, possibly increasing their income and job stability. Through examining the data and its implications, the analysis aimed to answer the research question: What is the impact of a digital platform connecting Green Feathers Farm to available labourers on labour market efficiency, farm productivity, and labourer income during a single agricultural season? **Table 18** shows paired sample statistics of different variables rounded off to two decimal places.

Table 18: Paired Sample Statistics

Paired Samples Statistics					
		Mean	**N**	**Std. Deviation**	**Std. Error Mean**
Part 1	Fulltime Workers	60.55	44	31.21	4.71
	Seasonal Workers	70.91	44	39.36	5.93
Part 2	Annual Farm Income (Million US$)	$1.45	44	$0.65	$0.10
	Total Yield Harvested (kg/ha)	7203.73	44	2861.55	431.39
Part 3	Area Cultivated for Tobacco (Ha)	79.55	44	13.33	2.01
	Yield for Tobacco (kg/ha)	1147.26	44	829.20	125.00
Part 4	Yield for Sugar Beans (kg/ha)	1594.50	44	699.91	105.52
	Area Cultivated for Sugar Beans (Ha)	30.91	44	12.12	1.83
Part 5	Area Cultivated for Maize (Ha)	46.93	44	9.84	1.48
	Yield for Maize (kg/ha)	4489.05	44	2014.25	303.66

The average yearly income is approximately US$1.45 million, with considerable fluctuation (standard deviation of $0.65). However, the relationship between labour input and financial output needs to be improved. The overall output produced averages 7203.73 kg/ha, with a significantly higher variability (standard deviation of 2861.55). This implies that, while income is relatively consistent, yield can change dramatically, thereby compromising income stability. The total yield harvested is high, demonstrating productive capacity during the previous season. The yields for various crops also varied, with maize yielding the most. This shows that the farm might profit from concentrated worker efforts on high-yield crops. The digital platform enabled targeted labour allocation to maximise yields, particularly for maize, which has the highest production. Improved scheduling and labour management via the platform boosted overall productivity by ensuring that workers are available when vital tasks are required.

On average, there are more seasonal workers (70.91) than full-time employees (60.55) are. The increased standard deviation for both groups of workers suggests that their numbers vary throughout the sample. This shows that seasonal work is more readily available or in higher demand, which could point to inefficiencies in how full-time and seasonal labour are utilised. The digital platform improved labour market efficiency by making it easier to find seasonal workers when they were needed, potentially lowering recruitment time. A more efficient match between labour needs and labour supply was realised, resulting in optimal workforce allocation.

The average area cultivated for tobacco is 79.55 hectares, resulting in a yield of 1147.26 kg per hectare. The yield has a high standard deviation, indicating significant fluctuation in tobacco output, maybe due to labour constraints or managerial methods. The average yield of sugar beans exceeds the area cultivated, indicating efficient production of the crop. The yield also varies significantly, suggesting that, despite the relatively small area planted, the production can fluctuate depending on the conditions. The average area planted for maize is 46.93 hectares, with a yield of 4489.05 kg per hectare. The yield has a large standard deviation, demonstrating variability in maize output. This shows that there could be factors influencing maize yield, such as labour availability or farming techniques. Tobacco and sugar bean cultivation appear efficient, with high yields compared to the

available land. Maize yields, on the other hand, vary widely, highlighting possible areas for development. For further analysis, a paired sample test was conducted.

Table 19: Paired Sample Test

Paired Sample Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Full-time Workers – Seasonal Workers	-10.36	38.51	5.81	-22.07	1.34	-1.79	43	.08
Pair 2	Annual Farm Income (Million $) - Total Yield Harvested (kg)	-7202.28	2861.35	431.36	-8072.20	-6332.35	-16.70	43	.00
Pair 3	Area Cultivated for Tobacco (Ha) – Yield for Tobacco (kg)	-1067.72	826.86	124.65	-1319.10	-816.33	-8.57	43	.00
Pair 4	Yield for Sugar Beans (kg) – Area Cultivated for Sugar Beans (Ha)	1563.59	700.90	105.67	1350.50	1776.69	14.80	43	.00
Pair 5	Area Cultivated for Maize (Ha) – Yield for Maize (kg)	-4442.11	2011.86	303.30	-5053.78	-3830.45	-14.65	43	.00

The negative mean difference shows that there are fewer full-time workers compared to seasonal workers. The p-value of 0.081 implies that this difference is not statistically significant at 0.05 level, but it is near, indicating a tendency toward greater seasonal labour. The digital platform may increase labour market efficiency by increasing access to seasonal workers, potentially reducing dependency on full-time employees. Improved recruitment practices could result in quicker hiring during busy seasons, increasing total labour utilisation.

A comparison between annual farm income and total yield harvested reveals a considerable negative difference, indicating that annual income is much lower than total yield harvested, implying inefficiencies in converting harvested crop into revenue. The strong correlation between annual farm income and yield ($p < 0.001$) indicates that there is a need for improvement. The digital platform aided in pricing optimisation and ensured that improved yields were translated into better market sales, resulting in more profitability. Connecting farmers with better marketplaces or purchasers increased income possibilities.

The considerable negative difference between the area cultivated for tobacco and its yield indicates that the area cultivated does not yield as much as predicted, implying inefficiencies in tobacco production. The digital platform may promote better resource management, resulting in increased yields and perhaps higher wages for labourers. Improved data on labour allocation may aid in the optimisation of planting and harvesting procedures.

Yield for sugar beans was compared with its area cultivated, a positive difference suggests that increasing the area cultivated for sugar beans significantly increases yield, implying efficient resource use in this sector. The digital platform assisted in identifying appropriate production regions and facilitated labour allocation to maximise these high-yield crops. The LMS assisted GFF managers in focusing on crops that yield higher profits. A negative mean difference between the area cultivated and the yield obtained indicates inefficiencies in maize production. The digital platform can therefore help manage labour more effectively in maize farming, potentially leading to higher yields and profitability. Training labourers on the platform could potentially boost productivity.

4.3.3.2 Impact of a Digital Labour Management System at GFF

a) Impact on Labour Market Efficiency

The digital platform significantly lowered recruiting times while improving labour matching, resulting in a more efficient labour market. Improved labour matching reduced downtime periods and ensured that labour is available during peak seasons like planting and harvesting. The platform also provided real-time data on labour availability, allowing GFF to respond promptly and more efficiently to labour needs, which enhanced output. Connecting directly with existing labourers, GFF reduced costs related to outdated hiring practices, such as advertising and intermediary fees. The labour management system streamlined the hiring procedure, making it less difficult for labourers to find work and for GFF to hire labour with the necessary skills. This could lessen the fluctuations seen in the availability of seasonal labour in future. Limited training and low implementation of LMS at GFF suggest inefficiencies in the labour market. A digital platform could modernise communication and hiring processes, making labour more readily available

for Green Feather Farm. Accountability and performance were enhanced by improving the tracking of employees, leading to more efficient utilisation of labour resources.

b) Impact on Farm Productivity

Through efficiently connecting labourers with GFF, there was improved matching of labour supply and demand, ensuring that the right number of workers is available when needed, resulting in increased total yields at GFF. The platform ensured that labour needs are met promptly, allowing the timely availability of work workforce, which improved crop management and harvesting procedures, resulting in higher overall productivity and yield. The relationship seen between the number of workers and yield suggested that increasing labour efficiency through the platform might lead to higher productivity. In addition, the platform facilitated the recruitment of skilled labourers, which further improved productivity and yield quality, through skill matching, especially for specific crops that require expertise, such as tobacco. Moreover, the digital platform enabled better planning for seasonal labour needs, which maximised productivity and ensured that labour was utilised effectively throughout the agricultural season. The current system may not be fully leveraging the available labour, given the moderate level of employee tracking and LMS features that are present. Farm productivity was improved by providing better management tools, which optimise labour allocation through the implementation of a digital platform that ensures workers are well trained and supported. A potential for integrating better management tools is presented by the high variability in LMS features, which suggests that these tools can be tailored to the farm's specific needs.

c) Impact on Labour Income

The platform promoted wage transparency, potentially leading to better compensation for labourers, thus attracting skilled workers to GFF. The platform facilitated competitive wage offers, resulting in higher incomes for labourers, more job satisfaction, and lower labour turnover rates. The digital platform also created more job opportunities by connecting labourers with multiple farms, enhancing their income through increased work availability. The diverse subscription fees indicate that willingness to pay a fee is attached to affordability, which may be a barrier for some labourers and farms. The platform could facilitate higher income opportunities through consistent work, by

connecting labourers more effectively with farm owners and operations, skilled labourers can potentially receive higher wages. Therefore, the digital platform should offer a subscription fee that is affordable and attractive to both farm operators and labourers. Reducing the costs associated with hiring and training may allow for better wages for labourers.

4.3.3.3 The Importance of Labour Management in Agriculture

Agriculture, the pillar of human civilisation, has always been dependent on human labour. However, the management of this labour force has conventionally been a contest for farmers globally. With the introduction of technology, particularly agricultural management software such as Etiquette HR Consultancy, the landscape of labour management in agriculture is experiencing a reflective transformation. Efficient labour management is vital for the success and sustainability of all agricultural operations. The following are the importance of labour management in agriculture;

- Correct allocation of labour guarantees that resources such as time, machinery, and inputs are employed optimally, leading to increased productivity and profitability.
- Agricultural tasks, such as planting, irrigation, and harvesting, are time-sensitive. Effective management of labour safeguards that these tasks are completed promptly, minimising crop losses and maximising yields and overall farm income.
- Labour costs constitute a significant portion of the total expenses in agriculture. Through effective labour management, farmers can control costs and increase overall financial performance.
- Well-managed labour practices contribute to a positive work environment, leading to higher job satisfaction among farm workers. This, in turn, promotes employee retention and loyalty.

Etiquette HR Consultancy is a cutting-edge agricultural management software designed to address the challenges related to labour management and streamline farm operations. Etiquette HR Consultancy is revolutionising labour management in agriculture, while mitigating labour shortages as highlighted below;

- Etiquette HR Consultancy offers a centralised platform where farmers can manage all aspects of labour, including scheduling, task assignment, attendance tracking, and performance evaluation. This guarantees unified coordination and communication between managers and workers.
- With Etiquette HR Consultancy, farmers can monitor labour activities in real time, allowing them to track progress, identify tailbacks, and make timely amendments to optimize workflow.
- Etiquette HR Consultancy helps farmers ensure compliance with labour regulations by providing features such as automated wage calculation, labour contract management, and safety protocol enforcement.
- Etiquette HR Consultancy gathers and analyses data on labour performance, production, and costs, empowering farmers to gain valuable insights into their operations and make data-driven decisions for continuous improvement.
- Etiquette HR Consultancy is accessible using of mobile devices, allowing managers and workers to access information and perform tasks from anywhere, at any time, improving flexibility and efficiency.

4.4 FINDINGS

- Labour demand varies dramatically during the agricultural season, making it difficult to retain workers during off-peak times.
- Compensation levels were determined to be insufficient to attract and retain employees, particularly when compared to other job alternatives.
- Certain agricultural jobs require specific abilities that are not always available in the local labour pool, resulting in a lack of specialised roles.
- Broader economic variables, such as competition from other businesses and local job markets, add to the difficulties of finding appropriate personnel.
- Labour shortages hampered the capacity to plant, grow, and harvest crops on schedule, resulting in lower yields.
- The necessity to engage temporary or less skilled personnel increased operating costs, further reducing farm income.

- Insufficient labour frequently resulted in hasty work and a lack of attention to detail, leading to lower-quality crops and a detrimental impact on market prices.
- The combination of reduced yields and increased operational costs resulted in substantial financial instability for the farm, making it difficult to engage in upgrades or expansion.
- The digital platform positively lowered recruiting times while improving labour matching, resulting in a more efficient labour market.
- The timely availability of labour improved crop management and harvesting procedures, resulting in higher overall productivity and yield.
- The platform facilitated competitive pay offers, resulting in higher wages for labourers, more job satisfaction, and lower turnover.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 CONCLUSION

The examination of Green Feathers Farm's agricultural labour shortages has provided crucial information about the root causes and their significant effects on crop yields and farm revenue. The investigation uncovered several significant factors contributing to labour shortages, such as the seasonality of agricultural production, which results in fluctuations in labour demand and makes it challenging to retain employees. Potential workers find it challenging to commit to farm work due to low pay, subpar housing, and unfavourable working conditions. Additionally, the farm's ability to fill specialised positions needed by modern agricultural operations is limited by a lack of skilled workers in the local labour pool. Potential workers are also deterred from agricultural jobs by the broader economic environment, which includes competition from other industries.

These labour shortages have serious repercussions. Farm profitability as a whole is impacted by lower farm productivity, which is directly correlated with lower crop yields. Crop quality and market prices decline when crops are not grown, cultivated, and harvested on schedule, creating a vicious cycle of unstable finances. Reliance on temporary or undertrained labour raises operating costs, which reduces profit margins and makes it more difficult for the farm to make important expansions or improvements. A digital labour management platform's pilot testing demonstrated revolutionary potential in response to these problems. By expediting the hiring process and enhancing the fit between available employees and job openings, the platform has significantly improved labour market efficiency. Because prompt access to qualified staff allowed for improved management of crucial agricultural tasks, this efficiency increased farm productivity. Additionally, the platform made it possible to offer competitive compensation packages, which raised worker earnings while simultaneously enhancing job satisfaction and reducing attrition. Overall, the launch of the digital platform is a calculated move to address the diverse types of labour shortages. It provides a scalable solution that can change to meet the evolving needs of the agricultural industry, building a more resilient workforce that can meet the demands of contemporary farming.

A comprehensive strategy that combines the knowledge gained from this study with successful initiatives is essential as Green Feathers Farm expands. By enhancing compensation packages,

offering focused training programs, and continuously improving the digital platform, GFF can create a solid workforce that not only meets present needs but is also equipped to handle challenges down the road. Resolving labour shortages is a critical factor in agricultural sustainability and success, not just an operational issue. By being proactive and putting new ideas into practice, Green Feathers Farm can increase its productivity, maintain financial stability, and positively influence the greater agricultural community. A healthier and more sustainable agricultural ecosystem will result from this comprehensive approach, which will benefit not only the farm but also the livelihoods of the labour force.

5.2 RECOMMENDATIONS

- In order to remain competitive in the local market, GFF should review and modify its salary structures, possibly incorporating incentives such as housing allowances.
- To help close the skill gap and guarantee a more skilled workforce, GFF may develop skill-training programs for local labourers. Collaborations with nearby educational institutions may also be necessary.
- Examine options for housing or transportation for employees, as these could help draw in more workers and reduce barriers to employment.
- Increase hiring efforts by using targeted marketing to advertise job openings at Green Feathers Farm and emphasise the advantages of working on the farm.
- Update and enhance the digital platform frequently in response to user feedback to make sure it satisfies the evolving needs of farm management and labourers.
- To evaluate the long-term effects of initiatives and make data-driven adjustments, establish a system for ongoing monitoring of farm revenue, crop yields, and labour market dynamics.
- Since labour characteristics do not significantly affect yield, efforts to boost productivity might concentrate on investing in technology or better farming methods rather than just hiring more workers.
- The government ought to take into account measures like tax breaks or subsidies that promote the employment of full-time staff. Increased productivity and job stability may result from this.
- The government ought to put policies in place that facilitate farmers' access to markets, like better market information systems and transportation infrastructure. This could increase farmers' income by enabling them to obtain better prices for their produce.

- To boost yields per acre, the government may also develop training programs for farmers that emphasise the most effective tobacco farming methods.
- Promote the production of crops with high yields, like sugar beans, and look into the causes of crops with lower yields. Given that current methods are yielding excellent results, the government may provide subsidies or other assistance to farmers to increase their sugar bean acreage outcomes.
- Perform evaluations to pinpoint barriers to maize yield efficiency and implement focused solutions, like better farming practices or easier access to superior seeds and fertilisers.
- Farmers may find it challenging to adhere to labour laws that regulate working conditions, pay, and hours. The farm's ability to recruit and retain staff may be hampered by rising regulatory expenses.
- Many farms depend on the supply of migrant labour, which may be restricted by strict immigration laws. Regulation changes may cause significant labour shortages if Green Feathers Farm has historically depended on seasonal migrant workers.

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APPENDICES

Appendix A

A questionnaire template on investigating the impact of labour shortages on crop yields and farm income: A case Study of Green Feathers Farm (Pvt) Ltd (GFF), and the Design and Development of Labour Management System to mitigate these Effects.

MUNASHE GUMBO is a student with the Bindura University of Science Education. He is doing a research on the above research topic. Information will be kept confidential and the analysis will not involve individual names, the information will be used only for the purpose of this research. You have the right to terminate the interview at any time and you have the right to refuse to answer any question you might not want to respond. If individuals, does not consent to the interview, please show gratitude and get replacement from the supervisor. If an individual consent to the interview, please continue with the interview.

Instructions: Please answer the following questions to the best of your ability. Your responses will be kept confidential and used only for research purposes.

Section 1: Demographic

Name (Optional): _____ Age: _____

Gender: Male [ ] Female [ ] Other [ ]

Region: _____

Section 2: Farm Information

1. What type of Farm do you operate?
   1=Smallholder [ ] 2=Commercial [ ] 3=Other [ ]
2. What type of enterprise do you operate?
   Crop [ ] Livestock [ ] Fisheries [ ] Mixed [ ] Other [ ]
3. How many years have you been operating? _____
4. What is the size of your farm (in hectares)? _____
5. What is your annual farm income? _____

Section 3: Labour Availability

1. How many full-time workers do you currently employ on your farm?
   _____
2. How many seasonal workers do you hire during peak seasons?
   _____
3. What is the average age of your labourers? _____
4. What is the average level of education among your labourers?
   _____
5. Have you experienced any labour shortages in the past year? Yes [ ] No [ ]
   If yes, please specify the duration of the shortage (e.g., months):
   _____
6. What factors do you believe contribute to labour shortages on your farm? (Select all that apply)
   Low wages [ ] Poor working conditions [ ] Migration to urban areas [ ]
   Lack of skilled labour [ ] Other (Specify): _____
7. What are the main reasons for labour shortages on your farm?
   Lack of skilled workers [ ] High turnover rates [ ]

Section 4: Productivity Metrics

1. For the top three (**3**) crops that you primarily grow, indicate area and Kg harvested for the past season.
   1. _____
   2. _____
   3. _____

   What was your average yield for the past season per each crop?

Crop	Area (Hectares)	Kg harvested	What percentage of your total variable costs for Crop is attributed to labour costs? 1=Less than 20% 2=21-30% 3=31-40% 4= 41-50% 5=51-60% 6=More than 60%

2. How have labour shortages impacted your farm's yields?
   1= No Impact (Yields remain the same) [ ] 2= Minor Impact (Yields reduced by < 10%) [ ]
   3= Moderate impact (yields reduced by 10 – 20 %) [ ] 4= Significant impact (yields reduced by 21-30%) [ ]
   5= Severe impact (yields reduced by >30%

3. How did labour shortages affect your crop yields in terms of quantity and quality?
   _____
   _
4. Were there any specific crops that were more affected by labour shortages than others? Yes [ ] No [ ]
   If Yes, which ones_____
5. Did you notice any changes in crop yields during peak labour shortage periods? Yes [ ] No [ ]
6. Have labour shortages resulted in reduced income for your farm? 0=No [ ] 1= Yes [ ]
   If yes, at what margin? High [ ] Medium [ ] Low [ ]
7. How does your current yield compare to previous years?
   Increased [ ] Decreased [ ] Almost the same [ ]
8. How did labour shortages affect your farm's income in terms of revenue and profitability?
   1= No Impact (Income remain the same) [ ] 2= Minor Impact (reduced by < 10%) [ ]
   3= Moderate impact (reduced by 10 – 20 %) [ ] 4= Significant impact (reduced by 21-30%) [ ]
   5= Severe impact (Income reduced by >30%
9. Were there any additional costs associated with addressing labour shortages (e.g., overtime pay, recruitment fees)?
   _____
10. Did you notice any changes in farm income during peak labour shortage periods? 0= No [ ] 1= Yes [ ]
11. How has your farm's annual income changed over the past 5 years?

Year	**Farm's average annual income**	**Casual labourers(numbers)**	**Permanent labourers (numbers)**
2024			
2023			
2022			
2021			
2020			

12. How do you think labour costs affect your farm's income and profitability?
    _____
    _
13. Have you noticed any changes in labour productivity or income over the past few years?
    _____
    _____
14. How do you think changes in labour laws or regulations might affect your farm's income and profitability?

_____
_____

15. Are there any other factors that you think affect the relationship between labour and income on your farm?

Section 5: Labour Productivity

1. How many hours do labourers work per day on average?
   _____
2. How many days do labourers work per week on average?
   _____
3. What is the average output per labourer per day (e.g., tons of crops harvested, number of animals cared for)?
   _____
4. How do you measure labour productivity on your farm?
   _____

Section 6: Labour Costs

1. What is the average daily wage for permanent labourers on your farm?
   _____
2. What is the average daily wage for casual labourers on your farm?
   _____
3. What other benefits do you provide to your labourers (e.g., housing, meals, and health insurance)?
   _____
4. How much do you spend on labour costs per year?
   _____

Section 7: Operational Efficiency

1 How do you perceive the efficiency of your farming operations?
Very efficient [ ] Efficient [ ] Neutral [ ] Inefficient [ ] Very inefficient [ ]

2 What challenges have you faced due to labour shortages? (Select all that apply)
Delays in planting [ ] Delays in harvesting [ ] Increased production costs [ ]
Reduced crop quality [ ] Other (Specify): _____

3. What is the percentage of labour shortage on the farm?_____%
4. What is the average wage rate for farm labourers per month ? $_____
5. Are there any labour-saving technologies or machinery used on the farm? 0=No [ ] 1=Yes [ ]
   If yes specify the machinery _____
6. What is the level of mechanisation on the farm (e.g., percentage of tasks automated)?_____%
7. What strategies have you implemented to cope with labour shortages? (Select all that apply)
   Hiring more seasonal workers [ ] Increasing wages [ ] Investing in technology [ ]
   Changing crop types [ ] Other (Specify): _____

Section 8: Current Labour Management Practices

1. Do you currently use a labour management system or software? 0=No [ ] 1= Yes [ ]
2. How do you currently schedule and assign tasks to your employees?
   [ ] 1. Manually (using paper or whiteboard)
   [ ] 2. Using digital calendars (e.g. Google Calendar)
   [ ] 3. Through project management software (e.g. Trello, Asana)
   [ ] 4. Using employee scheduling software (e.g. Deputy, When I Work)
   [ ] 5. Other (please specify): _____
3. How do you track employee hours, attendance, and productivity?
   [ ] 1=Manual timesheets (paper-based)
   [ ] 2= Digital timesheets (e.g. Excel, Google Sheets)
   [ ] 3= Time tracking software (e.g. Toggl, Harvest)
   [ ] 4= Payroll software with time tracking features
   [ ] 5=Other (specify); _____

4. Do you provide training or professional development opportunities for your employees?
   0= No [ ] 1= Yes [ ]

Section 9: Desired Features of a Labour Management System

1. What features would you like to see in a labour management system to help mitigate labour shortages?
   Scheduling [ ] Time tracking [ ] Task assignment [ ]
   Attendance monitoring [ ] Predictive analytics for labour forecasting [ ]
   Real-time reporting and labour cost tracking [ ]
   Other (specify): _____

2. Would you prefer a cloud-based or on-premise labour management system?
   Cloud-based [ ] On-premise [ ]
3. How important is mobile accessibility to you (the ability to access the system on a smartphone or tablet)? Easy [ ] Difficult [ ]
4. Would you be willing to pay a subscription fee for a labour management system? 0=No [ ] 1= Yes [ ]
5. How much would you be willing to pay per month? $ _____

Section 10: Mitigation Strategies

1. What strategies have you implemented to mitigate the impact of labour shortages on your farm?
   _____
   _____
2. Have you considered investing in labour-saving technologies or automation? 0= No [ ] 1= Yes [ ]
3. Are there any government programmes or initiatives that you have participated in to address labour shortages?
   0= No [ ] 1= Yes [ ]
   If yes, Please specify:
   _____

Section 11: Future Plans

1. How do you plan to address labour shortages on your farm in the future?
   _____
   _____
2. Are there any changes you plan to make to your farm's operations or management to mitigate the impact of labour shortages?
   _____
   _____
3. Do you foresee any challenges or opportunities related to labour shortages in the next 5-10 years?
   _____
   _____

Section 12: Additional Comments

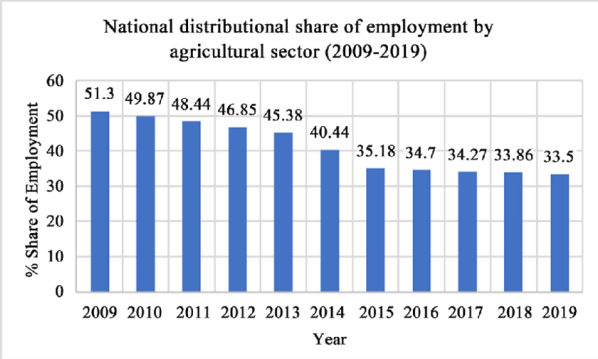
1. Are there any additional comments or suggestions you have regarding labour shortages or labour management systems?
   _____
2. Is there anything else you would like to share about your experiences with labour shortages or labour management on your farm?
   _____
   _
3. Please provide any additional comments or insights regarding labour shortages and their impact on your farming operations:

Thank you for your participation! Your insights are valuable to this research

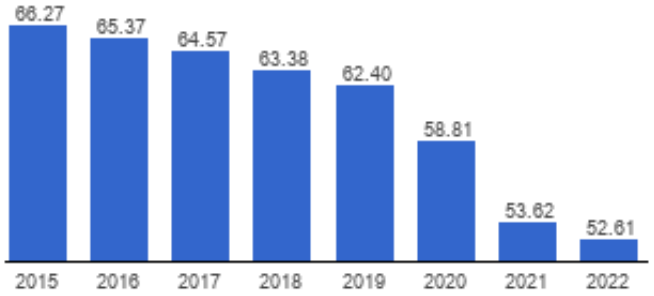
Appendix B

Composition of the agricultural labour force in Zimbabwe

(a)



(b)



1994-2004

Year	Total		Major Industry Group					
	Number	%	Agriculture	%	Industry	%	Services	%
1994	5281272	100	2084730	39.4	1046282	19.8	2150263	40.7
1995	5357110	100	1966794	36.7	1188270	22.2	2202054	41.1
1996	5537402	100	2072197	37.4	1218189	21.9	2246884	40.6
1997	5607881	100	2031907	39.3	1354956	24.1	2221019	39.6
1998	6049238	100	2378410	39.3	1325714	21.9	2230425	36.9
1999	6082746	100	2208324	41.8	1330114	21.8	2544203	41.8
2000	6310247	100	2274153	36.0	1490795	23.6	2545299	40.3
2001	6235588	100	2033343	32.6	1491408	23.9	2710837	43.5
2002	6519415	100	2247602	34.4	1459194	22.4	2812619	43.1
2003	7012755	100	2384397	34.0	1611493	23.0	3016866	43.0
2004	7394029	100	2474725	33.4	1781447	24.1	3137857	42.4

Notes: From 1994 to 2002 excluding Northern and Eastern provinces
2003 excluding Mullaitivu and Kilinochchi districts
2004 excluding Northern Province

(c) *Source: Annual Report of the Sri Lanka Labour Force Survey, 2004*

(d)

Year	Economically Active Population (%)			Distribution of economical inactive population (%)			Distribution of Employment by Sector (%)			Employed 15 years and above (%)	
							Agriculture			Agriculture	Lost their Jobs
	M	F	Total	M	F	Total	M	F	Total	Total	Total
1995	17.23	19.47	36.7	8.87	4.25	13.12	21.09	19.76	40.85	0	0
1996	30.01	7.39	37.4	6.99	4	10.99	22.23	18.99	41.22	0	0
1997	25.89	13.41	39.3	5.79	5.21	11	23.44	22.32	45.76	0	0
1998	27.33	11.97	39.3	5.76	5.33	11.09	22	16.89	38.89	0	0
1999	24.89	16.91	41.8	0	0	0	0	0	0	0	0
2000	16.23	19.77	36	0	0	0	0	0	0	0	0
2001	14.99	17.61	32.6	0	0	0	0	0	0	22.21	16.8
2002	19.05	15.35	34.4	0	0	0	0	0	0	23.03	17.07
2003	19.88	14.12	34	0	0	0	0	0	0	19.99	24
2004	13.01	20.39	33.4	0	0	0	0	0	0	23.46	18.03
2009	17.97	14.36	32.33	8.11	3.08	11.19	31,07	20.23	51.3	22.24	18.99
2010	26.3	20.5	46.8	7.03	4	11.03	24.91	24.96	49.87	24.66	17
2011	49	59	54	6	6.1	12.1	30.42	18.02	48.44	0	0
2012	26.56	17.77	44.33	9.87	13.13	23	28.32	18.53	46.85	0	0
2013	18.01	15.81	33.82	10.2	6.23	16.43	23.05	22.33	45.38	0	0
2014	48	44.21	92.21	4.46	3.33	7.79	23.22	17.22	40.44	0	0
2015	0	0	0	0	0	0	29.49	5.69	35.18	0	0
2016	0	0	0	0	0	0	29.03	5.67	34.7	0	0
2017	28,92	35.56	64.48	17.49	13.03	30.52	21	13.27	34.27	0	0
2018	23.23	13.69	36.92	0	0	0	27.65	12.86	35	24.3	12.11
2019	20	16	36	0	0	0	29.5	15.5	36	23.5	17
2020	0	0	0	0	0	0	25.34	14.09	58.81	23.03	16,60
2021	0	0	0	0	0	0	22.03	23.89	23.6	23.6	22.1
2022	0	0	0	0	0	0	22.03	22.4	20.3	23.6	22.1
2023	0	0	0	0	0	0	23.4	22.4	22.9	23.04	20.6
2024	0	0	0	0	0	0	21.1	19	20.3	11	23