

NAVIGATING THE CHALLENGES OF LOW COFFEE PRICES

NAVIGATING THE CHALLENGES OF LOW COFFEE PRICES: A STUDY ON KANZALU COFFEE CO.

by

Benjamin M. Mulli

Doctoral Research Project

Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

This qualitative study investigates the effects of warehousing strategies on commodity prices in Kenya, with a particular focus on the coffee industry. By conducting qualitative interviews with participants in the coffee value chain, the research aims to identify the impact of outdated warehousing strategies on coffee pricing. It explores how modern strategies, such as blockchain technology for crop traceability, can improve profitability for small-scale farmers. The study seeks to uncover the elements in current warehousing practices that contribute to low producer prices and gather actionable recommendations for significant improvements. The findings aim to provide valuable insights for stakeholders in the coffee value chain to enhance the sector's overall efficiency and profitability.

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SECTION 1: Introduction to Doctoral Research Project

Background of the Problem & Problem Statement

The general problem to be addressed is the low commodity price of coffee produced by farmers in Kenya and other coffee-growing regions, which can lead to lower production. The resulting decrease in production also leads to lower revenue for the individual farmer. Changing weather patterns also pose a significant threat to coffee production.

Literature Support

- Bilen et al. (2023) discuss the coffee plant's fragility and climate change's impact on global production. The article also discusses the potential for a significant reduction in farmers' income due to the decline in the quality and quantity of coffee.
- Fromm (2023) in the article provides information on the global agricultural commodities trade and its effects on the incomes of coffee farmers in East Africa and Central America. Information on production costs illustrates the impact of low prices on declining revenue and production.
- Panggabean et al. (2021) provide information on the global coffee trade, with figures on production and consumption. This includes information on the disparity between producer and consumer prices that highlights the problem of low producer prices.
- Ruben (2023) highlights the problem of poverty amongst coffee farmers and illustrates how current efforts to increase producer prices through certifications and other initiatives have failed. The article provides background information on coffee production and yields.
- Zhang et al. (2022) examine the coffee market power structure shift from producer to buyer. A historical look at this shift provides insights into the evolution of the problem of low producer prices.

Specific Problem Statement

The specific problem to be addressed will be the impact of outdated warehousing strategies resulting in low prices of coffee for small-scale farmers.

Purpose Statement & Significance of the study

This study, employing qualitative methodology, aims to investigate the effects of warehousing strategies on commodity prices in Kenya. The research aims to identify the impact of outdated warehousing strategies on the pricing of coffee and how modern warehousing strategies, such as the use of blockchain technology to enhance crop traceability, can improve profitability for small-scale farmers.

To accomplish this, qualitative interviews with participants employed by Kanzalu Coffee Co. (2024) will be conducted, focusing on warehousing. The study aims to explore the elements in warehousing that lead to low producer prices and gather recommendations for areas that could benefit from significant improvement.

Significance of the Study

This study is significant as it underscores the vital role of the coffee industry for farmers in Kenya, particularly through Kanzalu Coffee Co. (2024), which warehouses and markets coffee from various cooperative societies and coffee estates.

Coffee farming serves as the primary livelihood for approximately 700,000 farmers, the majority of whom cultivate this crop on less than 5 acres. This sector generates over \$230 million annually, supports nearly 5 million individuals, and constitutes over 5% of the country's exports (Karuri, 2021). However, coffee production in Kenya has been on a downward trajectory since 2005, primarily due to depressed prices, prompting many farmers to shift to other crops perceived as offering more profitable returns (Wanala et al., 2022).

The International Coffee Organization (ICO, n.d.) indicates in its monthly market publication that coffee consumption has been consistently increasing, currently running at a deficit exceeding 2% annually. This trend suggests the potential for the market to absorb higher production levels and increased prices in response to this deficit.

Therefore, the findings from this study will lay the groundwork for developing warehousing strategies aimed at enhancing producer prices and, subsequently, boosting overall production.

Research Questions and Methodology

RQ1: How can traceability and certification schemes be implemented in warehousing to enhance the marketability of coffee from Kanzalu Coffee Co. (2024) and small-scale farmers?

Context

By implementing certification and traceability, coffee from diverse regions can be effectively marketed, guaranteeing transparency and quality throughout the supply chain. Advanced technologies such as blockchain and QR codes facilitate the tracking of coffee beans from farm to cup, empowering consumers to verify both their origin and quality.

RQ2: How can improvements in warehousing infrastructure and management practices affect coffee's overall quality and marketability?

Context

Enhancing warehousing practices can significantly minimize losses by safeguarding coffee beans from pests, mold, and other harmful factors. By establishing controlled climate conditions, the quality of the beans can be preserved, thereby improving their marketability and pricing. Furthermore, optimized warehousing conditions enable the storage of coffee beans until market conditions are more favorable, ensuring consistent availability of the product for buyers.

Research Methodology

This research will delve into the warehousing challenges that Kanzalu Coffee Co (2024) faces in maintaining stable producer prices for coffee produced in Kenya. The importance of producer prices extends beyond just financial metrics; they directly impact on the livelihoods of thousands of small-scale farmers. To thoroughly explore these issues, qualitative research methods will be utilized to provide a well-rounded and comprehensive understanding of the factors at play.

The qualitative data obtained will undergo thematic analysis, identifying common themes and recurring patterns within the responses. This will facilitate the creation of a cohesive narrative that succinctly outlines the challenges faced by Kanzalu Coffee Co. (2024) and potential avenues for improvement.

SECTION 2: Literature Support

Discussion on the research problem and current practices

This study focuses on outdated warehousing practices, such as the storage of coffee in warehouses that are not climate-controlled, contributing to the low prices received by producers. Gabriel et al. (2023) state that storage conditions contribute to the quality of coffee in warehouses. Kanzalu Coffee (2024), an organization that collaborates with local cooperatives and coffee estates to warehouse and market their coffee, is grappling with this challenge.

Warehousing and Warehouse Management

Warehousing can be defined as the "storage of goods for profit" (Gale, 2019). The principal objective of warehousing is to maintain a steady supply of goods to meet market demand during peak periods, while also ensuring the safe storage of these goods during times of reduced demand. Current warehousing practices utilized by local operators are not only outdated but also fail to incorporate modern technologies that could enhance efficiency, streamline inventory management, and improve product traceability.

Traceability, defined as the ability to track a product from its point of production to its final distribution, or from "farm to cup" (Mbakop et al., 2023), can significantly add value to coffee. Enhanced traceability allows consumers to make informed judgments about quality based on the product's origin, as well as detailed information about the growing conditions that affect both the quantity and quality of the coffee crop. Similar to wine, coffee prices often increase based on their geographical origin and the conditions under which they are cultivated. However, coffee is distinct from wine in that it does not age favorably. The coffee bean undergoes various chemical processes from the time of harvest to processing, which are significantly influenced by environmental factors. The post-harvest deterioration of coffee beans is an ongoing process.

Therefore, the objective is to mitigate this deterioration by establishing optimal storage conditions to prolong the quality of the beans before they are distributed and sold.

Research by Gabriel et al. (2023) demonstrates that the implementation of modern storage techniques and high-barrier packaging can markedly improve the shelf life and quality preservation of coffee beans. Such strategies may provide a safeguard against periods of unfavorable market prices, allowing farmers to sell their commodities when prices become more favorable.

Globally, coffee is predominantly produced by small-scale farmers. In Kenya, for instance, there are approximately 700,000 farmers, most of whom manage less than five acres of land. The coffee sector supports the livelihoods of over five million individuals involved in the value chain (Karuri, 2021). In the 2022/2023 season, the country exported over 47,000 tons of coffee valued at over two hundred and seventy million US dollars (BMI, n.d.). While numerous studies have examined coffee warehousing in Kenya, there is a notable deficiency in the literature regarding practical and effective warehousing strategies. Panggabean et al. (2021) emphasize the growing consumer demand for high-quality coffee that is both sustainably produced and traded fairly thus creating an opportunity to market the traceability of quality coffee. The majority of coffee produced globally is consumed in countries such as the United States and various European nations, whereas major production occurs in countries like Brazil, Colombia, Indonesia, and Vietnam, which collectively account for nearly 70% of the world's coffee supply. According to Panggabean et al. (2021), the adoption of e-commerce technology could significantly enhance coffee marketing by facilitating improved information flow to consumers, reducing the number of intermediaries within the distribution chain, and increasing the availability of traceability information. Concerns regarding the lifecycle of agricultural

produce often contribute to a reluctance among corporations to embrace new technologies, resulting in a preference for traditional methods.

The coffee supply chain may also benefit from emerging technologies such as blockchain that would enhance traceability (Mohita, 2023), which could potentially address the "coffee paradox" characterized by high consumer prices juxtaposed with low producer prices. Currently, coffee is traded on numerous exchanges, including the New York Board of Trade, the New York Mercantile Exchange, and the Intercontinental Exchange (Tambi, 2023). There exists a direct correlation between producer prices of coffee and declines in production, which can often be attributed to ineffective warehousing strategies and a hesitance to adopt modern techniques, ultimately discouraging price increases and limiting incentives to enhance production (Kiura et al., 2023).

Discussion on Previous Research and the Findings

Numerous research designs have been employed in investigating the issues of traceability and certification of coffee, as well as current warehousing practices. A significant number of these studies adopt a Quantitative approach to ascertain optimal storage conditions for green coffee, which would enhance its longevity in the context of fluctuating market prices. For example, Gabriel et al. (2023) conducted an experimental study aimed at identifying ideal storage conditions for green coffee, resulting in definitive conclusions. Likewise, Zhang et al. (2022) employed Quantitative methods to explore the evolving power dynamics within the commodities market, providing a historical perspective on pricing challenges. Their research traces the transition from a quota system, characterized by stability, to a liberalized pricing regime marked by considerable fluctuations. Conversely, some studies utilize a Qualitative approach to investigate the poverty-related issues faced by smallholder coffee farmers. Ruben

(2023) explores the structural challenges associated with low coffee prices and focuses on payment systems, concluding that the revenues generated are often insufficient to sustain the average coffee farmer.

Additionally, Ruben, (2023) reviews various measures aimed at improving prices, including guaranteed minimum prices, Fairtrade certification, and the implementation of blockchain technology for certifying the origin and quality of coffee. The study concludes with recommendations advocating for direct payments and enhancements in local processing capabilities. Furthermore, Mbakop et al. (2023) apply a quantitative approach analyzing government-record data to demonstrate that traceability significantly enhances the market value of coffee. They assert that the value of coffee is "inextricably linked to its place of origin." However, this assertion may be an oversimplification, as the value of any commodity is influenced by a myriad of factors that contribute to its final price. Overall, the research designs discussed employ charts and diagrams extensively to effectively illustrate the relationships among the collected data and their corresponding conclusions.

Discussion of various methodologies,

There are three primary approaches to the methodologies employed in addressing this issue. The majority of research relies on case studies that focus on specific regions and organizations. In contrast, other studies utilize quantitative analysis of datasets sourced from various origins, which are examined to support the authors' theses. Each methodology provides unique insights into the challenges of low coffee prices for small-scale farmers, and when viewed holistically, it becomes clear that this is a significant problem. However, the literature reviewed so far indicates a gap in exploring modern warehousing techniques that allow for longer storage of commodities. Additionally, there is a lack of focus on contemporary strategies,

such as utilizing blockchain technology to certify coffee traceability and guarantee quality based on its origin. Panggabean et al. (2021) propose that e-commerce could serve as an effective marketing tool for coffee, enhancing exposure to potential consumers and ultimately leading to better prices for producers. Moreover, there is a notable gap in the literature regarding the modernization of warehousing practices, with few references to contemporary approaches such as leveraging social media influencers or creating a compelling brand that highlights the origin and quality of the coffee. The proposed methodology for this project involves a single case study that will investigate the current practices of a coffee warehousing company in Kenya. The objective is to identify strategies for enhancing existing practices, aiming to increase revenue by improving efficiency, eliminating outdated methods, and incorporating modern warehousing techniques.

Description of the Research Framework

The primary issue addressed in this study is the persistently low consumer prices for coffee produced by farmers in Kenya and other coffee-growing regions. Several specific challenges contributing to this problem have been identified, particularly outdated warehousing strategies that do not align with modern industry practices.

To effectively analyze this problem, a conceptual framework has been selected for this study. This framework will focus on the various factors within the coffee value chain that influence the final consumer price. By employing this framework, the study aims to pinpoint the specific areas within current warehousing practices that deviate from contemporary methods. By identifying the disconnects that create price bottlenecks, the research will propose targeted solutions to these challenges, ultimately aiming to enhance the profitability of coffee farmers. To

provide a comprehensive understanding of the current situation, an outline of the existing value chain as it operates in practice will illustrate the issue.

The process begins with the coffee production cycle, in which farmers carefully cultivate their crops and then deliver the harvested coffee cherries to a milling company. This initial step is critical, as the quality of the cherries greatly affects the final product.

Once received by the milling company, the coffee cherries undergo processing, which commonly includes milling and pulping. After processing, the company has two main options: they can either deliver the milled coffee to a designated warehouse or, more commonly, store the milled product in their own facility for later distribution.

An auction is held as a key component of the sales process, where buyers gather to bid on various lots of coffee. During the auction, buyers are given the opportunity to verify the quantities and quality of the coffee they wish to bid on, enhancing the transparency of the process.

Once the auction concludes, the successful bidders proceed to the warehouse to take delivery of the coffee they have purchased. This stage is crucial, as it marks the transition from producers to consumers.

As an alternative to the auction process, prospective buyers also have the option to make direct offers for the coffee stored in the warehouse, effectively allowing them to negotiate prices without participating in the auction.

Through this detailed exploration of the current value chain, the study aims to highlight existing inefficiencies and propose strategic improvements that can elevate the prices received by farmers, ultimately contributing to their financial sustainability and the overall health of the coffee industry in these regions.

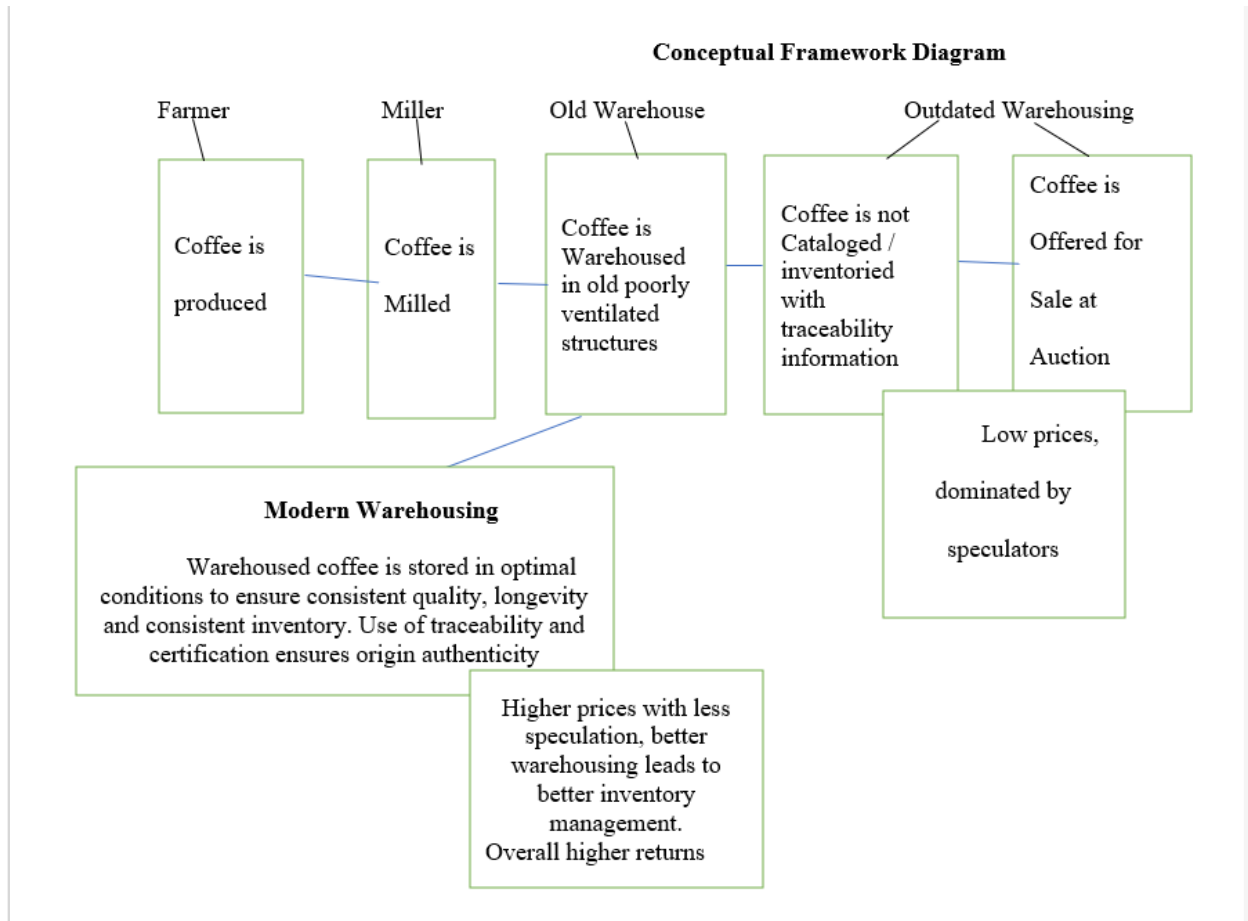


Figure 1. Framework Diagram.

Mulli, B. (2025)

Summary of Literature Review

The primary objective of this research study is to investigate the challenges arising from outdated warehousing strategies, which significantly diminish the prices received by small-scale coffee farmers. This issue poses a threat to the sustainable supply of coffee as a commodity.

The literature review commences with an examination of the historical context of the global coffee trade. It traces the origins of coffee cultivation in Ethiopia, its initial spread to the Middle East, and its eventual proliferation to other regions within the coffee belt worldwide (Fregulia, 2019), (Minderovic, 2021). The review provides an overview of the number of coffee growers globally, as well as the significant challenges they encounter due to fluctuating prices, which are exacerbated by antiquated practices (Ruben, 2023). Furthermore, the review explores the various processing methods that influence production costs and the quality of the coffee commodity (Farah, 2019).

Global Coffee Organizations

The review also highlights several key international organizations that have been established to address various challenges within the global coffee trade:

International Coffee Organization (ICO, n.d.): This organization unites coffee-producing and coffee-consuming countries with the objective of promoting international cooperation and sustainable development within the coffee sector.

Specialty Coffee Association (SCA, 2024): Representing professionals in the coffee industry, this association provides educational resources and conducts research aimed at enhancing coffee quality and establishing industry standards.

Fair Trade USA (2024): This organization establishes fair trade standards and certifies coffee producers who comply with these criteria. Its mission is to ensure fair prices, decent working conditions, and sustainable practices for coffee farmers.

Rainforest Alliance (Robertson & Schlager, 2023): The Rainforest Alliance certifies coffee farms that adhere to rigorous environmental, social, and economic standards, promoting sustainable farming practices and assisting farmers in improving their livelihoods while safeguarding ecosystems.

Coffee Quality Institute (2022): This institute is dedicated to enhancing both the quality of coffee and the welfare of coffee producers by offering training, education, and technical assistance, alongside advocacy for quality standards within the coffee industry.

Specific Problems in the Kenyan Coffee Sector

The Kenyan coffee sector faces a multitude of challenges, including outdated warehousing practices, which have resulted in lower prices and declining participation among farmers. Research conducted by Mbakop et al. (2023) indicates that inconsistencies in coffee supply and ineffective warehousing strategies such as the lack of traceability are significant factors contributing to the diminished market value of Kenyan coffee. Additionally, Zhang et al. (2022) emphasizes the necessity for modern warehouses and local futures markets to counteract market fluctuations and enhance the pricing structure for farmers.

Warehousing

Research by Gabriel et al. (2023) demonstrates that the implementation of modern storage techniques and high-barrier packaging can markedly improve the shelf life and quality preservation of coffee beans. Such strategies may provide a safeguard against periods of unfavorable market prices, allowing farmers to sell their commodities when prices become more

favorable. Furthermore, the integration of Warehouse Management Systems (WMS) can facilitate the optimization of storage operations, thereby mitigating the risks associated with market volatility (Fahmi et al.).

The literature review explores how certifications like Fair Trade (2024) and Rainforest Alliance (Robertson & Schlager, 2023) can enhance the value of coffee by appealing to consumers' preferences for ethically and sustainably produced goods. Mbakop et al. (2023) demonstrate that traceability within the coffee supply chain can lead to higher bidding prices by increasing consumer confidence in the product's origin and quality. Furthermore, the integration of blockchain technology, as proposed by Mohita (2023), could bolster trust in traceability and certification by addressing the "coffee paradox," which highlights the discrepancy in which farmers receive low prices while consumers are willing to pay a premium for high-quality, traceable coffee.

Research Methodologies

The literature review showcases a blend of quantitative and qualitative research methods. Gabriel et al. (2023) and Zhang et al. (2022) employ a Quantitative approach to analyze storage conditions and pricing fluctuations in the coffee market. Conversely, Ruben (2023) uses Qualitative methods to examine the low prices that farmers receive. Additionally, the review identifies a gap in research concerning modern warehousing strategies, with few studies investigating the potential role of digital tools and e-commerce in enhancing coffee warehousing (Panggabean et al., 2021).

Complete Literature Review

The primary objective of this research study is to investigate the considerable challenges stemming from outdated warehousing strategies, which significantly depress the prices received by small-scale coffee farmers, posing a threat to the sustainable supply of coffee as a commodity.

The coffee plant, a culturally and economically significant agricultural species, is believed to have its origins in the diverse ecological landscape of Ethiopia, a country renowned for its rich biodiversity. Among the various species of coffee, only two are commonly cultivated for global consumption: Arabica and Robusta. Arabica coffee, known for its nuanced flavors and aromatic qualities, accounts for over 70% of the world's coffee supply. This particular variety thrives in specific environmental conditions found within the so-called "coffee belt," a region that spans approximately 25 degrees north and south of the equator and is characterized by ideal altitudes, consistent rainfall, and favorable temperatures (Minderovic, 2021).

Following its discovery in Ethiopia, coffee beans gradually made their way to Arabian markets, where coffee houses became popular social hubs. By the 16th century, coffee cultivation had spread to the West Indies and Brazil, with additional plantations established in countries such as Indonesia. These regions possess the climatic and geographical characteristics necessary to support robust coffee growth, providing optimal conditions for cultivation and harvest.

Throughout history, coffee has been a cornerstone of global trade relations, with Venetian merchants playing a crucial role in exporting this highly sought-after product across Europe, where its popularity surged in the 17th century. This period marked a transformative era for coffee culture, leading to the development of innovative brewing methods and the proliferation

of coffeehouses, which fostered social and intellectual exchange among the populace (Fregulia, 2019).

Currently, there are approximately twelve million coffee farmers worldwide, with an overwhelming majority operating on small-scale farms, often on plots less than 5 acres in size. These smallholder farmers contribute around 60% of global coffee production, highlighting their importance in the supply chain. Notably, coffee serves as the primary income source for more than one hundred million individuals, the large majority of whom live below the international poverty line of \$3.20 per day, a concerning statistic that underscores the economic vulnerabilities faced by these farmers (Ruben, 2023).

Cultivating coffee is contingent upon specific agronomic conditions, including ample rainfall and soils that effectively retain moisture. Typically, coffee-growing regions are situated at higher elevations, where the temperature ideally ranges between 19 to 22 degrees Celsius, creating an environment conducive to producing high-quality coffee beans.

Two distinct processing methods are employed in the post-harvest treatment of coffee cherries: the dry processing method and the wet processing method. In dry processing, the cherries are spread out in the sun to dry, a technique that enhances the natural sweetness and complexity of the beans, resulting in what is known as natural coffee. Conversely, the wet processing method involves pulping the cherries to remove the outer skin, after which the beans are fermented and washed, leading to a cleaner flavor profile. Following the processing, the coffee beans are dried thoroughly, and the resulting parchment is milled to produce clean coffee, often referred to as green coffee beans, which are then ready for roasting and subsequent sale (Farah, 2019).

Coffee Organizations

Several global organizations have been established to fulfill various functions in the coffee industry:

International Coffee Organization (ICO, n.d.): This organization unites coffee-producing and coffee-consuming countries with the goal of promoting international cooperation and sustainable development within the coffee sector.

Specialty Coffee Association (SCA, 2024): Representing coffee professionals, this association offers educational resources and research aimed at improving coffee quality and standards.

Fair Trade USA (2024): This organization sets standards for fair trade and certifies coffee producers who meet those criteria. Its mission is to ensure fair prices, decent working conditions, and sustainable practices for coffee farmers.

Rainforest Alliance (Robertson & Schlager, 2023): The Rainforest Alliance certifies coffee farms that adhere to strict environmental, social, and economic standards. It encourages sustainable farming practices and aids farmers in enhancing their livelihoods while protecting ecosystems.

Coffee Quality Institute (2022): This institute focuses on improving the quality of coffee and the lives of the people who produce it. It provides training, education, and technical assistance to coffee producers and advocates for quality standards within the coffee industry.

Kenyan Coffee

In Kenya, Karuri (2021) reports that there are over 700,000 coffee farmers, the majority of whom cultivate the crop on less than 5 acres of land. This group generates more than \$230 million annually and supports nearly 5 million people. Zhang et al. (2022) explore the changing

power dynamics within the coffee market, which distorts the global value of this commodity. They attribute these changes to the collapse of the International Coffee Agreement in 1989, which led to trade liberalization and the removal of quotas.

Utilizing a price data test on US coffee futures from 1990 to 2020, Zhang et al. (2022) analyzed spot prices from indicators released by the International Coffee Organization (ICO, 2024). Their findings indicate inefficiencies in the coffee futures market and highlight the necessity to mitigate risks for small-scale coffee growers. They recommend establishing warehouses for storage and providing flexibility in bringing produce to the market based on global coffee price movements. Furthermore, they suggest developing local coffee futures markets to improve access to information and enhance efficiency within the commodities market.

Warehousing in the Coffee Sector

As previously noted in this literature review, coffee is prepared for market distribution post-milling and is stored in the form of green beans. The current state of warehousing presents significant challenges. Warehousing can be defined as the "storage of goods for profit" (Gale, 2019). Historically, the storage of food in granaries has played a crucial role in trade, particularly during periods of scarcity. The long-term storage of coffee necessitates the application of modern warehousing techniques that account for the unique characteristics of coffee beans, the effects of moisture, and the preservation of bean quality. Gabriel et al. (2023) conducted experiments that examined the storage of coffee beans under various conditions. Their findings indicate that the use of high-barrier packaging, as opposed to traditional jute bags, significantly enhances the preservation of bean quality over extended periods. These results imply that optimal warehousing conditions for coffee should include a temperature-controlled

environment that minimizes moisture and further maintains the quality of the beans. Currently, the warehousing practices for coffee in Kenya are relatively rudimentary, focusing primarily on temporary storage with the expectation of rapid turnover. Modern warehousing requires the integration of a Warehouse Management System (WMS) that not only facilitates the storage and movement of goods but also provides critical information regarding inventory levels, acts as a hedge against market fluctuations, and incorporates various additional functionalities. Fahmi et al. (2024) report that 60% of companies do not leverage Warehouse Management Systems, which diminishes both profitability and competitiveness. Their research adopted a Technology Acceptance Model to explore the Perceived Ease of Use (PEOU) and Perceived Usefulness (PU). The quantitative methodology involved surveys and closed questionnaires designed using a Likert scale, with a sample size of 255 respondents, all employees of private logistics companies. The research concluded that users' computer literacy directly influences their perception of the usefulness of a Warehouse Management System. For firms accustomed to established business practices over extended periods, managing the transition to a new system will be crucial in securing employee buy-in. In Kenya, there are several warehousing facilities that could be refurbished to create modern environments suitable for the long-term storage of green coffee. One such facility is Africa Logistics Properties (2023), which manages a network of facilities in the region appropriate for storing commodities such as coffee.

The predominant method of marketing coffee in Kenya is through the Nairobi Coffee Exchange (NCE, 2024). This platform facilitates the sale of coffee to international buyers via an open auction system, which may or may not include a reserve price. Critics of this marketing strategy highlight a notable decline in buyer participation, resulting in decreased prices, as reported by The Farmer's Journal (2023). A case study conducted by Kaido et al. (2021)

identified significant issues in coffee marketing, concluding that there is a lack of comprehensive information regarding the quality of coffee on offer and a concerning inconsistency in supply, indicative of storage challenges. Processed coffee is frequently sold immediately, irrespective of the prevailing market prices.

Mbakop et al. (2023), utilizing datasets from the Ministry of Trade, examined coffee price points before and after the implementation of traceability measures. Their findings revealed that traceability increases consumer confidence in the product's origin, enabling consumers to better assess quality, which, in turn, drives up bidding prices. Additionally, they observed deficiencies within the auction system, including complaints regarding price manipulation and the undervaluation of coffee at auction. Their study concluded that the value of coffee is strongly correlated with its origins, and implementing traceability significantly enhances the commodity's worth.

Beyond traceability, various certifications can augment the value of coffee as a commodity. One noteworthy certification is offered by the Rainforest Alliance, Inc. (Roberston & Schlager, 2023), which operates in over sixty countries with the mission of conserving forests and enhancing the livelihoods of farmers. Established in 1987, the Alliance has introduced sustainable coffee cultivation methods that promote environmental preservation. Certification from the Rainforest Alliance signifies that coffee is grown sustainably, appealing to environmentally conscious consumers. However, criticisms have emerged concerning potential mislabeling, which may mislead consumers into equating Rainforest Alliance certification with fair trade labeling, despite the former not including labor standards within its certification criteria. Another important certification enhancing value is the Fair Trade USA certification (2024), which provides assurances to consumers regarding the ethical sourcing and production of

coffee. Research by Mili, & Soto, (2022) investigated the satisfaction levels of fair trade coffee consumers through a questionnaire distributed to individuals in Spain. The study analyzed 177 completed questionnaires using structural equation modeling (SPSS/AMOS 26.0) and concluded that Fair Trade certification correlates with increased perceived quality and value among consumers. Both Fair Trade and Rainforest Alliance certifications are fundamentally forms of ethical consumption. Additionally, research conducted by Kutaula et al. (2024), employing a thematic literature review, described ethical consumerism as encompassing "decision-making, purchases, and other consumption experiences that are influenced by consumers' ethical concerns." In light of contemporary warehousing practices, a thematic approach to existing literature offers a comprehensive overview and valuable insights into current and future trends, characteristics that can be effectively integrated into existing warehousing strategies.

Blockchain technology, as discussed by Mohita (2023), is characterized by its anonymity, immutability, and distributed control, positioning it as a disruptive technology with substantial potential. Utilizing a case study, the research investigates how blockchain can be incorporated into the coffee value chain to resolve the "coffee paradox" and provide geographical indicators that certify the coffee's origin, thus ensuring quality and bolstering its reputation.

Acknowledging its relatively new application, the study emphasizes the significant disparity between the high value consumers assign to coffee and the low prices received by farmers.

Furthermore, it underscores the necessity for further research into the implementation of blockchain within the supply chain, aimed at creating value for all stakeholders involved.

Conclusion

Overall, this literature review establishes a solid foundation for the study by highlighting the essential role of warehousing strategies in improving the economic conditions of small-scale

coffee farmers. By pointing out existing inefficiencies in these areas, it emphasizes the need for research aimed at modernizing coffee storage techniques and practices, including the implementation of technologies such as blockchain and e-commerce. This groundwork paves the way for the current study to explore how these contemporary strategies can be integrated into the Kenyan coffee sector, ultimately enhancing both profitability and sustainability for smallholder farmers.

SECTION 3: Research Methodology

Role of the Researcher

The purpose of this study, employing single case study qualitative methodology, is to investigate the effects of warehousing strategies on commodity prices in Kenya. The research aims to identify the impact of outdated warehousing strategies on the pricing of coffee and how modern warehousing strategies, such as the use of blockchain technology to enhance crop traceability, can improve profitability for small-scale farmers.

To accomplish this, qualitative interviews with participants in the employ of Kanzalu Coffee Co. (2024) will be conducted, focusing on warehousing. The study aims to explore the elements in warehousing that lead to low producer prices and gather recommendations for areas that could benefit from significant improvement.

Researcher's background

The researcher involved in this project was raised on a coffee farm and possesses a deep understanding of the processes related to coffee production. Having personally experienced the industry's fluctuations in income, the researcher may hold biases that favor producers, potentially overlooking other critical factors within the value chain before the product reaches the end consumer market. This personal connection to the producer side of the industry may influence the researcher's perspective in ways that prioritize improving producer revenues.

Actions taken to conduct the study in an unbiased manner.

Bracketing refers to the researcher's ability to approach a study with an open mind, setting aside any previous experiences that may introduce bias (Sorsa et al., 2015). In this context, the researcher recognizes their personal interests and background related to the subject matter and intends to address potential bias in the following ways:

- By developing questionnaires that are factual and designed to avoid leading respondents toward skewed answers.
- By allowing respondents to complete the questionnaires in a private setting, free from external influences and distractions.
- By consciously setting aside personal opinions to interpret the data in an objective manner.

Research methodology

This study will consist of a single case analysis focusing on the challenges encountered in warehousing and by a coffee warehousing company. This approach will enable a comprehensive examination of the issues the company faces, potentially leading to effective solutions. The qualitative data gathered will undergo thematic analysis utilizing Taguette (n.d.) which will help identify common themes and recurring patterns within the responses. This process will contribute to the formation of a cohesive narrative that clearly outlines the challenges and potential strategies for improvement.

The single case study methodology allows for an in-depth exploration of the company's challenges, utilizing various data collection methods such as interviews, observations, surveys, and existing records (Longe, 2022). This flexible design enables the researcher to uncover new insights that may emerge throughout the study and incorporate them into the analysis.

Warehousing within the coffee industry is dynamic, subject to rapid changes influenced by numerous factors. From the impacts of climate change to logistical issues arising from disruptions in shipping lanes, many elements can affect commodity prices. To provide a meaningful analysis, it is essential to consider the complexity of the industry. The flexible design of the single case study will facilitate a deeper understanding of the problems at hand. The

thematic analysis will not only identify patterns within the challenges but will also review existing literature to address any gaps that previous researchers may have overlooked (Bouncken et al., 2020).

Discussion on Population and Sampling

The Target Population

- a) This proposed single case study aims to investigate the intricate value chain involved in the warehousing of coffee, with the full consent and cooperation of the relevant company. The study will encompass multiple stakeholders within the coffee value chain, each providing unique insights critical to understanding operational dynamics and potential areas for enhancement.
- b) Production warehouse manager: The initial contact point for the product. Producers are significantly impacted by price volatility. Data will be sourced from a representative of a local cooperative society, focusing on production cycles, quality, quantity, and logistical issues pertaining to both initial warehousing and subsequent distribution to marketing warehouses. The warehousing manager at the production facility will provide insight into issues and challenges and workable solutions.
- c) Warehouse manager local market: Engaging with the warehouse manager is essential to gather information regarding current warehousing conditions. Insights may also include ideal storage practices that could improve operational efficiency.
- d) Warehouse manager international market: The warehousing manager in charge of offshore warehousing, typically in the target market, will provide insight into current conditions and suggestions for future improvements.

- e) Warehouse manager traceability: The warehouse manager will contribute data on existing traceability strategies and could delineate ideal methods to enhance the product's market value, helping to identify avenues for improvement.
- f) Warehouse manager e-commerce: E-commerce is pivotal in opening optimal channels for the sale of produce. The warehouse manager dealing with e-commerce will provide insight into current trends and suggestions for future improvements.
- g) Warehouse manager certifications: The warehouse manager dealing with certifications will provide insights into current trends and suggestions for future improvements.
- h) Logistics manager local operations: The logistics manager's role is pivotal in elucidating current challenges in transporting coffee from the initial storage site to the company's warehouse and to buyers. Additionally, recommendations for strategies that could improve logistical efficiencies will be sought.
- i) Logistics manager international operations: The logistics manager responsible for getting the produce to consumers in international markets will provide valuable insight into the process as well as suggestions for improvement.
- j) CEO/Director: The CEO or Director of Kanzalu Coffee (2024) will provide a broader perspective on company operations, including strategic plans and insights into revenue loss due to bottlenecks in the value chain. This individual's vision regarding potential upgrades to warehousing, strategies, or product enhancement will be a key focus.
- k) Nairobi Coffee Exchange NCE (2024) : Insights from publicly available data from the Nairobi Coffee Exchange will be invaluable in understanding market trends and operational frameworks. This data will inform potential solutions to operational inefficiencies.

- l) Warehousing Providers: Targeting warehousing companies specializing in specialty goods, such as coffee, will facilitate the evaluation of modern storage techniques and their associated benefits for marketers.
- m) Multinational Coffee Companies: Engaging with multinational corporations that source coffee from diverse producers will yield critical comparative insights. Data collection will include feedback from their warehouse managers and publicly accessible information.
- n) International Coffee Organization (ICO n.d.): Utilizing publicly available data from the ICO (n.d.) will allow the study to examine global pricing trends and the factors influencing these fluctuations as projected for 2025.
- o) International Commodities Market: A thorough analysis of historical data from the international commodities market such as the Intercontinental Exchange, Inc. (n.d.) will serve to identify inefficiencies in the warehousing processes, aiming to link these to potential revenue improvements for the targeted company.

This comprehensive approach will facilitate a deeper understanding of the coffee industry's operational landscape, enabling the identification and implementation of enhancements throughout the value chain.

Sampling Frame

The sampling frame is as follows.

- The primary producers that will provide data and information on the current cost of production of coffee.
- The warehousing manager for the primary produce, which is the manager for the local cooperative society that processes coffee and is the initial storage point.

- The warehousing manager of the company that is the subject of this single case study will provide insight and information on current and potential warehousing procedures.
- The warehouse manager in charge of traceability of the company that is the subject of this single case study. who will provide insight and information on current and potential traceability procedures.
- The logistics manager of the company that is the subject of this single case study will provide insight and information on current and potential logistical procedures.
- The company Director/CEO will provide insight and information that is not proprietary on the current and potential strengths and weaknesses of the warehousing strategies.
- An official from the Nairobi coffee exchange, as well as publicly available data on current market trends with a backdrop on international commodities markets and how the local and international prices measure up with deductions as to the reason.
- Local warehousing providers that have the capacity to store specialty commodities in conditions that preserve the quality of the produce in order to anticipate market trends.
- Publicly available information from multinational coffee companies that source produce globally. Information and data will provide insight into potential earnings for the target company.
- International coffee organization (ICO n.d.) publicly available data and information on market trends, production in different markets as well as information on international commodities marketing agreements.
- Publicly available information from global commodities markets that can provide data on global prices. This can be used as a benchmark for the target company in terms of target revenues.

Sampling method

The sampling method that will be used for this study is the purposive sampling method described by Barrero, & Yalaz, (2018). as "being oriented towards a specific case and when the researcher has a clear image of what they aim to find out." In this case, the researcher aims to identify the impact of outdated warehousing strategies on the pricing of coffee and how modern warehousing strategies, such as the use of blockchain technology to enhance crop traceability, can improve profitability for small-scale farmers. Therefore, adopting a purposive-based sampling method is appropriate for this study.

Determination of the sample size

For this study, the researcher has selected fifteen participants, based on the scope of the study, with participants drawn from each crucial stage in the company's warehousing operations. Additionally, the sample size includes entities that collect and store data that are then made publicly available, which will provide realistic context to the study problem.

Criteria for participant selection

The criteria used for selecting participants is based on the participant's expertise in the industry. For example, for the warehouse manager, this selection is based on the individual's expertise in storage solutions. Eligibility for selection is based on expertise in an aspect of the industry, such as logistics, marketing, storage, planning, etc. Participants without expertise in the production, storage, and warehousing of coffee are ineligible for participation.

Demographic characteristics

The selected sample consists of individuals who have over five years of experience in the coffee industry and whose education level is high school or above. Gender, ethnicity, and age are not a factor in selecting participants.

Limitations in the sampling process

At this time, due to the low season in the coffee production cycle, the researcher did not encounter any challenges in the sampling process.

Ethical considerations

All participants are asked to consent to the use of their information for the purposes of this study. All participants are also assured of the confidentiality of their responses in the study. In order to maintain that confidentiality, the researcher assigns anonymous identifiers to each participant. These will be done by assigning pseudonyms to each participant.

Summary

The sampling of participants in this study has been conducted with a view to incorporating knowledgeable and experienced individuals in the industry that can provide in depth analysis of the issues the company faces in warehousing.

The study population, by virtue of their longevity in the industry, also have a passion for the sector, have gained invaluable insights into current practices, and are progressive enough to have realistic and workable solutions to current issues.

Data Collection and Analysis**Data collection**

The study will employ two methods for data collection. The first method will involve interviews with selected participants, primarily conducted via telephone. Roulston (2019) notes that requests for clarification from interviewees, as well as follow-up checks on their responses, tend to be more frequent and concise in telephone interviews compared to face-to-face interactions. Considering the geographical distances between the researcher and the study participants, telephone or video call interviews will be the appropriate means of conducting the

interviews. The interviews will be recorded where possible with the participants' permission to ensure greater accuracy.

The second method of data collection will consist of archival research. Institutions such as the Nairobi Coffee Exchange (NCE, 2025), the International Coffee Organization, (ICO, n.d.) and the International Coffee Exchange (ICE, 2025) maintain publicly available archival records, which the researcher intends to use to provide contextual information regarding the study's subject matter.

The personal interview method has been selected to gain a comprehensive understanding of the methodologies currently employed by participants, as well as potential enhancements and reasons for the slow adoption of modern approaches. Taylor (2015) describes qualitative interviewing as nondirective, unstructured, non-standardized, and open-ended. The researcher will leverage this methodology to gather deeper insights from the participants.

Data collections instruments

To gather insights from individual participants, the researcher will conduct structured interviews. (APPENDIX C) The questions for company personnel will follow a similar format to facilitate thematic analysis, which aims to identify common themes regarding issues and potential solutions.

Validation

By conducting interviews with members from the warehousing department, this study seeks to address and eliminate most threats to the validity and reliability of the data collection instruments utilized. According to Creswell and Creswell (2022), both internal and external threats to instrument validity must be acknowledged, and researchers should formulate strategies to mitigate such threats. In this study, a potential bias may arise from participants' fear of

retaliation, which can be alleviated by assuring them of their anonymity in their responses. Furthermore, the company director may have concerns about changing existing practices, but these can be addressed by clarifying that there is no obligation to implement the recommendations of this study.

Participants, sampling size selection criteria and demographics

For this study, the researcher has selected fifteen participants. The selection of this sample size was determined by the scope of the study, with participants drawn from each crucial stage in the value chain. Additionally, the sample size includes entities that collect and store data that is then made publicly available, which will provide realistic context to the study problem.

The criteria used for selecting participants is based on the participant's expertise in the company. For example, for the warehouse manager, this selection is based on the individual's expertise in storage solutions. Eligibility for selection is based on expertise in an aspect of warehousing, such as logistics, marketing, storage, planning, etc. Participants without expertise in the production, storage, and warehousing of coffee are ineligible for participation. Gender, ethnicity, and age are not a factor in selecting participants.

Data collection procedures

- Interview questions will be shared with the participants in advance of the actual interview, allowing them the opportunity to reflect on their potential answers. The interview format will also be communicated, which will be a telephone interview. Participants will be informed that the call will be recorded for later transcription, and their consent to record the interview will be required.
- Two or three options for interview dates and times will be proposed, and participants will be encouraged to select a time when they can engage without any unexpected

interruptions. Additionally, participants will have the option to choose between a voice call or a video call.

- At the end of the interview, participants will be invited to ask any questions they may have. The protocols regarding confidentiality and anonymity will be reiterated at this point to ensure participants feel secure.

Data collection storage

Collected data will include recorded interviews, written notes taken during the interviews, and archival data obtained from the International Coffee Organization (ICO, n.d.) the Nairobi Coffee Exchange (NCE, 2024) and the Intercontinental Exchange, Inc. (n.d.). All materials will be securely stored in a cloud storage account, with access strictly controlled by the researcher. To ensure optimum security, data collected using the researcher's devices such as a laptop, mobile phone, or tablet will be immediately uploaded to the cloud, and local copies will be permanently deleted to avoid accidental loss. All collected data will be encrypted using AES-256 encryption. To insure against data loss, cloud storage will be spread across three providers to hedge against data loss. Furthermore, participants' names and personal details will not be stored; they will be identified by pseudonyms related to the different aspects of the study in which they have contributed their expertise.

Data analysis

The researcher will employ a thematic analysis approach to identify and interpret patterns or themes within the data set (Naeem et al., 2023). Utilizing Taguette (n.d.) software, this will extract key words from the collected data and cross-reference these with the participants' responses. Once a theme or pattern is identified, the researcher will draw conclusions based on the emerging patterns. According to Naeem et al. (2023), this process involves six steps:

transcribing the collected data, becoming familiar with the data through thorough reading, developing a concept based on recurring key words, and ultimately creating a concept model.

Thematic analysis

The researcher will adhere to the six steps proposed by Naeem et al. (2023) to familiarize with the collected data and discern emerging themes. Subsequently, the researcher will develop codes to highlight aspects pertinent to the research questions. Following this, the researcher will formulate themes based on the patterns and codes identified within the data. The researcher will then articulate the concepts that have surfaced from the analysis. Finally, a conceptual model will be created to effectively address the research questions..

Methods used

This research employs a single case study approach, focusing on participants who are all employed by the target corporation across various roles. The study specifically sought to engage individuals from different departments, ensuring that multiple participants from each department were included to enhance the validity of the data collected.

Member checking and validity

Member checking, as outlined by McKim (2023), involves presenting transcripts to participants with the most experience for their feedback, corrections, or additions. In this process, the researcher will share the transcripts with senior management who were interviewed, allowing them to make necessary corrections or highlight any omissions. Participants will also have the opportunity to review their responses for enhanced clarity. Furthermore, as noted by McKim (2023), participants are considered knowledgeable in their respective fields. Therefore, the researcher will provide them with a report on the study's findings and encourage them to contribute any additional insights they deem relevant.

Limitations and constraints**Time Constraints**

Given that most participants work full-time, scheduling telephone interviews presents a significant challenge.

Geographical Considerations

The nature of the industry means operations are distributed across various locations. Therefore, the researcher must take into account the differing time zones and locales to effectively conduct the interviews.

Data Management

The considerable volume of data collected will create challenges for the researcher. Thorough processing and interpretation of this data will require substantial time and effort to ensure accuracy and provide meaningful contributions to the study.

Assumptions, Limitations, Delimitations**Assumptions**

This study argues that the primary challenge facing producers is the persistently low prices they receive, which can be attributed to significant inefficiencies in their warehousing strategies. These operational shortcomings not only hinder the effective distribution of goods but also reduce the overall market competitiveness of the producers. Additionally, the study highlights the influence of fluctuating global commodity prices, which introduces a level of unpredictability that further complicates the financial landscape for these businesses. The combined effect of these factors significantly escalates the cost of doing business, creating a precarious environment for producers striving for sustainability and growth. Furthermore, factors such as fluctuations in currency exchange rates in producer countries—shaped by elements

beyond the corporation's control, including political stability, inflation, and an unfavorable economic outlook—play a considerable role (Wanzala et al., 2024). To mitigate these concerns, the researcher will examine historical data on global commodity prices from the International Coffee Organization (ICO, 2024) to evaluate the true effect of enhanced efficiencies in warehousing.

Limitations

Participants in this study are situated in Kenya, an East African country. The company chosen for this single case study operates in several non-central locations. The researcher has decided to conduct telephone interviews with selected participants; however, potential limitations such as unreliable mobile phone service could affect the interview process. To mitigate this concern, the researcher will aim to schedule interviews during times when participants have few or no time constraints, ensuring their phones have sufficient battery life and that they are in quiet environments free from distractions. Additionally, participants will receive advance copies of the interview questions to prepare their responses effectively.

The research methodology necessitates interviewing members from the various warehousing departments to reduce threats to the validity and reliability of the data. As noted by Creswell and Creswell (2022), researchers should devise strategies to address such threats. In this instance, the researcher will ensure that participants' responses remain confidential and anonymous to minimize any potential risks of retaliation.

The data analysis phase will involve pattern matching, which may demand considerable time investment for effective results (Bouncken et al., 2020). To manage this limitation, the researcher will allocate an appropriate amount of time based on the volume of data collected to ensure the study is completed within the established timeframe.

Delimitations

Various factors influence coffee prices, with climate being a significant contributor that affects futures contracts. Moreover, derivatives trading adds to the volatility of these prices.

Ruben (2023) examines the impact of these elements on coffee pricing.

In contrast, this study will not delve into these broader factors; it will specifically concentrate on the inefficiencies in warehousing within the corporation, aiming to identify potential solutions to this business issue.

Conclusion

The researcher anticipates that the process of collecting and analyzing data will require considerable time and effort to yield accurate and clear answers to the research questions. The researcher will therefore incorporate the use of Tagette (n.d.) software to identify themes and patterns in the data. By incorporating newer techniques such as Tagette (n.d.) software in data interpretation and validation, as proposed by Naeem et al. (2023), along with the six steps of thematic analysis and the member-checking approach suggested by McKim (2023), the study can be significantly enhanced. These methods not only allow participants to redact sensitive information but also enable them to provide valuable insights based on their expertise and knowledge, ultimately leading to improved results.

SECTION 4: Results, Discussions, and Implications

Introduction To Findings

Purpose statement & significance of the study

This study, employing qualitative methodology, aims to investigate the effects of warehousing strategies on commodity prices in Kenya. The research aims to identify the impact of outdated warehousing strategies on the pricing of coffee and how modern warehousing strategies, such as the use of blockchain technology to enhance crop traceability, can improve profitability for small-scale farmers.

To accomplish this, qualitative interviews with participants employed by Kanzalu Coffee Co. (2024) were conducted, focusing on warehousing. The study aims to explore the elements in warehousing that lead to low producer prices and gather recommendations for areas that could benefit from significant improvement.

Significance of the study

This study is significant as it underscores the vital role of the coffee industry for farmers in Kenya, particularly through Kanzalu Coffee Co. (2024), which warehouses and markets coffee from various cooperative societies and coffee estates.

Coffee farming serves as the primary livelihood for approximately 700,000 farmers, the majority of whom cultivate this crop on less than 5 acres. This sector generates over \$230 million annually, supports nearly 5 million individuals, and constitutes over 5% of the country's exports (Karuri, 2021). However, coffee production in Kenya has been on a downward trajectory since 2005, primarily due to depressed prices, prompting many farmers to shift to other crops perceived as offering more profitable returns (Wanala et al., 2022).

The International Coffee Organization (ICO, n.d.) indicates in its monthly market publication that coffee consumption has been consistently increasing, currently running at a

deficit exceeding 2% annually. This trend suggests the potential for the market to absorb higher production levels and increased prices in response to this deficit.

Therefore, the findings from this study will lay the groundwork for developing warehousing strategies aimed at enhancing producer prices and, subsequently, boosting overall production.

Objectives and questions that guided this study

RQ1: How can traceability and certification schemes be implemented in warehousing to enhance the marketability of coffee from Kanzalu Coffee Co. (2024) and small-scale farmers?

Context

By implementing certification and traceability, coffee from diverse regions can be effectively marketed, guaranteeing transparency and quality throughout the supply chain. Advanced technologies such as blockchain and QR codes facilitate the tracking of coffee beans from farm to cup, empowering consumers to verify both their origin and quality.

RQ2: How can improvements in warehousing infrastructure and management practices affect coffee's overall quality and marketability?

Context

Enhancing warehousing practices can significantly minimize losses by safeguarding coffee beans from pests, mold, and other harmful factors. By establishing controlled climate conditions, the quality of the beans can be preserved, thereby improving their marketability and pricing. Furthermore, optimized warehousing conditions enable the storage of coffee beans until market conditions are more favorable, ensuring consistent availability of the product for buyers.

Data Collection and Analysis Methods

Data collection

Data was collected by means of telephone interview with selected participants from the Kanzalu Coffee co (2025) that were directly involved in the warehousing division of the company. 12 participants consented to the interview and were provided with the interview questions in advance of the interview. Interviews lasted from 30 to 35 minutes each. The interviews were recorded and transcribed with the final result uploaded to the open source qualitative research tool Taguette (n.d.). Tags related to the consistent themes were created and each response had tags highlighted that then provided an overview of highlighted themes presented in table one sorted by prevalence in mention by each of the participants.

Based on the collected data, several significant themes emerged from the participants' responses. The data analysis was carried out using the thematic analysis process described by Naeem et al. (2023).

The first step involved transcribing the data, becoming familiar with the content, and selecting pertinent quotations. Table 1 displays the codes along with their descriptions and the frequency of occurrence in the transcripts.

In the second step, key terms were identified, and their frequency was documented in Table 1. The third step focused on pinpointing phrases that encapsulate the core messages of the data, which subsequently informed the emerging themes.

The fourth step concentrated on developing these themes as they materialized from the analysis. In the fifth step, the data interpretation was conducted through a thorough examination of the key codes and emerging themes.

Finally, the sixth step facilitated the creation of a conceptual model, which is visually illustrated in Figure 2.

The study will employ two methods for data collection. The first method will involve interviews with selected participants, primarily conducted via telephone. Roulston (2019) notes that requests for clarification from interviewees, as well as follow-up checks on their responses, tend to be more frequent and concise in telephone interviews compared to face-to-face interactions. Considering the geographical distances between the researcher and the study participants, telephone or video call interviews will be the appropriate means of conducting the interviews. The interviews will be recorded where possible with the participants' permission to ensure greater accuracy.

The second method of data collection will consist of archival research. Institutions such as the Nairobi Coffee Exchange (NCE, 2025), the International Coffee Organization, (ICO, n.d.) and the International Coffee Exchange (ICE, 2025) maintain publicly available archival records, which the researcher intends to use to provide contextual information regarding the study's subject matter.

The personal interview method has been selected to gain a comprehensive understanding of the methodologies currently employed by participants, as well as potential enhancements and reasons for the slow adoption of modern approaches. Taylor (2015) describes qualitative interviewing as nondirective, unstructured, non-standardized, and open-ended. The researcher will leverage this methodology to gather deeper insights from the participants.

Data collections instruments

To gather insights from individual participants, the researcher will conduct structured interviews. The questions for company personnel will follow a similar format to facilitate thematic analysis, which aims to identify common themes regarding issues and potential solutions.

Validation

By conducting interviews with members from the warehousing department, this study seeks to address and eliminate most threats to the validity and reliability of the data collection instruments utilized. According to Creswell and Creswell (2022), both internal and external threats to instrument validity must be acknowledged, and researchers should formulate strategies to mitigate such threats. In this study, a potential bias may arise from participants' fear of retaliation, which can be alleviated by assuring them of their anonymity in their responses. Anonymity will be maintained by assigning each participant with a random pseudonym. Furthermore, the company director may have concerns about changing existing practices, but these can be addressed by clarifying that there is no obligation to implement the recommendations of this study.

Data analysis

The researcher will employ a thematic analysis approach to identify and interpret patterns or themes within the data set (Naeem et al., 2023). Utilizing Taguette (n.d.) software, this will extract key words from the collected data and cross-reference these with the participants' responses. Once a theme or pattern is identified, the researcher will draw conclusions based on the emerging patterns. According to Naeem et al. (2023), this process involves six steps: the first being transcribing the collected data, becoming familiar with the data through thorough reading, and selecting quotations that are relevant based on familiarization with the data. The second step involves selecting keywords by examining data. The third step involves coding the data by attaching key words that capture the essential message. The fourth step involves developing the theme/s as they emerge from the analysis of the data. The fifth step involves the interpretation of

the data by examining the key codes and emerging themes. The sixth step involves then allows for the, development of the conceptual model represented in a visual formation.

Presentation of Research Findings

Table 1 Codes

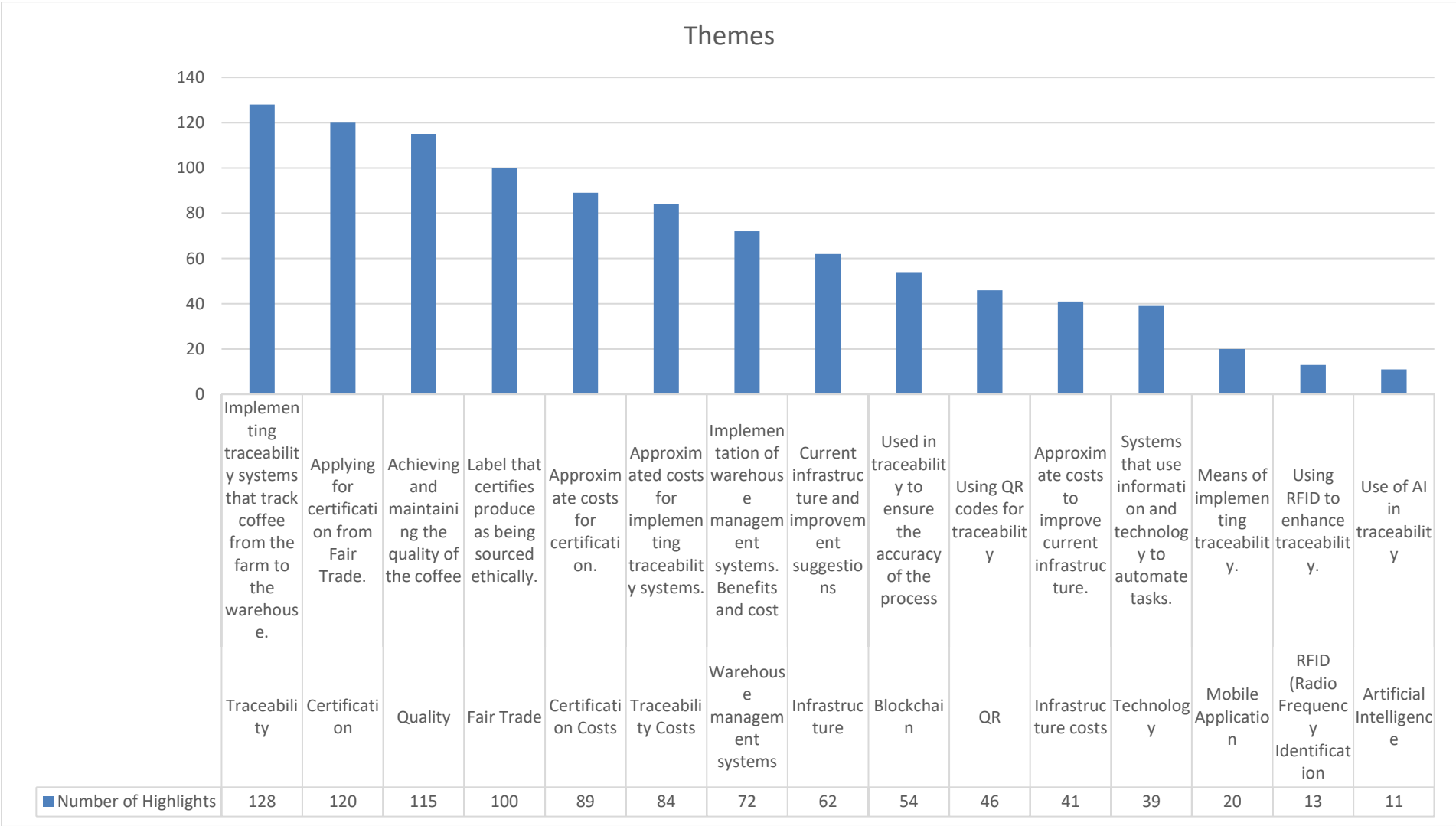
Codes	Description	Number of highlights
Traceability	Implementing traceability systems that track coffee from the farm to the warehouse.	128
Certification	Applying for certification from Fair Trade.	120
Quality	Achieving and maintaining the quality of the coffee	115
Fair Trade	Label that certifies produce as being sourced ethically.	100
Certification Costs	Approximate costs for certification.	89
Traceability Costs	Approximated costs for implementing traceability systems.	84
Warehouse management systems	Implementation of warehouse management systems. Benefits and cost	72
Infrastructure	Current infrastructure and improvement suggestions	62
Blockchain	Used in traceability to ensure the accuracy of the process	54
QR	Using QR codes for traceability	46
Infrastructure costs	Approximate costs to improve current infrastructure.	41
Technology	Systems that use information and technology to automate tasks.	39
Mobile Application	Means of implementing traceability.	20
RFID (Radio Frequency Identification)	Using RFID to enhance traceability.	13
Artificial Intelligence	Use of AI in traceability	11

Table 2 Codes and quotations

Participants	Code	Quote
Participant 1, 5, 7, 10, 12	Artificial Intelligence	“We also like the AI or artificial intelligence and we are looking at ways that we can use this in our operations.”
Participant 10,11 12, 4, 7, 9	Blockchain	“With technology such as blockchain I see it as being very bright because the coffee can be traced right down to the original farm level. This will show how the coffee is

		produced and lead to the end goal which is to get better prices.”
Participant 1 to 12	Certification Costs	“For certification we estimate around 400,000 Kenya Shillings or 3500USD with annual fees at around 200,000 Kenya shillings or 1500USD per year. So for both together with the tech cost we estimate in the region of 2 million Kenya Shillings or about 20000USD”
Participant 1 to 12	Certification	“For certification, organizations such as Fair Trade could provide support by having local offices that help to reduce the cost of attaining and maintaining certification.”
Participant 1 to 12	Fair Trade	“we would also need to get Fair trade certifications if we want to stand out in the market”
Participant 1 to 12	Infrastructure	“Are you interested in exploring different warehousing models (e.g., shared facilities, cooperative warehouses, third-party logistics providers)? Yes we are”
Participant 10	Infrastructure costs	“efficiency in the warehousing process, by better infrastructure we will have better climate control which means we will be able to store our coffee for longer while maintaining quality.”
Participant 3	Mobile Application	“mobile app that the farmers can use to document important milestones and that we can use in our farm to collect relevant information such as harvest dates and quantities”
Participant 1 to 12	QR	“lowest cost technology available, which is likely QR codes and barcodes that can be scanned with a smartphone”
Participant 1 to 12	Quality	“These challenges mean that we do not like to store our coffee for very long because the quality will deteriorate and it will lose value. Consequently we cannot take advantage of price fluctuations.”
Participant 1 to 12	RFID (Radio Frequency Identification)	“Using QR codes and RFID tags will also ensure that the coffee is tracked from the farm all the way to the end consumer. All this will generate data that can be used to check on the efficiency of the system and ensure integrity.”
Participant 1 to 12	Technology	“We need to be proactive in adopting technology so that we can take advantage and sell our coffee directly to customers at better prices.”
Participant 1 to 12	Traceability	“Currently we manage inventory using manual ledgers. We have very minimal traceability systems which generally only track produce from certain regions.”
Participant 5,6,7,8,9,12	Traceability Costs	“traceability we estimate around 1.5 million Kenya Shilling or about 15000 USD”
Participant 1 to 12	Warehouse management systems	“The weaknesses are that we do not have a warehouse management system, this means that all incoming and outgoing produce is tracked manually which can be cumbersome and is prone to mistakes.”

Figure 2 Themes



For this study 12 participants from Kanzalu Coffee Co. were given a set of questions based on the research questions. Their responses both verbal and written were then subjected to a thematic analysis to determine the predominant themes in the responses. Based on the interview response from the participants in this study certain consistencies can be gleaned from the responses.

Current practices in warehousing traceability and certification

From the responses it is clear that the study company does not use any advanced technology or practices in its current operations. The company also has no affiliation with any certification schemes. However, the company does have the realization that the implementation of a traceability scheme would be of benefit to the company in the following ways.

Benefits of traceability

Quality Assurance: By tracing the coffee's journey from farm to cup, quality control can be significantly improved. This ensures only the best beans make it to the end consumer.

Transparency and Trust: A traceability system promotes transparency. Consumers can know exactly where their coffee comes from, which builds trust and loyalty.

Sustainability: It can help track the environmental and social impact of coffee production. This encourages sustainable farming practices and fair labor conditions.

Market Differentiation: Being able to show a traceable supply chain can set a brand apart, appealing to consumers who value ethical and sustainable products.

Regulatory Compliance: Helps in adhering to local and international regulations regarding food safety and standards.

Drawbacks

The cost of implementing a traceability system can be significant, and managing the data involved can be complex. This may require specialized personnel, adding to the overall expenses. Current estimates indicate that the implementation costs for software and hardware can exceed \$10000, with annual maintenance fees around \$5,000 based on estimates provided by Kanzalu Coffee co (2024) . Additionally, hiring and/or training specialized staff may incur costs of approximately \$5,000. As a result, farmers and other stakeholders might be hesitant to adopt these new practices and technologies.

In summary, while a traceability system can enhance the quality and reputation of coffee, it necessitates careful planning, investment, and commitment to successfully address the potential challenges.

Certification schemes

There was consensus amongst the participants that a Fair Trade certification would be the most relevant for the company with the main reason being that it ensures a minimum price for the produce which is the aim of the company to strive for better pricing. The one drawback is the cost of acquiring and maintaining Fair trade certification which is estimated at approximately \$5000 with annual fees at approximately \$3000 per year as estimated by Kanzalu Coffee co (2024)

Summary

Implementing both traceability and certification systems will require a significant investment in financial, human, and technological resources. However, the benefits of improved quality, transparency, and market differentiation can outweigh these costs in the long run. Market requirements for traceability and certification.

Kanzalu Coffee (2025) is looking to market their produce locally and internationally. For the local market they will require compliance with local quality standards and regulations. For the European market they will require compliance with the European Union Deforestation Regulation European Commission. (n.d.), which mandates that coffee must be traceable to its origin and certified as free from deforestation. Additionally, Fair trade (2024) certification is highly recommended as it ensures compliance with environmental, social, and economic sustainability standards.

For the North American market, there exists an increasing demand for traceable coffee to ensure quality and ethical sourcing.

To successfully target these markets, Kanzalu Coffee Co. should invest in robust traceability systems and obtain relevant certifications. This will not only meet market requirements but also enhance the brand's reputation and appeal to consumers who value transparency and sustainability.

Implementation of traceability and certification

Participants largely agree that Kanzalu Coffee will implement a hybrid model that effectively balances control with expertise. This approach enables the company to utilize third-party software while customizing certain elements in-house to align more closely with Kanzalu Coffee Co.'s specific needs.

The benefits of this model include flexibility, combining expert support with tailored customization, while also achieving a balance between lower initial investment and sustainable maintenance costs. However, it is essential to recognize that this approach requires careful coordination between in-house teams and third-party providers, which can add a layer of complexity to management and maintenance.

Traceability technologies

Participants reached a consensus that the implementation of low-cost technology would be the most suitable approach for our project. Several specific options were explored, including cost-effective software solutions, budget-friendly hardware, and accessible online tools. These alternatives could effectively address our requirements while maintaining economic viability.

QR Codes

QR codes are a cost-effective solution, as printing them is relatively inexpensive. They are easy to use because they can be attached to coffee bags, allowing consumers to scan them with their smartphones to access traceability information. Additionally, QR codes offer flexibility by providing links to detailed information about the coffee's origin, processing, and journey.

RFID Tags

RFID tags offer significant advantages, as they can be automatically read by scanners and are more resilient than QR codes, making them capable of withstanding harsh conditions. Additionally, they facilitate real-time tracking of coffee during the processing phase.

On the downside, RFID tags can be costly compared to QR codes, and their implementation and maintenance demand a certain level of technical expertise.

Blockchain

Blockchain technology offers several benefits, including a transparent and tamper-proof record, which fosters trust among consumers by ensuring the authenticity of traceability. Security and reliability are enhanced because no single entity controls the data, ensuring its integrity.

However, one major drawback is the complexity involved in implementation, along with high initial setup costs and ongoing maintenance expenses.

Summary

For small-scale farmers, QR codes and RFID tags are the most viable low-cost traceability technologies. QR codes are particularly cost-effective and easy to implement, while RFID tags offer automation and durability. Blockchain can provide advanced traceability solutions but may require higher initial investments and technical expertise.

Warehousing and traceability data

Integrating traceability data into warehousing strategies can significantly enhance Kanzalu Coffee Co.'s competitiveness in markets like the EU and North America. By implementing a Warehouse Management System (WMS) that supports traceability, the company can achieve real-time visibility into inventory levels, locations, and movements. This system tracks batches, expiration dates, and serial numbers, ensuring that each coffee batch can be traced from the farm to the consumer.

Using batch tracking within the warehouse enables Kanzalu Coffee Co. to monitor the journey of each coffee batch. This capability helps quickly identify and isolate any defective items, ensuring quality control and compliance with regulations. A WMS captures data on receiving, put-away, picking, and shipping, providing real-time visibility of inventory. This ensures that customers receive their orders on time and in good condition while minimizing waste and errors in the supply chain.

Additionally, implementing barcode and RFID scanning automates inventory movements and improves accuracy. By scanning barcodes or RFID tags, the WMS can track inventory movements in real time, reducing the risk of errors and speeding up operations.

Furthermore, the reporting and analytics features of a WMS allow Kanzalu Coffee Co. to gain insights into inventory movements and identify trends or issues related to traceability. This information can be leveraged to optimize warehouse operations and enhance overall efficiency.

Promoting traceability data in marketing and branding efforts can also set Kanzalu Coffee Co.'s products apart. Emphasizing the transparency and ethical sourcing of the coffee appeals to consumers who value sustainability and quality.

By integrating traceability data into its warehousing strategies, Kanzalu Coffee Co. can strengthen its competitive edge in the EU and North American markets, ensuring quality, compliance, and consumer trust.

Training and infrastructure required to implement traceability systems

Implementing a reliable traceability system for farmers involves both training and infrastructure.

Training

There was a consensus that the company should conduct workshops and seminars to train and educate farmers on the importance of traceability. These sessions would cover how to document practices such as harvest dates, pesticide use, and other relevant activities.

Additionally, training will be provided on using digital tools and software for data entry and management, which includes mobile apps, tablets, and other devices.

Infrastructure

To enhance traceability and data management, it is essential to provide farmers with smartphones or tablets equipped with traceability apps for easy data entry. Implementing software solutions that enable farmers to input and track information related to their farming

practices is also crucial. This initiative will require reliable internet access to upload and sync data with the traceability systems.

Additionally, the company plans to implement systems for generating and printing barcodes or QR codes that can be attached to coffee bags for tracking purposes. The use of RFID tags for automated tracking and data collection should also be considered. Furthermore, there is an identified need for cloud-based storage solutions to ensure secure storage and backup, as well as local storage options to address potential internet connectivity issues.

By establishing the necessary infrastructure, Kanzalu Coffee Co. can ensure that farmers consistently document their practices and maintain a robust traceability system.

Warehousing infrastructure and management

Current facilities

Participants described the current facilities as old and outdated, having been built in the 1970s without any provisions for controlling humidity and temperature fluctuations. They highlighted the significant challenges in maintaining the produce at the correct temperature to ensure consistent coffee quality. Additionally, participants noted that there is currently minimal use of technology for monitoring and tracking coffee in the storage facilities, with manual ledgers being the primary method for managing and recording inventory.

Improving warehousing infrastructure

Participants concurred that enhancing infrastructure and management practices would yield substantial benefits, particularly in terms of efficiency. Improved infrastructure facilitates better organization and utilization of space, resulting in increased storage capacity and more effective inventory management. Advanced warehousing systems enable real-time inventory tracking, ensuring accurate documentation of coffee batches from farm to consumer. This

enhanced traceability cultivates consumer trust by providing detailed information about the coffee's journey and its adherence to various certifications.

Modern warehousing infrastructure can incorporate climate control systems to maintain optimal storage conditions, which in turn preserves the quality and freshness of the coffee. Furthermore, heightened hygiene and safety standards within the warehouse can mitigate the risk of contamination, ensuring a superior product. A contemporary warehousing system is also designed for scalability, allowing Kanzalu Coffee Co. to expand its operations without significant interruptions.

Nonetheless, a key drawback noted was the considerable initial investment required to upgrade existing infrastructure and implement advanced technologies, such as climate control and automation. Concerns were also raised regarding ongoing maintenance costs and the availability of skilled personnel to manage and maintain these sophisticated systems.

In conclusion, investing in enhanced warehousing infrastructure and management practices can deliver significant advantages in efficiency, traceability, quality control, scalability, and compliance. However, it is important to be mindful of challenges, including high upfront costs, continuous maintenance expenses, implementation complexities, and dependence on technology.

Benefits of improved warehousing facilities

By adopting advanced warehousing practices—including climate control, optimal storage conditions, and efficient inventory management—Kanzalu Coffee Co. can ensure that its coffee remains fresh and of the highest quality. This commitment to excellence can be highlighted in branding and marketing initiatives, further reinforcing the company's dedication to superior products. Enhanced warehousing facilitates accurate and transparent tracking of coffee from

farm to cup, a traceability that can be communicated to consumers through packaging, QR codes, and digital platforms. This transparency showcases the journey of each batch, fostering trust with customers.

Incorporating innovative packaging featuring QR codes allows consumers to access virtual tours of the warehouse and processing facilities, creating an engaging experience that deepens their connection to the brand and its values.

Improved warehousing practices also play a crucial role in Kanzalu Coffee Co.'s branding and storytelling by demonstrating the company's commitment to quality, transparency, sustainability, and ethical practices. By captivating consumers with compelling narratives and interactive experiences, the brand can build trust, differentiate itself in the market, and enhance its overall reputation. Furthermore, participants have expressed interest in exploring various warehousing models, such as shared facilities, cooperative warehouses, and third-party logistics providers.

Factors contributing to coffee quality degradation during storage

- High moisture levels can lead to the growth of mold and bacteria, which can spoil the coffee beans. The recommended moisture content for green coffee is between 8% and 12.5%¹.
- Water activity measures the amount of water available for microbial growth. High water activity can lead to the proliferation of molds, yeasts, and enzymatic activity, which can degrade the coffee's flavor.
- Fluctuations in temperature can cause condensation, leading to increased moisture levels and potential mold growth.

- Storing coffee at high temperatures can accelerate the degradation of volatile compounds, leading to a loss of aroma and flavor.
- Exposure to light, especially UV light, can cause the breakdown of chemical compounds in coffee, leading to a loss of flavor and aroma.
- Over time, coffee beans naturally lose their freshness and flavor. The longer the storage period, the greater the degradation of quality.
- Poor packaging can allow exposure to air, moisture, and light, accelerating the degradation process. Using airtight, moisture-proof, and light-resistant packaging can help preserve coffee quality.

By managing these factors effectively, Kanzalu Coffee Co. can minimize quality degradation during storage and ensure that their coffee remains fresh and flavorful for consumers.

Intercontinental exchange (ICE)

The Intercontinental Exchange (ICE 2025) serves as the commodities exchange platform for global coffee trading across three major cities: New York, London, and Singapore. The first graph below presents the price of coffee over the one-year period leading up to March 2025, while the second graph highlights future price forecasts, reflecting market expectations for coffee prices up to May 2027.

By leveraging the insights gained from historical and speculative pricing data, Kanzalu Coffee can strategically align its warehousing practices with market fluctuations.

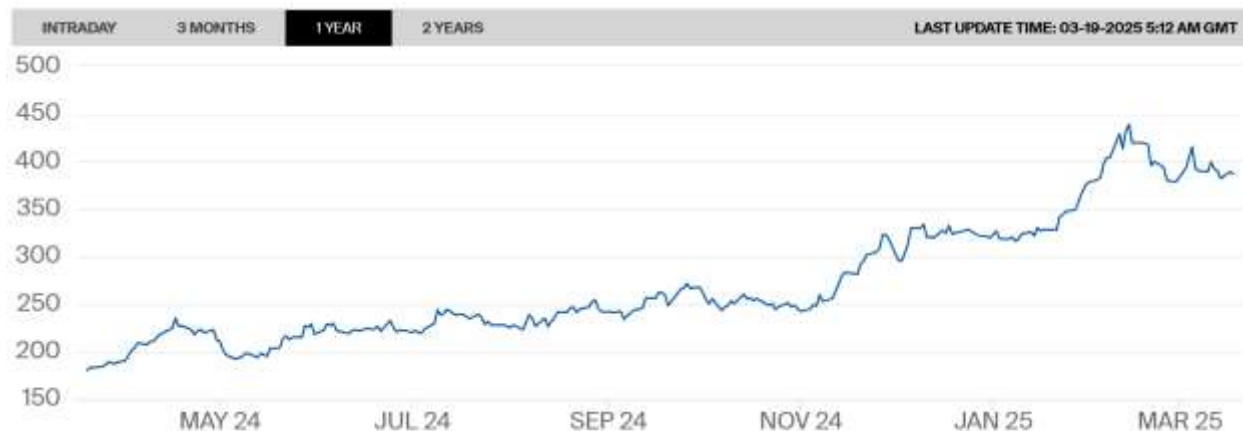


Figure 3 Intercontinental Exchange historical coffee prices (Intercontinental Exchange, Inc. n.d.).

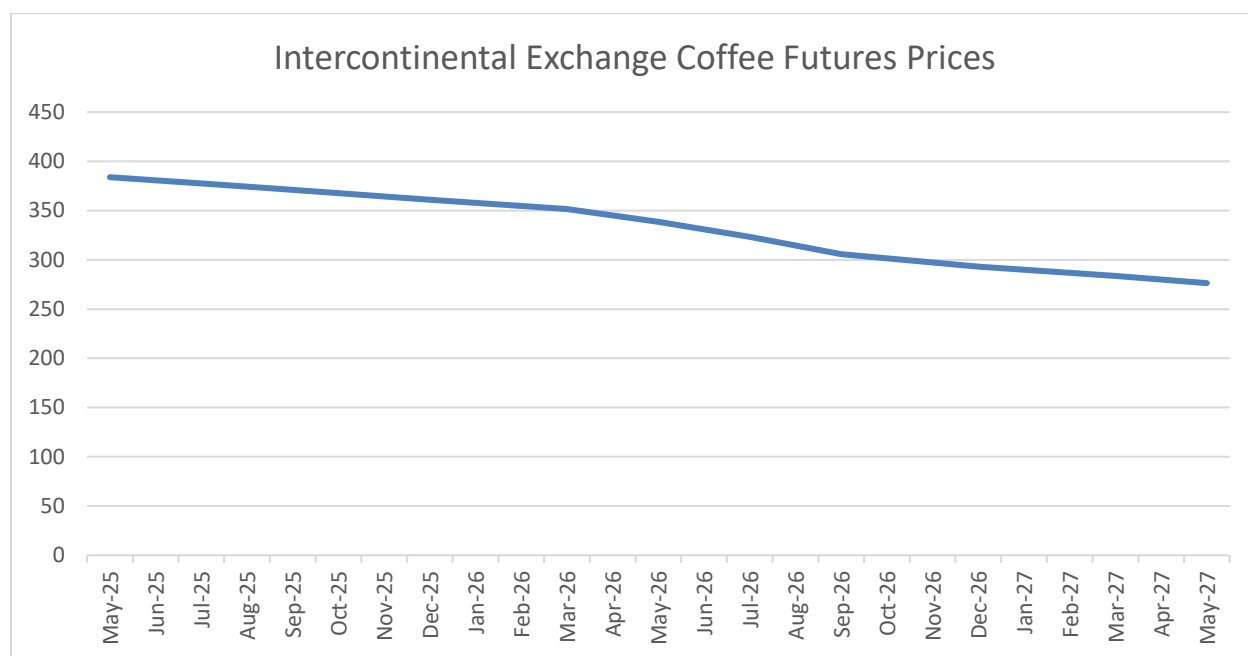


Figure 4. Coffee futures (Intercontinental Exchange, Inc. n.d.).

International coffee organization (ICO)

The International Coffee Organization (ICO), established in 1963, is the only intergovernmental organization focused specifically on coffee. It delivers crucial data on pricing and sustainability, along with various development programs for the industry. A significant resource is the monthly coffee market report, which is available free of charge. This report contains essential information on production in various coffee-producing regions and provides pricing details for the commodity.

Production data is particularly critical, as it underpins the futures pricing that Kanzalu Coffee can leverage in its warehousing strategy. For instance, the February 2025 report reveals a 14.2% decline in the export of green beans compared to the same period in 2024. Furthermore, it notes a 13.3% reduction in global coffee exports relative to last year. On the consumption side, the report indicates an overall growth of 2.1%, with North America experiencing a notably higher growth rate of 3.8%.

These monthly reports equip Kanzalu Coffee with key insights into market trends, which can significantly enhance their warehousing planning and operations.

Nairobi coffee exchange.

The Nairobi Coffee Exchange, founded in 1935, is responsible for overseeing the country's coffee auctions. These auctions take place weekly, giving buyers the opportunity to sample coffee from various regions and estates. Following each auction, comprehensive reports detailing the quantities sold and the prices achieved are published. For a company like Kanzalu Coffee, this information is invaluable, as it enables them to track pricing trends. By carefully monitoring market dynamics, they can identify optimal times to release coffee from their warehouse, ensuring they capitalize on periods of high demand and low production.

The graph below represents the average price of coffee at the exchange during the weekly auctions for the period up to February 2025.

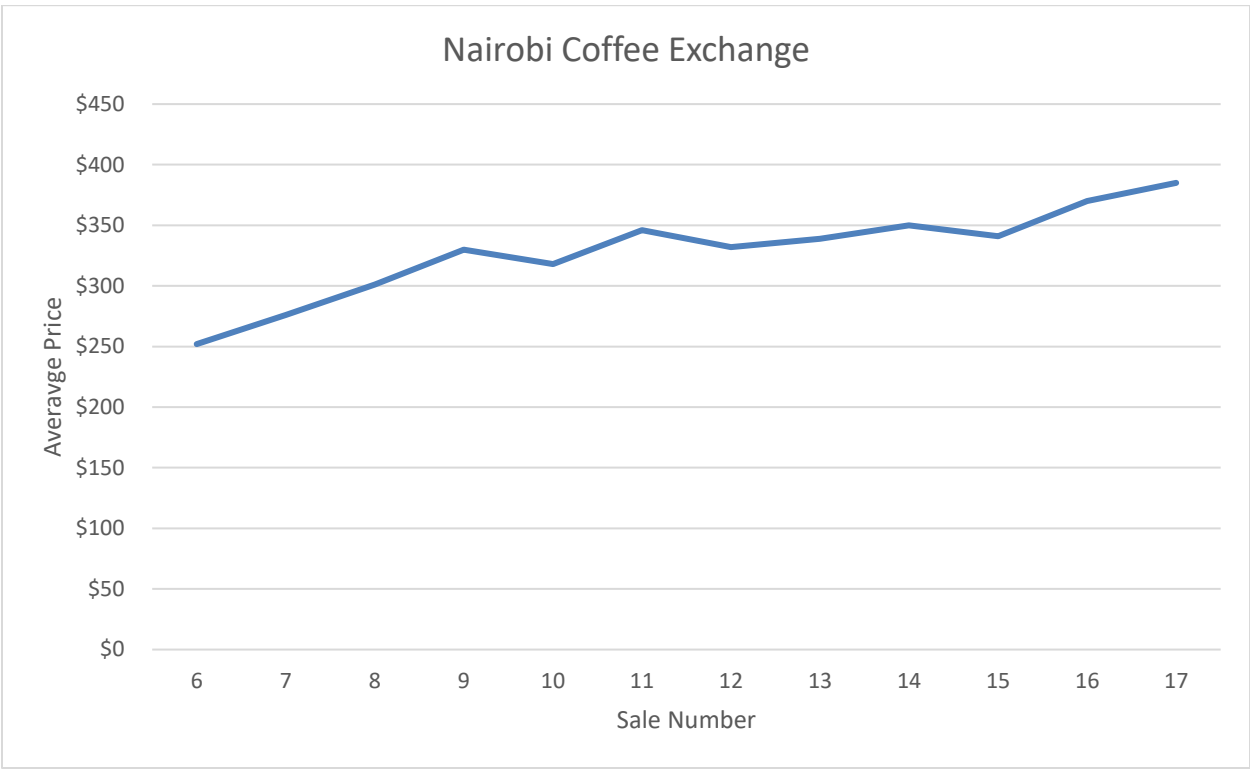


Figure 5. Nairobi coffee auction prices NCE (2024)

Conclusion

This study involved in-depth interviews with 12 individuals connected to Kanzalu Coffee Co. (2025). Additionally, the study examined publicly available information from three organizations: the Intercontinental Exchange (2025), the International Coffee Organization (n.d.), and the Nairobi Coffee Exchange (2024). A prevailing theme emerged from these discussions: participants emphasized the importance of Kanzalu Coffee prioritizing investments in solid infrastructure and state-of-the-art technology. By taking this approach, Kanzalu Coffee (2025) could unlock opportunities for more competitive pricing and explore a wealth of new markets, ultimately enhancing the quality and reach of their coffee products.

One of the participants put it succinctly stating, “ we must embrace technology and take advantage of market information if we are to grow as a company.”

Discussion of Findings

The research questions

- A. The first research question is “how can traceability and certification schemes be implemented in warehousing to enhance the marketability of coffee from Kanzalu Coffee Co. (2024) and small scale farmers.

The findings from the participants revealed that the corporation under study had not yet established any traceability or certification schemes. However, there is a clearly articulated plan for both current and future implementation of a certification and traceability system in the company’s warehousing practices. Participants indicated a preference for certification from Fair Trade (2024) due to its cost-effectiveness and alignment with the company’s operational needs.

Participants from the corporation noted the intention to implement traceability using a hybrid model that will leverage the expertise of a third-party provider alongside local talent. This collaborative approach aims to tailor the major components of the traceability scheme to better align with the specific requirements of Kanzalu Coffee Co. (2024). In pursuit of this, the company is considering the adoption of low-cost technologies, particularly QR codes and RFID tags. Furthermore, they are evaluating the potential integration of blockchain technology into their traceability framework.

For small-scale farmers, QR codes and RFID tags emerge as the most feasible low-cost traceability technologies. QR codes are particularly noted for their cost-effectiveness and ease of implementation, while RFID tags offer advantages in automation and durability. Although

blockchain technology can provide advanced traceability solutions, it may necessitate a higher initial investment and greater technical expertise.

The company is also exploring the implementation of a Warehouse Management System (WMS) that supports traceability. This system would enable the company to gain real-time visibility into inventory levels, locations, and movements. It is designed to track batches, expiration dates, and serial numbers, ensuring that each batch of coffee can be traced from the farm to the consumer.

The application of batch tracking within the warehouse would allow Kanzalu Coffee Co. to monitor the journey of each coffee batch effectively. This capability facilitates the swift identification and isolation of any defective items, thereby ensuring quality control and compliance with regulatory standards. A WMS captures critical data related to receiving, put-away, picking, and shipping, providing real-time visibility into inventory. This not only ensures that customers receive their orders promptly and in optimal condition but also minimizes waste and errors within the supply chain.

B. The second research questions asks, “how can improvements in warehousing infrastructure and management practices affect coffee's overall quality and marketability?”

The research findings indicate that current warehousing practices are outdated, with infrastructure dating back to the 1970s, and reliance on basic manual tracking procedures that are susceptible to errors and inaccuracies. By modernizing this infrastructure, the company can take advantage of advanced storage techniques. A study by Gabriel et al. (2023) illustrates that storage conditions play a crucial role in the quality of coffee in warehouses. Consequently, improving storage conditions and implementing high-barrier packaging can significantly

enhance the shelf life and quality preservation of coffee beans. These strategies may also provide a buffer against periods of unfavorable market prices, allowing Kanzalu Coffee (2024) to sell their coffee when market conditions are more favorable. The research findings reveal that current warehousing practices are antiquated, with infrastructure originating from the 1970s and reliance on basic manual tracking procedures that are susceptible to errors and inaccuracies. By modernizing this infrastructure, the company can take advantage of advanced storage techniques. A study by Gabriel et al. (2023) illustrates that storage conditions play a crucial role in the quality of coffee in warehouses. Consequently, improving storage conditions and implementing high-barrier packaging can significantly enhance the shelf life and quality preservation of coffee beans. These strategies may also provide a buffer against periods of unfavorable market prices, allowing Kanzalu Coffee (2024) to sell their coffee when market conditions are more favorable.

The research framework

The conceptual framework of this study examines the coffee production process, which begins with crop cultivation and proceeds to the processing plant. Once processed, the coffee is stored in a designated warehouse for subsequent auction or sale to prospective buyers. The research findings identified a significant flaw in the warehousing system, namely outdated infrastructure and practices that contribute to the persistent low prices of the crop. The study emphasizes that modern warehousing solutions can maintain coffee under optimal conditions, ensuring consistent quality, longevity, and effective inventory management. Furthermore, the implementation of traceability and certification processes helps authenticate the product's origin, resulting in higher prices, reduced speculation, enhanced inventory management, and ultimately increased returns.

Anticipated themes

The study initially expected that the primary focus would be on low prices. However, an unexpected theme emerged concerning the high costs associated with implementing various schemes. The company estimated that the expense of implementing a certification scheme would be approximately \$5,000, with annual fees of \$3,000. Furthermore, the implementation of both traceability and certification systems will necessitate a significant investment of financial, human, and technological resources Mulli, (2025)

While the study anticipated substantial costs related to infrastructure improvements, it did not account for the age and condition of the existing infrastructure, which dates back to the 1970s. Although modern warehousing can incorporate climate control systems to maintain optimal storage conditions, thereby preserving the quality and freshness of the coffee, the need for these upgrades became evident. Additionally, heightened hygiene and safety standards in the warehouse can mitigate the risk of contamination, ensuring a superior product. A contemporary warehousing system is also designed for scalability, allowing Kanzalu Coffee Co. to expand its operations with minimal disruption.

Nevertheless, a significant drawback noted in the study was the considerable initial investment required to upgrade the existing infrastructure and implement advanced technologies such as climate control and automation. Concerns were also raised regarding ongoing maintenance costs and the availability of skilled personnel to manage and maintain these sophisticated systems.

The problem

This research explores the impact of outdated warehousing strategies on the low prices of coffee for small-scale farmers and Kanzalu Coffee Co. (2024). The findings reveal that Kanzalu Coffee's current strategies are no longer effective, highlighting the necessity of adopting modern

technology in their warehousing operations. Enhancing storage conditions is crucial for improving coffee quality, which, in turn, could lead to better pricing.

Furthermore, implementing traceability and certifications could positively influence pricing, as consumer preferences increasingly favor fair and sustainable practices. This notion of ethical consumerism is supported by Kutaula et al. (2024), who describe it as the "deliberate purchase or avoidance of products for political, ethical, or environmental reasons."

The literature

Current literature on this research problem primarily addresses issues related to storage. Gabriel et al. (2023) conducted an experimental study to identify the optimum storage conditions for green coffee. Their findings revealed specific packaging and climatic conditions that are ideal for the long-term preservation of coffee. Furthermore, Mbakop et al. (2023) examine the topic of traceability, demonstrating its significant potential to enhance the commodity's value. Their research highlights parallels in the solutions proposed for both storage and traceability challenges. However, the existing literature does not effectively connect improved infrastructure and the implementation of traceability and certification with enhanced pricing and returns.

Research findings indicate a sluggish adoption of certifications from organizations such as Fair Trade. Meanwhile, literature suggests that Fair Trade certification is correlated with increased perceived quality and value among consumers (Mili & Soto, 2022). Additionally, current studies on blockchain underscore its considerable potential to address the "coffee paradox" and provide geographical indicators that authenticate the coffee's origin, thus ensuring quality and bolstering its reputation (Mohita, 2023). Given its relatively recent application, the study points out the significant discrepancy between the high value consumers place on coffee and the low prices that farmers receive. Moreover, it emphasizes the necessity for further

research into the integration of blockchain within the supply chain to generate value for all stakeholders involved.

In conclusion, while there is a wealth of information on various factors that could potentially enhance value and returns, there remains a gap in the knowledge and resources necessary for the effective implementation of these processes.

Conclusion

The research findings suggest that a substantial obstacle remains in the implementation of new strategies and technologies within warehousing. There is a notable gap in the methodology that limits the ability to maintain low costs while maximizing the effectiveness of these strategies. Utilizing low-cost QR codes and adopting blockchain technology could significantly reduce expenses and enhance returns. Furthermore, the potential application of artificial intelligence to improve efficiencies in traceability, certification, and storage of coffee has not been explored.

Practical implications of the research findings and recommendations for future research

The problem

This research explores the impact of outdated warehousing strategies on the low prices of coffee for small-scale farmers and Kanzalu Coffee Co. (2024). The findings reveal that Kanzalu Coffee's current strategies are no longer effective, highlighting the necessity of adopting modern technology in their warehousing operations. Enhancing storage conditions is crucial for improving coffee quality, which, in turn, could lead to better pricing.

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ethical consumerism is supported by Kutaula et al. (2024), who describe it as the "deliberate purchase or avoidance of products for political, ethical, or environmental reasons."

Practical implications of the research findings

A. Traceability

The research findings recommend that Kanzalu Coffee Co. (2024) implement a traceability scheme. Furthermore, the company should consider adopting cost-effective technologies, such as QR codes and RFID tags, in collaboration with a third-party provider, alongside its existing personnel, to develop a system that aligns with its requirements. Additionally, the exploration of blockchain technology is warranted, as it currently lacks significant application in coffee traceability.

B. Certification

The company should seek certification from Fair Trade (2024) due to its cost-effectiveness and alignment with its operational requirements. Furthermore, it may be beneficial to explore other relevant and cost effective certifications. It is advisable for coffee-producing regions to establish their own certification bodies that cater to specific local needs while maintaining sustainability and fairness standards.

C. Infrastructure

The company must make a substantial investment to enhance its existing infrastructure. While the costs may be considerable, alternative options should be explored, such as partnering with third-party logistics providers or implementing a cooperative warehousing system, where the company pays only for the space it requires, as needed. Furthermore, it is essential to conduct additional research on the optimal storage conditions for coffee, particularly in light of climate change, which may necessitate adjustments to storage facilities across different regions.

D. Technology

It is evident that the company currently relies on manual tracking systems within its warehouse and production facilities. To enhance traceability and offer consumers a transparent overview of the production process, the company must make a significant investment in technology.

By implementing a Warehouse Management System (WMS) that supports traceability, the company can achieve real-time visibility into inventory levels, locations, and movements. This system will track batches, expiration dates, and serial numbers, ensuring that each coffee batch can be traced from the farm to the consumer.

Utilizing batch tracking in the warehouse will allow Kanzalu Coffee Co. to effectively monitor the journey of each coffee batch. This capability enables the swift identification and isolation of any defective items, thereby ensuring quality control and compliance with regulations. A WMS captures data on receiving, put-away, picking, and shipping, providing real-time insights into inventory. As a result, customers can expect their orders to arrive on time and in excellent condition, while minimizing waste and errors throughout the supply chain.

Recommendations for future research

Current literature inadequately addresses the potential for incorporating artificial intelligence into the traceability and certification processes within coffee warehousing. Further research is necessary to explore the integration of artificial intelligence in this context, as well as the application of blockchain technology. Although these technologies have been proposed, practical investigations into their implementation could greatly enhance transparency in traceability and certification processes, thus bolstering consumer confidence in the origins of coffee products.

The quality of coffee beans is significantly impacted by moisture levels and their water content. Research conducted by Gabriel et al. (2023) indicates that optimal storage conditions for coffee beans involve refrigeration and the use of high-barrier packaging. This approach has the potential to preserve the quality of coffee beans for over nine months. Consequently, it is recommended that further studies focus on the utilization of high-barrier packaging specifically tailored to the climatic conditions of coffee-growing regions.

As reported by Panggabean et al. (2021), coffee is the most heavily traded commodity in the world after crude oil. Yet only 30% of coffee produced is consumed within the producing nations, with the vast majority exported to North America and Europe. Coffee futures are predominantly traded on the Intercontinental Exchange (n.d.). There is a pressing need for research into the establishment of coffee exchanges in major coffee-growing regions that could serve as benchmarks for global pricing. This initiative could potentially reverse current power dynamics, returning more authority to producers. Zhang et al. (2022) note that the collapse of the International Coffee Agreement in 1989 marked a significant shift in the global coffee marketplace and contributed to increased price volatility. Their study suggests that inefficiencies exist within the current futures market, alongside a lack of established markets in the coffee-growing regions. Given the critical importance of pricing, additional research into price stabilization mechanisms is warranted.

Conclusion

This study centers on a single company and a specific issue within the expansive and complex global commodities markets. Although it addresses a particular business challenge, the insights gained can be relevant to broader global issues. Additionally, the research highlights the need for further exploration into the application of technology in the agricultural production of

coffee, which has been practiced for many years but has not yet fully embraced contemporary technological advancements. To realize tangible improvements in warehousing, additional research is essential to identify appropriate technological solutions that can be effectively integrated into the industry.

The research identified deficiencies in the adoption of technology in improved infrastructure that would allow for more extended storage and maintenance of quality. Implementation of traceability, as well as the adoption of certification schemes, would improve the marketability of the commodity.

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Appendix A: CITI COMPLETION CERTIFICATE

Completion Date 27-Sep-2024
Expiration Date 27-Sep-2027
Record ID 65361032

This is to certify that:

Benjamin Mulli

Has completed the following CITI Program course:

Not valid for renewal of
certification through CME.

Social & Behavioral Research - Basic/Refresher
(Curriculum Group)

Social & Behavioral Research
(Course Learner Group)

1 - Basic Course
(Stage)

Under requirements set by:

California Intercontinental University

CITI
Collaborative Institutional Training Initiative

101 NE 3rd Avenue, Suite 320
Fort Lauderdale, FL 33301 US
www.citiprogram.org

Generated on 27-Sep-2024. Verify at www.citiprogram.org/verify/?w7f29cf8b-eb45-4492-abad-cc032a65cfe4-65361032

Appendix B: PARTICIPANT CONSENT AND CONFIDENTIALITY FORM**Participant consent and confidentiality form**

Please complete this form and affix your signature to indicate your acceptance of the terms as outlined for your participation in this study.

NAVIGATING THE CHALLENGES OF LOW COFFEE PRICES: A STUDY ON
KANZALU COFFEE CO.

Principal Investigator: Benjamin M. Mulli

Institution: California Intercontinental University

Contact Information: Tel: +1-9194428473; Email: bmulli@student.caluniversity.edu

Purpose of the Study

The purpose of this study is to investigate the effects of warehousing strategies on commodity prices in Kenya. This research aims to identify the impact of outdated warehousing strategies on the pricing of coffee and explore how modern strategies, such as blockchain technology for crop traceability, can improve profitability for small-scale farmers. The findings will provide valuable insights for stakeholders in the coffee value chain.

Procedures

As a participant in this study, you will be asked to take part in a qualitative interview focusing on warehousing strategies in the coffee value chain. The interview will be conducted at a time and location convenient for you and will last approximately 3 hours. Your responses will be audio-recorded and transcribed for analysis.

Voluntary Participation

Your participation in this study is entirely voluntary. You may choose to withdraw from the study at any time without any negative consequences. If you decide to withdraw, any data you have provided will be destroyed upon request.

Confidentiality

The information you provide will be kept confidential. Your identity will be protected by assigning a unique code and pseudonym to your data, and only the research team will have access to the code key. All data will be stored securely and will only be used for the purposes of this study. In any publications or presentations resulting from this research, your identity will remain anonymous.

Risks and Benefits

There are no significant risks associated with participating in this study. However, you may decline to answer any questions that make you uncomfortable. While there are no direct benefits to you for participating, your insights will contribute to a better understanding of warehousing strategies in the coffee industry and may benefit small-scale farmers in Kenya.

Contact Information

If you have any questions or concerns about this study or your participation, please contact Benjamin M. Mulli at +1 9194428473. If you have questions about your rights as a research participant, you may contact [Ethics Committee Contact Information].

Consent

By signing below, you acknowledge that you have read and understood the information provided above. You agree to participate in this study voluntarily and understand that you may withdraw at any time.

Participant Name: _____

Participant Signature: _____

Date: _____

Researcher Name: _____

Researcher Signature: _____

Date: _____

Appendix C: INTERVIEW QUESTIONS

Please state your name, qualifications, and position in the company.

RQ 1. How can traceability and certification schemes be implemented in warehousing enhance the marketability of coffee from Kanzalu Coffee Co (2024) and small-scale farmers?

Current Practices and Challenges.

1. Can you describe the current processes Kanzalu Coffee Co. uses for tracking coffee from farm to market? What are the strengths and weaknesses of this system?
2. Does Kanzalu Coffee Co. currently work with any certification schemes? If so, which ones and what has been the experience? If not, why not?
3. What are your perceptions of the potential benefits and drawbacks of implementing a traceability system for your coffee?
4. What are your thoughts on the various certification schemes available (e.g., Fair Trade, Organic, Rainforest Alliance)? Which ones seem most relevant to your coffee and target markets?
5. What are the estimated costs and resources (human, financial, technological) that Kanzalu Coffee Co. would need to invest in to implement traceability and/or certification?
6. How do you see traceability and certification impacting your relationships with small-scale farmers?
7. Which markets are you most interested in targeting for your coffee? What are the specific requirements of these markets in terms of traceability and certification?
8. How do you envision traceability and certification contributing to the branding and storytelling of Kanzalu Coffee Co.?

9. What kind of support would Kanzalu Coffee Co. need from external partners (e.g., government agencies, NGOs, private sector) to successfully implement traceability and certification schemes?
10. How important is it for Kanzalu Coffee Co. to maintain direct relationships with small-scale farmers throughout the implementation of traceability and certification?
11. What are your preferred models for implementing traceability and certification? (e.g., working with a third-party provider, developing an in-house system)
12. What low-cost traceability technologies (e.g., blockchain, QR codes, RFID tags) are most viable for small-scale farmers to track coffee from farm to consumer?
13. How can Kanzalu Coffee Co. integrate traceability data into warehousing strategies to differentiate their coffee in competitive markets like the EU or North America?
14. What training or infrastructure is required for farmers to reliably document practices (e.g., harvest dates, pesticide use) for traceability systems?
15. What warehousing strategies can effectively communicate the value of traceability and certifications to eco-conscious or socially responsible consumers?
16. What risks arise from fraudulent certification claims, and how can Kanzalu Coffee Co.'s traceability systems prevent such issues?
17. What do you see as the future of traceability and certification in the coffee industry?
18. How can Kanzalu Coffee Co. and small-scale farmers stay ahead of the curve in adopting these practices?

RQ2: How can improvements in warehousing infrastructure and management practices affect coffee's overall quality and marketability?

19. Describe your current warehousing facilities and practices for storing coffee. What are the strengths and weaknesses of your current system?
20. What are the biggest challenges you face in maintaining coffee quality during storage? (e.g., humidity, temperature fluctuations, pest control)
21. How do you currently monitor and track the quality of your coffee during storage?
22. How do you manage inventory and ensure traceability of coffee within the warehouse?
23. What are your perceptions of the potential benefits and drawbacks of investing in improved warehousing infrastructure and management practices?
24. Have you experienced any losses in coffee quality or quantity due to inadequate storage? If so, what were the causes?
25. What are the estimated costs and resources (human, financial, technological) that would be required to implement improvements in warehousing?
26. How do you currently transport your coffee from the farm/processing facility to the warehouse and from the warehouse to the buyer?
27. What are your specific goals for improving the quality and marketability of your coffee through better warehousing? (e.g., higher prices, access to specialty markets, reduced losses)
28. Which markets are you most interested in targeting for your coffee? What are the specific quality requirements of these markets?
29. How do you envision improved warehousing contributing to the branding and storytelling of your coffee?
30. What kind of support would you need from external partners (e.g., government agencies, NGOs, private sector) to successfully implement warehousing improvements?

31. Are you interested in exploring different warehousing models (e.g., shared facilities, cooperative warehouses, third-party logistics providers)?
32. What are your procedures for handling and inspecting incoming and outgoing coffee?
33. What training and certifications do your staff have related to coffee storage and handling?
34. What are the costs associated with your current warehousing operations?
35. What are your plans for improving your warehousing facilities and services?
36. What new technologies or management practices are you considering implementing?
37. How do you stay updated on best practices for coffee storage and handling?
38. What are the key factors that contribute to coffee quality degradation during storage?
39. What are the latest technologies and innovations in coffee warehousing?
40. What are the challenges and opportunities associated with implementing improved warehousing practices in different coffee-producing regions?
41. How do Warehouse Management Systems (WMS) enhance traceability in coffee supply chains, and what metrics (e.g., order accuracy, dock-to-stock time) directly affect marketability?
42. Can blockchain integration in warehouse systems improve transparency for coffee certifications (e.g., Fair Trade, Organic), and how might this influence consumer purchasing decisions?
43. What challenges arise when retrofitting older warehouses for specialty coffee storage, and how can these investments justify long-term marketability gains?

Appendix D: Organization letter

Guy Complex 2nd floor
Mary Ngondi Road
Tala Market
Machakos County
Kenya

Date: 25 November 2024

Benjamin M. Mulli
California Intercontinental University
USA

Dear Benjamin,

Re: Proposed Doctoral Research Study.

We are pleased to permit you to conduct your research within our organization. Please feel free to reach out to me for any further assistance you may require in the furtherance of your research, and we look forward to the results.

Sincerely

Mary N. Mbugua
Director
Email: m.mbugua@kanzalucoffee.com
Tel: +254 765 995357



Email: info@kanzalucoffee.com Tel: +254 782 662662 www.kanzalucoffee.com

List of Tables

Table 1 Codes

Codes	Description	Number of highlights
Traceability	Implementing traceability systems that track coffee from the farm to the warehouse.	128
Certification	Applying for certification from Fair Trade.	120
Quality	Achieving and maintaining the quality of the coffee	115
Fair Trade	Label that certifies produce as being sourced ethically.	100
Certification Costs	Approximate costs for certification.	89
Traceability Costs	Approximated costs for implementing traceability systems.	84
Warehouse management systems	Implementation of warehouse management systems. Benefits and cost	72
Infrastructure	Current infrastructure and improvement suggestions	62
Blockchain	Used in traceability to ensure the accuracy of the process	54
QR	Using QR codes for traceability	46
Infrastructure costs	Approximate costs to improve current infrastructure.	41
Technology	Systems that use information and technology to automate tasks.	39
Mobile Application	Means of implementing traceability.	20
RFID (Radio Frequency Identification)	Using RFID to enhance traceability.	13
Artificial Intelligence	Use of AI in traceability	11

Table 2 Codes and quotations

Participants	Code	Quote
Participant 1, 5, 7, 10, 12	Artificial Intelligence	“We also like the AI or artificial intelligence and we are looking at ways that

		we can use this in our operations.”
Participant 10,11 12, 4, 7, 9	Blockchain	“With technology such as blockchain I see it as being very bright because the coffee can be traced right down to the original farm level. This will show how the coffee is produced and lead to the end goal which is to get better prices.”
Participant 1 to 12	Certification Costs	“For certification we estimate around 400,000 Kenya Shillings or 3500USD with annual fees at around 200,000 Kenya shillings or 1500USD per year. So for both together with the tech cost

		we estimat in the region of 2 million Kenya Shillings or about 20000USD”
Participant 1 to 12	Certification	“For certification, organizations such as Fair Trade could provide support by having local offices that help to reduce the cost of attaining and maintaining certification.”
Participant 1 to 12	Fair Trade	“we would also need to get Fair trade certifications if we want to stand out in the market”
Participant 1 to 12	Infrastructure	“Are you interested in exploring different warehousing models (e.g., shared facilities, cooperative warehouses, third-party logistics providers)? Yes we are”
Participant 10	Infrastructure costs	“efficiency in the warehousing process, by better

		infrastructure we will have better climate control which means we will be able to store our coffee for longer while maintaining quality.”
Participant 3	Mobile Application	“mobile app that the farmers can use to document important milestones and that we can use in our farm to collect relevant information such as harvest dates and quantities”
Participant 1 to 12	QR	“lowest cost technology available, which is likely QR codes and barcodes that can be scanned with a smartphone”
Participant 1 to 12	Quality	“These challenges mean that we do not like to store our coffee for very long because the quality will

		deteriorate and it will lose value. Consequently we cannot take advantage of price fluctuations.”
Participant 1 to 12	RFID (Radio Frequency Identification	“Using QR codes and RFID tags will also ensure that the coffee is tracked from the farm all the way to the end consumer. All this will generate data that can be used to check on the efficiency of the system and ensure integrity.”
Participant 1 to 12	Technology	“We need to be proactive in adopting technology so that we can take advantage and sell our coffee directly to customers at better prices.”
Participant 1 to 12	Traceability	“Currently we manage inventory using manual ledgers. We have very

		minimal traceability systems which generally only track produce from certain regions.”
Participant 5,6,7,8,9,12	Traceability Costs	“traceability we estimate around 1.5 million Kenya Shilling or about 15000 USD”
Participant 1 to 12	Warehouse management systems	“The weaknesses are that we do not have a warehouse management system, this means that all incoming and outgoing produce is tracked manually which can be cumbersome and is prone to mistakes.”

List of Figures

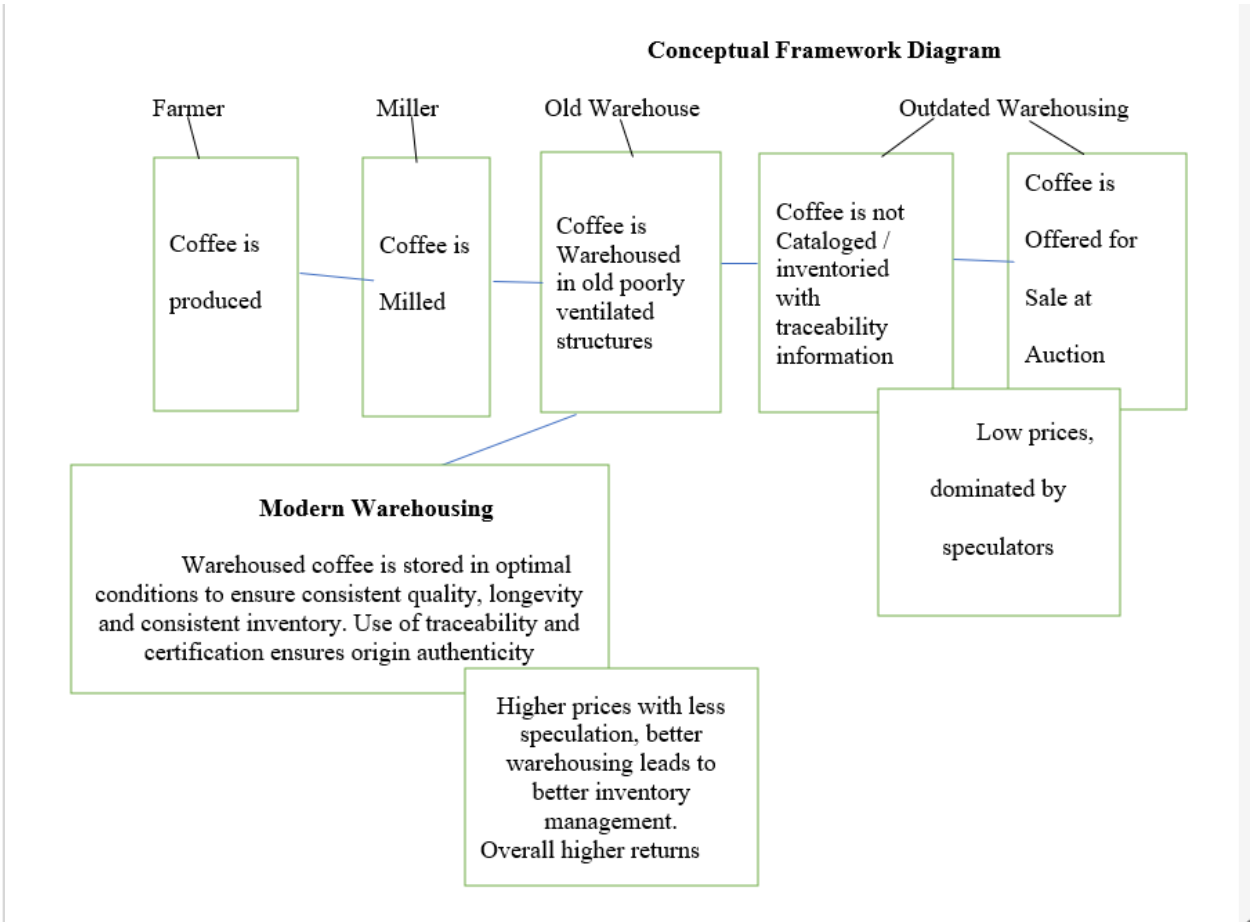


Figure 1. Framework Diagram.

Mulli. B (2025)

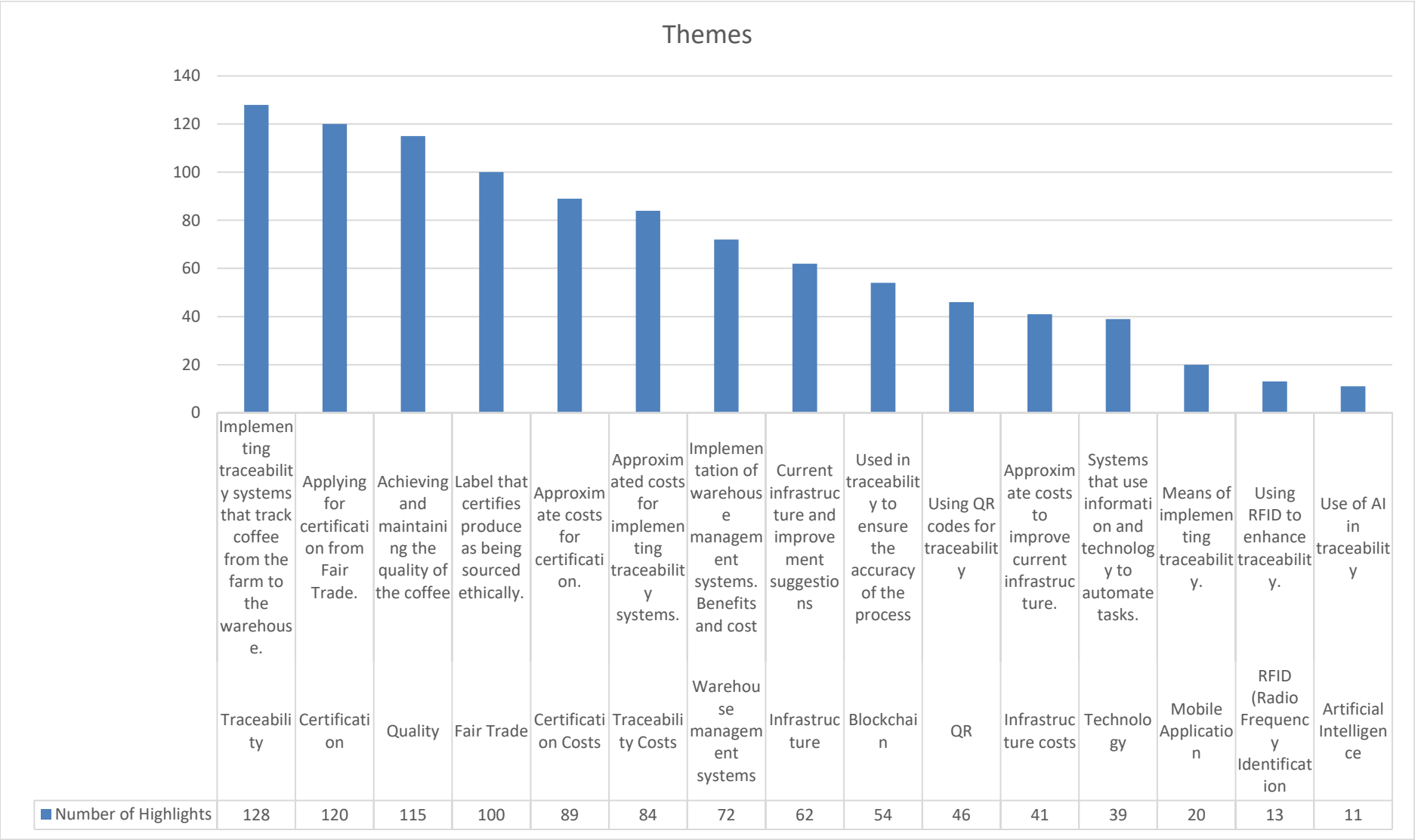


Figure 2 Themes

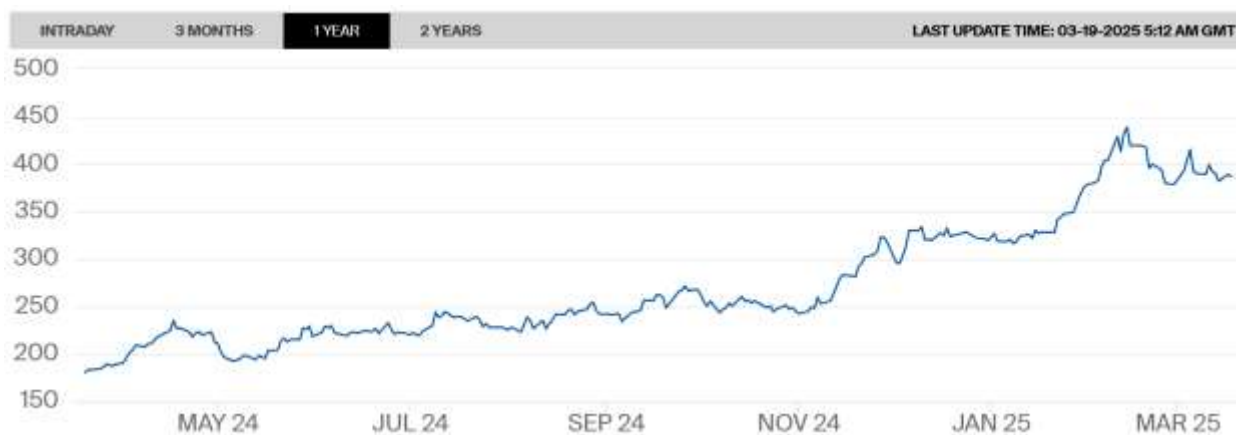


Figure 3 Intercontinental Exchange historical coffee prices

(Intercontinental Exchange, Inc. n.d.).

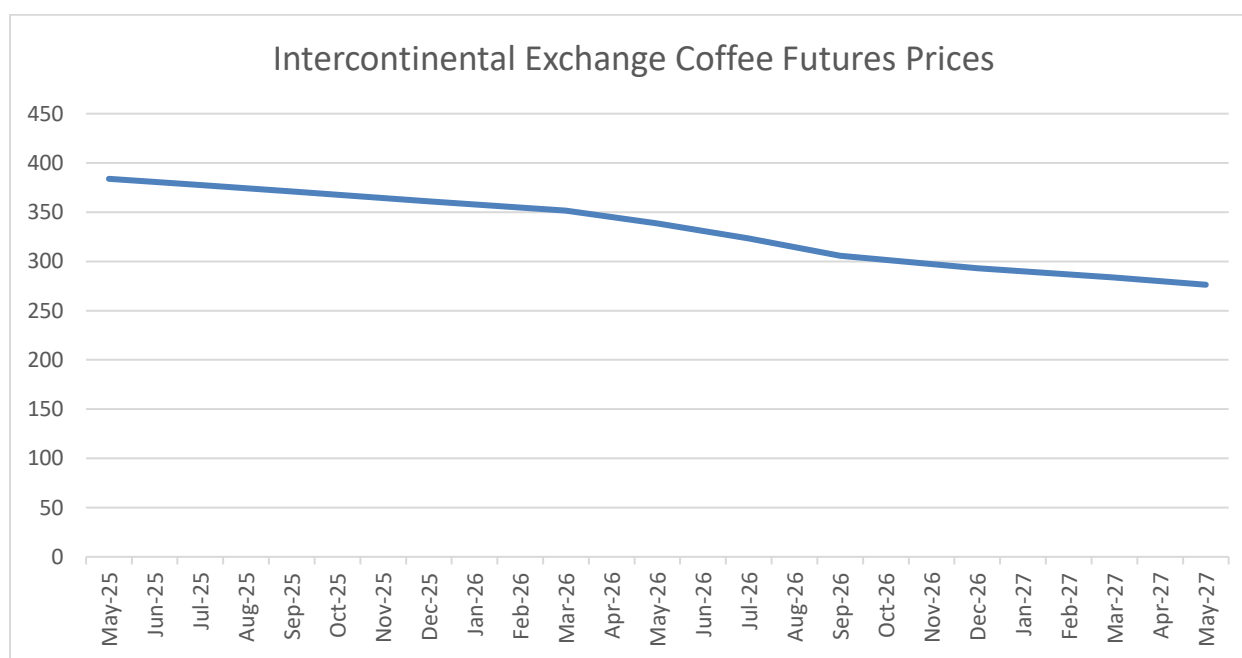


Figure 4. Coffee futures (Intercontinental Exchange, Inc. n.d.).

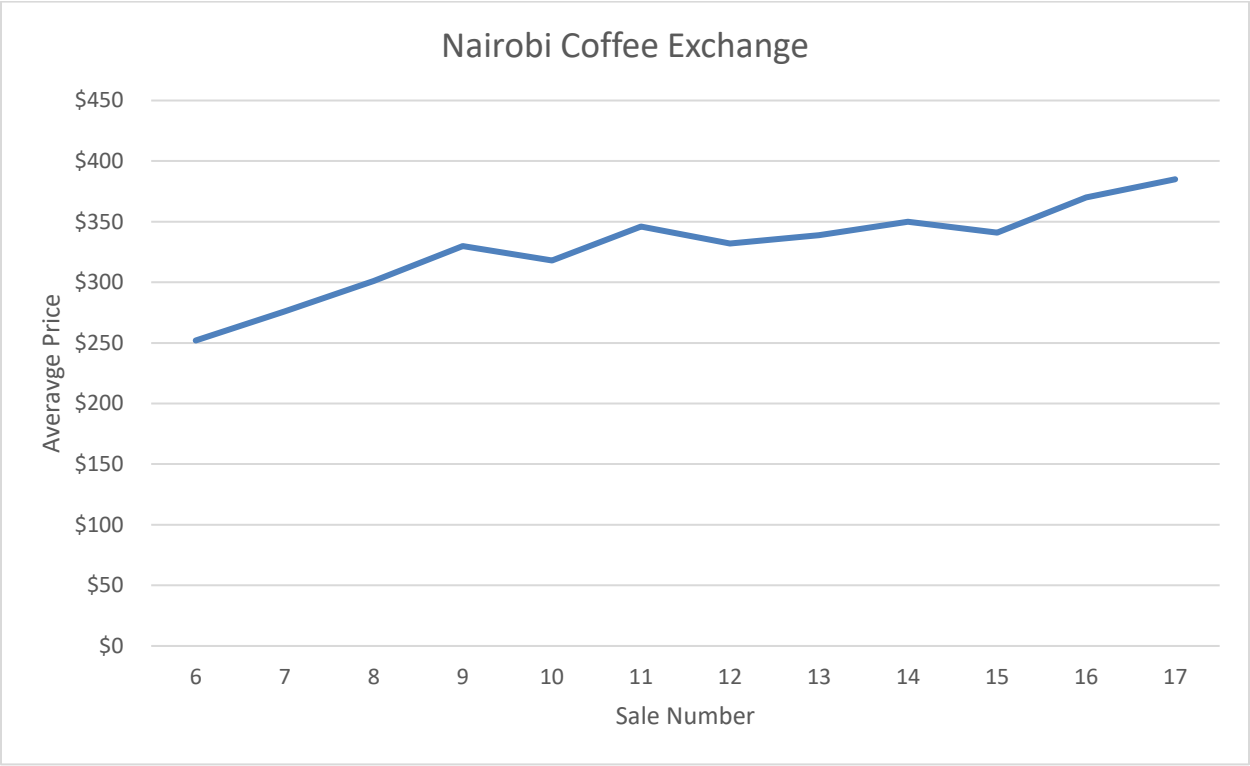


Figure 5. Nairobi coffee auction prices NCE (2024)