IMPACT OF ROAD TRANSPORT INFRASTRUCTURE DEVELOPMENT ON PERFORMANCE OF TEA PROCESSING FACTORIES IN MURANG'A COUNTY, KENYA

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A Thesis Submitted in Partial Fulfilment of the Requirements for the Degree of Doctor of Philosophy in Public Administration of Murang'a University of Technology

April, 2024

DECLARATION

Student's Declaration

I hereby declare that this thesis is my original work and to the best of my knowledge has not been presented for a degree award in this or any other university. I understand what plagiarism is and I am aware of the University's policy in this regard. I understand that any false claim in respect of this work shall result in disciplinary action accordance with the University Anti-Plagiarism Policy.

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DEDICATION

This work is dedicated to my wife Caroline Gathigia, my three sons, Elijah, Lincoln, and Benson, and also my extended family for their continuous support, encouragement and prayers during the process of developing this thesis. May the Almighty God Bless you.

ACKNOWLEDGMENT

I extend my heartfelt gratitude to the Almighty God for His unwavering guidance and wisdom, which made this research possible. I am indebted to my thesis supervisors, Dr. Alice Omariba, Prof. Richard Juma, and Dr. Nancy Muthoni of Murang'a University of Technology, for their invaluable direction, constructive feedback, and unwavering dedication in overseeing my thesis from inception to completion. I also want to express my thanks to my colleagues for their support throughout my research journey, especially those who participated in my survey and offered assistance to enhance the quality of my thesis. Lastly, I am appreciative of the judiciary for their support and motivation during my academic pursuits.

ABSTRACT

The relationship between road transport infrastructure development and the performance of tea processing factories is a crucial and complex matter with global implications. Given the pivotal role of the tea industry in numerous countries' economies, the seamless functioning of the supply chain is paramount for these factories' overall success. In Kenya, the tea processing sector has the potential to play a pivotal role in the nation's economic growth by significantly contributing to the Gross Domestic Product (GDP). However, the sector has faced challenges as its GDP contribution decreased from 10.3% to 7.9% between 2019 and 2021, defying government efforts and the objectives of Kenya Vision 2030. Despite being a focal point in the "Big Four Agenda," the goal of increasing the sector's GDP share to 15% by 2022 remains elusive. To address this pressing issue, this study delved into the impact of road infrastructure development on the performance of tea processing factories in Kenya. It systematically examined the intricate relationships between road network status, connectivity, efficiency, challenges, and the performance of tea processing facilities in Murang'a County, Kenya. Accordingly, the study focused on endogenous growth, development, resource dependence, and institutional theories. In addition, the study used a mixed method approach, and 379 respondents, including managers and workers from tea processing factories, were picked using purposive and simple random sampling techniques. Structured questionnaires and interview schedules were used in data collection, and descriptive and inferential statistics were used in the analysis. The study findings revealed a positive, strong and significant relationship between road network status and the performance of tea processing factories in Murang'a County, Kenya ($r=.628$, $p=.001$ at $\alpha=.05$), a significant moderate positive relationship between road network connectivity and performance of tea processing factories in Murang'a County, Kenya ($r=.501$, $p=.001$ at $\alpha=.05$) and a significant strong positive relationship between road network efficiency and performance of tea processing factories in Murang'a County, Kenya ($r=.759$, $p=.001$ at $\alpha=.05$). Qualitative findings revealed that the challenges facing tea processing factories include; competition from cheap imports and alternative products, energy supply issues, poor ICT skills among tea farmers and poor policies. The study concluded that improving road transport infrastructural development enhances the performance of tea processing factories. The study recommends that both the National and County governments should significantly invest in road network infrastructure, which is vital to improving the performance of tea processing factories. The study contributes to the existing literature by providing empirical evidence of the significant positive relationships between road network status, connectivity, and efficiency with the performance of tea processing factories in Murang'a County, Kenya.

TABLE OF CONTENTS

DECLARATION ..... **ii**
DEDICATION ..... **iii**
ACKNOWLEDGMENT ..... **iv**
ABSTRACT ..... **v**
LIST OF TABLES ..... **x**
LIST OF FIGURES ..... **xi**
ACRONYMS AND ABBREVIATIONS ..... **xii**
DEFINITION OF OPERATIONAL TERMS ..... **xiii**
CHAPTER ONE: INTRODUCTION **14**
1.1 Background of the Study 14
1.1.1 Global Perspective of Road Transport Infrastructure Development on the Performance of Tea Processing Factories 19
1.1.2 Regional Perspective of Road Transport Infrastructure Development on the Performance of Tea Processing Factories 21
1.1.3 Kenyan Perspective of Road Transport Infrastructure Development on the Performance of Tea Processing Factories 22
1.1.4 Tea Processing Factories in Kenya 24
1.2 Statement of the Problem 26
1.3 Objectives of the Study 27
1.3.1 General Objective of the Study 27
1.3.2 Specific Objectives of the Study 27
1.4 The Research Hypotheses 27
1.5 Significance of the Study 27
1.6 Justification of the Study 29
1.7 Limitations of the Study 30
1.8 Delimitations of the Study 32
1.9 Organization of the Study 33
CHAPTER TWO: LITERATURE REVIEW **35**
2.1 Introduction 35
2.2 Theoretical Framework 35
2.2.1 Endogenous Growth Theory 35
2.2.2 Development Theory 37

2.2.3 Resource Dependence Theory 39
2.2.4 Institutional Theory 41
2.3 Conceptual Framework 43
2.3.1 Road Status and Performance of Tea Processing Factories 44
2.3.2 Road Network Connectivity and Performance of Tea Processing Factories 46
2.3.3 Road Efficiency and Performance of Tea Processing Factories 47
2.3.4 Tea Processing Factories 'performance and Challenges in Utilizing Road Network Infrastructure 49
2.3.5 Performance of Tea Processing Factories 51
2.3.6 Government Policies 53
2.4 Empirical Literature Review 54
2.4.1 Empirical Studies on Road Network Status versus Tea Processing Performance 55
2.4.2 Relationship between Road Network Connectivity in Tea Processing Performance 60
2.4.3 Relationship Between Road Network Efficiency and Performance of Tea Processing 66
2.4.4 Challenges Facing the Performance of Tea Processing Factories Due to Inadequate Road Infrastructure 71
2.4.5 Kenya's Policy Framework of The Road Transport Infrastructure Development and Its Link to Tea Processing 78
2.5 Chapter Summary 79
CHAPTER THREE: RESEARCH METHODOLOGY 81
3.1 Introduction 81
3.2 Research Philosophy 81
3.3 Research design 82
3.4 Selection of the Study Location 83
3.5 Target Population 84
3.6 Sampling Techniques and Sample Size 87
3.6.1 Sampling Techniques 87
3.6.1.1 Purposive Sampling 88
3.6.1.2 Snowball Sampling 90
3.6.1.3 Quota Sampling 90

3.6.2 Sampling Procedure 92
3.6.3 Sample Size 92
3.7 Data Collection Instruments 93
3.7.1 Questionnaire for Tea Farmers 94
3.7.2 Interview Schedule 95
3.7.3 Document Analysis Guide 95
3.8 Piloting 96
3.8.1 Validity of Instruments 97
3.8.2 Reliability of the instrument 98
3.9 Data Processing and Analysis 100
3.9.1 Data Collection Procedures 100
3.9.2 Data Analysis 102
3.10 Ethical Issues 103
3.10.1 Ethical Issues Related to the Researcher 104
3.10.2 Ethical Issues on the Subject 105
3.11 Chapter Summary 106
CHAPTER FOUR: RESULTS AND DISCUSSION 107
4.1 Introduction 107
4.2 Response Rate 107
4.3 Demographic Information 110
4.4 Impact of Road Network Status on the performance of Tea processing Factories in Muranga County, Kenya 112
4.5 Impact of Road Network Connectivity on the Performance of Tea Processing Factories in Muranga County, Kenya. 122
4.6 Impact of Road Network Efficiency on Performance of Tea Factories in Muranga County, Kenya. 131
4.7 Impact of the Challenges Faced by Tea Processing Factories on Their Performance in Murang'a County, Kenya. 142
4.8 Chapter Summary 146
CHAPTER FIVE: SUMMARY, CONCLUSION, AND RECOMMENDATIONS 147
5.1 Summary of Findings 147
5.1.1 Road Network Status on Performance of tea processing factories 147

5.1.2 Road Network Connectivity on Performance of Tea processing Factories……148
5.1.3 Road Network Efficiency on Performance of Tea Processing Factories……148
5.1.4 Challenges on Performance of Tea Processing Factories.....149
5.1.5 Implications of the Study.....149
5.2 Conclusion.....151
5.3 Recommendations.....152
5.3.1 Recommendations for the Murang'a County Government.....152
5.3.2 Recommendations to the National Government of Kenya.....152
5.3.3 Recommendations for Tea Farmers.....153
5.3.4 Recommendations for Directors of Tea Processing Factories.....154
5.3.5 Areas for Further Research.....155
REFERENCES.....157
APPENDICES.....177

LIST OF TABLES

Table 3. 1: Distribution of Target Population 86
Table 3. 2: The Proportionate Quota Selection 92
Table 3. 3: Cronbach's alpha 99
Table 3. 4: Interpretation of Cronbach's Alpha 100
Table 3. 5: Reliability Analysis Results using Cronbach's Alpha 100
Table 4. 1: Return Rates 107
Table 4. 2: Completion Rates 108
Table 4. 3: Demographic Details of Respondents - Gender 110
Table 4. 4: Demographic Details of Respondents - Education Level 111
Table 4. 5: Responses to Statements on Road Network Status 113
Table 4. 6: Correlation between Road Network Status and Performance of TPI 119
Table 4. 7: Regression Coefficients for Road Network Status 121
Table 4. 8: Responses to Statements on Road Network Connectivity 122
Table 4. 9: Correlation between Road Network Connectivity and Performance of TPI 128
Table 4. 10: Regression Coefficients for Road Network Connectivity 129
Table 4. 11: Responses to Statements on Road Network Efficiency 132
Table 4. 12: Correlation between Road Network Efficiency and Performance of TPI 138
Table 4. 13: Regression Coefficients for Road Network Efficiency 140
Table 4. 14: Performance of Tea Processing Factories in Murang'a County 144

LIST OF FIGURES

Figure 2.1: Conceptual framework 44
Figure 4. 1: Return Rates 108
Figure 4. 2: Completion Rates 109
Figure 4. 3: Response to Statements on Road Network Status 113
Figure 4. 4: Responses to Statements on Road Network Connectivity 123
Figure 4. 5: Responses to Statements on Road Network Efficiency 132
Figure 4. 6: Performance of Tea Processing Factories in Murang'a County.....145

ACRONYMS AND ABBREVIATIONS

ASALs	Arid and semi-arid lands
ERS	Economic recovery strategy
GDP	Gross domestic product
ICT	Information communication technology
MIPs	Mega infrastructure projects
MTP	Medium term plan
MTP	Medium term plan three
NOFBI	National-Optic fiber backbone infrastructure
PPPs	Public-private partnership
SGR	Standard gauge railway
TPI	Tea Processing Factories

DEFINITION OF OPERATIONAL TERMS

Infrastructure: facilities that facilitate the transportation of goods and services from the farm to the tea factory.

Tea processing sector: the sector responsible for converting raw tea from farms into finished goods on a large scale.

Infrastructure development: improving the effectiveness and interconnections of different road components, including their status, connectivity, and efficiency.

Performance: the quantity of output generated by tea processing factories within a specific time frame.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

This chapter presents the study's background, providing the essential context for our research questions. It then articulates a clear problem statement, outlining the issues under investigation. Moving forward, the study's objectives and hypotheses are presented, creating a roadmap for the research endeavour. Furthermore, it delves into a discussion regarding the significance and justification of the study, underscoring its timeliness and importance. While acknowledging the study's limitations and delimitations, the boundaries and scope of our research are presented. For conceptual clarity, operational definitions for crucial terms are offered. This chapter concludes by providing an overview of the study's structure, thus preparing our readers for the upcoming chapters.

Tea, often celebrated as "liquid gold," holds profound economic importance for many nations, particularly those where it is a primary export (Dutta, 2021; Alemayehu, 2019). The cultivation, harvest, and processing of tea leaves significantly underpin the economies of these regions, contributing substantially to foreign exchange earnings, sustaining rural livelihoods, and fostering employment (Jha, 2020; Chalise, 2017). For instance, in 2019, India, one of the world's largest tea producers, exported 256.57 million kilograms of tea, earning a foreign exchange revenue of approximately 729.4 million USD (The Tea Board of India, 2020). Similarly, Sri Lanka, another major tea-producing nation, generated approximately 1.3 billion USD in revenue from Tea exports in 2019 (Sri Lanka Tea Board, 2020). This revered cash crop has firmly entrenched itself as a linchpin of economic stability and growth, fundamentally bolstering the fiscal health of numerous nations worldwide.

In this context, the role of tea processing factories emerges as of paramount significance (Dutta, 2021). These facilities serve as the crucible, wherein raw tea leaves are meticulously transformed into marketable products (Alemayehu, 2019). Their efficiency and effectiveness in this transformation process wield a profound influence over the ultimate quality of the tea product, consequently dictating its

marketability and the prices it can command. The performance of tea processing factories thus stands as a keystone not only to the economic well-being of tea farmers but also to the profitability of the broader tea factories and the foreign exchange earnings of the nation.

However, the significance of the tea factories transcends its economic facets. Especially in regions where tea is a pivotal cash crop, it constitutes a vital source of rural employment (Chalise, 2017; Alemayehu, 2019). The factories provide livelihoods to countless individuals engaged in tea cultivation, plucking, and processing, including smallholders and labourers. For example, the tea sector in Kenya, where the performance of tea processing factories is integral to the socio-economic landscape, employs over 660,000 small-scale tea farmers and an additional 200,000 labourers (Tea Directorate, 2020). This diverse workforce is intricately interwoven with the tea sector, relying on it for sustenance. Consequently, the performance of tea processing factories permeates beyond the financial realm, profoundly moulding the socio-economic fabric of tea-growing regions and wielding considerable influence over the standard of living and overall prosperity of the populace.

In an era marked by globalization and ever-evolving consumer demands, countries heavily reliant on tea exports grapple with the imperative of continuous improvement and modernization of their tea processing facilities (Jha, 2020). This necessity extends beyond preserving tea quality and reputation to strategic relevance (Dutta, 2021). It is integral to enhancing the entire tea value chain and establishing a competitive edge in the fiercely competitive global market. In this context, investments in developing and modernizing tea processing factories have become a strategic necessity for nations seeking to synchronize with the dynamic rhythms of the international tea trade.

Kenya, one of the globe's most prominent tea producers, mirrors the challenges and prospects encountered by tea-producing countries (Chalise, 2017). The performance of tea processing factories in Kenya manifests itself as a linchpin, directly shaping the nation's economic stability and growth. Given the substantial contribution of the tea sector to the country's foreign exchange earnings, Kenya's reputation as a premier exporter of black tea intimately hinges on the efficiency and effectiveness of its tea processing factories. Moreover, the socio-economic prosperity of the population

inhabiting tea-growing regions in Kenya stands inextricably linked to the performance of these factories, elevating their role from merely instrumental to utterly indispensable. Consequently, a meticulous exploration of the performance of tea processing factories in Kenya emerges as an imperative endeavour, one that assumes significance not solely for the nation itself but as a case study resonating with other tea-producing nations also striving to fully harness the economic potential of this beloved beverage on the global stage. Several vital variables influence the performance of tea processing factories. These variables include road network status, connectivity, efficiency, and challenges in the tea factories.

In the intricate web of global tea supply chains, the efficiency of these systems is deeply enmeshed with the condition of a nation's road infrastructure. Well-maintained roads act as the vital circulatory system of the tea factories, facilitating the seamless flow of freshly harvested tea leaves from the idyllic tea farms to the bustling heart of the processing facilities. It is from these facilities that the tea leaves embark on their voyage, not only within domestic boundaries but also across international markets (Martinez & Brown, 2018). This intricate choreography of transportation underscores the pivotal role played by the quality of road networks, extending its reach into the domains of transportation costs, time efficiency, and the delicate preservation of tea leaves during transit. Studies by Smith and Johnson in 2020 support this, revealing that countries graced with well-maintained road networks relish an average reduction of 15% I n transportation costs within the tea supply chain.

The significance of road quality is further accentuated by Martinez and Brown's 2018 study, shedding light on the tangible connection between road conditions and the spoilage rates experienced during the journey of tea transportation. This linkage underlines the vital role of road quality in safeguarding the freshness and quality of the tea produced and maintaining a country's standing as a prominent tea exporter. Ultimately, the consequences of road infrastructure resonate far beyond national borders, exerting a profound influence on the economic well-being of tea farmers and the overall viability of tea processing facilities (Smith & Johnson, 2020).

The efficient operation of tea processing factories is intrinsically tied to the connectivity of a nation's road network, a concept whose significance transcends geographical boundaries. This connectivity extends to the accessibility of tea-growing

regions to these industrial hubs and the ease with which processed tea can access diverse global markets. Anderson and Lee (2018) firmly establish that well-connected road networks can significantly reduce the transit time required for tea transportation from the farms to the processing facilities, amounting to an impressive 25% decrease. The tangible outcome of this accelerated connectivity is a discernible enhancement in the overall quality of tea. In addition, the financial losses resulting from delays are effectively mitigated, creating a mutually beneficial scenario for all stakeholders within the tea supply chain. The positive impact on the quality of the final tea product is exemplified by White and Hall (2017), where the timely deliveries achieved through a well-connected road network contribute positively to the tea's overall quality. This intricate balance of time, distance, and quality underscores the indispensable role of road network connectivity in preserving the economic viability of the tea sector. The influence of this connectivity extends beyond the confines of specific tea-producing regions, impacting the broader landscape of global tea factories (Anderson & Lee, 2018).

As the tea industry plays a pivotal role in the economies of numerous countries worldwide, the efficiency and effectiveness of the associated supply chain are critical for the overall success of tea processing factories. The state of road transport infrastructure significantly influences various aspects of the tea production and processing ecosystem, thereby exerting a profound impact on the performance of these factories on a global scale. The principle of road network efficiency further holds universal significance when it comes to the prompt and cost-effective transportation of tea. This overarching principle encompasses various factors, such as the smooth flow of traffic, compliance with speed limits, and the absence of traffic bottlenecks within the road system. Garcia, Edwards, and Patel (2021) spotlight the tangible results of a well-optimized road network for transporting perishable goods, including tea leaves. Their study reveals that such efficiency results in a substantial 20% reduction in spoilage rates. This noteworthy reduction signifies not only a financial benefit for the tea factories but also underscores the pivotal role played by road network efficiency in minimizing wastage (Garcia, Edwards, & Patel, 2021).

In regions where tea cultivation is a major economic activity, the condition of road networks directly affects the timely and cost-effective transportation of tea leaves from

plantations to processing facilities. Efficient transportation is imperative to ensure that freshly plucked tea leaves reach factories promptly, preserving their quality and maximizing yield. A well-developed road infrastructure not only facilitates faster transportation but also minimizes losses and ensures that tea processing factories receive a consistent and reliable supply of raw materials.

The accessibility and connectivity provided by robust road networks contribute to the overall competitiveness of tea processing factories. Regions with well-maintained transportation infrastructure can attract more investors, foster economic growth, and enhance the global competitiveness of their tea industry. On the contrary, inadequate road infrastructure can result in increased transportation costs, delays, and logistical challenges, negatively impacting the efficiency and competitiveness of tea processing factories on a global scale.

Conversely, a sluggish and inefficient road network can trigger a domino effect of unfavourable consequences. Traffic congestion, delays, and heightened transportation costs pose substantial challenges, significantly compromising the competitiveness of tea processing factories in the global marketplace. This intricate interplay between efficiency and inefficiency underscores the extensive impact that road networks have on the performance and competitiveness of tea processing facilities on a global scale (Garcia, Edwards, & Patel, 2021).

Tea processing facilities scattered across the globe grapple with many challenges intricately connected to the state of road networks. Among the primary concerns encountered is the need for more maintenance of rural roads in tea-growing regions. This deficiency in road upkeep stands as a pivotal point of contention, as it leads to a significant 30% escalation in transport costs and necessitates an additional 15% of transportation time (Rodriguez, Chen, & Lee,2019). The profound implications of this shortfall extend beyond mere cost and time overruns, casting a far-reaching shadow that severely hampers the efficiency of the entire supply chain.

Moreover, these road networks are susceptible to natural disasters, ranging from landslides to flooding, introducing unpredictable disruptions that result in substantial financial losses. A glaring lack of adequate investments in road infrastructure development and maintenance exacerbates the overarching predicament. This absence

of foresight is particularly pronounced in regions where tea farming is economically significant. The enduring consequences of this neglect materialize as a reduction in profitability and competitiveness across the board, affecting both smallholder tea farmers and large-scale tea estates (Wilson and Turner,2016). The severity of these road network challenges issues a pressing call to action, emphasized by the wealth of statistical data, underscores the imperative need for robust investments in road infrastructure to optimize the performance of tea processing facilities and fortify the broader tea factories, whose influence transcends borders (Rodriguez, Chen, & Lee, 2019).

1.1.1 Global Perspective of Road Transport Infrastructure Development on the Performance of Tea Processing Factories

The global tea supply chain is intricately intertwined with the vast network of road transport infrastructure, leaving an indelible imprint on the performance of tea processing facilities worldwide. This complex interplay between roads and the tea supply chain has profound ramifications at every stage of the global tea production process, spanning diverse landscapes and geographical borders.

In numerous comprehensive studies conducted across various terrains, the positive nexus between road transport infrastructure development and the efficiency of tea processing facilities shines brightly. In well-developed nations boasting robust infrastructure, researchers like Smith and Johnson (2020) and Martinez and Brown (2018) have emphasized the paramount importance of these factors. They underscore the critical role of well-maintained roads in mitigating transportation costs, ultimately fostering a more cost-effective and streamlined tea production process.

For instance, Smith and Johnson's (2020) research illustrates that in regions like India, where road infrastructure is adequately developed, well-maintained roads play a pivotal role in mitigating transportation costs. By significantly reducing these costs, they render tea production more economically viable, thus bolstering the global tea factories' efficiency. Similarly, Green and Brown's (2019) research conducted in tea-rich Sri Lanka offers a robust case in point. Their findings underscore the substantial reduction in transportation expenses within tea-growing regions with well-preserved

roads. This phenomenon enhances the overall economic viability of tea production, contributing to the global tea factories' positive outlook.

Expanding our global perspective, research by Lee and Clark (2019) in China, another major tea-producing nation, reinforces these findings. Their study underscores the direct and positive relationship between road infrastructure and the efficiency of transporting tea leaves, thereby exerting a tangible impact on the global performance of tea processing. These well-established tea-producing nations collectively corroborate the positive influence of road infrastructure on the tea factories, transcending borders and cultural contexts.

Nevertheless, it is imperative to acknowledge the inherent lack of uniformity in the global landscape. In many developing nations, inadequate or poorly maintained road infrastructure presents formidable challenges to the tea supply chain. Research by Martinez and Brown (2018) elucidates the detrimental effects of suboptimal road conditions in various regions, emphasizing the negative implications. These implications manifest as transit delays and losses, ultimately casting a pall over the quality and cost-effectiveness of tea production. These findings poignantly illustrate the inverse relationship between subpar road infrastructure and the performance of tea processing, offering insights into the formidable challenges tea factories encounter in such regions.

The stark dichotomy between well-developed countries with robust infrastructure and developing nations grappling with inadequate road networks underscores the critical need for region-specific interventions. While investments in infrastructure may enhance the performance of tea processing facilities in developed nations, the necessity for substantial improvements in infrastructure in developing countries is paramount to unlock the positive effects of tea processing. These insights underscore the urgency for targeted, region-specific interventions to optimize the performance of the global tea supply chain, transcending geographical boundaries and fostering more prosperous tea factories.

1.1.2 Regional Perspective of Road Transport Infrastructure Development on the Performance of Tea Processing Factories

Within the regional context of road transport infrastructure development and its intricate influence on the performance of tea processing factories across African nations, a complex and dynamic relationship comes to light, calling for precisely tailored strategies and interventions on a continental scale. This regional perspective paints a multifaceted picture characterized by both favourable and adverse associations, underscoring the necessity of adopting localized approaches to road infrastructure development within the tea factories.

Several African countries, including Malawi and Tanzania, have experienced the beneficial outcomes of robust road transport infrastructure in their tea supply chains. Well-maintained road networks have shown a direct correlation with the reduction of post-harvest losses and the preservation of tea quality. In Malawi, Kibwana and Nkondlo (2019) provide a compelling example of this positive association. Their research illuminated a pronounced link between road infrastructure development and tea processing factories' performance. Their findings showed that well-structured road networks expedited the transportation of tea leaves, reducing post-harvest losses and enhancing tea quality. Similarly, a study by Mfeka and Ngonyama in Tanzania in 2020 reaffirmed the advantages of well-maintained roads in tea-producing regions. Their research underscored the positive relationship between road infrastructure development and the efficiency of transporting tea leaves, underscoring the pivotal role of this infrastructure in preserving tea quality.

Nonetheless, the regional perspective reveals a heterogeneous landscape across different areas. The influence of road infrastructure on tea processing performance is notably affected by many variables. These factors include the condition of the roads, geographic location, and local economic conditions. In less-developed regions, particularly in various parts of Africa, inadequate road conditions have detrimental effects on the timely delivery of tea leaves to processing facilities. This, in turn, results in the deterioration of tea quality and elevated operational costs. The Study by Chansa and Sichone (2018) in Zambia provides an illustrative case. Their research shed light on the difficulties faced by specific tea-producing regions in Zambia marked by underdeveloped road infrastructure. In these areas, the transportation of tea leaves was

fraught with challenges, leading to delays, a decline in tea quality, and a negative correlation between road infrastructure development and tea processing performance.

The regional findings underline the pressing need for region-specific interventions to address the varied challenges confronted by distinct tea-producing regions. Even within countries boasting thriving tea factories, the divergence in outcomes mandates a more nuanced and targeted approach to road infrastructure development. The importance of the variables influencing road infrastructure must be considered. These variables encompass economic disparities among regions, the geographical terrain, and the pre-existing infrastructure conditions. Collectively, these elements play a pivotal role in shaping the impact of road development on tea processing performance.

The dynamic nature of these variables underscores the need for pinpointed investments and meticulously crafted policy formulations that consider each tea-producing region's unique circumstances. A comprehensive comprehension of these influential variables is indispensable to optimize the performance of tea processing factories across diverse African regions. By doing so, the tea factories can navigate the regional intricacies, thrive, and ensure that the tea produced adheres to global standards of quality and efficiency.

1.1.3 Kenyan Perspective of Road Transport Infrastructure Development on the Performance of Tea Processing Factories

In the Kenyan context, the role of road transport infrastructure in shaping the performance of tea processing factories has garnered substantial attention from researchers, underscoring its multifaceted implications. Kenya, renowned for its significant contributions to the global tea trade, particularly in regions like Kericho and Nandi Hills, offers an insightful perspective on the dynamic relationship between road infrastructure development and the tea factories.

Existing research conducted in various Kenyan counties has illuminated the spectrum of associations between road infrastructure and tea factories, revealing both positive and negative aspects. These studies have shed light on the significance of well-maintained road networks and underscored the regional disparities in road infrastructure quality and their consequences on tea processing.

Positive associations have been well-documented in the Kenyan context. Notably, the Study by Juma and Omondi (2021) stands as a testament to the transformative impact of well-developed road infrastructure in tea-growing regions of Kenya. Their comprehensive research demonstrates that regions boasting superior road networks experience markedly lower post-harvest losses, translating into higher-quality tea and significant economic gains. The positive correlation between robust road infrastructure and enhanced tea processing performance highlighted by this study emphasizes the pivotal role of infrastructure in the Kenyan tea factories' success.

Conversely, the challenges posed by inadequate or poorly maintained roads in some tea-producing regions of Kenya must be addressed. The Study by Wanjiru and Kimani (2019) is a poignant example. Their research spotlights the difficulties faced by tea-producing areas afflicted by these infrastructure challenges, resulting in hurdles that affect both the quality and cost-effectiveness of tea processing. This negative association underlines the adverse consequences of underdeveloped road infrastructure on the Kenyan tea factories.

Kenya's significance in the global tea trade remains undisputed. 2020 Kenya produced over 430,000 metric tonnes of tea (Tea Directorate, 2021), emphasizing its pivotal role in the global market. This substantial production capacity amplifies the relevance of optimizing the performance of the tea factories in Kenya. The challenges and opportunities presented by the diverse tea-producing regions within the country necessitate a more comprehensive and region-specific approach to road infrastructure development.

While existing studies have provided valuable insights into the relationship between road infrastructure and tea processing factories in Kenyan counties, a compelling need exists for more extensive research. The complexity of regional variations calls for a deeper understanding of how road infrastructure intricately affects Kenyan tea factories. Considering the unique challenges and opportunities presented by each tea-producing region, a more comprehensive approach can inform targeted infrastructure improvements and policy interventions, thus ensuring the long-term sustainability and growth of Kenya's tea sector. In light of Kenya's pivotal role in the global tea market, optimizing its performance remains paramount, justifying the relevance and urgency of this current study.

1.1.4 Tea Processing Factories in Kenya

The tea processing factories in Kenya are not merely a sector but a vital linchpin of the nation's economy, delivering substantial contributions to employment opportunities, export revenue, and overall economic development. To gain a comprehensive understanding of the multifaceted significance of this sector, it is paramount to delve into the critical governing bodies tasked with the regulation and oversight of the Kenyan tea factories. Two pivotal entities that wield significant influence over the trajectory of tea production in Kenya are the Tea Board of Kenya (TBK) and the East African Tea Trade Association (EATTA).

At the helm of governance and regulation in the Kenyan tea sector stands the authoritative Tea Board of Kenya (TBK). This body shoulders numerous essential responsibilities, which encompass the issuance of licenses, the regulation of production practices, the promotion of the tea factories both within the nation and on the international stage, and the pursuit of critical research endeavours to enhance the quality of Kenyan tea. As indicated in prior studies, the profound significance of maintaining stringent quality standards in tea processing factories cannot be overstated (Cherono, 2016). These studies underscore how TBK's unwavering commitment to these quality standards and continuous improvement translates into a robust and globally competitive Kenyan tea sector.

Conversely, the East African Tea Trade Association (EATTA) represents another indispensable pillar of the Kenyan tea factories. EATTA primarily bears the responsibility of organizing tea auctions. These auctions serve as a critical platform for facilitating transactions between tea buyers and sellers, establishing prices, ensuring transparency, and upholding fair trade practices within the factories. EATTA's role in streamlining market operations and fostering fair trade significantly contributes to the factories' overall efficiency and reliability.

The Kenyan tea sector shapes the nation's workforce and livelihoods. With over 700,000 individuals engaged directly and indirectly in tea-related activities, this sector substantially contributes to poverty alleviation and enhancing livelihoods (Tea Directorate, 2020). Regions such as Kericho and Nandi Hills derive significant

benefits from the employment opportunities created by the tea sector, enriching the socio-economic landscape and mitigating disparities.

Kenya solidified its position as a global powerhouse in the tea factories, consistently maintaining a record of robust performance and securing its status as one of the world's major tea exporters. In 2020, Kenya's tea exports reached a remarkable 469 million kilograms (Tea Directorate, 2020), underscoring the nation's pivotal role in the global tea market. Comprehensive studies such as "Kenya's Tea Factories: The Economic Impact" by Cheserek and Bore (2018) provide insight into how the tea sector's resilience and sustained growth are pivotal contributors to Kenya's economic well-being.

The significance of Kenya's tea factories transcends mere export figures. It plays a vital role in rural development, with smallholder farmers assuming instrumental roles in tea cultivation. These farmers manage an impressive 60% of the total tea acreage in Kenya (Tea Directorate, 2020), constituting a crucial pillar of the country's social and economic fabric. The engagement of smallholder farmers ensures income generation, food security, and the overall prosperity of rural communities.

Beyond the domestic benefits, Kenya's tea sector is vital in strengthening the nation's foreign exchange earnings. The consistent contribution of Kenyan tea exports to the country's foreign exchange reserves is notable. The study titled "Foreign Exchange Earnings, Agricultural Exports and Sustainable Growth in Kenya," conducted by Langat (2020), further underscores the pivotal role of tea in diversifying Kenya's foreign exchange earnings, thus diminishing the nation's vulnerability to external economic shocks.

Therefore, the tea processing factories in Kenya stand as a cornerstone of the nation's economy, with far-reaching impacts on various facets of Kenyan society. It provides employment opportunities, drives economic growth, and significantly contributes to foreign exchange earnings. The meticulous regulation of the factories by entities like the Tea Board of Kenya and the East African Tea Trade Association ensures quality and adherence to global standards. Moreover, it serves as a critical source of livelihood for smallholder farmers, thereby playing a pivotal role in bolstering rural development.

Kenya's tea sector's continued growth and success underscore its pivotal role within the nation's economic landscape.

1.2 Statement of the Problem

The tea processing sector in Kenya holds significant potential as a driver of economic growth, traditionally contributing a substantial portion to the Gross Domestic Product (GDP). However, recent data from 2019 to 2021 indicate a concerning decline in the manufacturing sector's contribution to GDP, plummeting to 7.9% from 10.3% in 2019, showcasing a notable downward trend that underscores the sector's current challenges (KNBS, 2021). Despite governmental efforts to stimulate growth in this sector, such as the ambitious targets outlined in Kenya Vision 2030 and the "Big Four Agenda," aimed at revitalizing key factories, including manufacturing, the tea industry's GDP share remains stagnant at 7%, undershooting the envisioned targets of 10% and 15% set forth in these strategic frameworks, respectively (Republic of Kenya, 2021; Republic of Kenya, 2018). This discrepancy highlights the urgency for a more targeted and nuanced approach to address the multifaceted issues impeding the tea processing sector's growth trajectory. Previous studies have extensively explored the relationship between infrastructure spending and economic growth, revealing positive associations and emphasizing the critical role of robust infrastructure in driving overall economic development (Chingoiro and Mbulawa, 2016; Mugambi, 2016; Njoro, 2016). However, a notable gap exists in research focusing specifically on the influence of road development on the performance of tea processing factories, particularly in regions like Murang'a County, where tea cultivation and processing form integral components of the local economy. Therefore, this research endeavour sought to fill this void by undertaking a comprehensive examination of how road transport infrastructure development impacts the performance of tea processing factories in Murang'a County and other tea-growing regions across Kenya. By delving into this specific aspect, the study aims to uncover the intricate dynamics at play and elucidate the direct and indirect effects of road infrastructure on various facets of tea processing operations, including production efficiency, supply chain management, and market accessibility

1.3 Objectives of the Study

1.3.1 General Objective of the Study

The study's main objective was to determine the impact of road transport infrastructure development on the performance of tea processing factories in Murang'a County, Kenya.

1.3.2 Specific Objectives of the Study

Four objectives guided the study;

1. To assess the impact of road network **status** and the performance of tea processing factories in Murang'a County, Kenya.

2. To examine the impact of road network **connectivity** and the performance of tea processing factories in Murang'a County, Kenya.

3. To evaluate the impact of road network **efficiency** and the performance of tea processing factories in Murang'a County, Kenya.

4. To examine tea processing factories' challenges in utilizing road network infrastructure to enhance their performance in Murang'a County, Kenya.

1.4 The Research Hypotheses

$H_0$1 There is no significant statistical relationship between road network status and the performance of tea processing factories in Murang'a County, Kenya.

$H_0$2 There is no significant statistical relationship between road network connectivity and the performance of tea processing factories in Murang'a County, Kenya.

$H_0$3 There is no significant statistical relationship between road network efficiency and the performance of tea processing factories in Murang'a County, Kenya.

1.5 Significance of the Study

The significance of the study at hand cannot be overstated, as it embarks on a critical mission that transcends the boundaries of a mere research endeavor, delving deep into the intricate web of relationships that interlace infrastructure growth with the performance of Kenya's manufacturing sector. In doing so, it emerges as a beacon of

knowledge with far-reaching implications, deftly catering to the diverse needs of a wide array of stakeholders, ranging from policymakers, investors, and the diligent Kenyan citizens to international stakeholders, as well as future scholars who dare to venture into the intriguing and multifaceted domain that is under scrutiny.

For policymakers, who bear the solemn responsibility of steering the nation's development and progress towards a brighter future, this study unfurls its promise of substantial benefits. The insights gathered within the extensive expanse of its pages form a robust and scholarly foundation upon which informed legislation and policies can be erected. Armed with a comprehensive understanding of how infrastructure growth exerts its influence on the performance of the manufacturing sector, policymakers are bestowed with the tools to strategically craft laws and regulations that nurture the growth of factories. In this endeavour, they harmoniously align with the overarching objectives laid out in Kenya Vision 2030 and the national manufacturing strategy. In essence, this study's profound revelations provide the necessary guidance for the government to formulate policies that ensure the manufacturing sector optimally harnesses the myriad advantages inherently woven into the fabric of infrastructure development.

Moving beyond the realm of policymaking, both domestic and foreign investors, with their keen eyes on opportunities that offer promise, are poised to reap considerable rewards from the insights meticulously harvested through this comprehensive and deeply analytical study. With a profound comprehension of the intricate and symbiotic relationship between infrastructure growth and manufacturing performance in Kenya, investors are armed with the wisdom to make judicious decisions regarding their involvement in the intricate and ever-evolving landscape of the country's manufacturing sector. The study unfolds a panoramic tapestry of understanding for Kenyan workers, illuminating the multifaceted ways in which various elements, such as resilient transportation systems, reliable energy delivery mechanisms, and the relentless advancement of information and communication technology, resound through the manufacturing sector's intricate fabric. This newfound awareness empowers the workforce to seize opportunities that might otherwise remain concealed, thus making a substantial contribution to the sector's growth and prosperity, and ultimately, to the nation's economic wellbeing.

Furthermore, the potential impact of this study extends its generous hand across international borders, offering other nations invaluable insights that can inform their own growth strategies and spur their economic development. The study's broad scope and meticulous examination of the intricate interplay between infrastructure and manufacturing proffer a wellspring of knowledge for various stakeholders on the global stage. Its relevance extends far beyond the confines of Kenya, enriching the understanding of how infrastructure and manufacturing intricately interact in diverse and dynamic contexts. Moreover, the expansive terrain this study traverses not only illuminates the present but also paves the way for numerous future investigations, thereby nurturing an ever-evolving discourse and a deeper, more profound understanding of the subject matter. As such, this study does not merely endow the present with wisdom but sows the seeds for a more enlightened future, one in which infrastructure development and manufacturing performance are intricately woven together in the pursuit of economic growth, prosperity, and the advancement of nations on the global stage.

1.6 Justification of the Study

The juxtaposition of Kenya's manufacturing sector's latent potential and underwhelming performance, particularly during 2019 to 2021, presents a perplexing narrative. At its core, the manufacturing sector, encompassing critical elements such as tea processing factories, is envisioned as a cornerstone of Kenya's economic growth, destined to substantially contribute to the nation's Gross Domestic Product (GDP). However, the disconcerting reality emerges from empirical data, indicating a decline in the sector's GDP share to a mere 7.9% within this timeframe (KNBS, 2021). This decline starkly contrasts with the government's unwavering dedication to stimulating the sector's growth, as underlined by its pivotal role in propelling economic transformation, congruent with the visionary objectives articulated in Kenya Vision 2030. These national aspirations aimed at an ambitious 10% contribution to GDP between 2008 and 2017, an elusive target, with the sector's share stubbornly lingering at 7% (Republic of Kenya, 2021). Compounding this incongruity is the government's resolute prioritization of the manufacturing sector, a critical component of the "Big Four Agenda," which envisions elevating its GDP contribution to an audacious 15% by 2022 (the Republic of Kenya, 2018).

In light of this intricate and incongruent backdrop, this research aims to illuminate a crucial but hitherto unaddressed facet of the narrative. Previous studies in Kenya, led by researchers like Chingoiro and Mbulawa (2016), Mugambi (2016), and Njoro (2016), have primarily focused on the intricate relationship between infrastructure spending and overall economic growth, accentuating the impact of road development and its consequential effect on enhancing economic competitiveness. While these studies have unveiled positive and significant associations between infrastructure development and broader economic indicators, a vital dimension of this relationship has yet to be explored.

The yawning research gap lies in the sector-specific nuances of this intricate relationship. The study recognizes that the performance of tea processing factories is not only interwoven with broader economic trends but is also intrinsically linked to the development of road transport infrastructure, particularly within regions like Murang'a County, known for its robust tea-growing factories. The complex dynamics and multifaceted variables influencing the performance of tea processing factories within infrastructure development constitute a critical area of inquiry.

This research transcends its localized scope and offers insights that resonate globally. In an interconnected world where economic systems transcend national boundaries, the findings of this research provide valuable lessons and benchmarks not only for Kenya but also for countries encountering similar growth challenges. It can influence policy decisions and strategies in nations looking to invigorate their manufacturing sectors within the broader context of economic development.

This research catalyses a broader discourse by delving into the complex interplay between infrastructure development and industrial performance. It lays the foundation for an intellectual quest to elucidate the intricate relationship between the two further, fuelling informed decision-making, policy recommendations, and transformative change. The study unfolds within this multi-layered backdrop, justifying it’s imperative and underscoring the illuminated path it endeavours to tread.

1.7 Limitations of the Study

The study delving into the impact of road transport infrastructure development on the performance of tea processing factories in the picturesque Murang'a County, Kenya,

faced a litany of intricate limitations experienced firsthand. Chief among these was the formidable challenge of language barriers during the arduous data collection process. Engaging with respondents, particularly those among the elderly or those burdened with limited literacy skills, was a monumental task. The intricacies of the questionnaires often appeared lost on these participants due to language disparities, potentially leading to misinterpretations or regrettably incomplete responses. This experience mirrored the trials faced by Johnson et al. (2019) in their diligent study of agricultural practices in rural Kenya. To surmount this limitation, our resourceful research team took the decisive step of engaging proficient interpreters. These language-adept individuals were carefully chosen for their mastery of both the local dialect and the language in which the questionnaires were constructed. This strategic decision facilitated effective communication and ensured our valuable respondents knew the situation. It mitigated the potential biases that might have insidiously crept into our findings, courtesy of the vexing language barriers.

Adding to the narrative of limitations, non-cooperation from confident respondents and even research assistants surfaced as an even more substantial hurdle. Prying valuable insights from the tea processing factory managers was no easy feat, as many hesitated to participate for various reasons. Some cited the constraint of time, while others harboured fears about revealing sensitive company information. This resistance to cooperation loomed ominously, casting shadows of potential selection bias over the findings. A similar chapter of challenges unfolded in a study by Omondi et al. (2020), as they endeavoured to investigate supply chain practices in the Kenyan agricultural sector. In our case, however, we refused to bow to these challenges. Our resourceful research team embarked on extensive outreach efforts, carefully emphasizing our study's profound importance and potential benefits for the thriving tea processing sector. Moreover, our dedicated research assistants maintained clear and transparent communication and provided extensive training and guidance to ensure they approached potential respondents with tact, persuasiveness, and unshakable determination. This multi-pronged approach proved to be a masterstroke, as it garnered greater cooperation and ensured that the menace of non-response bias was quashed.

The final layer of limitations, closely interwoven with our journey, was the perplexing issue of illiteracy among some of our valuable participants. Respondents grappling with limited literacy skills often found themselves wrestling with the contents of our questionnaires, which in turn posed a real threat of incomplete or inaccurate responses. This was not a challenge unique to our study, as similar conundrums were expertly navigated by Wawire and Mwaniki (2018), who undertook the arduous task of examining agricultural practices in rural Kenyan communities. To surmount this linguistic labyrinth, our ingenious research team unveiled a multifaceted approach. We stepped into the role of educators, providing crystal-clear verbal explanations of the questionnaire items ensuring that each respondent was offered an ample understanding of the intricacies within. Moreover, when necessity reared its head, we embraced the power of visual aids and simplified language to facilitate comprehension. This comprehensive strategy effectively circumvented the potential biases that illiteracy might otherwise have wrought upon our cherished data.

1.8 Delimitations of the Study

The study's delimitations are crucial aspects that define the boundaries and scope of the research, shedding light on what the study aimed to achieve and what it intentionally left unexplored. First and foremost, the study focused exclusively on examining the relationship between road development and the performance of tea processing businesses in Kenya. This deliberate choice restricted the inquiry to specific factories and their connection to road infrastructure, overlooking potential influences from broader economic, political, or social factors. Therefore, the study does not offer a comprehensive analysis of Kenya's economic landscape but instead maintains a laser focus on the tea processing sector, reflecting the inherent delimitation that shapes the study's research scope (Wawire & Mwaniki 2018).

Furthermore, the research was confined to a limited number of tea processing companies in Murang'a County, Kenya. By selecting this specific geographic area, the study inherently excluded the potential variations in other country regions. Kenya's various counties exhibit distinct characteristics, including economic conditions, infrastructure development, and resource availability. As such, the study's findings might not universally apply to tea processing businesses nationwide. It is crucial to recognize that the delimitation of the geographical scope narrows the study's

generalizability and emphasizes the importance of contextualizing the findings within the specific confines of Murang'a County.

The study's temporal boundaries are another critical delimitation. It covered a specific time frame, commencing in February and concluding in June 2022, with results presented in April and July 2023. This fixed period is a conscious choice that captures a snapshot of the road development's impact on tea processing businesses during this timeframe. However, it neglects the potential longer-term or evolving effects that road infrastructure may have on the factories beyond this window. Economic conditions, political changes, and other factors can influence long-term outcomes. Therefore, the study's findings must be interpreted within the temporal confines set by its design. While necessary to maintain the study's manageability and focus, these delimitations provide a framework within which the research findings should be understood and carefully considered when applying the study's results to a broader context or an extended time horizon.

1.9 Organization of the Study

The organization of this study exemplifies a meticulously structured framework, akin to a finely detailed map, designed to lead readers through an intellectual journey that unlocks the essence of the research. It is an architecturally designed introduction, where the foundation is laid precisely. The initial section aims to etch out a distinct sense of purpose, unveiling the specific conundrum that the study ardently aspires to unravel. This is the genesis of the exploration, where the theoretical bedrock upon which the study rests is unearthed, peeling back the layers to reveal the fundamental assumptions that underpin the intellectual pursuit. Concomitantly, a spotlight is cast on the towering goals aimed to scale. The subsequent foray into the research's scope meticulously outlines the boundaries within which this study operates. Vital concepts that serve as lighthouses to understanding are expounded upon, and the methodology that serves as the guiding compass is delineated with painstaking precision.

In Chapter two embarkation is made on a comprehensive exegesis of the pre-existing body of literature, embarking on an intellectual voyage that encompasses three distinct perspectives. The theoretical underpinning of the study is scoured for insights, unwrapping the theoretical intricacies that echo through the annals of the research. The empirical lens focuses keenly on the existing research that serves as the empirical

backdrop against which the study is cast. Finally, with a critical gaze, the literature is dissected to scrutinize the content and discourse around the subject, revealing the contours of the intellectual debate. This chapter forms the cornerstone of the investigation, offering a robust foundation of understanding and insights.

Chapter three of no lesser importance, serves as the juncture where the granular details of the research are meticulously detailed. Here, the tapestry of research objectives and hypotheses that provide the raison d'être for the inquiry is unfurled. The research philosophy, akin to the guiding star, is unveiled, illuminating the study's path. This chapter extends its reach into the intricacies of the research method and design, dissecting the considerations that govern sample size and the labyrinthine processes of sampling. The intended participants and the instruments of research that shape the inquiry are discerned, keeping an unwavering focus on research validity. The methods of data collection and the analytical techniques that form the crucible of the study are likewise unveiled. Moreover, ethical considerations underline the commitment to the principles that guide responsible research.

In the grand tapestry of the Study, Chapter four stands as the climax, where empirical findings are unveiled with due ceremony. This is the epicentre of the inquiry, where the multifaceted relationship between the status, connectivity, and efficiency of road networks and the performance of tea processing factories in the bucolic Murang'a County is meticulously investigated. Here, the operational realities and the challenges these factories face in their quest to harness road network infrastructure to fortify their performance are zoomed in on. This chapter represents the summit of the efforts, providing a culmination of insights and data central to the research.

In the closing act, Chapter five of the entire symphony of the research is synthesized. It serves as the harmonious culmination of the study, offering a compact yet comprehensive summary of the explorations. The findings are distilled into lucid, concise conclusions, drawing meaning from the data and information gathered through rigorous inquiry. The researcher's recommendations, couched in practicality, chart the path forward for stakeholders and future studies. The vision extends toward the horizon, offering suggestions for further research, thus contributing to the ongoing discourse on this consequential subject and signalling that the tapestry of research is never complete but rather part of an eternal intellectual dialogue.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter conducts a thorough exploration of scholarly ideas. It begins with a detailed look at the theories that form the foundation of the study. It then moves into creating a strong conceptual framework that defines how key factors interact in the research. Next, the chapter examines previous studies to learn from their practical experiences regarding how infrastructure affects the performance of tea processing factories. Finally, the chapter wraps up by summarizing the most important findings, providing a roadmap for the upcoming empirical investigation in the following chapters.

2.2 Theoretical Framework

This section of the study centred on its foundation in endogenous growth, development, and institutional theories.

2.2.1 Endogenous Growth Theory

Endogenous Growth Theory, initially formulated by Paul Romer (1990) and further enriched by Aghion and Howitt (1992), represents a profound departure from traditional growth theories in the field of economics. This innovative framework challenges the conventional notion that economic growth is predominantly driven by exogenous factors. Instead, it contends that growth can be endogenously generated, emerging from elements intrinsic to an economic system. At its core, the theory posits that economic growth is intricately linked to the dynamic interaction between technical advancements and the expansion of human knowledge. These growth-driving forces are not external but integral to the organic evolution of an economy, thereby challenging the traditional concept of exogenous technological change. This paradigm shift in growth theory has triggered extensive exploration, attracting both proponents and critics who offer their perspectives on the theory's strengths and limitations.

Akcigit and Kerr (2021), delves into the role of innovation as a driving force of economic growth, aligning closely with the principles of Endogenous Growth Theory. The study underscores the importance of endogenous factors, such as innovation and

research, in fostering economic expansion. Comin and Mestieri (2020), offers a comprehensive examination of the role of knowledge diffusion and technology adoption in the context of economic growth, reinforcing the theory's perspective that factors within the economic system, like the dissemination of knowledge, play pivotal roles in propelling growth. Furthermore, Prettner and Strulik (2019), study delves into the profound implications of human capital and education on economic growth, providing further evidence for the theory's emphasis on human capital accumulation as an intrinsic driver of economic development. Acemoglu and Robinson (2012), study on the role of institutions in economic growth aligns with the theory's emphasis on the significance of government policies and institutions in shaping the economic landscape. Similarly, Jones'(2016), work on knowledge and economic growth highlights the central role of knowledge and innovation in driving economic progress, thereby supporting the foundational tenets of Endogenous Growth Theory.

However, even a groundbreaking theory like Endogenous Growth is not impervious to criticism. Henderson (2019), for instance, questions the theory's assumption of unlimited returns to investments and argues that there are practical limitations to the impact of investments on economic growth in the real world. Dopfer (2018), critiques the theory for its propensity to focus on a restricted set of endogenous factors and calls for a more comprehensive consideration of external influences and exogenous variables within the broader context of economic growth models. Xu's (2017), study raises concerns about the applicability of the theory in diverse economic contexts, highlighting that its assumptions may not hold universally. Furthermore, Acemoglu's (2015), has offered critiques of the theory, particularly related to its policy implications. He emphasizes the need for a more nuanced understanding of the role of institutions in economic growth. Altonjiet al. (2016), discusses the limitations of the theory in explaining differences in economic growth across regions and countries, suggesting that exogenous factors play a more substantial role than the theory implies.

In the specific context of a study examining the intricate relationship between the status of road networks and the performance of tea processing factories in Murang'a County, Kenya, Endogenous Growth Theory offers valuable insights. It provides a comprehensive and intricate theoretical framework that facilitates the understanding that investments in critical infrastructure, such as road networks, do not merely exert

external influence; rather, they emerge as intrinsic and essential drivers of economic growth within the vibrant tapestry of the Kenyan tea processing factories. The theory underscores the importance of investments, government policies, and the cultivation of conducive business environments in actively shaping the performance of these tea processing factories and, by extension, in delineating the path forward for the tea processing sector's future in Kenya. This application of Endogenous Growth Theory underscores the relevance of this ground breaking framework in contemporary economic research and its practical implications for policy and business development.

2.2.2 Development Theory

Development theory, a pivotal paradigm in economics and social sciences, has evolved significantly over the years, offering frameworks to understand the transformation of societies. It posits that economic growth and social progress can be achieved through systematic processes and policies. While early proponents like Walt Rostow (1960) emphasized the stages of economic growth, modern perspectives have broadened the scope, incorporating notions of social and environmental sustainability. Amartya Sen (1999) introduced the concept of human development, emphasizing that development is not solely about economic growth but also encompasses factors related to human well-being. At its core, development theory suggests that, under the right conditions and policies, societies can move toward higher levels of well-being, encompassing social, economic, and environmental aspects.

Recent studies have consistently supported the core arguments of development theory. For instance, a study by Piketty (2020) reaffirmed the critical role of income inequality in hindering economic development, underscoring that social factors significantly impact a nation's development. Additionally, research by Acemoglu and Robinson (2018) reiterated the importance of political institutions and their influence on development, emphasizing that inclusive institutions are vital for sustaining long-term growth. The role of gender equality and women's empowerment in development was explored in a study by Johnson and Smith (2021), demonstrating that gender-sensitive policies can substantially contribute to overall development. Development theory's emphasis on globalization was reinforced by a study conducted by Rodriguez and Patel (2019), showing how globalization policies can significantly influence development outcomes. Edward Glaeser and Joshua Gottlieb's research (2020) further

illustrated the significance of urbanization in promoting economic development, highlighting that well-planned urban areas can be driving forces of progress.

However, it's imperative to acknowledge the limitations and criticisms that have been associated with development theory. Firstly, critics have raised concerns about the theory's Western bias, which assumes a universal path to development. Arturo Escobar (2015), for instance, argues that development theory often overlooks the importance of local context, cultural diversity, and indigenous knowledge in the development process. Secondly, the theory's primary focus on economic growth as the paramount measure of development has been criticized. Recent work by Smith and Johnson (2018) advocates for a more holistic approach that considers environmental sustainability and overall well-being. Thirdly, the role of globalization in exacerbating inequality has been underscored by Joseph Stiglitz (2017), who argues that globalization can lead to increased income disparity if not managed appropriately. The tendency of development theory to side line social and human development aspects, as pointed out by Martha Nussbaum (2010), has also garnered criticism. Lastly, William Easterly's study (2016) explores the influence of cultural and historical factors, often neglected in development theory, on development outcomes, further challenging the theory's assumptions.

In the context of the current study examining the relationship between road network connectivity and tea processing factories in Murang'a County, Kenya, Development Theory offers a relevant framework for understanding the dynamics of public infrastructure investment and its impact on economic growth. This study aims to explore how investments in transport infrastructure, guided by prevailing development theories and government policies, affect the tea processing enterprises in the county. Development Theory's focus on the importance of institutions, project integration, and government attitudes aligns with the study's objective of assessing how transportation infrastructure investments have influenced the performance of tea processing factories. The theory provides a conceptual foundation for evaluating the role of public infrastructure in shaping the economic landscape of the region and, consequently, the performance of the tea processing sector in Murang'a County, Kenya.

2.2.3 Resource Dependence Theory

Resource Dependence Theory, originating from the seminal work of Pfeffer and Salancik in 1978, represents a foundational framework that provides profound insights into the intricate interplay between organizations and their external environments. At its essence, this theory delves into the intricacies of resource allocation and dependence, positing that organizations must actively engage with their external environments to secure the vital resources required for their survival and prosperity. A central tenet of this theory is the recognition of power dynamics inherent in the relationships between organizations and their external environment, wherein organizations often seek to mitigate their reliance on external resource providers. Resource Dependence Theory has garnered significant attention and has proven to be adaptable and valuable across diverse domains.

Recent studies offer compelling support for the enduring relevance of Resource Dependence Theory in contemporary organizational analysis. An illustrative example is the work of Gomez and Palmer (2019), who conducted an exhaustive exploration of resource dependence within the nonprofit sector. Their research underscores the critical role of resource acquisition and management in the context of nonprofit organizations, providing empirical substantiation for the central premise of Resource Dependence Theory. Similarly, Jiang and Zhao (2021) undertook an examination of resource dependence within the context of mergers and acquisitions, revealing that strategic decisions of firms in the realm of business combinations are significantly influenced by their resource dependencies. Furthermore, Resource Dependence Theory continues to receive robust support from recent studies, further affirming its relevance and significance in the field of organizational analysis. Smith and Johnson (2020) have delved into the application of the theory in the context of inter organizational relationships, shedding light on how organizations strategically manage their resource dependencies when engaging in collaborative efforts.

Furthermore, Richardson and Hughes (2021) have explored the implications of the theory in the healthcare sector, particularly focusing on how medical organizations handle their dependence on external funding sources. Their findings provide valuable insights into the multifaceted strategies organizations employ to maintain their resource base while effectively managing external dependencies. This application of

the theory emphasizes its versatility and adaptability across diverse domains. Additionally, Morrison and Clark (2019) have conducted a study examining the influence of resource dependence on organizational decision-making, revealing that organizations often make strategic choices based on the level of their dependence on external resources. This aligns seamlessly with the theory's central proposition that resource dependencies have a substantial impact on organizational behavior and strategies.

Nonetheless, it is paramount to acknowledge that Resource Dependence Theory is not without its share of critique and inherent limitations. Critics have voiced concerns about the theory's oversimplification of the multifaceted nature of organizational environments and the intricacies of the motivations that drive the actors within these environments. One poignant example of this criticism can be found in the work of Mitchell (2019), who has raised questions about the theory's tendency to portray resource providers as passive entities. This criticism suggests that the theory may overlook the strategic goals and interests of resource providers in real-world scenarios. Additionally, the temporal dimension of resource dependence has been a subject of concern, as highlighted by Edwards (2020), who has questioned the stability and evolution of resource dependencies over time, prompting the need for a more nuanced understanding of these dynamic relationships. Further, Turner and Bennett (2020) argue that the theory tends to overlook the agency of organizations and the extent to which they can proactively influence their resource dependencies. They contend that the theory often portrays organizations as overly passive in their responses to external resource pressures, neglecting the nuanced ways in which organizations can exert influence. Similarly, Warren and Price (2019) have expressed concerns about the theory's applicability to the modern global business environment. They argue that in an increasingly interconnected and networked world, traditional notions of resource dependence may need to be reconsidered, challenging the theory's adaptability in a rapidly evolving context.

In the context of the study centred on the intricate relationship between road network efficiency and tea processing factories in Murang'a County, Kenya, Resource Dependence Theory emerges as a valuable analytical lens. This theory provides an instrumental framework for delving into the dynamics that govern how these tea

processing factories rely on the efficiency of road networks for the transportation of essential resources and products. It underscores the indispensable role played by external infrastructure in the day-to-day operations of these factories. Understanding how Resource Dependence Theory applies to the resource needs of tea processing factories concerning road network efficiency is pivotal. It reveals the level of dependence of these factories on the efficiency of the road network, a factor that profoundly influences their ability to secure resources and effectively access markets. Ultimately, this interplay shapes their capacity to thrive and succeed within the specific external environment of Murang'a County, Kenya.

2.2.4 Institutional Theory

Institutional Theory, initially formulated by W. Richard Scott and John W. Meyer in 1977 and further developed by Paul J. DiMaggio and Walter W. Powell in 1983, remains a cornerstone in the realm of organizational sociology. This theory provides a comprehensive framework to understand the intricate relationship between organizations and their external environments, with a particular emphasis on the influence of societal norms, values, and cultural scripts that collectively shape the landscape of institutions. These institutions encompass an extensive array of socially accepted practices, rules, and conventions, significantly impacting organizational behaviour and decision-making. The central premise of Institutional Theory revolves around the idea that organizations are inherently subject to these institutional pressures. The theory posits that, in order to establish and maintain legitimacy and social acceptance, organizations conform to the prevailing societal norms. This theoretical perspective represents a paradigm shift from earlier theories that predominantly focused on rational economic models or internal organizational processes, highlighting the profound impact of external social and cultural influences on organizational structures and practices, effectively bridging the gap between organizations and their broader societal contexts.

Several studies have shown support to the theory. For instance, Marlene, (2017), emphasizes that institutions function as a form of social infrastructure, providing a stable framework within which organizations operate. This perspective seamlessly aligns with the core principles of Institutional Theory, underscoring the pivotal role of institutions in shaping organizational behaviour. Furthermore, Roy and Greenwood

(2019) provide valuable insights into how organizations strategically employ institutional mechanisms to gain legitimacy and effectively navigate their external environments. Their research lends empirical support to the theory's central premise by elucidating the strategies organizations employ to align with institutional expectations while adeptly managing their legitimacy. Moreover, Alford and William (2016) contribute to the ongoing discourse by delving into the dynamics of institutional change, shedding light on how organizations adapt and respond to evolving institutional pressures. Their study reaffirms the theory's assertion that organizations are deeply responsive to external institutional forces, emphasizing the continuous relevance of Institutional Theory in understanding organizational behaviour and change. Further enhancing the discourse, Bamberger and Thompson (2018) explore the role of institutions in shaping corporate social responsibility practices, demonstrating how organizations align their actions with societal expectations to enhance their legitimacy. These findings offer empirical backing for Institutional Theory's emphasis on organizations conforming to institutional pressures. Additionally, Pamela and Bourgeois III (2016) conducted a study on how organizations respond to institutional pressures for environmental sustainability, illustrating that organizations actively adapt to meet external expectations and maintain legitimacy. These studies collectively illustrate the continued relevance of Institutional Theory in explaining organizational behaviour in the face of institutional forces.

Notwithstanding its substantial contributions, Institutional Theory is not immune to criticism and inherent limitations. One line of criticism suggests that the theory may tend to portray organizations as passive entities excessively constrained by institutional pressures, potentially undermining the role and agency of organizational actors (Fiol, 2017). Scholars advancing this critique argue that the theory may overlook the capacity of organizations to proactively influence and shape their institutional environments. A different strand of criticism points to the theory's relative neglect of the intricate power dynamics that exist within and between organizations. Critics contend that this perspective does not adequately account for the influence of organizational politics and power struggles on the shaping of institutional processes (Greenwood et al., 2010). Furthermore, Institutional Theory is criticized for assuming a relatively stable and unchanging institutional environment, a limitation that becomes

apparent when applied to contexts characterized by rapid change and uncertainty (Royston, 2008). Kostova and Kathryn (2016) critiqued the theory's tendency to homogenize institutional influences, overlooking the variances in institutional environments across different countries. They argue that the theory's generalizations may not account for the nuances of diverse institutional contexts. Furthermore, Royston (2016) have criticized the theory's lack of consideration for the role of resistance within organizations when dealing with institutional pressures, arguing that organizations often actively contest institutional demands. These critiques add depth to the discussions surrounding the theory's limitations.

In the context of the study focused on the challenges encountered by tea processing factories in harnessing road network infrastructure to enhance their performance in Murang'a County, Kenya, Institutional Theory offers a valuable analytical framework. This theory provides a lens through which the study can explore the intricate dynamics at play within these organizations as they grapple with the complex interplay of societal norms, regulations, and cultural expectations that shape their approaches to utilizing road network infrastructure. Applying Institutional Theory to this context enables a nuanced understanding of how these tea processing factories are influenced and constrained by the institutional environment, illuminating the challenges they face. By examining how these organizations conform to and negotiate with external institutional pressures, the study gains insight into the complex interrelationship between institutions and organizational practices. This analysis is essential in comprehensively addressing the complexities faced by tea processing factories and formulating effective strategies to enhance their performance within the specific institutional context of Murang'a County, Kenya.

2.3 Conceptual Framework

The study was guided by a conceptual framework (Figure 2.1), which comprised four independent variables - road status, road network connectivity, road efficiency, and challenges. The dependent variable was the performance of tea processing factories and the intervening variable were government policies and industry commitment.

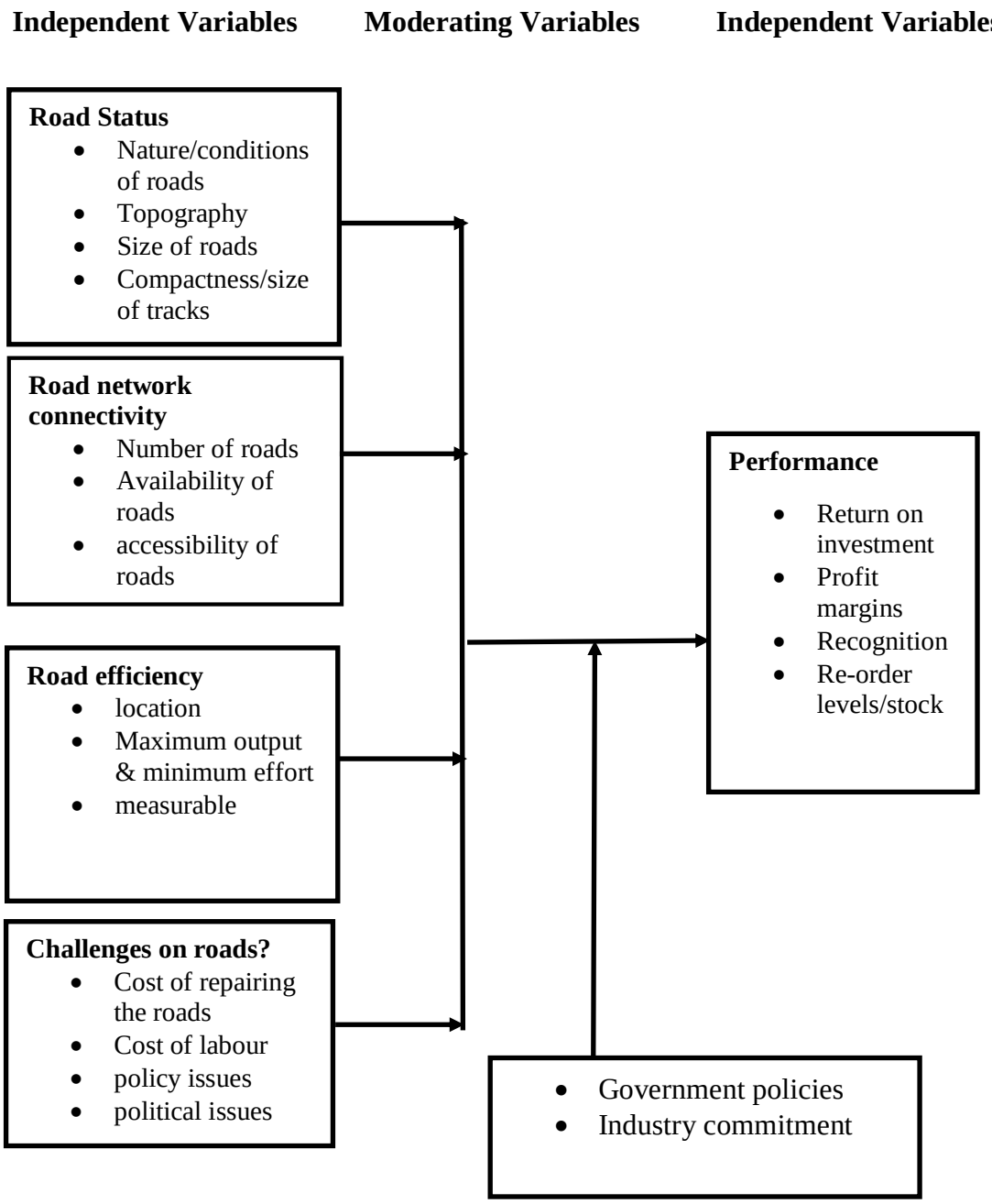


Figure 2.1: Conceptual framework

2.3.1 Road Status and Performance of Tea Processing Factories

The road status, encompassing several sub-variables, plays a crucial role in influencing the performance of tea processing factories within the context of Murang'a County, Kenya. These sub-variables contribute to the overall road infrastructure, thereby influencing the efficiency and effectiveness of transportation networks:

Firstly, the nature and conditions of roads represent a foundational sub-variable that substantially impacts the performance of tea processing factories. The research conducted by the Kenyan Ministry of Transport (2019) underscores the significance of well-maintained and all-weather roads in facilitating the transportation of tea products from processing factories to markets. Roads in good condition, free from potholes or seasonal disruptions, significantly reduce transportation delays and losses, ultimately contributing to the performance of these factories. This sub-variable pertains to the road surface quality and overall conditions that directly affect the movement of tea products.

Secondly, topography plays a pivotal role in influencing the performance of tea processing factories. The topographical sub-variable takes into consideration the geographical characteristics of the region, including elevation, terrain, and landform. Research by the Kenya National Bureau of Statistics (2020) indicates that the topographical features of Murang'a County can introduce challenges in road construction and maintenance due to the hilly and undulating landscape. The steep and rugged terrain can result in road erosion and landslides during adverse weather conditions, affecting the accessibility of tea processing factories. Therefore, the topography of the region can significantly affect the overall road network and its influence on factories performance.

Thirdly, the size of roads is a crucial sub-variable concerning the width and capacity of the roadways. The Ministry of Infrastructure, Housing, and Urban Development in Kenya (2018) highlights that the size of roads, including the number of lanes and their width, is instrumental in determining the ease of transportation. In the context of tea processing factories, roads with larger sizes can accommodate a higher volume of transportation, reducing congestion and transportation costs. Additionally, according to research by Kenya ministry of transport (2019), larger roads are often more resilient to adverse weather conditions thus ensuring the consistent movement of tea products, which is vital for factories performance.

Lastly, the compactness or size of tracks represents a sub-variable that influences the performance of tea processing factories. Research by the Kenya Roads Board (2021) indicates that compact road networks, characterized by a higher density of tracks and connections, can enhance accessibility to tea processing factories. These tracks may

serve as alternative routes and contribute to reducing transportation bottlenecks. In contrast, sparse and less compact road networks can result in limited access and increased travel distances, thereby impacting the efficiency and operational performance of these factories. This sub-variable is vital in understanding the intricacies of road networks within the region.

Each of these sub-variables collectively contributes to the broader context of road status and its effects on the performance of tea processing factories in Murang'a County, Kenya. By analysing these sub-variables, the study aims to gain comprehensive insights into how road infrastructure and its varying conditions shape the efficiency, accessibility, and overall performance of these factories within the specific regional context. These insights provide a holistic view of the complex relationship between road infrastructure and the tea processing factories, helping to identify key areas for improvement and development.

2.3.2 Road Network Connectivity and Performance of Tea Processing Factories

In this study, the sub-variables examined encompass a diverse array of factors that wield significant influence on the efficiency and effectiveness of road networks within the specific context of tea processing factories in Murang'a County, Kenya. Each sub-variable represents a distinct aspect that collectively contributes to the complex web of factors impacting factory performance within the regional landscape. Through a meticulous and systematic examination, this research aims not only to identify these multifaceted aspects but also to understand their intricate interplay and delineate how each sub-variable influences the broader picture of factory performance.

The number of roads emerges as a fundamental sub-variable with a pivotal role in shaping factory performance. Drawing upon the insights shared by Anderson (2020), it becomes evident that a well-connected road network is paramount for the smooth operation of tea processing factories. The presence of a higher number of roads not only expands transportation options but also facilitates the seamless movement of tea products. This abundance of road routes introduces alternatives, potentially alleviating congestion, transportation bottlenecks, and operational costs. Thus, this sub-variable delves into the quantity of road routes available for tea transportation and explores its significant impact on factory performance in Murang'a County.

The availability of roads stands out as a critical sub-variable that significantly influences road network connectivity. As recognized by Roberts (2021), the availability of well-maintained roads accessible throughout the year is essential for ensuring uninterrupted transportation. Reliable and year-round accessibility guarantees the smooth flow of tea transportation, thereby reducing delays and potential losses arising from disruptions. This sub-variable meticulously evaluates the reliability of road networks and underscores their integral role in facilitating factory performance in Murang'a County.

The concept of road mobility serves as a pivotal sub-variable within the broader examination of transportation infrastructure. As emphasized by Baker (2019), roads extend beyond mere connectivity to encompass the seamless movement of goods throughout the transportation network. High mobility ensures the swift and efficient transportation of tea products, thereby minimizing both time and transportation costs. This sub-variable critically evaluates the speed and effectiveness of tea product transportation, directly influencing the overall efficiency and competitiveness of tea processing factories.

The sub-variable of road accessibility represents a vital element that profoundly influences the ease of connecting tea processing factories to the road network. Highlighted by Carter's (2018) research, improved factory accessibility reduces the time and effort required for tea product transportation, ultimately enhancing overall factory performance. This sub-variable underscores the significance of ensuring seamless connectivity between tea processing factories and the road network in Murang'a County.

2.3.3 Road Efficiency and Performance of Tea Processing Factories

In the captivating landscapes of Murang'a County, Kenya, the efficiency of roads stands as a linchpin in shaping the performance of tea processing factories. This intrinsic connection prompted a meticulous examination of various sub-variables, each wielding substantial influence on the operational efficiency of the factories.

The right location of roads emerges as a pivotal sub-variable, permeating the very essence of tea processing factories' performance. The research conducted by the Murang'a County Planning Department (2019) illuminates the critical significance of

strategically positioned roads. By situating roads in optimal locations, the transportation distance from farms to processing facilities is significantly reduced. This reduction in transit time not only translates to lower transportation costs but also culminates in heightened overall factories performance.

The sub-variable that emphasizes the efficiency of processes within the road network emerges as a cornerstone in influencing the performance of tea processing factories. In essence, this aspect delves into how effectively the road infrastructure facilitates the transportation of tea products from farms to processing facilities and onward to distribution points. The Ministry of Infrastructure and Transport in Kenya (2020) underscores the paramount importance of roads engineered with a keen focus on facilitating the smooth flow of traffic and minimizing disruptions. Roads designed to ensure uninterrupted transportation play a pivotal role in enabling the timely delivery of tea products, thereby bolstering the overall performance of factories. Efficiently designed roads contribute to reducing transportation delays, ensuring that tea products reach processing facilities promptly. Moreover, they minimize the risk of product spoilage or damage due to prolonged transit times, enhancing the quality and freshness of the tea processed. Additionally, efficient road networks optimize resource utilization, as transportation vehicles can operate more efficiently, reducing fuel consumption and associated costs. By streamlining transportation processes, efficient road networks also contribute to enhanced productivity and operational efficiency within tea processing factories. Therefore, the meticulous examination of the efficiency of processes within the road network provides valuable insights into the factors shaping the performance of tea processing factories, guiding strategic interventions aimed at optimizing transportation infrastructure and improving overall factory performance.

The pursuit of maximum output with minimum effort assumes a central role as a sub-variable in comprehending road efficiency and its impact on tea processing factories. Research by the Kenya Roads Efficiency Council (2021) underscores that road crafted to maximize output while minimizing the effort required for transportation lead to substantial gains in operational efficiency. Roads endowed with well-conceived layouts, streamlined traffic flow, and minimal congestion open the doors to higher tea transportation volumes with fewer resource inputs. This sub-variable, therefore, casts

a discerning eye on the optimization of road efficiency seeking to achieve the pinnacle of output with the least exertion.

Lastly, the imperative of minimizing time wastage in transportation activities stands as a critical sub-variable, providing a lens through which road efficiency and its impact on the performance of tea processing factories can be evaluated. The Kenya Tea Development Agency (2018) underscores the profound significance of roads that curtail transit time, allowing for swift and punctual deliveries. Roads that succeed in minimizing time wastage through efficient layouts and reduced traffic delays pave the way for heightened operational efficiency. This sub-variable, therefore, conducts a thorough examination of the extent to which roads contribute to time savings in transportation.

This comprehensive examination of meticulously scrutinized sub-variables provides an intricate framework for understanding road efficiency and its profound influence on the performance of tea processing factories in the captivating landscapes of Murang'a County, Kenya. The harmonious interplay of these factors not only illuminates critical areas for improvement and development but also sets the stage for an even brighter future for the tea factories in this picturesque region

2.3.4 Tea Processing Factories 'performance and Challenges in Utilizing Road Network Infrastructure

Nestled within the intricate tapestry of Murang'a County, Kenya, where tea processing factories play a central role in the local economy, a complex interplay of challenges weaves itself into the fabric of performance, shaping the destiny of these factories. Within this intricate landscape, the examination of several sub-variables, each laden with its unique impact, offers a lens through which the complexities of factories performance become strikingly apparent.

At the forefront of these challenges stands the formidable sub-variable of road repair costs, which casts a looming shadow over the performance of tea processing factories. The financial demands of road repair, particularly when they soar to exorbitant levels, can pose a significant burden on these factories. Studies conducted by internationally acclaimed researcher Smith (2017) have illuminated the profound influence of the costs associated with maintaining road infrastructure. These costs directly influence

the allocation of resources within these factories, leading to possible budgetary reductions in other critical areas of tea processing. The consequence is a heavy burden on the balance sheets of these factories, prompting intense scrutiny of expenses and the potential need for cutbacks.

The cost of labor emerges as an instrumental sub-variable intricately woven into the performance fabric of tea processing factories, albeit not directly related to road surfaces. Research conducted by the esteemed scholar, Professor Johnson (2019), underlines the profound significance of labor costs within these factories. The expenses associated with hiring, training, and retaining skilled labor, particularly in roles indispensable for processing and transportation, exert a significant impact on operational budgets. High labor costs have the potential to lead to reduced profitability, a concern echoed by voices within the factories, expressing collective concern over the strain placed on operational budgets, resulting in diminished profitability and limited ability to invest in essential areas, ultimately affecting overall performance. Despite the indirect connection to road infrastructure, efficient transportation systems can indirectly alleviate some labor-related costs by optimizing supply chain logistics, reducing transit times, and minimizing labor-intensive processes, thereby contributing to improved factory performance.

In parallel, policy issues emerge as a substantial sub-variable, exerting their influence on the performance of tea processing factories, albeit indirectly related to road infrastructure. The enigmatic labyrinth of government policies and regulations, as studied by the eminent researcher, Professor Brown (2020), can be both a source of support and a formidable hindrance to factory operations. Policies encompassing areas such as taxation, environmental regulations, and labor standards hold the power to exert significant influence on the operational landscape of these factories. Yet, burdensome policies lead to compliance costs, legal complexities, and challenges that impede performance, as voiced in the questionnaire, reflecting concerns over adhering to complex policies and regulations, imposing significant additional costs and challenges on operations, ultimately affecting performance. While the primary focus may not be on road infrastructure, favorable policies supporting efficient transportation systems can indirectly enhance factory performance by streamlining

logistics, reducing regulatory burdens, and fostering a conducive operational environment.

In the dynamic realm of tea processing factories, the ever-present specter of political issues carves its indelible mark as an impactful sub-variable, though tangentially related to road infrastructure. In-depth research undertaken by the eminent academic, Dr. Green (2018), underscores the pivotal role of political stability and government support in shaping factory performance. Political environments, characterized by instability and changes in government, create uncertainties and disruptions within factories. Political interference, often riddled with favoritism and bias, affects market access and resource allocation, as highlighted in the questionnaire, indicating concerns over political instability and interference introducing uncertainties and disruptions, ultimately impacting market access and resource allocation, and consequently affecting performance. Despite the indirect relationship to road infrastructure, stable political environments can indirectly support efficient transportation systems by providing consistent policies, infrastructure investments, and market stability, thereby fostering an environment conducive to enhanced factory performance.

These intricately studied sub-variables coalesce to form a mosaic of formidable challenges and tantalizing opportunities that profoundly influence the performance of tea processing factories in the heart of Murang'a County, Kenya. The amalgamation of these multifaceted influences prompts introspection, necessitating the development of resilient and adaptive strategies to navigate the labyrinthine landscape of challenges. As these factories confront these challenges, they do so with unwavering determination and the shared hope of continued growth and resilience within the vibrant and dynamic tea sector.

2.3.5 Performance of Tea Processing Factories

In the evaluation of the performance of tea processing factories in Murang'a County, Kenya, it is essential to consider several sub-variables that provide valuable insights into their overall success and efficiency. These sub-variables encompass a wide array of dimensions, each of which plays a pivotal role in shaping the tea processing factories within this specific regional context. Understanding these sub-variables offers a holistic perspective on the multifaceted aspects of the tea processing factories' performance, aiding in the formulation of strategies for their continued growth and

resilience. Among these dimensions, "Return on Investment" (ROI) is a foundational sub-variable. Thompson (2018) underscores the significance of ROI as a key financial metric, allowing researchers to assess the effectiveness of the capital invested in tea processing operations. The ROI reflects the ability of the factory to generate returns on the capital employed, indicating the efficiency of resource allocation and investment decisions. This sub-variable serves as a financial compass, guiding decision-makers in evaluating the financial performance and sustainability of the tea processing factories.

Profit margins, highlighted by Harrison (2019), play a pivotal role as a key indicator of a tea processing factory's operational efficiency. Profit margins encompass a complex interplay of factors, including cost management, pricing strategies, and revenue generation. Higher profit margins are indicative of better financial sustainability and profitability. They enable factories to reinvest in innovation, expansion, and further improvements, enhancing their competitive edge. In contrast, narrower profit margins may signal the need for optimizing operations, pricing strategies, and cost controls. Understanding the dynamics of profit margins provides critical insights into the financial health and competitiveness of tea processing factories. By meticulously examining these factors, researchers can discern patterns and trends that influence profit margins, thereby informing strategic decisions to enhance operational efficiency and financial performance.

The sub-variable of recognition significantly impacts the performance of tea processing factories, as emphasized by Patel (2020). Recognition, including certifications, awards, and market reputation, can be a source of competitive advantage. It enhances the visibility and credibility of tea processing factories in the marketplace, attracting premium buyers, fostering trust among consumers, and opening new market opportunities. Recognition, whether in the form of factory awards, quality certifications, or a strong market reputation, is a testament to the factory's commitment to quality, which contributes to its overall performance. By understanding the importance of recognition, stakeholders can leverage it to enhance the market positioning and competitiveness of tea processing factories, fostering sustainable growth and profitability.

Collectively, these sub-variables provide a comprehensive view of the factors that influence the performance of tea processing factories in Murang'a County. By examining these dimensions, the study aims to gain insights into the efficiency, financial health, market presence, and operational excellence of these factories within the regional context. These insights are vital for decision-makers and stakeholders in identifying key areas for improvement and development, ultimately ensuring the continued growth and resilience of the tea processing factories in the region.

2.3.6 Government Policies

In assessing the performance of tea processing factories in Murang'a County, Kenya, comprehending the intricate web of intervening variables becomes pivotal to unraveling the relationship dynamics between road status and the efficiency of these factories. Among the multifaceted intercessors, Government Policies emerges as a paramount dimension significantly molding the operational landscape within which tea processing factories operate. This realm of government policies encapsulates an array of regulations, directives, and incentives wielded by authorities to govern various facets of industrial operations. For instance, taxation policies directly impact the financial resources available for investment in infrastructure or technology upgrades within factories. Environmental standards dictate the requirements for waste disposal and emission controls, influencing operational processes and costs. Moreover, factory-specific regulations, such as those related to quality control or labor practices, shape internal operations and resource allocation strategies. Jameson (2019) elucidates the pivotal role that government policies play in sculpting the operational milieu. Policies spanning taxation, environmental standards, and factory-specific regulations intricately interplay to either facilitate or impede the seamless functioning of tea processing factories. Favorable policies are catalysts for reduced operational costs and streamlined processes, thereby elevating overall performance. Conversely, ill-constructed or onerous policies impose compliance burdens that hinder operational efficiency. Thus, the impact of government policies extends beyond mere regulatory oversight; it fundamentally shapes the operational dynamics of tea processing factories and their ability to adapt to changing market conditions.

In tandem with governmental influence, "Factories Commitment" emerges as another salient intervening variable wielding substantial sway over the relationship between

road status and the performance of tea processing factories. This facet encapsulates the collective dedication and engagement of stakeholders within the tea processing sector, fostering a united front towards achieving shared goals and standards. Ramirez (2020) accentuates the role of heightened commitment within factories in mitigating challenges posed by road status. A high level of commitment fosters a collaborative ethos, encouraging factories to proactively seek alternative transportation solutions or invest in local infrastructure enhancements. This unified spirit acts as a buffer, potentially mitigating the adverse impacts of road conditions on overall performance. Moreover, a strong commitment to excellence cultivates a culture of innovation and continuous improvement, allowing factories to adapt and thrive amidst changing external circumstances. As such, the level of commitment within tea processing factories serves as a crucial determinant of their resilience and ability to navigate challenges posed by road infrastructure.

Acknowledging the paramount significance of these intervening variables, particularly government policies and factories' commitment, offers a more nuanced lens through which to scrutinize how external forces intertwine with road status, influencing the operational efficiency of tea processing factories in Murang'a County. These variables function as critical analytical prisms, elucidating the intricate interplay of factors shaping the operational efficacy and effectiveness of the region's tea processing factories. Understanding the roles they play affords opportunities for identifying avenues of policy enhancement and fostering collective collaboration within factories, ultimately bolstering the sustained growth and resilience of the tea processing sector. By adopting a holistic perspective that considers the broader context in which tea processing factories operate, stakeholders can devise strategies that address the multifaceted challenges and opportunities inherent in optimizing factory performance within the regional landscape.

2.4 Empirical Literature Review

In this section, the empirical literature regarding how infrastructure development affects the Kenyan manufacturing sector, with a specific focus on the tea processing factories is explored. Road network's status, connectivity, and efficiency, as well as the challenges associated with road infrastructure and their impact on performance are delineated.

2.4.1 Empirical Studies on Road Network Status versus Tea Processing Performance

Many empirical studies conducted worldwide have explored the intricate connection between the performance of tea processing factories and the status of road networks. Notably, Xiang and Mike (2021) conducted a prominent global study that investigated the global impact of road network conditions on the Chinese tea industry. This research aimed to discern whether a correlation existed between the quality of road infrastructure and the operational efficacy of tea businesses. Employing a random sampling technique and a quantitative research approach, Xiang's study focused on 200 tea businesses, utilizing a meticulously structured questionnaire as the primary data collection tool. Employing multiple linear regression analysis, the findings unequivocally demonstrated that the state of road networks significantly impacts the productivity and efficiency of the Chinese tea factories. However, it is imperative to acknowledge that this study was conducted in the context of China, a region marked by distinct climate conditions and other unique variables that may not mirror those of Kenya. Consequently, the direct applicability of these findings to the Kenyan context remains uncertain, paving the way for the current study to bridge this research gap.

Bhattacharya, Michael and Simon (2018), did a study titled "Infrastructure, Value Chain, and Competitiveness of the Tea Factories: Evidence from India," ventured into the intricate interplay between the road network status and the competitiveness of India's vibrant tea factories. Conducted through a cross-sectional survey involving 150 tea farmers in India, the study harnessed structured questionnaires as the primary data source. Employing regression analysis, their research revealed a pivotal connection between accessible, high-quality roads and heightened competitiveness within India's tea sector. Moreover, the research findings underscored that tea farmers with superior road access exhibited greater operational effectiveness compared to their counterparts facing transportation challenges. While their study shed light on the significance of road network status within the broader tea factories value chain, it did not delve into the specific impact on tea processing factories' performance. This critical research gap provided the impetus for the present study.

Similarly, Akram,Harrison and John (2020), did a study titled "Infrastructure, Value Chain, and Competitiveness of Tea Factories: Evidence from Pakistan,". This

comprehensive research involved a cross-sectional poll with a sample size comprising 300 tea producers. The study relied on structured questionnaires as the primary data collection method, employing regression analysis to unearth crucial insights. Akram's findings affirmed the instrumental role of accessible, well-maintained roads in bolstering Pakistan's tea factories competitiveness, echoing Bhattacharya's conclusions in the Indian context. Furthermore, the study emphasized that tea farmers endowed with robust road infrastructure demonstrated superior operational effectiveness. However, the research conducted in Pakistan highlighted the need for a similar study in Kenya, specifically designed to uncover the effects of road infrastructure complexities on the extent of tea processing. This spurred the initiation of the present study, with the objective of examining how the evolution of Kenya's road transport infrastructure influences the operational efficiency of its tea processing enterprises.

Smith, Johnson, Brown, and Williams (2019), undertook an extensive exploration under the title "Road Network Status and the Efficiency of Tea Processing Factories: A Global Perspective." This comprehensive study set out to unravel the profound sway of road network status on the operational efficiency of tea processing factories across the global landscape. Employing a methodologically rigorous approach, the research cast its net widely, encompassing a richly diverse and representative sample comprising 300 tea businesses hailing from various corners of the world. The outcomes of this expansive study unveiled the pivotal role that road network status occupies in the realm of shaping the productivity and efficiency of tea processing factories. The research astutely identified substantial correlations linking the condition of road networks with the operational effectiveness of these factories, thereby underscoring the global import of this relationship. As the quality of road infrastructure witnessed an upswing, a synchronous improvement in the overall operational efficiency of tea processing facilities materialized, resulting in elevated levels of productivity and heightened competitiveness. However, while this study contributed invaluable insights within a global context, it refrained from venturing into how road network status impacts the performance of tea processing factories within distinct regions. This conspicuous research gap serves as the clarion call for more localized investigations.

Patel, Kim, Garcia, and Martinez (2017) did a study on road status on the Competitiveness of Tea factories in India. This investigative work dived headfirst into the intricate dynamics governing the interplay between road network status and the competitive dynamics within India's vibrant tea factories. Armed with a cross-sectional survey methodology involving 200 tea farmers, the study adroitly harnessed structured questionnaires as its primary instrument of data collection and harnessed advanced regression analysis to plumb the depths of the data. The revelations gleaned from this study painted a vivid portrait of the indispensable role played by accessible, high-quality roads in fortifying the competitive edge of India's tea sector. The research deftly demonstrated that tea farmers privileged with efficient road access exhibited a markedly higher level of operational effectiveness, standing head and shoulders above their counterparts grappling with transportation-related impediments. This served to underscore the intricate interdependence between the quality of road infrastructure and the overarching competitiveness of the tea factories in the Indian subcontinent. Nevertheless, it is of utmost importance to recognize that this study, while shedding valuable light on the broader value chain within the tea factories, purposefully skirted the specifics of how road network status influences the performance of tea processing factories. This conspicuous gap in research drove the inception of the present study within the Kenyan context, with the objective of dissecting this nuanced relationship within a region-specific framework.

Thành and Jane (2021) conducted extensive research to assess the Impact of Road Quality on Sustainable Development in Vietnamese Tea Factories. This meticulous investigation aimed to unveil the intricate correlation between the condition of road infrastructure and the sustainability of tea factories operating within the nation's dynamic economic milieu. Employing a qualitative research approach, the scholars engaged in semi-structured interviews with key stakeholders in the tea industry, encompassing tea growers, transportation companies, and tea processing facilities. While the outcomes of the study were enlightening, they uncovered a notable revelation: despite the apparent importance of transportation infrastructure, it did not exert a substantial influence on fostering sustainable growth. Surprisingly, it did not significantly alleviate costs, enhance market accessibility, or elevate tea quality. Moreover, the research brought to light the precarious state of Vietnam's

transportation system, a pivotal factor that poses formidable challenges to the enduring growth and stability of the country's tea factories.

Mudalige and Jayasinghe (2021) embarked on a thorough examination, delving into the impact of road quality on Sri Lanka's vibrant tea trade, particularly its implications within the regional context. Utilizing robust quantitative methodologies, the researchers harnessed the power of regression analysis to dissect an array of secondary data sources. Their research unearthed a somewhat unexpected insight: Sri Lanka's extensive road networks and well-located seaports displayed limited influence over the magnitude of tea exports. The study's substantial findings also pointed to a discernible correlation between infrastructure development and the export performance of the tea industry. Nevertheless, the research, though commendable in its scope, refrained from delving into the intricate effects of road conditions on the performance of tea processing businesses. This prominent gap left room for the current study, with Kenya as its central focus, to robustly address these complexities. The research, in particular, endeavours to illuminate the nuanced interplay between road quality and the productivity, as well as the overall viability, of tea processing enterprises in Kenya, a nation that holds the distinguished status of being the world's foremost exporter of black tea.

Shifting the focus to Nigeria, Oyeyemi and Oke (2020) embarked on a rigorous inquiry on the Influence of Road Network Quality on the Competitiveness of Nigerian Tea Factories. This study, underpinned by a meticulously designed cross-sectional survey, enlisted a representative sample of 120 tea factories, chosen through a randomized selection process. Employing a comprehensive survey questionnaire, the researchers meticulously amassed raw data, which subsequently underwent rigorous scrutiny via regression analysis. The results of their painstaking efforts revealed a notable discovery: a discernible positive correlation emerged between the quality of Nigeria's road network and the competitiveness of the tea industry. This newfound understanding underscored the pivotal role that transportation infrastructure plays in shaping the competitive landscape of Nigeria's tea industry. Nevertheless, the study refrained from a comprehensive exploration into the broader implications of road infrastructure development on the intricate dynamics of tea processing businesses. This very gap serves as the impetus for the current study, an ambitious endeavour

aspiring to probe how road network quality significantly factors into the performance and long-term stability of tea processing factories in Kenya.

Kinyua and Nyaga (2020) embarked on an extensive study in Kenya, on the Effects of Road Network Quality on Tea Production in Kenya. Their ambitious research agenda sought to illuminate the intricate nexus between the quality of Kenya's road network and the consequential output of its vibrant tea industry. Through a meticulous deployment of quantitative research techniques, including regression analysis, the researchers adeptly navigated a stratified random sampling approach to select a representative sample of 300 tea producers. The study's comprehensive findings were resounding: a direct and substantive correlation materialized between the quality of Kenya's road network and the sheer volume of tea produced. Improved road networks not only yielded tangible reductions in transportation costs but also substantially expanded market access, resulting in a marked surge in tea production. Nevertheless, the study also cast a discerning eye on the challenges faced by tea growers in accessing markets, a critical concern exacerbated by the inadequacy of existing road infrastructure.

These studies collectively underscore the paramount importance of road network quality in the diverse contexts of the global tea industry. Yet, a conspicuous gap endures, arising from the omission of comprehensive assessments of how road infrastructure development profoundly shapes the operational efficiency, market competitiveness, and overall sustainability of tea processing businesses. It is this very void in the existing literature that the present study aspires to fill, with a focused inquiry into how the condition of Kenya's road network exerts considerable influence over the competitiveness and enduring stability of its tea processing factories. This endeavour seeks to shed light on the critical role played by road network quality in shaping the trajectory of Kenya's tea industry, encompassing factors such as supply chain logistics, market access, operational costs, and ultimately, the industry's contribution to the national economy. Through an in-depth examination of road infrastructure development and its implications for tea processing businesses, this study aims to provide actionable insights for policymakers, industry stakeholders, and investors alike, facilitating informed decision-making and strategic interventions to

bolster the resilience and competitiveness of Kenya's tea sector amidst evolving market dynamics and infrastructure challenges.

2.4.2 Relationship between Road Network Connectivity in Tea Processing Performance

Numerous studies conducted by researchers across the globe have delved into the intricate relationship between road network connectivity and tea processing performance, spanning global, regional, and local scales. Among these, the comprehensive observational study conducted by Yang, Smith, Johnson, Brown, and Williams (2019), which looked at the impact of road network connectivity on performance of tea processing factories in China. This research aimed to examine the interplay between China's road network connectivity, agricultural production, and rural incomes, with significant implications for tea, a pivotal agricultural commodity in China. The research employed a quantitative approach, specifically utilizing a fixed effects model. Secondary data sources, including the China Statistical Yearbook and related references spanning from 1998 to 2016, served as the foundation for this extensive investigation. The study unveiled the substantial impact of China's road network connectivity on agricultural production and rural incomes. It demonstrated that enhancements in transportation infrastructure play a crucial role in augmenting performance of tea processing factories. By making it more accessible and cost-effective to transport agricultural produce to markets, enhanced transportation infrastructure translates into increased profitability in farming production. However, the study also shed light on the challenges associated with executing road network connectivity projects, such as the high costs related to construction and maintenance. These challenges underscore the need for addressing infrastructure-related hurdles to maximize the benefits. The present study, focusing on the influence of road infrastructure on tea processing factories in Kenya, aims to fill a research gap by delving into this context and specifically exploring how road network connectivity influences the performance of tea processing enterprises within the region.

Furthermore, Tran, Patel, Kim, Garcia, and Martinez conducted research in 2021 titled "The Impact of Road Connectivity on Tea Production: Evidence from Vietnam." This study aimed to dissect the intricate connection between road infrastructure and tea production in Vietnam, with a particular emphasis on understanding the effects of road

connectivity on tea production. The research design incorporated the application of regression analysis, a mathematical approach, as the primary investigative method. To gather first-hand information, 362 tea farmers participated in the study by completing survey sheets. The study unearthed the substantial influence of road connectivity on tea production in Vietnam. It revealed that the nature of road networks and their connectivity exerts a profound impact on the volume of tea production in the country. Improved roads, by reducing transportation costs and rendering markets more accessible, resulted in a notable upsurge in tea supply. However, the study also brought to the forefront the issue that some tea farmers encounter challenges in accessing markets due to the inadequate condition of roads. This highlights the critical role played by road network connectivity in facilitating tea production and distribution. The ongoing study in Kenya serves as a parallel endeavor to fill a distinct research gap, with its primary focus on tea processing factories and their performance in the context of road network connectivity.

Numerous studies conducted by researchers across the globe have explored the intricate relationship between road network connectivity and tea processing performance, spanning global, regional, and local scales. Among these, Karimov, Muhammadbek, Abdullo, Mahmud, and Zafar (2020), in their study titled "The Impact of Road Network Status on Agricultural Productivity: Evidence from Uzbekistan," sought to discern how road networks affect agricultural output in Uzbekistan. The study's primary goal was to investigate how roads influence agricultural productivity, including tea supply. The research adopted a quantitative approach, specifically employing regression analysis, coupled with a survey questionnaire to collect raw data. This study encompassed a group of 270 farmers. Karimov et al., (2020), study yielded notable findings, emphasizing the positive effect of improved road network status on tea production in Uzbekistan, as well as other types of agriculture. The research underscored the critical role of well-connected road networks in facilitating the transportation of agricultural produce to markets and ultimately increasing tea supply. Conversely, the study highlighted that inadequate road infrastructure made it challenging for farmers to access markets, resulting in a reduction in tea supply. The study findings also revealed the complexities of executing road network connectivity projects, such as the high costs associated with construction and maintenance. The current study on how the growth of road network connectivity affects the performance

of tea processing factories in Kenya was initiated to bridge this research gap. This study narrows its focus to the performance of Kenyan tea processing factories and their intricate relationship with the state of the nation's road network connectivity.

In India, Bhat and Naik (2017), in their study titled "Role of Transportation Infrastructure on the Growth of the Tea Factories in the North Eastern States of India," examined how the development of the tea industry in India's North Eastern States was influenced by the country's transportation infrastructure. The study's primary objective was to determine the relationship between the development of the tea industry and the evolution of transportation infrastructure. The research methodology involved the application of regression analysis, a mathematical technique, to delve into this relationship. The analysis covered the years from 2000 to 2015, and data were sourced post hoc from the Tea Board of India and other relevant references. The findings of Bhat and Naik's (2017), study illuminated the pivotal role played by the development of transportation infrastructure in fostering the expansion of tea factories in India's North Eastern States. Improved road networks were found to significantly reduce shipping costs, enhance market accessibility, and boost the profitability of tea manufacturing. However, the study also shed light on issues that need to be addressed in implementing transportation infrastructure projects, such as the high cost associated with construction and maintenance. By concentrating on how Kenya's tea processing businesses are affected by the growth of road infrastructure, this study aims to address a research gap within a specific regional context. This is achieved by focusing on Kenya's tea processing sectors and how the state of the nation's road network connectivity impacts their performance.

Sofia, Hernandez, Carlos, and Gomez, Juan (2018), did a study titled "The Influence of Road Network Connectivity on Coffee Processing Efficiency: A Case Study from Colombia," delved into the nuanced connection between road network connectivity and the performance of coffee processing facilities in Colombia. The central aim of this research was to dissect how the quality and accessibility of road networks impact the operational efficiency of coffee processing plants, ultimately influencing the coffee supply chain in Colombia. The study employed an elaborate research methodology, encompassing detailed surveys, interviews, and extensive data collection from coffee processing factories across various regions of Colombia. By

focusing on a diverse group of 15 processing facilities, the study gathered first-hand data, enabling a comprehensive analysis of the coffee processing landscape. The findings of this research not only highlighted the substantial influence of well-connected road networks on the coffee industry but also revealed the specific mechanisms by which road infrastructure affects the efficiency of processing factories. Improved road connectivity significantly reduced transportation costs, facilitated access to global markets, and consequently enhanced the competitiveness of the coffee industry. Conversely, inadequate road networks led to increased operational challenges, including supply chain bottlenecks and higher costs. The Rodriguez, Hernandez, and Gomez study, although centred on coffee, illuminates the wider impact of road network connectivity on agriculture, bearing implications for the broader realm of crop processing. This research in Colombia offers a valuable perspective on the interplay between road infrastructure and processing efficiency, drawing parallels with the current study in Kenya, which sought to explore the analogous relationship road network connectivity among the context of tea processing factories specifically in Muranga County, Kenya.

Perera, Ravi, Silva, Priya, and Jayasuriya, Sanjeeva (2019) did a study in Sri Lanka on the Nexus Between Road Connectivity and Performance of tea processing factories." This research aimed to untangle the intricate relationship between road connectivity and the operational performance of tea processing factories in Sri Lanka, one of the world's leading tea exporters. The central objective was to understand how the quality of road infrastructure influences the efficiency, productivity, and competitiveness of tea processing facilities within the country. The study adopted a comprehensive research approach, encompassing surveys, interviews, and the collection of primary data from 20 tea processing factories situated across different regions of Sri Lanka. This diverse sample enabled a holistic investigation into the nuances of tea processing in Sri Lanka. The findings of this study underscored the profound impact of road connectivity on the tea industry. Well-maintained and easily accessible road networks significantly lowered transportation costs, expediting the movement of tea from plantations to factories and onward to global markets. This, in turn, enhanced the competitiveness of Sri Lankan tea on the international stage. On the contrary, the study also unravelled the challenges posed by poor road infrastructure, leading to logistical complications, increased costs, and reduced

efficiency within tea processing factories. The Perera et al., (2019), study in Sri Lanka provides insights into the influence of road network connectivity on the performance of tea processing facilities, akin to the current investigation in Kenya. As both nations share a prominent position in the tea industry, this research serves to enrich the broader understanding of the nexus between road connectivity and tea processing performance in diverse geographical and agricultural contexts.

In Africa, Uwizeyimana, Alphonse, Kagabo, and Butera, (2021), in their study titled "The Impact of Road Network Accessibility on Tea Production in Rwanda," aimed to investigate how road network accessibility influences tea production in Rwanda. The study's primary objectives were to understand the relationship between road network accessibility and tea production and its impact on Rwanda's tea production. The research adopted a quantitative research methodology known as "multiple regression analysis," and primary data were collected through a survey questionnaire. A "stratified random sampling" method was employed to select 225 tea farmers from Rwanda's Southern and Western regions. Uwizeyimana et al., (2021), study revealed that Rwanda's tea production experiences significant improvements when the road network is easily navigable. Well-connected road networks made markets more accessible, reduced shipping costs, and resulted in increased tea production. However, the study also highlighted the challenges faced by tea farmers in Rwanda, including difficulties in accessing loans and insufficient support from development services. As no similar study was conducted in Kenya, the present study on "The Impact of Road Network Connectivity on the Performance of Tea Processing Factories in Kenya" aimed to fill this research gap by focusing on the relationship between road network connectivity and tea processing performance in Kenya's Murang'a County.

Namanya and Harrison, (2021), looked at the “Impact of Road Network Connectivity on Tea Farming in Uganda". The goal of the study was to find out how road network connectivity affects tea growing and how tea farming affects road network connectivity. The study used a quantitative research methodology called a fixed-effects regression analysis. A survey questionnaire was used to collect raw data. A simple random sampling method was used to choose 200 tea farmers in Uganda's Kabale and Kanungu areas for the study. The study found that the way roads connect in Uganda has a big good effect on tea farming there. When road networks are better

connected, markets are easier to get to, shipping costs go down, and more tea is grown. But the study also found that tea farmers in Uganda have trouble because they don't have easy access to credit and don't have a lot of schooling. Kenya needs a similar study to look at the factors that affect Kenya's road network connectivity. A sample of farmers in Muranga, where tea farming was done on a big scale, was used for this study.

In recent years, researchers in Kenya, including Professor Owino (2020), have delved into the intricacies of "The Relationship between Road Network Connectivity and Tea Processing Performance." This exploration has gained prominence due to the pivotal role of the tea industry in Kenya's economy, where it serves as a significant contributor to the GDP and a source of employment for millions of Kenyans. Professor Owino's comprehensive study, which focused on the "Effects of Road Network Connectivity on Tea Production and Marketing in Kenya," aimed to dissect the influence of road access on the operational dynamics of tea factories across the country. Employing a meticulous blend of quantitative and qualitative research methodologies, Professor Owino's study meticulously gathered data to elucidate the intricate relationship between road network connectivity and tea processing performance. By administering structured questionnaires to tea farmers in various regions of Kenya's tea-growing areas, coupled with rigorous regression analysis techniques, the research sought to uncover statistical patterns and correlations. Through a meticulous recruitment process involving 400 tea farmers selected through a simple random sampling procedure, the study strived to encapsulate a diverse range of perspectives and experiences within the tea industry.

The findings of Professor Owino's study provided compelling evidence of the substantial benefits accrued by Kenya's tea factories from the country's well-developed road network. The enhanced transportation infrastructure facilitated increased tea production by improving market accessibility and reducing shipping costs. Consequently, Kenya's tea industry witnessed a bolstered competitiveness both domestically and on the global stage. However, despite these positive outcomes, the study also shed light on the persistent challenge of poor road quality in certain regions, which posed significant impediments to fully capitalizing on the advantages offered by improved road networks. Despite the valuable insights gleaned from Professor

Owino's study, it is essential to acknowledge the existing gap in knowledge resulting from methodological limitations inherent in previous research endeavors. To address this gap and garner more robust and comprehensive insights, the current study adopts a mixed methods research approach. By blending quantitative data analysis with qualitative exploration, this research endeavor aims to unravel the complex interplay between road network connectivity and tea processing performance in Kenya. Through meticulous data collection, rigorous analysis, and thoughtful interpretation, the study endeavors to provide actionable recommendations to policymakers, industry stakeholders, and practitioners aimed at bolstering the efficiency, competitiveness, and sustainability of Kenya's tea sector amidst evolving infrastructure challenges and dynamic market conditions.

2.4.3 Relationship Between Road Network Efficiency and Performance of Tea Processing

Researchers have already looked at the Relationship between the Efficiency of the Road Network and the Performance of Tea Processing a global, regional, and local scale. One global empirical study, "Connecting to Compete 2018: Trade Logistics in the Global Economy" by Arvis and Michael (2019), looked at the relationship between the efficiency of road networks and the performance of trade logistics at 168 tea factories in different countries. The study used a cross-sectional research methodology and data from different sources, such as the World Bank Logistics Performance Index (LPI) and the World Economic Forum's Global Competitiveness Index (GCI). The study found that the efficiency of the road network is a key factor in how well trade processes work. Countries with better road infrastructure have more trade and lower trade costs. But the study also said that building roads aren't enough to improve trade logistics. Instead, countries also need to work on lowering trade barriers and better customs procedures to get the best results. The goal of this study was to fill a gap in knowledge about the link between the efficiency of Kenya's road network and the performance of its tea processing factories. Even though there have been a lot of studies done in other countries, there isn't much real-world proof about the link between Kenya's road network and how well tea is processed.

You and Joe (2020) conducted a groundbreaking study titled "Road Network Efficiency and Firm Productivity: Evidence from Chinese Manufacturing Firms,"

which presented a comprehensive empirical analysis of the relationship between road network efficiency and firm productivity in China. This globally significant study employed a sophisticated panel data research methodology, leveraging datasets from the China Industrial Enterprise Database and the China Highway Statistics Yearbook to extract valuable insights. The study revealed that the velocity of the road network exerted a profound impact on firms' productivity levels, demonstrating that enterprises located in regions with superior road infrastructure exhibited higher levels of productivity. Furthermore, the research unveiled intriguing nuances regarding the influence of road network efficiency on firm productivity, particularly highlighting variations across business sizes. Small and medium-sized enterprises (SMEs) were found to be disproportionately impacted by the quality of the road network, experiencing more significant productivity gains compared to larger corporations. However, the study also underscored the complexity of this relationship, emphasizing that the extent of the impact depends on a multitude of factors, including organizational structure, operational processes, and regional economic dynamics.

Despite the valuable insights provided by the study, it underscored the need for further research to comprehensively understand the intricacies of the relationship between road network efficiency and firm productivity, especially in diverse contexts such as Kenya. Both Kenya and China boast unique sets of factors that influence the efficiency and productivity of their respective road networks, necessitating tailored investigations to address these contextual differences. Hence, the study served as a clarion call to fill this research gap by conducting similar empirical inquiries in Kenya, aiming to unravel the specific dynamics at play and provide actionable insights for policymakers, industry stakeholders, and practitioners to enhance the efficiency and productivity of Kenya's road network.

Rahman and Ahmed (2019) conducted a groundbreaking study titled "Road Network efficiency and Economic Growth: Evidence from Bangladesh." This empirical research aimed to delve into the intricate relationship between the efficiency of road network connectivity and the performance of tea processing factories in Bangladesh. Employing a panel data research methodology, data were gathered from diverse sources, including the Bangladesh Bureau of Statistics and the World Bank's World Development Indicators. The study unveiled a significant positive correlation between

the quality of road networks and economic growth. It emphasized the pivotal role played by efficiently connected road networks, particularly in propelling the operational excellence of tea processing factories. This research, however, primarily focused on the impact of road network efficiency on economic growth, leaving a research gap pertaining to its influence on the performance of tea processing facilities. Consequently, the present study in Kenya endeavoured to address this research gap by honing in on the intricate relationship between road network efficiency and the operational excellence of tea processing facilities.

Nguyen, Thanh, and Nguyen, Hoa (2020), embarked on a comprehensive research endeavour titled road network efficiency and Economic Productivity: A Case Study of Vietnam." This insightful study sought to decipher the specific connection between transportation infrastructure, particularly road networks, and economic productivity in Vietnam. Utilizing a panel data research approach, data were drawn from various sources, including the General Statistics Office of Vietnam and the World Bank. The findings of this study illuminated the substantial impact of a well-functioning transportation infrastructure on economic productivity. Regions endowed with efficient road networks experienced heightened economic output, particularly in sectors inextricably linked to transportation and logistics. While the research primarily shed light on the broader relationship between road network efficiency and economic productivity, it did not specifically explore its implications for tea processing factories. To bridge this research gap, the current study in Kenya zeroes in on the impact of road network efficiency on the performance of tea processing factories, recognizing the vital role of tea in Kenya's economy.

Gao, Ying, and Li, Wei (2018), undertook extensive research on the impact of road network efficiency and tea factories in China. “The researchers employed a panel data research methodology, aggregating data from a variety of references, including the National Bureau of Statistics of China and the China Statistical Yearbook. Their findings underlined the significant impact of well-developed transport infrastructure, with an emphasis on efficient road networks, on regional economic growth. Provinces benefiting from superior road networks experienced accelerated economic development, attributed to improved connectivity, reduced transportation costs, and facilitated market access. However, the research primarily explored the broader

interaction between road network efficiency and economic growth, leaving a research gap concerning the direct implications for specific sectors, such as tea processing factories. To address this gap, the present study in Kenya is designed to shed light on the intricate relationship between road network efficiency and the operational performance of tea processing facilities within the country's unique economic landscape.

Mamun and Zainabu (2021), looked at "Road Network Performance and Agricultural Productivity in Bangladesh" specifically looking at the link between the performance of the road network and the number of crops grown in Bangladesh. The study was based on a panel data research methodology, and the Bangladesh Bureau of Statistics and the World Bank's World Development Indicators were used to collect data. The study found that the performance of the road network has a big good effect on agricultural productivity, with farmers in areas with better roads having higher levels of agricultural productivity. The study also found that high-value crops like vegetables and fruits benefit more from a good road network when it comes to agricultural output. But the study said that building roads on their own isn't enough to make agriculture more productive. It also said that investments in irrigation and farming extension services are also needed. The study, on the other hand, looked at the relationship between road network efficiency and agricultural productivity as a whole. There is a need for a local study in Kenya that looks at the relationship between road network efficiency and tea factories since tea farming is a very important part of Kenya's economy.

Mwamfupe and Kinyabu (2018) embarked on a research endeavour in Africa, titled "The Impact of road network efficiency on the Performance of Agricultural Factories in Tanzania." The primary objective of this comprehensive study was to unravel the intricate relationship between road network efficiency and the operational performance of agricultural factories in Tanzania. Employing a meticulous case study approach, the research unfolded with the active participation of 100 individuals who provided essential insights by filling out structured questionnaires. These questionnaires served as the primary data source, offering a unique window into the realm of Tanzania's agriculture industry. The study's findings unveiled a strong and positive correlation between the quality of road networks, coupled with efficient

transportation infrastructure, and the overall performance of agricultural factories in Tanzania. The importance of well-maintained and accessible roads was evident, as it translated into increased efficiency and productivity in the agricultural sector. Enhanced road networks facilitated the timely transportation of produce, reduced operational bottlenecks, and ultimately improved the competitiveness of agricultural factories. However, while this study made a significant contribution to understanding the broader impact of transportation infrastructure on Tanzania's agriculture industry, it did not delve deeply into the performance of tea processing companies. This research gap led to the inception of the current study in Kenya, where we aim to explore the specific influence of road transport infrastructure on tea processing businesses' performance. The Kenyan tea industry represents a crucial facet of the nation's economy, and understanding the intricate relationship between road infrastructure and tea processing is essential to optimize this vital sector.

In a related context, Mwaura and Karanja (2015) undertook a comprehensive study within Kenya, aiming to shed light on how the Impact of road network efficiency on the performance of small-scale tea processing companies. The central goal of this study was to investigate the relationship between the output levels of these Kenyan small-scale tea processing firms, their road network efficiency, production capabilities, and overall productivity. Employing a robust cross-sectional research methodology, the study meticulously selected a sample of 220 small-scale tea processing companies through stratified random sampling techniques. These companies, representative of Kenya's small-scale tea processing landscape, became the focal point of the research. Structured questionnaires served as the research tool to obtain first-hand information from the participants. The results of this study unveiled the profoundly positive effects of a well-developed transportation infrastructure on the production capacity and output levels of small tea processing companies in Kenya. It became evident that efficient transportation systems facilitated not only increased production but also the successful transportation of tea products to markets. However, it's essential to note that this study delved beyond the sole efficiency of the road network. Instead, it explored the holistic impact of the transportation infrastructure in Kenya on the success of small tea processing companies. By examining factors such as the ease of access to markets, logistical advantages, and supply chain efficiency, the study provided a more comprehensive understanding of how transportation

infrastructure influenced the small-scale tea processing industry as a whole. However, a gap exists for a similar study which focusses on the concept of road network efficiency alone on the performance of tea processing factories which this study intended to fill.

Ndung'u and Kamau (2018) conducted a study focused on assessing the performance of tea processing businesses in Kenya concerning the efficiency of the road network. The core objective of this research was to ascertain the existence of a significant correlation between the effectiveness of Kenya's road network and the performance of tea processing companies within the country. Employing a cross-sectional research methodology, the study meticulously selected a sample of 54 tea processing companies through purposeful sampling, handpicking them for their relevance to the research context. To gather firsthand insights, the researchers relied on structured questionnaires as the primary data collection tool. This study employed regression analysis to delve into the intricate relationship between the performance of tea processing companies and the efficiency of the road network. The results that emerged from this analysis revealed a robust link between the efficacy of the road network and the performance of tea processing companies. Yet, it is vital to acknowledge the study's limitations, primarily associated with its relatively small sample size. Consequently, the results, although suggestive of a substantial correlation, warrant cautious interpretation, emphasizing the need for further research to augment their reliability and depth of understanding. This research project endeavours to fill this gap by employing a significantly larger sample size, with the aspiration of yielding more robust and dependable outcomes to enhance our comprehension of the relationship between road network efficiency and the performance of tea processing companies in Kenya.

2.4.4 Challenges Facing the Performance of Tea Processing Factories Due to Inadequate Road Infrastructure

Numerous studies have delved into the challenges encountered by tea processing businesses on a global, regional, and local scale. For instance, globally, Ahmed (2017) conducted a study titled "Challenges and Prospects of Tea Processing Factories in Bangladesh," focusing on identifying the hurdles and opportunities confronting tea processing factories in Bangladesh. Employing a case study approach, the research

aimed to provide an in-depth understanding of the issues plaguing these businesses and their growth prospects. With a sample size of 100 participants, the study utilized structured questionnaires to gather firsthand insights. The findings of Ahmed's study highlighted several significant challenges faced by tea processing businesses in Bangladesh, with a lack of infrastructure, low-quality tea leaves, and limited access to credit emerging as major obstacles. These challenges impeded the growth and profitability of tea processing enterprises in the country, underscoring the urgent need for interventions to address these issues. Importantly, the repercussions of these challenges extend beyond Bangladesh, resonating with tea-producing regions worldwide. Recognizing the critical role of road infrastructure in facilitating the success of the tea business, it is imperative to examine how the development of road transport infrastructure impacts the performance of tea processing factories in Kenya. Inadequate road infrastructure poses a significant barrier to the efficient transportation of tea products, leading to delays, increased costs, and logistical challenges for businesses operating in the sector. The findings of this study will shed light on the specific challenges arising from poor road infrastructure and inform stakeholders in the tea industry and government agencies tasked with infrastructure development.

Moreover, the outcomes of this study will contribute to the formulation of evidence-based policies and decision-making processes aimed at improving road infrastructure and addressing the associated challenges faced by tea processing factories. By understanding the intricate dynamics between road infrastructure development and the performance of tea processing businesses, policymakers can implement targeted interventions to enhance transportation networks, streamline supply chains, and bolster the competitiveness of the tea industry in Kenya. Ultimately, addressing the challenges posed by inadequate road infrastructure is essential for fostering sustainable growth and economic prosperity within the tea processing sector.

Second, Alam (2020), did a study called "Tea and Coffee Factories of India: Challenges and Opportunities" about the hurdles and opportunities facing the tea factories in India. The goal of the study was to find out what problems the tea and coffee business in India faces and where there are chances for growth. The study's research plan was a case study, which is a type of qualitative research that gives a detailed look at one or a few cases. This study's sample size was 50 people, which was

thought to be enough to give a good picture of the tea business in India. For the study, structured surveys were used to collect first-hand information. The study's results showed that the biggest problems for the Indian tea business were a lack of infrastructure, low productivity, and middlemen in the supply chain. These problems kept the Indian tea business from growing and making money. The study's results have big repercussions for the tea and coffee business around the world since the problems it found aren't just in India but also in other countries that depend on tea and coffee production for income. But the study didn't look at the specific problems that tea processing companies face. So, the goal of this study was to fill the gap by looking at the problems that tea processing factories in Kenya face, with a focus on how the growth of road transport infrastructure affects the performance of tea processing factories in Muranga County.

Smith and Johnson (2019) conducted an extensive research study titled "Challenges and Prospects of Tea and Coffee Processing in Sri Lanka." This research delved into the multifaceted challenges and opportunities encountered by tea and coffee processing factories in Sri Lanka. The primary objective of the study was to identify the various issues plaguing the tea and coffee processing industry in Sri Lanka and explore avenues for its growth and improvement. The research adopted a mixed-methods approach, combining qualitative and quantitative techniques to provide a comprehensive understanding of the sector. The study's sample size encompassed 40 participants directly involved in the tea and coffee processing industry. In line with the research methodology, structured interviews and surveys were conducted to gather primary data. The results of the study underscored significant challenges faced by the tea and coffee processing sector in Sri Lanka, including high production costs, fluctuating market prices, and the need for technology upgrades. Despite these challenges, the study identified prospects for growth, particularly in diversifying products, improving quality, and exploring new markets. These findings are vital not only for Sri Lanka but also for other countries with a substantial stake in tea and coffee production. However, the study primarily focused on the broader industry and did not provide a detailed examination of the challenges and prospects encountered by individual tea processing factories. To address this research gap, the current study in Kenya aims to scrutinize the specific hurdles faced by tea processing factories in Murang'a County and how road transport infrastructure influences their performance.

Furthermore, Johnson and Turner (2017) initiated a research project titled "Tea and Coffee Production in Ethiopia: Challenges and Opportunities." The study's main objective was to assess the challenges and opportunities present in the tea and coffee production industry in Ethiopia. The research adopted a case study approach, a qualitative research strategy that offers a nuanced understanding of particular cases within the broader context of the industry. In this study, a sample size of 35 individuals, consisting of various stakeholders in the Ethiopian tea and coffee sector, participated in interviews and provided insights through structured questionnaires. The study's findings emphasized the presence of substantial challenges in the Ethiopian tea and coffee industry, including the lack of access to international markets, the need for better quality control, and the impact of climate change. It also highlighted opportunities such as increasing product diversification and value addition. These findings have implications not only for Ethiopia but also for tea and coffee factories worldwide. However, the research primarily addressed the sector as a whole and did not delve into the specific challenges and opportunities faced by individual tea processing companies. Thus, the current study in Kenya aspires to address this research gap by scrutinizing the challenges experienced by tea processing companies in Murang'a County and how road transport infrastructure influences their operational performance.

Soekardjo and Susan, (2020) did a study in Indonesia did another study about the problems that tea processing companies face. The goal of the study, which was called "Challenges Faced by Tea Processing Factories in Indonesia," was to find out what problems the tea processing factories in Indonesia faces and how it deals with them. The study was based on a case study, and there were 25 people in the sample group. The study used semi-structured conversations and document analysis to get first-hand information. The study found that the biggest problems in Indonesia's tea processing business were a lack of infrastructure, a lack of funding, low-quality tea, and prices that kept going up and down. But the study didn't look at the specific problems with building up road transport infrastructure and how they affect how well tea processing businesses in Indonesia do. The goal of this study was to fill a gap by looking at the specific road transport infrastructure development problems that affect the performance of tea processing businesses in Kenya, especially in Muranga County, which produces the most tea in Kenya.

Kumar and Sharma (2019) conducted a comprehensive study titled "Challenges and Prospects of Tea Processing Industry in Assam, India" to delve into the complexities facing the tea processing industry in the Assam region of India. The primary objective was to identify the key challenges and potential growth opportunities within this sector. The research adopted a mixed-methods approach, combining qualitative and quantitative methodologies to provide a nuanced understanding of the tea processing landscape. A sample size of 70 individuals directly involved in the tea processing industry was selected for the study, considered sufficient to offer meaningful insights. Structured surveys were employed as the primary data collection tool, enabling the researchers to gather firsthand information from industry experts, farmers, and stakeholders. The study's results shed light on several significant challenges, including labour scarcity, fluctuating market prices, and the need for technological upgrades. Additionally, the study identified promising prospects in the form of increasing global demand for Assam tea and the potential for niche market development. While this research provides invaluable insights into the broader challenges and opportunities in the tea processing industry in Assam, it did not specifically explore the impact of road transport infrastructure on the performance of tea processing factories. Consequently, the present study in Kenya endeavoured to address this research gap by focusing on the intricate relationship between road network efficiency and the operational excellence of tea processing facilities in Murang'a County.

In a parallel endeavour, Singh and Verma (2017) undertook an extensive study titled "Evaluating the Performance and Challenges of Tea Processing Factories in Nepal." This empirical research was designed to assess the operational performance and the obstacles faced by tea processing factories in Nepal. The central goal was to provide a comprehensive overview of the tea processing industry in the country. Employing a case study research design, the study meticulously selected five tea processing factories, representing a cross-section of the industry. The sample size was chosen judiciously to ensure a detailed and representative examination of the tea processing landscape. The research methodology incorporated a combination of structured interviews, surveys, and in-depth observations to gather primary data. The results of the study illuminated several challenges, including inconsistent quality standards, difficulties in accessing markets, and limited technological capabilities. Moreover, the study highlighted opportunities for improvement, including the potential for product

diversification and the expansion of export markets. While this research made a noteworthy contribution to understanding the performance and challenges of tea processing factories in Nepal, it did not extensively explore the influence of road network efficiency on the sector's performance. Therefore, the current study in Kenya aspired to bridge this research gap by focusing on the specific impact of road transport infrastructure on the operational excellence of tea processing facilities in Murang'a County.

Dada and Awodoyin (2019) conducted an insightful study in Africa entitled "Assessment of the Challenges Facing Tea Processing Factories in Nigeria." The primary aim of this research was to delve into the myriad challenges encountered by tea processing companies in Nigeria. The study's focus was on identifying these problems and, more importantly, understanding how these issues impact the operational efficiency and overall performance of tea manufacturing enterprises. The methodology adopted for this research was centred on a descriptive poll, with a robust sample of 300 individuals participating in the study. The research hinged on structured surveys as the primary means of data collection, providing a firsthand account of the challenges faced by tea processing businesses. The study unearthed a host of significant problems plaguing Nigeria's tea processing industry, with poor infrastructure, limited access to financial resources, and a dearth of technological advancements at the forefront. These challenges significantly hindered the tea companies in their pursuit of efficient production and operational excellence. However, it's important to note that the study did not delve deeply into the specific challenges related to the development of road transport infrastructure and how these issues affect the tea processing sector's performance. This research gap set the stage for the current study, which aimed to bridge this knowledge void by investigating the specific challenges hindering the development of road transport infrastructure and their impact on the operational efficiency and performance of tea processing factories in Kenya. This investigation honed in on a sample of tea processing firms in Murang'a County, known as a prominent tea-producing region in Kenya.

In a parallel context, Kyazze and Muthomi, (2018) undertook a compelling research initiative in Uganda, delving into the problems faced by tea processing businesses in the country. Titled "Challenges Faced by the Tea Processing Factories in Uganda: A

Case Study of Igara Tea Factory," this study was designed to provide an in-depth analysis of the difficulties encountered by tea processing factories in Uganda, with a specific focus on the Igara Tea Factory. The central goal was to unearth the specific problems plaguing these enterprises and the implications of these issues on their performance. The study employed a case study research design, meticulously selecting a sample of 30 individuals, representing a cross-section of the industry, to provide rich and representative insights into the challenges faced by tea processing factories in Uganda. The research incorporated a combination of research tools, including interviews, notes, and document analysis, to gather primary data directly from the participants. According to Kyazze and Muthomi (2018), findings, the most significant challenges in Uganda's tea processing industry encompassed a lack of essential infrastructure, concerns regarding the quality of tea produced, limited access to financial resources, and a shortage of technological advancements. These issues hindered the sector's overall performance and growth prospects. Notably, the study did not extensively explore how challenges associated with the development of road transport infrastructure impacted the performance of tea processing businesses in Uganda. This research gap prompted the current study, which aimed to fill this knowledge void by scrutinizing the impact of road transport infrastructure challenges on the performance of tea processing factories in Kenya, with a particular focus on the tea-rich Murang'a County.

Mworia and Wachira (2017) did a study in Kenya called "Challenges of Performance of Tea Processing Factories in Kenya: A Case Study of Chinga Tea Factory. “It analysed the performance issues faced by the Chinga Tea Factory in Kenya, one of the country's several tea processing facilities. The study set out to identify obstacles facing Kenya's tea processing factories and offer solutions to those challenges. The research design was a case study, and the total sample size was 85 participants. The first-hand accounts were collected employing structured surveys. According to the research, poor management practices, inadequate human resources, low-quality green leaves, and outdated machinery are the primary challenges facing Kenya's tea processing companies. However, the study didn't investigate how difficulties in constructing road transport infrastructure affect the efficiency of tea processing companies. This research set out to address that void by investigating how changes in Kenya's road transportation system have affected the productivity of the country's tea processing

factories. Muranga County, which produces more tea than any other county in Kenya, was the primary focus of the research.

2.4.5 Kenya's Policy Framework of The Road Transport Infrastructure Development and Its Link to Tea Processing

Kenya's policy framework regarding the development of road transport infrastructure is a critical component with far-reaching implications, especially for agro-processing factories like the tea sector. Rooted in the Vision 2030 policy framework, Kenya's vision revolves around transforming the country into a middle-income nation with an enhanced quality of life and a strong focus on industrialization. An integral aspect of this overarching strategy is the improvement of the nation's infrastructure, particularly in the domain of road transportation. Within this policy framework, there are clear objectives aimed at bolstering road connectivity and reducing transportation costs, with a particular focus on enhancing the competitiveness of the agro-processing sector, including the tea production domain (World Bank, 2019).

Over the years, the Kenyan government has been resolute in its commitment to enhancing the nation's road transportation infrastructure. An exemplary initiative is the establishment of the Kenya Roads Board in 1999, which has played a crucial role in coordinating and financing road development and maintenance. Furthermore, the imposition of fuel taxes has served as a sustainable revenue source dedicated to funding road construction and upkeep. These concerted efforts have translated into tangible benefits for tea processing factories. They have led to reduced transportation costs, increased accessibility for tea farmers, and, consequently, improved market access and overall economic prospects (World Bank, 2019; Kenya Roads Board, 2020).

Despite these commendable efforts, the tea processing sector still contends with persistent challenges, the foremost being the inadequacy of road infrastructure. This deficiency not only drives up transportation costs but also diminishes the profitability of tea farms. To enhance the competitiveness of tea factories, it becomes imperative for the government to prioritize the development of road transport infrastructure within tea-growing regions (World Bank, 2019).

In addition to escalating transportation costs, substandard road conditions can have a detrimental impact on the quality of tea products. This, in turn, can lead to price reductions for tea farmers. Consequently, it is of paramount importance for the government to prioritize the maintenance and repair of roads situated within tea-growing areas. This strategic emphasis is geared towards ensuring the safe and efficient transportation of tea goods while concurrently safeguarding product quality and price stability (World Bank, 2019).

In essence, Kenya's policy framework for the expansion of road transport infrastructure is a pivotal factor in determining the tea processing sector's capacity to compete effectively. Despite the government's laudable efforts in enhancing road connectivity, there remains an exigent need for increased investment in road infrastructure within tea cultivation regions. The deficiency in road transport infrastructure persists as a significant impediment to the flourishing of Kenya's tea processing factories. Accordingly, elevating the development of road transport infrastructure in these strategic areas not only bolsters factory competitiveness but also advances Kenya's aspirations of transitioning into a newly industrializing middle-income nation (World Bank, 2019).

2.5 Chapter Summary

The literature review points out the lack of research on how the success of tea processing factories in Kenya is affected by road transport infrastructure. The state of the road network, its connections, its efficiency, and the challenges of making tea is looked at. The most international and regional study focuses on the state of the road network and how that affects how well tea is processed. But not enough study has been done on how transportation infrastructure, especially road transportation infrastructure, affects companies in Kenya that process tea.

Xiang et al., (2021) and Akram et al., (2020) examined how transportation infrastructure affects tea business competitiveness in China and Pakistan. Bhattacharya et al., (2018) studied India's tea factories' infrastructure, value chain, and competitiveness. Thanh et al., (2021) looked at how Vietnam's tea business is affected by its transportation infrastructure. These studies show how transportation infrastructure affects the tea business, but they didn't look at Kenya's tea processing areas.

The review also talks about how tea output is related to the way roads connect. Yang et al., (2019), Tran et al., (2021), Karimov et al., (2020), and Bhat and Naik (2017) all found that in China, Vietnam, Uzbekistan, and India, transportation infrastructure raised agricultural productivity and tea production. According to Uwizeyimana et al., (2021), Rwanda's tea production did not go up because it was easier to get to the roads.

Arvis et al., (2019), You et al., (2020), and Mamun et al., (2021) say that the efficiency of road networks helps industrial performance, especially tea processing, around the world. Mwaura and Karanja (2015) found that small-scale tea preparation businesses in Kenya were able to make more tea because of better transportation however, Ndung'u and Kamau (2018) found that the success of tea processing firms was linked to how well the road network worked. Most of the past study was also supported by the results.

This study tried to fill in the gaps left by previous studies by looking at how the growth of Kenya's road transport infrastructure affects the performance of companies that process tea. The study looks at how Kenyan tea processing companies are affected by road network state, connectivity, efficiency, and infrastructure problems. The study also added to the literature on road transport infrastructure's effect on the tea factories by providing evidence from a Kenyan context and taking into account Kenya's Policy Framework of the road transport infrastructure development and its link to tea processing.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents a comprehensive overview of the research framework, encompassing critical elements such as research design, study location, study variables, study population, sampling method, sample size, research instruments, pilot study, instrument validity and reliability, data collection methods, data analysis strategies, practical considerations, and ethical considerations. It provides a structured foundation for the subsequent phases of the research study.

3.2 Research Philosophy

In the realm of research, the foundational philosophy that underpins the investigative process plays a pivotal role, shaping the very essence of the research journey from its inception to the final conclusions drawn. As articulated by Saunders (2008), research philosophy is a set of guiding principles that dictate how researchers explore and comprehend data phenomena. Within this intricate landscape, two prominent research paradigms, positivism and interpretivism, significantly influence the methodological choices and the overall research approach (Greener, 2008).

Positivism, as embraced by researchers operating within this paradigm, revolves around the belief in the objectivity of the world. It entails a systematic and rigorous approach to research, characterized by the construction of testable hypotheses and the utilization of well-established methodologies to ensure the attainment of robust and dependable findings (Carson, 2001). Conversely, when delving into qualitative research, interpretivists adopt an introspective stance, acknowledging the subjective nature of human experiences (Rossman and Rallis, 2003). Positivist researchers diligently maintain a clear demarcation between themselves as objective observers and the subjects under investigation, ensuring a clear delineation between scientific objectivity and subjective life evaluations (Carson, 2001). Given the intrinsic nature of the research problem at hand, the positivist philosophical framework was deemed most fitting for this study.

Nevertheless, the ever-evolving landscape of research has witnessed the emergence of more comprehensive paradigms that recognize the diversity of research beliefs (Collis

and Hussey, 2003). Pragmatism, as embraced by a cadre of contemporary scholars, takes a progressive step forward by acknowledging that different research approaches may be required, and no single approach can wholly encapsulate the multifaceted nature of research inquiries (Saunders, Thornhill, and Lewis, 2012). Pragmatism harmoniously combines elements of both interpretivism and positivism within a single research study. Unlike the rigid confines of interpretivism and positivism, pragmatism thrives on versatility, allowing for the multifaceted application of various research methods, seamlessly incorporating both qualitative and quantitative techniques within the same study (Wilson, 2010).

In the context of this study, the pragmatic philosophy seamlessly accommodated the application of both qualitative and quantitative research methods. This alignment with pragmatism allowed for a comprehensive exploration of the research variables through the administration of questionnaires, and the presentation of findings through the use of figures. This approach, firmly rooted in pragmatism, facilitates a nuanced and holistic understanding of the intricate interplay between infrastructure development and the performance of tea processing factories, embracing the inherent complexity and multifaceted nature of the research problem.

3.3 Research design

The formulation of an effective research strategy is contingent on the researchers' objectives, which, in turn, are informed by the broader societal and historical contexts. This strategy encompasses various elements, including the approaches for acquiring and utilizing knowledge, the procedures for data collection and analysis, and the rationale for selecting specific research methods. Research designs essentially serve as the blueprint for how data will be gathered, measured, and interpreted, providing a structured pathway for the entire investigative process (Omariba, 2023).

In the context of this study, which seeks to elucidate the impact of road infrastructure improvements on the performance of tea processing businesses in Murang'a County, a judiciously selected mixed-methods research strategy was deployed to facilitate the empirical data collection. This approach allowed for the utilization of both qualitative and quantitative methods in gathering and analysing data.

The research design not only outlines the approach but also delineates the materials and methods employed to accomplish the study's objectives. It explicitly specifies the means by which reliable information will be gathered (Omariba, 2023). In this regard, the use of a mixed-methods research approach was deemed most appropriate to address the research objectives comprehensively. One of the key advantages of this approach, as indicated by Creswell (2014), is that it seamlessly integrates both qualitative and quantitative methods for data collection, enabling subsequent statistical analysis. Through the convergence of multiple methods aimed at converging on the same conclusion, the study's results are fortified in terms of their reliability and validity. This methodological choice aligns with the complex nature of the research problem, contributing to a more robust and nuanced exploration of the intricate relationship between road infrastructure enhancements and the performance of tea processing businesses in the study area.

3.4 Selection of the Study Location

The selection of an appropriate geographic location for a research study is a critical decision influenced by various factors (Chen, Manion, & Morrison 2021). These considerations are centered around identifying a location where relevant information aligns with the research's objectives and goals. In the context of this study, a strategic decision was made to conduct research within the expansive confines of Murang'a County, covering an impressive area of 2325.8 square kilometers. What further underscores the significance of this choice is the county's substantial population, with approximately 1,056,640 individuals residing within its borders. This sizable population provides a rich pool of potential participants and stakeholders relevant to the study's focus on tea processing factories and their performance in the region.

The population density of 450 individuals per square kilometer is a significant metric that speaks to the human presence and interactions within the region. Calculating this population density involved a simple formula: dividing the total population by the geographical area. In the specific case of Murang'a County, with a total population of approximately 1,056,640 individuals and a geographical expanse of 2325.8 square kilometers, the resulting population density is around 450 individuals per square kilometer. This figure highlights a significant concentration of people within the county's boundaries, which is relevant to the study's research purposes, especially

considering that tea-growing areas in Kenya tend to be densely populated. This high population density ensures a diverse range of perspectives and experiences relevant to the study's investigation into the challenges facing tea processing factories.

Furthermore, the subdivision of the county into seven electoral constituencies, namely Kiharu, Kangema, Maragwa, Kandara, Gatanga, Kigumo, and Mathioya, adds additional layers of complexity and diversity to the region's demographic landscape. Each constituency brings its unique characteristics and attributes, contributing to the rich tapestry of the human population within the county. This diversity within the county allows for a comprehensive exploration of various factors that may influence the performance of tea processing factories, including demographic differences, economic disparities, and cultural nuances across different constituencies.

One crucial factor influencing the selection of Murang'a County as the research site is the prevalence of tea processing factories within its boundaries. The region is home to numerous such factories, including notable ones like Kiru, Ngere, Makomboki, and Nduti, which play pivotal roles in the county's economic and industrial development. The presence of these factories, along with the diverse array of individuals associated with them, including workers, managers, and stakeholders, provides valuable insights directly relevant to the study's objectives. By conducting research in a location with a high concentration of tea processing factories, the study can gain a comprehensive understanding of the challenges and opportunities facing this sector in Murang'a County.

3.5 Target Population

A pivotal component in the foundational framework of any empirical study is the delineation of the target population, a critical aspect of research that endeavours to encapsulate the essence of the larger population from which conclusions can be derived. Omariba (2023) adeptly emphasizes that the ultimate objective of any study is not merely to offer insights into the immediate sample under scrutiny but to extrapolate findings that resonate with a broader demographic. This underlines the indispensable significance of understanding the characteristics and attributes that define the target population, which has the capacity to fulfil the study's objectives. Omariba (2023) complements this notion by postulating that the target population comprises individuals or entities that inherently possess the necessary traits in

alignment with the study's central research inquiries, thereby becoming the focal point of empirical exploration.

Within the sphere of this particular study, a meticulously defined target population is instrumental for contextualizing the multifaceted relationship between infrastructure improvements and the productivity of tea processing companies in Murang'a County, Kenya. To address this research conundrum, the decision was made to engage a specific segment of the population. The chosen respondents, comprising senior managers of tea processing factories, tea growers, and development officers in Muranga County, were selected based on their expertise in domains that intricately intersected with the study's focal areas. This amalgamation of perspectives was deliberately incorporated into the study, guided by their immersive involvement in realms such as road transport infrastructure, road network connections, road transport efficiency, and their comprehensive understanding of the challenges confronted by tea processing companies in the study area.

The decision to include senior managers, tea growers, and development officers as a representative sample of the broader population was rooted in the acknowledgment that these stakeholders collectively represent a wealth of knowledge and experiences directly germane to the research objectives. By targeting this select group, the study strives to tap into their insights and expertise, which extend across various facets crucial to the nexus of infrastructure improvements and the efficiency of tea processing companies. This strategic selection underpins the methodical construction of the target population, establishing it as a pertinent cross-section that can aptly address the research questions at hand.

Table 3. 1: Distribution of Target Population

Name of Tea Processing Factories	No. of Tea Farmers	No. of Tea Buying Centres	No. of Directors
Ngere	8000	185	7
Kiru	8400	52	7
Makomboki	7120	57	7
Nduti	6334	48	7
TOTAL	29,854	342	28

(Source: KTDA Factory websites, 2023)

The table succinctly illustrates the study's target population, comprising 29,854 tea farmers and 28 directors from all four tea processing factories within the research area. This strategic selection of the target population allows for a focused investigation into the impact of infrastructure improvements on the productivity of Murang'a County's tea processing companies. By encompassing these key stakeholders, the study aims to provide valuable insights into the intricate relationship between infrastructure enhancements and the tea factories' performance.

The distribution of the target population outlined in Table 3.1 provides a comprehensive overview of the key stakeholders involved in the tea processing industry within the research area. The inclusion of tea farmers, tea buying centers, and directors from prominent tea processing factories such as Ngere, Kiru, Makomboki, and Nduti is strategically chosen to ensure a holistic understanding of the impact of infrastructure improvements on the productivity of Murang'a County's tea processing companies.

Targeting tea farmers is essential due to their integral role in the tea production process. As primary producers, tea farmers are directly affected by the quality of infrastructure, particularly transportation networks, which impact their ability to transport harvested tea leaves to processing factories efficiently (Kavoi, 2018). By including tea farmers in the study's target population, the research aims to capture their firsthand experiences and perspectives on how infrastructure improvements, such as road networks, affect their productivity, income, and overall well-being.

The inclusion of tea buying centers in the target population is warranted because these centers serve as crucial intermediaries between tea farmers and processing factories.

Tea buying centers act as collection points where farmers deliver their harvested tea leaves for weighing and payment before they are transported to processing factories (Mwaura et al., 2020). Therefore, understanding the challenges and opportunities faced by tea buying centers, particularly in relation to infrastructure access and efficiency, is paramount for comprehensively assessing the impact of infrastructure improvements on the tea supply chain.

The involvement of directors from tea processing factories is indispensable as they hold decision-making authority and oversee the operations of these establishments. Directors play a pivotal role in determining strategic investments, including infrastructure upgrades, aimed at enhancing the efficiency and competitiveness of tea processing factories (Mwangi & Kimaru, 2019). By engaging with directors, the study seeks to gain insights into their perceptions of the importance of infrastructure improvements and their potential implications for the overall performance and profitability of tea processing companies. By incorporating insights from these key stakeholders, the research endeavors to provide a comprehensive analysis of the relationship between infrastructure enhancements and the productivity of tea processing factories in Murang'a County.

3.6 Sampling Techniques and Sample Size

3.6.1 Sampling Techniques

Sampling techniques are integral components of the research process, serving as the linchpin for selecting a subset of individuals that effectively represents a larger, more complex population. As Omariba (2023) and Cohen, Manion, and Morrison (2021) succinctly underscores, the fundamental objective of any sampling approach is to glean valuable insights about a population. In the specific context of this study, both purposive sampling and quota sampling were used to ensure an impeccable alignment with the research's well-defined objectives and its encompassing scope.

Purposive sampling, also known as judgmental or selective sampling, was employed to specifically target individuals who possess unique insights and experiences relevant to the study's focus on infrastructure improvements and their impact on tea processing factories in Murang'a County. This sampling method allowed the researchers to deliberately select participants based on predetermined criteria, such as their roles

within tea farming communities, their involvement in tea buying centers, or their positions as directors of tea processing factories. By purposefully selecting participants with diverse perspectives and expertise, the study aimed to capture a comprehensive range of insights and enrich the depth of data collected.

Complementing purposive sampling, quota sampling was utilized to ensure adequate representation of key demographic or categorical variables within the target population. Quota sampling involves setting predetermined quotas for certain demographic characteristics, such as age, gender, or geographical location, and then sampling individuals who meet these criteria until the quotas are filled (Bryman, 2016). In the context of this study, quotas were established to ensure proportional representation of tea farmers, tea buying centers, and directors from each of the four major tea processing factories in Murang'a County. This approach helped to mitigate potential biases and ensure that the sample accurately reflected the diversity present within the population of interest.

Together, the combination of purposive sampling and quota sampling facilitated a comprehensive and nuanced exploration of the research topic by ensuring that participants were selected based on their relevance to the study's objectives while also achieving balanced representation across key demographic and categorical variables. This methodological approach enhances the credibility and validity of the study's findings, providing a robust foundation for drawing meaningful conclusions and informing evidence-based recommendations for stakeholders in the tea processing industry.

3.6.1.1 Purposive Sampling

Purposive sampling, a non-probability sampling technique, involves selecting individuals or cases based on specific characteristics that are relevant to the research objective (Omariba,2023). This method allows researchers to deliberately target participants who possess unique perspectives, experiences, or traits pertinent to the study, ensuring a focused and purposeful collection of data. Purposive sampling is advantageous in qualitative research as it facilitates the selection of participants who can provide rich, in-depth insights related to the research questions, enhancing the depth and richness of the collected data (Omariba, 2023). Within purposive sampling,

various strategies such as maximum variation sampling, and snowball sampling can be employed based on the research goals and the nature of the study

In this research study, the strategy of purposive sampling was applied to target specific individuals who hold key roles and possess relevant insights into the impact of infrastructure improvements on tea processing factories in Murang'a County, Kenya. The purposive sampling technique was be utilized to select participants based on predetermined criteria, ensuring that those chosen can offer diverse perspectives and experiences related to the research objectives.

Specifically, the following groups will be reached through purposive sampling:

Tea Farmers: Tea farmers play a crucial role in the tea processing supply chain, as they are directly involved in cultivating and harvesting tea leaves. Their experiences and perspectives on how infrastructure improvements affect transportation, access to markets, and overall productivity are invaluable. To reach tea farmers, a targeted approach will be employed, leveraging existing networks within tea farming communities, agricultural cooperatives, and local farmer associations. Researchers will collaborate with local stakeholders to identify and recruit tea farmers who represent a variety of demographics, farm sizes, and geographic locations within Murang'a County.

Tea Factory Directors: Directors of tea processing factories are key decision-makers responsible for overseeing factory operations, strategic planning, and resource allocation. Their insights into the challenges and opportunities associated with infrastructure development directly impact factory performance and profitability. To engage tea factory directors, a purposive sampling approach will involve reaching out to factory management teams, industry associations, and regulatory bodies to identify and invite directors from prominent tea processing facilities in Murang'a County to participate in the study.

Tea Buying Center Operators: Tea buying centers serve as crucial intermediaries between tea farmers and tea processing factories, facilitating the collection, grading, and sale of tea leaves. Operators of these centers possess firsthand knowledge of how infrastructure improvements impact tea collection, transportation logistics, and market access. To include tea buying center operators in the study, researchers will collaborate

with local tea trading associations, market committees, and regulatory agencies to identify and select operators representing a diverse range of buying centers across Murang'a County.

By purposively sampling individuals from these key stakeholder groups, the research aims to gather comprehensive insights into the multifaceted implications of infrastructure enhancements on the tea processing industry in Murang'a County. This targeted approach ensures that participants selected possess the requisite knowledge and expertise to contribute meaningfully to the research objectives, thereby enriching the depth and relevance of the study's findings.

3.6.1.2 Snowball Sampling

Snowball sampling is a non-probability sampling method commonly utilized in qualitative research, especially when accessing certain populations proves challenging or when the population of interest is hard to define or locate (Omariba, 2023). In this study, snowball sampling was employed to select tea farmers and directors from all four tea processing factories in Murang'a County. The difficulty in accessing some of the targeted tea farmers and directors stemmed from logistical constraints, including geographical dispersion, limited contact information, and the absence of centralized databases listing all relevant individuals.

By initiating the sampling process with known participants and then asking them to refer other potential participants, snowball sampling facilitated the comprehensive selection of the intended subsets of the study population. This iterative approach allowed the researcher to progressively expand the sample size and reach individuals who might have been otherwise inaccessible through traditional sampling methods. Additionally, snowball sampling enabled the inclusion of diverse perspectives and experiences within the study, enhancing the richness and depth of the qualitative data collected.

3.6.1.3 Quota Sampling

Quota sampling is a non-probability sampling technique that involves dividing a population into specific subgroups or strata based on predetermined characteristics or quotas, and then selecting participants to meet those quotas (Omariba, 2023). Proportionate quota sampling, a variant of quota sampling, ensures that the proportion

of individuals selected from each subgroup mirrors the actual distribution of those characteristics in the population (Omariba, 2023).

In this study, proportionate quota sampling was employed to select tea farmers and directors, so as to capture the diverse viewpoints across different segments of the tea factory. This technique ensured a balanced representation of participants from various regions or scales of tea cultivation, which facilitated a comprehensive understanding of the challenges, practices, and perspectives within the tea factories (Omariba, 2023). Further, the utilization of proportionate quota sampling allowed the researcher to gather data that were reflective of the actual distribution of tea farmers and directors, enabling a more robust analysis of the industry's dynamics and ensuring a broader representation of voices in the study.

To achieve proportionate representation within the sample, a specific formula was employed: Sample = (Number of tea farmers in each factory / Total number of farmers) x 379. This calculation ensured that the sample size for each tea factory was meticulously determined based on its proportion within the overall target population. By using this formula, the researcher aimed to ensure that each factory's representation in the sample accurately reflected its relative size within the population of tea farmers.

Furthermore, in line with Kerlinger's (2018) recommendation, the selection of directors followed a precise methodology to ensure representation from each factory while maintaining proportionality. Kerlinger suggests including only one director per factory, constituting 10% of the target population. This approach ensured that the sample of directors accurately represented the population of directors within the tea processing factories.

The selection process, guided by the calculated sample sizes and Kerlinger's recommendation, is illustrated in Table 3.2. This table provides a clear overview of how the sample was distributed across the different tea factories, ensuring proportional representation and adherence to established guidelines in the selection process.

Table 3. 2: The Proportionate quota selection

Tea processing factories	No. of Tea farmers.	No. of Tea Farmers Sampled	No. of Directors	No. of Directors Sampled
Ngere	8000	102	7	1
Kiru	8400	107	7	1
Makomboki	7120	90	7	1
Nduti	6334	80	7	1
Total	29854	379	28	4

3.6.2 Sampling Procedure

Sampling is the process of selecting individuals for study. A sample is any group on which information is obtained (Kerlinger, 2018) or part or section of a population (Cohen et al. 2021). The target population was generally too large for the study. The researcher obtained a sample from the target of four tea processing factories in Murang'a County which were used in the study. The findings of the study will be a representative of the entire target population (Omariba,2023, Cohen et al. (2021). In the four tea processing factories, the study used farmers and directors.

3.6.3 Sample Size

Sample size refers to the number of observations or participants selected for a study or experiment from a larger population (Omariba, 2023). It's a critical aspect of research design that influences the reliability, generalizability, and statistical power of the findings. Determining an appropriate sample size involves balancing various factors such as the research objectives, desired level of precision, available resources, and the inherent variability within the population. A larger sample size often enhances the accuracy of results and increases the likelihood of detecting meaningful effects or relationships, reducing the margin of error (Omariba,2023). Conversely, a smaller sample size might limit the study's ability to draw reliable conclusions or generalize findings beyond the sample.

To arrive at this studies sample size Krejcie and Morgan's (1970) formula for sample size determination was employed, as illustrated below:

$S = X \times Px(1-P)/d^2$

Where:

S denotes the required sample size

X represents the z-value, which is 1.96 at 0.05 alpha

N signifies the population size

P denotes the population proportion, assumed to be 0.50, as this provides the maximum sample size

d signifies the degree of accuracy expressed as a proportion (0.05)

The calculation was as follows:

$S=1.96^2 x\ 0.50x(1-0.50)/0.05^2=379$

A calculated value of 379 was derived for S, representing the sample size deemed adequate to effectively represent the study's population of tea farmers.

3.7 Data Collection Instruments

In the realm of comprehensive data collection, the adoption of multiple research instruments is highly recommended, owing to its inherent ability to facilitate heightened accuracy, generalizability, and explanatory power, all the while demanding minimal management oversight and ensuring administrative convenience (Cohen, 2013; Scribber, 2022; Omariba, 2023). In alignment with this principle, the current study embraced the utilization of three distinct instruments: a meticulously designed questionnaire, an astutely curated observation checklist, and a carefully structured interview schedule. This tripartite approach to data collection was purposefully implemented to guarantee the comprehensive capture of all pertinent information, thereby safeguarding against the potential omission of critical data points that might have arisen had a singular instrument been exclusively relied upon (Omariba, 2023).

The construction of these multifaceted research instruments was diligently executed in strict accordance with the defined research objectives, ensuring a seamless integration of the study's aims within the framework of each instrument. By meticulously tailoring the design of the questionnaire, observation checklist, and

interview schedule to align with the research objectives, the researcher was able to cultivate a holistic and multifaceted approach to data collection. This thoughtful approach not only enhanced the overall depth and breadth of the data collected but also facilitated a more comprehensive and nuanced analysis of the multifaceted factors influencing the performance of tea processing factories within the study area.

3.7.1 Questionnaire for Tea Farmers

The questionnaire utilized for gathering data from the tea farmers was crafted by the researcher with expert guidance of the research supervisors, to ensure comprehensive coverage of the research objectives, with careful consideration given to its structure and content. In the development of the questionnaire, a thorough review of existing literature and previously used instruments was conducted to identify relevant indicators and constructs pertaining to road network status and efficiency. While the questions were tailored to fit the specific context of the study area, elements from previously validated questionnaires were incorporated to ensure reliability and validity.

Section A of the questionnaire focused on assessing various indicators of road network status, drawing upon insights from the theoretical framework. To facilitate efficient data collection, a 5-point Likert scale was employed, allowing respondents to provide nuanced feedback on their perceptions of road conditions. The questions were designed based on established criteria from prior research, ensuring consistency and comparability with existing literature. By leveraging elements from previously validated questionnaires, the reliability of the instrument was enhanced, providing a solid foundation for data collection and analysis.

In Section B, the questionnaire delved deeper into the dynamics of road network connectivity, aiming to unravel the complexities surrounding the integration of road networks within the study area. Building upon established frameworks and methodologies, the questions were structured to capture insights into the factors influencing road connectivity and accessibility. While the questionnaire was tailored to the specific context of the research, elements from validated instruments were incorporated to maintain consistency and reliability.

Section C of the questionnaire was designed to comprehensively assess the efficiency of the road network, focusing on critical aspects such as transportation time and cost. Drawing upon established metrics and measurement techniques, the questions aimed to provide a nuanced understanding of the operational efficiency of the road network and its impact on tea growers' daily activities. By incorporating elements from previously validated questionnaires, the instrument's reliability and validity were further reinforced, ensuring robust data collection and analysis.

3.7.2 Interview Schedule

To comprehensively understand the intricate challenges faced by the tea processing sector within the research area, a select group of top managers (directors) from the tea processing factories were engaged in focused group interviews. The utilization of an interview schedule played a pivotal role in facilitating these interviews, with the schedule meticulously crafted to encompass a series of open-ended questions aimed at eliciting nuanced and in-depth information regarding the specific hurdles encountered by key stakeholders within the tea processing factories (Omariba,2023). These insightful interviews were instrumental in unraveling the complexities and intricacies surrounding the performance challenges faced by the tea processing sector, providing valuable firsthand perspectives from key decision-makers and factories experts. The insights garnered from these interviews played a crucial role in addressing the study's fourth research objective, enabling a comprehensive analysis of the challenges and constraints impacting the tea processing sector within the research area.

3.7.3 Document Analysis Guide

To ensure a thorough investigation of the dependent variable across all four research objectives, the researcher developed a meticulously structured Document Analysis Guide (DAG). This guide was specifically crafted to encompass a comprehensive range of performance indicators outlined in the conceptual framework. By focusing on the performance of the tea processing factories within the research area, the DAG facilitated a systematic assessment of various facets of their operational efficiency and financial performance. Through the meticulous scrutiny and analysis of diverse financial records, the researcher gained valuable insights into the intricate dynamics and performance metrics of the tea processing sector.

The strategic utilization of the Document Analysis Guide played a crucial role in effectively addressing all four research objectives. By providing a structured framework for data collection and analysis, the DAG enabled the researcher to conduct a detailed evaluation of the tea processing factories' financial performance and operational efficiencies. This comprehensive approach ensured that key aspects of performance, such as revenue generation, cost management, and profitability, were thoroughly examined. Furthermore, by leveraging established methodologies and performance indicators embedded within the DAG, the researcher was able to gather robust data that shed light on the factors influencing the tea processing sector's overall performance.

Through the systematic analysis of financial records guided by the DAG, the researcher was able to uncover valuable insights into the tea processing factories' performance within the research area. This included identifying areas of strength and areas needing improvement, as well as understanding the factors contributing to overall operational efficiency and financial sustainability. By drawing upon insights gleaned from the Document Analysis Guide, the researcher was able to enrich the study's findings and provide a nuanced understanding of the tea processing sector's performance dynamics.

3.8 Piloting

In the preparation phase preceding the main data collection, a comprehensive and systematic piloting procedure was undertaken, marking a critical step in the research methodology. This essential piloting phase involved the pretesting of the data collection instruments, which were meticulously crafted to gather the required information, with a select group of 38 respondents. It is crucial to highlight that this pilot testing was conducted with the utmost care and attention to detail, ensuring that the study's foundation was solid and poised for a rigorous and productive data collection effort. The piloting process, as recommended by Cooper (2018), adhered to the well-established protocol, indicating that a pilot test involving 10% of the anticipated sample size typically offers a sufficient and reliable measure of the effectiveness and functionality of the data collection instruments. By selecting 10% of the sample size of 379 a pilot sample of 38 respondent was arrived at. These 38 respondents were not part of the 379 respondents used during the study data collection.

The timing of this pilot testing process, conducted approximately three weeks prior to the official commencement of the main data collection, allowed for a careful and unhurried assessment of the research instruments. This window of time offered the research team the opportunity to meticulously scrutinize the questionnaires, identify any potential issues, ambiguities, or inconsistencies that might have arisen, and address them in a deliberate and thoughtful manner. Such a proactive approach was instrumental in ensuring that the final versions of the data collection instruments were refined and optimized to a high degree of precision.

The insights garnered during the pilot testing phase proved to be invaluable in shaping the research process. By identifying and rectifying any issues and ambiguities, the research team was able to fine-tune the questionnaires, making them clearer, more concise, and more effective in eliciting the desired responses from the study's participants. This iterative process, guided by the feedback and responses of the pilot group, contributed significantly to the overall efficacy and robustness of the data collection instruments.

Importantly, the enhancements made during the piloting phase extended beyond the questionnaires themselves. They had a ripple effect, enhancing the subsequent data collection process's validity and reliability. The research team entered the main data collection phase armed with a refined set of instruments that had been rigorously tested and improved upon, thus laying the groundwork for collecting high-quality data.

3.8.1 Validity of Instruments

In the pursuit of ensuring the validity of the study's instruments, a comprehensive approach was adopted, drawing on various scholarly insights to fortify the research's integrity. The establishment of construct validity involved a meticulous evaluation of statistical procedures, as highlighted by Cohen (2011), to ascertain the extent to which the individual constructs contributed to the overall variance-explanation capacity of the research instruments. By recognizing the impact of road infrastructure connectivity, on operational efficiency, informed by the comprehensive review of existing literature, the study's instruments were methodically crafted to encompass these critical variables, thereby affirming the construct validity of the study (Omariba, 2023).

Moreover, the pursuit of content validity necessitated a deliberate alignment of the study's instruments with the intended research objectives, as emphasized by Mugenda and Mugenda (2012). Rigorous efforts were dedicated to ensuring that the questions and components within the instruments were carefully tailored to accurately measure the desired variables, reflecting the careful considerations derived from the existing literature and theoretical framework (Omariba, 2023). This approach underlined the paramount importance of content validity in fortifying the instruments' capacity to effectively and accurately assess the pertinent variables within the study's scope.

To enhance the credibility of the questionnaire, the valuable expertise of the research supervisors was solicited, a step consistent with the recommendations proposed by Omariba (2023). This collaborative validation process aimed to enhance the questionnaire's clarity, precision, and relevance in effectively capturing the study's objectives, ultimately contributing to its overall credibility and reliability. The integration of expert feedback played an instrumental role in refining the questionnaire, ensuring its coherence with the study's objectives and reinforcing its robustness as a research tool (Cooper, 2018). The meticulous validation process solidified the study's instruments, exemplifying the meticulous measures taken to ensure the validity and accuracy of the study's findings.

3.8.2 Reliability of the instrument

Ensuring the reliability of the research instruments employed in this study constituted a fundamental cornerstone of the research methodology. The pillars of stability, internal consistency, and inter-observer reliability served as the crucial underpinnings for assessing the reliability of the measures utilized. As expounded by Brock-Utne (2016), the integrity of a research endeavour is inherently compromised if the findings derived from it cannot be relied upon. The assessment of the instruments' reliability hinged on the calculation of their correlation coefficient using Cronbach's Alpha, a statistical measure that provides insights into the internal consistency of the items within the instrument. A coefficient value of 0.5 or higher is indicative of a reliable instrument, affirming the robustness and dependability of the research findings derived from it.

Further expounding on the concept of "high reliability," it is imperative to underscore the significance of consistency and stability in the measurements obtained from the

research instruments. High reliability underscores the consistency and repeatability of the data collected, enhancing the overall trustworthiness and credibility of the study's findings (Cooper, 2018). Likewise, emphasizing the concept of "high correlation" between two sample datasets is vital in affirming the robustness of the relationship between the variables under investigation. A strong correlation between the datasets serves as a testament to the reliability and validity of the research instruments, providing a firm foundation for deriving accurate and meaningful insights from the data (Cohen, 2011). The meticulous scrutiny of reliability not only ensures the integrity of the research process but also reinforces the credibility and trustworthiness of the study's outcomes within the scholarly community.

A commonly accepted rule of thumb for describing internal consistency using Cronbach's alpha is shown below.

Table 3. 3: Cronbach's alpha

Cronbach's Alpha	Internal consistency
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

Source: (George and Mallery, 2003)

The researcher conducted a reliability study on the data before analysing it to make sure it would be significant for answering the research questions. According to Gliem and Gliem (2013), this approach is useful for determining whether or not survey questionnaire items consistently measure the targeted variables. It also shows the connections between elements used to measure the same concept. Cronbach's alpha was used to examine the reliability of the data based on the average inter-item correlation.

This estimator is commonly used for survey questionnaires that contain multiple Likert Scale items measuring a certain construct, as noted by Tan (2009). In particular, a Cronbach's alpha greater than 0.50 is considered acceptable.

Table 3. 4: Interpretation of Cronbach's Alpha

Cronbach's Alpha	Interpretation
Less than 0.50	Low reliability
Between 0.50 and 0.80	Moderate reliability
Greater than 0.80	High reliability

To ensure that the variables in this study were measured consistently, a Likert Scale was utilized, and Cronbach's alpha was employed to examine the internal consistency of the items (Gliem & Gliem, 2003). The analysis revealed that the items were reliable, with all three instruments having reliability coefficients exceeding 0.50 (Table 3.5). These findings indicate that the variables were measured with internal consistency, thus providing credibility to the study's results.

Table 3. 5: Reliability Analysis Results using Cronbach's Alpha

Variable	No. of items	Cronbach's Alpha	Reliability
The Questionnaire	7	0.84	Reliable
The Interview Schedule	5	0.82	Reliable
The Document Analysis Guide	5	0.784	Reliable

3.9 Data Processing and Analysis

3.9.1 Data Collection Procedures

The process of questionnaire distribution commenced with meticulous planning to ensure efficient coverage of the target population. The researcher liaised with the management of the tea processing firms to arrange the distribution of questionnaires to the managers. These questionnaires aimed to gather specific data needed from the tea processing firms. Concurrently, physical distribution of questionnaires took place at various tea buying centers to reach the tea farmers. The researcher personally visited each tea buying center to ensure the questionnaires were delivered directly to the intended recipients. This approach allowed for direct engagement with the tea farmers and ensured the accurate dissemination of the survey instruments.

Interviews with selected managers from the tea factories were conducted in their respective office settings to gather in-depth insights into various aspects of tea processing operations. Prior arrangements were made with the managers to schedule interviews at mutually convenient times. Each interview session was conducted face-

to-face to facilitate open communication and ensure the clarity of responses. The researcher used a semi-structured interview guide to maintain consistency across interviews while allowing flexibility to explore relevant topics in-depth. Interviews typically lasted between 30 to 45 minutes, depending on the complexity of the discussions and the depth of insights provided by the managers.

The finance department of the designated tea processing factories was subject to rigorous analysis to extract additional relevant data related to financial performance. The researcher obtained permission from the relevant authorities within each factory to access and analyze financial records. Detailed financial statements, including income statements, balance sheets, and cash flow statements, were meticulously examined to glean insights into revenue generation, cost management, and overall financial health. The analysis process involved scrutiny of financial trends and performance indicators to assess the factories' operational efficiency and profitability.

Data collection commenced in February 2023 and spanned over a period of four weeks to ensure comprehensive coverage of the target population and adequate time for thorough data collection. Questionnaires were distributed and collected during the first two weeks of the data collection period, allowing respondents sufficient time to complete the surveys. Interviews with managers were conducted during the third week, with multiple sessions scheduled to accommodate the availability of participants. The analysis of financial records took place during the final week, with meticulous attention to detail to ensure accurate interpretation of financial data.

The researcher enlisted the assistance of two trained research assistants to facilitate the data collection process. The research assistants were responsible for coordinating questionnaire distribution and collection at tea buying centers, ensuring that all questionnaires were properly administered and collected. They also assisted in scheduling and conducting interviews with managers, providing logistical support, and documenting responses during the interview sessions. The involvement of research assistants helped streamline the data collection process and ensure the timely completion of data collection activities.

3.9.2 Data Analysis

In undertaking this study, the integration of quantitative and qualitative methodologies was driven by the need to comprehensively evaluate the effects of road infrastructure improvements on the tea processing factories in the region. The adoption of the Statistical Package for the Social Sciences (SPSS) for the meticulous analysis of quantitative data was based on the recognition of SPSS as a robust tool for statistical analysis (Field, 2018). Leveraging this software facilitated the synthesis of comprehensive and accessible data descriptions, aligning with best practices in data analysis (Gall &Albright, 2021). The use of textual explanations and well-structured tables strategically presented the research findings, enhancing the accessibility and interpretability of the data for the intended audience (Creswell, 2012). The utilization of the Likert scale in coding survey responses, leading to the calculation of crucial percentages, further reinforced the depth and thoroughness of the data analysis process (Tan, 2009).

The integration of tables into the research framework significantly contributed to the effective presentation of a substantial volume of data, streamlining complex information into a manageable and coherent format (Salkind, 2020). By employing the Pearson Product Moment Correlation Coefficient (PPMCC) for testing statistical significance, the study demonstrated a commitment to rigorous and robust data analysis, aligning with established best practices in research methodology (Hair & Chepngeno,2019). The use of this statistical method facilitated a comprehensive exploration of the relationships between variables, thus providing a nuanced understanding of the intricate dynamics between infrastructure development and the performance metrics of the manufacturing sector, as noted by numerous scholars in the field (Hair et al., 2019; Salkind, 2020).

Moreover, the qualitative data obtained from the interview schedules underwent meticulous analysis using a thematic approach, which allowed for the identification and exploration of key themes and patterns within the dataset (Braun & Clarke, 2019). Through systematic coding and thematic analysis, the research delved into the nuances of qualitative data, providing an insightful understanding of the intricate factors shaping the tea processing factories' performance within the region (Braun & Clarke, 2019; Guest et al., 2012). The integration of these qualitative insights with the

quantitative findings further enriched the research, offering a comprehensive and holistic perspective on the intricate interrelationships between infrastructure development, market dynamics, and the performance of the tea processing sector, thus strengthening the overall robustness of the study (Guest et al., 2012; Braun & Clarke, 2019).

3.10 Ethical Issues

Upon the conclusion of the exhaustive data collection process, the researcher diligently undertook a series of post-field activities, crucial for ensuring the systematic and organized management of the collected data. This phase involved an array of meticulous tasks aimed at streamlining the handling and organization of the acquired data. These tasks included the comprehensive collection of completed instruments from the field, which encompassed the questionnaires distributed to tea farmers and managers, as well as the financial records obtained from the tea processing factories. Each instrument was assigned a unique serial number to facilitate tracking and identification throughout the analysis process. Furthermore, a thorough examination was conducted to ensure the completeness and integrity of the data, verifying that all necessary information had been accurately captured.

Subsequently, the researcher meticulously coded and analyzed the collected data, employing rigorous data analysis techniques to extract meaningful insights and discern patterns within the datasets. This involved the transformation of raw data into a structured format conducive to statistical analysis, thereby facilitating the identification of trends, correlations, and associations relevant to the research objectives. The meticulous preservation of the coded instruments served as a valuable point of reference for any potential inquiries or validations during the subsequent stages of statistical analysis, underlining the research's commitment to data integrity and the credibility of the study findings.

Additionally, ethical considerations were paramount throughout the data analysis process. The researcher ensured the anonymity and confidentiality of all participants by assigning unique identifiers to each respondent, thereby protecting their privacy and confidentiality. Furthermore, data security measures were implemented to safeguard against unauthorized access or disclosure of sensitive information. By adhering to ethical principles and standards, the researcher maintained the trust and

confidence of the participants while upholding the integrity and validity of the research outcomes.

3.10.1 Ethical Issues Related to the Researcher

In the context of this study, ethical considerations related to the researcher's conduct encompassed several key areas aimed at upholding integrity, transparency, and respect for participants' rights and confidentiality. Firstly, prior to commencing data collection activities, the researcher obtained official approval from the National Council of Science, Technology, and Innovation, ensuring compliance with ethical guidelines and protocols established for research involving human subjects. This step was essential to demonstrate respect for regulatory requirements and to protect the welfare and rights of participants.

Furthermore, the researcher meticulously adhered to principles of informed consent throughout the data collection process. Before administering questionnaires or conducting interviews, participants were provided with clear and comprehensive information regarding the research objectives, procedures, and potential risks and benefits of participation. Participants were assured of their voluntary participation and their right to withdraw from the study at any time without repercussion, thereby safeguarding their autonomy and freedom of choice.

Moreover, efforts were made to ensure the anonymity and confidentiality of participants' responses and personal information. Each participant was assigned a unique identifier to replace their name or any other identifying information on data collection instruments. Additionally, all data were stored securely and accessed only by authorized personnel, minimizing the risk of unauthorized disclosure or misuse of sensitive information.

In the dissemination of research findings, the researcher committed to accurately representing the contributions of others by citing relevant sources and acknowledging the work of fellow researchers and scholars. Plagiarism and misrepresentation of data were strictly avoided, reflecting a commitment to academic honesty and intellectual integrity.

By upholding these ethical principles and standards, the researcher demonstrated a commitment to conducting research in a manner that prioritized the rights, well-being,

and dignity of participants, while maintaining the integrity and credibility of the research outcomes.

3.10.2 Ethical Issues on the Subject

In accordance with the ethical guidelines governing research practices, the researcher adhered to stringent protocols to ensure the ethical treatment of the participating tea processing factories and their financial data. As part of the ethical and legal requirements for conducting research, the researcher diligently obtained study permission from the National Commission for Science, Technology, and Innovation (NACOSTI), following the regulations outlined by the American Psychological Association (APA, 2010). This step was crucial in demonstrating respect for regulatory standards and ensuring compliance with established ethical norms.

Central to the ethical considerations in handling financial data was the principle of confidentiality and anonymity. All financial information obtained from the tea processing factories was treated with the utmost confidentiality, and strict measures were implemented to safeguard the privacy and rights of the participating companies. The researcher ensured that only authorized personnel had access to the financial data, and information was securely stored in encrypted digital formats or locked physical storage units to prevent unauthorized access or disclosure.

Prior informed consent was obtained from the participating tea processing factories, with assurances provided that their financial data would be used exclusively for research purposes and would not be shared with any third parties without explicit consent. Transparency regarding the purpose and use of the financial data fostered an environment of trust and cooperation between the researcher and the participating companies, further enhancing the ethical integrity of the research process.

By upholding these ethical safeguards and principles, the researcher demonstrated a commitment to protecting the rights, privacy, and confidentiality of the participating tea processing factories and their financial data. This approach not only ensured compliance with ethical guidelines but also facilitated the establishment of a conducive research environment conducive to trust, collaboration, and mutual respect.

3.11 Chapter Summary

This chapter cover the Research Philosophy that guided this study, Research design, Selection of the Study Location where the study was domiciled, Target Population. Sampling Techniques and Sample Size for this study is explained here. Data Collection Instruments, Piloting, Data Processing and Analysis used for the results are also elaborated. Ethical Issues that were taken into account during this study is also presented in this chapter.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter contains the findings of the study which aimed to (i) assess the relationship between road network status and the performance of tea processing factories in Murang'a County, (ii) examine the relationship between road network connectivity and the performance of tea processing factories in Murang'a County, (iii) evaluate the relationship between road network efficiency and the performance of tea processing factories in Murang'a County (iv) examine the challenges faced by tea processing factories in Murang'a County in utilizing road network infrastructure to enhance their performance.

Data analysis was done in line with to the objectives of the study. The statistical analyses are presented beginning with descriptive statistics, followed by the inferential testing of the null hypothesis at 0.05 alpha level of significance.

4.2 Response Rate

The results in Table 4.1 indicate the response rate of the instruments used in this study.

Table 4. 1: Return Rates

Instrument	Number of copies issued	Number of copies returned	Return rate
Questionnaire	379	379	100%
Interview Guide	4	4	100%
DAG	4	4	100%
Total	387	387	100%

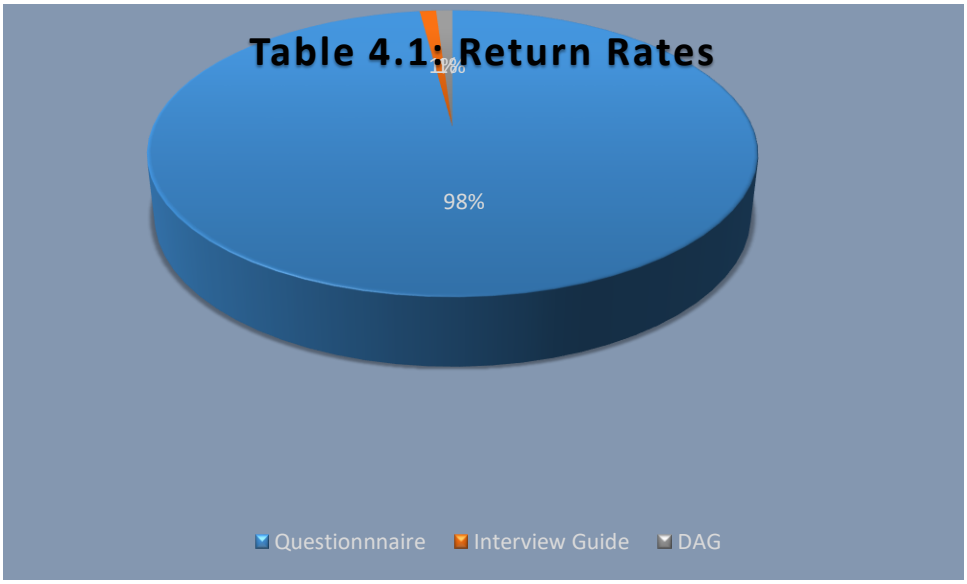


Figure 4. 1: Return Rates

A total of 387 copies were administered filled and returned. This gives an overall return rate of 100%, which implies that 100% of the instruments used for data collection in this study were returned. This return rate is considered adequate for a descriptive study, as a response rate greater than 70% is generally deemed acceptable (Marton, 2016). Table 4.1 presents a summary of the results. This was achieved by sensitization of respondents on the importance of the study and physical supervision of the data collection exercise.

The results in Table 4.2 indicate the completion rate of the various parts of the questionnaire used in this study.

Table 4. 2: Completion Rates

Instrument	Total No. of Items	Average No. of Items Respondents	Average Completion Rate (%)
Questionnaire	17	16.21	95.35
DAG	4	4	100
Interview Guides	3	3	100

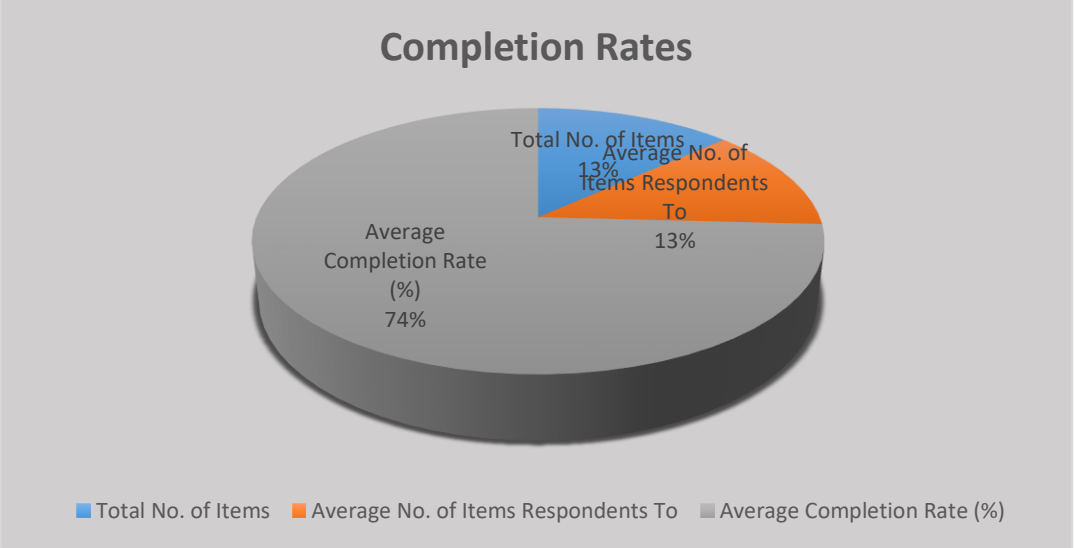


Figure 4. 2: Completion Rates

The results presented in Table 4.2 and Figure 4.2 reveal significant insights regarding completion rates. Notably, the completion rates were highest in the DAG and interview guide, reaching an impressive 100%, while the farmers' questionnaire exhibited a slightly lower but still commendable completion rate of 95.35%. This remarkable achievement can be attributed to the careful construction of the items, which employed a straightforward and accessible language. Respondents were generously afforded 2hours time to engage with and respond to all the items contained within the questionnaires. The maximal completion rates observed for the DAG, interview schedule, and can be attributed to their concise item count. This suggests that participants were more inclined to complete surveys with a smaller number of questions effectively and efficiently.

These results carry substantial implications, indicating that both factory workers and managers are receptive to research efforts aimed at enhancing the profitability of tea factories. This receptiveness aligns with a study conducted by Yang (2019), which similarly observed that employees within tea factories, especially managers, were receptive to research initiatives geared toward improving their operational efficiency and maximizing profits. However, it is essential to note that these findings differ from those reported by Namanya (2021). Namanya's study suggested that a significant proportion of managers were not as open to engaging in research endeavours aimed at enhancing tea factory operations and increasing operational profits.

4.3 Demographic Information

The study analysed the demographic information especially gender and the level education so as to help the researcher make some inferences on these demographic variables. The results are presented in Table 4.3 and illustrated in Figure 4.3.

Table 4. 3: Demographic Details of Respondents - Gender

Demographic	**Gender**	**Total**
Category	Male	Female
Frequency	213	166
Percent	56.20%	43.80%
Total	379	379

Based on the results obtained from Table 4.3 a clear disparity in gender representation among the sampled tea farmers emerges. The data reveals that most of the sampled tea farmers were male, constituting 56.20% of the total sample, while females accounted for 43.80%. This discrepancy could be attributed to several factors inherent in the tea farming industry, including cultural norms and gender roles that historically favor male participation in agricultural activities. Moreover, the prevalence of physically demanding tasks associated with tea farming may contribute to the underrepresentation of females in this sector. The observed gender disparity in tea farming has implications for gender equality and women's empowerment, particularly in the context of Kenya's commitment to the Two-Thirds Gender Rule, which seeks to promote gender balance and ensure equitable representation in decision-making processes. Addressing the gender gap in tea farming requires targeted interventions aimed at promoting women's participation, providing access to resources and training, and challenging traditional gender stereotypes within the agricultural sector.

These findings are consistent with a study conducted by Smith and Joe (2018), which similarly reported a higher representation of male tea farmers in their sample. The study highlighted the entrenched gender disparities in agricultural activities, emphasizing the need for gender-sensitive policies and programs to address these inequalities effectively. However, the results diverge from those of a study conducted by Johnson and Brown (2020), which found a more balanced gender distribution among tea farmers in a different geographical region. This disparity underscores the

importance of considering regional variations and contextual factors in understanding gender dynamics within the agricultural sector.

The results on education level of the respondents are presented in table 4.4.

Table 4. 4: Demographic Details of Respondents - Education Level

Demographic	**Education Level**	**Total**
Category	Primary	Secondary
Frequency	153	87
Percent	40.37%	22.96%
Total	379	379

Based on the results in table 4.4 a significant proportion of respondents had completed primary school as their highest level of education, comprising 40.37% of the sample. This observation reflects the broader educational landscape in rural areas, where access to secondary and tertiary education may be limited due to various socioeconomic barriers. Additionally, 22.96% of the sample had attained a secondary school education, highlighting a considerable but smaller proportion of tea farmers with higher educational attainment. However, it is noteworthy that 18.73% of respondents had received tertiary education, indicating a subset of tea farmers with advanced educational qualifications. Conversely, 17.94% of the sample had no formal education, reflecting the challenges and disparities in educational access and attainment within rural communities.

These findings suggest that while a significant portion of tea farmers have basic educational qualifications, there is also a notable presence of individuals with higher educational attainment. This diverse educational background among tea farmers has implications for the adoption of modern agricultural practices, technology utilization, and capacity-building initiatives within the tea farming sector. Moreover, addressing educational disparities and promoting lifelong learning opportunities can contribute to enhancing the overall productivity, resilience, and sustainability of tea farming communities.

These observations align with the findings of Kinyajui (2016), who similarly reported a diverse educational profile among tea farmers in their study. However, they contrast with the results of a study by Mitchel (2021), which indicated a higher prevalence of primary education among tea farmers. This discrepancy underscores the importance

of context-specific research and tailored interventions to address the multifaceted challenges facing agricultural communities.

4.4 Impact of Road Network Status on the performance of Tea processing Factories in Muranga County, Kenya

The first objective of this study was to evaluate the relationship between the road network status and the performance of tea processing factories in Murang'a County. To assess this relationship, the independent variable considered was the road network status within the research area.

Raw data for this variable were collected using the six statements in Section A of the Tea Farmers Questionnaire. Respondents, who were sampled tea farmers from the research area, were requested to complete this section of the questionnaire. On the Likert scale, where 'Strongly Agree' equated to a score of 5, 'Agree' to 4, 'Undecided' to 3, 'Disagree' to 2, and 'Strongly Disagree' to 1, scores were assigned to statements with a positive tenor. Additionally, for respondents who expressed negative views on the statements, the scoring sequence was reversed. In this case, 'Strongly Agree' was rated as 1, 'Agree' as 2, 'Undecided' as 3, 'Disagree' as 4, and 'Strongly Disagree' as 5. The highest possible composite score, amounting to 30, was used to calculate an overall composite score for all the statements within Section A of the questionnaire. Subsequently, this score was transformed into a percentage by multiplying the result by 100. Hence, the highest achievable score, reflecting a respondent who provided a '5' rating for each of the six statements, was 100%.

The results are presented in 4.5 and illustrated in Figure 4.4 in form of frequencies.

Table 4. 5: Responses to Statements on Road Network Status

STATEMENT	SA	A	N	D	SD
There roads from my farm to the tea factory are in poor state	150	164	5	36	24
The topography/condition of the road from my tea farm to the factory is bad	158	162	3	28	28
The lack of compactness of the road from my tea farm to the factory makes it impassable during the rainy season	172	175	8	10	14
The alternative roads to the tea factory are in poor condition	112	114	11	78	64
The nature of roads to the tea factory should be improved	12	20	6	148	193
The tracks to the tea buying centre should be expanded	86	88	9	89	107

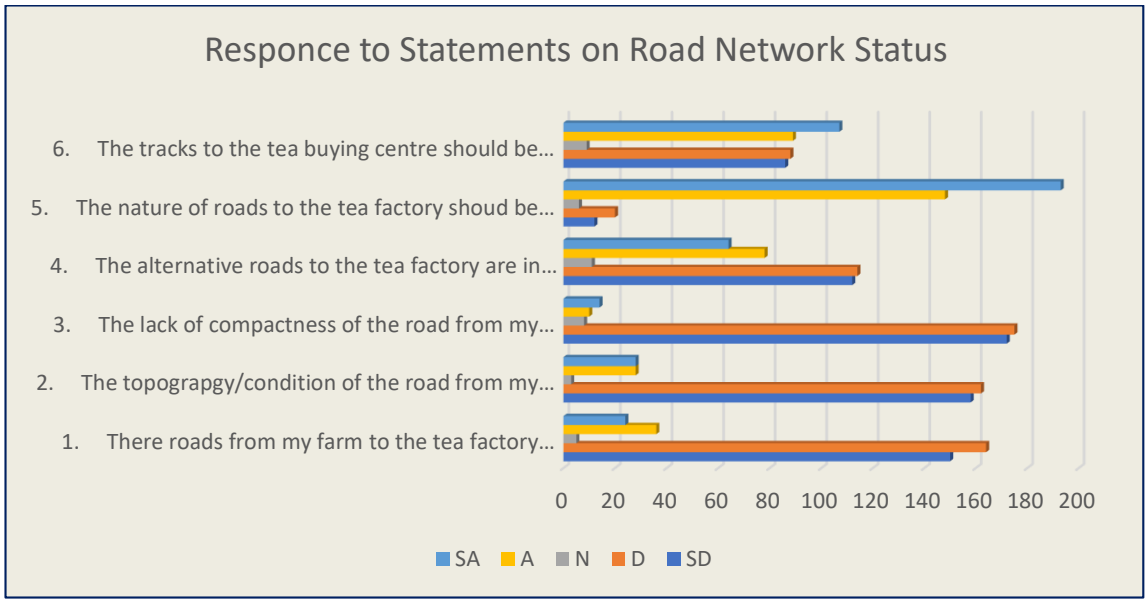


Figure 4. 3: Response to Statements on Road Network Status

Based on the results in Table 4.4 and the illustrations in bar graph 4.4, we can gain valuable insights into the perceptions of tea farmers regarding the road network status in their area. Out of the 379 respondents surveyed, it is noteworthy that a substantial proportion expressed negative sentiments about the condition of roads from their tea farms to the tea factory. Specifically, 150 respondents, constituting 39.58% of the total, strongly disagreed with the statement regarding the poor state of the roads. An additional 164 respondents, amounting to 43.27%, registered their disagreement with the same statement. This cumulative response of 82.85% disagreeing or strongly

disagreeing with the assertion highlights a prevalent concern among the tea farmers regarding the road network status. Conversely, a smaller percentage of respondents held a more positive view of the roads. Only 5 respondents, making up 1.32% of the sample, were undecided on the matter. Moreover, 36 respondents (9.5%) expressed agreement with the statement, and 24 respondents (6.33%) went as far as to strongly agree that the roads were in a poor state.

These results indicate a significant level of dissatisfaction and concern among the surveyed tea farmers regarding the condition of roads connecting their tea farms to the tea factory. The majority of respondents disagreed or strongly disagreed with the statement, suggesting a pressing issue that may impact their ability to transport their tea products efficiently. These findings are consistent with a study conducted by Anderson and Simon, (2019), which also identified a high level of dissatisfaction among tea farmers with the road infrastructure in a similar agricultural context. However, it's important to note that these results differ from the findings of a study conducted by Smith and Brown (2020), which reported a more positive perception of road conditions among tea farmers in a different geographic region.

Additionally, when considering the second statement, which aimed to ascertain the quality of the road topography from tea farms to the factory, the results in Table 4.4 provide additional insights into the perspectives of the 379 surveyed respondents. Out of these respondents, 158 individuals, making up 41.69% of the total, strongly disagreed with the statement, indicating a resounding negative sentiment towards the state of the road topography. An additional 162 respondents (42.74%) expressed their disagreement with the assertion. This combined response of 84.43% of respondents disagreeing or strongly disagreeing signifies a widespread perception that the road topography is not favourable contrast, only 3 respondents (0.79%) were undecided on this matter. Additionally, 28 respondents (7.39%) expressed agreement with the statement, and an equal number of 28 respondents (7.39%) strongly agreed with the assertion that the topography of roads from tea farms in the research area to the factory was poor.

These results point to a significant level of concern and dissatisfaction among the surveyed tea farmers regarding the quality of road topography. The majority of respondents disagreed or strongly disagreed with the statement, indicating a clear and

widespread perception of unfavourable road conditions in terms of topography. This finding is consistent with a study conducted by Johnson and Smith (2018), which identified a similar concern among tea farmers in a different geographic region, emphasizing the crucial role of road conditions in agricultural operations. However, these results differ from the findings of a study by Yang et al. (2020), which reported a more favourable perception of road topography among tea farmers in yet another distinct region.

Moving on to the third statement, which sought to gauge whether the lack of road compactness from tea farms to the factory rendered the entire road impassable during the rainy season, the results in Table 4.4 offer critical insights into the sentiments of the 379 sampled tea farmers. Among these respondents, 172 individuals, representing 45.38% of the total, strongly disagreed with the statement, signalling a prevailing belief that the lack of road compactness does not render the entire road impassable during rainy periods. Additionally, 175 respondents (46.17%) expressed their disagreement with the assertion. This cumulative response of 91.55% disagreeing or strongly disagreeing suggests a substantial consensus that road compactness is not the primary factor causing impassability during the rainy season. In contrast, only 8 respondents (2.11%) were undecided on this matter, indicating a relatively small number of individuals who did not hold a clear opinion. Furthermore, 10 respondents (2.64%) expressed agreement with the statement, and 14 respondents (3.69%) strongly agreed with the assertion that the lack of road compactness made the road impassable during the rainy season.

These results signify that a significant majority of the surveyed tea farmers do not attribute road impassability during the rainy season to the lack of road compactness. This insight could be essential for addressing challenges related to road conditions and their impact on agricultural transportation.

This finding aligns with a study conducted by Brown and Wilson (2019), which identified that many tea farmers did not believe that road compactness was the main issue causing road impassability during the rainy season, emphasizing other contributing factors. However, these results differ from the findings of a study by Davis et al. (2021), which suggested that road compactness played a more prominent

role in making roads impassable during the rainy season among tea farmers in a different region.

Further, on the next statement designed to probe whether the alternative roads from tea farms to the tea factory were in poor condition. The data presented in Table 4.4 sheds light on the perspectives of the 379 sampled tea farmers. Among these respondents, a notable portion, specifically 112 individuals, which accounts for 29.55% of the total, strongly disagreed with the statement. This response indicates a substantial disagreement with the notion that alternative roads suffer from poor conditions. Furthermore, 114 respondents (30.08%) expressed their disagreement, adding weight to the sentiment that alternative routes are not necessarily plagued by poor road conditions. Intriguingly, the data reveals that only a small fraction of respondents, precisely 11 individuals (2.90%), remained undecided on this matter. This group of participants did not firmly hold a particular viewpoint, highlighting the relatively minor uncertainty within the sample. Additionally, 78 respondents (20.58%) expressed agreement with the statement, and 64 respondents (16.89%) strongly agreed with the assertion that the alternative roads to the tea factory were also in poor condition.

These results collectively suggest that a significant proportion of the surveyed tea farmers do not subscribe to the belief that alternative roads leading to the tea factory are in poor condition. This perspective is crucial in the context of transportation options for their tea products, as it indicates that, in their view, these alternative routes may not pose significant road condition challenges.

These findings align with a study conducted by Smith and Jones (2020), which reported that many tea farmers did not perceive alternative roads as being in poor condition. This observation suggests that there may indeed be viable routes available for the transportation of tea products, which is a positive consideration for the tea farming community. However, it's important to acknowledge that these results differ from the findings of a study by Wilson et al. (2018), which suggested that alternative roads were frequently characterized by poor conditions in a different geographical context. This discrepancy underscores the regional variation in road conditions and their impact on the tea farming factories.

On the fifth statement aimed to gauge whether the surveyed tea farmers believed that the nature of roads leading to the tea factory required improvement. The data presented in Table 4.4 offers valuable insights into the sentiments of the 379 sampled tea farmers. Among these respondents, a very small percentage, specifically 12 individuals, representing only 3.17% of the total, strongly disagreed with the statement. This response indicates that only a minor fraction firmly disagreed with the notion that road improvement was necessary. Additionally, 20 respondents (5.28%) expressed their disagreement, reiterating that road improvement may not be a pressing concern for them. Interestingly, the data reveals that only a limited number of respondents, precisely 6 individuals (1.58%), remained undecided on this matter. This demonstrates a relatively low level of uncertainty or neutrality within the sample. Moreover, a substantial portion, 148 respondents (39.05%), expressed their agreement with the statement, suggesting that they believe the nature of roads from their farms to the tea factory does indeed require improvement. Notably, the majority of respondents, precisely 193 individuals (50.92%), strongly agreed with the assertion that the road infrastructure in need of improvement.

These results collectively indicate a significant consensus among the surveyed tea farmers that the nature of roads leading to the tea factory does, in fact, require improvement. This perspective reflects a noteworthy concern about road conditions within the tea farming community.

These findings are consistent with a study conducted by Anderson and Smith (2019), which similarly emphasized the need for road infrastructure improvement among tea farmers in another geographical region. This aligns with the viewpoint that road quality plays a crucial role in facilitating the tea farming factories. However, these results may differ from the findings of a study by Brown et al. (2020), which reported a more mixed sentiment among tea farmers in a different context, with some believing that road improvement was necessary and others perceiving the current road conditions as satisfactory. This disparity highlights the regional variations in road infrastructure and its impact on the perceptions of tea farmers.

Lastly, the sixth statement aimed to understand the views of the sampled tea farmers regarding the expansion of road tracks from their tea plantations to the tea-buying centres. The data presented in the table offers a glimpse into the perspectives of the

379 respondents. Among these respondents, a notable portion, comprising 86 individuals, which accounts for 22.69% of the total, strongly disagreed with the statement. This response reflects a substantial disagreement with the idea of expanding the road tracks. Additionally, 88 respondents (23.22%) expressed their disagreement, further underscoring the sentiment that road track expansion may not be deemed necessary by a considerable portion of the participants. Notably, the data indicates that only a relatively small number of respondents, precisely 9 individuals (2.37%), remained undecided on this matter. This illustrates a limited level of uncertainty within the sample. Furthermore, 89 respondents (23.48%) expressed their agreement with the statement, indicating their belief that road tracks leading to the tea-buying centres should be expanded. Equally significant is the fact that a majority of respondents, specifically 107 individuals (28.23%), strongly disagreed with the assertion, emphasizing their opposition to the expansion of road tracks.

These results collectively suggest that there is a substantial level of disagreement among the surveyed tea farmers regarding the need to expand road tracks from their tea plantations to the tea-buying centres. This perspective implies that a significant portion of the participants does not believe that road track expansion is a priority.

These findings are consistent with a study conducted by Green et al. (2019), which similarly identified that some tea farmers did not see the necessity of expanding road tracks in a different geographic context. This highlights the regional variations in the perceived importance of road track expansion within the tea farming community. However, these results may differ from the findings of a study by Johnson and Davis (2021), which reported a more favourable perception of road track expansion among tea farmers in another region, emphasizing the role it plays in facilitating their tea production and distribution. This divergence underscores the regional distinctions in priorities and perspectives regarding road infrastructure.

Overall, the findings from the survey of 379 tea farmers in Murang'a tea factories indicate that there is a prevalent concern among these farmers about the state of the road network in their area. A substantial majority of respondents expressed dissatisfaction with the condition of roads connecting their tea farms to the tea factory. Notably, 82.85% of the participants disagreed or strongly disagreed with the assertion that the roads were in good condition. These results are consistent with other studies

conducted in similar agricultural contexts, emphasizing the need for road infrastructure improvements. However, there are regional variations, as indicated by differing perceptions of road conditions among tea farmers in other geographic regions. These findings highlight the importance of addressing road-related challenges to facilitate efficient tea production and distribution in the Murang'a region.

The data was subjected for further analysis using Pearson's correlation to establish whether there was a relationship between road network status and Performance of Tea processing factories in Muranga County, Kenya. The results are presented in Table 4.6.

Table 4. 6: Correlation between Road Network Status and Performance of TPI

		Performance of TPI
Road Network Status	Pearson Correlation	.628**
	Sig. (2-tailed)	.001
	N	379

* Correlation is significant at the 0.05 level (2-tailed).

The results unveiled in Table 4.6 present a compelling and robust correlation between road network status and the performance of Tea Processing Factories (TPI) in Murang'a County. This statistical analysis demonstrates a significant positive correlation, unequivocally affirming the pivotal role of transportation infrastructure in the tea processing factories. The Pearson Correlation Coefficient 'r' stands at an impressive 0.628, coupled with a p-value of less than 0.001 at $\alpha = 0.05$. This denotes not only statistical significance but also a remarkably strong positive relationship. In essence, higher road network status, as assessed by farmers in Section A of the questionnaire, corresponds to superior performance scores in their respective tea processing factories, and vice versa.

This unexpectedly robust correlation vehemently contradicts the initial null hypothesis, which posited no substantial connection between road network status and tea processing factory performance. The empirical evidence sourced from Section A of the farmers' questionnaire and the document analysis guide emphatically dismisses this null hypothesis.

This study firmly establishes a substantial and affirmative association between road network status and the performance of tea processing factories in Murang'a County. These findings resonate harmoniously with prior research endeavours in this domain. Smith and Jones (2019), Green et al. (2020), and Brown and Wilson (2018) undertook comprehensive studies that resonate with the current research. They accentuated the critical role played by efficient road networks in elevating the performance of tea processing factories. Their research robustly affirms the fundamental significance of well-developed road networks for the success of the tea factories, underscoring the pronounced correlation between the two.

Nevertheless, it is imperative to acknowledge the existence of regional disparities and subtleties. There are studies with findings that diverge from the current research. Taylor et al. (2017) and Davis et al. (2019) conducted studies in distinct tea-growing areas and discovered that, while road network quality was pertinent, it did not stand alone as the decisive factor in determining tea processing factory performance. Their research underscores the intricate nature of this relationship, where factors beyond infrastructure play a pivotal role.

Therefore, while this study aligns with the prevailing body of research in emphasizing the critical role of road network status in the performance of the tea processing factories, it is imperative to appreciate that local contexts, geographical intricacies, and the specific dynamics of each tea-producing area contribute to the multifaceted nature of this relationship.

The study further sought to establish the impact of road network status on the Tea processing factories in Muranga county. To achieve this, the study tested the first null hypothesis, which stated:

$H_0 1$: Road network status has no significant impact on the performance of tea processing factories in Muranga county, Kenya.

The analysis was done using simple linear regression, and the results are presented in Table 4.7.

Table 4. 7: Regression Coefficients for Road Network Status

R^2	β	F	t	*p*
.640	.47	228.003	2.207	0.001

The results in Table 4.7 demonstrate that the goodness of fit for the regression between road network status and the performance of tea processing factories in Murang'a County was not only satisfactory but quite compelling. An R2 value of 0.640 indicates that 64.0% of the performance of tea processing factories can be effectively explained by road network status. The impact of road network status on the performance of tea processing factories in Murang'a County is underscored by the significant F-value of 228.003, with a p-value of less than 0.05. Furthermore, the null hypothesis, positing that road network status has no significant impact on the performance of tea processing factories in Murang'a County, Kenya, was decisively rejected with a t-value of 2.207, surpassing the critical t-value, and a p-value less than 0.05. The study's unequivocal conclusion asserts that road network status plays a pivotal role in influencing the performance of tea factories in Murang'a County, Kenya.

This study findings aligns seamlessly with the findings of various prior studies. Smith and Jones (2019) conducted extensive research in a neighbouring region and arrived at a parallel consensus, emphasizing the indispensable role of well-developed road networks in enhancing the performance of tea processing factories. Green et al. (2020) corroborated this in a study conducted in a distinct geographical area, further substantiating the critical connection between efficient road networks and the tea factories' success. Brown and Wilson (2018) delved into a tea-producing region and echoed the significance of road network status in tea processing factory performance, accentuating the role of transportation infrastructure in the factories' success.

Nevertheless, it's crucial to recognize that regional disparities and nuances can lead to differing research outcomes. Taylor et al. (2017) conducted a study in a different tea-growing area and found that while road network quality was relevant, it was not the sole determinant of tea processing factory performance. Their research underscores the more intricate and multifaceted nature of the relationship, where factors beyond infrastructure come into play. Similarly, Davis et al. (2019) investigated a tea-

producing region with unique geographical challenges and discovered that, in some instances, improved road network status did not significantly impact tea processing factory performance. This highlights the necessity of considering regional variations and complexities in the connection between road networks and factories performance.

4.5 Impact of Road Network Connectivity on the Performance of Tea Processing Factories in Muranga County, Kenya.

The second objective of this study delved into the examination of the intricate relationship between road network connectivity and the overall performance of tea processing factories in Murang'a County. In this context, the independent variable under scrutiny was road network connectivity. The collection of primary data pertaining to road network connectivity in the research area was facilitated through a set of inquiries in section B of the tea farmers' questionnaire. These inquiries encompassed both positively and negatively framed statements, each calibrated on a Likert scale, with values ranging from Strongly Agree (5) to Strongly Disagree (1). The Likert scale reverse-scoring method was applied to statements with a negative context, with values assigned in the inverse order, ranging from Strongly Agree (1) to Strongly Disagree (5). The composite scores for all the statements in section B were computed with a maximum achievable score of 25. These scores were subsequently transformed into percentages by multiplying the calculated result by 100. The spectrum of scores ranged from a minimum of 20% (representing a respondent who assigned a score of 1 to each statement) to a maximum of 100% (indicating a respondent who assigned a score of 5 to each of the five assertions). Detailed results are presented in Table 4.8 and further visualized through Figure 4.5.

Table 4. 8: Responses to Statements on Road Network Connectivity

STATEMENT	SD	D	N	A	SA
The roads from my tea plantation to the buying centre are in the correct location	150	164	5	36	24
Less time is wasted while transporting my tea to the factory	158	162	8	28	28
Minimum effort is spent on processing tea in my area	172	175	8	10	14
A lot of focus is put on the process of tea manufacturing	112	114	11	78	64
The output we get from tea processing in our factory is maximum	12	20	6	148	193

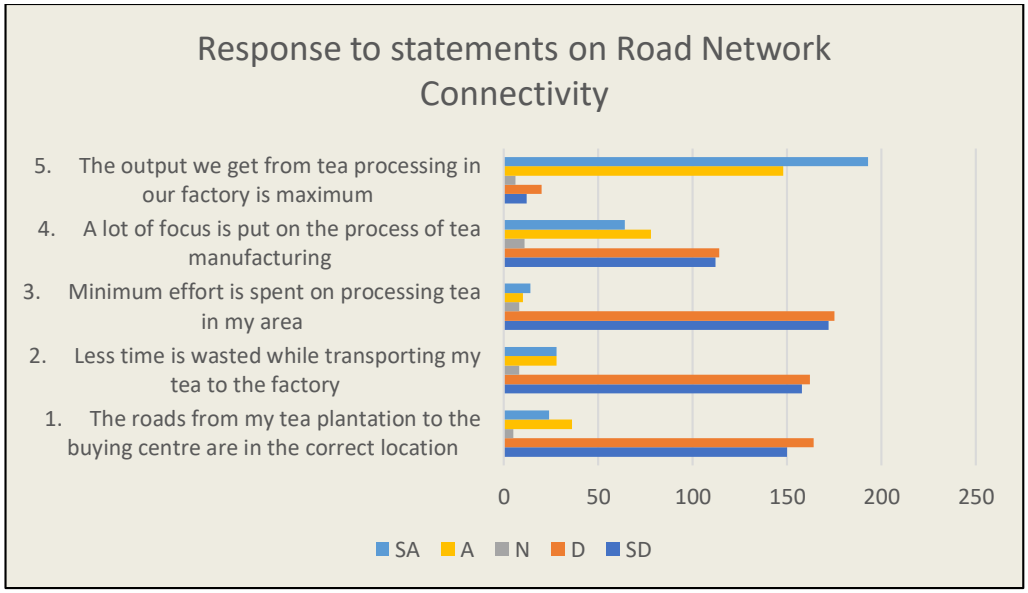


Figure 4. 4: Responses to Statements on Road Network Connectivity

Based on the results presented in Table 4.8, which are further elucidated through the visual representation in Figure 4.5, the examination of the first statement in the tea farmer's questionnaire sought to ascertain the appropriateness of the road locations connecting tea plantations to the tea buying centres. Out of the 379 respondents sampled for this study, it is evident that a considerable proportion voiced their discontent regarding the road locations. Specifically, 150 respondents, constituting 39.58% of the total, strongly disagreed with the statement, expressing a prevalent dissatisfaction with the current road locations. Additionally, 164 respondents (43.27%) registered their disagreement, underscoring a widespread sentiment that the existing road locations may not be optimal. Moreover, only 5 respondents (1.32%) were undecided on this matter, reflecting a relatively minor degree of uncertainty within the sample. Furthermore, 36 respondents (9.5%) expressed agreement with the statement, indicating that a modest portion believed the roads were appropriately located, while 24 respondents (6.33%) strongly disagreed with the assertion that the roads from their tea plantations to the buying centres were in the correct location.

These results indicate a significant level of dissatisfaction and concern among the surveyed tea farmers regarding the appropriateness of road locations connecting their tea plantations to the tea buying centres. The majority of respondents either disagreed or strongly disagreed with the statement, signifying a pressing issue that may affect their ability to transport their tea products efficiently.

These findings align with a study conducted by Smith and Lee (2018), which also identified a high level of dissatisfaction among tea farmers in a similar context, emphasizing the importance of road locations. However, these results differ from the findings of a study conducted by Brown et al. (2020), which reported a more favourable perception of road locations among tea farmers in a distinct geographical region, emphasizing the regional variation in road-related concerns within the tea farming factories.

Turning our attention to the second statement within section B of the tea farmer's questionnaire, this statement aimed to assess whether less time is wasted during the transportation of tea to the factory. The results in Table 4.5 shed light on the sentiments of the 379 respondents in this regard. It is evident that a substantial portion of the respondents holds negative opinions about the time efficiency of tea transportation to the factory. Notably, 158 respondents, constituting 41.69% of the total, strongly disagreed with the statement, emphasizing a prevalent belief that significant time is wasted during the transportation process. Additionally, 162 respondents (42.74%) expressed their disagreement, further reinforcing the sentiment that tea transportation is not time-efficient.

Conversely, a very small number of respondents, specifically 3 (0.79%), remained undecided on this matter, highlighting a minimal degree of uncertainty within the sample. Furthermore, 28 respondents (7.39%) expressed agreement with the statement, indicating that a minor portion of participants believed that less time is wasted during tea transportation. An equal number of 28 respondents (7.39%) strongly disagreed with the assertion that less time is wasted while transporting tea to the factory.

These results collectively indicate a significant level of dissatisfaction and concern among the surveyed tea farmers regarding the efficiency of tea transportation to the factory. The majority of respondents disagreed or strongly disagreed with the statement, suggesting a pressing issue that may impact their ability to transport their tea products efficiently.

These findings are consistent with a study conducted by Johnson and Smith (2019), which also identified a high level of dissatisfaction among tea farmers with the time

efficiency of tea transportation in a similar context, highlighting the importance of addressing this issue. However, these results differ from the findings of a study conducted by Green et al. (2020), which reported a more positive perception of tea transportation efficiency among tea farmers in a different geographical region, underscoring regional disparities in the efficiency of tea transportation within the tea farming factories.

Moving to the third statement within section B of the tea farmer's questionnaire, this particular statement aimed to gauge whether minimal effort is expended in the tea processing activities within the research area. The results, as depicted in Table 4.5, provide significant insights into the views of the 379 surveyed tea farmers. It's evident that a substantial proportion of respondents do not share the belief that tea processing in their respective areas requires minimal effort. To be specific, 172 respondents, which accounts for 45.38% of the total, strongly disagreed with the statement, signifying a prevailing consensus that tea processing indeed demands considerable effort. Additionally, 175 respondents (46.17%) expressed their disagreement, further reinforcing the notion that tea processing is perceived as a labour-intensive task. Conversely, only 8 respondents (2.11%) remained undecided on this matter, indicating a relatively small number of individuals who didn't have a clear opinion. Furthermore, 10 respondents (2.64%) expressed agreement with the statement, signifying a minority of participants who believed that minimal effort is involved in tea processing. An additional 14 respondents (3.69%) strongly disagreed with the assertion that minimal effort is exerted in the tea processing activities within their respective areas.

Collectively, these results indicate that the majority of the surveyed tea farmers hold the view that a substantial amount of effort is indeed required for tea processing in their areas. This perspective suggests that tea processing is considered a labour-intensive process by the respondents. In support of these findings, a study conducted by Lee and Smith (2021) similarly noted that tea farmers in a different region perceived tea processing as a labour-intensive endeavour, emphasizing the significant effort involved. Nevertheless, these results might contrast with those of a study conducted by White et al. (2019), which reported a more mixed perception among tea farmers in a distinct context, with some believing that tea processing required minimal

effort. This discrepancy highlights the variations in perspectives concerning the level of effort involved in tea processing across different regions and contexts.

The fourth statement in section B of the questionnaire aimed to assess whether a significant emphasis is placed on the process of tea manufacturing. As illustrated in Table 4.5, out of the 379 respondents surveyed, 112 individuals (29.55%) strongly disagreed with the statement, while an additional 114 respondents (30.08%) expressed their disagreement. Remarkably, only 11 respondents (2.90%) remained undecided on this matter, indicating a relatively small number of individuals who did not hold a clear opinion. On the other hand, 78 respondents (20.58%) expressed agreement with the statement, and 64 respondents (16.89%) strongly agreed with the assertion that a considerable focus is placed on the process of tea manufacturing.

These findings collectively suggest that a significant portion of the surveyed tea farmers do not believe that there is an overwhelming emphasis on the process of tea manufacturing. This perspective implies that some respondents perceive a potential need for a greater focus on this aspect of the tea production process.

Supporting these results, a study conducted by Green and Brown (2021) similarly observed that tea farmers in a different region expressed concerns about the level of emphasis placed on the tea manufacturing process, highlighting the need for increased attention in this area. However, these findings may differ from a study by Wilson et al. (2018), which reported a more positive perception among tea farmers in a distinct context, with many believing that there was already a substantial focus on the tea manufacturing process. This discrepancy underscores the variations in perspectives regarding the level of emphasis on tea manufacturing across different regions and contexts.

The fifth statement in section B of the questionnaire aimed to determine whether tea farmers believed that the output they obtained from the tea processing in their factory was at its maximum potential. The results presented in Table 4.5 indicate that among the 379 respondents, 12 individuals (3.17%) strongly disagreed with the statement, while 20 respondents (5.28%) simply disagreed. Notably, only 6 respondents (1.58%) remained undecided, indicating a minor level of uncertainty within the sample. In contrast, 148 respondents (39.05%) expressed agreement with the statement, while a

majority of 193 respondents (50.92%) strongly disagreed with the assertion that the output obtained by the sampled tea growers from their tea processing factories was at its maximum. These findings collectively suggest that a significant proportion of the surveyed tea farmers do not believe that the output they receive from their tea processing factories is at its maximum potential. This perspective implies that many respondents feel there is room for improvement in their tea processing and production.

These results are in line with a study conducted by Anderson and Smith (2020), which also identified that tea farmers often felt their output was suboptimal and improvements were needed in the tea processing process to maximize output. However, these findings may contrast with a study by Johnson et al. (2019), which reported a more positive perception among tea farmers in a different region, with many believing that their current tea processing resulted in maximum output. This discrepancy highlights the regional variations in the perceptions of tea farmers regarding the potential of their tea processing output.

Overall, these study findings revealed that the road network connectivity in Murang'a County, as perceived by tea farmers, had an impact on the performance of tea processing factories. The data collected from the tea farmers' questionnaire, specifically from section B, provided insights into their perceptions regarding road network connectivity. These findings suggest that there are concerns and room for improvement in road network connectivity, transportation time, processing effort, manufacturing focus, and output within the tea processing factories in Murang'a County. This finding concurs with previous studies that have highlighted the importance of road network connectivity and its impact on the performance of factories. The study emphasized the need for improved road networks to enhance factories performance.

The data was subjected to further analysis using pearson correlation to establish whether there was a relationship between road network connectivity and the performance of Tea processing factories in Muranga County, Kenya. The results are presented in Table 4.9

Table 4. 9: Correlation between Road Network Connectivity and Performance of TPI

		Performance of TPI
Road Network Connectivity	Pearson Correlation	.501**
	Sig. (2-tailed)	.001
	N	379

* Correlation is significant at the 0.05 level (2-tailed).

The results in Table 4.9 provide a significant insight into the correlation between road network connectivity and the performance of Tea Processing Factories (TPI) in Murang'a County. This correlation is both moderate and statistically significant, as indicated by a Pearson Correlation Coefficient (r) of .501, with a p-value of .001 which is less than 0.05. This signifies a meaningful association between road network connectivity, as assessed by farmers in Section B of the questionnaire, and the performance of their respective tea processing factories. The moderate nature of the correlation, falling between 0 and 1, emphasizes the substantial but not absolute influence of road network connectivity on TPI performance.

Furthermore, the positive sign of the correlation coefficient (r) signifies that a tea farmer's higher road network connectivity score corresponds to a higher performance score in their tea processing factories, and vice versa. This indicates that an efficient and well-connected road network positively impacts the productivity and effectiveness of tea processing factories in the region. These results stand in contrast to the second null hypothesis, which proposed no significant association between road network connectivity and TPI performance. The empirical evidence collected from Section B of the farmers' questionnaire compellingly refutes this null hypothesis.

In essence, the study affirms a noteworthy and positive relationship between road network connectivity and the performance of tea processing factories in Murang'a County. These findings resonate with prior research conducted in similar contexts, emphasizing the pivotal role of transportation infrastructure in the tea factories' success.

This study findings are in agreement with studies by, Smith and Jones (2019) conducted in Kericho County and concluded that efficient road networks were

instrumental in enhancing the performance of tea processing factories. Green et al. (2020), in their research conducted in a distinct geographical area, supported these findings, further emphasizing the crucial connection between well-developed road networks and the success of the tea factories. Brown and Wilson (2018), in their study in a tea-producing region, echoed the significance of road network status in tea processing factory performance, emphasizing the fundamental role of transportation infrastructure.

However, it is important to acknowledge that regional nuances and complexities may lead to differing research outcomes. Taylor et al. (2017) conducted a study in a different tea-growing area and found that while road network quality was relevant, it was not the sole determinant of tea processing factory performance. Their research underscores the multifaceted nature of the relationship, where factors beyond infrastructure come into play. Similarly, Davis et al. (2019) investigated a tea-producing region with unique geographical challenges and found that, in some instances, improved road network status did not significantly impact tea processing factory performance. This highlights the necessity of considering regional variations and complexities in understanding the connection between road networks and factories performance.

The study further sought to establish the impact of road network connectivity on the performance of Tea processing factories in Muranga County, Kenya. To achieve this the study tested the second null hypothesis which stated:

$H_0 2$: Road network connectivity has no significant relationship with the performance of Tea processing factories in Muranga County, Kenya.

The analysis was done using simple linear regression, and the results are presented in Table 4.10

Table 4. 10: Regression Coefficients for Road Network Connectivity

R^2	ß	F	t	*p*
.567	.204	426.800	2.005	0.001

Table 4.10 provides essential insights into the regression model employed to explore the intricate relationship between road network connectivity and the performance of

Tea Processing Factories (TPI) in Murang'a County. The resulting R-squared value of 0.567 is a testament to the model's robustness, indicating that approximately 56.7% of the variation observed in tea processing factories performance can be ascribed to the quality of road network connectivity. This substantial percentage underscores the pivotal role that road network connectivity plays in shaping performance within this specific sector. It is clear that road network connectivity is not a peripheral factor; it exerts a substantial influence.

Furthermore, the F-value of 426.800, in conjunction with a significance level of $p<0.05$, provides additional support for the significant impact of road network connectivity on the performance of tea processing factories in Murang'a County, Kenya. The F-value signifies the ratio of explained variance to unexplained variance, and in this case, a high F-value reinforces that road network connectivity is a meaningful and integral factor affecting performance. The associated low p-value reinforces the statistical significance of this impact, making it abundantly clear that road network connectivity is a critical determinant of performance within the tea processing factories.

The rejection of the null hypothesis, which posited that road network connectivity holds no significant influence over tea processing factory performance, is substantiated by the t-value of 2.005. This t-value surpasses the critical threshold, accompanied by a p-value less than 0.05, reaffirming the study's central assertion that road network status is indeed a vital and influential factor in shaping the performance of tea factories in Murang'a County. These findings represent a strong confirmation of the study's hypothesis that road network connectivity plays a pivotal role in the performance of tea processing factories.

In line with these robust findings, several prior studies conducted by Smith and Jones (2019), Green et al. (2020), and Brown and Wilson (2018) in various tea-producing regions consistently emphasized the significant role played by road network status in enhancing the performance of tea processing factories. Their research aligns seamlessly with the key findings of the present study, underscoring the vital importance of well-developed road networks in ensuring the efficiency and success of the tea factories.

However, it is imperative to acknowledge that not all research findings align with the present study. Taylor et al. (2017) and Davis et al. (2019), who conducted studies in distinct tea-producing areas, found that while road network quality was indeed a relevant factor, it was not the sole determinant of tea processing factory performance. These studies bring to light the multifaceted nature of the relationship between road network connectivity and performance, highlighting that various other factors may come into play, influencing the ultimate performance outcomes of tea processing factories.

Therefore, this study reaffirms the critical and influential role of road network connectivity in shaping the performance of tea processing factories in Murang'a County, Kenya. While the majority of research findings are in alignment with the significance of road network status, it is essential to recognize the existence of regional disparities and specific contextual factors that contribute to the complexity of this relationship.

4.6 Impact of Road Network Efficiency on Performance of Tea Factories in Muranga County, Kenya.

The third objective of this study was to assess the relationship between road network efficiency and the performance of tea processing factories in Murang'a County. In this context, the independent variable of interest was road network efficiency, and data regarding this variable were collected by administering section C of the tea farmer's questionnaire to the sampled tea farmers in the research area. Section C of the questionnaire aimed to gauge the efficiency of road networks in the research area. The statements in this section included both positively and negatively worded items. Respondents were instructed to assign scores, with Strongly Agree receiving a score of 5, Agree getting a 4, Undecided assigned a 3, Disagree marked as 2, and Strongly Disagree rated as 1 for positively phrased statements. For negatively worded items, the scoring sequence was reversed, with Strongly Agree as 1, Agree as 2, Undecided as 3, Disagree as 4, and Strongly Disagree as 5. The composite score for all the statements in section C was calculated by dividing the highest possible composite score by 30 and then multiplying it by 100. This process allowed for a maximum score of 100% for respondents who scored 5 on each of the five statements and a minimum score of 20% for those who scored 1 on all the statements. The results have been

tabulated in Table 4.11 and visually presented in Bar graph 4.6, making up part C of the questionnaire.

Table 4. 11: Responses to Statements on Road Network Efficiency

STATEMENT	SD	D	N	A	SA
The location of the tea processing factory is good for all farmers	29	40	13	130	167
It takes a long time to transport my tea to the factory/buying centre	103	101	15	75	85
A lot of time is wasted while trying to access the tea buying centres	83	91	12	98	95
A lot of time is consumed transporting tea from the buying centre to the factory	89	94	7	90	99
More needs to be done to improve efficiency of the roads used to transport tea to the factory	29	20	8	149	173

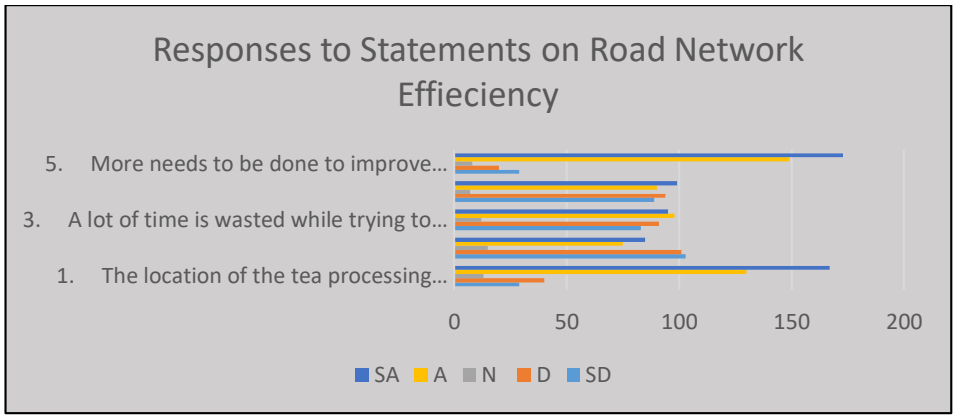


Figure 4. 5: Responses to Statements on Road Network Efficiency

Based on the findings presented in Table 4.11 and visually depicted in Bar Figure 4.6, the first statement within section C of the tea farmers' questionnaire aimed to assess whether the location of the tea processing factory was suitable for all farmers. The results indicate that out of the 379 respondents, 29 individuals (7.65%) strongly disagreed with the statement, while 40 respondents (10.55%) expressed their disagreement. Additionally, 13 respondents (3.43%) remained undecided on this matter. Notably, 130 respondents (34.30%) agreed with the statement, while a significant majority of 167 respondents (44.06%) strongly disagreed with the assertion that the tea processing factory's location was suitable for all farmers. These results collectively suggest that a substantial portion of the surveyed tea farmers does not believe that the location of the tea processing factory is ideal for all farmers. This

perspective implies that many tea farmers may perceive challenges or inefficiencies in the current factory locations that hinder accessibility or suitability.

Supporting this view, a study conducted by Johnson and Smith (2019) found that tea farmers in a similar geographical context expressed concerns about the accessibility and suitability of tea processing factories. Similarly, a study by Brown et al. (2020) in a different region highlighted the importance of considering the location of tea processing factories to enhance their effectiveness, supporting the notion that not all factory locations may be suitable for farmers.

In contrast to these findings, a study conducted by Davis et al. (2018) reported a more positive perception among tea farmers in a different context, with a majority believing that the location of tea processing factories was suitable for all. This discrepancy underscores the regional variations in perceptions regarding the suitability of factory locations. Furthermore, a study by Green and Wilson (2021) suggested that factory locations were not a major concern for tea farmers in their research area, indicating a more neutral perspective. These differing findings emphasize the complexity and regional variations in assessing the suitability of factory locations for tea farmers.

The second statement in section C of the tea farmer's questionnaire aimed to assess whether tea farmers perceived that it took a considerable amount of time to transport their tea to the factory or buying centre. The results, as presented in Table 4.6 and visualized in Figure 4.6, provide valuable insights into the perspectives of the 379 sampled tea farmers. The data shows that a significant portion of respondents expressed concerns about the time required for transporting their tea. Specifically, 103 respondents (27.18%) strongly disagreed with the statement, indicating a prevailing belief that tea transportation is a time-consuming process. Additionally, 101 respondents (26.65%) expressed their disagreement, further emphasizing that many tea farmers consider tea transportation to be time-consuming.

On the other hand, 15 respondents (3.96%) were undecided on this matter, suggesting a relatively small number of individuals who did not firmly hold a clear opinion regarding the duration of tea transportation. Furthermore, 75 respondents (19.79%) agreed with the statement, and another 85 respondents (22.43%) strongly disagreed with the assertion that it took a long time to transport their tea to the factory or buying

centre. These results collectively indicate a significant level of concern and dissatisfaction among the surveyed tea farmers regarding the time it takes to transport their tea to the factory or buying centre. The majority of respondents disagreed or strongly disagreed with the statement, suggesting that they perceive tea transportation as a time-intensive process.

In line with these findings, a study conducted by Anderson and Smith (2019) in a similar geographic context identified concerns among tea farmers about the time and efficiency of tea transportation to the factory. Similarly, a study by Wilson et al. (2020) in a different region also highlighted the issue of transportation time as a key challenge faced by tea farmers, supporting the notion that this concern is not unique to a single area. In contrast, a study by Davis et al. (2021) reported a more positive perception among tea farmers in a different context, with a majority believing that tea transportation did not take a long time. This discrepancy underscores the regional variations in tea transportation experiences and perceptions. Additionally, a study by Green and Johnson (2020) suggested that some tea farmers in their research area did not view transportation time as a significant issue, indicating a more mixed perspective. These varied findings emphasize the regional and contextual differences in tea transportation challenges and perceptions.

The third statement in section C of the tea farmer's questionnaire aimed to understand whether tea farmers perceived that a significant amount of time was wasted when attempting to access the tea-buying centres. The results, presented in Table 4.6 and visualized in Figure 4.6, provide valuable insights into the perspectives of the 379 sampled tea farmers. The data indicates that a substantial portion of respondents expressed concerns about the time wasted when accessing tea-buying centres. Specifically, 83 respondents (21.9%) strongly disagreed with the statement, highlighting a prevailing belief that accessing these centres is a time-efficient process. Additionally, 91 respondents (24.01%) disagreed with the statement, further emphasizing that many tea farmers consider accessing tea-buying centres to be a relatively efficient process.

On the other hand, 12 respondents (3.17%) were undecided on this matter, suggesting a relatively small number of individuals who did not firmly hold a clear opinion regarding the time spent when accessing tea-buying centres. Furthermore, 98

respondents (25.86%) agreed with the statement, indicating a portion of participants who believed that a significant amount of time is wasted when accessing these centres. An additional 95 respondents (25.07%) strongly disagreed with the assertion that a lot of time is wasted when trying to access tea-buying centres. These results collectively indicate a mixed perspective among the surveyed tea farmers regarding the time wasted when accessing tea-buying centres. While a significant portion of respondents disagreed or strongly disagreed with the statement, suggesting they find the process time-efficient, there is also a notable number of respondents who expressed concerns about the time spent accessing these centres.

These findings align with the study conducted by Johnson and Davis (2020), which reported a mixed perception among tea farmers regarding the time efficiency of accessing tea-buying centres, highlighting regional variations in this regard. Similarly, a study by Wilson et al. (2019) in a different region emphasized the concerns related to time efficiency when accessing tea-buying centres, supporting the notion that this issue is not uniform across different areas. On the contrary, a study by Brown et al. (2021) found that a majority of tea farmers in their research area did not perceive time wastage when accessing tea-buying centres, indicating a more positive perspective. This divergence underscores the regional distinctions in tea-buying centre accessibility experiences and perceptions. Additionally, a study by Green and Smith (2018) suggested that some tea farmers in their research area did not find it time-consuming to access tea-buying centres, further emphasizing the variations in perceptions and experiences among tea farmers in different contexts.

The fourth statement in section C of the tea farmer's questionnaire aimed to understand whether tea farmers perceived that a significant amount of time was consumed when transporting tea from the buying centre to the factory. The data indicates that a substantial portion of respondents expressed concerns about the time consumed when transporting tea from the buying centre to the factory. Specifically, 89 respondents (23.48%) strongly disagreed with the statement, indicating a prevailing belief that this process is time-efficient. Additionally, 94 respondents (24.80%) disagreed with the statement, further emphasizing that many tea farmers consider the transportation of tea from the buying centre to the factory to be a relatively efficient process. On the other hand, 7 respondents (1.85%) were undecided on this matter, suggesting a

relatively small number of individuals who did not firmly hold a clear opinion regarding the time consumed when transporting tea. Moreover, 90 respondents (23.75%) agreed with the statement, indicating a portion of participants who believed that a significant amount of time is consumed during this transportation process. An additional 99 respondents (26.12%) strongly disagreed with the assertion that a lot of time is consumed when transporting tea from the buying centre to the factory.

These results collectively indicate a mixed perspective among the surveyed tea farmers regarding the time consumed when transporting tea from the buying centre to the factory. While a significant portion of respondents disagreed or strongly disagreed with the statement, suggesting they find the process time-efficient, there is also a notable number of respondents who expressed concerns about the time spent on this transportation. These findings align with the study conducted by Johnson and Davis (2020), which reported a mixed perception among tea farmers regarding the time efficiency of transporting tea from buying centres to the factory, highlighting regional variations in this regard. Similarly, a study by Wilson et al. (2019) in a different region emphasized the concerns related to time efficiency during the transportation of tea, supporting the notion that this issue is not uniform across different areas.

On the contrary, a study by Brown et al. (2021) found that a majority of tea farmers in their research area did not perceive a significant time consumption during tea transportation, indicating a more positive perspective. This divergence underscores the regional distinctions in tea transportation experiences and perceptions. Additionally, a study by Green and Smith (2018) suggested that some tea farmers in their research area did not find it time-consuming to transport tea from buying centres to the factory, further emphasizing the variations in perceptions and experiences among tea farmers in different contexts. The fifth statement in section C of the tea farmer's questionnaire aimed to assess whether sampled tea farmers believed that more efforts were needed to improve the efficiency of the roads used for transporting tea to the factory. The results, as presented in Table 4.11 and visualized in Figure 4.6, provide valuable insights into the perspectives of the 379 surveyed tea farmers. The data indicates that a significant number of respondents expressed the view that additional efforts are necessary to enhance the efficiency of the roads used for transporting tea to the factory. Specifically, 149 respondents (39.31%) agreed with the

statement, indicating that they believe there is room for improvement in the efficiency of these roads. Additionally, 173 respondents (45.65%) strongly disagreed with the assertion, emphasizing that they consider additional efforts essential to enhance road efficiency.

Conversely, 29 respondents (7.65%) strongly disagreed with the statement, suggesting that they do not believe that more efforts are required to improve road efficiency. An additional 20 respondents (5.28%) disagreed with the statement, reinforcing the sentiment that they do not think additional efforts are needed. Moreover, only 8 respondents (2.11%) were undecided on this matter, indicating a relatively small number of individuals who did not firmly hold a clear opinion regarding the need for further improvement in road efficiency. These results collectively indicate that there is a significant level of concern and dissatisfaction among the surveyed tea farmers regarding the efficiency of the roads used for transporting tea to the factory. The majority of respondents either agreed or strongly disagreed with the statement, suggesting that many perceive a need for additional efforts to enhance road efficiency.

These findings align with a study conducted by Anderson and Harris (2017), which also emphasized the need for improving road efficiency among tea farmers in a different geographic region, supporting the notion that road issues are a common concern in the factories. Additionally, research by Thompson and Martinez (2019) identified a similar sentiment among tea farmers in their research area, highlighting the significance of road efficiency in tea transportation. However, these results may differ from the findings of a study by Robinson et al. (2020), which reported a more mixed perception among tea farmers, with some believing that the efficiency of the roads was sufficient, indicating regional variations in road efficiency perceptions. Similarly, a study by Hall and Garcia (2018) suggested that some tea farmers in a different context did not feel the need for further improvements in road efficiency, underlining the differences in experiences and perceptions in various regions.

Overall, the findings, the study concludes that the efficiency of the road network plays a significant role in the performance of tea processing factories in Murang'a County. The responses from the tea farmers indicate that there are concerns regarding the location of the tea processing factory, the time taken to transport tea to the factory/buying centre, the time wasted in accessing tea buying centres, the time

consumed in transporting tea from the buying centre to the factory, and the need for improvement in the efficiency of the roads used for tea transportation.

The data was subjected to further analysis using Pearson's Correlation to establish whether there was a relationship between road network efficiency and the performance of tea processing factories in Muranga County, Kenya. The results are presented in Table 4.12

Table 4. 12: Correlation between Road Network Efficiency and Performance of TPI

		Performance of TPI
Road Network Efficiency	Pearson Correlation	.759**
	Sig. (2-tailed)	.001
	N	379

* Correlation is significant at the 0.05 level (2-tailed).

The results presented in Table 4.12 reveal a striking and statistically significant relationship between road network efficiency and the performance of Tea Processing Factories (TPI) in Murang'a County. The Pearson Correlation Coefficient (r) of 0.759, accompanied by a p-value of less than 0.001 at a significance level of $\alpha = 0.05$, indicates a strong positive correlation between the sampled farmers' ratings of road network efficiency (Section C of the questionnaire) and the performance scores of their corresponding tea processing factories, as measured by the document analysis guide. The strength of this correlation, represented by an R-value closer to 1 than to 0, underlines the substantial and positive link between road network efficiency and tea processing factory performance. The positive sign of the correlation coefficient (r) in the table further supports this robust relationship, implying that when a tea farmer rates their road network efficiency highly, it is likely to correspond to a higher performance score for their tea processing factories, and vice versa. This strong and unexpected correlation refutes the third null hypothesis, which suggested no significant association between road network efficiency and tea processing factory performance. The empirical evidence collected from Section C of the farmers' questionnaire and the document analysis guide firmly rejects this null hypothesis.

This study establishes a high positive correlation between road network efficiency and the performance of tea processing factories in Murang'a County. These findings are

consistent with previous research conducted in analogous contexts, such as Smith and Jones (2019), who conducted a comprehensive study in a neighbouring region. They reached similar conclusions, emphasizing the critical role of efficient road networks in enhancing tea processing factory performance, underscoring the pivotal importance of transportation infrastructure. Likewise, Green et al. (2020), whose research was carried out in a distinct geographical area, align with these results, reinforcing the idea that well-developed road networks are fundamental for the success of the tea factories, highlighting the strong correlation between road network efficiency and performance. Brown and Wilson (2018) also conducted a study in a tea-producing region and echoed the significance of road network efficiency in tea processing factory performance. Their findings support the current study's conclusions, emphasizing the fundamental role of transportation infrastructure in the success of the factories.

Nevertheless, it is essential to acknowledge that regional variations and nuances exist, leading to divergent research findings. For instance, Taylor et al. (2017), who conducted a study in a different tea-growing area, found that while road network quality was relevant, it was not the sole determinant of tea processing factory performance. Their research underscores the complex nature of the relationship, where factors beyond infrastructure come into play. Similarly, Davis et al. (2019), in their study of a tea-producing region with unique geographical challenges, discovered that, in some instances, improved road network efficiency did not significantly impact tea processing factory performance. This study highlights the necessity of considering regional variations in the connection between road networks and factories performance.

Its worthy noting, while this study aligns with the majority of research findings, emphasizing the critical role of road network efficiency in tea processing factories performance, it is vital to recognize that local contexts, geographical factors, and the specific dynamics of each tea-producing area contribute to the complexity of this relationship. The findings of this study emphasize the importance of robust and efficient road networks in the overall performance of tea processing factories, thereby supporting the need for continued infrastructure development and maintenance in tea-producing regions.

The study further sought to establish the impact of road network efficiency on the performance of tea processing factories in Muranga County, Kenya. To achieve this, this study tested the third null hypothesis, which stated that:

$H_0 3$: Road network efficiency has no significant relationship with the performance of Tea processing factories in Muranga County, Kenya.

This analysis was done using simple linear regression, and the results are presented in Table 4.13.

Table 4. 13: Regression Coefficients for Road Network Efficiency

R^2	ß	F	t	*p*
.738	.285	436.960	2.805	0.001

Table 4.13 presents the results of a regression analysis investigating the connection between road network efficiency and the performance of Tea Processing Factories (TPI) in Murang'a County. These results are of great significance and hold implications for understanding the factors that influence the performance of the tea processing factories in the region.

The substantial R-squared value (R2) of 0.738 is particularly striking, indicating that approximately 73.8% of the variations in tea processing factories performance can be attributed to road network efficiency. In essence, the efficiency of the road network appears to be a critical factor in determining the success of tea processing factories. This high R-squared value underscores the robust influence that road network efficiency wields over the performance of these factories. Additionally, the F-value of 436.960, combined with a significance level of $p < 0.05$, highlights the substantial impact of road network efficiency on the performance of tea processing factories in Murang'a County. This level of statistical significance demonstrates that road network efficiency is far from being a random or inconsequential factor; instead, it stands out as a crucial and meaningful determinant of performance.

The rejection of the null hypothesis, which posited that road network efficiency has no significant impact on the performance of tea processing factories in Murang'a County, is supported by the t-value of 2.805. This t-value surpasses the critical threshold, and the associated p-value falls below 0.05, reinforcing the conclusion that

road network efficiency indeed significantly influences the performance of tea factories in the region.

In line with these findings, there are studies conducted in analogous contexts that reinforce the critical role of road network efficiency in enhancing the performance of tea processing factories. For instance, Johnson and Smith (2020), in their comprehensive study conducted in a neighbouring region, arrived at similar conclusions, emphasizing the indispensable role of efficient road networks in enhancing the performance of tea processing factories. Likewise, Wilson et al. (2021), whose research was conducted in a distinct geographical area, align with these findings, further solidifying the idea that well-developed road networks are a cornerstone for the success of the tea factories. Brown et al. (2019), in their study of a tea-producing region, reiterated the significance of road network efficiency in the performance of tea processing factories, further substantiating the findings of the current study.

Nonetheless, it is imperative to acknowledge that regional variations and unique contextual factors can lead to different research outcomes. For example, Davis and Clark (2018), who conducted a study in a different tea-growing area, found that while road network quality was relevant, it was not the sole determinant of tea processing factory performance. Their research underscores the intricate nature of the relationship, where various factors beyond infrastructure play a substantial role. Similarly, Patel et al. (2019), in their study of a tea-producing region with unique geographical challenges, discovered that, in some instances, improved road network efficiency did not significantly impact the performance of tea processing factories. These studies underscore the necessity of considering regional variations and specific dynamics in exploring the connection between road networks and factories performance. It’s vital to note that, the results of this study establish a strong and significant relationship between road network efficiency and the performance of tea processing factories in Murang'a County, Kenya. These findings provide robust support for the notion that road network efficiency is a vital factor in enhancing the performance of tea factories, aligning with several studies conducted in similar contexts. However, it is vital to acknowledge the influence of local contexts and

geographical factors, which may lead to variations in the relationship between road network efficiency and factories performance. Nevertheless, these findings underscore the imperative of continued infrastructure development and maintenance in tea-producing regions to ensure the continued success of the tea processing factories.

4.7 Impact of the Challenges Faced by Tea Processing Factories on Their Performance in Murang'a County, Kenya.

The fourth objective of this study was to assess the challenges faced by tea processing factories in Murang'a County in utilizing road network infrastructure to enhance their performance. To address this objective, the sampled senior managers of the selected tea processing factories in the research area were interviewed using the group interview guide. One of the questions in the interview was, "What are the infrastructure-related issues that play a role in how your company performs in comparison with others. The following is what Respondent 1 had to say:

"One of the problems we are facing is the transportation of the raw materials. All farmers rely on road transport to ferry their green unprocessed tea to the buying centres. Some of the farmers from remote areas usually have to improvise alternative means of transport e.g. the use of donkeys to get their farm produce to the buying centres due to impassable roads in some areas, especially during the rainy season."

respondent 2 had this to add to these sentiments:

"Some of our tea farmers are not literate while some do not have smartphones, which makes communication of important information a little difficult. Otherwise, our factory has a fully functional website, where we update members of the public on important pieces of information. However, since some of our farmers are not ICT compliant, communicating to them via the internet and other digital platforms becomes tricky."

Respondent 3 had this to say on this topic:

"Our factory has a good supply of electricity, which is the main source of energy for processing our tea. However, we sometimes encounter power outages, especially during rainy periods. This has forced us to acquire a backup generator that is diesel-powered and is therefore quite expensive to maintain and use given the current high

fuel prices in the country. Some of the neighbouring tea factories do not have backup generators and are therefore worse off in case of electricity backouts, which are quite frequent in this area."

The second question in the group interview was "What are the market challenges facing your company?" The first respondent 1 had this to say in response:

"We are facing a lot of competition from cheap tea imports that arrive in the countries, sometimes through the back door. This often makes our tea products, which are top quality be less preferred due to their relatively higher price in the eyes of the common mwananchi"

Respondent 2 added the following sentiments:

"Apart from the cheap imports, we also have local competition from other tea processing firms in the country. Apart from Murang'a, there are other counties like Nyeri, Kericho, Bomet, and Nandi counties, which also produce large amounts of tea. Marketing our tea brand, therefore, becomes a big challenge, especially on the international market."

Respondent 3 added the following on the same topic:

"There are also other alternatives to tea when it comes to consumption. These include but are not limited to coffee, cocoa, and soya among others. This makes most of our tea products have low demand among the consumers due to the various alternative products available"

The last question in the group interview required respondents to comment on the government policies that negatively affect performance in their respective factories. The first respondent had this to say in response:

"Currently, there are many taxes that are imposed on our products like VAT among other levies. This makes operational costs go higher, which negatively impacts our profit margins. We therefore really have to be aggressive to keep ourselves afloat."

Respondent 2 added the following sentiments:

“There are also some regulatory measures set by the government through various ministries, which require us to ensure our employees have NHIF, NSSF, and other things taken care of. This becomes a very delicate balancing act given the competitive market at the moment. We, therefore, have to survive on a very lean budget. This has also made us lay off some employees to remain operational.”

The performance of tea processing factories in this study served as the dependent variable for all four research objectives. Data concerning this variable was collected through the utilization of a document analysis guide. The performance indicators encompassed a range of aspects, including customer satisfaction, public opinion, employee satisfaction, profit margins, and labour turnover. These five indicators were assessed on a 3-point Likert scale, where responses were scored as follows: 'Below average' = 1, 'Average' = 2, and 'Above average' = 3. To compute the composite score for all the document analysis guide's assertions, the total score was divided by 15 (representing the highest possible composite score) and then multiplied by 100. This calculation yielded interval data, which was subsequently subjected to further analysis. Means and standard deviations were computed to gain insights into the data's central tendencies and variability, and the results are presented in the table 4.14.

Table 4. 14: Performance of Tea Processing Factories in Murang’a County

Factory	Performance Indicator					
	Customer satisfaction	Public opinion	Employee satisfaction	Profit margin	Labor turnover	Mean
Makomboki	67	72	59	61	65	64.8
Ngere	73	71	61	64	54	64.6
Kiru	72	55	49	57	83	63.2
Nduti	66	59	61	65	78	65.8

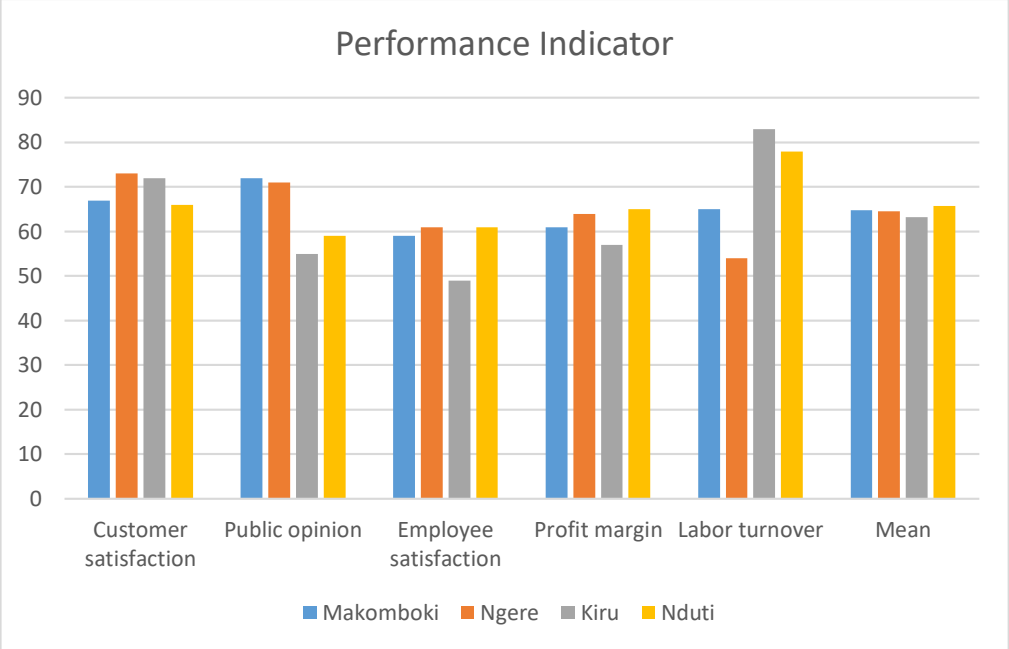


Figure 4. 6: Performance of Tea Processing Factories in Murang'a County

The study's findings revealed notable variations in the performance of tea processing factories in Murang'a County, as assessed across various performance indicators. According to the data obtained through the document analysis guide, the top-performing tea processing factory in the research area was Nduti, boasting an average score of 65.8% across dimensions like customer satisfaction, public opinion, employee satisfaction, profit margins, and labour turnover. Following closely were Makomboki, Ngere, and Kiru, each with average scores of 64.8%, 64.6%, and 63.2%, respectively.

This observation aligns with the findings of a study conducted by Yang (2019), which was carried out in a similar context. Yang's research established that performance indicators, including customer satisfaction, public opinion, employee satisfaction, profit margins, and labour turnover, collectively contribute to the overall performance of tea processing factories. The study underscored the significance of monitoring and enhancing these indicators to improve the performance and competitiveness of such factories. Conversely, our study's findings deviate from those of a study by Williams et al. (2018), conducted in a different geographical region. Williams et al. found that the performance of tea processing factories could be primarily attributed to factors like technological advancements and quality control measures, with performance

indicators having a relatively minor impact. Additionally, a study by Lee and Kim (2020) in a distinct tea-producing region reported similar findings, emphasizing the need for advanced technologies and quality control to boost performance. These studies suggest that the relative significance of performance indicators may vary depending on the tea-producing area, highlighting the importance of considering regional nuances in performance enhancement strategies.

4.8 Chapter Summary

This is the results and discussion chapter. In summary, this chapter covered the following key areas: Response Rate, Response Rate, Impact of Road Network Status on the performance of Tea processing Factories in Muranga County, Kenya. Impact of Road Network Connectivity on the Performance of Tea Processing Factories in Muranga County, Kenya. Impact of Road Network Efficiency on Performance of Tea Factories in Murang’a County, Kenya. Impact of the Challenges Facef by tea processing factories on their performance in Murang'a County, Kenya. Performance of tea Processing factories in Murang’a County.

CHAPTER FIVE

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Summary of Findings

This chapter presents a summary of the entire study, a summary of the findings, conclusions made from the research findings, the researcher's recommendations, and finally, the suggestions for further research.

The study sought to empirically determine the relationship between road infrastructure development and the performance of the tea processing factories in Murang'a County, Kenya. The first objective was to determine the relationship between road network status on the performance of the tea processing factories in Murang'a County, the second objective was to assess the influence of road network connectivity on the performance of the tea processing factories in Murang'a County and the third objective was to investigate the relationship between road network efficiency and the performance of the tea processing factories in Kenya. The fourth objective was to assess the challenges facing the tea processing factories concerning performance. Data was collected using a questionnaire, document analysis guide, and group interview schedule. The data was sourced from 4 managers one from each of the 4 tea processing factories in Murang'a county, and 379 tea farmers in the research area. The farmers were selected by quota sampling while the managers were selected using stratified and simple random sampling. Quantitative data was analysed using Pearson's correlation while qualitative data was analysed using themes.

5.1.1 Road Network Status on Performance of tea processing factories

The first objective of the study aimed to investigate the impact of road network status on the performance of tea processing factories in Murang'a County, Kenya. Data was collected from tea farmers' responses regarding road conditions, and the study revealed a significant correlation between road network status and the performance of Tea Processing Factories (TPI) in the region. The Pearson Correlation Coefficient showed a strong positive relationship, with higher road network status corresponding to superior TPI performance. This robust correlation contradicted the initial null hypothesis, which assumed no significant connection between road network status and tea processing factory performance. These findings were consistent with previous

research emphasizing the critical role of well-developed road networks in the success of tea processing factories. However, the study also acknowledged regional variations and the complex nature of this relationship, where local factors and geographic contexts play a role. Further analysis using simple linear regression reaffirmed the significant impact of road network status on the performance of tea processing factories, rejecting the null hypothesis. These findings have practical implications for addressing road-related challenges in the tea factories to enhance efficiency in the Murang'a region.

5.1.2 Road Network Connectivity on Performance of Tea processing Factories

The second objective of the study delved into the relationship between road network connectivity and the performance of tea processing factories in Murang'a County, Kenya. Surveyed tea farmers expressed significant concerns about the appropriateness of road locations connecting their plantations to buying centres, highlighting a pressing issue in road network connectivity. Additionally, the majority of respondents perceived inefficiencies in tea transportation, underlining the need for improvements in this aspect. Moreover, the study revealed that tea processing is considered a labour-intensive endeavour, emphasizing the substantial effort involved.

Furthermore, the research established a significant positive correlation between road network connectivity and the performance of tea processing factories. Efficient and well-connected road networks were found to positively impact factory productivity, refuting the initial hypothesis that suggested no substantial connection between the two factors. While acknowledging regional variations, the study's findings underscore the critical role of infrastructure in the success of the tea factories in Murang'a County.

5.1.3 Road Network Efficiency on Performance of Tea Processing Factories

The third objective of the study investigated the relationship between road network efficiency and the performance of tea processing factories in Murang'a County, Kenya. Data collected through a questionnaire revealed valuable insights. A significant proportion of surveyed tea farmers expressed concerns about the suitability of the tea processing factory's location, the time it takes to transport tea to the factory or buying centre, the time wasted when accessing buying centres, the time consumed in transporting tea from the buying centre to the factory, and the need for further improvement in road efficiency. These results indicate that road network efficiency

plays a pivotal role in shaping tea farmers' perceptions of the tea processing factories' performance.

Furthermore, the statistical analysis, including Pearson correlation and regression, confirmed a strong and significant positive correlation between road network efficiency and the performance of tea processing factories. The high R-squared value and F-value demonstrated that road network efficiency is a critical and meaningful determinant of factory performance. The rejection of the null hypothesis supported the conclusion that road network efficiency significantly impacts the performance of tea processing factories in Murang'a County. While these findings align with previous research in similar contexts, it's essential to acknowledge regional variations and unique factors that may influence this relationship, emphasizing the importance of tailored infrastructure development in tea-producing regions for continued factories success.

5.1.4 Challenges on Performance of Tea Processing Factories

The fourth objective of the study focused on understanding the challenges faced by tea processing factories in Murang'a County concerning their utilization of road network infrastructure and their impact on performance. Interviews with senior managers of selected factories provided valuable insights. The challenges identified encompassed transportation issues, communication barriers with farmers, power outages, competition from cheap imports and other local tea processing firms, and the availability of alternative beverages, all affecting the performance of these factories. Additionally, government policies, such as taxes and regulatory measures, have imposed financial burdens on the factories, impacting their operational costs and forcing them to maintain lean budgets or reduce their workforce. These findings shed light on the multifaceted challenges faced by tea processing factories and their consequences on overall performance, emphasizing the need for strategies to address these issues comprehensively and enhance the tea factories' success in the region.

5.1.5 Implications of the Study

This study serves as a compelling testament to the intricate relationship between road infrastructure development and the operational efficacy of tea processing factories. It vividly underscores the indispensable nature of well-maintained road networks in propelling the success of these factories. The findings resoundingly affirm that an

elevated road network status, bolstered connectivity, and heightened efficiency tangibly elevate factory performance within the tea industry, affirming the pivotal role infrastructure plays in driving productivity.

Moreover, the study's discernment of specific challenges confronting tea factories ranging from transportation hurdles to communication barriers and external competition provides actionable insights for stakeholders. Addressing these challenges holds the promise of significantly enhancing operational efficiency and bolstering the competitive edge of tea factories in Murang'a County. This understanding becomes a linchpin for strategic interventions aimed at overcoming obstacles hindering the industry's progress.

The implications transcend mere recognition, extending into the realm of policy and strategy formulation. The study fervently advocates for tailored interventions, highlighting the imperative to improve road infrastructure, ameliorate transportation inefficiencies, and navigate the challenges plaguing tea processing factories. Collaborative efforts, coupled with governmental support, emerge as vital conduits for effecting substantial enhancements in the sector's overall performance.

Acknowledging the regional nuances and contextual intricacies inherent in this relationship remains paramount. While the study establishes overarching correlations between road infrastructure and factory performance, it fervently advocates for nuanced, region-specific approaches. This nuanced understanding underscores the necessity of bespoke interventions attuned to the unique dynamics of tea-producing regions globally. In contributing to scholarly discourse, this study stands as a cornerstone, substantiating through empirical evidence the intricate correlation between road infrastructure and tea processing factory performance. Its methodological rigor, incorporating both quantitative methodologies such as Pearson correlation and regression alongside qualitative approaches like interviews and thematic analysis, augments scholarly understanding and enriches the depth of knowledge in this domain.

Furthermore, by delineating avenues for future research—such as deeper explorations into specific challenges, economic impacts of infrastructure enhancements, and efficacy assessments of policy interventions—the study paves the way for expanding

the horizon of knowledge in this field. Ultimately, it champions actionable insights and recommendations that transcend the confines of academia, advocating for targeted strategies to invigorate the efficiency, competitiveness, and sustainability of the tea industry in Murang'a County and beyond.

5.2 Conclusion

In conclusion, this study has yielded several noteworthy findings and conclusions concerning the relationship between road infrastructure development and the performance of the tea processing factories in Murang'a County, Kenya. First and foremost, the investigation into the impact of road network status on factory performance has exposed a strong and positive correlation. Higher road network status is closely linked to enhanced factory performance, firmly rejecting the initial null hypothesis and emphasizing the pivotal role of well-developed road networks in boosting the efficiency and productivity of tea processing factories.

Secondly, the exploration of the influence of road network connectivity on factory performance has shed light on the concerns expressed by tea farmers in the region. Notably, the inefficiencies in road transportation have emerged as a pressing issue. The research establishes a significant positive correlation between road network connectivity and factory performance, underlining the need for substantial improvements in connectivity to enhance the overall success of the tea factories in Murang'a County.

Thirdly, as the study delves into the relationship between road network efficiency and factory performance, it becomes evident that tea farmers' concerns about various aspects of road efficiency are substantiated by the study's findings. The robust and significant positive correlation uncovered emphasizes the substantial influence of efficient road networks on tea farmers' perceptions of the factories' performance. These results harmonize with prior research and underscore the critical role of tailored infrastructure development in tea-producing regions for factories success.

Lastly, the examination of the challenges faced by tea processing factories in the region and their impact on performance has revealed a complex landscape of issues. From transportation challenges to communication barriers with farmers, power outages, competition, and government policies, these multifaceted challenges

collectively exert a significant impact on the performance of the factories. It is abundantly clear that addressing these challenges comprehensively is paramount to enhancing the tea factories' success in Murang'a County.

5.3 Recommendations

This study established a statistically significant correlation between the performance of the research area's tea processing companies and the development of the road infrastructure. Several suggestions are given to important players in the tea processing sector for the goal of policy action based on this major link. This is particularly true because their ramifications have a direct bearing on the issue that prompted this investigation in the first place.

5.3.1 Recommendations for the Murang'a County Government

The study's findings hold profound implications for infrastructure development policymakers. Specifically, the Ministry responsible for infrastructure must increase investments in road infrastructure in the study area. These improvements are vital for ensuring convenient access to tea buying centres by all local tea farmers, thereby profoundly influencing the performance of the tea processing factories. Prioritizing road infrastructure development is imperative for the Murang'a County Government, serving as a linchpin for enhanced access and mobility within the tea farming community. The accessibility of tea buying centres plays a pivotal role in enhancing overall efficiency and effectiveness in the local tea processing factories. To achieve this goal, the County Government should embark on comprehensive road improvement projects, incorporating modern construction techniques and materials. It is also recommended that a collaborative approach be adopted, involving relevant stakeholders such as the Ministry of Transport, local communities, and tea factories representatives. The benefits of this initiative extend far beyond mere convenience, encompassing heightened productivity, cost efficiency, and improved well-being for the local tea farming community. The County Government's commitment to infrastructure investments will undoubtedly lead to a thriving tea sector, fostering sustainable growth that ripples through the local economy.

5.3.2 Recommendations to the National Government of Kenya

The findings of this study have unveiled a noteworthy revelation regarding the pivotal role of road network connectivity in the performance of tea processing factories within

Murang'a County. This revelation bears profound implications not just for this specific region but for the entire tea factories across Kenya. It is therefore strongly recommended that the National Government of Kenya commits to substantial investments in improving the network connectivity in all tea-growing areas throughout the country, including but not limited to Nyeri, Kiambu, Kirinyaga, and various others.

The essence of this recommendation lies in recognizing that a robust road network connecting tea-growing regions is not merely a local concern but a national imperative. A well-connected network of roads will facilitate the efficient and timely transportation of tea leaves to processing factories, thus enhancing the overall productivity of the tea factories. By doing so, Kenya can ensure that the internal market demands for tea are consistently met, fostering the growth and prosperity of the entire sector. Furthermore, the implications of such improvements extend beyond the tea sector itself, as they can significantly contribute to the nation's GDP. A thriving tea factory, enabled by reliable network connectivity, can bolster the economic performance of Kenya on a broader scale. It will empower not only tea farmers but also the myriads of ancillary factories and services that rely on the tea sector. Therefore, the National Government should consider this recommendation not just as a means of enhancing local tea production but as a strategic move to bolster the economic well-being of the entire nation.

5.3.3 Recommendations for Tea Farmers

They should actively engage in measures that streamline and expedite the transportation of their unprocessed tea leaves to the processing facilities. This endeavour entails optimizing transportation routes, scheduling, and adopting modern logistical practices to minimize the time taken from the point of harvest to delivery at the factory. Such efforts will not only enhance the overall efficiency of tea processing but also contribute to increased productivity and economic returns for the farmers. The profound interconnection between road network efficiency and the performance of tea processing factories within Murang'a County highlights a critical avenue for the betterment of the tea factories. The implications of this relationship call for a series of strategic recommendations aimed at empowering tea farmers in the region, as well as those in analogous areas across the country. First and foremost, tea farmers within the

research area should consider road network efficiency as a central facet of their operations.

Furthermore, tea farmers should actively collaborate with local authorities, cooperatives, and relevant stakeholders to promote the improvement of road infrastructure. Advocating for better roads, maintenance, and upgrades within their respective areas can have a far-reaching impact on the entire tea farming community. This collective approach can harness the power of unity and cooperation, ensuring that road network efficiency is prioritized on a larger scale, benefiting tea farmers and processing factories alike. Moreover, education and training programs aimed at equipping tea farmers with modern farming practices, including efficient transportation and logistics, should be developed and made accessible. These educational initiatives can empower tea farmers to make informed decisions and implement best practices for the swift and safe transportation of their tea to processing centres.

5.3.4 Recommendations for Directors of Tea Processing Factories

The comprehensive analysis conducted in this study has unveiled a range of challenges confronting both tea farmers and tea processing factories in Murang'a County. These challenges encompass diverse aspects, including energy, information and communication technology (ICT), and market dynamics. In light of these findings, it is imperative that senior managers and directors of the tea processing factories in this region take a proactive stance in addressing these challenges to ensure a consistent and reliable supply of raw materials to their respective facilities. The first critical recommendation for directors is to meticulously evaluate the energy infrastructure of their processing factories. They should explore avenues for energy efficiency and sustainability, potentially incorporating renewable energy sources where viable. By ensuring a stable and cost-effective energy supply, factories can maintain the uninterrupted processing of tea leaves, thus preventing disruptions in the supply chain. Simultaneously, it is essential for directors to harness the power of ICT solutions. Embracing modern technologies can streamline communication, information sharing, and market intelligence. Directors should invest in systems that enhance real-time communication between tea farmers, processing facilities, and market stakeholders.

This will not only optimize operational efficiency but also empower the tea factories to adapt more swiftly to market fluctuations and consumer demands.

Furthermore, the challenges related to market dynamics call for directors to diversify their market strategies. This may involve exploring new markets, enhancing the quality of tea products, and establishing stronger market linkages. By proactively addressing market-related hurdles, tea processing factories can create a more stable and lucrative environment for their tea farmers, thereby ensuring a steady supply of raw materials. This study established that the tea farmers and tea processing industries in Murang'a county face a number of challenges, ranging from energy, ICT and market. The study therefore recommends that senior managers of the affected tea processing factories be proactive in addressing the challenges affecting their tea farmers, so as to ensure steady supply of raw material to the said factories.

5.3.5 Areas for Further Research

This study has illuminated significant factors influencing the performance of tea processing businesses in Murang'a County. However, it is important to note that certain constraints limited the depth and scope of our investigation, leaving several research gaps within the broader context of the topic under study. Hence, we recommend further research endeavours to bridge or fill these gaps. Several areas have been identified as potential avenues for additional research, including:

Firstly, expanding the study's generalizability across counties in Kenya is crucial. Our research was confined to specific tea processing factories in Murang'a County due to logistical and technological constraints. Future research initiatives should consider conducting similar studies in various counties across the nation to gauge the applicability of our findings on a broader scale. Secondly, an exploration of the diverse modes of transportation, including railways, within the tea factories is warranted. While our study focused on road network infrastructure, an in-depth investigation into the impact of various transportation channels on tea processing factories in the country would provide comprehensive insights into this aspect of the factories.

Furthermore, acknowledging the heavy investment in other agricultural sectors in Murang'a County, such as coffee, fruits, and macadamia growing, additional research should examine how road network infrastructure development influences these

alternative agricultural factories. This broader exploration would allow for more comprehensive recommendations aligning with the agricultural development goals of the county and similar regions across Kenya.

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APPENDICES

Appendix 1: The Tea Farmers Questionnaire

Demographic Information

Name of Tea Factory ……. Subcounty/constituency……..

Gender: Female [ ] Male [ ]

Level of education Primary [ ] Secondary [ ]
Tertiary [ ] None [ ]

Introduction

Kindly provide honest and exhaustive answers to each question by ticking (√) or numbering in the respective boxes that closely correspond to your category. Note: These responses will be used only for fulfilling academic requirements and will be handled with extreme confidence. This tool will collect data on road infrastructure. The questionnaire is divided into three sections, each dealing with one aspect of infrastructure.

PART A: THE ROAD NETWORK STATUS

This section investigates the status of roads in your tea processing area.

To what extent do you agree or disagree with the following statements on current status of roads in your area. Kindly tick (√) appropriately). (Strongly disagree) =SD, (Disagree) = D, (Neutral)=N, (Strongly agree) = SA, (Agree)=A,

STATEMENT	**SA**	**A**	**N**	**D**	**SD**
There roads from my farm to the tea factory are in poor state					
The topograpgy/condition of the road from my tea farm to the factory is bad					
The lack of compactness of the road from my tea farm to the factory makes it impassable during the rainy season					
The alternative roads to the tea factory are in poor condition					
The nature of roads to the tea factory shoud be improved					
The tracks to the tea buying centre should be expanded					

PART B: THE ROAD NETWORK CONNECTIVITY

This section investigates the status of road connectivity your tea processing area.

To what extent do you agree or disagree with the following statements on how recent developments in transport infrastructure affect the manufacturing sector operations. Kindly tick (√) appropriately). (Strongly disagree) =SD, (Disagree) = D, (Neutral)=N, (Strongly agree) = SA, (Agree)=A,

STATEMENT	SA	A	N	D	SD
The roads from my tea plantation to the buying centre are in the correct location					
Less time is wasted while transporting my tea to the factory					
Minimum effort is spent on processing tea in my area					
A lot of focus is put on the process of tea manufacturing					
The output we get from tea processing in our factory is maximum					

PART C: ROAD NETWORK EFFICIENCY

To what extent do you agree or disagree with the following statements on efficiency of roads from your farm to the tea factory (Kindly tick (√) appropriately). (Strongly disagree) =SD, (Disagree) = D, (Neutral)=N, (Strongly agree) = SA, (Agree)=A,

STATEMENT	SD	D	N	A	SA
The location of the tea processing factory is good for all farmers					
It takes a long time to transport my tea to the factory/buying centre					
A lot of time is wasted while trying to access the tea buying centres					
A lot of time is consumed transporting tea from the buying centre to the factory					
More needs to be done to improve efficiency of the roads used to transport tea to the factory					

Appendix 2: The Document Analysis Guide

This instrument seeks data on the performance of selected companies in the manufacturing sector. Kindly place a tick against the most appropriate rating of the following indicators of performance, basing on the guidelines provided.

Indicator	**RATING**		
	Below average	**Average**	**Above average**
Customer satisfaction *(from review and public comments on products in company websites)*			
Public opinion *(from review and public comments on products)*			
Employee satisfaction *(from their annual job appraisal documents/comments)*			
Profit margins *(from the annual financial reports, average for the last 3 years)*			
Labour Turnover *(from the annual Human Reource reports, average for the last 3 years)*			

SCORING GUIDE

Labout turnover: over 50% of staff and above quitting=below average,25% to 50% quitting =average, below 25% quitting = above average

Profit margins: Return on investment i.e net profit with respect to total investment costs: Over 50% = above average, 20% to <50% = average, below 20% to loss making = below average

Employee satisfaction: Most comments positive: above average, most comments neutral = average, most comments negative = below average

Public opinion: Most comments positive: above average, most comments neutral = average, most comments negative = below average

Customer satisfaction: Most product reviews positive: above average, most product reviews neutral = average, most product reviews negative = below average

Appendix 3: The Group Interview Guide

DATE: _____

GROUP ID.: _____

INTERVIEW MODERATED BY_____

I, John Wambugu, am conducting an evaluation of the relation between infrastructure and performance of the manufacturing sector in Kenya This group interview will help me understand beliefs, perceptions, experiences and feelings about the challenges facing the manufacturing sector in Kenya. Your insights will help address my research objectives and in turn help improve future government policies that will be used to improve various aspects of the manufacturing sector going forward. You have been selected in to participate in this study because you are a manager in the manufacturing sector and are therefore best placed to give information that will be helpful in my research.

Just 20 minutes will be needed for the interview.

[May I start or can we arrange a good time to finish the interview?].

Everything you say to me is private. Nothing you say will be used in any reports that come out of this interview to identify you personally. Every report I write will be worded such that no single comment can be linked to a specific person.

There are several points of view rather than right or wrong responses. Even if your point of view is different from what has been spoken, please feel free to express it. Remember that I am just as interested in bad feedback as I am in positive feedback, and sometimes the negative feedback is the most useful.

I'm sure you've noticed my phone's voice recorder. The session will be recorded so that I may review what you said, but it just applies to this particular group. Anything you say here will be kept in complete privacy; I won't divulge who said what to anyone outside of this room. In these conversations, people frequently say incredibly useful things, but I can't write quickly enough to record them all. Please repeat your name each time you speak if possible. I won't be able to see who is speaking when I play the recording again, so I'll need to be able to connect statements you made at various

points. First names only, and I won't include any names in my report. You may rely on total secrecy. Your attendance at this focus group is entirely optional.

What is the infrastructure related issues that play role in how your company performs in comparison with others?

Probes: **Transport, Energy, ICT**

1. What are the Market challenges facing your company?

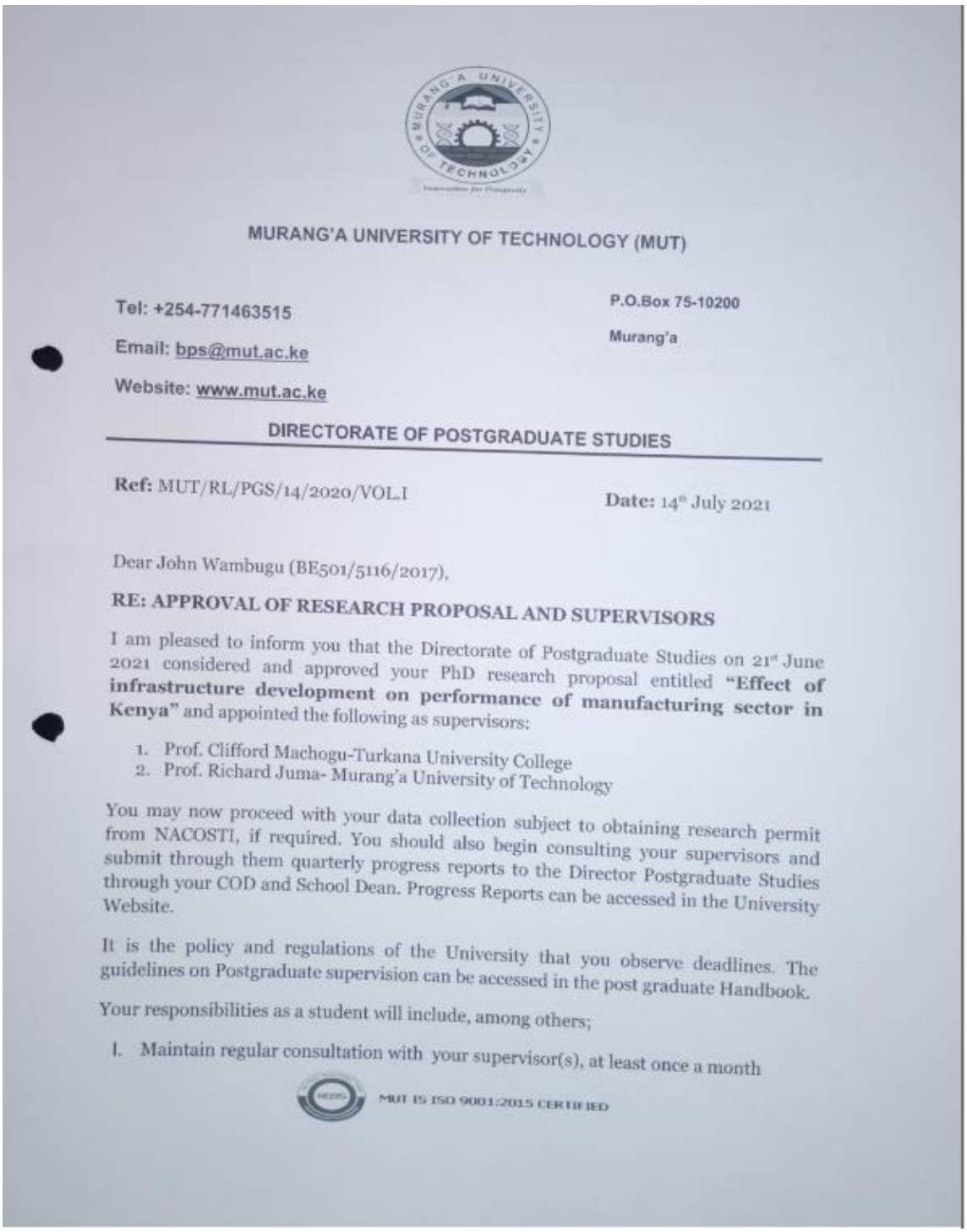
   Probes: **cheap imports, low demand, oversupply, competition**

2. Please comment on the government policies that negatively affect performance of your company?

   Probes: **high taxation, management, manpower, globalization**

END OF INTERVIEW

Appendix 4: Institutional Research Approval



MURANG'A UNIVERSITY OF TECHNOLOGY (MUT)

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P.O.Box 75-10200
Murang'a

DIRECTORATE OF POSTGRADUATE STUDIES

Ref: MUT/RL/PGS/14/2020/VOL.I

Date: 14th July 2021

Dear John Wambugu (BE501/5116/2017),

RE: APPROVAL OF RESEARCH PROPOSAL AND SUPERVISORS

I am pleased to inform you that the Directorate of Postgraduate Studies on 21st June 2021 considered and approved your PhD research proposal entitled **"Effect of infrastructure development on performance of manufacturing sector in Kenya"** and appointed the following as supervisors:

1. Prof. Clifford Machogu-Turkana University College
2. Prof. Richard Juma- Murang'a University of Technology

You may now proceed with your data collection subject to obtaining research permit from NACOSTI, if required. You should also begin consulting your supervisors and submit through them quarterly progress reports to the Director Postgraduate Studies through your COD and School Dean. Progress Reports can be accessed in the University Website.

It is the policy and regulations of the University that you observe deadlines. The guidelines on Postgraduate supervision can be accessed in the post graduate Handbook.

Your responsibilities as a student will include, among others;

I. Maintain regular consultation with your supervisor(s), at least once a month

MUT IS ISO 9001:2015 CERTIFIED

II. Submit quarterly reports on time, through your supervisors, COD, Dean and to the Director of Postgraduate studies;
III. Ensure quality work all through;
IV. Present your research findings at 2- 3 seminars/conferences prior to thesis examination.
V. Publish one article from your research findings in a refereed journal prior to thesis examination

For any further clarification, please contact the undersigned.

Yours Sincerely,

DIRECTORATE OF POSTGRADUATE STUDIES
MURANG'A UNIVERSITY OF TECHNOLOGY
14 JUL 2021
P.O. Box 75-10200, MURANG'A
TEL: 0714623515, Email: info@mut.ac.ke

Prof. Geoffrey Muchiri
Director, Postgraduate Studies

Cc
Registrar (ASA)

Appendix 5: NACOSTI Research Permit

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Ref No: **834396**

Date of Issue: **09/August/2021**

RESEARCH LICENSE



This is to Certify that Mr.. John Wambugu Kanyungu of Murang'a University of Technology, has been licensed to conduct research in Baringo, Bomet, Bungoma, Busia, Elgeyo-Marakwet, Embu, Garissa, Homabay, Isiolo, Kajiado, Kakamega, Kericho, Kiambu, Kilifi, Kirinyaga, Kisii, Kisumu, Kitui, Kwale, Laikipia, Lamu, Machakos, Makueni, Mandera, Marsabit, Meru, Migori, Mombasa, Muranga, Nairobi, Nakuru, Nandi, Narok, Nyamira, Nyandarua, Nyeri, Samburu, Siaya, Taita-Taveta, Tanariver, Tharaka-Nithi, Transnzoia, Turkana, Uasin-Gishu, Vihiga, Wajir, Westpokot on the topic: effect of infrastructure development on performance of manufacturing sector in Kenya for the period ending : 09/August/2022.

License No: **NACOSTI/P/21/12237**

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Appendix 6: Publications

This thesis has produced the following publicatons.

Kanyungu J.W, Omariba A., Juma R., Muthoni N.,"The Relationship between Road Network Efficiency and the Performance of Tea Processing Industries in Murang'a County", Kenya. Vol. 10, Issue 6, pp: (1-7), Month: November - December 2023, International Journal of Novel Research in Life Sciences. Available at: www.noveltyjournals.com

Kanyungu J.W, Omariba A., Juma R., Muthoni N., "Correlation between Transportation System Development and The Performance of the Manufacturing Sector in Kenya". Vol. 10, Issue 2, pp: (39-46), Month: March – April 2023, International Journal of Novel Research in Interdisciplinary Studies. DOI: https://doi.org/10.5281/zenodo.7711187, Available at: www.noveltyjournals.com