THE EFFECT OF CLIMATE FINANCE ON THE EXPORTATION OF RED MEAT CARCASS IN KENYA

BY

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DECLARATION

I hereby declare that this research project is my original work and has not been submitted for a degree or examination at any other University.

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This Research Project has been submitted for examination with my approval as the University Supervisor.

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DEDICATION

This project is dedicated to the greatest teacher, Prophet Mohamed (Peace be upon him), who taught us life's purpose. Secondly, my father and lovely mother imparted me with knowledge, focused all their resources and time on my success in this life and the hereafter, and sacrificed a lot to make sure my path of seeking knowledge and academic success had the least challenges.

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Thanks to all that touch my heart, and God bless you all.

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LIST OF ABBREVIATIONS AND ACRONYMS

ASAL	Arid and Semi-Arid Land
CBK	Central Bank of Kenya
CSA	Climate Smart Agriculture
CW	Carcass Weight
SDGs	Sustainable Development Goals
FAO	Food and Agriculture Organisation
GHGP	Greenhouse Gas Protocol
GHG	Greenhouse Gases
KMC	Kenya Meat Commission
KNBS	Kenya National Bureau of Statistics
LCA	Life Cycle Assessment
NCCAP	National Climate Change Action Plan
USD	United States Dollar
VCARD	Value Chain Analysis for Resilience in Drylands
VIF	Variation Inflation Factors

ABSTRACT

The study's main objective was to elaborate upon the effect of climate finance on the exportation of red meat carcasses in Kenya. The influence of climate finance, prevailing temperature, rainfall patterns, exchange rates, and the GDP of the Kenyan population on the exportation of red meat carcass in Kenya served as the goal of the study. The study adopted a descriptive research design. Secondary data for each study variable was collected for the study period 2012 – 2021. The study undertook a correlational as well as regression analysis to determine the relationship between the study variables. The findings indicated that climate finance and exchange rate had a significant positive correlation against exportation of red meat carcass while temperature, rainfall and GDP indicated an insignificant correlation on exportation of red meat carcass. The regression analysis indicated that the coefficient of determination is 18.5 %. This implied that the model could only account for 18.5 of the changes in transportation of red meat carcass. The adjusted R square was lower than the value of R square indicating that the model contained elements that did not add value to it. The regression model was statistically significant indicating that there was positive statistically significant effect of climate finance on exportation of red meat carcass in Kenya. The regression coefficient indicated that all the independent variables were insignificant apart from exchange rate. Only the exchange rate was found to have a statistically significant effect on exportation of red meat carcass. The study therefore concludes that further investment should be injected into climate finance for the purposes of improving exports of red meat carcass. The study also concluded that the climate finance contributed in Kenya was inadequate and more measures needed to be undertaken to enhance climate finance that would enhance production as well as exportation of red meat carcass in Kenya. The study also recommends farmers to ensure that during the dry season, they should dispose off most of their livestock to avoid losses from droughts. This would increase exportation of red meat carcass during dry and hot seasons.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Climate change is a significant effect on livestock production worldwide. Global warming is associated with variations in climate that cause an adverse effect on livestock feeds, water resources, and the general health and growth of livestock, thereby affecting overall livestock production (Rivero et al., 2021). According to Thornton and Herrero (2010), climate change has several effects on livestock, including livestock diseases, heat stress, inadequate quantity and quality of feeds, interference with biodiversity, insufficient water, and lack of food security. Climate change also has implications for the processing, storing, and transporting red meat carcasses from slaughterhouses to the port, ready to be exported, therefore introducing climate finance in developing countries like Kenya to aid in curbing climate change. Climate finance is local, national, or transnational financing that raises for the purposes of climate change mitigation and adaptation actions. Climate finance can be sourced from private, public, or alternative finance sources. Climate finance was introduced in developing countries in response to climate change to encourage investors in these countries to invest in climate-resilient and low–emission projects to build a sustainable. This fund aims to reduce harmful gasses emitted to the environment, such as greenhouse gases, by different activities done in the country and assist vulnerable societies affected by climate in developing countries (Jakob et al., 2015).

This study pins on several theories that have been found relevant to the study. Green theory by Goodin (1992) is a theory that fosters international relations by positing environmental issues as central in studying international relations. Green theory primarily focuses on global justice, modernization, international development, and security. The theory can be split into an international political economy-oriented wing and a cosmopolitan wing where both wings have contributed equally to environmental issues (Dunne, Kurki & Smith, 2021). The study anchors on securitization theory which was introduced in 1983 by Barry Buzan. Securitization theory describes transforming subjects from common political issues into matters of security by state actors, enabling the use of exceptional measures in the name of security. Securitized issues are issues that have successfully been constructed into existential problems. The study as well will be

underpinned by the dynamic capabilities theory pioneered by (Teece, Pisano, and Shuen 1997). Dynamic capability is the ability of an organization to adapt a resource base with a purpose. It involves integrating, building, and configuring internal and external competencies to address a dynamic environment. It involves multiple capabilities to combine to have the capacity to react timely and adequately to rapid external changes.

Kenya is a developing country that experiences challenges due to climate change which poses some adverse effects on the exportation of red meat carcasses in Kenya. According to (Rojas-Downing et al. 2017), climate change poses numerous threats to livestock farming, especially large-scale agriculture for exportation purposes. These threats include loss of livestock productivity, occasioned by heat stress which lowers feed intake, limits weight gain, causes a negative effect on fertility, and reduces the quality of meat produced. High temperature increases livestock mortality rates due to increases in types of diseases and parasites. Future uncertainty arises, such as water availability, given that the country's climate keeps changing. Adaptation to climate change is complex due to water scarcity. Climate change accelerates the intensity and frequency of extreme events such as drought, extending these effects on sea levels and increasing the salinity of surface and groundwater around coastal regions (Chesterman & Neely, 2015). An analysis done by FAO on 48 developing countries, from the year 2003 to the year 2013, on 78 post-disasters indicated that climate hazards such as floods and drought cause an economic loss of about 25% in the agricultural sector (Chesterman & Neely, 2015).

1.1.1 Climate Finance

Climate finance lacks a universally accepted definition, although, according to Weikmans et al. (2017), the term indicates the financial resources set aside for climate change prevention and adaptation. Climate finance can also refer to mobilized financial resources intended to be used by developing countries to prevent and assist vulnerable groups in adapting to climate change. In Kenya, climate finance is sourced from different sources, including carbon finance which firms and industries contribute, and public and private sources from international and local sources. International sources of climate finance in Kenya are diversified into distinct parts involving high transaction costs. Multinational agencies and bilateral development partners are the international public sources of Green finance. At the same time, World Bank and African Development Bank

are the leading multinational institutions that support climate finance in Kenya (Kiremu et al., 2022).

The amount of climate finance required by developing countries like Kenya to create growth resilient to climate change and a carbon-free environment is colossal. According to World Bank (2010), middle-class countries require annual climate finance of USD 70-100 billion for the next twenty-seven years to facilitate the adaptation of climate change required and approximately USD 140-155 billion for the next ten years to facilitate mitigation purposes. However, the total annual climate finance flow for both adaptation and migration in developing countries is significantly below this target, according to Newell and Bulkeley (2017). They estimate that the region receives nearly USD 40 to USD 175 billion annually. In Kenya, climate finance faces political, corruption, and technical challenges that hinder its effectiveness. Some of the technical barriers include fragmented funding landscapes, lack of harmonized standards, and capacity gaps. In contrast, lack of political will and diverging agendas between development actors and government are political challenges that affect green finance facilitation. Its coordination can only be improved if the government prioritizes climate change by rendering it a threat to the nation, which requires mitigation attention.

1.1.2 Exportation of Red Meat Carcass

Kenya Meat Commission (KMC) is the most modern and biggest licensed abattoir in the Eastern, central part, and the horn of Africa. Its top meat products of high quality are supplied in the international markets, including Middle East Africa, Central Africa, and North Africa (Irungu et al., 2014). Saudi Arabia, South Sudan, Kuwait, Bahrain, and UAE are the top five international markets that consume meat export products from Kenya. KMC exports 500 tonnes of red meat carcasses, primal cuts, and canned products weekly. KMC exports its products through very professional and organized consignments and ensures that hygiene is maintained while packing these products for different markets (Wafula & Wasonga, 2021).

In the financial year 2020, Kenya's livestock sector contributed approximately 12% of the GDP. The exportation of meat accounted for 1.1% of the total exports in Kenya. Exported meat products amounted to USD 65.4 million, which included red meat from sheep and goats that comprised

85% of the total export, 7.1% from bovine animals, and only 2.5 % of the total meat came from white meat according to Kenya meat export statistics (Mbae et al., 2020). The director general of KALRO reported that total annual meat production in Kenya, which stands at 300,000 tonnes is yet to meet the total demand of 648252 tonnes. The low output can be attributed to challenges facing livestock production in Kenya, including diseases and pests, drought and extreme climatic changes, and low resource allocation to the sector by the government, among other challenges. During drought seasons in Kenya, the government mops up emaciated livestock animals to slaughter at KMC abattoirs compromising the quality and quantity of meat supplied by KMC. Nevertheless, the commission is expected to compete effectively and efficiently with other suppliers at the international level. The quality and quantity of livestock brought to slaughter because of climate change decreases, causing fluctuation of the steady supply in the market (Zwaagstra et al., 2010).

1.1.3 Climate Finance and Exportation of Red Meat Carcass

A myriad of challenges affects food production, which requires robust financial investments to support the global food system (Palmer, 2016). The pressure on demand for food has increased in the 21st century as growing populations manifest in most parts of the world, the changing preferred diets, levelling off of crop yields, biodiversity as well as dwindling natural resources coupled with additional threats to the food production system occasioned by climate change. Palmer (2016), in their discussion paper, envisaged that a warming climate could cut crop yields by more than 25%. The extreme weather events that follow climate change would also devastate farmers, animals, and agricultural land production. It is, therefore, paramount to direct climate financing to issues that would directly impact agricultural production. Small and large-scale farmers should out rightly be benefactors of climate finance. Climate financing utilized in mitigating climate change is likely to directly influence the quality and quantity of production of beef animals, therefore indicating a positive relationship between climate finance and the exportation of red meat carcasses. The more the use of climate finance in creating sustainable weather patterns, the more conducive environment is created that facilitates livestock production where there are fewer challenges of inadequate water, pastures, extreme temperatures, and drought as well pests and diseases that emanate from climate change.

1.1.4 Climate Change and Livestock Production in Kenya

The effect of climate change on livestock production and the corresponding value chain in Kenya has barely been studied. All indications show that livestock sectors continue to suffer significant losses due to climate change, resulting in reduced production in the industry. These climate-related challenges include reduced quantity and quality of forage, scarcity of water, increased livestock diseases, and high temperature. These challenges affect the sustainability of the high productivity of livestock and the entire value chain livelihood of livestock (Godde et al., 2021). Herd size takes years to recover when faced with drought seasons in semi-arid and arid areas, especially when financial resources are inadequate to pre-actively re-stock forage before drought season begins and purchasing animals after the season is over to increase the stock. Thornton et al. (2019) point out a need to establish climate risk instruments such as loans, grants, drought insurance, and funds for emergency climate change occurrences. The government should also formulate policies supporting livestock compensation in calamities. Low literacy level also affects livestock production, given that most people who practice livestock production cannot research weather forecasting to anticipate future uncertainties such as droughts to prepare for such climate changes and establish the perfect types of breeds that can withstand certain climatic weathers.

The livestock sector in Kenya contributes to GHGs emissions mainly from land use change and methane emitted by livestock, according to Kenya Climatic Change Framework Policy (2016). The policy explains that positive externalities may be drawn from the livestock sector through agroforestry, biogas manufacturing, and management of manure, adoption of an efficient livestock production system, rangeland management, and conservation of pasture as well as agriculture conservation (Wambua, 2019). Several policies in Kenya encourage the formation of synergies that can successfully drive climate change mitigations and adaptation activities, especially those that can develop reforestation and sustainable land management projects. Reforestation in Kenya is cited solely as a climate change mitigation strategy where the country targets to increase forest coverage by 10% of the total land in Kenya (Wambua, 2019).

1.2 Research Problem

Exportation of red meat carcasses faces challenges, more so from climate change that affects the quality and quantity of the products from livestock. Climate change results in a drought affecting livestock feeds and water, affecting their health and lowering quality. Climate change also influences the diseases and pests that affect livestock farming (Rivero et al., 2021). Heat stress in animals that reduces productivity by lowering their fertility and increasing their mortality rate is also caused by climate change (McDowell, 1968). Therefore, climate change is a threat that affects the value and quantity of red meat carcasses exported from Kenya. Climate, as one of the drawbacks of the exportation of red meat, has led to a shortage in supply where the country is unable to meet its demand and compete effectively in the market. For the remedy, the government has developed programs to mitigate climate change and has developed climate finance for climate change mitigation and adaptation.

Therefore, the Kenya meat commission board undertakes to find a solution to this significant problem by collaborating with the government in raising climate finance for climate mitigation to enhance sustainability. Climate finance is local, national, or transnational financing that is purposed for climate change mitigation and adaptation actions. Climate finance can be sourced from private, public, or alternative finance sources (Kiremu et al., 2022). Climate finance is therefore availed to mitigate climate change to create a conducive environment that facilitates livestock production to increase the quality and quantity of red meat exportation.

In 2020 Kenya exported meat products that amounted to USD 65.4 million, which included red meat from sheep, goats comprised 85% of the total export, 7.1% from bovine animals, and only 2.5 % of the total meat came from white meat according to Kenya meat export statistics (Mbae et al., 2020). This exportation is affected by several factors; climate change is one of the major factors. Thornton et al. (2009) assert that climate change significantly affects livestock production worldwide. Global warming is associated with climate variations that cause an adverse effect on livestock feeds, water resources, and general animal health and growth, thereby affecting overall livestock production. Climate change has several effects on livestock, including livestock diseases, heat stress, inadequate quantity and quality of feeds, interference with biodiversity, insufficient

water, and lack of food security. Climate change also has implications for the processing, storage, and transportation of red meat carcasses from livestock.

Climate finance is a topic that has recently gained more attention, especially in Kenya, where the country is striving to achieve SDGs. However, a microscopic study has been done on climate finance, mainly how it affects livestock farming and produce. Thornton and Herrero (2015) studied climate change adaptation in sub-Saharan Africa's mixed crop and livestock farming systems. Odhong et al. (2019) as well did a study on financing large-scale mitigation by smallholder farmers: what roles for public climate finance? Therefore, the study seeks to investigate the effect of climate finance on the exportation of red meat carcasses in Kenya. Thus, answering the question: how does climate finance affect the exportation of red meat carcasses in Kenya?

1.3 Research Objective

The study's objective is to establish the effect of climate finance on the exportation of red meat carcasses in Kenya.

1.4 Value of the Study

Kenya Meat Commission and the livestock sector in Kenya will benefit from this study as it will enlighten them on the benefits of financial finance that will help mitigate climate change, thus creating a sustainable climate that will facilitate growth in livestock production. The study will help them make informed decisions regarding climate finance and other factors affecting the exportation of red meat carcasses in Kenya that the study will identify.

The study will be of use to the government, regulatory authority, and policymakers in Kenya as it will guide the policy formulation process, which will be based on the factual premise of this study's findings, therefore assisting in making relevant and attainable policy objectives. Policymakers will acquire the necessary information required to formulate effective policies that will lead to climate change mitigation or adaptation of vulnerable societies.

In academia, scholars can use this study for reference. They will acquire relevant material on climate finance and the effect of climate change on the exportation of red meat carcasses as well

as livestock production. The study will also add to the literature on how climate change can be mitigated using climate finance to improve livestock farming, which will help boost the economy through increased exports. The scholars will also be able to borrow the research methods this study will adopt.

The study will contribute to the theories that the study in that has pinpointed; it will refine or add to the theories by testing a previously untested hypothesis about previous findings to discover the clarity of the theories. It will also assist in testing the theories that have been used in this study to confirm or rebut them. Furthermore, the study will enlarge the theories used by revealing new applications or processes and extending their usefulness.

This study will also be relevant to livestock farmers who practice large-scale farming. From the study, they will be enlightened on the effects of climate change upon their livestock which will help them make informed decisions. The study will also inform these farmers about climate finance and help them understand the importance of climate finance in mitigating and adapting to climate change and creating a conducive sustainable environment.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The chapter will focus on a theoretical review where relevant theories to the study will be discussed. The chapter will then discuss some factors that affect the exportation of red meat carcasses, which will be used as the study's independent variables. The chapter will also review the empirical studies that have been done on the topic of this study. The chapter will conclude by outlining the conceptual framework and the literature review summary.

2.2 Theoretical review

The study will therefore be anchored on three theories that have been found relevant to the study: green theory, securitization theory, and regime theory. The theories will be expounded below.

2.2.1 Green Theory

The green theory was pioneered by Goodin (1992) as a theory that fosters international relations by positing environmental issues as central in studying international relations. Green theory primarily focuses on global justice, modernization, international development, and security. The theory can be splinted into an international political economy-oriented and cosmopolitan wing where both wings have contributed equally to environmental issues (Dunne, Kurki & Smith, 2021). Climate change dominates in the ecological problems addressed by this theory, which explains that climate change is caused by over-reliance on fossil fuels. Human activities have significantly changed the climate globally, forcing the natural environment to become a fast-rising issue worldwide. This theory acknowledges the effort that countries are making in fighting climate change by protecting the environment. It points out that a broader range of non-state actors is the critical change agent. Therefore, they should not be left out when international agreements are made and implemented by the government and other constitutional bodies since global governance institutions and communities should work together to implement a green solution to climate change by reducing damaging emissions and preserving the environment which human depend on (Eckersley, 2007).

The perspective of green theory on climate change is that it is a direct consequence of collective human choices, which have led to historically anthropocentric economists' practices of historically arbitrary political groups who have exploited nature in their short-term interests. Solutions to climate change that represent a clear case of injustice to the present and future humans who are held accountable for climate change require an egocentric theory of value and a more ethical one (Barry, 2014). Therefore, the green theory is relevant to this study as it helps the study redefine the issue of climate change in terms of long-term ecological value rather than short-term political interest to benefit present and future generations (Beck, 2010).

The green theory has a few shortcomings, given that it belongs to the critical theory tradition where environmental issues evoke questions about relations between and among us and others in the context of community and collective decision-making. Green theory aligns itself with post-positivism. It thus opposes neorealism and neoliberalism, which are mainstream theories. Realists believe that conflict for states is caused by scarcity of resources, while neoliberal institutionalism believes that people are superior to nature, so they look instrumental to nature as realists. Green theory lacks empirical measures (Ivakhiv, 2008).

2.2.2 Securitization Theory

Securitization theory was introduced in 1983 by Barry Buzan. Securitization theory describes the process of transforming subjects from common political issues into matters of security by state actors. These enable extraordinary means to be used in the name of security. Securitized issues are issues that have successfully been constructed into existential problems. Securitization theory explains why and how a non-security issue can be termed as a threat to the country, thus becoming a security issue. Securitization affirms that issues can only become security problems if they are termed as 'security issues' without necessarily meaning that they are initially essential to security (Nyman, 2013). The theory explains that only the security actors have the social and institutional mandate to label an issue as a threat or a danger that requires urgent measures to be remedied. Therefore security issues must be articulated as problems to be given a high priority that requires actions necessary for mitigation.

Securitization theory is relevant to this study as it explains how a country can give a problem top priority if it is labeled as a security issue if, when scrutinized, it is found to be a threat by the

security actors. In the context of climate change which threatens the social and economic livelihood of many Kenyans especially marginalized poor people instigating discontentment among societies whose only means of livelihood is through livestock production. Climate change threatens the availability of water and forages for the livestock sector. These can lead to conflicts among communities over pastoral land, forced migration, and the overall security of the population involved in livestock farming. Due to these factors, climate change ought to be labeled as a security issue to be given a top priority to be mitigated (Scott, 2012). The government can therefore prioritize its mitigation by allocating a substantial share of green finance for the adaption and prevention of climate change in Kenya

Securitization theory has been criticized by scholars in that it is found not to account for gender relations as well as empirical and methodological approaches. Securitization theory lacks the concept of observation which traces the bias in the practical deployment of securitization theory. This observational criticism specifically deals with what the theory teaches from what is projected or through prominence. Observational criticism clearly focuses on what we can learn about a theory through the dominance or absence of cases (Corry, 2012).

2.2.3 Dynamic Capabilities Theory

Dynamic capabilities theory was introduced by Teece, Pisano, and Shuen (1997). Dynamic capability is the ability of an organization to adapt a resource base with a purpose. It involves integrating, building, and configuring internal and external competencies to address a dynamic environment. It involves multiple capabilities to combine to have the capacity to react timely and adequately to rapid external changes. Dynamic capabilities theory utilizes the idea of competitive advantage in a dynamic environment. Collins (1994) classified organizational capabilities into three hierarchal levels. In the dynamic capability view, competitive advantage refers to the ability of a firm to adapt to the changing environment through renewing, building, and reconfiguring competencies and capabilities (Teece et al., 1997).

The first level consists of functional capabilities, which are the zero-level capabilities essential for an organization's survival and the maintenance of its primary income-generating processes. The second level consists of dynamic capabilities for the necessary dynamic improvement required for the business processes. These capabilities are set aside for the repeated processes in an organization

or product innovation manufacturing flexibility, short development cycles, and market trends due to the responsiveness of customers. They have used core competencies as well as the foundation of a firm to gain a competitive advantage (Amit & Schoemaker, 1993). As presented by Collins, the third level in the hierarchy of capabilities is firm capabilities to improve on creativity and entrepreneurial level in an organization. These include the ability to develop novel strategies using their recognition of different resources' value faster than their competitors. This must be done more quickly than the speed at which environmental dynamics occur. These capabilities assist a business in renewing its core capabilities according to the environmental changes, which are the first and the second level capabilities (Andreeva & Chayka, 2006).

This theory is relevant to this study as it explains the ability to develop capabilities that will assist in the renewal of core capabilities. KMC may apply this theory in raising green finance to mitigate climate change to have a sustainable environment that will enhance livestock production.

The major criticism of the dynamic capability theory is that it lacks operationalization, is also obscure, and its definitions are redundant. There exists a change in measuring capabilities empirically since they are underlying operational processes, and it is also difficult to measure the relationship between these capabilities and a firm's performance (Ambrosini & Bowman, 2009). Another challenge arises in measuring the routines and processes that are peculiar to the firm or form part of the resource bundle, which lacks a coherent theoretical foundation and has unclear practical implications (Barreto, 2010).

2.3 Determinants of Exportation of Red Meat Carcass in Kenya

The study identified climate finance, climate change, livestock development expenditure, as well as pests, and diseases as the independent variables in this study that affect the exportation of red meat carcasses in Kenya. The theoretical expectation of their relationship with the exportation of red meat carcasses in Kenya will be expounded below.

2.3.1 Climate Finance

Climate finance lacks a universally accepted definition, although, according to Weikmans et al. (2017), the term indicates the financial resources set aside for climate change prevention and

adaptation. Climate finance can also refer to mobilized financial resources intended to be used by developing countries to prevent and assist vulnerable groups in adapting to climate change. In Kenya, climate finance is sourced from different sources, including carbon finance, which firms and industries contribute, and public and private sources from both international and local sources. International sources of climate finance in Kenya are diversified into distinct parts involving high transaction costs. Multinational agencies and bilateral development partners are international public sources of Green finance, while World Bank and African Development Bank are the leading multinational institutions supporting climate finance in Kenya (Kiremu et al., 2022).

The amount of climate finance required by developing countries like Kenya to create growth resilient to climate change and a carbon-free environment is colossal. According to World Bank (2010), middle-class countries require annual climate finance of USD 70-100 billion for the next twenty-seven years to come to facilitate the adaptation of climate change required and approximately USD 140-155 billion for the next ten years to enable mitigation purposes. However, the total annual climate finance flow for both adaptation and migration in developing countries is significantly below this target, according to Newell and Bulkeley (2017), who estimate that the region receives close to USD 40 to USD 175 billion per year. In Kenya, climate finance faces political, corruption, and technical challenges that hinder its effectiveness. Fragmented funding landscapes, lack of harmonized standards, and capacity gaps are some of the technical barriers, while lack of political will and diverging agendas between development actors and government are political challenges that affect green finance facilitation. Its coordination can only be improved if the government prioritizes climate change by rendering it a threat to the nation, requiring mitigation attention.

2.3.2 Climate Change

Climate change is a major effect on livestock production worldwide. Global warming is associated with variations in climate that cause adverse effects on livestock feeds, water resources, and livestock's general health and growth, thereby affecting overall livestock production (Rivero et al., 2021). According to Thornton and Herrero (2010), climate change has several effects on livestock, including livestock diseases, heat stress, inadequate quantity and quality of feeds, interference with biodiversity, insufficient water, and lack of food security. Climate change also has implications

for the processing, storing, and transporting red meat carcasses from slaughterhouses to the port, ready to be exported. According to Nardone et al. (2010), global warming may influence the weight, body size, and fat thickness to increase in ruminant animals, which may alter the quality and quantity of the meat. Dark-coloured beef cattle with high weights and thick coats are more vulnerable to high temperatures.

The genetic potential, stage of life, species, humidity, nutrition status, and temperatures contribute to heat stress on livestock. High latitude livestock is more affected by temperature variations and exceptionally high temperatures since they are less resilient to climate change than livestock in low latitudes, which are more adaptable to climatic changes such as high temperatures and drought (Thornton et al., 2009). Some of the effects of heat stress in livestock include reduction of forage intake, the efficiency of feed conversion and productivity of an animal, and sometimes mortality of the animal (Haun, 1997). When an animal's behavior and metabolism rate decrease, the general health of the animal decreases, decreasing production and reproduction and increasing the mortality rate.

2.3.3 Exchange Rate Fluctuations

Fluctuations in the exchange rate are natural for economies adopting floating exchange rates. Several factors influence fluctuations in a country's exchange rate, including the country's economic performance, the outlook of inflation, interest rate differentials, international policies adopted by the government, capital flows, and many others. Generally, the exchange rate of a country is influenced by the nature of the economy in the country. A better-performing economy is likely to have a stronger currency than an economy that is performing poorly. The strengths and weaknesses in the economy's performance in a country fluctuate from time to time due to the underlying conditions. It follows that the exchange rate is likely to fluctuate at the same rate if a floating exchange rate is adopted (Kandil, 2004).

The uncertainties surrounding exchange rate fluctuations and their impact on exports and imports require specific assumptions that theory alone may not suffice to explain. The convexity of the profit function relative to prices suggests that an increase in price uncertainty may increase expected returns in the export sector. However, there are potential asymmetries in the cost of

adjusting factors of production and risk aversion that tend to make the uncertainty-exports relation negative (Cabarello & Corbo, 1989).

2.3.4 Economic Growth

Economic growth is defined as the increase or improvement in the production of goods and services in a particular economy, the improvement in the inflation-adjusted market value of goods and services in a specific economy for a certain period, usually one year. Economic growth is therefore determined by the improvement in capital goods, labour force, level of technology, or human capital (Kandil, 2004). It follows that the improvement in economic growth is occasioned by an increase in the total value of goods and services produced in the country. When agricultural products are increased in a developing country like Kenya, it is expected that the exportation of red meat carcasses will also increase. Economic growth may, therefore, directly correlate with the exports of red meat carcasses.

2.4 Empirical Literature

The empirical literature relates to the empirical research that has been carried out previously. Therefore, the study is interested in previous research that has been carried out related to climate finance, as well as the exportation of red meat carcasses or agricultural products. Research associated with climate change will also be reviewed, where both local and international studies will be examined to identify the research gap that this study would address.

Vellinga and De Vries (2018) sought to determine climate change mitigation strategies adopted in a dairy system that seeks to optimize milk production, considering the compensation for changes in the amount of beef produced as a result. The study adopted the LCA modelling approach to examine four mitigation strategies in the Dutch dairy system. In each of the strategies adopted, the study examined the effect of mitigation on milk production and the effect on carcass weight (CW) from the dairy system. They also calculated the emission intensities of GHG. The findings indicated that there was a reduction in CW per kg of fat protein-corrected meat in the system for all the strategies. In the case of GHG emissions per kg of fat protein corrected meat only, the strategies reduced emissions by 0.2 to 18.1%. The study's conclusion indicated that the mitigation strategies adopted were less effective in reducing GHG emissions. It also concluded that

challenges in reducing GHG emissions in milk and beef production were interrelated. Audsley et al. (2011), in a way, concurred with the study as it indicated that reduction in livestock product consumption reduced emissions of greenhouse gas emissions. A switch from red meat to white meat indicated that there was a reduction in food consumption-related greenhouse gas emissions. The study also found that reducing livestock product consumption could enhance significant environmental benefits, including reductions in ammonia and nitrate emissions.

Cadez and Czerny (2016) undertook a study to determine mitigation strategies adopted by carbon-intensive firms to mitigate climate change. The study was conducted in 158 firms from three EU countries where these firms were known to be significant emitters of carbon and its products. The study examined the relationship between the firms' carbon reduction practices and underlying strategies. The study's findings indicated that firms adopted five leading practices to reduce combustion emissions. However, firms only adopted one of the practices instead of several approaches at a go, mainly indicating that the firms deployed these mitigation strategies to comply. The study revealed that climate policy stringency positively affected corporate efforts to reduce emissions.

Chingala et al. (2017) were concerned that small-scale farmers would be highly affected by climate change as they rely on climate-sensitive ventures with low adaptive capacity. The study administered a total of 182 structured questionnaires where primary data was collected to determine socio-economic factors that influenced small-scale farmers' perceptions of the impact of climate change on beef production in Malawi. The study determined that men had a higher perception of cattle feed intake and decreased mortality than female heads. The study showed that gender, age, education, and income level were critical socio-economic factors that influenced farmers' perceptions of the impact of climate change on beef production. The study's conclusion indicated that socio-economic factors should therefore be incorporated while devising climate change adaptation to climate change.

Rust and Rust (2013) studied climate change and livestock production with an emphasis on South Africa. The study noted the dependence of livestock on the survival of most people in South Africa. However, the production of the beef carcass is prone to be affected by climate change, which has already devastated the global development of agricultural production systems. The study, therefore, discussed the effect of climate change on livestock species that include dairy and beef

cattle, ruminants, and mono-gastric production animals. The study concluded that livestock production at all levels (local and international) would undergo changes due to climate change.

Gerber et al. (2015) examined beef production's environmental impacts as they noted beef's importance to the human population. They stipulated the benefits of rumination that allowed cattle to digest fibrous feeds which would otherwise not be absorbed. Cattle were also found to convert crop residues and by-products into edible products and their significant contribution to soil fertility. The study found that water use, land use, biomass appropriation, and green gas emissions are higher per unit of edible products in beef systems than in other livestock systems. Feed production was also affected by other challenges, such as changing consumer perspectives, resilience to climate change, and inequity in access to crucial resources.

Herrero et al. (2010) assessed the impact of climate change and variability on Kenya's agriculture sector and economy. The study reviewed the historical performance of the Kenyan agricultural industry under varying climate change; the variability of climate and climate change in Kenya, the impact of climate change on crop yield, production, and livestock yields using crop and livestock simulation models as well as the assessment of the broader effects on the economy. The findings indicated that the production of critical staple food in Kenya was likely to be adversely affected by climate change, consequently increasing the prices of essential staple food. Low food accessibility was likely to lead to an increase in malnutrition, mostly among children. Increased drought frequencies could also lead to irreversible decreases in livestock numbers in arid and semi-arid regions. The study also found that some ASAL regions in Kenya might be affected by climate change to the extent that cropping might no longer be possible, and livestock would be the only source of livelihood.

Pauw and Dzebo (2016) sought to investigate the challenges and opportunities for private finance for climate change adaptation in Kenya. They recognized the costs for adaptation to climate change to be high such that it would not be possible for the public sector to meet such costs solely. However, it is challenging to depend on the private sector for such investments, particularly in developing countries such as Kenya. Policy briefs and country practices were reviewed, and the study also carried out interviews and an analytical framework to unravel the mobilization and delivery of private investments. Even though the government has established enabling environments for mobilizing investments in adaptations, which is a priority area for both the

government and its development partners, there is little knowledge in the private sector regarding adaptation and only acts on adaptation as resource efficiency or addressing land degradation.

Silvestri et al. (2012) studied climate change perception and adaptation of agro-pastoral communities in Kenya, where data was collected from 7 rural districts in Kenya. The study assessed vital adaptation strategies for livestock producers that include mixing crop and livestock production, destocking, diversifying livestock feeds, changing animal breeds, and moving animals to other sites. The study indicated that the most desired adaptation strategies include introducing new species and increasing herd size. The study identified vital setbacks that included a lack of credit or savings and a lack of access to land and inputs. The challenges that affected livestock production were mainly the absence of markets to purchase new breeds or species.

Mariara (2009) examined the economic impact of climate change on livestock production in Kenya. The study adopted the Ricardian model of net livestock incomes as they estimated the marginal effects of climate change. The study also simulated different income levels through livestock under other climatic conditions. The study indicated that livestock production was highly dependent on climate change, where there was a non-linear relationship between the two variables. The study predicted that livestock production in Kenya would likely incur heavy losses from climate change conditions warranted by global warming. The study concluded that climate change was likely to cause poverty, vulnerability, and loss of livelihood.

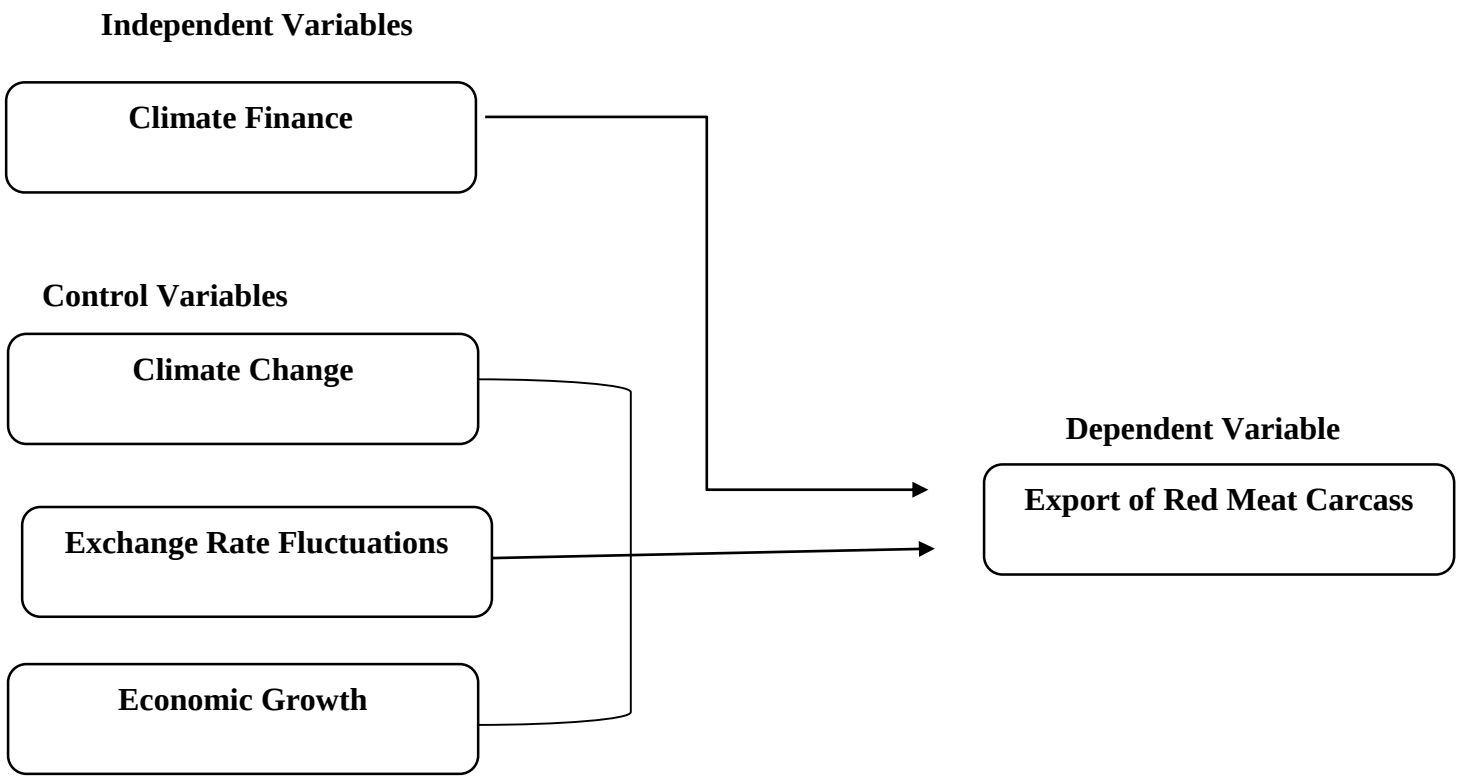
Ndiritu (2020) examined beef value chain analysis and adaptation to climate change in the semi-arid lands of northern Kenya. The study adopted an innovative approach to value chain analysis, and this was a three-step Value Chain Analysis for Resilience in Drylands (VC-ARID). The study respondents indicated changes in rainfall, temperature, and climate extremes. The study's conclusion showed that pastoralists were required to undertake investments in fattening programmes that would increase beef quality. The significant potential was also envisaged in the improvement during the fattening stage in the value chain as it would help meet market demand that desires finished top-quality meats.

2.5 Conceptual Framework

The conceptual framework indicates the relationship between the study variables that are presented in a pictorial format.

Figure 2. 1: Conceptual Framework

Figure 2.1 indicates the relationship between the study variables, where the study's independent variables are climate finance, climate change, exchange rate fluctuations, and economic growth. These independent variables are expected to influence the dependent variable export of red meat carcasses, as indicated in figure 2.1.



2.6 Summary of Literature Review

The review of previous literature indicates that no single study has been undertaken on climate finance and its influence on the exportation of red meat carcasses in Kenya. This could be explained by the following fact that climate finance is still a new concept in finance that came about as a result of worldwide concerns about environmental emissions that polluted the environment leading to climate change. The depletion of the ozone layer is a catastrophic phenomenon that threatens not only the survival of human beings but also the survival of living things and the ecosystem as we know it. The anchor theory of the study is the green theory that fosters environmental issues in all international relations, and it is concerned with limiting emissions and polluters that will degrade the environment and cause climate change (Rivero et al., 2021).

The studies mainly focused on climate change and mitigation of climate finance (Chingala et al., 2017); (Cadez & Czerny, 2016). The studies that were close to this study related to climate change mitigation strategies and beef production. Therefore, no study was undertaken that specifically investigated climate finance and the exportation of red meat carcasses, and this forms the study gap that this study would address.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

The research methodology chapter indicates the process and procedure followed in the research to analyze the study variables to meet the research objective. The chapter, therefore, highlights the study's design, the study population, data collection, and data analysis.

3.2 Research Design

Research design is the idea that a researcher chooses to integrate and analyze the different components of research to have coherent and logical answers to the research questions of the study while at the same time meeting the research objectives. It is the blueprint for data collection, measurement, and analysis (De Vaus, 2001). The research design adopted by the study is the descriptive research design which seeks to explain the variables without necessarily seeking to understand the why. Therefore, descriptive research design informs the study as the independent variables are explained, and their impact on the dependent variable is ascertained.

3.3 Data Collection

Study population refers to all the elements or objects of the study, or still a group of individuals with similar characteristics, and where each individual, component, or entity has an equal chance or opportunity to participate in the study. The population of this study represents all the red meat carcass exporters in Kenya who are registered under Kenya Meat Commission. Fifty-one companies export meat in Kenya to different countries through KMC. The list of these companies is provided in appendix 1.

The study investigated quarterly climate finance for the last ten years (2012-2021). The period identified is ten years since climate finance is a new concept in Kenya that gained traction not more than 15 years ago.

Secondary data for each study variable was collected for the study period 2012 – 2021. Quarterly data was preferred, where qualitative and quantitative data were used in the study. Climate finance data was collected from published data on CBK's website and data published on the KNBS

website. Kenya Meteorological department provided climate change data regarding weather changes in the amount of average rainfall and temperatures each quarter. Data on economic growth, as well as exchange rate fluctuations, were obtained from relevant websites and publications. Publications undertaken by KMC contain data regarding the total weight of red meat carcasses exported each quarter.

3.4 Data Analysis

The data collected was sorted, arranged, and assessed for completeness. Similarly, data analysis as measures of central tendency was undertaken for each variable to describe the data collected. The study also undertakes regression analysis as it helps measure the study hypothesis and ascertain the effect of the independent variables on the dependent variable. However, stationarity tests was conducted to ensure that data conform to assumptions made before regression analysis.

3.4.1 Diagnostic Tests

These tests are undertaken to ensure that data complies with assumptions adopted by the study's regression analysis. The tests undertaken are multi-collinearity tests, normality tests, linearity tests, heteroscedasticity tests, stationarity tests, and

3.4.1.1 Multicollinearity Test

Multi-collinearity test was undertaken to ensure that the independent variables are indeed independent and do not have significant correlations against each other. Multi-collinearity test is measured by VIF (Variation Inflation Factors), where all independent variables may not possibly have zero correlations. However, through practice, significant correlations among the independent variables are defined by VIF values of greater than 10, while values less than 10 indicate that the correlation needs to be more substantial to create problems in regression analysis. Multi-collinear variables are often dropped from the model before undertaking regression analysis.

3.4.1.2 Linearity Test

The linearity test measures whether the variables form linear tendencies or the data distribution is in a linear format, so it is practical to use linear tendencies. The linearity test is determined by

plotting the study variables and observing whether the distribution can be explained linearly. It identifies whether a line of best fit can be used to describe the data collected relatively. If the data fails this test, it is impossible to use linear regression analysis, and other non-parametric methods would be preferred.

3.4.1.3 Normality Test

The normality test determines whether data is distributed in the form of a normal curve or whether data is skewed positively or negatively. Data pass the normality test if it is normally distributed and forms a normal curve. This is tested by use of the Shapiro-Wilk Test, where a significance of greater than 0.05 indicates that the variable is normally distributed, while a variable is not normally distributed if its p-value is less than 0.05. Data that is not normally distributed can be transformed by either squaring the data or standardizing the data.

3.4.1.4 Heteroscedasticity Test

The heteroscedasticity test is undertaken by use of the Breusch Pagan Test. The assumption is that data should be homoscedastic; therefore, the variation between the line of best fit and each variable arises as a result of chance, and any bias is canceled out as distribution is equally above and below the line of best fit. Heteroscedastic data suggests that data transformation is preferred before undertaking regression analysis.

3.4.1.5 Stationarity Test

The study will undertake this test using Durbin Watson Statistic to establish whether the time-series data used in this study is stationary or non-stationary. Stationary data does not show cyclic variation when a variable of the data is increased or decreased but only through a real variation in the variable. Stationary data can be tested by comparing the coefficient of determination (R^2) with the Durbin-Watson Statistic. It is situational if it indicates a value greater than (R2).

3.4.2 Analytical Model

The analytical model that is used in the study takes the form

$$\mathbf{Y= \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \epsilon}$$

Where Y = Natural log of the amount of export of Red Meat Carcass

X1 = Climate Finance measured by the quarterly natural log of the total amount of climate finance

X2 = Climate Change, measured by the average temperature in a quarter.

X3= Climate Change, measured by the average rainfall in a quarter

X4 = Exchange Rate Fluctuations; The average exchange rate of Ksh to 1 USD in a quarter

X5 = Economic Growth – Natural log of total GDP, GDP growth rate quarterly

β1, β2, β3, β4 and β5 are coefficients of X1, X2, X3, X4 and X4

α and ε are regression constants

3.4.3 Tests of Significance

The study used the F-test model to test the significance of the study. This model can find significance levels with this study's sample and is simple to conduct and interpret. The statistical significance level used in this study is 0.05, which means the confidence level will be 95% because it is statistically significant for this study.

CHAPTER FOUR: DATA ANALYSIS, RESULTS AND DISCUSSION OF FINDINGS

4.1 Introduction

This chapter presents the analysis of the data to achieve the study objective. Descriptive analysis is carried out to describe the variables from the data collected for each variable. The study also undertakes the diagnostic tests, correlation analysis, and regression analysis. The chapter concludes by summarizing the results and a discussion of the study findings.

4.2 Descriptive Statistics

The study described the data obtained in every variable in terms of mean, standard deviation the maximum value and the minimum value to show the distribution of the data in each variable.

Table 4. 1: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
YExptRed	120	8.16	8.96	8.5789	.26318
X1ClimtFin	120	8.41	9.05	8.6089	.20037
X2Temp	120	23.00	27.75	25.2938	1.14090
X3Rainfall	120	15.14	166.71	57.8300	35.75544
X4ExcnRat	120	82.90	112.91	98.1052	8.64615
X5GDP	120	3.30	9.20	6.7471	1.60656
Valid N (listwise)	120				

Source: Researcher, (2022)

Descriptive statistics indicated that the mean of exportation of red meat carcass was 8.96 with a standard deviation of 0.263 which implied that for 10 years covered by the study, since 2012 to

2021, the variation of the exportation of red meat carcass in Kenya has been very minimal indicated by the minimum value which was 8.16 and the maximum value of 8.96.

Climate finance indicated a mean of 8.609 with a standard deviation of 0.200 implying that the amount of climate finance contributed every month in Kenya varies closely with the mean which is also supported by the minimum value 8.41 and the maximum value of 9.05.

Climate change which is given by both temperature and rainfall indicate that temperature indicated a mean of 25.29 with a standard deviation of 1.14. The minimum value was 23.00 and the maximum value was 27.75 implying that all values indication a small variation from the mean. Rainfall on the other hand, indicated a mean of 57.83 with a standard deviation of 35.76. The minimum value was 15.14 and the maximum value was 166.71, implying that rainfall varied widely across the 10 years.

Exchange rate indicated a mean of 98.105 with a standard deviation of 8.646, the minimum value was 82.90 and the maximum value was 112.91 indicating that the exchange rate relatively varied from the mean. GDP on the other hand, which was the last independent of the study, indicated a mean of 6.747 with a standard deviation of 1.607, the minimum value was 3.30 and the maximum value was 9.20 implying that the variation of the values from the mean was average across the years covered by the study.

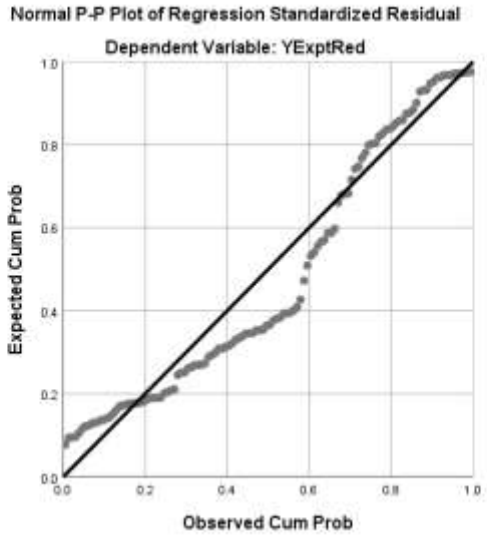
4.3 Diagnostic Tests

The diagnostic tests are performed as a precaution to make sure that no erroneous regressions are made because the data is in a format that allows for such analysis. The study undertook linearity test, normality test, autocorrelation test, multicollinearity, and heteroscedasticity test as follows.

4.3.1 Linearity Test

Linearity test is done by fitting the data in to a straight diagonal line. This suggests that a straight line might be used to accurately characterize the distribution of data, and that the elements of a straight line could be used to make projections and choose the line that fits the data the best for the study's objectives. To assess the linearity of the data used in the study, linear plots are used.

Table 4. 2: Normal P-P Plot



Source: Researcher, (2022)

The table indicating the normal P-P plot shows that the data of the study does not form a diagonal straight line when plotted. This implies that the data is not linear. To correct this problem the study used standardisation to transform the data.

4.3.2 Normality Test

To determine whether the data is distributed in a bell-shaped pattern known as a normal curve, the normality test is used. Normality was tested by testing the null hypothesis. To determine whether data is regularly allocated or not, the Shapiro-Wilk test is performed in this study.

Table 4. 3: Tests of Normality

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
YExptRed	.165	120	.000	.879	120	.000
X1ClimtFin	.219	120	.000	.843	120	.000
X2Temp	.072	120	.190	.982	120	.103
X3Rainfall	.146	120	.000	.893	120	.000
X4ExcnRat	.247	120	.000	.881	120	.000
X5GDP	.143	120	.000	.943	120	.000
a. Lilliefors Significance Correction						

Source: Researcher, (2022)

The normality test indicates that all variables, apart from temperature indicate p-values that are less than 0.05 which implies that the data is not normally distributed. The study transformed the data through standardisation.

4.3.3. Autocorrelation Test

The study applied Durbin- Watson test to determine whether the data had the problem of autocorrelation or not. According to the Durbin Watson Score rule of thumb, a number between 1 and 2 denotes the absence of autocorrelations, whereas a score below 1 or above 2 denotes the presence of either positive or negative autocorrelations.

Table 4. 4: Autocorrelation Test

Model	Durbin-Watson
1	.1.36

Source: Researcher, (2022)

Durbin- Watson test indicate a value of 1.36 which is between 1 and 2 indicating absence of autocorrelation in the data.

4.3.4 Multicollinearity Test

By ensuring that the independent variables have no correlation with one another, the test seeks to eliminate any potential problem of collinearity in the data. When two independent variables are related to one another, they tend to measure or have a comparable effect on the dependent variable which is a problem according to regression analysis. The multi-collinearity of variables with VIF or a value greater than 10 may have an effect on regressions. Variation inflation factors are used to evaluate multi-collinearity (VIF). A tolerance level greater than 1 indicates that multicollinearity problems exist and need to be resolved.

Table 4. 5: Multicollinearity Table

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	X1ClimtFin	.444	2.253
	X2Temp	.887	1.128
	X3Rainfall	.973	1.028
	X4ExcnRat	.307	3.260
	X5GDP	.244	4.098

Source: Researcher, (2022)

Multicollinearity table indicate presence of multicollinearity since the VIF value of all the independent variables are above 1. The study collected this problem by standardising the data.

4.4 Correlation Analysis

The correlation analysis is used to determine the correlation between each independent variable and the dependent variable. Spearman's correlation was employed for this study because it is a non-parametric test since the data is not normally distributed. On a scale of 0 to 1, perfect correlation is represented by a correlation score of 1.

Table 4. 6: Correlations Table

			Zscore(YExptRed)	Zscore(X1ClimtFin)	Zscore(X2Temp)	Zscore(X3Rainfall)	Zscore(X4ExcnRat)	Zscore(X5GDP)
Spearman's rho	Zscore(YExptRed)	Correlation Coefficient	1.000					
		Sig. (2-tailed)	.					
		N	120					
	Zscore(X1ClimtFin)	Correlation Coefficient	.227*	1.000				
		Sig. (2-tailed)	.012	.				
		N	120	120				
	Zscore(X2Temp)	Correlation Coefficient	.018	-.181*	1.000			
		Sig. (2-tailed)	.842	.048	.			
		N	120	120	120			
	Zscore(X3Rainfall)	Correlation Coefficient	-.033	-.094	.202*	1.000		
		Sig. (2-tailed)	.724	.305	.027	.		
		N	120	120	120	120		
	Zscore(X4ExcnRat)	Correlation Coefficient	.291**	.570**	-.180*	-.027	1.000	
		Sig. (2-tailed)	.001	.000	.049	.774	.	
		N	120	120	120	120	120	
	Zscore(X5GDP)	Correlation Coefficient	.129	.623**	-.147	-.018	.811**	1.000
		Sig. (2-tailed)	.159	.000	.110	.847	.000	.
		N	120	120	120	120	120	120

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

**. Correlation is significant at the 0.01 level (2-tailed).

Source: Researcher, (2022)

Correlation analysis table indicate that climate finance and exchange rate have significant correlation against exportation of red meat carcass while temperature, rainfall and GDP indicated an insignificant correlation on exportation of red meat carcass. Climate finance recorded a weak positive and significant correlation of 0.227 against exportation of red meat carcass. Temperature recorded a weak positive and insignificant correlation of 0.018 against exportation of red meat carcass. Rainfall as well recorded a weak negative and insignificant correlation against of -0.033 exportation of red meat carcass. Exchange rate indicated a positive and significant correlation of 0.291 against exportation of red meat carcass. GDP recorded a positive and insignificant correlation of 0.129 against exportation of red meat carcass.

4.5 Regression Analysis

Regression analysis is undertaken to establish the significance of relationship connecting the independent variables and the dependent variable and to establish the coefficients of the independent variable

4.4.1 Model Summary

Table 4. 7: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.430[a]	.185	.150	.92220134
a. Predictors: (Constant), Zscore(X5GDP), Zscore(X3Rainfall), Zscore(X2Temp), Zscore(X1ClimtFin), Zscore(X4ExcnRat)				
b. Dependent Variable: Zscore(YExptRed)				

Source: Researcher, (2022)

The model summary indicates that the R square is 0.185 indicating that the coefficient of determination is 18.5 %. This implies that the model can only account for 18.5% of the changes in transportation of red meat carcass (dependent variable) while 81.5% of the changes in the dependent variable can be attributed to factors that are not within the model. The adjusted R square is 0.150 which is lower than the value of R square indicating that the model contains elements that do not add value to it.

4.4.2 Analysis Of Variance

Table 4. 8: ANOVA Table

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	22.048	5	4.410	5.185	.000[b]
	Residual	96.952	114	.850		
	Total	119.000	119			
a. Dependent Variable: Zscore(YExptRed)						
b. Predictors: (Constant), Zscore(X5GDP), Zscore(X3Rainfall), Zscore(X2Temp), Zscore(X1ClimtFin), Zscore(X4ExcnRat)						

Source: Researcher, (2022)

The ANOVA table indicates that the p value of the model is 0.000 which is less than 0.05 thus the study rejects the null hypothesis and concludes that the regression model is statistically significant.

4.4.3 Regression Coefficients

Table 4. 9: Coefficients Table

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	0.00	.084		.000	1.000	-.167	.167
	Zscore(X1ClimtFin)	.022	.127	.022	.171	.864	-.230	.273
	Zscore(X2Temp)	.093	.090	.093	1.032	.304	-.085	.270
	Zscore(X3Rainfall)	-.039	.086	-.039	-.452	.652	-.209	.131
	Zscore(X4ExcnRat)	.591	.153	.591	3.872	.000	.289	.893
	Zscore(X5GDP)	-.232	.171	-.232	-1.354	.178	-.571	.107
a. Dependent Variable: Zscore(YExptRed)								

Source: Researcher, (2022)

The coefficient table indicates that all the independent variables are insignificant since their p value is above 0.05 apart from exchange rates whose significance is 0.00. This implies that only exchange rate was found to have a statistically significant effect on exportation of red meat carcass. The coefficient of the exchange rate transforms the model of the study in to:

Y= 0 .591X4

The model suggest that a unit increase in the exchange rate will lead to an increase of 0 .591 in the exportation of red meat carcasses. Similarly, a unit decrease in exchange rate lead to a decrease of 0 .591 in the exportation of red meat carcasses

4.5 Summary and interpretation of findings

Descriptive statistics indicated that the mean of exportation of red meat carcass was 8.96 with a standard deviation of 0.263 which implied that for 10 years covered by the study, since 2012 to 2021, the variation of the exportation of red meat carcass in Kenya was very minimal. Climate finance indicated a mean of 8.609 with a standard deviation of 0.200 implying that the amount of climate finance contributed every month in Kenya varies closely with the mean. Climate change was given by both temperature and rainfall. Temperature indicated a mean of 25.29 with a standard

deviation of 1.14, implying that all values indication a small variation from the mean. Rainfall on the other hand, indicated a mean of 57.83 with a standard deviation of 35.76, suggesting that rainfall varied widely across the 10 years. Exchange rate indicated a mean of 98.105 with a standard deviation of 8.646. This insinuated that the exchange rate relatively varied from the mean. GDP on the other hand, which was the last independent of the study, indicated a mean of 6.747 with a standard deviation of 1.607, which implied that the variation of the values from the mean was average across the years covered by the study.

The study carried out correlation analysis which indicated that climate finance and exchange rate had significant correlation against exportation of red meat carcass while temperature, rainfall and GDP indicated an insignificant correlation on exportation of red meat carcass. Climate finance recorded a weak positive and significant correlation of 0.227 against exportation of red meat carcass. Temperature recorded a positive and insignificant correlation of 0.018 against exportation of red meat carcass. Rainfall as well recorded a negative and insignificant correlation against of -0.033 exportation of red meat carcass. Exchange rate indicated a positive and significant correlation of 0.291 against exportation of red meat carcass. GDP recorded a positive and insignificant correlation of 0.129 against exportation of red meat carcass.

The regression analysis indicated that the R square was 0.185 indicating that the coefficient of determination is 18.5 %. This implied that the model could only account for 18.5 of the changes in transportation of red meat carcass (dependent variable) while 81.5% of the changes in the dependent variable could be attributed to factors that were not within the model. The adjusted R square was 0.150 which was lower than the value of R square indicating that the model contained elements that did not add value to it. The analysis of variance indicated that the p value of the model was 0.000 which was less than 0.05 thus the study rejected the null hypothesis and

concluded that the regression model was statistically significant. The regression coefficient indicated that all the independent variables were insignificant since their p value was above 0.05 apart from exchange rates whose significance was 0.00. This implied that only exchange rate was found to have a statistically significant effect on exportation of red meat carcass. The model suggested that a unit increase in the exchange rate leads to an increase of 0 .591 in the exportation of red meat carcasses.

The findings of the current study are like the findings of Chingala et al. (2017) who established that gender, age, education and income level were critical socio-economic factors which influenced farmers' perceptions of impact of climate change on beef production. The current study found no significant relationship between climate change and exportation of red meat carcasses

However, the findings of the current study contradicted the studies of Vellinga and De Vries (2018) and Audsley et al. (2011) who established that reduction in livestock product consumption reduced emissions of greenhouse gas emissions. The study also found that the reduction in livestock product consumption had the ability to enhance significant environmental benefits including reductions in ammonia and nitrate emissions. The results of the current study also disagreed with those of Rust and Rust (2013) found out that production of livestock at all levels (local and international) was to undergo changes due to climate change. Similarly, Gerber et al. (2015) found that water use, land use, biomass appropriation and green gas emissions are higher per unit of edible product in beef systems than in any other livestock systems. Production of feed was also found to be affected by resilience to climate change.

The current study as well contradicted the studies of: Herrero et al. (2010) who established that climate change affected the production of key staple food in Kenya consequently increasing prices

of key staple food. The study also found out that increased drought frequencies could also lead to irreversible decreases in livestock numbers in arid and semi-arid regions. Pauw and Dzebo (2016) who recognized that the costs for adaptation to climate change was high such that it would not be possible for the public sector to solely meet such costs. Pauw and Dzebo also found that it was challenging to depend on the private sector for such investments, particularly in developing countries such as Kenya. Mariara (2009) found that there existed a non-linear relationship between livestock production and climate change. Mariara predicted that livestock production in Kenya was likely to incur heavy losses from climate change conditions warranted by global warming. Ndiritu (2020) established that climate change affected the quality of beef and pastoralists were required to undertake investments in fattening programmes that would increase quality of beef

Silvestri et al. (2012) established that lack of credit or savings and lack of access to land and inputs as well as absence of markets to purchase new breeds or species were the challenges that affected livestock production unlike the current study that only established exchange rate as the only factor affecting exportation of red meat carcass.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter contains the elaboration on that manner in which the objective of the study was met as a summary of the study. This chapter also contains the conclusions derived from the findings, and an in-depth recommendation plus the limitations encountered in the process of the study. The chapter concludes by identifying areas of further research.

5.2 Summary of the Study

The main objective of the study was to elaborate upon the effect of climate finance on the exportation of red meat carcasses in Kenya. The influence of climate finance, prevailing temperature, rainfall patterns, exchange rates and the GDP of the Kenyan population on the exportation of red meat carcass in Kenya served as the goal of the study. So as to achieve this objective, the study collected secondary data from pertinent sources including websites of the main institutions concerned with climate, livestock and balance of payments.

Descriptive statistics were utilised for the purposes of the study to describe the variables under review. Descriptive statistics established the mean of exportation of red meat carcass as 8.57 and the standard deviation at 0.26318 with the maximum and the minimum values indicate that there is no substantial change in the volume of exportation in Kenya over the years. Climate finance had a mean of 8.6089 and a standard deviation of 0.20037 indicating that the allocation of funds for the purpose of climate measures has experienced few upturns or downturns as it has remained relatively the same. The rainfall variable depicted the change of weather and rainfall patterns with

a mean of 57.83 and a standard deviation of 35.7 indicative of the unpredictable nature of the rainfall patterns in Kenya in recent times. The exchange rate was also indicative of the slowly changing nature of economies as the trade for the USD dollar for the Shilling over the years had a mean of 98.10 with a standard deviation of 8.64615 with the minimum and maximum values indicating that the rates have gradually increased in recent times. The final variable was the GDP with a mean of 6.741 demonstrating the constant manner of the GDP in Kenya.

Diagnostic tests were undertaken since the data is in a format that permits such analysis, the diagnostic tests are carried out as a safety measure to ensure that no incorrect regressions are made. The linearity test depicted that the data was relatively distributed in a normal and linear manner passing one of the tests required to ensure that data is fit for subjection to regression. The normality test established that the data collected for the variables was significantly deviate from the normal distribution. The autocorrelations test established a degree of similarity between the independent variables since the value was below 1 indicating the presence of autocorrelations. The multicollinearity test established that all the independent variables were independent and did not relate enough to affect the regression analysis since all the variable VIF values were below 10 and the tolerance level values were all below 1. The correlation analysis established that the variable of climate finance and exchange rate had a considerable pragmatic effect on the exportation of red meat carcass in Kenya while the other variables proved to be insignificant in affecting the dependent variable.

The regression analysis indicated that the R square was 0.185 indicating that the coefficient of determination is 18.5 %. This implied that the model could only account for 18.5 of the changes in transportation of red meat carcass (dependent variable) while 81.5% of the changes in the dependent variable could be attributed to factors that were not within the model. The adjusted R

square was 0.150 which was lower than the value of R square indicating that the model contained elements that did not add value to it. The analysis of variance through the ANOVA test established that the model rejected the null hypothesis and was thus statistically viable and significant. The regression coefficients show that, with the exception of exchange rates, all independent variables are inconsequential because their p value was more than 0.05. This means that only the exchange rate was shown to have a statistically significant effect on red meat carcass exports.

5.3 Conclusion of the Study

From the study findings, various conclusions concerning the study variables were arrived at. The exportation of red meat carcass in Kenya was found to be low given the low averages and the lack of significant upturns in the funds accrued from red meat carcass exportation.

From the findings it was established that climate finance had a significant impact on the exportation of red meat carcass in Kenya. The study therefore concludes that further investment should be injected into climate finance for the purposes of improving the livestock and red meat carcass quality. The study also concluded that the climate finance contributed in Kenya is not adequate and hence the need to increase it.

The findings also established that exchange rates had an effect on the exportation of red meat carcass out of Kenya. The study thus concludes that a decrease in exchange rates relative to the dollar could positively affect the volume of red carcass exportation out of Kenya.

The study established that the temperature variable had a pragmatic but insignificant bearing on the exportation of red meat carcass. The study concludes that exportation procedures should not be based on the prevailing temperature conditions.

The study also established that rainfall had an insignificant but antagonistic relation to the exportation of red meat carcass in Kenya. The study concludes that rainfall mainly affects the quality of red meat and not primarily its exportation out of the country thus the statistical insignificance.

The study finally concluded that GDP had an insignificant but pragmatic effect on the international distribution of red meat carcass from Kenya. The research thus concludes that only partly affects the exportation of red meat carcass since it depicts the earnings of some of the stakeholders within the meat exportation industry.

5.4 Recommendation of the Study

The study recommends that policy makers in the fields of climate finance and livestock rearing for red meat arrive at a framework that would ideally improve and maintain the volume of expots out of the country. The implementation of measures that ultimately improve the quantity through the presenting of climate finance could make the meat exportation industry in Kenya reach its hidden potential.

The study also recommends that the government and related shareholders utilise the weak state of the Shilling in relation to the dollar and other currencies to increase the value of exports especially red meat carcasses out of Kenya to various parts of the world. Holding all other factors constant, the findings have established that the exchange rate is key in the enhanced exportation of red meat carcass out of Kenya.

5.5 Limitations of the Study

The study ran into problems acquiring correct data from secondary data sources available on the internet. Despite the fact that the study was able to obtain audited data from relevant sources, this data is prone to flaws such as entry errors and miscalculation errors, among others, which may impair the quality of the study's findings.

The study experienced challenges in identifying effective factors that affect exportation of red meat carcass in Kenya. The study could only establish a few factors which were found to only account for 18.5% of the changes in transportation of red meat carcass (dependent variable) while 81.5% of the changes in the dependent variable could be attributed to factors that are not within the model

5.6 Areas of Further Research

The study recommends that further research is done with primary data pertaining to the exportation of red meat carcass from Kenya as it is more accurate and similarly less prone to errors. This study can serve as a comparison when further research is conducted so as to arrive at ultimately accurate conclusions.

The study also advocates for a future study to be undertaken, where the context of the study can be broadened perhaps to cater for general exportation of meat and other livestock products. This would be critical in providing an outlook on the patterns that affect the exportation of meat. Other similar studies can also be done on the effect of climate finance on various fields of agricultural output.

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APPENDIX 1: List of Meat Exporters

1. Hellmann Perishable Logistics (H.P.L)
2. Meat Savana
3. Kenya Meat Commission
4. Kalimoni Greens
5. Baobab Restaurant Beach Apartments & Meat Shop
6. Alpha Fine Foods Ltd
7. Gilani Butchery Ltd
8. Synergy Ltd
9. Westend Butchery Ltd
10. Central Meat Suppliers
11. Highridge Butchery Ltd
12. Meat Masters Ltd
13. Meat Poultry & Seafoods Ltd
14. Saddam Makhalasa Meat Supply
15. Southern Meat Supply
16. Super Meat Supply
17. Afro Meat Co Ltd
18. Alpha Fine Foods Ltd
19. Chef's Choice Industries
20. KMC Mombasa
21. Meatons (K) Ltd
22. NAS Meat Processing Division

23. Safeway Meats & Fish (1996) Ltd

24. Farmer's Choice Ltd

25. Gourmet Meat Products Ltd

26. Al – Momin Supply

27. Galgalomeat Supplies

28. Gilani's Meat Market Ltd

29. Good Living Meat Chicken & Fish

30. Home Butchery Ltd

31. Kenya Meat Supply Co Ltd

32. Kenya Cold Storage Foods Ltd

33. Kilimani Meat Supply

34. K K Meat Supply

35. Meat Bazaar Ltd

36. Mombasa Choice Butchery

37. Muthaiga Meats

38. Sharow Meats Ltd

39. Sonata Meat Paper Store

40. Southern Meats

41. Thika Meat Supply

42. Vipingo Meat Supply

43. Waithaka Meat Supplies

44. Westend Meat Products Ltd

45. Westlands Meats

46. Windsor Meat Ltd

47. Young Star Butchery

48. Alpha Fine Foods Ltd

49. Anglo Danish Meat Co (MSA) Ltd

50. Town Meat Supply

51. Kenya Meat Commission Athi River

Appendix 2: Data Used

YExptRed	X1ClimtFin	X2Temp	X3Rainfall	X4ExcnRat	X5GDP
8.17	8.41	24.97	46.57	86.34	3.30
8.17	8.41	25.90	15.53	83.18	3.30
8.17	8.41	27.50	23.34	82.90	3.30
8.17	8.41	26.11	107.88	83.19	3.30
8.17	8.41	25.52	95.61	84.38	3.30
8.17	8.41	24.14	38.07	84.79	3.30
8.17	8.41	23.42	26.93	84.14	4.70
8.17	8.41	24.34	36.32	84.08	4.70
8.17	8.41	25.22	42.06	84.61	4.70
8.17	8.41	25.73	89.34	85.11	5.20
8.17	8.41	25.48	124.18	85.63	5.20
8.17	8.41	24.59	110.37	85.99	5.20
8.17	8.43	25.56	42.97	86.90	4.30
8.17	8.43	26.66	16.88	87.45	4.30
8.18	8.43	27.15	145.51	85.82	4.30
8.17	8.43	25.00	152.40	84.19	6.40
8.18	8.43	25.59	68.73	84.15	6.40
8.18	8.43	23.28	27.09	85.49	6.40
8.18	8.43	23.77	25.59	86.86	4.10
8.19	8.43	23.57	51.81	87.49	4.10
8.16	8.43	25.20	45.25	87.41	4.10
8.17	8.43	25.26	36.52	85.31	6.00
8.16	8.43	25.81	84.29	86.10	6.00
8.17	8.43	25.34	72.66	86.31	6.00
8.89	8.49	25.64	20.15	86.21	5.69
8.89	8.49	26.69	34.76	86.28	5.69
8.89	8.49	26.89	60.41	86.49	5.69
8.89	8.49	25.47	61.91	86.72	5.69
8.89	8.49	25.61	66.42	87.41	5.69
8.89	8.49	25.09	43.83	87.61	5.69
8.89	8.49	24.57	27.10	87.77	5.69
8.89	8.49	23.83	36.45	88.11	5.69
8.89	8.49	24.84	47.02	88.84	5.69
8.89	8.49	25.40	63.85	89.23	5.69
8.89	8.49	25.45	102.13	89.96	5.69
8.89	8.49	25.45	50.65	90.44	5.69
8.89	8.53	25.04	26.25	91.36	5.80
8.89	8.53	26.39	21.82	91.49	5.80

8.89	8.53	26.56	48.46	91.73	5.80
8.89	8.53	26.07	136.34	93.44	5.50
8.89	8.53	25.07	101.46	96.39	5.50
8.89	8.53	24.59	70.93	97.71	5.50
8.89	8.53	24.46	20.79	101.20	5.80
8.89	8.53	24.35	17.97	102.43	5.80
8.89	8.53	25.43	36.75	105.28	5.80
8.89	8.53	26.97	64.36	102.78	5.90
8.89	8.53	25.29	163.61	102.17	5.90
8.89	8.53	26.23	63.24	102.20	5.90
8.89	8.55	27.04	56.73	102.31	6.24
8.88	8.55	27.60	18.22	101.93	6.24
8.96	8.55	27.75	30.49	101.49	6.24
8.92	8.55	26.94	166.71	101.23	6.24
8.92	8.55	25.33	70.67	100.73	6.24
8.92	8.55	24.29	34.91	101.15	6.24
8.89	8.55	24.26	34.55	101.33	6.24
8.90	8.55	24.09	25.53	101.41	6.24
8.89	8.55	24.44	15.14	101.27	6.24
8.88	8.55	26.03	40.01	101.32	6.24
8.86	8.55	25.57	122.00	101.75	6.24
8.89	8.55	25.74	100.26	102.13	6.24
8.44	8.64	25.56	31.78	103.75	6.84
8.44	8.64	26.66	25.36	103.64	6.84
8.44	8.64	27.15	63.53	102.85	6.84
8.44	8.64	25.00	134.19	103.33	6.84
8.44	8.64	25.59	92.52	103.26	6.84
8.44	8.64	23.28	35.61	103.49	6.84
8.44	8.64	23.77	31.81	103.88	6.84
8.44	8.64	23.57	35.06	103.56	6.84
8.44	8.64	25.20	28.09	103.12	6.84
8.44	8.64	25.26	77.44	103.39	6.84
8.44	8.64	25.81	110.48	103.57	6.84
8.44	8.64	25.34	60.20	103.10	6.84
8.48	8.75	25.64	46.92	102.92	7.68
8.48	8.75	26.69	44.59	101.40	7.68
8.48	8.75	26.89	96.31	101.18	7.68
8.48	8.75	25.47	109.24	100.61	7.68
8.48	8.75	25.61	72.86	100.66	7.68
8.48	8.75	25.09	45.95	101.00	7.68
8.48	8.75	24.57	16.55	100.67	7.68

8.48	8.75	23.83	33.53	100.61	7.68
8.48	8.75	24.84	16.72	100.83	7.68
8.48	8.75	25.40	50.51	101.08	7.68
8.48	8.75	25.45	59.73	102.36	7.68
8.48	8.75	25.45	42.68	102.29	7.68
8.51	8.82	25.04	46.34	101.58	8.37
8.51	8.82	26.39	32.87	100.23	8.37
8.51	8.82	26.56	28.05	100.36	8.37
8.51	8.82	26.07	22.33	101.07	8.37
8.51	8.82	25.07	92.95	101.15	8.37
8.51	8.82	24.59	72.84	101.69	8.37
8.51	8.82	24.46	30.47	103.16	8.37
8.51	8.82	24.35	18.31	103.30	8.37
8.51	8.82	25.43	19.44	103.80	8.37
8.51	8.82	26.97	19.67	103.67	8.37
8.51	8.82	25.29	130.98	102.39	8.37
8.51	8.82	26.23	77.41	101.50	8.37
8.60	8.42	27.04	89.99	101.09	8.39
8.60	8.42	27.60	34.76	100.79	8.39
8.60	8.42	27.75	60.41	103.74	8.39
8.60	8.42	26.94	61.91	106.41	8.39
8.60	8.42	25.33	66.42	106.68	8.39
8.60	8.42	24.29	43.83	106.40	8.39
8.60	8.42	24.26	27.10	107.27	8.39
8.60	8.42	24.09	36.45	108.14	8.39
8.60	8.42	24.44	47.02	108.41	8.39
8.60	8.42	26.03	63.85	108.64	8.39
8.60	8.42	25.57	102.13	109.25	8.39
8.60	8.42	25.74	50.65	110.59	8.39
8.74	9.05	24.00	37.00	109.83	9.20
8.74	9.05	25.00	34.00	109.68	9.20
8.74	9.05	26.00	62.00	109.73	9.20
8.74	9.05	24.00	125.00	107.95	9.20
8.74	9.05	24.00	102.00	107.43	9.20
8.74	9.05	23.00	48.00	107.81	9.20
8.74	9.05	23.00	20.00	108.14	9.20
8.74	9.05	25.00	28.00	109.24	9.20
8.74	9.05	24.00	20.00	110.15	9.20
8.74	9.05	23.00	49.00	110.86	9.20
8.74	9.05	23.00	94.00	111.92	9.20
8.74	9.05	23.00	55.00	112.91	9.20