ADOPTION OF CIRCULAR ECONOMY PRACTICES AND PERFORMANCE OF AGRICULTURAL VALUE CHAINS IN KENYA

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MASTER OF BUSINESS ADMINISTRATION IN PROCUREMENT AND SUPPLIES MANAGEMENT

KCA UNIVERSITY

OCTOBER 2024

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A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF BUSINESS ADMINISTRATION IN PROCUREMENT AND SUPPLIES MANAGEMENT IN THE SCHOOL OF BUSINESS AT KCA UNIVERSITY

OCTOBER 2024

DECLARATION

I declare that this dissertation is my original work and has not been previously published or submitted elsewhere for award of a degree. I also declare that this contains no material written or published by other people except where due reference is made and author duly acknowledged.

Signature:  Date: 12 September 2024

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I do hereby confirm that I have examined the master's dissertation of

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And have certified that all revisions that the dissertation panel and examiners recommended have been adequately addressed.

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ABSTRACT

This research explored the adoption of circular economy practices within Agri-Value Chains in Kenya under varying external factors, a critical step towards enhancing sustainability, efficiency, and resilience in agriculture. The primary objectives were to assess the level of circular economy practices integration, identify barriers to its adoption, and evaluate its effect on Agri-Value Chain performance. The target population includes publicly listed agricultural firms, stakeholders such as farmers, agribusinesses, policymakers, and civil society organizations. The study adopted descriptive design to delve into the adoption of circular economy practices within Agri-Value Chains. The study targeted 438 respondents including 403 farming groups and 35 ministry and development partner key informants. A total of 209 respondents pre-determined using Yamanes formula were selected using stratified random sampling. Data was analysed using descriptive and inferential statistics. The relationship between variables was established using multiple linear equation modelling. The product development demonstrated a beta coefficient that was statistically significant. In light of these findings, it can be inferred that, assuming all other independent variables remain constant, enhancing product development will lead to an improvement in the performance of agricultural value chains in Kenya. The circular supplies exhibited a robust and statistically significant relationship with the efficacy of agricultural value chains in Kenya. Furthermore, circular supplies exhibited a significant beta coefficient. This led to the conclusion that enhanced circular supplies would correlate with an improvement in the performance of agricultural value chains in Kenya. The beta coefficient for product life extension was observed to be both positive and significant. This culminated in the conclusion that extending product life may enhance the performance of agricultural value chains in Kenya. The results suggest that the beta value associated with product recovery was not statistically significant. This study determined that variations in product recovery, whether improvement or decline, would not lead to any significant alteration in the performance of agricultural value chains in Kenya. Of the four variables—product development, circular supplies, product life extension, and product recovery—Product life extension exhibited the most profound influence on the performance of agricultural value chains in Kenya. This study indicates that agricultural firms in Kenya ought to prioritize the extension of their product lifespan, as this approach is anticipated to improve their profitability. The analysis revealed that product recovery exerted a minimal influence on the performance of agricultural value chains in Kenya. Considering these findings, this study advises agricultural firms in Kenya to exercise prudence in allocating substantial resources to product recovery, as such investments may yield limited returns. The results demonstrate that product development, circular supplies, product life extension, and product recovery constitute 69.1% of the performance metrics within agricultural value chains in Kenya. The residual 29.1% can be ascribed to additional variables that were not encompassed within the scope of this study. This indicates the imperative of pursuing additional research that integrates various variables to uncover further elements influencing the efficacy of agricultural value chains in Kenya.

ACKNOWLEDGMENT

I sincerely thank Dr. Jackson Ndolo, for his exceptional supervision and KCA University library services for their academic and technical support. I am also grateful for the encouragement from my mum and dad and their friends.

LIST OF ACRONYMS AND ABBREVIATIONS

CE:	:	Circular Economy
SDGs	:	Sustainable Development Goals
TAM	:	Technology Acceptance Model
GAP	:	Good Agricultural Practices
PAC	:	Performance of Agri-value Chain
3R	:	Reduce, Reuse, Recycle
KAM	:	Kenya Association of Manufacturers
UNEP	:	United Nations Environment Programme
OECD	:	Organisation for Economic Co-operation and Development
CSR	:	Corporate Social Responsibility
ICT	:	Information and Communication Technology
GVC	:	Global Value Chain
FAOSTAT	:	Food and Agriculture Organization Statistics
R&D	:	Research and Development
SMEs	:	Small and Medium Enterprises
USAID	:	United States Agency for International Development
MoALF	:	Ministry of Agriculture, Livestock, and Fisheries
VC	:	Value Chains
KALRO	:	Kenya Agricultural and Livestock Research Organization
SPSS	:	Statistical Package for the Social Sciences
MCDA	:	Multi-Criteria Decision Analysis
UN	:	United Nations
LED	:	Low Emission Development
MRV	:	Monitoring, Reporting, and Verification

DEFINITION OF TERMS

Circular Economy	This model encompasses various processes related to production and consumption, including sharing, leasing, reusing, repairing, refurbishing, and recycling materials and products to extend their lifecycle as much as possible.
Circular Supplies	This model represents a circular economy approach that focuses on the utilization of renewable, recyclable, or biodegradable resource inputs.
Performance of Agri-Value Chains	The effectiveness, sustainability, and robustness of agricultural value chains, encompassing economic outcomes and environmental consequences.
Product Development	This process encompasses a sequence of stages involving the conceptualization, design, development, and marketing of newly created or rebranded products and services.
Product Lifetime Extension	The act of delaying or reversing a product's obsolescence through intentional measures plays a significant role in promoting a circular economy.
Product Recovery	This is understood as an advanced idea that encompasses principles such as reuse and recycling, with the objective of reclaiming a product's intrinsic value when it ceases to meet the user's requirements.

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CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The agricultural sector is facing significant challenges on a global scale, including the depletion of resources, the pollution of the environment, and the lack of food security. An increasing number of people are becoming aware of the necessity of transitioning towards agricultural systems that are more sustainable and resilient in order to address these difficulties. A framework that appears promising for accomplishing these goals is the acceptance of behaviors that are associated with the circular economy. In contrast to the conventional linear model of "take, make, dispose," which utilizes a substantial amount of non-renewable resources (Dey et al., 2022; García-Quevedo, Jov´e-L-lopis, & Martínez-Ros, 2020; Mangla et al., 2018; Saha, Dey, & Papa-giannaki, 2020; Schroeder, Anggraeni, & Weber, 2019), the concept of the circular economy (CE) is both restorative and regenerative. This is achieved by advocating the reduction, reuse, and recycling of materials.

The existing body of literature in the fields of business and management has discussed CE practices as a combination of lean practices, which emphasize the achievement of resource efficiency through responsible consumption of materials and waste reduction, and sustainable oriented innovation, which focuses on optimizing business processes to achieve economic benefits, and sustainable practices, which emphasize the philosophy of reducing, reusing, and recycling in order to increase environmental performance by reducing greenhouse gas emissions and social performance through the creation of new jobs (Dey et al., 2019; 2020). The adoption of CE will result in GDP growth of 0.8–7%, the addition of 0.2–3% more jobs, and a reduction of carbon emissions of 8–70%, as stated in a report by the World Economic Forum (WEF) (WEF, 2017). This will ultimately lead to economic growth and business

productivity in developing economies, which is a goal of the Sustainable Development Goals (SDGs). Although, the adoption and implementation of CE has been widely studied in developed economies such as UK (Dey at al., 2019; Dey at al., 2020), USA (Lonca, Lesage, Majeau-Bettez, Bernard, & Margni, 2020; Vunnava & Singh, 2021), Australia (Payne, Nay, & Maguire, 2021; Halog, Balanay, Anieke, & Yu, 2021), European countries (Leipold, Weldner, & Hohl, 2021; Mazur-Wierzbicka, 2021; Dey et al., 2022), China (Pesce et al., 2020; Kuo & Chang, 2021), and few developing economies such as Mexico (Rodríguez-Espíndola et al., 2022), and India (De, Chowdhury, Dey, & Ghosh, 2020), empirical research for factors impacting CE adoption in emerging (low and middle-income) economies (Tura et al., 2019) are still scant. Additionally, there are no documented CE and agricultural value chain performance studies in Africa, which makes the situation much direr.

Although empirical studies offer useful insights, it is important to note that they are not without limitations. In order to guarantee the dependability and validity of the outcomes of the research, it is necessary to conduct an in-depth analysis of the methodological rigor. For example, Carbonell-Alcocer, Romero-Luis, and Gertrudix (2021) conducted a study that brought to light the necessity of conducting experiments with more stringent experimental designs and higher sample sizes in order to increase the evidence base regarding the implementation of circular economies in agrichemical value chains. Additionally, concerns have been expressed regarding the generalizability of findings due to the limited geographic scope of many studies Stillitano, Nathalie Iofrida, Falcone, and De Luca (2021). Other studies fall into this category. The synthesis of empirical evidence and the conduct of meta-analysis allow researchers to identify trends, drivers, and barriers to adoption, which in turn informs policy decisions and guides' practice. Although empirical studies play a crucial role in advancing our understanding of the adoption of circular economy practices in Agri value Chains, researchers can also identify these trends, drivers, and barriers by conducting meta-

analysis. Nevertheless, in order to guarantee the reliability and robustness of the conclusions of the research, it is necessary to conduct a critical evaluation of the methodological rigor. There is a clear need for methodological advancements in order to fill in the information gaps that currently exist and to encourage the development of sustainable farming practices. Because of this, it is necessary to combine a number of different research strategies in order to reach the outcomes that are wanted. In light of this, the present investigation makes use of a systematic review and a meta-analysis, in addition to designing explanatory studies.

1.1.1 Adoption of Circular Economy Practices

Adoption of circular economy practices is a term that describes the degree to which players in agri-value chains put into effect the principles of the circular economy. These principles place an emphasis on the efficient use of resources, the reduction of waste, and the implementation of sustainable production techniques. According to Singh et al. (2023), the effectiveness of implementation is measured by the degree to which circular economy practices promote economic performance, resilience, and sustainability within agri-value chains. According to the findings of research, there are a variety of factors that ought to be taken into consideration while applying the CE idea to agriculture. Resource efficiency is the central axis in decision-making and economic activities, as stated by Ruiz et al. (2019). This is done to ensure that there is a better added value and to keep resources inside the production system for as long as possible. The optimization of processes in circular agriculture models is necessary in order to achieve efficiency (Jurgilevich et al., 2016; McCarthy et al., 2019; Sherwood, 2020). This optimization helps to reduce the use of resources and prevent waste accumulation.

The concept of sustainability is another important concept to consider while discussing the application of CE in agriculture. Because the CE aims to generate economic and social prosperity and protect the environment by preventing pollution, thus facilitating sustainable

development (Burgo-Bencomo et al., 2019), circular agriculture should i) become a pillar of the economy, rather than a subsidized sector, ensuring economic sustainability (Bos and Broeze, 2020); ii) ensure the conservation of biodiversity and productivity over time in its agroecosystems, ensuring environmental sustainability (Jun and Xiang, 2011); and iii) generally contribute to providing food security, eradicating poverty, and improving health and living conditions, or social sustainability (Burgo-Bencomo et al., 2019; Kristensen et al., 2016). Last but not least, it is generally acknowledged that circular agriculture must be regenerative. Regenerative agriculture is defined as a system that works to preserve and improve the benefits provided by the ecosystem (Morseletto, 2020). Agriculture needs to adapt to include regenerative systems that close nutrient loops, prevent leakage, and optimize the long-term value of each loop (EMF, 2015; Morseletto, 2020). This is necessary in order to develop models for circular production.

Therefore, in the context of agriculture, the term "common ecosystem" (CE) can be defined as "the set of activities designed to not only ensure economic, environmental, and social sustainability in agriculture through practices that pursue the efficient and effective use of resources in all phases of the value chain, but also guarantee the regeneration of and biodiversity in agroecosystems and the ecosystems that surround them." The concept of "design out waste and pollution" is one of the principles of circular economy (CE) in agrivalue chains. This concept aims to improve the efficiency of the system by detecting and removing any negative externalities that may be present (EMF, 2015).

According to Aznar-Sanchez et al. (2019), agriculture is the cause of soil contamination because of the improper application of fertilizers, herbicides, and pesticides. This information pertains to the externalities that are associated with agriculture. The majority of developed nations, on the other hand, have enacted regulations that restrict or outright prohibit the use of these goods. As a result, chemical fertilizers have been replaced with organic fertilizers, and

biological pest management techniques have been developed (Cobo et al., 2019). To maximize the value of products, co-products, and by-products at every stage of the supply chain and between supply chains, the second principle of "keeping products and materials in use" requires that the value of products, co-products, and by-products be maximized. The overarching goal is to keep resources at their highest utility and value at all times (EMF, 2019a). The advancement of technology has made it possible for a wide range of materials to be utilized in numerous processes prior to their ultimate disposal. For instance, these materials can be utilized in the production of bioenergy (Bos and Broeze, 2020; Zabaniotou, 2018), as well as for the purpose of soil amendment and bio-fertilizers (Casson-Moreno et al., 2020; Molina-Moreno et al., 2017). Additionally, these materials can be utilized as livestock feed (Fernandez-Mena ´ et al., 2020; Guo et al., 2015).

In conclusion, the concept of "regenerating natural systems" refers to the preservation and improvement of ecosystems through the substitution of renewable resources for finite supplies (EMF, 2015). Regenerative agriculture is a definition of a crop and animal production system that attempts to improve the health of the natural environment that is around the farm (Colley et al., 2020). This principle has been put into practice, which has led to the development of regenerative agriculture. The concept of regeneration encompasses a wide range of possibilities, such as the creation of packaging that is made from biological materials and is designed for decomposition (EMF, 2013). Additionally, the increase of carbon sequestration through plant waste management practices (EMF, 2017) or material treatment processes such as composting (EMF, 2019) are also included in the realm of rehabilitation.

Over the past several years, there has been a significant increase in the amount of empirical research that focuses on the implementation of circular economy techniques within Agri-Value Chains. This is a clear indication of the growing acknowledgment of the significance

of sustainability in the agricultural sector. Kessler (2020), for example, investigated on the implementation of circular practices in a dairy farm in Kenya. The research underlined the benefits of waste recycling and the utilization of renewable energy in terms of lessening the influence that humans have on the environment. A similar study was carried out by Ogada, Muchai, Mwabu, and Mathenge (2014), who conducted a longitudinal examination of the adoption of circular economy practices in the maize value chain in Kenya. The findings of this study revealed that participating farmers experienced gains in resource efficiency as well as cost reductions. The application of meta-analytic tools to empirical research in this area has shown a number of interesting patterns and trends. For example, Aguilar-Hernandez, Dias Rodrigues, and Tukker (2021) conducted a meta-analysis in which they found a constant positive link between the adoption of circular economies and the outcomes of environmental sustainability in a variety of agricultural situations.

According to Abad-Segura et al.'s research from 2020, the move from a linear model to a CE model is still a continuous problem that necessitates the creation and implementation of new knowledge. This transformation will result in the development of innovative, technological, and environmentally friendly processes, products, and services. According to de Boer and van Ittersum (2018), "scientific advancements related to circularity in food production appear to be in their infancy at the present time." A clear idea of the CE has not yet been described, despite the fact that there have been debates and actions for a significant amount of time (Kirchherr et al., 2017). Mikielewicz et al. (2020) demonstrate that this is the case, and that over 114 definitions have been offered in the literature. D'Amato et al. (2017) and Carus and Dammer (2018) are two writers that believe that there is a profound misunderstanding between the concepts of the CE and bioeconomy in agriculture. This misunderstanding pertains to the definitions of both concepts, as well as their borders and the degree of connectivity and overlap between them.

In spite of the anticipated benefits in terms of resources, the environment, and the economy, the implementation of CE in agriculture continues to face a number of obstacles that must be solved before it can be properly implemented. Borrello et al. (2016) differentiate between a number of factors, including but not limited to: i) legislative limits; ii) a lack of reverse logistics; iii) geographic dispersion of firms; iv) low acceptance among customers; v) the necessity of technology development and spread; and vi) unclear investments and incentives.

1.1.2 Performance of Agricultural Value Chains

There are a number of indicators that are included in the Performance of Agri-Value Chains (PAC) framework. These indicators represent the effectiveness, profitability, and long-term viability of agricultural value chains in Kenya. A number of aspects, including operational efficiency, market access, sustainability practices, and economic resilience, are taken into consideration in the evaluation of PAC provided by the study. Furthermore, according to Ghisellini et al. (2016), it is of strategic importance to have suitable instruments and indicators for evaluating and monitoring the performance of circularity. Assessing the level of circularity in agriculture, for example, not only offers helpful direction in establishing appropriate objectives, but it also largely reveals the areas in which a country is more or less developed, which enables comparisons to be made across different regions and countries (Elia et al., 2017). Therefore, it is of the utmost importance to build sets of indicators that are both well-designed and effective in order to support robust decision-making processes that guarantee a sustainable transition from a linear economy to a CE (Di Maio and Rem, 2015; Geng et al., 2013; Genovese et al., 2015).

Efficiency indicators have been utilized extensively in a variety of nations and locations for the purpose of evaluating the overall performance of agricultural activities (Ni et al., 2019; Santagata et al., 2020; Vasa et al., 2017; Wang et al., 2019). In addition, Di Maio et al. (2017) propose an indicator that is distinct from the indicators that have been presented in the past.

This indicator is a value-based indicator that makes use of the monetary value to quantify CE with respect to the agricultural value chain. According to the authors, circularity is defined as the proportion of the value of the resources that are incorporated into a service or product that is returned at the conclusion of its useful life. This unit of measurement is considered to be the definition of circularity. Furthermore, the studies show that this indicator is better suited to address the information demands of policymakers and is easier to deploy because it makes use of secondary information that is widely available.

1.1.3 Agri-Value Chains in Kenya

Agricultural areas especially in developed countries have made substantial progress in adopting measures that parallel these principles; however, data indicates that agriculture still needs to improve in its use of polluting products and the development of a waste management infrastructure and value chain capable of exploiting the potential for the use of by-products (Alexander et al., 2015; Garnett et al., 2013; Rufí-Salís et al., 2020). For developing countries the adoption of CE practices is at nacet stages. There are over 500,000 small scale farmers in Kenya classified into 455 groups who have been support through various government initiatives to transition or have potential to transition from being subsistence farmers to commercial farmers or are selling only a small percentage of their produce commercially. The 9 value chains that have been strategically selected based on a thorough qualitative and quantitative assessment based on their ranking are: Dairy, Coffee, Chicken, Fruits (Avocado, Banana, Mango), Vegetables (Irish potatoes, Tomato), Apiculture, Pyrethrum, Cashew nut and Cotton. This is in line with GoK (2019) National Agricultural Value Chain Development Project (NAVCDP) inception report.

1.2 Statement of the Problem

The global agro-food sector has encountered significant challenges, including resource scarcity and the generation of food loss and waste throughout the supply chain. In 2019, these issues culminated in an estimated annual total of around 1.3 billion tons, incurring costs exceeding 1000 billion dollars (UN, 2019). The current body of business and management literature has explored circular economy practices as an amalgamation of lean methodologies, which prioritize resource efficiency via responsible material consumption and waste minimization, alongside sustainability-driven innovation, which aims to enhance business processes for economic gain, and sustainable practices that embody the principles of reduction, reuse, and recycling to bolster environmental performance by mitigating greenhouse gas emissions and enhancing social outcomes through job creation (Dey et al., 2019b; 2020). Consequently, embracing circular economy practices within agri-value chains holds considerable promise for augmenting resource efficiency, mitigating impact, and bolstering economic resilience. Nonetheless, there remains a significant deficiency in comprehending the particular challenges and opportunities associated with the adoption of CE in this sector.

This disparity presents a challenge for multiple reasons. Initially, in the absence of a comprehensive grasp of the obstacles to circular economy adoption, policymakers and stakeholders may find it challenging to formulate effective strategies for sustainability within agricultural value chains. The lack of specific interventions may result in overlooked opportunities in resource management and waste reduction, thereby obstructing sustainable agricultural development in Kenya (Wang'ombe, 2023; Malik et al., 2022). Furthermore, current studies fail to sufficiently consider the distinct socio-economic, cultural, and institutional elements that shape sustainable practices in Kenya. This oversight jeopardizes the implementation of tailored solutions that could be more effective in specific contexts,

thereby diminishing the potential advantages of circular economy practices (Schindler, Graef, & König, 2015). It is essential to tackle particular challenges, including restricted funding, insufficient waste management systems, and disjointed supply chains, in order to formulate effective policies (AlJaber, Martinez-Vazquez, & Baniotopoulos, 2023).

Moreover, evaluating the efficacy of circular economy practices is crucial for understanding their influence on sustainability, resilience, and economic viability. There is a necessity for empirical evidence regarding diminished resource consumption, enhanced product quality, and heightened market competitiveness to inform decision-making and investment priorities (Mor, Singh, & Bhardwaj, 2015; Gedam et al., 2021). The absence of such evidence in Kenya underscores the necessity for research that yields practical insights (Ngan et al., 2019). The present research aims to address these gaps by offering empirical evidence and recommendations to promote the adoption of circular economy practices within Kenya's Agri-Value Chains. This endeavor contributes to the sustainable development goals and positions Kenya's agricultural sector for inclusive growth, poverty alleviation, and environmental preservation (Schröder, Lemille, & Desmond, 2020; Zilss, Howard, & Hopkinson, 2023).

1.3 Objectives of the Study

1.3.1 General Objective

The purpose of the study was to establish the effect of circular economy on perfomance of agricultural value chains in Kenya.

1.3.2 Specific Objectives

i. To establish the effect of product development on the performance of agricultural value chains in Kenya.

ii. To determine the effect of circular supplies on the performance of agricultural value chains in Kenya.

iii. To establish the effect of product life extension on the performance of agricultural value chains in Kenya

iv. To determine the effect of product recovery on the performance of agricultural value chains in Kenya.

1.4 Research Hypothesis

H_1 Product development does not significantly affect the performance of agricultural value chains in Kenya

H_2 Circular supplies does not significantly affect the performance of agricultural value chains in Kenya.

H_3 Product life extension does not significantly affect the performance of agricultural value chains in Kenya

H_4 Product recovery does not significantly affect the performance of agricultural value chains in Kenya

H_5 External factors does not significantly moderate the relationship between circular economy practices and performance of the agricultural value chains in Kenya

1.5 Significance of the Study

This project uniquely emphasizes the integration of circular economy principles within the particular framework of agri-value chains in Kenya. In light of the insights provided by Popon, Arcese, Ruggieri, & Pacchera (2023), addressing this gap could facilitate significant theoretical developments and practical implementations of circular economy principles within the realm of agricultural sustainability. The findings of the study may also extend beyond scholars and practitioners within the realm of agricultural sustainability. Aligning

with the perspective of Friant, Vermeulen, & Salomone (2020), the research findings will enhance the scholarly dialogue surrounding circular economy principles and their implementation within agricultural settings.

This study will provide practitioners, such as legislators, policymakers, growers, and agribusinesses, with insightful recommendations and guidelines aimed at enhancing sustainability within agri-value chains. According to the findings of Hina, Chauhan, Sharma, & Dhir (2023), the implementation of circular economy practices and principles outlined in this research enables practitioners to bolster the resilience, efficiency, and environmental sustainability of agricultural production and value chains. This, in turn, plays a significant role in advancing food security, economic development, and environmental conservation.

1.6 Scope of the Study

The focus of the study is, on the industry particularly highlighting agri-value chains in Kenya. The research covers a current time frame, focusing on current practices and trends in circular economy adoption within agri-value chains in Kenya. While historical context may be considered to understand the evolution of farming practices, the primary focus is on present-day challenges and opportunities. The study does not focus on specific demographic groups or communities within Kenya but rather takes a universal approach to examine the agricultural sector. However, considerations may be given to variations in agro-ecological zones, socio-economic contexts, and cultural practices that influence the adoption of circular economy practices across different regions and communities. The study primarily addresses the adoption of circular economy practices within agri-value chains and its impact on sustainability, resilience, and economic performance. Key themes to be explored include resource efficiency, supervision of waste management, supply chain optimization, stakeholder engagement, policy frameworks, and best practices for promoting sustainable agricultural development.

The research study employed both quantitative research approach, utilizing systematic reviews and meta-analyses as well as survey instruments to collect data from stakeholders. Drawing upon the evidence from government reports, industry publications, and academic literature, the study population will include farmers, agribusinesses, legislators, policymakers, and civil society organizations, Non-Governmental Organisations (s) involved in agricultural production, processing, distribution, and consumption.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The sections document the theories under which the study is anchored, conceptual framework, empirical review and research gaps identified from the literature review.

2.2 Theoretical Review

The study is anchored on the Technology acceptance model, dynamic capability theory and triple bottom line theory.

2.2.1 The Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM), introduced by Davis in 1989, is esteemed as one of the leading frameworks for comprehending technology acceptance. The central empasis lies on the two fundamental elements that shape a person's propensity to embrace new technology: perceived usability and ease of usage. The claim suggests that consumers' decisions regarding the adoption of new technology are influenced by their evaluations of its usefulness and user-friendliness. The perceived ease of use refers to the degree to which an individual looks at a system as necessitating little effort, while perceived usefulness pertains to the extent to which an individual believes that utilizing a particular system will improve their work performance. As a result, it has been suggested that the key determinant in the success or failure of an information system project is the support of the users (Mogeni, 2012). This hypothesis posits that the intricate nature of emerging technologies, like personal computers, coupled with the ambiguity regarding their adoption, leads individuals to develop attitudes and intentions toward learning to utilize the new technology prior to engaging in any practical application (Bagozzi, 2007). Bagozzi (2007) posits that attitudes regarding the use of technology and the intentions to engage with it may be underdeveloped or characterized by

uncertainty, or they may emerge only subsequent to initial attempts to acquire proficiency in utilizing the technology.

Consequently, these dispositions and intentions might not have a direct or immediate impact on the actual application. Brychan (2010) asserts that Tornatzky and Klein formulated the diffusion of innovation hypothesis, which is intricately linked to the concept of perceived usefulness. In the analysis of adoption, it was determined that compatibility, relative advantage, and complexity emerged as the most significantly correlated factors across diverse forms of innovation. The emergence of TAM has redirected scholarly attention away from other significant research areas, creating an illusion of progress in the accumulation of knowledge, as observed by Benbasat and Barki (2007). Although TAM was initially conceived to evaluate the acceptability of computers (Davis, Bagozzi, and Warshaw, 1989), it has since been adapted or employed for a range of purposes and technologies.

Understanding the factors that influence acceptance, and adoption can aid organizations in tailoring their implementation strategies and overcoming challenges to adoption (Davis, 1989). The model posits that various factors play a significant role in shaping users' decisions regarding the adoption and timing of new technology utilization. Within the framework of circular economy practices, the Technology Acceptance Model serves to elucidate the factors that shape stakeholders' perspectives on the adoption of sustainable practices in Agri-Value Chains. The perceived advantages and the simplicity of implementation serve as essential factors influencing adoption behavior. Although the Technology Acceptance Model (TAM) stands as a pivotal framework in the exploration of technology acceptance and has demonstrated considerable empirical validity, it is imperative to apply it judiciously. This caution arises from the increasing internationalization of enterprises, which necessitates a deeper comprehension of how cultural variables may influence a multinational organization's capacity to embrace and utilize information technologies.

2.2.2 Dynamic Capability Theory

Ambrosini and Bowman (2009) assert that Teece's (1990) research represents the foundational contribution to the understanding of dynamic capabilities. He illustrated that the Resource-Based View (RBV) inadequately captures the strategies utilized by many successful firms to rapidly adopt product innovation, sustain flexibility, and effectively manage the coordination and reallocation of both external and internal talent. He contended that the ever-evolving landscape demands careful consideration of strategic management. The concept of dynamic capacities relates to the manner in which an organization creates and shares new knowledge, integrates this comprehension into innovative products or services, and then introduces them into the market (Augier & Teece, 2008). Moreover, the methodology aims to determine the ways in which global transformations may lead to organizational changes and explores how companies can influence their surroundings and improve their capabilities (Augier & Teece, 2008.

The model views a strategically agile organization as one that can adeptly modify its daily functions to correspond with changes in the broader environment. The dynamic capability model views a strategically agile organization as one that can adapt its daily operations in alignment with changes in the macro-environment. Dynamic capacities highlight the continuous evolution in reaction to external influences. Penrose (1995) posits that strategic agility enables a corporation to respond effectively to market opportunities and risks. The model is therefore inclined to prompt and instantaneous responses to market fluctuations. The dynamic capabilities theory suggests that the way organizations cultivate specific competencies and skills in reaction to shifts in the business environment is fundamentally connected to their operational processes, market positioning, and the opportunities that arise over time.

The dynamic capability hypothesis aims to utilize unique firm-specific capabilities to achieve a competitive edge. It clarifies the expression, conveyance, and safeguarding of specific abilities. This concept is essential for comprehending the interplay between responsiveness capability and corporate competitiveness, highlighting the organization's capacity to adapt adeptly to alterations that could influence its operations. This theory holds significant importance for this research, as it examines how unique organizational capabilities facilitate the effective creation, expansion, or adaptation of the resource base, ultimately enhancing performance (Chowdhury & Quaddus, 2017).

This examination utilizes the framework of dynamic capability to discern critical prerequisites for cultivating strategic agility. The dynamic capability model is predicated on the presence of costs linked to asset transitions amid varying conditions. Dynamic capacities facilitate ongoing operational performance by enabling the organization to effectively utilize and adapt its current skills and resources in manners that are beneficial to the customer and difficult for competitors to imitate. Dynamic capabilities empower organizations to discern opportunities and effectively capitalize on them through the strategic reallocation of resources, frequently involving the adaptation of current competencies or the cultivation of new ones.

The investigation is grounded in Dynamic Capability Theory (DCT), as derived from the organizational management literature, to explore the research inquiries. Consequently, the capabilities of an organization—encompassing leadership, internal competencies, and culture—are essential for reconfiguring business models and operations to attain sustainable performance and a competitive edge (Prieto-Sandoval, Jaca, Santos, Baumgartner, & Ormazabal, 2019). The current body of research indicates that the implementation of circular economy principles necessitates organizational transformations aimed at reconfiguring business operations to facilitate corporate sustainability (Khan, Daddi, & Iraldo, 2020; Amui,

Jabbour, de Sousa Jabbour, & Kannan, 2017). Furthermore, internal organizational challenges are likely to obstruct the successful adoption of a circular economy business model (Scarpellini, Marín-Vinuesa, Aranda-Uson, & Portillo-Tarragona, 2020; Mousavi, Bossink, & van Vliet, 2018). Consequently, this study will utilize DCT to elucidate and analyze the intricate relationships among organizational factors—such as leadership, culture, innovation mindset, skills, and competencies—and the adoption of CE, specifically in the context of new business models, to enhance the performance of agricultural value chains.

2.2.5 Triple Bottom Line (TBL) Theory

The Triple Bottom Line theory, introduced by Elkington in 1997, advocates for organizations to consider their environmental and social impacts alongside their financial performance. While the concept of accounting for social and environmental impacts has been established for some time (Norman and MacDonald, 2004; Richardson, 2004), the Triple Bottom Line has significantly advanced the integration of sustainability into the business agenda (McDonough and Braungart, 2002). Through the assessment of performance in relation to economic, environmental, and social factors, organizations can pursue sustainable development. Utilizing the TBL approach in Agri-Value Chains offers a comprehensive view of the efficacy of circular economy practices, considering their influence on economic prosperity, environmental responsibility, and social fairness.

The TBL has faced its share of scrutiny. A line of critique has emerged regarding its function as a reporting instrument, particularly concerning the challenges of quantifying and consolidating non-financial impacts in reports (Norman and MacDonald, 2004), as well as the tendency for companies to selectively disclose information (Milne and Gray, 2013, p. 17). Reporting issues of this nature can transform sustainability reports into mere superficial

displays (Kolk, 2003), serving as instruments to bolster legitimacy in reaction to governmental and societal demands (Sridhar, 2012), wherein companies reveal only fundamental details regarding each bottom line without any meaningful integration (Moneva et al., 2006). Therefore, notwithstanding its elevated discourse, reports influenced by TBL do not fundamentally contest the conventional accounting framework (see Rambaud and Richard, 2015).

Despite these critiques, TBL has transformed from its original role as a reporting mechanism to a representation of sustainability within the business realm (Milne and Gray, 2013); its interpretation of sustainability as a balanced consideration of the three dimensions stands as perhaps the most prevalent perspective on sustainability in management (Tregidga et al., 2015). Businesses occasionally reference the TBL to indicate a general endorsement of sustainable business practices (Porritt, 2004). Brown et al. (2006) contend that, for enterprises, the TBL has evolved into a symbol of sustainability – one that 'conveys an impression of compensatory relationships among the three dimensions implying a common currency and additivity. Marcus et al. (2010) agree, highlighting that the representation of each dimension as equal-sized spheres has obscured any hierarchical significance among the dimensions. As the TBL model evolves from a mere reporting instrument to a pervasive metaphor for sustainability within the business realm, it is imperative that critical assessments extend beyond its reporting dimensions to include a broader examination of its sustainability discourse.

2.3 Empirical Review

While the conventional emphasis has been on economic performance as a determinant of corporate viability, there is a growing discourse in scholarly literature regarding the significance of sustainability within organizations (Kiefer, Del Rio Gonzalez, & Carrillo-Hermosilla, 2019). Recent studies have begun to explore the integration of these

sustainability factors into organizational frameworks (García-Quevedo, Jov´e-Llopis, & Martínez-Ros, 2020). This section present a concise examination of the existing literature related to circular economy and sustainability, the elements that facilitate the adoption of circular economy practices, and ultimately, an overview of the knowledge gaps that this study aims to explore.

2.3.1 Product Development and performance of agricultural value chains

The concept of the 3Rs – reduce, reuse, and recycle – finds its roots in this origin. Reduction entails identifying avenues to alter raw materials, enhancing production and consumption methodologies, and refining process design (Goyal, Esposito, & Kapoor, 2018; Geng & Doberstein, 2008). Reuse involves practices that facilitate the reintegration of end-of-cycle products, aiming to minimize the consumption of raw materials and other resources associated with the design, production, and utilization of products or components (Goyal et al., 2018). When products cannot be repurposed or minimized, recycling emerges as a valuable option. This strategy is prevalent due to its capacity to minimize the exploitation of finite resources by converting end-of-life products into valuable materials (Haas et al., 2015; De Corato, 2020). The integration of the 3Rs with methodologies like eco-innovation (Kiefer et al., 2018) facilitates the effective utilization of resources, resulting in economic, environmental, and social advantages (Stewart & Niero, 2018; Prieto-Sandoval, Jaca, & Ormazabal, 2018; Govindan & Hasanagic, 2018).

Circular economy practices involve a variety of strategies and initiatives designed to promote circularity within agricultural value chains, encompassing aspects such as product design, production processes, consumption patterns, and end-of-life management practices (Schmidpeter, 2021). As articulated by González-Sánchez, Settembre-Blundo, Ferrari, and García-Muiña (2020), the characteristics of Supply Chains encompass dimensions such as

chain length, collaboration, power dynamics, and governance structures. This component elucidates the structural and relational aspects of agri-value chains that significantly influence the adoption and implementation of circular economy practices.

Leadership has been identified as an essential component in order to create successful innovation (Lukoschek, Gerlach, Stock, & Xin, 2018, Busola Oluwafemi, Mitchelmore, & Nikolopoulos, 2020). This is something that can have an impact on the circular economy. In order to measure the impact that CE expertise, consumer awareness, leadership, and governmental backing have on CE practices in the leather industry in Bangladesh, Moktadir, Rahman, Rahman, Ali, and Paul (2018) employ graph theory in conjunction with a matrix approach. The results of their study indicate that understanding about CE from managers is a very important component, followed by leadership and dedication from top management and customer awareness in large organizations, with less of an impact on smaller organizations. The findings of Moktadir et al. (2020) are in agreement with these findings, and they highlight leadership and top management commitment as critical elements that affect the application of CE in supply chains. Along the same lines, Wang, Shen, Chen, and Carmeli (2021) demonstrate how environmentally responsible leadership can contribute to the development of environmentally innovative practices. It would appear that leadership is a significant factor that has an impact on the individual factors and behaviors that occur within organizations (Lukoschek et al., 2018, Wood, Logar, & Riley, 2015). Internal factors suggested in the literature affect the implementation of CE and sustainable practices include innovation (Bertassini, Zanon, Azarias, Gerolamo, & Ometto, 2021, Brown, Von Daniels, Bocken, & Balkenende, 2021, Imoniana, Silva, Reginato, Slomski, & Slomski, 2020), skills and competencies (Govindan & Hasanagic, 2018, Gelhard & Von Delft, 2016), and culture (Jeronimo, ´ Henriques, de Lacerda, da Silva, & Vieira, 2020, Veronica, Alexeis, Valentina,

& Elisa, 2020). It is necessary, however, to do additional empirical research in order to comprehend the influence that these organizational characteristics have on CE practices.

The literature on management and organizational studies that is currently available has examined the importance that leadership and senior management play in boosting the innovation capabilities of organizations in order to achieve a competitive advantage, particularly in developing economies (Lei, Gui, & Le, 2021). In this context, past research has demonstrated that leadership plays a critical role in the process of building and shaping a good culture inside an organization, which is conducive to the implementation and management of new strategies (Le & Lei, 2019; Le, 2020). An environment like this helps to create a culture of support within the organization, which in turn boosts the motivation and commitment of employees to embrace innovative ideas, procedures, and strategies. This, in turn, assists the organization in dynamically adapting to new circumstances and evolving (Lei et al., 2020; Al-Husseini, El Beltagi, & Moizer, 2021). According to Gui, Lei, and Le (2021), leadership practices within an organization will have an effect on the psychological immunity of its employees, which includes job satisfaction and productivity. This, in turn, will enhance the capability of both the employees and the organization to embrace new practices, innovation, and business procedures. According to Nguyen and Mohamed (2011), leadership has a significant role in intellectually stimulating employees' abilities to do their responsibilities and embrace change through the implementation of career development programs; this is a crucial function. Employees will be able to harness new skills by building on existing knowledge, access to relevant knowledge and expertise base will be facilitated, and finally, employees will be encouraged to share this knowledge with their peers (Le & Lei, 2018). This is because it helps to develop appropriate conditions, strategies, and resources within the organization.

2.3.2 Circular Supplies and performance of agricultural value chains

The advent of the Sustainable Development Goals by the United Nations has illuminated the necessity to transcend mere financial objectives and consider the ramifications of human activities (UN, 2015). The notion of sustainability was articulated by Elkington (1998) through the framework of the triple bottom line, which is founded upon three essential pillars: economic, social, and environmental. In addition to the conventional emphasis on financial achievement, sustainability necessitates an examination of societal perspectives and the repercussions of human endeavors on the environment (Gunasekaran & Irani, 2014). The shift towards sustainability presents considerable challenges for organizations. It necessitates a shift away from a primary focus on financial outcomes to encompass the broader social and environmental ramifications, a transition that may prove challenging for companies that are risk-averse and operating under limited resources (Games & Rendi, 2019).

The primary objective of a circular economy is to minimize waste while enhancing energy and resource efficiency (Navarro, Cantero, Valls, & Puig, 2020; Willersinn, Mack, Mouron, Keiser, & Siegrist, 2015; Katz-Gerro & Lopez ´ Sintas, 2019). This can be accomplished by establishing cycles of nutrients that can reintegrate into the biosphere or materials that can circulate within economic activities, coupled with a reduction in overall resource consumption through the transformation of processes (Haas, Krausmann, Wiedenhofer, & Heinz, 2015).

According to Mousavi et al. (2018), the skills and abilities of people inside a company are regarded key tangible resources that may be utilized to create business efficiency and a sustainable competitive advantage in the market environment. (Khan et al., 2020) found that organizations that possess these characteristics are dynamically capable of implementing sustainability-driven innovation approaches such as customer engagement. Therefore, human resources within the company are essential in order to develop, rethink, adapt, and

disseminate environmentally friendly processes within corporate organizations. In this context, it is necessary to strike a balance between design-specific knowledge and transdisciplinary abilities (systems thinking) in order to effectively engage in and implement practices related to the circular economy (Charnley, Lemon, & Evans, 2011). Within the framework of this discussion, De los Rios and Charnley (2017) have emphasized the significance of skills and competences within organizations in order to develop capabilities internally that will assist in the achievement of resource and process optimization. As a result of limited policies and government strategies to reskill and upskill a workforce in accordance with green strategies to achieve sustainable development within the economy, the skills gap is likely to be even more substantial in emerging economies (Mangla et al., 2018). This is because of the fact that developing economies are more often than developed economies. According to Schroeder et al. (2019), the technical skills of both employees and entrepreneurs will have an impact on the wider acceptance and diffusion of CE practices within corporate organizations that facilitate business model innovation. This is because CE practices provide a platform for business model innovation. It will be necessary for remanufacturing companies to implement specific skill training, capacity building programs, and multistakeholder partnerships in order to facilitate the adoption of CE within their organizations (Bourguignon, 2016). This is because remanufacturing companies seek to optimize both product design (design that makes products last longer) and business operations (resource and process optimization and innovation

2.3.3 Product Life Extension and performance of agricultural value chains

Regarding the elements that influence the implementation of CE practices, there have been significant contributions made to the existing body of literature. Using supply chains as a case study, Govindan and Hasanagic (2018) conducted an in-depth investigation of the

factors that enable the adoption of circular economies, including the drivers, challenges, and practices. An examination of the content of sixty publications that were a part of their systematic literature evaluation revealed the existence of drivers and barriers that were connected to both the internal and external environment. It is possible to categorize the drivers as follows: policy and economy, health, environmental protection, society, and product development. On the other hand, the barriers are grouped together in concerns that pertain to the government, economy, technology, knowledge and skill, management, CE frameworks, culture and society, and market. The findings emphasize the significance of job possibilities, climate change, and population increase as motivators for the adoption of CE. On the other hand, technological limits appear to be the most common impediments being encountered. There have been a number of studies that have indicated the relevance of the economic considerations that have an effect on the adoption of CE. Cluster analysis is used by Gusmerotti, Testa, Corsini, Pretner, and Iraldo (2019) to investigate the degree to which CE practices have been implemented, and logit regression is utilized to highlight the most important drivers for adoption in the manufacturing sector. Generally speaking, they are looking for CE practices that solve environmental concerns while also providing financial benefits. They consider economic efficiency to be the most relevant aspect, and they endeavor to locate these practices. In addition, they come to the conclusion that businesses that make use of natural resources are more likely to use CE practices.

Govindan and Hasanagic (2018) highlight the external environment, which includes things like government rules, market dynamics, technological breakthroughs, and customer preferences. These elements make up the external context in which circular economy projects are positioned. This component emphasizes the significance of taking into account larger socio-economic and environmental elements that have an impact on the behavior and performance of organizations. Firm Size and Resources: The capacity and willingness of

businesses to adopt circular economy practices is largely determined by firm-specific features such as size, financial resources, and R&D investment (Ali & Johl, 2023). These variables play a vital role in defining the capacity of organizations to adopt these practices. In the context of agri-value chains, this component draws attention to the diversity of organizational capabilities and resource endowments that exist across the chain. For the purpose of promoting the acceptance and implementation of circular economy initiatives, it is vital to possess managerial capabilities, knowledge, effective leadership, and managerial competence, as stated by Villet (2021). According to Zamafir, Gingioveanu, Ciuciuc, and Rusu (2023), this component places an emphasis on the role that top management plays in promoting sustainability efforts and cultivating a culture that values innovation and continual development.

Cultural norms and values, such as societal attitudes toward sustainability, environmental stewardship, and corporate social responsibility, are a significant factor in shaping organizational behavior and decision-making processes, according to Morea, Fortunati, Cappa, and Oriani (2022). This component highlights the role of cultural variables in driving the adoption and proliferation of circular economy techniques within agri-value chains by highlighting the importance of cultural dynamics. For example, research conducted by Ahmadi-Gh and Bello-Pintado (2024) highlights the crucial impact that supply chain features have in determining how organizations react to difficulties related to sustainability. In a similar vein, research conducted by Govindan and Hasanagic (2018) sheds insight on the impact that external contextual factors, such as the policies of the government and the preferences of consumers, have on the adoption of circular practices. For instance, shedding light on the mechanisms that are driving the adoption of circular practices within Agri-Value Chains could be accomplished by investigating the precise interactions that occur between the characteristics of the supply chain and the external contextual elements, such as the policies

of the government and the dynamics of the market (Govindan & Hasanagic, 2018). According to Koistinen et al. (2022), doing research that investigates the impact that managerial talents and cultural norms have in shaping the behavior of organizations to difficulties related to sustainability may yield fresh insights into successful ways for cultivating a culture of circularity. In addition, Piñeiro (2020) placed significant emphasis on the role that policy interventions have in encouraging the adoption of sustainable practices in agriculture. This highlights the necessity of focused policies that specifically address certain barriers and support the transition to circular economic models.

According to Mol and Birkinshaw (2009), management innovation is the process of introducing new management practices into an organization with the goal of increasing the productivity of the business. The term "innovation" can refer to a wide range of facets and forms, including but not limited to business models, services, processes, products, technologies, and human resources. CE is a process that involves closed-loop supply chain innovation. This process can be defined as the process of designing, implementing, and managing the activities that combine the upstream and downstream of the supply chain. The goal of this process is to maximize value creation throughout the entire life cycle of a product, while also ensuring dynamic recovery of value from various types and volumes of returns over time (Reimann et al., 2019; Krug, Guillaume, & Battaía, 2021). Because of this, CE encompasses innovation in the areas of process, product, digital, and service across the entire spectrum of the supply chain. According to Xu and Wang (2018), the innovation of CSLC will make it possible to use waste as an alternative resource within the ecosystem of the supply chain. This will be accomplished through waste management and conversion practices, which will result in the creation of new business opportunities that will increase profitability while simultaneously reducing the amount of carbon emissions that businesses

produce. The acquisition and maintenance of S is the basic objective of innovation. According to Chowdhury et al. (2022), a sustainable competitive advantage in the dynamic business environment, the improvement of the quality of products and services offered to consumers, and the conceptualization of new practices and the strategic alignment of those practices to business priorities in order to make a sustainable impact through goal-oriented activities (Suchek, Fernandes, Kraus, Filser, & Sjogren, 2021).

The literature that is now available contains a significant amount of research that examines the role that organizational culture plays in business processes, as well as its impact on corporate strategy and productivity (Anning-Dorson, 2021). In an organization, it is a representation of the deeply ingrained values and ideas that are held by all of the personnel. According to Martins and Terblanche (2003), the concept of organizational culture is inextricably linked to work practices, the manner in which these practices modify themselves over the course of time, and the manner in which this modification is controlled internally inside the organizations. It is also an essential component of the way in which an organization operates within the context of the business environment. It is the culture of an organization that serves as the foundation for communication, mutual understanding, and meaningfulness in the context of jobs, tasks, and work practices. This culture will have a significant impact on the efficiency of an organization as well as its capacity to adopt new practices and business model innovation (McLaughlin, Bessant, & Smart, 2008; Barrett, 1998). Using resources and processes to guide and manage change, culture helps to bridge the gap between strategy and its implementation inside the organization (Anh Vu, Plimmer, Berman, & Ha, 2022; Filipczak, 1997). In this context, culture helps to bridge the gap between strategy and its implementation. Prior research (Bass & Avolio, 1993; Ogbonna & Harris, 2000; Sarros, Cooper, & Santora, 2008; Sarros, Gray, & Densten, 2002) has provided a comprehensive discussion on the significance of leadership in the process of establishing an organization

culture that is appropriate and favorable to the functioning of the organization. Recent research that has been published in academic journals (Anning-Dorson, 2021; Tung & Dung, 2022) demonstrates that the culture of an organization is of utmost importance for human resource orientation in order to achieve productivity and improvement orientation in order to facilitate the evolution of management processes and business operations.

2.3.4. Product Recovery and performance of agricultural value chains

According to Govindan & Hasanagic (2018), the external context encompasses factors such as government regulations, market dynamics, technological advancements, and consumer preferences, all of which form the framework within which circular economy initiatives are developed. This element highlights the significance of examining the wider socio-economic and environmental influences that inform organizational behavior and performance. Schroeder, Anggraeni, & Weber (2019) illustrated the potential of integrating Circular Economy practices within agricultural value chains, highlighting the resultant decrease in waste and enhancement of resource efficiency, which corresponds with the objectives of sustainable development.

Prior research has underscored the possible advantages of circular methodologies across diverse sectors, including manufacturing and retail; however, there exists a paucity of studies that focus explicitly on their implementation within agricultural supply chains (Mehmood, Ahmed, Viza, Bogush, & Ayyub, 2021). It is essential to formulate policy interventions that encourage sustainable practices and assist businesses in adopting circular economy initiatives, thereby improving both environmental and economic outcomes (Asgari & Asgari, 2021). The United Nations Sustainable Development Goals (SDGs), especially Goal 2 (Zero Hunger) and Goal 12 (Responsible Consumption and Production), highlight the critical role

of sustainable agriculture and circular economic principles in the pursuit of global food security and environmental sustainability (United Nations, 2015). The implementation of circular methodologies significantly improves the performance and sustainability of agricultural value chains (Pakseresht, Yavar, Kaliji, & Hakelius, 2023).

Agyemang et al. (2019) highlight the significance of economic considerations that drive the implementation of CE practices by utilizing the context of vehicle manufacturing in Pakistan as an example. They use a mix of interviews and surveys to investigate the factors that are driving the adoption of CE as well as the obstacles that are preventing it from happening. An additional 28 interviews were conducted in addition to the 112 survey results that were collected in order to determine the primary causes that are driving the implementation of CE in businesses. These considerations include environmental appreciation, cost savings, and environmental profitability. According to the findings of Tura et al. (2019), it is essential to take into account the environment in which the organization operates simultaneously. Their exhaustive classification of the factors that influence the implementation of CE makes use of reports from the existing body of literature to develop a framework that is then evaluated in four different organizations through the use of thirty-six interviews. It is stated by them that the drivers of particular vehicles are dependent on the context in which they are used, and that information technology plays an essential part in the implementation of CE practices. Patwa et al. (2021) use a sample of 183 consumers to identify the need for extending the lifetime for products using the 3Rs, the use of big data to improve information flows, and government policy as significant factors for the adoption of circular economy policy in developing countries. This research is conducted from the perspective of emerging economies. In spite of the fact that CE practices have the ability to contribute to the Sustainable Development Goals (Kristoffersen, Blomsma, Mikalef, & Li, 2020), Liu and Bai (2014) state that organizations have a number of worries regarding the potential obstacles that

could prevent their adoption. As a matter of fact, Gusmerotti et al. (2019) highlight the fact that a number of businesses are only vaguely aware of the majority of the possible advantages of CE. According to Meath, Linnenluecke, and Griffiths (2016), this has been reflected in the low adoption rate of circular economy methods in corporations (Fehrer & Wieland, 2021). This is especially true in the case of small and medium-sized enterprises (SMEs), despite the fact that these organizations are responsible for a significant amount of resource consumption on a worldwide scale. In order to give these organizations insights that will support their implementation of CE practices, it is essential to take into consideration the conditions and the setting in which they operate. Prieto-Sandoval et al. (2018) use a Delphi panel to evaluate the degree of circular economy implementation for organizations that fall into three categories: industrial symbiosis, environmental certifications, and circular economy fields of action (take, make, distribute, use, and recover). This research was conducted in order to investigate the factors that influence the adoption of circular economy by small and medium-sized enterprises (SMEs). The results of their investigation indicate that the most crucial area of focus for managers is recovery, followed by the implementation of sustainable design ideas. In order to investigate the various CE techniques that are utilized in European nations, Bassi and Dias (2019) employ multilevel orbital probit models to analyze the data obtained from 10,618 interviews that were conducted as part of the Flash Eurobarometer 441. One of the things that they discovered was that the intention to adopt environmentally friendly behavior is influenced by factors such as the size of the organization, the turnover, the percentage of turnover that is dedicated to research and development, and the type of activity. At the same time, they point out that organizations are able to implement strategies such as the reduction of waste, but it is possible that they are unable to introduce more ambitious redesigning practices. Using the same Flash Eurobarometer Survey 441 from 2016, García-Quevedo et al. (2020) come to the conclusion that regulatory difficulties, the expense of

complying regulations, and inadequate human resources are the constraints that prevent organizations from adopting CE.

2.3.5 Performance of Agricultural Value Chains

Various performance metrics and indicators are utilized in experimental studies that investigate the performance of agri-value chains. These studies are conducted in order to evaluate various elements of performance. Measures such as crop yields, profit levels, market share, environmental impact, and value-added activities are examples of what may fall under this category. Research conducted by Chege and Wang (2020) utilized a combination of productivity measures and market access criteria in order to assess the performance of particular value chains in Kenya. These value chains included horticulture and dairy production, among others. In spite of the fact that empirical studies offer insights that are extremely valuable, it is essential to recognize both their strengths and limits. Their empirical correctness and use of a variety of approaches, such as case studies, surveys, and experimental designs, contribute to the robustness of the studies, which is one of their strengths. On the other hand, the generalizability and reliability of the results may be affected by factors such as the small sample sizes, regional biases, and methodological restrictions. Additionally, our comprehension of the long-term consequences and patterns that are associated with Agri-Value Chains is hindered by the absence of longitudinal studies (Tomek & Myers, 1993).

The usefulness of circular economy methods in tackling bigger systemic challenges such as the alleviation of poverty, the assurance of food security, and the adaptation to climate change may be called into question by counterarguments. (Murray, Skene, & Haynes, 2017) and (Whalen & Whalen, 2020) are two examples of critics who contend that a restricted focus

on economic success may disregard social and environmental factors, which might lead to repercussions that were not intended. Additionally, contrasting viewpoints may call into question the scalability and replicability of good interventions across a variety of agroecological contexts, highlighting the importance of developing solutions that are tailored to the specific situation (Acharya, 2023). Through the promotion of resource efficiency, the reduction of food waste, and the enhancement of the resilience of agricultural systems, the adoption of CE leads to the achievement of these goals (United Nation, 2015).

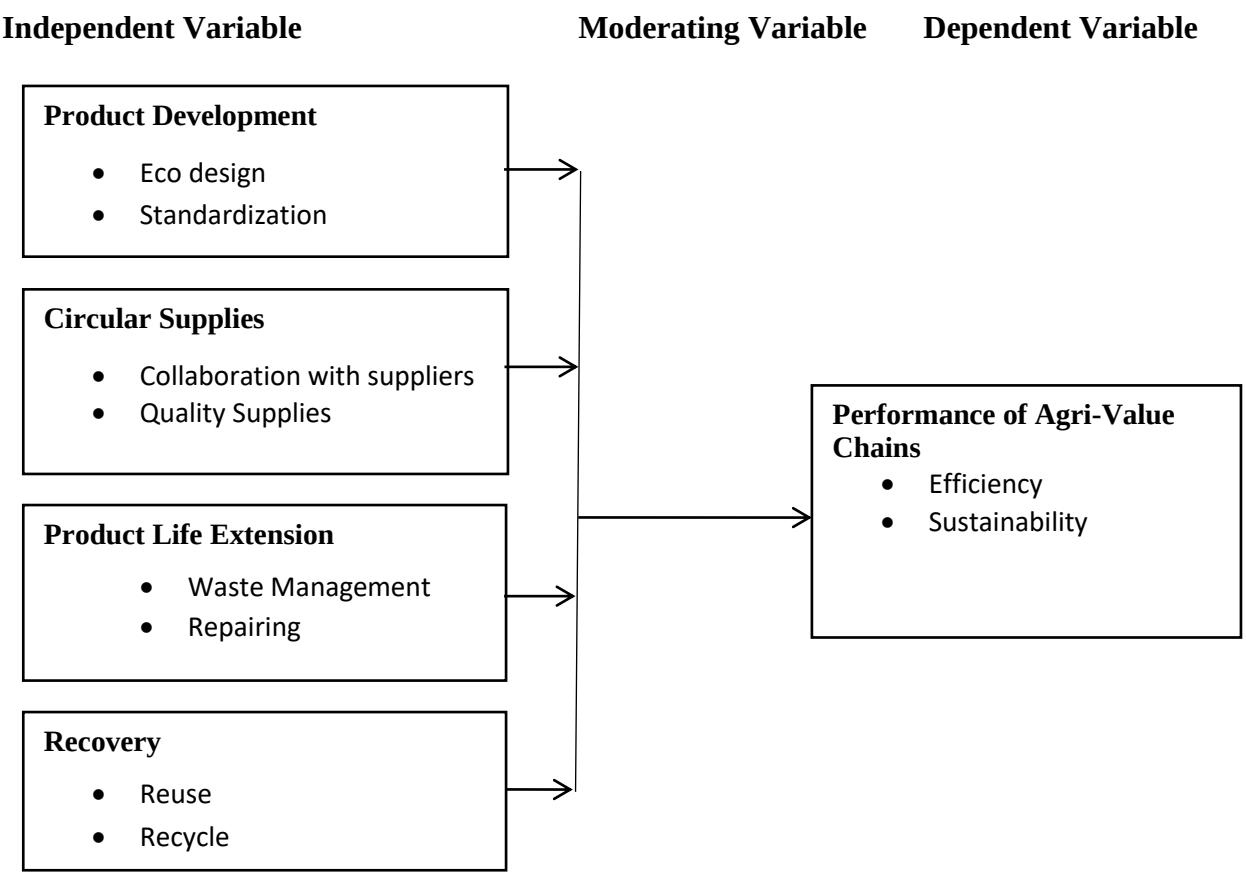
Since the beginning of time, performance has been connected to many financial measurements. On the other hand, organizations have more and more begun to strike a balance between economic metrics and social and environmental performance (Epstein & Roy, 2003). This is done in order to consider the various benefits that can be obtained in various dimensions (Katz-Gerro & Lopez ´ Sintas, 2019). It is essential to establish a connection between the implementation of CE practices and sustainable performance in order to guarantee the production of genuine enhancements (Harris, Martin, & Diener, 2021). This is particularly necessary in order to facilitate and direct the transition of small and medium-sized enterprises (Nguyen et al., 2020). According to Dey et al. (2019), Sarkis, Zhu, and Lai (2011), Sauv´e, Bernard, and Sloan (2016), organizations can be encouraged to participate in corporate social responsibility initiatives by the benefits that are reported, which include higher business productivity and enhanced reputation. A number of studies have been conducted to investigate the connection between corporate social responsibility (CSR) practices and environmental performance, as well as the implications of sustainable practices on environmental and financial performance. However, the literature on this subject has not yet reached a definitive conclusion (Lee & Raschke, 2020; Wagner, 2015; van Loon, Diener, & Harris, 2021). It is essential to have a deeper comprehension of the total impact that

commercial enterprise practices have on the many aspects of sustainable performance. According to Games and Rendi (2019), the impact is essential in order to provide organizations with valuable insights, particularly when taking into consideration their aversion to risk and the limited resources they have available to invest. A variety of criteria, including crop yields, income levels, market share, environmental consequences, and value-added activities, are utilized by academics in order to evaluate the effectiveness of agri-value chains in the agricultural sector. For example, Chege and Wang (2020) did a study in which they researched productivity indicators and market access measures in order to analyze value chains in Kenya, such as those in the dairy and horticulture industries.

2.4 Conceptual Framework

FIGURE 2. 1

Conceptual Framework



2.5 Research Gaps

It is possible to gain a valuable grasp of several progressive features of sustainable agriculture by reading the existing literature on the implementation of circular economy methods in agri-value chains. On the other hand, there are a number of holes in the knowledge that require additional investigation, which could make a significant contribution to the advancement of this discipline. There is a significant lack of attention paid to smallholder farmers within agri-value chains, which is a notable omission in the existing body of research. There are a few research studies that have investigated the implementation of circular economy methods among large-scale commercial farms; however, there is a dearth of research that specifically targets smallholder farmers, who account for a significant proportion of agricultural production in many developing nations. For instance, research conducted by Jayne, Mather, and Mghenyi (2010) and Feleke et al. (2021) mostly concentrated on commercial farms, ignoring the specific difficulties and opportunities that smallholder farmers confront when attempting to implement Circular Economy methods.

There have been a significant number of studies that have investigated the implementation of CE practices; however, there have been fewer investigations that have concentrated on agrifood supply chains up until this point (Balboa and Domingues Somoente, 2014; Ghisellini et al., 2016; Jesus and Mendonca, 2018; De Angelis et al., 2018; Govindan and Hasanagic, 2018; Masi et al., 2018). An additional deficiency in the existing body of research is the absence of longitudinal studies that investigate the effects of circular economy practices on agri-value Chains over an extended period of time. A significant number of the currently available research are either cross-sectional or short-term in character, which means that they offer limited insights on the effectiveness of circular economy interventions over the course of time. According to Sehnem, Vazquez-Brust, Pereira, and Campos (2019), longitudinal studies that were conducted over a period of several years and tracked changes in

productivity, environmental effect, and economic implications would provide a more comprehensive understanding of the dynamics that are at play. To give an example, Hamam et al. (2021) conducted a study that lasted for one year and focused on the introduction of circular practices in agri-value chains. However, they did not investigate the ramifications that these practices would have in the long run.

Circular economy activities in agri-value chains continue to receive insufficient attention in academic literature, despite their potential socio-economic impact. In spite of the fact that environmental outcomes, such as resource efficiency and waste reduction, receive a great deal of attention, there is a dearth of empirical research that investigates the social and economic ramifications for the various stakeholders along the value chain. As an illustration, research conducted by Sehnem, Vazquez-Brust, Pereira, and Campos (2019) concentrated exclusively on environmental indicators, failing to take into account the more comprehensive socio-economic aspects of the implementation of circular economy.

The majority of the studies have utilized a single type of research design, which is primarily descriptive. Different studies have utilized systematic reviews; nevertheless, it is necessary to utilize different types of designs. The current investigation makes use of an exploratory research strategy in conjunction with a combination of systematic review and metanalysis. Researchers are able to elucidate key drivers and barriers to the adoption of circular economy practices by employing robust research methodologies and leveraging interdisciplinary perspectives. This gives researchers the ability to inform the development of evidence-based strategies for enhancing sustainability within Agri-Value Chains (Alivojvodic & Kokalj, 2024)

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The chapter outlines the research design, target population and data collection methods. Subsequently, a detail of the procedures for sampling, data collection, and data analysis, ensuring transparency and reproducibility in in the research process. Finally, the ethical considerations inherent in the methodology, acknowledging potential constraints and biases in the study design.

3.2 Research Design

As noted by Akhtar (2016), a research design serves as a structured framework encompassing the various techniques and methods employed by the researcher throughout the study process to effectively gather and analyze data. Mugenda & Mugenda (2012) assert that a descriptive design is crucial in research aimed at illustrating the relationship between variables, particularly when emphasizing primary data. Bloomfield and Fisher (2019) suggest that employing a quantitative research design enables the researcher to gain profound insights from the social context through the application of a quantitative research strategy. Consequently, the quantitative design guarantees that the research employs a quantitative survey to gather data that measures the behaviors, opinions, and attitudes of the participants within the context of structured questions grounded in the variables. The research employed a descriptive design to explore the integration of circular economy practices within Agri-Value Chains.

3.3 Target Population

The focus of this research includes officers from the Ministry of Agriculture, Livestock and Fisheries; county governments; the Agricultural Sector Development Support Programme (ASDSP); the Kenya Plant Health Inspectorate Services (KEPHIS); the Pest Control Products Board (PCPB); the Horticultural Crops Development Authority (HCDA); the Kenya Agricultural Research Institute (KARI); as well as public and private sector participants in the dairy, maize, and horticulture value chains. The 22 counties categorized within high-rainfall (HR1) and arid and semi-arid zones (SA2) encompass Bomet, Trans Nzoia, Elgeyo-Marakwet, Uasin Gishu, Nandi, Kericho, Bungoma, Busia, Kakamega, Vihiga, Siaya, Homabay, Kisumu, Nyamira, Kisii, and Migori in the western region, alongside Meru, Tharaka, Machakos, Makueni, Kitui, and Taita-Taveta in the eastern regions of Kenya (KARI, 2016). The Kenya Agricultural Value Chains Enterprises fosters the advancement and diversification of value chains. This enhances the productivity and earnings of smallholder farmers, as well as other participants in the value chain, engaged in the dairy, maize, and various staple and horticultural sectors. The initiative collaborates with over 30 organizations from both the Kenyan government and the private sector. To date, the initiative has engaged with 403 agricultural collectives throughout all counties. The target population for this study comprised 403 farmer groups, along with 35 key informants from the ministry and development partners.

TABLE 3. 1

Target Population

Category	**Sample population**
Farmers groups	403
Ministry and Development Partners	35
Total	438

3.4 Sample size and Sampling Technique

When referring to a population, a sample is a subset of that population that is easily accessible. According to Creswell (2019), the sample size that is selected should be able to convey an accurate representation of the population and make the inspection process more uncomplicated. In order to obtain the best possible outcomes, it is recommended that a sample consist of at least thirty different components (Kombo and Tromp, 2019). For the purpose of determining the proper sample size, this inquiry made use of Yamane's (1967) Formula. When applying the formula for finding the sample size (n), it is necessary to consider both the size of the population (N) and the margin of error (€). The formula is an example of a random sampling technique that is utilized in order to determine the size of the sample in question. The reasons for selecting this formula are that it considers the total population size.

$$n = \frac{N}{1 + NE^2}$$

Whereby:

n = number of samples

N = target population

E = margin of error (0.05)

$$n = \frac{438}{1 + 438 * 0.05^2}$$

$$n = 209$$

According to Kombo and Tromp (2019), the term "sampling" refers to the approach that researchers use to collect individuals, locations, or items for the goal of conducting empirical study. Methods of sampling are strategies that are used to pick a subset of a population from a

larger group. The goal of these methods is to properly reflect the characteristics of the full population or the population of interest with regard to the subset that is selected. The utilization of sampling has the potential to significantly cut down on the amount of time and financial resources required to finish the investigation. According to Saunders et al. (2018), employing a sample rather than the complete population enables the collection of more information on each indicator of interest. This is in comparison to collecting everything from the population. A greater degree of population representation can be found in the sample. During the year 2020, Saunders, Lewis, and Thornhill carried out research activities. An adequate unit representative was obtained through the utilization of a stratified random sample approach for the analysis at hand. The categorization of units into various groups was accomplished by the use of stratified sampling. Every single person who was a part of the diverse population had the same opportunity to involve themselves in the activity. As an illustration of the grouping of the sample size in this manner.

TABLE 3. 2

Sample Size

Category	**Sample population**
Farmers Groups	192
Ministry and Development Partners	17
Total	209

3.5 Instrumentation and Data Collection

Data collection is a crucial stage in the research process. Therefore, a researcher needs an instrument to gather data based on the type of data plan. Heale & Twycross (2015) describe research instruments as tools to gather, measure and analyze data related to the topic. The various instruments can be surveys, tests, checklists, and questionnaires. Therefore, the researcher decided on the instrument to use based on the type of research design such as a

mixed-method, qualitative or quantitative approach (Heale & Twycross, 2015). The present study followed a quantitative design. Hence, the researcher used questionnaires.

Primary data was collected for the study using a self-administered questionnaire. A series of prepared questions were used in a questionnaire to collect statistically significant data on respondents' opinions on a relevant problem. Kothari (2008) asserts that a questionnaire is the best tool for this research since it can gather a lot of data in a manageable amount of time, making it a suitable instrument for this investigation. A closed ended questionnaire was used in the study, which aided in the researcher's ability to obtain precise data. The closed structured questionnaire was on Likert scale and is easy to complete, allowing one to get a lot of data quickly.

The data collection was carried out after the research was approved by the KCAU institute and the authorization letter was given out. The researcher proceeded to data collection. After getting consent to visit the selected respondents for the collection of data, the researcher engaged in all necessary ethics of the study and the purpose of the research. The researcher then administered the questionnaires to the respondents face to face to have time to explain what was required and the importance of the information. The respondents had enough time to fill and return the completed questionnaires to the researcher. For clarity, the researcher allowed the participants to possess the questionnaires for one week to read, understand and filled in the required information in their comfort. The researcher then collected the completed questionnaires in readiness for data analysis.

3.6 Pilot Study

A pilot study was conducted to evaluate the validity and reliability of the research instruments in order to ensure that they are reliable and accurate. Before using the questionnaires to gather data for the research, Nakuru County hosted a pilot study that is not

included in the study sample. Fifteen participants were the target of the trial program. Pre-testing the research instrument served to confirm that the questionnaire is understandable to the respondents, determine whether it successfully gathers the data required for the study, and evaluate and identify any issues that respondents might have with completing the questionnaire that were not anticipated during questionnaire construction. This was utilized to verify that the data collection instruments are accurate.

3.6.1 Validity and Reliability

Reliability in research instruments is the ability to measure relevant properties consistently over a long period of time. The test's consistency, reliability, and stability are its main concerns (Nachmias & Nachmias, 1996). Reliability of a research instrument is the extent to which it yields consistent results after several trials (Mugenda & Mugenda, 2003). Since continuous and non-dichotomous data will be used, Cronbach's Alpha was used. It was specifically applied to the testing of Likert scale questions. The reliability tool was determined by the study using the test-retest procedure.

The widely accepted rule of thumb states that an alpha of 0.7 denotes adequate reliability while an alpha of 0.8 or higher denotes good dependability (Gliem & Gliem, 2003). Having very high dependability (0.95 or more) does not always mean that the things are entirely redundant. Cronbach's Alpha evaluates whether each goal would provide consistent findings if the study were to be repeated, according to Kinyua and Ali (2016). The reliability of the questionnaires was evaluated using the Cronbach's Alpha correlation coefficient and the Statistical Package for Social Sciences (SPSS) program. According to Gliem & Gliem (2003), a Cronbach Alpha reliability coefficient value of 0.7 or above is considered sufficient, hence all of the study's constructs will be dependable because they all displayed a value more than 0.7 for Cronbach's Alpha reliability.

3.6.2 Validity of the Research Instrument

Best and Khan (2013) defined validity as the extent to which conclusions drawn from data analysis accurately reflect the topic being studied. It is the significance and correctness of conclusions drawn from study results. It displays the degree of agreement between the true value and the measured value. By comparing measurements with values that are as near to the genuine values as is practical, validity is ascertained. A validity measure ensures that the research tool is measuring the variables that the investigator intends it to (Polit & Hunger, 2015). The study made use of content validity. The supervisors' feedback was also be evaluated and considered to enhance the construct validity and substance of the questionnaire.

3.8 Data Analysis and Presentation

Data process and analysis entail methods and activities that a researcher performs on the data to help in the description of the facts, develop explanations, detect the existing patterns, and test the hypotheses (Vonrhein et al.2011). The study embraced descriptive data analysis based on the numerical data obtained from the quantitative questionnaires. The researcher embraced tables, graphs, and charts to summarize the relationships that exist between the variables (Dimitrov, 2008). Moreover, the researcher exceled to analyze the data because of its rationale of providing a wide range of statistical methods and formulas to calculate data. Separately, the researcher used the SPSS v27 because it allowed the application of inferential, descriptive statistics and regression analysis for trade facilitation (dependent variable) by focusing on various indicators. Moreover, the researcher embraced inferential statistics, regression analysis and descriptive statistics.

Separately, the researcher summarized data using frequency tables and graphs and regression analysis based on the below regression model: To ascertain the significance of the association

between the predictor and the result variables, inferential statistical analysis employed multiple regression analysis and Pearson correlation. Hair et al. (2005) state that multiple regression analysis is used to determine the association between one dependent variable and several independent variables. The following equation is the algebraic representation of the study model.

$$\mathbf{Y= \beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+ \beta_4X_4+ \varepsilon}$$

Where,

Y = Performance

$\beta_0 \ldots \beta_4$= Constant to be determined.

X_1= Product Development

X_2= Circular Supplies

X_3= Product Life Extension

X_4= Product Recovery

ε = error term

3.9 Diagnostic Tests

According to Glasser (2014), the objective of diagnostic research is to assess the effectiveness of a diagnostic test in confirming or excluding specific characteristics found in the sample under investigation. According to Rommel (2013), diagnostic tests are designed to tackle different predispositions that could emerge during an investigation focused on evaluating precision. The researcher sought to determine the viability of proceeding with the regression model of the study, and the purpose of the assumption test was to assess this evaluation. This study assessed multiple assumptions to determine their validity. This analysis examined two assessments: the normality test and the multicollinearity test.

3.9.1 Testing for Normality

The premise that residuals follow a normal distribution is crucial to the OLS regression model, impacting the validity of all related tests (Oscar, 2017). This study utilized the Shapiro-Wilk test to evaluate the normality of residuals, a technique that assesses normal distribution without relying on graphical representations.

3.9.2 Testing for Multicollinearity

Kumari (2018) describes multicollinearity as the presence of a linear relationship among variables that are considered independent. This study utilized the Variance Inflation Factor (VIF) and Tolerance to evaluate the existence of multicollinearity. The variance inflation factor quantifies how much multicollinearity affects the increase in the variance of the coefficient estimate. According to Oscar (2007), a Variance Inflation Factor greater than 10 (VIF > 10) suggests a possible concern regarding multicollinearity.

3.10 Ethical Considerations

To guarantee conformity with ethical measures and protocol, several procedures are followed all through the research process. Primarily, researchers must obtain correct approvals and authorizations to retrieve and use secondary data, while observing and obeying any terms and conditions stipulated by data providers or copyright holders (Magendanz, 2024). This may involve acquiring licenses, agreements, or agreement forms to access proprietary data or copyrighted materials. Moreover, researchers anonymize and de-identify data whenever possible to safeguard the confidentiality of individuals or organizations mentioned in the secondary sources (Weinbaum, et al., 2019). This consists of deleting or hiding personally identifiable information and combining data to prevent the identification of specific individuals or entities (Majeed & Lee, 2020). The researcher will obtain an introduction letter

from the school of graduate studies of KCA University and research license from National Council of Science, Technology and Innovation (NACOSTI).

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND DISCUSSION

4.1 Introduction

This chapter provides a comprehensive examination of the findings and analyses derived from the conducted research investigation. Statistical methods, including descriptive analysis and regression analysis, were employed to analyze the acquired data. Following the reporting

of the outcomes and response rate from the pilot study, descriptive data were subsequently presented to the participants.

4.2 Pilot Test Results

Table 4.1 presents a detailed assessment of the research instrument's reliability, as established through the pilot test. To assess the existence of any relevant issues that must be addressed before initiating the actual data collection phase, questionnaires were administered to five farmers in Nakuru County.

TABLE 4. 3

Reliability Test results

Variable	Cronbach's Alpha	Number of Items
Performance	.751	4
Product Development	.709	4
Circular Supplies	.711	4
Product Life Extension	.811	4
Product Recovery	.799	4

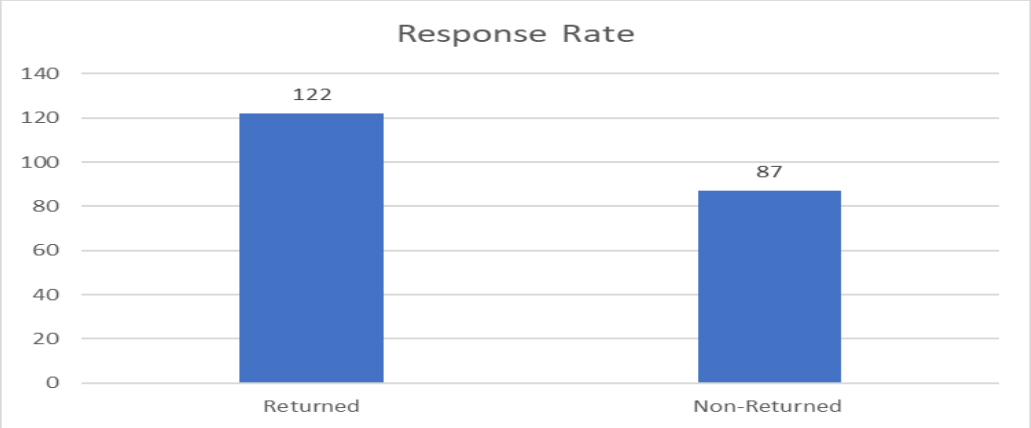
The reliability test results indicate that the Cronbach's alpha coefficients for performance, product development, circular supplies, product life extension, and product recovery are 0.751, 0.709, 0.711, 0.811, and 0.799, respectively. The values can be found in table 4.1. A minimum acceptable coefficient of 0.7 was established, indicating that the questionnaire demonstrated reliability, as noted by Bryman (2018). Outdated citation

4.3 Response Rate

A total of 209 questionnaires were sent out by the researcher to various potential respondents. Figure 4.1, which can be found below, illustrates the results.

FIGURE 4. 1

Response Rate



A total of 122 individuals completed the questionnaire, representing 58.4% of the overall responses. Figure 4.1 presents this information. The response rate for the survey was deemed satisfactory. This aligns with the assertion by Mugenda and Mugenda (2012) that a response rate of seventy percent is considered acceptable in the field of social sciences.

4.4 Respondent's Gender

The research examined the gender of individuals who completed the questionnaires. Table 4.2 presents the findings.

TABLE 4. 4

Respondent's Gender

Gender	Frequency	Percentage
Male	77	63.1
Female	45	36.9
Total	122	100.0

Table 4.2 indicates that 63.1% (77) of participants identified as male, whereas 36.9% (45) identified as female. The results of this study indicate a relatively equal distribution of genders.

4.5 Diagnostic Tests

To obtain unbiased estimates of study parameters, various regression assumptions were analyzed. Normality tests and multicollinearity tests exemplify these categories of assessments.

4.5.1 Normality Test

The results on normality tests are shown in table 4.3 below.

TABLE 4. 5

Normality Tests

	Shapiro-Wilk		
	Statistic	**Df**	**Sig.**
Performance	.325	122	.151
Product Development	.346	122	.140
Circular Supplies	.234	122	.086
Product Life Extension	.543	122	.058
Product Recovery	.344	122	.110

The normality test results indicated that performance, product development, circular supplies, product life extension, and product recovery exhibited p-values of 0.151, 0.140, 0.086, 0.058, and 0.110, respectively. The p-values for the five predictor variables and the outcome variable exceeded the alpha threshold of 0.05, as indicated by Razali and Wah (2011).

4.5.3 Multicollinearity Test

Table 4.4 shows the multicollinearity test results.

TABLE 4. 6

Multicollinearity Test

Variable	Tolerance	VIF
Product Development	.421	2.378
Circular Supplies	.402	2.487
Product Life Extension	.501	1.997
Product Recovery	.967	1.034

4.6 Descriptive Analysis

4.6.1 Performance

The dependent variable was Performance of agricultural value chains in Kenya. The results from a 5-point Linkert scale questionnaire are shown in **T**able 4.5. The Variance Inflation Factor (VIF) values for product development, circular supplies, product life extension, and product recovery were 2.378, 2.487, 1.997, and 1.034, respectively. All four independent variables exhibited Variance Inflation Factor (VIF) values below the upper threshold of 10. A Variance Inflation Factor (VIF) value of 10 or lower, according to O'Brien (2007), indicates the absence of multicollinearity among the predictor variables.

Table 4. 7 Performance of agri- value chains

Performance	Mean	Std. D.
Adoption of CEP has improved our operational efficiency	4.3607	.79321
Adoption of CEP has resulted into low wastage of materials in our organization	4.5328	.96367
Adoption of CEP has led to improved quality	4.7049	.63881
Adoption of CEP has led to high customer satisfaction	4.3525	1.08271

The descriptive statistics indicate that the adoption of CEP has enhanced operational efficiency (mean = 4.3607, standard deviation = 0.79321). The low standard deviation

indicates that the respondents provided comparable responses, demonstrating a consensus among them. The adoption of CEP has led to reduced material wastage in our organization (mean = 4.5328, standard deviation = 0.96367). The results indicate that the implementation of CEP has resulted in enhanced quality (mean = 4.7049, standard deviation = 0.63881). Finally, the implementation of CEP has resulted in elevated customer satisfaction levels (mean = 4.3525, standard deviation = 1.08271). The high standard deviation indicates a broad range of responses from the participants regarding the statement.

4.6.2 Product Development and Performance of agri-value chains

The first objective was to establish the effect of product development on the performance of agricultural value chains in Kenya. The descriptive statistics from the responses based on 166 respondents.

TABLE 4. 8

Product Development

Product Development	Mean	Std. Dev
The organization has embraced eco-design practices in our production	4.3197	.69552
The organization has standardized production	4.6803	.73029
The organization has put mechanisms in place to ensure variety of products to meet diversity among end users	4.6885	.76149
Our production practices are geared towards sustainability	4.5984	.84950

The descriptive statistics indicate that the organization has adopted eco-design practices in production (mean = 4.3197, standard deviation = 0.69552). The increase in profitability demonstrated this. The low standard deviation indicates that the respondents provided comparable responses, reflecting a consensus among them. Furthermore, the organization has established standardized production, with a mean of 4.6803 and a standard deviation of 0.73029. The investigation's findings indicate that the organization has implemented

mechanisms to ensure a variety of products that cater to the diversity of end users (mean = 4.6885, standard deviation = 0.76149). Finally, the findings indicate that production practices are oriented towards sustainability (mean = 4.5984, standard deviation = 0.84950). The high standard deviation indicates a broad range of responses from the respondents regarding the statement.

4.6.3 Circular Supplies and Performance of agri-value chains

The second objective was to determine the effect of circular supplies on the performance of agricultural value chains in Kenya. The descriptive statistics from the responses based on 122 respondents.

TABLE 4. 9

Circular Supplies

Circular Supplies	Mean	Std. Dev
We collaborate with our suppliers for optimal supplies use and returns	4.2869	.87650
The organization has put measures into place to reduce waste in the entire supply chain	4.6803	.76349
The organisation encourages repairing of equipments, facilities and even other supplies for optimized value	4.6967	.62838
The organisations has put quality controls at all stages of the supply chain	4.6230	.83644

The descriptive statistics indicate that respondents collaborate with their suppliers to optimize supply usage and returns (Mean = 4.2869, Standard Deviation = 0.87650). The substantial standard deviation indicates that the respondents exhibited disagreement regarding that statement. Furthermore, it was shown that the majority of organizations have implemented measures to minimize waste throughout the supply chain (mean = 4.6803, standard deviation = 0.76349). Furthermore, it was shown that the majority of organizations promote the repair

of equipment, facilities, and other supplies to maximize value (Mean = 4.6967, Standard Deviation = 0.62838). The organization has implemented quality controls at every stage of the supply chain (Mean = 4.6230, Standard Deviation = 0.83644). The responses exhibited considerable variation, as evidenced by the high standard deviation. They were in conflict with each other.

4.6.4 Product Life Extension and Performance of agri-value chains

The third objective was to evaluate the effect of product life extension on the performance of agricultural value chains in Kenya. The results from a 5-point Linkert scale questionnaire are shown in table 4.8.

TABLE 4. 10

Product Life Extension

Product Life Extension	Mean	Std. D.
The organization encourages waste reduction at all the stages of the supply chain	4.4426	.88186
To extend the life span of supplies, the organization encourages efficient record keeping, storage and repairs	4.5738	.87119
The organization has implemented strategies to promote efficiency in production	4.7541	.71941
The organization models that keep supplies in long usage period to minimize extraction of new materials adopts business	4.5738	.84225

Respondents indicated that most organizations promote waste reduction throughout all stages of the supply chain (mean = 4.4426, standard deviation = 0.88186). The low standard deviation indicates that the respondents' answers were similar to each other. It was demonstrated that extending the lifespan of supplies involves organizations encouraging efficient record keeping, storage, and repairs, with a mean of 4.5738 and a standard deviation

of 0.87119. Furthermore, it was found that the majority of organizations have adopted strategies aimed at enhancing production efficiency (mean = 4.7541, standard deviation = 0.74720). Finally, it was shown that organizational models that maintain supplies for extended periods to reduce the extraction of new materials adopt business practices (mean = 4.5738; standard deviation = 0.71941). The high standard deviation indicates a broad range of responses from the participants regarding the statement.

4.6.5 Product Recovery and Performance of agri-value chains

The fourth objective of the study was to determine the effect of product recovery on the performance of agricultural value chains in Kenya. The results from a 5-point Linkert scale questionnaire are shown in table 4.9.

TABLE 4. 11

Product Recovery

Product Recovery	Mean	Std. D.
The organization encourages recycling of wastes	4.2951	.76804
The organization has put mechanisms into place that ensure re-suse of materials before disposal	4.5820	.84149
The organization ensures emissions are reduced through use of environmentally friendly materials	4.6967	.62838
The organization encourages employees to take care of the environment through optimal usage of available resources	4.4508	1.04528

The findings indicate that the majority of respondents believe their organizations promote waste recycling (mean = 4.2951, standard deviation = 0.76804). The low standard deviation indicates that the respondents' answers were similar to each other. Furthermore, it was shown that most of the organization has implemented mechanisms to ensure the reuse of materials prior to disposal (mean = 4.5820, standard deviation = 0.84149). Furthermore, it was found

that the majority of organizations effectively reduce emissions by utilizing environmentally friendly materials (mean = 4.6967, standard deviation = 0.62838). Finally, it was shown that most organizations promote environmental care among employees by optimizing the use of available resources (mean = 4.4508, standard deviation = 1.04528). The high standard deviation indicates that respondents exhibited a broad spectrum of responses concerning the statement.

4.7 Correlation Analysis

Table 4.10 presented a pair wise results of the variable correlated which were independent variables and dependent variable.

TABLE 4. 12

Correlations Matrix

		Y	X_1	X_2	X_3	X_4
Performance (Y)	Pearson Correlation	1				
	N	122				
Product Development (X_1)	Pearson Correlation	.712**	1			
	Sig. (2-tailed)	.000				
	N	122	122			
Circular Supplies (X_3)	Pearson Correlation	.741**	.727**	1		
	Sig. (2-tailed)	.000	.000			
	N	122	122	122		
Product Life Extension (X_3)	Pearson Correlation	.748**	.643**	.668**	1	
	Sig. (2-tailed)	.000	.000	.000		
	N	122	122	122	122	
Product Recovery (X_4)	Pearson Correlation	-.163	-.174	-.107	-.137	1
	Sig. (2-tailed)	.073	.056	.241	.133	
	N	122	122	122	122	122

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

A strong positive correlation was identified between product development and the performance of agricultural value chains in Kenya, indicated by a correlation coefficient of 0.712 and a p-value exceeding 0.05. The circular supplies demonstrated a strong and statistically significant correlation ($r=0.741$, $p<0.001$) with the performance of agricultural

value chains in Kenya. Additionally, a strong and statistically significant positive correlation (r=0.748, p=0.000<0.05) was identified between the performance of agricultural value chains in Kenya and product life extension. There was a weak and negligible negative Pearson correlation of -0.163 between the performance of agricultural value chains in Kenya and product recovery (r=0.163, p=0.073>0.05).

4.8 Regression Analysis

Regression analysis aims to ascertain the distribution value of a model summary by utilizing one random multivariate as the variable of interest, while controlling for all other variables.

4.8.1 Model Summary

The values obtained were recorded in table 4.11 as shown below.

TABLE 4. 13

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.831[a]	.691	.680	.37158

After presenting the summary of the regression model in table 4.9, it was found that the correlation coefficient R was 0.831, and the square of R was 0.582. The model encompassing product development, circular supplies, product life extension, and product recovery accounts for 69.1% of the performance of agricultural value chains in Kenya, as evidenced by a R squared value of 0.691. Additional variables not included in this study account for 29.9% of the performance of agricultural value chains in Kenya.

4.8.2 Analysis of Variance

TABLE 4. 14

Analysis of Variance

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	36.077	4	9.019	65.323	.000[b]
	Residual	16.154	117	.138		
	Total	52.232	121			

The data in table 4.10 indicate that the p value corresponding to the F value of 65.323 is 0.000, which is below the 5% threshold. This demonstrates that the model achieved statistical significance at the 5% level. Improvements in the performance of agricultural value chains in Kenya were realized through the implementation of independent variables such as product development, circular supplies, product life extension, and product recovery. The model summary was appropriate for predicting the differences between variables.

4.8.3 Regression Coefficients

Table 4. 15 Regression Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	-.252	.431		-.586	.559
Product Development	.265	.091	.231	2.916	.004
Circular Supplies	.402	.105	.311	3.836	.000
Product Life Extension	.406	.076	.387	5.327	.000
Product Recovery	-.038	.055	-.037	-.698	.486

The findings presented in table 4.11 indicate that the constant term (β0) is -0.252, and the insignificance level is p=0.559, which is more than 0.05. The product development exhibited a beta coefficient (β1) of 0.265, which was statistically significant at a 5% alpha level (p=0.004<0.05). In the event that all other independent variables remain unchanged, there will be a 26.5% gain in performance of agricultural value chains in Kenya if the product

development is improved by one unit. In addition, it is worth noting that circular supplies had a noteworthy beta coefficient (β2) of 0.406, which indicates that a change in a single unit of circular supplies was associated with a 40.2% improvement in performance of agricultural value chains in Kenya. Furthermore, it is worth noting that the beta coefficient (β3) for product life extension was found to be 0.406, which indicates that a major change in a single unit of product life extension might result in an increase of 40.6% in performance of agricultural value chains in Kenya. Finally, it is worth noting that the beta value of (β4) for product recovery was -0.038, which was insignificant. A single unit improvement in product recovery would result in no significant change performance of agricultural value chains in Kenya. The crucial value, which was determined to be statistically insignificant, was p=0.486, which was more than 5%.

CHAPTER FIVE

SUMMARY OF FINDINGS CONCLUSION AND RECOMMENDATION

5.1 Introduction

The purpose of this chapter is to provide a summary of the findings that are in accordance with the particular objectives of the study, as well as the conclusions that were formed and the recommendations that were made for the study, which include suggested areas of subsequent study to enrich relevant previous knowledge.

5.2 Summary of the Findings

5.21. Product Development and Performance of Agri-value chains

The descriptive statistics indicate that the organization has adopted eco-design practices in production. Furthermore, the organization has established standardized production. The investigation's findings indicate that the organization has implemented mechanisms to ensure a variety of products that cater to the diversity of end users. The findings indicate that production practices are oriented towards sustainability. A strong positive correlation was identified between product development and the performance of agricultural value chains in Kenya. The product development exhibited a beta coefficient which was statistically significant meaning that in the event that all other independent variables remain unchanged, there will be gain in performance of agricultural value chains in Kenya if the product development is improved.

5.2.2 Circular Supplies and Performance of Agri-value chains

The descriptive statistics indicate that respondents collaborate with their suppliers to optimize supply usage and returns. Furthermore, it was shown that the majority of organizations have implemented measures to minimize waste throughout the supply chain. Furthermore, it was

shown that the majority of organizations promote the repair of equipment, facilities, and other supplies to maximize value. The organization has implemented quality controls at every stage of the supply chain. The circular supplies demonstrated a strong and statistically significant correlation with the performance of agricultural value chains in Kenya. In addition, it is worth noting that circular supplies had a noteworthy beta coefficient which indicates that a change in a single unit of circular supplies was associated with improvement in performance of agricultural value chains in Kenya.

5.2.3 Product Life Extension and Performance of Agri-value chains

Respondents indicated that most organizations promote waste reduction throughout all stages of the supply chain. It was demonstrated that extending the lifespan of supplies involves organizations encouraging efficient record keeping, storage, and repairs. Furthermore, it was found that the majority of organizations have adopted strategies aimed at enhancing production efficiency. Finally, it was shown that organizational models that maintain supplies for extended periods to reduce the extraction of new materials adopt business practices. Additionally, a strong and statistically significant positive correlation was identified between the performance of agricultural value chains in Kenya and product life extension. Furthermore, it is worth noting that the beta coefficient for product life extension was found to be positive and significant which indicates that a major change in a single unit of product life extension might result in an increase in performance of agricultural value chains in Kenya.

5.2.4 Product Recovery and Performance of Agri-value chains

The findings indicate that the majority of respondents believe their organizations promote waste recycling. Furthermore, it was shown that most of the organization has implemented mechanisms to ensure the reuse of materials prior to disposal. Furthermore, it was found that the majority of organizations effectively reduce emissions by utilizing environmentally

friendly materials. Finally, it was shown that most organizations promote environmental care among employees by optimizing the use of available resources. There was a weak and negligible negative Pearson correlation between the performance of agricultural value chains in Kenya and product recovery. Finally, it is worth noting that the beta value for product recovery was insignificant. A single unit improvement in product recovery would result in no significant change performance of agricultural value chains in Kenya.

5.3 Conclusion

5.3.1. Product Development and Performance of agri-value chains

The product development exhibited a beta coefficient which was statistically significant. Based on these findings, it was concluded that meaning that in the event that all other independent variables remain unchanged, there will be gain in performance of agricultural value chains in Kenya if the product development is improved.

5.3.2 Circular Supplies and Performance of Agri-value chains

The circular supplies demonstrated a strong and statistically significant correlation with the performance of agricultural value chains in Kenya. In addition, circular supplies had a noteworthy beta coefficient. This led to conclusion that that a improved circular supplies would be associated with improvement in performance of agricultural value chains in Kenya.

5.3.3 Product Life Extension and Performance of agri-value chains

It is worth noting that the beta coefficient for product life extension was found to be positive and significant. This led to conclusion that product life extension might result in an increase in performance of agricultural value chains in Kenya.

5.3.4 Product Recovery and Performance of Agri-value chains

The findings indicate that that the beta value for product recovery was insignificant. This study concluded that improvement or decline in product recovery would result in no significant change performance of agricultural value chains in Kenya.

5.4 Recommendation

Among the four variables—product development, circular supplies, product life extension, and product recovery—Product Life Extension demonstrated the most significant impact on the performance of agricultural value chains in Kenya. This study suggests that agricultural firms in Kenya should focus on extending the lifespan of their products, as this strategy is expected to enhance their profitability. The analysis indicated that Product Recovery had a negligible impact on the Performance of agricultural value chains in Kenya. In light of these findings, this study suggests that agricultural firms in Kenya should be cautious about allocating significant resources to product recovery, as it may lead to investments with limited returns**.**

5.5 Suggestion for Further Studies

The findings indicate that product development, circular supplies, product life extension, and product recovery account for 69.1% of the performance of agricultural value chains in Kenya. The remaining 29.1% is attributed to other variables not considered in this study. This study suggests the necessity of conducting further research incorporating different variables to identify additional factors that affect the performance of agricultural value chains in Kenya.

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APPENDICES

Appendix I: Questionnaire

Section A: Circular Economy Practices

Kindly indicate to what extent do you agree with the following statements about circular economy practices as practiced in your organization. please tick appropriate box where;

1. Gender

   Male ()

   Female ()

5=to a very large extent, 4=large extent, 3= Moderate extent, 2=Small extent and 1very small extent

No	Statement	1	2	3	4	5
	Product Development					
a	The organization has embraced eco-design practices in our production					
b	The organization has standardized production					
c	The organization has put mechanisms in place to ensure variety of products to meet diversity among end users					
d	Our production practices are geared towards sustainability					
	Circular Supplies					
a	We collaborate with our suppliers for optimal supplies					
b	The organization has put measures into place to reduce waste in the entire supply chain					
c	The organization encourages repairing of inventories for optimized value					
d	The organization has put quality controls at all stages of the supply chain					
	Product life Extension					
a	The organization encourages waste reduction at all the stages of the supply chain					
b	To extend the life span of supplies, the organization encourages efficient record keeping, storage and repairs					
c	The organization has implemented strategies to promote efficiency in production					
d	The organization adopts business models that keep supplies					

	in long usage period to minimize extraction of new materials					
	Product Recovery					
a	The organization encourages recycling of wastes					
b	The organization has put mechanisms into place that ensure resuse of materials before disposal					
c	The organization ensures emissions are reduced through use of environmentally friendly materials					
d	The organization encourages employees to take care of the enviroment through optimal usage of available resources					

Section C: Performance of Agri-value Chains

The list provides a Performance metrics of Agri-value chain in organisations. Please appropriate box where;

5=to a very large extent, 4=large extent, 3= Moderate extent, 2=Small extent and 1very small extent

No	Statement on Performance of agricultural value chains	**1**	**2**	**3**	**4**	**5**
	Performance of agricultural value chains					
a	Adoption of CEP has improved our operational efficiency					
b	Adoption of CEP has resulted into low wastage of materials in our organisation					
c	Adoption of CEP has led to improved quality					
d	Adoption of CEP has led to high customer satisfaction					