

**BUSINESS OPPORTUNITIES ALONG CROCODILE VALUE CHAIN: CASE OF  
CROCODILE FARMS IN MALAWI**

**MSc THESIS IN TRANSFORMATIVE COMMUNITY DEVELOPMENT**

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**MZUZU UNIVERSITY**

**JANUARY, 2026**

**BUSINESS OPPORTUNITIES ALONG CROCODILE VALUE CHAIN: CASE OF  
CROCODILE FARMS IN MALAWI**

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**MTCD1623**

**A THESIS SUBMITTED TO THE FACULTY OF ENVIRONMENTAL SCIENCES,  
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FOR THE AWARD OF MASTER OF SCIENCE DEGREE IN TRANSFORMATIVE  
COMMUNITY DEVELOPMENT**

**MZUZU UNIVERSITY**

**JANUARY, 2026**

## **DECLARATION**

I, Hope Ngilazi, hereby declare that this thesis titled “Business opportunities along crocodile value: case of crocodile farms in Malawi” is my own original work. All citations, references, and borrowed ideas have been duly acknowledged. It is being submitted in fulfilment of requirements for the award of the MSc. degree in Transformative Community Development of Mzuzu University. This work has not been submitted to any other institution for similar purposes.

**Signature:** \_\_\_\_\_

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## **CERTIFICATE OF APPROVAL**

I, the undersigned, certify that this thesis is a result of the author's own work and that to the best of my knowledge, it has not been submitted for any other academic qualification within the Mzuzu University or elsewhere. The thesis is acceptable in form and content and that satisfactory knowledge of the field covered by the thesis was demonstrated by the candidate through an oral examination held on January 28<sup>th</sup>, 2025.



Signature\_

Date: 10/12/2025

**Mavuto Tembo, PhD**

**Associate Professor in Development Geography**

**Major Supervisor**

## **DEDICATION**

This thesis is dedicated to me.

## **ACKNOWLEDGEMENTS**

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## **LIST OF ABBREVIATIONS AND ACRONYMS**

|                |                                                                             |
|----------------|-----------------------------------------------------------------------------|
| <sup>0</sup> C | : Degree Celsius                                                            |
| ACENUB         | : African Centre of Excellence for Neglected and Underutilized Biodiversity |
| BICC           | : Bingu International Conference Centre                                     |
| CITES          | : Conventional for International Trade on Endangered Species                |
| COVID-19       | : Corona Virus Disease 2019                                                 |
| DC             | : District Council                                                          |
| DWNP           | : Department of Wildlife and National Parks                                 |
| EFSA           | : European Food Safety Authority                                            |
| EU             | : European Union                                                            |
| FAO            | : Food and Agriculture Organization                                         |
| GDP            | : Gross Domestic Product                                                    |
| GVC            | : Global Value Chain                                                        |
| IUCN           | : International Union for Conservation of Nature                            |
| KIIs           | : Key Informant Interviews                                                  |
| LTD            | : Limited                                                                   |
| LUANAR         | : Lilongwe University of Agriculture and Natural Resources                  |
| MITC           | : Malawi Investment and Trade Centre                                        |
| MK             | : Malawi Kwacha                                                             |
| MWCS           | : Malawi Wildlife Conservation Society                                      |
| MZUNIREC       | : Mzuzu University Research Ethics Committee                                |
| NCST           | : National Commission for Science and Technology                            |
| NGOs           | : Non-Governmental Organizations                                            |

|       |                                                                      |
|-------|----------------------------------------------------------------------|
| NRDC  | : National Research Dissemination Conference                         |
| NUS   | : Neglected and Underutilized Species                                |
| NVivo | : Non-Numerical Unstructured Data Indexing, Searching and Theorizing |
| SPSS  | : Statistical Packages for Social Sciences                           |
| TA    | : Traditional Authority                                              |
| VCA   | : Value Chain Analysis                                               |
| WCS   | : World/Wildlife Conservation Society                                |
| WESM  | : Wildlife and Environmental Society of Malawa                       |
| WWF   | : World Wildlife Fund                                                |

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## **ABSTRACT**

The crocodile is one of the most commercially valuable animal species. Its utilisation in Africa, including Malawi, is based on ranched specimens. Despite the industry's global recognition and economic potential, the production remains underdeveloped, hindered by a lack of comprehensive data. This study was therefore conducted to assess the business opportunities along the crocodile value chain in Malawi. The study specifically analysed the value chain map of the commercial crocodile farming; assessed the current status of the crocodile production, marketing and consumption; and examined types of investment required in crocodile commercialisation. A cross-sectional descriptive and explanatory research design was used. The data was collected using survey and Key Informant Interviews (KIIs). Purposive and stratified sampling techniques were employed to select 100 survey respondents and 8 key informants from the targeted crocodile farms. The actors were farmers, suppliers, exporters, the government and local communities. The value chain stages ranged from input supply to production, processing and trading of crocodile products. The study noted Shire River and Nyika Crocodile farms housed 365 and 8700 crocodiles, respectively with 200 skins exported annually. The crocodile market shows growing demand, limited supply, intense competition and increasing meat consumption. Education levels, income levels, availability, personal preference, lifestyle and brand reputation were the main factors determined crocodile consumption. The critical investments required in the commercial crocodile value chain were land, feed and nutrition, labour and infrastructure. To capitalize on the promising opportunities, government agencies, entrepreneurs and investors should invest in key areas such as crocodile stock, feed and nutrition, labour and infrastructure. The Ministry of Agriculture and relevant departments should strengthen the capacities of underrepresented actors like processing

plants and conservation organizations. The Ministry of Agriculture should assist in improving resource availability for crocodile farmers.

Key words: *Crocodile, Business opportunities, Value chain, Underutilized, Neglected*

## **CHAPTER ONE: INTRODUCTION**

### **1.1 Chapter Introduction**

This chapter provides an overview of the study about business opportunities along the crocodile value chain. It brings the background to the study, problem statement, research objectives, including research questions, justification and chapter summary. The sections provide a foundation for understanding the research context, identifying the knowledge gaps and articulating the research goals and rationale.

### **1.2 Background of the study**

Over the years, food systems globally have largely prioritised a narrow range of crops and animal products, focusing on high-yield and widely consumed staples such as maize, wheat, rice, and select livestock species. This emphasis has inadvertently led to a reduction in dietary diversity and a limited range of food choices available to consumers. The predominance of these staple foods often comes at the expense of numerous neglected and underutilised species (NUS), which hold immense potential to contribute to nutritional, economic, and environmental sustainability (Bharucha & Pretty 2010). NUS play critical roles in enhancing food diversity, preventing chronic diseases and promoting overall dietary health.

This diversity of food resources represents a form of natural wealth, particularly for biodiversity-rich countries where indigenous and traditional food systems often rely on a wide range of wild and domesticated species (Hunter et al. 2017). These underutilised species are often highly adapted to local environments, making them resilient to climate variability and well-suited for sustainable agricultural practices (Mabhaudhi et al. 2019). In addition to enhancing resilience, these species

can provide opportunities for rural communities to diversify their income streams by creating niche markets for high-value, underutilised products (Padulosi et al. 2013).

Despite their potential, NUS have historically received little to no investment in research, development, and commercialisation compared to mainstream species. This neglect stems from a lack of awareness about their nutritional and economic value, coupled with underrepresentation in national and international agricultural policies (Padulosi et al. 2013). Given the potential of NUS to contribute to sustainable food systems, it is essential to explore specific examples of these species. Crocodiles, for example, are a globally neglected and underutilised edible species despite their significant commercial value (Chen 2024). Commercial crocodile farming offers a unique opportunity to harness the economic and nutritional benefits of NUS. While crocodile meat and other products are consumed in some parts of the world, their global trade and consumption are also limited, and their potential as a sustainable food source remains underexplored. As Aus et al. (2009) further highlight, crocodiles not only offer high-value products, such as skins and meat, but also possess substantial ecological and cultural significance in many regions. By overlooking NUS therefore, food systems fail to harness their full potential to address global challenges such as malnutrition, food insecurity and poverty. Investing in the development and promotion of these species can diversify diets, strengthen local economies and contribute to more sustainable and resilient food systems. This calls for a paradigm shift in how we perceive and integrate neglected species like crocodiles into mainstream agricultural and food security strategies.

Taking this global perspective to the local context, in Malawi, crocodiles are legally protected under the Wildlife Act enacted in 1992, which prohibits their killing without a permit from the Department of Wildlife. While this regulation aims to ensure sustainable management and conservation of crocodile populations, it poses significant challenges to their full utilisation,

especially for commercial and subsistence purposes. The regulatory frameworks governing the trade and conservation of crocodiles often create barriers to sustainable use, limiting the contribution of the industry to the economic growth, employment opportunities, and socio-economic development particularly for local communities that rely on crocodiles for their livelihoods (Giampiccoli & Hayward Kalis 2012). Access to crocodile products, whether for consumption, trade, or other purposes, is also hindered by bureaucratic requirements and a lack of clear pathways for communities to benefit from these resources legally.

Additionally, the perception of crocodiles as a nuisance animal compounds their underutilisation. Many people regard crocodiles as dangerous pests due to their potential threat to livestock and human life, leading to conflict between communities and crocodile conservation efforts (Caldwell 2017). This negative perception limits the willingness of local populations to explore and adopt sustainable practices for the use of crocodiles. Further exacerbating the issue is the limited availability of data on neglected and underutilised species (NUS), such as crocodiles. Most existing information is scattered across grey literature sources and lacks accessibility, which hampers informed decision-making and investment in crocodile farming and conservation efforts (Chimonyo et al. 2022).

Investment requirements represent another significant barrier to crocodile utilisation in Malawi. Setting up crocodile farming or ranching operations necessitates significant capital investment in areas such as licensing, specialised breeding facilities, suitable land, and appropriate equipment. Studies have shown that these requirements, coupled with economic restrictions, create high entry barriers for individuals and communities seeking to engage in crocodile farming (Nature Conservation Act 1992).

Despite these challenges, crocodiles remain a valuable resource, hunted by farmers, intermediaries, and other stakeholders primarily for their hides, meat, and medicinal properties (Whiting 2013; Thorbjarnarson 1992). Crocodile skins are especially sought after in the international luxury goods market, while their meat and body parts are used for food and traditional medicine in various cultures. Moreover, crocodiles hold both moral and economic significance for tribal communities. For many indigenous and rural populations, crocodiles hold cultural significance, representing spiritual or symbolic importance. These cultural ties and the economic benefits derived from crocodile products can foster community engagement in conservation and sustainable use initiatives. However, these potential benefits can only be realised in contexts where conflicts between human and crocodile populations are minimised and effective management strategies are implemented. While crocodiles in Malawi have significant potential for economic and cultural utilisation, barriers such as legal restrictions, negative perceptions, lack of accessible data, high investment costs, and human-wildlife conflicts must be addressed. Bridging these gaps requires a balanced approach that integrates conservation efforts, community engagement, and sustainable utilisation strategies.

Historically, the demand for crocodile products has been significant. It has been estimated that world trade in crocodile skins in the late 1950s reached a peak of over 5 million skins per year. In a report by John (2020), it was indicated that the volume of world trade in classic crocodilian skins has been variable over the ten years 2009 to 2018, with an average of 1.47 million crocodile skins. The Middle East Africa region, North America, and Europe acquired a significant share of the global crocodile farming market in 2021. The presence of licensed crocodile farms and the growing exports of crocodile meat to Taiwan, China and Hong Kong are among the predominant factors driving the growth of the market in the region (Nguyen et al. 2024). The increasing demand for

exotic meat in these countries has created a lucrative market for crocodile farmers and exporters. Additionally, the increased consumption and import of crocodile meat and the high usage of crocodile body parts in the making of various pharmaceuticals and traditional medicines in China, Australia and India are also substantially contributing to the growth of the market in the Asia Pacific region.

In line with the global trends, Malawi reported exporting 12,097 skins in 2016 and a further 5,449 in 2017 from farms such as Nyika and Shire Valley, Chiwale and Koma crocodile farms (John 2020). Industry experts and informed sources within the leather trade estimate that the present total of classic skins does not exceed one third of one million. The number of tanneries processing crocodile skins has been correspondingly reduced and certain countries abroad which formerly produced high quality crocodile leather are no longer have any specialist tanneries. Crocodile skins and teeth are further used in the production of handbags and other luxury items such as shoes, belts, wallets, upholstery, furniture and necklaces. All available evidence suggests that supply is still well below demand and that demand shows no sign of weakening and the consumer demand for crocodile goods appears to be strong and the indications are that a demand could probably be rekindled in countries that have largely lost contact with the industry because of the products shortage. Although global trade patterns have undergone some shifts, France continues to hold its position as the primary importer of classic skins. According to John (2020), Italy, Japan, Switzerland, Austria, Hong Kong, Singapore and the United States are also prominent importers of crocodilian skins, and the demands for skins in these countries far surpasses the existing supply.

Despite the low supply of crocodile products to meet the demand, crocodile and crocodile ranching are a crucial income source and provide encouragement to conserve crocodiles, respectively (van der Ploeg et al. 2011). This supported a study in Zimbabwe by Hutton, Ross and Webb (2001) that

crocodile farming has the potential to generate foreign exchange for the country. In Nigeria, crocodile farmers also advocate for ecotourism, which allows people to appreciate wildlife without harming them (Ogorode, Vincent-Akpu & Babatunde 2025). Therefore, prioritising crocodile in Malawi is considered paramount to improve the resilience of food systems, income, reduce risks of nutrition and food insecurity, and enhance the livelihoods of citizens as a whole. However, businesses along its value chain are not yet clear.

### **1.3 Problem Statement**

Crocodile farming is a globally recognised economic activity, contributing to the production of high-value products such as leather, meat, and medicinal items. In Malawi, crocodile farming primarily operates through ranching specimens, which are regulated under the Convention on International Trade in Endangered Species (CITES) (Secretariat 2019). Despite its potential, the sector remains underdeveloped, with little attention paid to its broader economic prospects, particularly the business opportunities along the crocodile value chain. The sector's growth is hindered by starkly low government funding, with budget allocations between 0% and 0.2% (ActionAid 2023). This is concerning, given the significant contribution of the livestock sector including non-conventional species such as crocodile farming to the Malawi economy accounting for around 11% of GDP and 36% of agricultural GDP (Kachingwe, Banda & Phiri 2024). This limits the sector's contribution to the national economy, constrains job creation, and reduces income generation and poverty reduction opportunities for local communities who could benefit from crocodile farming and its related industries, for example the selling of locally prepared foods to tourists (Giampiccoli & Hayward Kalis 2012).

In addition, the current status of crocodile production, marketing, and consumption in Malawi has not been systematically assessed. While there are operational farms such as Shire River Crocodile

Limited (Marsh 2016) and Nyika Crocodile Farm (Chairman et al. 2004), the extent to which these farms contribute to national and local economies, including meeting domestic and export demands, remains unclear. For instance, the review by Caldwell (2012, 2017) on the global trade in crocodile skins fails to provide information on current export trends and volumes. Additionally, consumer perceptions, market trends, and challenges influencing the production and consumption of crocodile products in Malawi are poorly documented, hindering the sector's ability to expand sustainably.

Furthermore, the value chain of commercial crocodile farming in Malawi is equally underexplored. Though studies by Caldwell (2017), John (2020), and Kasapila (2023) highlighted a number of actors in the chain such as crocodile farmers, regulatory bodies, market intermediaries, research institutions, non-governmental organisations (NGOs), suppliers, processors and local communities, they just listed them without mapping. Therefore, these require detailed mapping to understand how value is created and distributed. Without this information, inefficiencies in the value chain remain unaddressed, limiting profitability and sustainability (Zamora 2016). Furthermore, the absence of comprehensive data makes it difficult for stakeholders to identify leverage points for investment and innovation in the crocodile value chain.

Supplementing this, a critical gap also exists in understanding the types of investments required to commercialise crocodile farming in Malawi. The Nature Conservation Act (1992) has focused on conservation and welfare aspects of crocodile farming, emphasizing land for infrastructure, skilled labour and adequate living conditions for breeding animals as well as disease control programs. However, its primary focus on regulatory and conservation measures failed in addressing the specific investment requirements such as land acquisition, breeding facilities, feed production, workforce training, and marketing infrastructure which are essential for scaling up the crocodile

farming (Iheanacho 2025; Amanyanya 2023; Corey 2018; Manolis & Webb 2016; Hutton, Ross & Webb 2001). This lack of information presents a significant barrier to attracting investors and developing policies that support the crocodile value chain in Malawi.

By assessing the current status of crocodile production, marketing, and consumption, analysing the value chain, and identifying critical investment needs, this research aims to provide the foundational knowledge required to guide strategic decisions and foster sustainable growth in crocodile farming in Malawi.

## **1.4 Study Objectives**

### **1.4.1 Main Objective**

To assess the business opportunities along crocodile value chain in Malawi.

### **1.4.2 Specific Objectives**

1. To analyse the value chain map of commercial crocodile farming in Malawi.
2. To assess the current status of the crocodile production, marketing and consumption in Malawi.
3. To examine types of investment required in crocodile commercialisation in Malawi.

### **1.4.3 Research Questions**

The study was guided by questions below;

1. Who are the key actors and stages involved in the value chain of commercial crocodile farming in Malawi?
2. What is the current status of the crocodile production, marketing and consumption in Malawi?
3. What are the types of investment required in crocodile commercialisation in Malawi?

## **1.5 Justification**

This study revealed the key actors' map in the commercial crocodile value chain in Malawi, which provided investors an understanding of market dynamics and potential collaborations. This further foster industry connections and supports sustainable business growth. In addition, unearthing the current status of the commercial crocodile farming can provide stakeholders with actionable insights into business opportunities along crocodile value chain, enabling informed decision-making, strategic planning and investment prioritization. Awareness of the various investments needed in crocodile commercialization such as infrastructure, equipment, land and breeding stocks help investors to develop accurate financial projections, assess return on investment and effectively plan their investment strategy. The research is crucial for achieving several sustainable development goals and Malawi vision 2063 including but not limited to; no poverty, agricultural commercialization, industrialization and human capital development on health and nutrition specifically (enabler 5). Finally, it is also useful to others especially researchers and academicians, as it provides a helpful guide for those interested undertaking the related study.

## **1.6 Chapter Summary**

This chapter has provided a comprehensive introduction to the study, encompassing the background, problem statement, and justification. Additionally, it has outlined the research objectives and questions that will guide the investigation. Having established the study's framework, the next chapter will delve into the literature review, examining existing scholarly work in relation to the study's objectives.

## **CHAPTER TWO: LITERATURE REVIEW**

### **2.1 Chapter Introduction**

This chapter elucidates the theoretical framework that guides this study including empirical literature review on the value chain map of the commercial crocodile farming; the current status of the crocodile production, marketing and consumption; and the investments required in crocodile commercialisation. The chapter commences with the theoretical framework and concludes with the review of the literature.

### **2.2 Theoretical Framework**

#### **2.2.1 Concept of Value Chain Analysis**

Value Chain Analysis (VCA) is a strategic management tool used to analyse and improve the internal and external activities of an organization, with the ultimate goal of creating a sustainable competitive advantage (Porter 1985). VCA provides a holistic perspective by viewing a company as an integral part of the broader value chain of a product which includes activities from raw material sourcing to after-sales support, supplier linkages and consumer relationships (Porter 1996). Therefore, understanding the organization's position within this chain, managers can leverage VCA to enhance the product's competitive advantage by identifying areas to increase customer value or lower costs. VCA was further recognized by Fearne et al. (2012) as a pioneering approach to building sustainable corporate value, underscoring its significance in today's business landscape. At its core, value chain analysis also requires the mapping of the market to track and analyse the contribution of the different chain actors and the relationships among themselves (Zamora 2016). By doing so, organisations can further identify areas of inefficiency, opportunities for cost reduction, and potential sources of competitive advantage, ultimately leading to improved profitability and sustainability.

The value chain analysis framework is mainly comprised of two primary categories, namely primary activities and support activities (Porter 1985). Primary activities are directly involved in the creation of a product or service and include inbound logistics, operations, outbound logistics, marketing, sales, and service. Support activities, on the other hand, provide the necessary inputs and infrastructure for the primary activities to take place, and include procurement, technology development, human resource management and firm infrastructure. By examining these activities and processes, organisations can identify opportunities for innovation, differentiation, and improvement of their products or services, ultimately leading to increased competitiveness and profitability (Ketchen & Hult 2007). The framework is also applied to study and understand the impact of globalization on industries and economies (Kaplinsky 2000). Building on this, the Global Value Chain approach assist in analysing and recognizing the intricate relationships between stakeholders in a chain and enabling the incorporation of social influences, constraints, governance structures, and upgrading strategies (Raikes, Friis Jensen & Ponte 2000). There are different types of value chains, including producer-driven and buyer-driven value chains (Gereffi & Lee 2016). However, in developing countries including Malawi, middlemen often play a crucial role, leading to a third type of value chain, the “middlemen-driven value chain” (Munshi 2014). This type of value chain is characterized by the dominance of middlemen who take a greater share of the market share, limiting upgrading possibilities for farm individuals and households (Maertens & Barrett 2013; Lee, Gereffi & Beauvais 2012).

Governance structure is further crucial aspect of value chains, referring to the coordination and related positions in finding vibrant cost advantages and allocating key players’ roles (Kaplinsky & Morris 2000). Governance involves realizing encounters between businesses in a value chain, revealing organizational forms rather than merely random interactions (Kaplinsky & Morris 2000).

The governance structure provides information concerning farm households' positions in the value chain as well as the relationships among farmers and buyers. In developing countries, the governance structure is often influenced by the presence of middlemen, who can act as market impediments and affect prices. Upgrading is another element, referring to strategies for adding value and enhancing competitiveness (Ponte et al. 2014). There are four types of upgrading opportunities: process upgrading, product upgrading, functional upgrading, and inter-chain upgrading (Ponte & Ewert 2009). Process upgrading focuses on enhancing the efficiency of external and internal processes, while product upgrading involves improving existing products and/or developing new ones. Functional upgrading is achieved when a firm changes its position within the chain to add value, and inter-chain upgrading involves moving to a new chain. Upgrading options can be specified by assessing profitability inside the chain and defining its constraints (Ponte et al. 2014). Understanding the governance structure and upgrading opportunities, stakeholders can enhance their competitiveness and shift toward higher-value activities.

This framework therefore provides a robust tool for understanding the intricacies of industries and economies. The Global Value Chain approach further enables the incorporation of social influences, constraints, governance structures and upgrading strategies, providing a nuanced understanding of the complex relationships within value chains including crocodile value chain. The analysis to the crocodile industry in Malawi offers a unique opportunity to explore the potential of this framework in a context characterized by rich biodiversity and emerging markets. By mapping the commercial crocodile actors, current production levels, consumption patterns, and marketing channels, this research provides a detailed understanding of the value chain and its governance structure. The study's findings significantly contribute to the development of

sustainable business strategies and policies that promote economic growth, job creation and environmental conservation. Specifically, the research aims to identify potential business opportunities along the crocodile value chain, such as the development of new products, services, and markets, ultimately contributing to the increased competitiveness of Malawian crocodile products in the global market. By leveraging the insights from VCA, stakeholders in the crocodile industry can make informed decisions to upgrade their value chain activities, enhance their competitiveness, and capitalize on emerging business opportunities, ultimately contributing to the growth and development of the Malawian economy as a whole (Piña et al. 2007).

## **2.3 Empirical Literature**

### **2.3.1 Crocodile Value Chain Map**

The value chain in the commercial crocodile industry relies heavily on the contributions of crocodile farmers, who are primarily responsible for breeding, rearing and managing crocodiles in captivity. A value chain is a vertical sequence of activities that lead to the delivery, consumption, and maintenance of goods and services (Sturgeon 2001). According to the review done by Hutton, Ross and Webb (2001) in Zimbabwe, a typical crocodile value chain includes various stakeholders, such as crocodile farmers, regulatory bodies, market intermediaries, research institutions and local communities. These stakeholders are key to the industry's success and sustainability. For instance, a study by Getpech (2011) in Thailand found that crocodile farmers were responsible for breeding and rearing crocodiles in captivity, while Thorbiarnarson (1999) established that globally, regulatory bodies such as CITE regulate wildlife markets and oversee the industry and ensure compliance with international standards. A study in Colombia by McGregory (2006) found that market intermediaries, such as traders, exporters, and processors, play a crucial role in linking crocodile farmers to domestic and international markets, including the lucrative luxury goods

market, which highly values crocodile leather products. Additionally, processing and tanning companies add significant value to the hides, while auction houses enable the global sale of premium crocodile products.

Globally, actors in crocodile value chain play critical roles. In a world trade crocodile skins report by Caldwell (2017), actors such as but not limited to; crocodile farmers, regulatory bodies, market intermediaries, research institutions and local communities were revealed. It was also noted that these actors are interconnected, with each playing a critical role in ensuring the sustainability and profitability of the industry. For instance, research institutions provide technical assistance and conduct research to improve industry practices, while local communities play a vital role in conservation and sustainable management (Shackleton, Ticktin & Cunningham 2018). Local communities near crocodile habitats play a crucial role in promoting coexistence with wildlife and mitigating human-wildlife conflicts. Community-based conservation initiatives not only reduce conflict but also generate income through eco-tourism and other activities.

In Africa, the crocodile value chain is distinct. Specifically, in Zambia, the crocodile value chain was found characterized by a mix of small-scale and large-scale farming operations (Manolis & Webb 2016). However, Manolis and Webb (2016) emphasised the importance of understanding the value chain to identify opportunities for improvement and address the challenges facing the industry. The Crocodile value chain is influenced by various factors, including market demand, regulatory frameworks, and disease management practices. For example, a study in Australia by Corey (2018) found that changes in market demand can impact the profitability of crocodile farming, while regulatory frameworks can affect the industry's compliance with international standards (Manalo & Alcala 2013). However, Corey highlighted that unchecked market demand can lead to exploitation, posing a significant threat to wildlife populations, potentially driving them

towards decline and extinction (Sodhi et al. 2004; Wilson et al. 2010; Eisemberg et al. 2011). To mitigate this risk, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) was established to regulate international wildlife trade and prevent species extinction. Disease management practices such as vaccination programs and biosecurity measures were also revealed critical as emphasized in a study by Manolis and Webb (2016), as they can impact the health and well-being of crocodiles, as well as the sustainability of the industry.

Further dynamism among actors was observed in Malawi's crocodile value chain. The crocodile value chain consists of actors in the production, processing and marketing of crocodile products, including crocodile farmers, regulatory bodies including the Department of Wildlife and National Parks, market intermediaries, research institutions, non-governmental organisations (NGOs) and local communities (Caldwell 2017). In a study by John (2020), it was revealed that there are five authorised crocodile farms in Malawi namely; Nyika in Salima, Shire Valley in Chikwawa, Chiwale in Thyolo, Koma in Mangochi and Shire River in Nsanje, Malawi, with no producer association. The study further stressed that Department of Wildlife and National Parks (DWNP) is the only government agency, playing a crucial role in regulating the crocodile industry (Ogorode, Vincent-Akpu & Babatunde 2025; Ityavyar, Inah & Akosim 2011), while market intermediaries, such as traders and farmers' associations, link farmers to domestic and international consumers (Shackleton, Ticktin & Cunningham 2018). According to Kasapila (2023), research institutions such as the University of Malawi and the Lilongwe University of Agriculture and Natural Resources (LUANAR), focus on research in crocodile ecology, conservation, and management. Organizations like the Malawi Wildlife Conservation Society (MWCS) and the Wildlife and Environmental Society of Malawi (WESM) work with local communities and government agencies to promote sustainable farming and conservation of biodiversity. Local communities play

a vital role in conservation and sustainable management, with community-based crocodile farming enhancing livelihoods, promoting food security, and supporting biodiversity conservation.

While existing literature provides valuable insights into the crocodile industry's dynamics, the examination reveals a significant gap in understanding the value chain of commercial crocodile farming in Malawi context. Studies conducted in other countries, such as Zimbabwe (Hutton, Ross & Webb 2001), Thailand (Getpech 2011), and Australia (Manolis & Webb, 2016), have shed light on the industry's global perspectives, but little is known about Malawi's current specific context. The lack of detailed mapping of the value chain in Malawi's commercial crocodile farming industry is a notable omission, particularly given the importance of understanding key actors and processes, including suppliers, farmers, processors, and exporters (Hutton, Ross & Webb 2001). This knowledge gap hinders efforts to address inefficiencies and promote profitability and sustainability in the industry (Zamora 2016). To bridge this gap, this study aimed to analyse the value chain map of commercial crocodile farming in Malawi, focusing on mapping key actors, processes, and value flows. This provides stakeholders with essential information to identify opportunities for investment and innovation.

### **2.3.2 The Current Status of Crocodile Production, Marketing and Consumption**

The decline of wild crocodilian populations in the 1960s and 1970s spurred the development of crocodile farming as a strategy to reduce pressure on wild populations while generating commercial incentives for their conservation (Brien et al. 2008). This shift coincided with the enactment of legislation by many countries to protect crocodilians, including the introduction of the Convention on International Trade in Endangered Species (CITES) in 1975, aimed to regulate the trade of wild species (Jelden et al. 2014). In the global study by Caldwell (2015), it was noted

that participation in international trade, these facilities need to be registered as CITES-approved captive breeding operations.

Unlike conventional livestock raised primarily for meat, crocodilians were primarily valued for their skins, which can command hundreds of dollars per unit, followed by meat (Caldwell 2017; Whiting, Williams & Hibbitts 2013). Live crocodilians are also traded globally for various purposes, such as personal pets, zoo exhibits, and breeding. Some ranches import crocodiles to diversify their gene pools, while range states use imports to strengthen wild populations (Caldwell 2012). However, data analysis of CITES reports highlights challenges in drawing precise conclusions due to the limited range of purpose codes used in reporting.

#### **2.3.2.1 Global Trends in Crocodile Trade**

The global trade in crocodile skins has experienced considerable fluctuations. From 2001 to 2010, an average of 1.3 million crocodilian skins were exported annually, peaking at 1.35 million skins in 2010. Since 2000, South Africa, Zambia, and Zimbabwe have consistently exported between 140,000 and 170,000 *Crocodylus niloticus* skins per year (Caldwell 2012). By 2015, international trade involved over 1.5 million skins per year from approximately 30 countries, highlighting the steady demand for crocodile products (Calwell 2015).

Malawi, though a smaller player in this global trade, reported exporting 12,097 skins in 2016 and 5,449 skins in 2017, primarily from ranching operations. However, trade volumes have been variable, with an average of 1.47 million skins exported annually over the period 2009–2018 (John 2020) (Figure 1). The primary markets for *Crocodylus niloticus* meat include Europe, Hong Kong, and China, with exports reaching a peak of over 475 tonnes in 2007 but later declining to less than 200 tonnes by 2010.

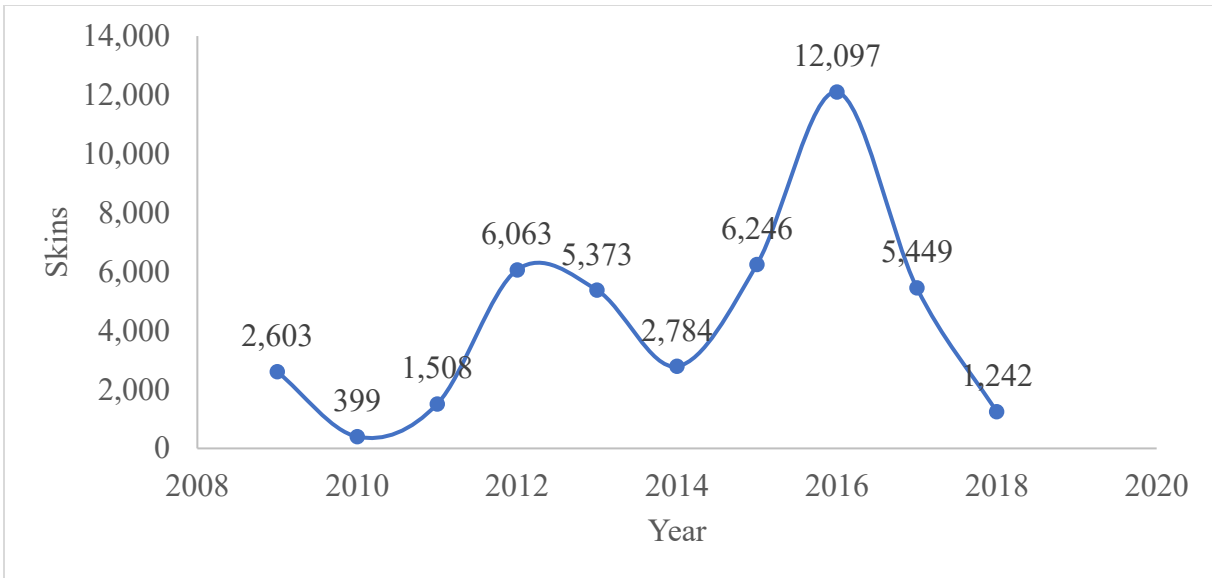


Figure 1: Direct, commercial exports of *Crocodylus* skins from Malawi, 2009-2018.

Live crocodilians are traded for many purposes. Young animals are frequently kept as personal pets; circuses and zoos regularly exhibit such creatures and there are well-established crocodile breeding establishments in many countries including Morocco and Malawi. Crocodile farms and ranches import animals to supplement their gene pool and some animals are imported by range States in order to strengthen wild populations. This variety of use, and the limited number of possible purpose codes used in CITES annual reports, means that some conclusions drawn from analysis of CITES data are only tentative (Caldwell 2012).

### 2.3.2.2 Consumption and Historical Context

The European Union has witnessed a significant increase in imports of fresh, chilled or frozen crocodile meat in recent years. This upward trend is attributed to the growing perception of crocodile meat as not only exotic but also dietary and healthy, owing to its low fat and sodium content and high protein percentage. According to Tosun (2013), the demand for crocodile meat has grown, with one South African farm processing over 20,000 specimens annually and marketing

the meat in many European and far Eastern countries. The European Union's average annual import of reptile meat, including crocodile, reaches almost 100 tons, with a growth of over 50% in imported quantities between 2007 and 2017 (Zhang et al. 2021).

The main importers of reptile meat into the EU are South Africa, the United States, and Zimbabwe, with a total value increasing from €80,000 in 2002 to €475,000 in 2005. The majority of trade is either imported or exported via Belgium, France, Germany, the Netherlands, or the United Kingdom (European Food Safety Authority (EFSA) 2007). Crocodile meat is considered a novel food in the EU, and as such, it is subject to specific regulations. Commission Implementing Regulation (EU) 2021/405 defines reptile meat as edible parts obtained from farmed reptiles belonging to specific species, including *Alligator mississippiensis*, *Crocodylus johnstoni*, *Crocodylus niloticus*, *Crocodylus porosus*, and others.

Crocodile farming is a growing industry, with several species farmed worldwide, including the Nile crocodile (*Crocodylus niloticus*), freshwater crocodile (*Crocodylus johnstoni*), Siamese crocodile (*Crocodylus siamensis*), saltwater crocodile (*Crocodylus porosus*), alligator (*Alligator mississippiensis*), and caiman (*Caiman yacare*). These species are farmed in various countries, including Australia, Papua New Guinea, Thailand, Cambodia, Egypt, Madagascar, Kenya, Zimbabwe, Tanzania, Seychelles, Comoros, South Africa, Israel, Indonesia, France, Japan, United Kingdom, and Spain. In South Africa, crocodile meat is marketed as a delicacy, with many farms and restaurants offering crocodile dishes and specialties, such as paté, kebab, sausages, smoked crocodile carpaccio, and more (Uys 2019; Fasulkova, Strateva & Stratev 2024). Crocodile meat and eggs have further historically served as a protein source for indigenous communities around the world (Klemens & Thorbjarnarson 1995, Maisuthisakul 2015). This traditional practice is not

only a vital source of nutrition but also holds significant cultural, spiritual and economic importance for many indigenous communities worldwide (van der Ploeg et al. 2011). Research indicates that crocodile meat is nutrient-dense, offering high protein, low fat and rich micronutrients, making it a valuable part of a healthy diet (Hoffman & Cawthorn 2012). In Australia's Northern Territory during the 1970s, crocodile nests were harvested, and landowners were compensated with chicken eggs to offset nutritional losses. Similarly, in Malawi, crocodiles have cultural and economic significance, often used for meat, hides, and traditional medicine (Whiting, Williams & Hibbitts 2013).

#### **2.3.2.3 Determinants of Crocodile Production and Consumption Trend**

The crocodile industry is influenced by various factors that affect production and consumption patterns. Education level and income level were crucial determinants of crocodile production, with individuals possessing tertiary education and high-income levels being more likely to venture into commercial crocodile farming in Nigeria, Australia and Uganda (Ogorode, Vincent-Akpu & 2025; Tisdell 2005; Amany 2023). In Australia, Tisdell (2005) reported that the high initial cost of setting up a crocodile farm was a significant requirement for entrants into the industry. The demand for crocodile products is driven by both domestic and international markets, with countries like Singapore, China, India, South Africa, and the European Union importing skins from Malawi. The market is characterized by intense competition over high-quality skins and meat, driven by the growing demand for luxury crocodile products, particularly in Asian markets (Jansen van Rensburg 2017; Thorbjarnarson 1999).

The consumption patterns of crocodile meat are influenced by factors such as education level, income level, availability, personal preference, lifestyle, and brand reputation. Research in Kenya suggests that education may not necessarily influence crocodile meat utilization (Mosse, Odadi, &

Kibue 2024). However, affluent individuals are more likely to purchase luxury food products like crocodile meat, and consumers are more likely to purchase crocodile meat if it is readily available (Jansen van Rensburg 2017). Personal preference and lifestyle also play a significant role, with individuals who value exotic and luxury food products being more likely to consume crocodile meat. Brand reputation is crucial, with consumers willing to pay a premium for high-quality crocodile meat products from reputable sources (Uys 2019; Jansen van Rensburg 2017). The significance of brand reputation and certification of origin in influencing consumers' purchasing decisions for crocodile products has also been highlighted in South Africa (Jansen van Rensburg 2017).

#### **2.3.2.4 Industry Challenges and Opportunities**

The crocodile production and ranching industry faces several challenges, including underinvestment, policy constraints, and limited indigenous participation. Obtaining annual operating licenses and fulfilling reporting requirements pose barriers to commercial crocodile farming, especially when compared to the relatively barrier-free livestock industry (Manolis & Webb 2016). This lack of investment and frustration with government support has led some ranchers to disinvest, potentially undermining the sector's sustainability.

Despite these challenges, the global demand for crocodile products remains strong, driven by their use in luxury items such as handbags, belts, and wallets (Zietsman 2017). The growing global demand for crocodile meat and skins presents a significant opportunity for Malawi to tap into this market and commercialize its crocodile industry. Developing supportive policies, infrastructure, and market connections can enhance the industry's contributions to the economy while promoting sustainable wildlife management.

Crocodile farming and ranching offer an opportunity for foreign exchange earnings (Hutton, Ross & Webb 2001), while also enhancing rural households through job creation and community engagement in conservation efforts. In Zambia, Lindsey et al. (2013) found that if well supported, crocodile farming can diversify income streams, enhance conservation efforts, and contribute to achieving national development goals. Sustainable crocodile farming can generate significant economic benefits, including job creation and revenue. Moreover, crocodile farming can also contribute to conservation efforts by reducing the demand for wild-caught crocodiles and promoting the conservation of wild populations (van der Ploeg et al. 2011). However, the current state of the industry requires significant reform, including a more enabling legislative framework and targeted investments to unlock its full potential (Caldwell 2017).

The literature therefore, found mentioning global trends and statistics. However, it fails to provide a clear picture of the current status of crocodile production in various countries, including Malawi. For instance, the review cites Caldwell (2012) on the global trade in crocodile skins, but it does not provide information on Malawi's current export trends and volumes. Similarly, the review discusses the European Union's import of reptile meat, including crocodile, but it does not provide insights into Malawi's domestic market and consumption patterns.

Additionally, the extent to which the existing farms contribute to national and local economies, including meeting domestic and export demands, remains unclear (Marsh 2016; Chairman et al. 2004). Furthermore, consumer perceptions, market trends and challenges influencing the production and consumption of crocodile products are poorly documented. Given the lack of clarity on official product exports, such as skins, from 2018 onwards, and the current meat consumption patterns and predictors influencing production and consumption being grey areas,

the objective to assess the current status of crocodile production, marketing, and consumption in Malawi is well justified and timely.

## **2.4 Types of Investment Required in Crocodile Commercialisation**

Crocodile farming necessitates a wide range of investments to ensure sustainable and profitable operations. These include logistical and communication investments, infrastructure development, breeding stock, labour and management, research and development, marketing and value-added products, feeding and nutrition, disease control, hatchling care, and maintenance of captive breeding facilities. Each investment area plays a critical role in optimising productivity and addressing challenges within the crocodile farming industry.

Globally, the crocodile industry requires investment in sustainable and responsible practices to ensure its long-term viability. In Northern Australia, the crocodile industry was reported to be a model of sustainable conservation because of its ability to balance environmental conservation with economic benefits (Isberg 2016). Similarly, a study conducted by the International Union for Conservation of Nature (IUCN) found that sustainable and responsible practices can improve the conservation of wild crocodile populations and their habitats (Hlaing 2019). According study conducted by Atanga (2019) at the Paga crocodile ponds in Ghana, sustainable and responsible practices can also improve the social and economic benefits of the industry, by promoting fair trade and fair labour practices.

In Africa, the crocodile industry requires investment in capacity building, training, and extension services to improve the skills and knowledge of farmers, processors, and marketers. A study conducted in Uganda by Amanywa (2023) found that capacity building and training programs can

improve the productivity and efficiency of crocodile farmers, leading to increased income and improved livelihoods. The crocodile industry requires investment in infrastructure, technology, and marketing to increase efficiency, productivity, and market access (Hutton, Ross, & Webb 2001). Similarly, a study conducted in Australia by Corey et al. (2018) found that investment in infrastructure, such as farms and processing facilities, can improve the efficiency and productivity of the industry.

Further, the crocodile industry requires investment in infrastructure, technology and marketing to increase efficiency, productivity and market access. A review of aquaculture conducted by Iheanacho (2025) in Africa found that investment in infrastructure, such as farms, processing facilities and transportation networks, can improve the efficiency of crocodile farming. Similarly, a study by Manolis and Webb (2016) in Zambia found that investment in technology such as breeding and feeding systems can improve the quality and quantity of crocodile products. According to Hutton, Ross and Webb (2001), investment in marketing and promotion can also increase demand and market access for crocodile products, leading to increased income and improved livelihoods for farmers and processors. In Vietnam, Nossal et al. (2016) found that market development and promotion programs can increase demand and market access for crocodile products, leading to increased income and improved livelihoods for farmers and processors. Similarly, in South Africa, market development and promotion programs can improve the competitiveness and sustainability of the industry, by promoting high-quality products and services (McGregor 2006).

High-quality breeding stock is a critical investment to maintain the genetic diversity and health of farmed crocodiles. Genetically superior breeding animals in Zambia were found contributing

significantly to farm productivity and the quality of crocodile products (Manolis & Webb 2016). Similarly, skilled labour and effective management are indispensable. This was supported by research results by Amanywa (2023) at Lake Victoria and Victoria Nile River in Uganda which advocated for investment in training programmes and the recruitment of experienced personnel to ensure efficient farm operations and animal welfare. The study found that local communities who have successfully acquired training in egg collection and hatching in Uganda got employment opportunities in incubation and ranching stations. This implies that community conservation can be an effective approach to fostering positive human-crocodile relations, provided that ranching programs are supported by a favourable regulatory framework.

Research and development play a crucial role in improving the efficiency and profitability of crocodile farming operations. It drives innovation and improvement in farm husbandry practices. According to Hutton & Webb (2016), pioneering research in Australia has significantly advanced understanding of crocodilian farming, enabling the development of best management practices. Ongoing scientific research informs farm husbandry practices, while also stimulating industry growth and ensuring compliance with animal welfare standards. A study by Corey et al. (2018) in Australia argued that investments in innovative production techniques, disease management and product development can provide a competitive edge. Research partnerships and the adoption of advanced technologies further contribute to improving production processes and marketability.

Marketing and the development of value-added products are vital for maximising revenue. Zietsman (2017) in South Africa found that investments in branding, packaging, and targeted marketing strategies enable crocodile farms to access lucrative markets. Value-added products,

such as high-end leather goods and gourmet crocodile meat, offer additional revenue streams, thereby increasing the profitability of the farming enterprise.

Nutrition is a critical factor in crocodile farming. Study by Fasulkova, Strateva and Stratev (2024) and Beyeler (2019) in South Africa emphasised the importance of feeding systems that optimise growth rates while minimising costs. Crocodiles are typically fed diets that include red meat and poultry by-products, which are expensive due to their high-water content. Developing manufactured feeds with better nutrient profiles can improve cost efficiency and reduce waste. Proper feeding practices are particularly crucial for juvenile crocodiles, which consume 15–20% of their body weight in food weekly at optimal temperatures. Study by Tosun (2013); Blessing et al. (2014) and Brien et al. (2007) indicated that the diet of crocodilians evolves as they grow. Juveniles primarily feed on invertebrates like crayfish and insects, while larger ones shift to consuming fish and eventually larger prey such as mammals, reptiles, birds (Veldsman 2019), and even smaller crocodilians.

Effective disease prevention and management are essential for maintaining the health and productivity of crocodile farms. The Nature Conservation Act (1992) outlines the importance of disease control programmes that address internal and external parasitism, bacterial infections, and other health concerns. Farm managers must promptly seek veterinary expertise to address outbreaks and maintain high survival rates.

Hatchling care is another critical aspect of crocodile farming. Piña et al. (2007) unearthed that incubation conditions significantly influence post-hatching growth and survival. The study further found that hatchlings incubated at 31°C were larger than those incubated at 29°C and 33°C. Additionally, females (incubated at 29°C and 31°C) exhibited faster growth rates than males

(incubated at 33°C) over a one-year period. This suggest that high incubation temperatures may have long-term effects on post-hatching growth, although further research is needed to confirm this.

Maintaining a captive breeding colony is both challenging and expensive, requiring significant investments in land, construction, and resources. The Nature Conservation Act (1992) underscores the importance of ensuring adequate living conditions, water, and feed for breeding animals. Diet is a key factor in breeding success, with red meat-based diets shown to enhance fertility and hatchling survival rates compared to fish-based diets. Establishing a breeding herd is a long-term commitment, as many commercially important crocodilian species take years to reach reproductive maturity.

Notably, these studies were conducted in diverse geographical contexts including Australia (Isberg 2016; Corey et al. 2018), Ghana (Atanga 2019), Uganda (Amanya 2023), Zambia (Manolis & Webb 2016), and Vietnam (Nossal et al. 2016). The review revealed various investment areas along the value chain such as infrastructure development, breeding stock, labour and management, research and development, marketing, feeding and nutrition, disease control, hatchling care and maintenance of captive breeding facilities, which are essential for scaling up crocodile farming (Iheanacho 2025; Amanya 2023; Corey 2018; Manolis & Webb 2016; Hutton, Ross & Webb 2001). However, they did not provide a clear understanding of the current status of these investment areas in Malawi. Therefore, examining the types of investments required in crocodile commercialization became one of the interesting areas of focus to provide valuable insights into the investment requirements for crocodile farming in Malawi.

## **2.5 Chapter Summary**

This chapter reviewed the theoretical framework and empirical literature on Malawi's commercial crocodile value chain, covering its mapping, current production and market dynamics and investment requirements for commercialization. The findings provide a foundational understanding of the industry, paving the way for the methodology outlined in the next chapter.

## **CHAPTER THREE: METHODOLOGY**

### **3.1 Chapter Introduction**

This chapter describe the methodological framework underpinning the business opportunities along crocodile value chain in Malawi. The chapter includes details on study areas selection and designs such as a cross-sectional descriptive and explanatory, collecting data from farms and local communities. The study employed a mixed methods approach, integrating both quantitative and qualitative data. The chapter further includes details on sample size calculation, sampling techniques, data collection methods, data management methods, data analysis techniques to the respective specific objective under study, ethical considerations. The chapter concludes with study limitations and mitigation measures.

### **3.2 Study Area**

The study areas for this study were: Shire River Crocodile Limited in Nsanje (Marsh 2016) in the Southern Region, Nyika crocodile ranching in Salima (Chairman et al. 2004), in the Central Region and their respective surrounding communities (Figure 2). For Shire River Crocodile Limited, the study was conducted in two distinct locations; Shire River Limited at Kaombe, TA Mbenje, in Nsanje. The surround communities rely on farming as their main source of livelihood. During periods of food shortages, many households in the area surrounding Shire River Crocodile farms consumes water lilies (Tenthani 2005). Crop yields and cultivated areas in the areas fluctuate annually, with many farmers recently experiencing crop failure, primarily attributing it to climatic factors such as unpredictable rainfall, rising temperatures, and severe flooding (Forsythe and Turpie 2016). The communities surrounding crocodile farms were therefore focused for the study due to their proximity and employment opportunities in farms, which enables them to have firsthand experiences and insights into the operations, challenges and opportunities within the

crocodile industry. Their closeness to the farms allows for a deeper understanding of the value chain including production, marketing and consumption patterns (Llobet & Seijas 2002). Additionally, these communities are likely to be directly affected by the farms' activities, making their perspectives and experiences crucial for informing sustainable conservation and commercialization efforts (Hutton, Ross & Webb 2001). The proximity also presents opportunities for identifying potential investment requirements and business opportunities that can benefit both the industry and the local communities, aligning with the principles of integrated conservation and development (Van Weerd 2002). Crocodile farms were ideal study areas for this research due to their comprehensive involvement in various stages of production, from breeding and raising crocodiles to processing and marketing their by-products.

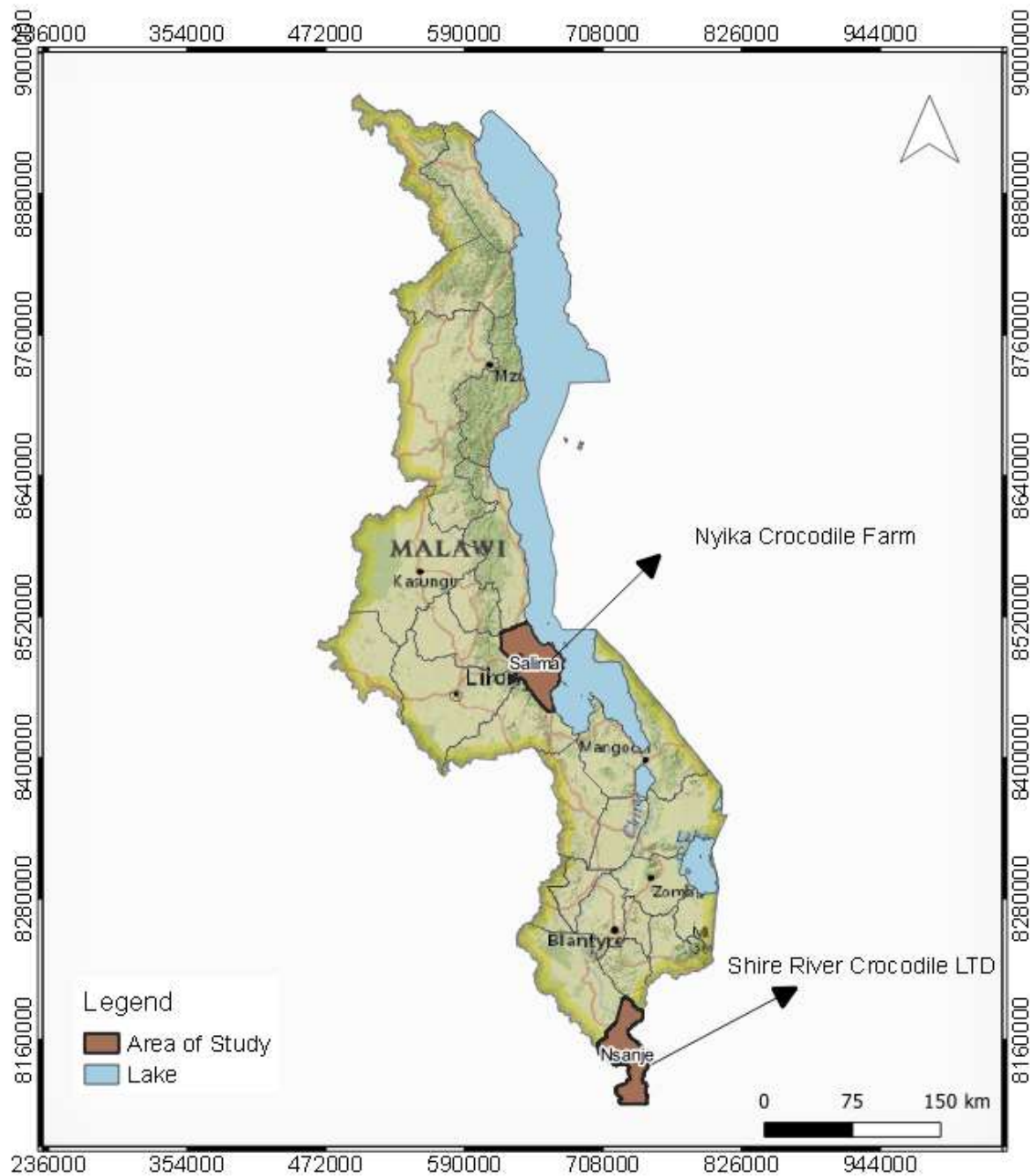


Figure 2: Map of Malawi showing the study areas

### 3.3 Study Design and Approaches

A cross-sectional descriptive and explanatory research design was employed. This design combined the strengths of descriptive research, which profiles characteristics and trends (Creswell

2014), with explanatory research, which explores the relationships between variables and the underlying reasons for observed phenomena. The research used case studies to gather both qualitative and quantitative data simultaneously through in-depth interviews and surveys (Marczyk, Dematteo & Festinger 2010). By employing a mixed-methods approach, the study integrated quantitative and qualitative data to gain a more nuanced understanding of the research issue (Leech 2010; Johnson & Onwuegbuzie 2004). The convergent-parallel strategy and parallel databases design enabled the simultaneous collection and integration of diverse data sources (Edmonds & Kennedy 2016). The cross-sectional design was selected for its efficiency, cost-effectiveness, and brevity (Cummings 2018), facilitating data collection from a large sample at a single point in time (Olsen & St George 2004). This design allowed for the examination of multiple variables and their relationships, providing a snapshot of the factors influencing commercial crocodile farming and its value chain. The case study approach facilitated an in-depth exploration of the dynamics of commercial crocodile farming, particularly in relation to the value chain map, production, marketing, and consumption. The case study yielded detailed insights into individual behaviors and perspectives, enhancing knowledge of investment requirements and opportunities in the industry (Marczyk, Dematteo & Festinger 2010). Although the findings may not be generalizable to the broader population (Feagin, Oram & Sjoberg 1991), the study's mixed-methods approach and case study design provided a comprehensive understanding of the research issue, capitalizing on the strengths of both qualitative and quantitative data. A survey was included to complement the case study's limitations in explaining causality. While cross-sectional studies have limitations, particularly in establishing causality (Olsen & St George 2004), the study's design and approach enabled a thorough exploration of the research issue.

### 3.4 Sample size calculation

Determining the optimal sample size is a crucial aspect of research design, as it directly impacts the validity and reliability of study findings. The size of a sample is a crucial aspect of any study or investigation that seeks to draw conclusions about a larger population based on a subset of it. A carefully calculated sample size ensures that the results are representative of the target population, while minimizing errors and biases. According to Cochran (1977), sample size calculation for both known and unknown population under the study should take into account key statistical factors such as the desired confidence level, margin of error, and variability within the population. Furthermore, Cochran (1963) elucidated approach and formula for estimating the sample size required to achieve a specified level of precision. The formula is particularly useful when the population size is large or unknown, as it provides a reliable estimate of the sample size needed to make inferences about the population.

For this study therefore, sample size for community members was determined using Cochran (1963) formula for unknown population illustrated below;

*Equation 1:*

$$n = \frac{Z^2 p (1 - P)}{e^2}$$

Where:

$Z$ =Z-score

$e$  =Margin of error

$P$ = Standard of deviation

$n$ =sample size

Therefore, confidence level at 95%, Confidence level turn into Z- score=1.96, Standard deviation =0.5, the research results tolerated 10% errors (0.1)

$$n = \left( \frac{1.96^2 \times 0.5 \times (1-0.5)}{0.1^2} \right) = 96.04$$

$$= 96 \text{ (rounded)}$$

Based on the formula, the sample size for the study was 96. Contrary to initial sample size distribution, farm workers comprised a smaller proportion of the sample due to the limited number of crocodile farms in operation, hence, census was employed (Israel 2013). In addition, each farm had a relatively small workforce, exacerbating the constrained supply of eligible participants. However, the researcher managed to interview 100 respondents from two sub-groups, namely community members and crocodile farm workers. Specifically, 20 workers were employed in the crocodile farms, and out of 96, 80 community members, which is acceptable, were interviewed (Vasileiou et al. 2018) (Table 1).

Table 1: Sample size distribution across study areas

| Target                    | Sample (n)                  |
|---------------------------|-----------------------------|
| Nyika Crocodile farm      | 10                          |
| Shire River Crocodile LTD | 10                          |
| Community members         | 80 (40 from each community) |
| <b>Total</b>              | <b>100</b>                  |

### **3.5 Pilot survey**

Prior to the main study, a pilot survey was conducted with a group of 10 respondents utilizing purposive sampling. This preliminary exercise, as noted by Wadood, Akbar and Ullah (2021) is crucial for testing research design, data collection methods and survey instruments. By identifying and addressing potential issues such as ambiguous questions and logistical challenges, the pilot survey enables researchers to refine their approach, ultimately enhancing the reliability, validity and quality of the questionnaires and primary research data.

### **3.6 Sampling techniques**

#### **3.6.1 Purposive sampling**

Crocodile farms and communities of focus were purposively selected for the study. Purposive sampling is a strategy that involves recruiting participants based on pre-defined criteria relevant to the research questions (Lopez & Whitehead 2013). Also known as judgment sampling, purposive sampling targets participants who can offer valuable insights and in-depth information, specifically those with relevant experience, status, or specialized knowledge that aligns with the research objectives.

#### **3.6.2 Stratified sampling**

Stratified sampling technique was further employed to determine the respondents from crocodile farms and surrounding communities. The population was divided into two main strata: crocodile farm workers and community members (Etikan & Bala 2017). The crocodile farm workers stratum included all accessible workers from the two focused crocodile farms, thereby ensuring that the entire population of interest was captured (Israel 2013). The community members stratum comprised individuals residing in the surrounding communities. Random sampling was used to select 80 community members, while a census approach was used for the crocodile farm workers

due to their limited number. This approach allowed for a more representative sample, reducing the risk of over or under-representation of certain groups and increasing the generalizability and validity of the study (Cochran 1977).

### **3.7 Data collection methods**

The data needed for this study were both quantitative and qualitative. The quantitative data was collected using questionnaire survey and the qualitative data was collected using checklist.

#### **3.7.1 Questionnaire survey**

For direct data, a semi-structured questionnaire was used to collect information on the value chain map of the crocodile farming, the current status of crocodile production, marketing, and consumption, as well as the investments required for commercial crocodile farming. The questionnaire was administered face to face to crocodile farm managers, crocodile feeders, crocodile skimmers, including other ground labourers, tour guides and community members surrounding targeted crocodile farms. Therefore, the questionnaire included both closed and open-ended questions, capturing data on respondents' demographics, such as education level, gender, marital status, income level, tribe, religion, and age. The questionnaire also included many questions that recorded different variables addressing the subject matter. Prior to conducting the semi-structured interviews, the researcher informed participants about the study's purpose and guaranteed the confidentiality of their responses (Bryman 2016). This ensured that participants felt comfortable sharing their thoughts, opinions and increased the validity of the data collected.

#### **3.7.2 Key Informant Interviews (KIIs)**

Key informant interviews (KIIs) are a qualitative research approach that involves conducting in-depth interviews with a select group of individuals who possess specialized knowledge, expertise, and insights on a particular subject, thereby providing valuable information and ideas (Kumar

1989; Marshall 1996). However, the high regard for key informants' status and expertise can lead to an inadvertent hierarchy, where their knowledge is perceived as more valuable than that of "ordinary" people, potentially skewing the research findings (Lokot 2021). To mitigate this, researchers used interview guides to structure the conversations and ensure comprehensive coverage of objectives, while also acknowledging the potential for biases and limitations in the informants' responses (Homburg et al. 2012). To enhance the accuracy and reliability of the findings, researchers triangulated KII data with other sources such as surveys to estimate measurement error and validate the results (Burgess 2003). A strategic selection process is therefore essential to identify and recruit a diverse range of informants, capturing a broad spectrum of viewpoints and experiences, which enables researchers to identify common themes, acknowledge differing opinions and develop an explicit understanding of the research topic. By incorporating multiple informants and perspectives, researchers can therefore balance knowledge and expertise, identify assumptions, reduce bias, and ultimately enhance the robustness, credibility, and comprehensiveness of their findings (Cossham and Johanson 2019).

Given the limited number of crocodile farms found operating, a total of eight key informants were identified and interviewed (Table 2). Although this exceeds the recommended 3-6 key informants suggested by Palinkas et al. (2015) for achieving thematic saturation, the researcher ensured that all aspects of the study were comprehensively covered, thereby providing a rich and detailed understanding of the subject matter.

Table 2: Categories of interviewed key informants

|              |                           | <b>Crocodile farms</b> |                    |                  |
|--------------|---------------------------|------------------------|--------------------|------------------|
| <b>#</b>     | <b>Key Informants</b>     | <i>Nyika</i>           | <i>Shire River</i> | <b>Sub-total</b> |
| 1            | Farm manager              | 1                      | 1                  | 2                |
| 2            | Crocodile feeder          | 0                      | 1                  | 1                |
| 3            | Tour guides               | 1                      | 1                  | 2                |
| 4            | Community representatives | 1                      | 2                  | 3                |
| <b>Total</b> |                           |                        |                    | <b>8</b>         |

### 3.8 Data management methods

#### 3.8.1 Quantitative data

Several data management methods and processes to ensure the integrity, reliability and accuracy of the research results were employed. These methods included such as data collection/generation, data processing and conversion, data analysis, data utilization, data storage, data backup, data security and confidentiality, data retrieval and data re-use (Owan & Bassey 2019). Data collection/generation is a critical step in the research process, and it involves generating or collecting data using appropriate instruments and methods. In this study, data was collected using a household survey. The quantitative data collected through the Kobo platform acted as a server for the data that was collected, ensuring efficient data management. A set of measures were taken to ensure quality assurance, including pilot survey to test the quality of the questionnaire. The questionnaire was programmed in Android Tablets using Kobo collect, which had built-in quality control checks.

Once the data was collected, it underwent cleaning, processing and conversion to transform it into meaningful information. Following data processing, data analysis was conducted to derive meaningful insights from the data. Data analysis techniques such as descriptive and inferential statistics were employed to understand the hidden truths behind the collected data (Model 2016). The analysis was done using the Statistical Packages for Social Scientists (SPSS version 27) computer software. Computerized techniques outperform manual methods in terms of speed and efficiency when it comes to data management and analysis (Owan & Bassey 2018). The results of the data analysis were then utilized to make informed decisions and solve problems. Data utilization refers to the process of using research data to reach an end, providing evidence or justification for claims and speculations made in formulating hypotheses (Miller et al. 2018). In this study, the findings from data analysis were used to inform business decisions and contribute to the growth and development of the crocodile industry.

To ensure the integrity and availability of the research data, a robust data storage system was implemented. Data storage is critical for future investigations, allowing researchers to retrace back and verify results if errors are found. Data backup was also conducted to prevent data loss, with multiple copies of data stored in different locations and media. Data security and confidentiality were further prioritized to prevent unauthorized access to the data. Measures were taken to protect the data from theft, alteration, hacking, and viruses, including the use of anti-viruses, firewalls, passwords and folder locks. Data confidentiality was also maintained by ensuring that sensitive information was not disclosed without authorization. In addition to these measures, data retrieval and re-use were also considered. Data retrieval refers to the process of regaining access to stored data, allowing individuals to make use of data that were previously stored (Miller et al. 2018). Data re-use, on the other hand, involves using existing data to solve new problems or validate the results

of earlier studies. By employing these data management methods and processes, the integrity and reliability of the research findings were ensured.

### **3.8.2 Qualitative data**

The study employed a systematic approach to manage qualitative data from Key Informants (KIs), involving several phases. Data collection entailed recording qualitative data from KIs in the field using a smartphone while taking notes to ensure quality. The data was then managed through a series of phases, including data transcription, data organization, sorting data into relevant topical categories, data coding, and theme identification (Saldaña 2013). The data analysis process was supported by NVivo 14 software, which facilitated the organization and analysis of the data. The NVivo outputs were stored in multiple folders for security, ensuring safe storage and easy retrieval (White et al. 2012). By employing this systematic approach to data management and analysis, the study maintained the trustworthiness and rigor of the research (White et al. 2012).

## **3.9 Data Analysis**

### **3.9.1 Quantitative data analysis**

The data collected using a semi-structured questionnaire were captured in SPSS Version 27. For the first objective, descriptive statistics (percentage) were employed. Descriptive statistics involve the use of statistical methods to summarise and describe the basic features of data (Johnson 2014). On this objective, descriptive statistics were utilised to provide an overview of the value chain actors. In addition, functional analysis, a methodological approach that examines the functions and interactions of different components within a system (Bryman 2016), was also applied to map the value chain actors by providing a structured framework for understanding their roles, interactions and contributions to value creation within the value chain.

Descriptive statistics (frequency and percentage) were also utilized on the second objective to identify the key variables influencing the current commercial crocodile farming status including the quantity exported, breeding purposes and challenges faced in commercial crocodile investment. Furthermore, multivariate analysis was employed to explore the interactions between dependent predictors such as (gender, age, education level, disability, religion, tribe, income level, marital status) and the response, crocodile production. Multivariate analysis is a statistical technique used to examine the relationships between multiple independent variables and a single dependent variable (Afifi et al. 2019). Linear regression analysis, a statistical method used to model the relationship between a dependent variable and one or more independent variables (Gujarati 2021), was also used to establish the factors that determined crocodile consumption including education levels, income levels, availability, personal preferences, lifestyle and brand reputation.

Descriptive statistics analysis was further used to establish the primary investments required in commercial crocodile value chain including land, feed and nutrition, labour and infrastructure. Binary logistic regression was further applied in order to find out the critical investment required in crocodile commercialization amongst crocodile farmers. Binary logistic regression is a subset of the binomial family used to model the probability of a binary outcome (success or failure) based on one or more predictor variables (Hosmer, Lemeshow, & Sturdivant 2013). The results were presented in form of tables, figures and themes.

### **3.9.2 Qualitative data analysis**

To address all the study objectives, a qualitative analysis was further conducted. All KIIs were recorded using a smartphone, and detailed summaries were written while in the field. Recordings were transcribed verbatim and translated by the researcher who conducted the interview. This

method enabled the researcher to provide contextual information necessary for interpretation in all study's objectives, while also maintaining the translated meaning as close as possible to the original. Pre-coding was done in NVivo 14. Then, the codes were populated with relevant text and where required, new codes and child-nodes were coded. Then, thematic and content analysis were done after exporting the texts from the package.

### **3.10 Ethical consideration**

The ethical approval was sought from Mzuzu University Research Ethics Committee (MZUNIREC). Permission from the respected authorities of the study sites was also obtained. Therefore, application letters were sent to the Directors of Crocodile farms and other stakeholders.

The researcher ensured that consent is obtained from study participants. In research, it is imperative that consent should be given freely. Voluntary consent was obtained upon full explanation of what was to be involved in the research. To achieve this, the researcher ensured that participants understand what is to be asked of them, and that the involved persons are competent to give consent. This means; to participate in the research study, participants were needed to be adequately informed about the research, comprehend the information, and have the power of freedom of choice to allow them to decide whether to participate or decline. Participants' agreement to participate in this study was obtained only after a thorough explanation of the research process. On the same note, as regards voluntary participation, informed consent, and harmlessness, the researcher explained to study participants that their participation in the study is voluntary, and that they have the freedom to withdraw from the study at any time without any unfavourable consequences, and that they cannot be harmed as a result of their participation or non-participation in the study.

All participants were required to provide written informed consent to ensure they understood the study's purpose, risks and benefits, and to confirm their voluntary participation. The potential participants were approached individually and given an explanation of the purpose of the study and data collection process. They were also given an appropriate time to ask questions and address any concerns. It was further explained that as their participation is voluntary, refusing to participate or withdraw from the study while in progress will not affect their job in any way. Consent to record the interview was also asked of them.

The anonymity and confidentiality of the participants was preserved by not revealing their names and identity in the data collection, analysis and reporting of the study findings. Privacy and confidentiality of the interview environment was managed carefully during telephone communication, interview session, data analysis and dissemination of the findings.

### **3.11 Study limitations and mitigation measures**

During data collection, it was challenging to meet all respondents from the farms because they were always busy, except during lunch hours on the scheduled days. The researcher therefore utilized these lunch hours to meet the respondents, ensuring that the data is collected.

### **3.12 Chapter Summary**

This chapter outlined the methodological framework of the study, covering study area, research design, sample size calculation, sampling techniques, data collection, data management, data analysis, ethical considerations, study limitations and mitigation measures. With the methodology established, the next chapter presents the study's findings.

## **CHAPTER FOUR: RESULTS**

### **4.1 Chapter introduction**

This chapter provides key findings of subject matter, the commercial crocodile farming industry in Malawi, aligning them with study's objectives. The chapter start by detailing the value chain map of the industry followed by the current status of crocodile production, marketing and consumption. The chapter concludes with the critical investments required for commercial crocodile farming in Malawi.

### **4.2 Demographic characteristics of the respondents**

Based on the data collected, 44.4% were females and 55.6% were males. The average age of the respondents was 35 years, and their monthly income was 912,344 Malawi Kwacha. Regarding the highest level of education attained, the majority (40.4%) attended secondary school, followed by those who attended primary school (40.4%) and tertiary education (10.1%). The least represented group among the respondents were those with disabilities (5.1%). Concerning marital status, 88.9% of the respondents were married, 9.1% were divorced and 2.0% were widowed.

### **4.3 The Value Chain Map of Commercial Crocodile Farming.**

#### **4.3.1 Actors in the crocodile value chain**

The main actors found participating in the commercial crocodile value chain were farmers, suppliers, exporters, government, wholesalers, retailers, processing plants, local communities, restaurants, conservation organizations, Non-Governmental Organizations and the international partners (Figure 3). The most reported actors by survey respondents were farmers (89.3%), exporters (80.5%) and government (77.95%). The least actors were the processing plants, conservation organizations and Non-Governmental Organizations (0.9%).

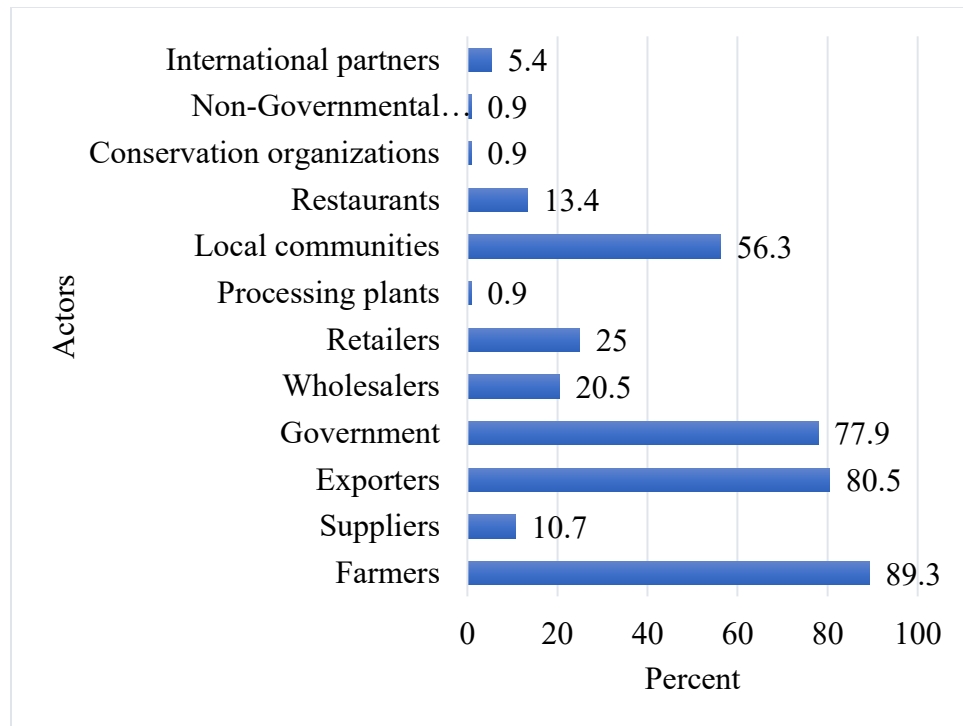


Figure 3: Knowledge about actors in the crocodile value chain

One of the informants had this to say;

*“When we were starting our farming here, we used to get crocodile eggs from Shire River through community members. But now, we stopped because we now have crocodiles which we keep as layers, that means we are no longer relying on those members we used to. So, here we pick eggs, taking them to our incubator which is at Ngabu farm, that is also where skinning takes place. We also provide the collected eggs to our friends who are into the same business” (KII008).*

#### 4.3.2 Stages in the commercial crocodile value chain

The study disclosed that the commercial crocodile value chain in Malawi is characterized by a complex network of actors interacting across various levels (Figure 4). Specific actors at the input level were fish suppliers, government agencies, veterinary service providers and local crocodile

trappers. Commercial farms, such as Nyika Crocodile Farm and Shire River Crocodile Limited operate at the production level, practicing intensive farming in pens. Notably, these farms also own and operate cold storage facilities, abattoirs, skin and meat processing plants, thereby integrating processing level activities. The farms then interact with various trading level actors, including selling meat directly to surrounding households and retailers such as Kapani Food Lovers in Lilongwe, while also exporting skins to wholesalers abroad.

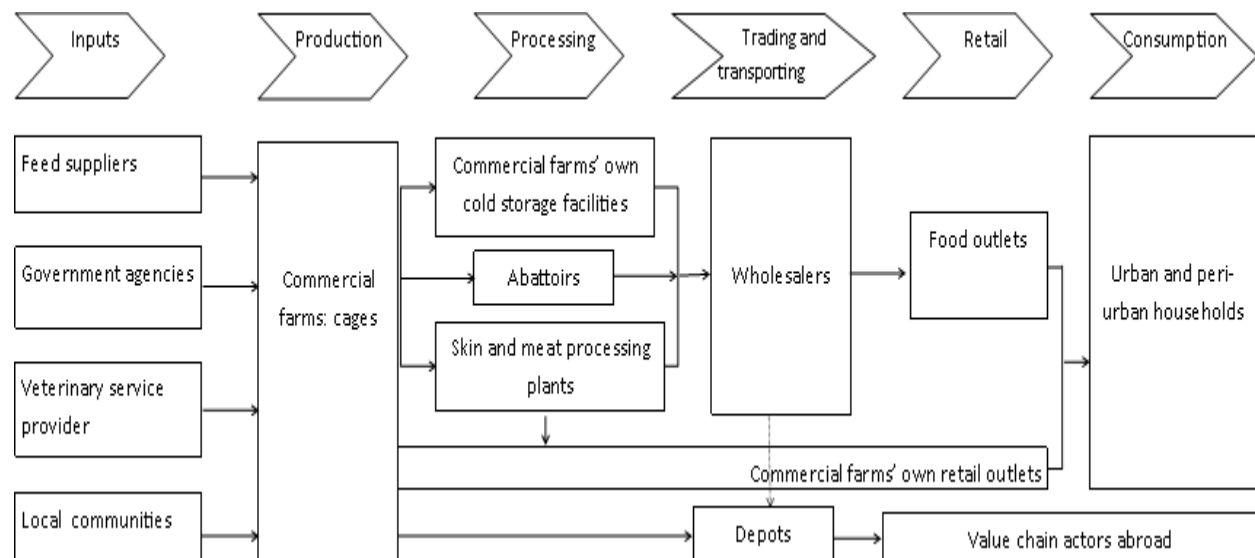


Figure 4: Stages in the commercial crocodile value chain

## 4.4 The Current Status of the Crocodile Production, Marketing and Consumption

### 4.4.1 Crocodile production

The study established the difference in the population of crocodiles across the targeted crocodile farms in Malawi (Table 3). Specifically, Shire River Crocodile Limited is home to 365 crocodiles whereas Nyika Crocodile farm in Salima boasts a substantially larger population of 8700 crocodiles. Both farms employ intensive farming practices, with crocodiles being kept in a ranch-style settings.

Table 3: Distribution of crocodiles across farms as at October 2024

| Company name               | Location           | Enterprise type | No of crocs |
|----------------------------|--------------------|-----------------|-------------|
| Shire River Crocodiles Ltd | Nsanje (Kaombe)    | Ranching        | 365         |
| Nyika Crocodile Farm       | Salima (Senga Bay) | Ranching        | 8700        |

*“We have number of pens here and you can see that we have big land and all these pens were filled with crocodiles. However, now, we can only manage these few 365 crocodiles due to lack resources such as feed, security personnels, market volatility and other compliance costs. You know, keeping more of them requires more food and to get food we need to have good monies which can be there if our market is stable. To be detailed in some issues, the COVID-19 pandemic worsened the challenges which were already there, for example, finding a viable world market for our crocodile skins. As a result, our business was severely impacted, leading to bankruptcy. During COVID-19 period, it was difficult for us to sustain our crocodile population. You can see that some more pens are now empty, due to the lack of resources such as finance. In addition, sir., the District Council's (DC) had to increase the business permit tax from MK1,500,000.00 last year to MK3,700,000.00 per annum this year in addition to the rising compliance costs. To say the truth, Mr, this added a burden on our operations. It has even forced our farm to stop skin sales” (KII008).*

Someone from one of the farms noted;

*“Our farm hosts 8700 crocodiles of different sizes. Come and see....., you can appreciate that each pen is housing different specific crocodile sizes. We have one where there are crocodiles aged 2 years, and the other one 5 years and so on. This arrangement also helps in feeding, preventing older crocodiles from violating chicks” (KII002).*

Results further show that in Malawi, the targeted crocodile farms keep *Crocodylus niloticus*. The primary purposes of the crocodile farms visited were for the production of skins and meat. While tourism was also a component of the farms’ activities, however, it is secondary to the main purpose of skin and meat production.

*“The main purpose for this farm is skin production and tourism. However, tourism is the least prioritised aspect because we get little money through it as people just comes here and there” (KII008).*

*“Our farm focus mainly on skin and meat production. We also accommodate tourists who come to see the crocodiles and pay something such as money. This also acts as our supplementary income stream” (KII002).*

#### **4.4.1.1 Factors that determine crocodile production**

Table 4 show factors that determined the involvement in crocodile production in Malawi such as but not limited to gender, age, education level, disability, religion, tribe, income level and marital status. Among these, education level ( $p=0.002$ ) and income level ( $p=0.01$ ) were statistically significant in influencing participation in crocodile production. Specifically, the model shows that a one unit increase in education level was associated with a 0.0856-unit

increase in crocodile production, while a one-unit increase in income level corresponds to a  $4.41 \times 10^{-7}$  unit increase in production.

Table 4: Factors that determine crocodile production in Malawi

| <b>Production</b> |                  |                 |
|-------------------|------------------|-----------------|
| <b>Parameters</b> | <b>Coef</b>      | <b>Std. Err</b> |
| Gender            | -0.0640503       | 0.0544114       |
| Age               | -0.0050195       | 0.0032969       |
| Education level   | <b>0.0855684</b> | 0.0264385       |
| Disability        | 0.1134825        | 0.1215528       |
| Religion          | -0.0674925       | 0.0452153       |
| Tribe             | -0.0166303       | 0.0109366       |
| Income level      | <b>4.41e-07</b>  | 2.66e-07        |
| Marital status    | 0.0378324        | 0.0718124       |
| <b>R-Square</b>   | 0.740            |                 |
| <b>P-value</b>    | <b>0.000</b>     |                 |

*Dependent variable: Number of crocodiles owned, Note: Significant at 0.05 level.*

#### 4.4.2 Marketing

The crocodile marketing situation revealed a dynamic landscape marked by a significant surge in demand (47.0%) (Table 5). However, this burgeoning demand is compared with a limited supply of crocodile products such as skins (only 2000 skins exported yearly since 2019), as reported by 22.0% of respondents. Additionally, the market is further characterized by intense competition, with 31.0% of respondents identifying this as a pressing concern.

Table 5: Current crocodile skin market situation

| Variable       | Percent |
|----------------|---------|
| Growing demand | 47.0    |
| Limited supply | 22.0    |
| Competition    | 31.0    |

Apart from skin's market, the growing interest in crocodile meat was evidenced during the study, with some respondents and key players in the industry sharing their experiences and insights.

A certain respondent had this to say;

*“I have been hearing about this meat and number of elites in town have been saying how delicious the meat is. Till this other time when I visited Sunbird hotel and I enjoyed the meat with some of our family members” (KII005).*

*“We supply crocodile meat to customers who order it for example food lovers. After one order, it takes some days to receive another order. Right now, I can say we are the only ones selling this meat in Malawi, so, I think we are meeting the consumers' needs...yeah” (KII002).*

#### 4.4.3 Consumption

The findings in Table 6 revealed that a good proportion of community members surrounding crocodile farms, 65.7%, consume crocodile meat.

Table 6: Crocodile meat consumption patterns among participants

| Variable | Percent |
|----------|---------|
| Yes      | 65.7    |
| No       | 34.3    |

*“Crocodile meat is the best my son, it is white and tender, with amazing smell like that what comes when you mix that meat of chicken, goat and cattle, that makes my mouth water. Its brai also gives and I enjoy it so much” (KII007).*

Factors influencing patterns of crocodile meat consumption were analysed and summarized in Table 7. The variables considered included gender, age, education level, disability, religion, tribe, marital status, income level, culture, availability, personal preference and lifestyle, social influence, quality, brand reputation, price and awareness. The regression model identified education level ( $p=0.000$ ), income level ( $p=0.010$ ), availability ( $p=0.000$ ), personal preference and lifestyle ( $p=0.009$ ) and brand reputation ( $p=0.023$ ) as significant predictors of consumption behaviour. The model further indicated that for each unit increase in education level, income level, availability, personal preference and lifestyle, and brand reputation, the probability of crocodile meat consumption increased by 0.194, 0.242, 0.623, 0.238, and 0.176 units, respectively.

Table 7: Multiple linear regression output

| <b>Standardized Coefficients</b>  |             |              |
|-----------------------------------|-------------|--------------|
| <b>Factors</b>                    | <b>Beta</b> | <b>Sig.</b>  |
| Gender                            | -0.027      | 0.358        |
| Age                               | -0.131      | 0.440        |
| Education level                   | 0.194       | <b>0.000</b> |
| Disability                        | 0.159       | 0.237        |
| Religion                          | -0.013      | 0.736        |
| Tribe                             | 0.013       | 0.300        |
| Marital status                    | 0.037       | 0.987        |
| Income level                      | 0.242       | <b>0.010</b> |
| Culture                           | -0.021      | 0.770        |
| Availability                      | 0.623       | <b>0.000</b> |
| Personal preference and lifestyle | 0.238       | <b>0.009</b> |
| Social influence                  | -0.092      | 0.233        |
| Quality                           | -0.034      | 0.623        |
| Brand reputation                  | 0.176       | <b>0.023</b> |
| Price                             | -0.044      | 0.620        |
| Awareness                         | 0.146       | 0.128        |
| R-Square                          | 0.596       |              |
| Adjusted R-Square                 | 0.556       |              |
| Sig. F-change                     | 0.000       |              |

*Dependent variable: Crocodile consumption (1=yes, 0=no), Note: Significant at 0.05 level.*

#### 4.5 The Types of Investment Required in Crocodile Commercialization.

The investment required in crocodile commercialization were combination of land, crocodile stock, feed and nutrition, labour, security measures, compliance costs, marketing and sales, research and development, infrastructure and risk management measures (Table 8). The proportion of the required investments were land (95.1%), infrastructure (94.9%), labour (67.6%), feed and nutrition (62.7%) and the least reported requirements were risk management measures (8.8%) and research and development (4.9%).

Table 8: Required investments in crocodile commercialization

| Variable                 | Percent |
|--------------------------|---------|
| Land                     | 95.1    |
| Crocodile stock          | 36.3    |
| Feed and nutrition       | 62.7    |
| Labour                   | 67.6    |
| Security measures        | 22.5    |
| Compliance costs         | 16.7    |
| Marketing and sales      | 32.4    |
| Research and development | 4.9     |
| Infrastructure           | 94.9    |
| Risk management measures | 8.8     |

Table 9 shows the most critical investments required in commercial crocodile value chain. Land (P=0.000), feed and nutrition (p=0.007), labour (p=0.047) and infrastructure (p=0.000) were the most needed investments required when venturing into commercial crocodile farming.

Table 9: Critical investments required in commercial crocodile farming

| <b>Investment</b>        | <b>B</b>     | <b>S. E</b> | <b>df</b> | <b>P-value</b> |
|--------------------------|--------------|-------------|-----------|----------------|
| Land                     | 38.396       | 4.611       | 1         | <b>0.000</b>   |
| Crocodile stock          | -0.802       | 2.488       | 1         | 0.115          |
| Feed and nutrition       | -0.563       | 7.295       | 1         | <b>0.007</b>   |
| Labor                    | 18.297       | 3.943       | 1         | <b>0.047</b>   |
| Security measures        | -1.453       | 1.261       | 1         | 0.261          |
| Regulatory compliance    | 0.732        | .864        | 1         | 0.353          |
| Marketing and sales      | 0.345        | 2.084       | 1         | 0.149          |
| Research and development | -1.688       | 0.222       | 1         | 0.638          |
| Infrastructure           | -1.697       | 1.690       | 1         | <b>0.000</b>   |
| Risk management measures | -14.871      | 0.417       | 1         | 0.519          |
| <b>R-Square</b>          | <b>0.902</b> |             |           |                |

*Dependent variable: Investments in crocodile farming (1=yes, 0=no), Note: Significant at 0.05 level.*

One of the respondents elucidated;

*There are so many things that are required when venturing into any other business including this crocodile venture. Land is the most important thing that we need for number of activities such as constructing structures such as pens for our crocodiles,*

*water pumping machines, processing equipment such as abattoir and other supporting facilities such as offices. For example, to this side of our farm, we bought a whole of this big piece of land. We want to use this land to start growing fish for food for our crocodiles so that we can stop importing from other countries such as Tanzania. We planned this as one way of diversifying our income streams which will in turn help to not struggle financially in situation where one source is negatively affected. Am sure that this will also save money we spent on importation and will help our crocodile farm work well (KII001).*

Another key informant added this;

*“Most people think that they can just start this venture anyhow. This farming need special labourers for number of activities. It requires watchmen to safeguard, skimmers to skin the crocodile with care, meat and even skin packagers to prepare for market and other people special feeders to feed crocodiles” (KII002).*

#### **4.6 Chapter summary**

This chapter presented analysis and interpretation of both quantitative and qualitative data, identifying key themes and content. The findings are now ready for discussion and interpretation, which is presented in the next chapter.

## **CHAPTER FIVE: DISCUSSION**

### **5.1 Chapter Introduction**

This chapter delves deeper into an in-depth analysis of the findings on the business opportunities along commercial crocodile value chain in Malawi, drawing on insights from the broader literature. The chapter examines the value chain map of commercial crocodile farming through discussion around the study's objectives such as the value chain map of commercial crocodile farming; the current status of crocodile production, marketing and consumption, as well as the types of investments required for commercial crocodile farming in Malawi. The chapter reveals how the findings confirm, extend, or challenge existing scholarship, identifies gaps and contributions, and proposes implications in the context of crocodile farming in Malawi. It concludes with the integration of findings with the theory, literature and study's contributions to the body of knowledge.

### **5.2 The Value Chain Map of Commercial Crocodile Farming.**

In an effort to find actors in commercial crocodile farms, such main actors were as farmers, suppliers, exporters, government, wholesalers, retailers, processing plants, local communities, restaurants, conservation organizations, NGOs and the international partners (Figure 3). In Malawi crocodile value chain context, main actors were fish farmers, government, veterinary service providers, local trappers, crocodile farmers, retailers, crocodile products exporters and consumers (Figure 4).

The study revealed that commercial crocodile farms in Malawi rely heavily on imported fish from neighbouring countries, such as Mozambique and Tanzania, to feed their crocodiles. Fish was found to be a significant protein source in the diet of crocodiles. This contradicts with Fasulkova,

Strateva, and Stratev (2024) and Beyeler (2019) findings in South Africa which emphasized the use of red meat and poultry by-products in crocodile diets. However, the research findings consistent with the studies by Tosun (2013), Blessing et al. (2014), and Brien et al. (2007) that suggest larger crocodilians shift to consuming fish and other larger prey as they grow. Furthermore, Beyeler (2011) indicated that crocodile farmers in South Africa often provide unbalanced diets, using various animal protein sources that can lead to suboptimal growth and skin quality. Determining the protein requirements of juvenile Nile crocodiles (*Crocodylus niloticus*) is essential to inform feed formulations and optimize growth performance. It emphasized that animal-based protein is a preferred feed source for Nile crocodiles due to its high protein content, palatability and digestibility.

Government agencies, research institutions and organisations such as the Ministry of Agriculture, the Malawi Investment and Trade Centre (MITC), Department of Wildlife and National Parks, University of Malawi, the Lilongwe University of Agriculture and Natural Resources (LUANAR), Malawi Wildlife Conservation Society (MWCS) and the Wildlife and Environmental Society of Malawi (WESM) reported providing regulatory oversight, licensing, research and promoting of industrial sustainability (Kasapila 2023). This aligns with studies in Nigeria by Ogorode, Vincent-Akpu and Babatunde (2025) and Ityavyar, Inah and Akosim (2011), which indicated the importance of government departments ensuring crocodile farms operate within legal frameworks, adhering to international standards and guidelines for animal welfare and humane practices. Specifically, the Department of Wildlife and National Parks (DWNP) regulate the industry, while research institutions like the University of Malawi and LUANAR focus on research in crocodile ecology, conservation and management (Kasapila 2023). Additionally, organizations such as

MWCS and WESM collaborate with local communities and government agencies to promote sustainable farming and biodiversity conservation.

It was found that some of these actors are from the government livestock department and they offer essential services to both Nyika and Shire River crocodile farms. These professionals identify diseases affecting the crocodiles and provide necessary treatment. This supports findings by Manolis and Webb (2016) in Zambia that access to veterinary and animal health expertise is important to ensuring good health is maintained, especially in hatchlings and juveniles.

Community members commonly found in Nsanje, found playing a significant role in supplying crocodiles to farms. Locals and individuals from Mozambique create snares to trap crocodiles, which are then suffocated by crocodile farmers for easy handling and transportation to the farms. Similarly, when community members find crocodile eggs on the Shire River shore, they notify the farms (Shire River). However, it was reported that egg collection exercise requires special expertise to maintain egg quality and prevent disability in crocodile chicks. This aligns with Amanywa (2023) study in Uganda, which advocated for investment in training programs and recruitment of experienced personnel to ensure efficient farm operations and animal welfare. Specifically, Amanywa's study found that local communities trained in egg collection and hatching secured employment opportunities in incubation and ranching stations. Similarly, van der Ploeg et al. (2011) demonstrated that rural communities can benefit economically from crocodile farming, as seen in Papua New Guinea where communities generated income through the sale of crocodiles to commercial farms.

The most reported actors in commercial crocodile value chain were farmers namely; Nyika in Salima and Shire River in Nsanje (Table 3), a reduction in number from five authorised farms including Shire Valley in Chikwawa, Chiwale in Thyolo and Koma in Mangochi (John 2020; FAO

2021). Crocodile farmers were found responsible for various activities including but not limited to breeding and hatchery management, feeding and nutrition, habitat maintenance, health care and disease control, harvesting, regulatory compliance and marketing. This is consistent with Getpech (2011) study in Thailand, which describe the same role of crocodile farmers in the industry. This implies that crocodile farmers are expertise in their field of operations which enable them to oversee the entire production process, ensuring that crocodiles' good health is maintained especially at hatchling and juvenile stage (Manolis & Webb 2016). Furthermore, the study revealed that crocodile farms such as Nyika Crocodile Farm and Shire River Crocodile Limited own and operate cold storage facilities, abattoirs, skin and meat processing plants. These integrated processing level activities enable the farms to control the quality of their products. The cold storage facilities maintain the meat's freshness and quality, while the abattoirs facilitate humane and hygienic slaughter processes. The skin and meat processing plants transform raw materials into value-added products such as leather goods, biodiesel and crocodile packaged meat which further considered as a crucial protein for human consumption in the world (Tosun 2013; Hoffman & Cawthorn 2012; Maisuthisakul 2015).

The farms were further managing waste effectively after killing crocodiles. They ensure that all waste materials including gallbladder, carcasses and offal are disposed of in an environmentally friendly manner, adhering to regulations and guidelines to prevent pollution and maintains a clean and healthy environment. One of the crocodile farm's employees stated: *"Once we kill the crocodile, our managers follow us till I get to the toilet where we throw gallbladder just to make sure that it is indeed carefully thrown away. He used to do so because the gallbladder is known to be poisonous and harmful to human once consumed"* (KII006). This support Ogorode, Vincent-Akpu and Babatunde (2025) suggestions that promotion of best practices such as effective waste

management and sustainable feed sourcing is crucial for environmentally and socially responsible crocodile farming, ultimately ensuring its long-term sustainability.

Sales and export were found effective steps taken after processing products from the crocodile. A study by Ogorode, Vincent-Akpu and Babatunde (2025) in Emede and Esanma Kingdoms, Delta State, Nigeria emphasized that effective crocodile farming requires to have a good plan for selling the products. The study found crocodile companies selling their products to various actors. Nyika Crocodile Farm used to sell crocodile meat directly to consumers including surrounding households and now supplies Kapani Food Lovers in Lilongwe at wholesale prices. Kapani Food Lovers then retails the meat (Figure 5) to urban and semi-urban consumers while ensuring compliance with regulations to maintain meat quality. Both Nyika and Shire River Crocodile Farm export processed skins to actors abroad, who then supply these products to clients for the manufacture of various end products such as belts, handbags, shoes and earrings.



Figure 5: Crocodile meat at retail market

### **5.3 The Current Status of the Crocodile Production, Marketing and Consumption**

The study assessed the status with a focus on population differences, farming systems, and market orientation across selected farms. The findings revealed significant disparities in crocodile populations among farms (Table 3), which directly relate to differences in market presence and

diversification strategies. Nyika Crocodile Farm, which maintained the largest population (8,700 crocodiles), benefitted from a well-established market and diversified production of both meat and skins. This diversification not only expanded its incomes streams but also enabled sustained compliance with regulatory requirements and reinvestment in breeding, transport, and other operational activities. In contrast, Shire River Crocodile Farm, with only 365 crocodiles, experienced chronic market challenges even before the COVID-19 pandemic, which further deepened its operational decline.

The exclusive farming of Nile crocodile (*Crocodylus niloticus*) in Malawi is consistent with previous reports (Marsh 2016). As confirmed by key informants, this species is favored due to its fast growth rates, large body size, high-quality meat and skins, and relatively manageable temperament compared to other crocodile species. This preference aligns with global farming practices where *C. niloticus* is widely targeted for commercial purposes. The results of this study therefore support the view that commercial motivations, particularly the production of high-value skins and meat, are the primary drivers of crocodile farming in Malawi, with ecotourism serving as a supplementary activity. Comparable findings were reported in Australia, where tourism provided an additional income stream for farms (Tisdell 2005), and globally, demand for crocodile products remains high due to their use in luxury industries such as fashion (Zietsman 2017). Importantly, all farms surveyed employed intensive ranch-style farming systems, characterized by high-density enclosures and controlled feeding and breeding regimes. This is consistent with the definition of intensive crocodile farming by Ogorode, Vincent-Akpu and Babatunde (2025), who noted that such systems allow efficient management of populations and maximize production outputs. While these practices were effective in maintaining farm populations, their long-term sustainability warrants closer examination, particularly regarding animal welfare, disease

management and environmental impacts. The disparities observed across farms highlights the influence of both structural and contextual factors. Market access, diversification and farm management capacity appear to be more decisive than species choice alone.

Given the growing demand for crocodile products such as bags, shoes, belts, and challenges faced by the industry including limited farming capacity, climate change and disease outbreaks, it was also essential to understand the factors that influence crocodile production and consumption patterns of crocodile meat in Malawi such as gender, age, education level, disability status, religion, tribe, income level, marital status, cultural aspects, availability, personal preference and lifestyle, social influence, product quality, brand reputation, price and awareness. Education level ( $p=0.002$ ) and income level ( $p=0.001$ ) (Table 4) were significant influencers of crocodile production. Specifically, individuals with tertiary level education had a significant advantage in venturing into commercial crocodile farming, as they possessed greater knowledge and skills acquired through various platforms including managerial skills, business planning, marketing strategies and access to financial resources. This agrees with the findings of Ogorode, Vincent-Akpu and Babatunde (2025) and Amanyia (2023) in Emede and Esanma Kingdoms, Delta State, Nigeria that educated, trained and experienced personnels ensured long term, efficient operations and animal welfare. Furthermore, individuals with high income levels were more likely to venture into commercial crocodile farming, as it requires substantial capital to cover expenses such as purchasing crocodile stock, labour, transportation, feed and veterinary care. Similar results have been reported by Tisdell (2005) that high initial cost of setting up a crocodile farm was the main requirement to entrants into crocodile farming Australia.

It was clear from the findings that crocodile products' market in Malawi is characterised by a significant surge in demand (47.0%) for crocodile products, particularly skins for high-value

products such as bags, shoes, watch straps, wallets and belts (Table 5). The growing demand is driven by international markets, with Malawi's crocodile farms exporting skins to countries like Zimbabwe, Singapore, China, India, South Africa and the European Union. However, this growing demand was met with a limited supply of crocodile products such as skins as compared to meat, attributed to factors such as limited farming capacity, climate change and disease outbreaks. Furthermore, the market is marked by intense competition over high-quality skins. This competition was driven by the growing demand for luxury crocodile products, particularly in Asian markets. Similar market trends have been reported in South Africa by Jansen van Rensburg (2017), who noted a significant increase in demand for crocodile products in Africa, driven by growing luxury markets. Global demand for crocodile products was found driving the growth of the industry, with Asia being a major market (Thorbjarnarson 1999). Furthermore, Caldwell (2012) and Thorbjarnarson (1999) in Europe found the growing demand for crocodile meat and skins resulting in growing skin hunting business, which expanded into Mexico, Central America, and the Caribbean.

The study found that 65.7% of the respondents consume crocodile meat, with consumption patterns varied based on factors such as education level, income level, availability, personal preference, lifestyle, and brand reputation (Table 6). While educated individuals were more likely to be aware of the nutritional benefits and unique characteristics of crocodile meat, research in Kenya by Mosse, Odadi and Kibue (2024) revealed that education may not necessarily influence crocodile meat utilization. A key informant further confirmed that affluent individuals are more likely to purchase luxury food products like crocodile meat, and that consumers are more likely to purchase crocodile meat if it is readily available. Personal preference and lifestyle were also found significant factors, with individuals who value exotic and luxury food products being more likely

to consume crocodile meat, consistent with Jansen van Rensburg (2017) findings in South Africa and Asia. Finally, brand reputation emerged as crucial factor, with consumers willing to pay a premium for high-quality crocodile meat products from reputable sources. This finding is consistent with Uys' (2019) study in Gauteng Province, South Africa, which revealed that consumers were willing to pay more for crocodile meat products from reputable farms that adhered to high standards of quality and safety. Furthermore, Jansen van Rensburg's (2017) research highlighted the significance of brand reputation and certification of origin in influencing consumers' purchasing decisions for crocodile products in South Africa. The interplay between crocodile production predictors illustrates the industry's complexity, where knowledge, skills and financial capacity are crucial for success.

#### **5.4 The Types of Investment Required in Crocodile Commercialisation.**

In the process of finding the requirements in crocodile commercialization, ten requirements were found (Table 8). Across all farmers, land was the most reported requirement (95.1%) for commercial crocodile farming. Crocodiles require a large space to live, breed and be farmed. The land must be suitable for building ponds, enclosures and other infrastructure necessary for crocodile farming. It was unearthed that in Malawi, the required land for crocodile farming can range from 10 to 100 hectares depending on the scale of production. Land is essential for providing a habitat for the crocodiles as well as for constructing facilities for feeding, breeding, and processing. Land was found to be a highly significant requirement ( $p=0.000$ ), implying that its availability is crucial for the success of a commercial crocodile farm. Nature Conservation Act (1992) stated that land availability is a critical factor in the success of crocodile farming, with larger farms tend to be more profitable. Access to suitable land and water resources is essential for the establishment and operation of commercial crocodile farms.

Infrastructure was the second most reported requirement (94.9%) and was found to be a highly significant ( $p=0.000$ ). Infrastructure is necessary for providing a suitable environment for the crocodiles, as well as for supporting the various operations of the farm. Examples of infrastructures required include utilities, meat and skins processing plants, water pumping systems and equipment, crocodile catching equipment such as hooks and nets, and incubators for hatchlings. Additionally, infrastructure such as fencing, gates, and buildings were necessary for housing the crocodiles, staff and equipment. The use of electrocution equipment is also used to suffocate the crocodile in order to catch it and also to kill the crocodile. According to Porter (1985), infrastructure was identified crucial asset for primary activities which include procurement, technology development and human resource management. In Africa, Iheanacho (2025) found that investments in infrastructure such as farms, processing facilities, and transportation networks can significantly improve the efficiency and productivity of the industry. This is reinforced by Ketchen and Hult (2007) and Manolis and Webb (2016), who noted that infrastructure plays a vital role in enhancing the competitiveness and profitability of crocodile farms by providing opportunities for innovation, differentiation, and quality improvement of their products and services.

Among the interviewed respondents, 36.3% considered crocodile stock as essential for starting a commercial crocodile farm. The required stock farmed in Malawi was found to be *Crocodylus niloticus*. One of the key informants confirmed that this species is preferred for farming due to its desirable traits, including rapid growth, large size, high-quality meat and skin. The informant also described the species well-suited for farming in Malawi due to its adaptability to the local climate and its high demand in the market. Crocodile stock is necessary for providing the initial population of crocodiles for farming as well as for replenishing stocks and avoiding genetic disturbances and fixations (Blessing et al. 2014).

Furthermore, 62.7% of the respondents reported feed and nutrition component. It was discovered that in Malawi, crocodiles are fed a diet consisting of fish (tilapia and kapenta), meat (including beef, chicken, and crocodile meat), vegetables (cabbage and carrots), fruits (apples and bananas) and other supplements. Feed and nutrition were found to be highly significant requirements ( $p=0.007$ ). Feed and feeding systems optimise the health and growth rate of farmed crocodiles efficiently (Fasulkova, Strateva & Stratev 2024). Growth rate of crocodiles increases with feed intake (Blessing et al. 2014; Tosun, 2013; Brien et al. 2007).

In addition, labour was crucial for the day-to-day operations of a commercial crocodile farm. The types of labour required include farm managers, veterinarians, feeders, security personnel and skinning and processing personnel. Labour is further necessary for managing the crocodile population, feeding and breeding, processing and marketing and maintaining farm infrastructure. Labor was found to be a significant requirement ( $p=0.047$ ). One of the crocodile managers had this to say: *“The availability and quality of labour such as feed formulation and preparation, feeding, cleaning pens, guarding and value-added practices, enhance the efficiency, profitability and maintain high-quality crocodile care and our farm management”* (KII001).

Security measures are necessary to prevent the theft of crocodiles and other equipment, as well as to protect the farm personnel and visitors (22.5%). The reported and observed security measures included fencing and guards. This supports Manolis and Webb (2016) study findings in Zambia where crocodile farms implement robust security measures such as a fence to prevent stock losses and maintain a good relationship with neighbours. Security from theft and vandalism is a further serious consideration in some countries. Fencing generally needs to be adequately strong, buried a short distance into the ground (or based on a firm foundation and regularly inspected and maintained. In Zambia, it was noted that adequate fencing is also an important component of

demonstrating stable inventory and legal sources of stock for local regulatory and CITES purposes (Manolis & Webb 2016).

Crocodile farms must and are required to comply with regulations and laws at cost so called compliance costs. Compliance costs therefore refer to the expenses incurred by crocodile farms to comply with regulations and laws governing the industry. In Malawi, crocodile farms comply with costs associated with premise taxes paid to the DC, fees for permits and licenses and costs associated with meeting health and safety standards. Compliance costs are necessary for ensuring that the farm operates within the legal framework and maintains high standards of animal welfare and environmental sustainability. However, Manolis and Webb (2016) in Zambia found that complying with regulatory requirements resulted in increased costs, reduced profitability and making it difficult for them to remain competitive in the market.

Marketing and sales are cornerstones for commercial crocodile farms worldwide, including Malawi (32.4%). In Malawi, crocodile farms market their products such as meat and skins through various channels, including social media, trade shows and word of mouth. The products are profitably sold to local and international markets including leather goods manufacturers. This agrees with Zietsman (2017) who emphasized that having proper marketing strategies enables crocodile farms accessing lucrative markets for their products. The strategies are further essential for generating revenue and ensuring the success of commercial crocodile farming, as they enable farmers to access new markets and increase their revenue.

For improving the efficiency and productivity of commercial crocodile farming, research and development were crucial, though least reported (4.9%). Research and development in this area was mainly focused on improving breeding programs, developing new feed formulations and enhancing disease management practices, which in turn lead to significant improvements in

crocodile farming. According to Ogorode, Vincent-Akpu and Babatunde (2025), research is crucial for ensuring the long-term sustainability of crocodile farming. Research services provide technical assistance which improves industry practices (Shackleton, Ticktin & Cunningham 2018). For example, Corey et al. (2018) argue that investments in innovative production techniques, disease management and product development can provide a competitive edge.

Risk management measures were also required and necessary for mitigating the various risks. These risks include disease outbreaks, escapes and natural disasters. Examples of risk management measures employed were include but not limited to vaccination programs, quarantine facilities and emergency response plans. Risk management measures such as insurance and diversification can further help to reduce the financial risks associated with commercial crocodile farming. In Northern Australia, Manolis and Webb (2016) also found that crocodile farms implement risk management practices, including vaccination programs and biosecurity measures to mitigate disease outbreaks.

### **5.5 Integration with theoretical frameworks and existing literature**

The findings of this research validate the applicability of the Value Chain Analysis (VCA) theory in the context of commercial crocodile farming in Malawi. According to Porter (1985), VCA is a framework that views a company's activities as part of a larger value chain that creates value for customers. The study reveals that the value chain map of commercial crocodile farming in Malawi comprises a network of actors interacting across various levels including input suppliers, producers, traders and consumers. The main actors in this value chain are farmers, suppliers, exporters, government, wholesalers, retailers, processing plants, local communities, restaurants, conservation organizations, Non-Governmental Organizations (NGOs), and international partners. In addition to this, the challenges faced by actors in the commercial crocodile value chain were unearthed including market volatility, low income and education levels. However, low-income

levels and limited education were significant challenges that affect the efficiency and competitiveness of the chain. These challenges are consistent with the VCA theory's emphasis on identifying areas of inefficiency and opportunities for cost reduction and value creation (Ketchen & Hult 2007). Addressing these challenges can help improve the overall performance of the crocodile industry.

Moreover, the study underscores the importance of governance structure in value chains, which is influenced by demand-driven market forces that can act as drivers of change and affect prices (Gereffi & Lee 2016). Understanding the governance structure of the value chain is crucial therefore for identifying opportunities for upgrading and innovation. By mapping the value chain and identifying the key actors and their relationships, stakeholders can pinpoint areas where value is being lost or where opportunities for improvement exist.

The study also supports the idea of upgrading opportunities in value chains, which can be achieved through investments in infrastructure, technology and human capital as well as through the development of new products and markets (Ponte et al. 2014). Specifically, the results show that land, feed and nutrition, labour and infrastructure are critical investments required for commercial crocodile farming in Malawi. These investments can help crocodile farmers increase their productivity, improve the quality of their products, and access new markets, thereby enhancing their competitiveness and profitability. By identifying these opportunities, the research contributes to the development of sustainable business strategies and policies that promote economic growth, job creation, and environmental conservation in Malawi.

## **5.6 Contribution of the study to the body of knowledge**

This study provides an understanding of the commercial crocodile farming industry in Malawi. Specifically, it provides a detailed mapping of the value chain, identifying key actors such as

crocodile farmers, government agencies, retailers, research institutions and local communities. The study also maps out the processes involved in the production, processing and marketing of crocodile products, as well as the value flows that have been lacking in previous research.

The study also sheds light on the current status of crocodile production, marketing and consumption in Malawi, which has been poorly documented in existing literature. Additionally, the study identified the types of investment required in crocodile commercialization such as infrastructure development such as farms and processing facilities, breeding stock to improve the quality of crocodiles, labour and training to enhance the skills of farmers and processors, and research to improve farming practices and product development, which can inform strategies for industry growth and development.

## **5.7 Chapter Summary**

This chapter discussed the study's findings in the context of existing literature, exploring their significance, practical, theoretical, and policy implications including study's contributions to the body of knowledge. The following chapter presents the study's conclusions and provides recommendations based on the findings.

## **CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS**

### **6.1 Chapter Introduction**

This chapter presents the study's conclusion and recommendations. The conclusion is structured as follows: it summarizes the key findings related to the main objective of the study which is the business opportunities along crocodile value chain in Malawi; the value chain map of commercial crocodile farming; the current status of the crocodile production, marketing and consumption; and types of investment required in crocodile commercialisation in Malawi's crocodile industry. The recommendations section covers practical recommendations and areas for future research.

### **6.2 CONCLUSION**

#### **6.2.1 The value chain map of commercial crocodile farming**

Network of actors and stages that contribute to the industry's functioning was revealed. The actors in the commercial crocodile value chain included farmers, suppliers, exporters, government agencies and local communities. The actors were found playing important roles in the production, processing and distribution of crocodile products. Notably, farmers, exporters, and government agencies were the most prominent actors, while processing plants, conservation organizations and non-governmental organizations were less represented. The stages in the value chain were characterized by a range of activities from input supply to production, processing and trading of crocodile meat to local retailers such as Kapani food lovers as well as the export of skins to international markets.

#### **6.2.2 The current status of the crocodile production, marketing and consumption**

Crocodile farms in Malawi such as Shire River Crocodile Limited and Nyika Crocodile Farm employ intensive farming practices, with the latter having a significantly larger population of

crocodiles compared to the former due to resource constraints. The primary purpose of these farms was skin and meat production, with tourism playing a secondary role. The marketing landscape for the crocodile products such as skins and meat was characterized by growing demand, limited supply, and intense competition. Large number of community members surrounding the farms found they consume crocodile meat, with factors such as education level, income, availability, personal preference and brand reputation significantly influencing consumption patterns.

### **6.2.3 Types of investment required in crocodile commercialization**

Land, crocodile stock, feed and nutrition, labour, security measures, compliance costs, marketing and sales, research and development, infrastructure and risk management measures were the types of investment required in ensuring the success of commercial crocodile farming ventures. The majority of respondents emphasized the importance of land and infrastructure, with statistical analysis confirming these as the most critical investments required alongside labour and feed and nutrition. As one respondent aptly noted that land is essential for building pens and supporting facilities, and can also be utilized to diversify income streams, such as through fish farming to produce feed for the crocodiles. Additionally, the need for specialized labour, including watchmen, skimmers, packagers, and feeders shows that crocodile farming also requires specialized skills and labour.

### **6.2.4 Business opportunities along crocodile value chain**

Based on the results in Chapter 4, the study revealed a range of promising opportunities across various stages, including input supply, production, processing and trading. The value chain map showed that farmers, suppliers, exporters and government agencies play crucial roles, with potential for investment in areas such as crocodile stock, feed and nutrition, labour and infrastructure. The growing demand for crocodile products coupled with limited supply, presents

opportunities for entrepreneurs and investors to tap into the market. Additionally, the consumption of crocodile meat by local communities suggests potential for growth in the domestic market.

## **6.3 RECOMMENDATIONS**

### **6.3.1 Practical recommendation**

The crocodile value chain found demonstrates a network of actors and stages, with notable gaps in representation from key stakeholders such as processing plants, conservation organizations, and non-governmental organizations. Therefore, the Ministry of Agriculture, Department of Trade and Industry, Malawi Investment and Trade Centre (MITC) and Veterinary Services Department should collaborate to strengthen the capacities and roles of these underrepresented actors through targeted capacity-building initiatives, infrastructure development and policy support. This cannot only foster a more inclusive and sustainable value chain that contributes to the country's economic growth, but also development in line with Malawi Vision 2063's goals of agricultural productivity and economic diversification.

The Ministry of Agriculture and farmers should employ a multi-faceted approach that includes improving resource availability such as water and human resource, providing training and support to farmers, launching awareness campaigns to promote crocodile meat, and integrating farm experiences into local tourism initiatives. Strengthening market linkages, supporting product diversification, and providing technical and financial assistance to smaller farms will also enhance economic sustainability and contribute to Malawi's economic growth and food security.

Financial institutions such as banks and microfinance institutions should provide critical support to crocodile farmers by offering low-interest loans and other financial services. This can help farmers invest in critical areas such as land, feed and nutrition, labour and infrastructure, and improve the quality and quantity of their products in turn. Financial institutions should work with

farmers to understand their needs and provide tailored financial services that meet those needs and increase their competitiveness locally including at international markets.

To capitalize on the promising opportunities in the crocodile value chain, the stakeholders, including government agencies, entrepreneurs, and investors, should invest in key areas such as crocodile stock, feed and nutrition, labour, and infrastructure, while also promoting market development and awareness campaigns to tap into the growing domestic and international demand for crocodile products, thereby contributing to economic growth and sustainable development.

### **6.3.2 Areas for further research**

The study has identified promising business opportunities in the crocodile value chain, particularly in areas such as input supply, production, processing and trading driven by growing demand and limited supply. To further leverage these opportunities, additional research is needed to investigate market demand for crocodile products such as meat and skins, which would provide valuable insights to inform business decisions, guide investment and develop effective marketing strategies.

Processing plants, conservation organizations, and non-governmental organizations were found to be less represented. Analysing why and how these underrepresented actors can be integrated into the value chain to improve efficiency, sustainability, and profitability will be crucial.

Longitudinal assessments of farm performance, including profitability analysis, ecological sustainability of intensive systems, and the role of crocodile farming in supporting local livelihoods should be done. Comparative studies with other African countries could also provide useful benchmarks for improving the competitiveness of Malawi's crocodile industry in the global market.

Investigation of effective risk management measures and research and development strategies in commercial crocodile farming, given their relatively low reported requirements despite the industry's potential vulnerabilities and need for innovation is required.

#### **6.4 Chapter Summary**

This chapter distils the study's essence, presenting conclusions and actionable practical and academic recommendations that crystallize the key findings and their implications.

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## Appendix 1: Methodology Matrix

|   | Objective                                                          | Variables                                                                                                                                                                                                                                                | Method of<br>data<br>collection                   | Data collection<br>tools                    | Analysis                                               |
|---|--------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|---------------------------------------------|--------------------------------------------------------|
| 1 | To analyse the value chain map in the commercial crocodile farming | Processes<br>Crocodile farms<br>Suppliers<br>Exporters/marketers<br>Communities<br>Restaurants<br>Government,<br>Wholesalers<br>Retailers<br>Processing plants<br>Conservation organizations<br>Non-Governmental Organizations<br>International partners | Individual interviews<br>Key Informant Interviews | Semi-structured questionnaire<br>Checklists | Percentage<br>Functional analysis<br>Thematic analysis |

|   |                                                                                      |                                                                                                                                                                                                                           |                                                                         |                                             |                                                                                              |
|---|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|---------------------------------------------|----------------------------------------------------------------------------------------------|
| 2 | To assess the current status of the crocodile production, marketing and consumption. | Gender<br>Education<br>Age<br>Income level<br>Crocodile farms<br>Crocodile population<br>Production volume of crocodile products<br>Products demand<br>Consumption trend<br>Consumer preferences<br>Products availability | Individual interviews<br>Key Informant Interviews                       | Semi-structured questionnaire<br>Checklists | Frequency<br>Percentage<br>Multivariate regression<br>Linear regression<br>Thematic analysis |
| 3 | To examine types of investment required in crocodile commercialisation.              | Feeds, feeding and nutrition<br>Logistics and communication<br>Diseases control<br>Hatchling and care                                                                                                                     | Individual Interviews<br>Key Informant Interviews<br>Literature review. | Semi-structured questionnaire<br>Checklists | Percentage<br>Binary logistic regression<br>Thematic analysis                                |

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Captive breeding

maintenance

Labor and

management

Breeding stock

Marketing and sale

Infrastructure

Research and

development

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## Appendix 2: Data Protocol

### OBJECTIVE 1: TO ANALYSE THE VALUE CHAIN MAP OF COMMERCIAL CROCODILE FARMING.

|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Definition              | The objective entails examining and analysing the entire sequence of activities (crocodile farming or wild capture, breeding, feeding, harvesting, skinning, tanning, manufacturing, marketing, and distribution of crocodile-derived products such as leather, meat, and other goods) and participants (farmers, breeders, processors, manufacturers, wholesalers, retailers) involved in the commercial crocodile industry, from production or breeding to the final sale of crocodile products. This analysis aims to understand the various stages, actors and value-added processes within the value chain, with the goal of identifying strengths and weaknesses in the industry. Ultimately, the objective seeks to gain insights into how the value chain functions, its efficiency, sustainability, and overall competitiveness. To assess means to evaluate, analyse or appraise something in order to understand its qualities, value, characteristics or significance. |
| Respondents/Data source | Crocodile farmers<br>Consumers<br>Literatures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Data type               | Processes<br>Crocodile farms<br>Suppliers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

|                                     |                                                                                                                                           |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
|                                     | Exporters/marketers<br><br>Communities<br><br>Restaurants                                                                                 |
| Method of data collection           | Survey, Key Informant Interviews (KIIS)<br><br>Literature review                                                                          |
| Sampling procedure                  | Respondents in this study will therefore be purposively sampled.                                                                          |
| Data collection site                | Crocodile farms: Shire River Crocodile LTD, Nyika and surrounding communities.                                                            |
| Sample size                         | 107 will participate in the questionnaire survey                                                                                          |
| Data collection tools               | Questionnaire<br><br>Interview guide                                                                                                      |
| Question to be included in the tool | <b><u>SURVEY QUESTIONNAIRE</u></b><br><br><b><u>See Appendix 3</u></b>                                                                    |
| Data analysis                       | Quantitative: Descriptive statistics (frequencies, tables and graphs) and Chi-square<br><br>Qualitative: Functional and Thematic analysis |

**OBJECTIVE 2: TO ASSESS THE CURRENT STATUS OF THE CROCODILE PRODUCTION, CONSUMPTION AND MARKETING.**

|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Definition              | This objective aims to assess the present situation of crocodile farming, including how much crocodile meat or products are being produced, how they are being sold, and how much is being consumed by people. It helps in understanding the industry's current state and potential areas for improvement or growth. To assess means to evaluate or judge the quality, value, or performance of something. In this context, crocodile is a large predatory reptile with a long snout, sharp teeth, tough armoured body and they are carnivorous and hunt a variety of prey including fish, mammals, birds and humans. Crocodile production therefore, refers to the process of breeding, hatching, rearing and harvesting crocodiles for their valuable products such as meat, skin and other byproducts. |
| Respondents/Data source | Crocodile farmers<br>Consumers<br>Literatures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Data type               | Gender<br>Education<br>Age<br>Income level<br>Crocodile farms<br>Crocodile population<br>Crocodile species                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

|                                     |                                                                                                                                                                                                                                                         |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                     | Production volume of crocodile products<br>Products demand<br>Consumption trend<br>Consumer preferences<br>Products availability                                                                                                                        |
| Method of data collection           | Survey, Key Informant Interviews (KIIS), Focus Group Discussion (FGD)<br>Literature review                                                                                                                                                              |
| Sampling procedure                  | Respondents in this study will therefore be purposively sampled.                                                                                                                                                                                        |
| Sample size                         | 107 respondents will participate in the questionnaire survey                                                                                                                                                                                            |
| Data collection site                | Crocodile farms: Shire River Crocodile LTD, Nyika and surrounding communities                                                                                                                                                                           |
| Data collection tools               | Questionnaire<br>Interview guide                                                                                                                                                                                                                        |
| Question to be included in the tool | <p style="text-align: center;"><b><u>SURVEY QUESTIONNAIRE</u></b></p> <p style="text-align: center;"><b><u>See Appendix 3</u></b></p>                                                                                                                   |
| Enumerators                         | 1                                                                                                                                                                                                                                                       |
| Denominator                         | Total number of respondents                                                                                                                                                                                                                             |
| Data analysis                       | <b>Quantitative:</b> Descriptive statistics will be used to analyse the quantitative data using frequencies, percentages and charts. Descriptive statics will be done in Statistical Package for Social Sciences version 27 and Microsoft Excel (2021). |

|  |                                                                                                             |
|--|-------------------------------------------------------------------------------------------------------------|
|  | <b>Qualitative:</b> Transcribing, coding, grouping into sub themes, themes answering to research objectives |
|--|-------------------------------------------------------------------------------------------------------------|

**OBJECTIVE 3: TO EXAMINE TYPES OF INVESTMENT REQUIRED IN CROCODILE COMMERCIALIZATION.**

|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Definition              | This objective entails studying the various forms of investment needed to support the commercialization of crocodile farming. It involves analysing the financial resources, infrastructure, technology, and expertise required to develop and scale up crocodile farming operations for commercial purposes. By examining the types of investment needed, stakeholders can better understand the financial considerations and strategies necessary to facilitate the growth and success of the crocodile farming industry. To examine therefore refers to look at or consider something carefully in detail in order to discover something about them. That something in this context is investment. Required is adjective that indicates that something is needed or demanded in a particular situation or context. |
| Respondents/Data source | Crocodile farmers<br><br>Consumers<br><br>Literatures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Data type               | Feeds, feeding and nutrition<br><br>Logistics and communication<br><br>Diseases control                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

|                                     |                                                                                                                                                          |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                     | Hatchling and care<br>Captive breeding maintenance<br>Labor and management<br>Breeding stock<br>Marketing and value addition<br>Research and development |
| Method of data collection           | Survey, Key Informant Interviews (KIIS), Literature review                                                                                               |
| Sampling procedure                  | Respondents in this study will therefore be purposively sampled.                                                                                         |
| Sample size                         | 107 will participate in the questionnaire survey                                                                                                         |
| Data collection sites               | Crocodile farms: Shire River Crocodile LTD, Nyika and surrounding communities.                                                                           |
| Data collection tools               | Questionnaire<br>Interview guide                                                                                                                         |
| Question to be included in the tool | <p style="text-align: center;"><b><u>SURVEY QUESTIONNAIRE</u></b></p> <p style="text-align: center;"><b><u>See Appendix 3</u></b></p>                    |
| Data analysis                       | Quantitative: Descriptive statistics (frequencies, tables and graphs) and Chi-square<br>Qualitative: Thematic analysis                                   |

## Appendix 3: Survey Questionnaire

### Introduction

Would like to participate in the survey?

*1=Yes*

*2=No*

*If 'No', terminate the survey and thank the respondent.*

### SECTION 0: GENERAL INFORMATION

| <i>Question</i>                                                   | <i>Response options</i>                                                  |
|-------------------------------------------------------------------|--------------------------------------------------------------------------|
| 0.1. Name of the enumerator                                       | _____                                                                    |
| 0.2. Questionnaire ID                                             | / _ _ _ /                                                                |
| 0.3. Date of interview ( <i>Kobo will collect automatically</i> ) | / _ _ _ / / _ _ _ / / _ _ _ / / _ _ _ / / _ _ _ / / _ _ _ /<br>/ _ _ _ / |
| 0.4. Name of Traditional Authority                                | _____                                                                    |
| 0.5. Name of Group Village Head:                                  | _____                                                                    |
| 0.6. GPS Coordinates                                              | <i>[Collect coordinates]</i>                                             |

## SECTION I: DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENT

| <i>Questions</i>                          | <i>Response options</i>                                                                                                                                            | <i>Skip logic</i>                                   |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| 1.1. What is respondent sex               | <i>1=Male</i><br><br><i>2=Female</i>                                                                                                                               |                                                     |
| 1.2 Respondent age                        | <i>[in years]</i>                                                                                                                                                  |                                                     |
| 1.3 Respondent highest education level    | <i>1=No education</i><br><br><i>2=Primary</i><br><br><i>3=Secondary</i><br><br><i>4=Vocation trainings</i><br><br><i>5=Tertiary</i><br><br><i>6=Adult literacy</i> |                                                     |
| 1.4 Gender of the household head          | <i>1=Male</i><br><br><i>2=Female</i>                                                                                                                               |                                                     |
| 1.5 Do you have any disability?           | <i>1=Yes</i><br><br><i>0=No</i>                                                                                                                                    | <i>If 0,</i><br><br><i>go to</i><br><br><i>Q1.7</i> |
| 1.6 What is the nature of the disability? | <i>1=Behavioural or emotional.</i>                                                                                                                                 |                                                     |

| <i>Questions</i>          | <i>Response options</i>                                                                                                                                      | <i>Skip logic</i> |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
|                           | <i>2=Sensory impaired disorders</i><br><br><i>3=Physical</i><br><br><i>4=Developmental</i><br><br><i>5=Other (Specify)</i>                                   |                   |
| 1.7 What is your religion | <i>1=Christianity</i><br><br><i>2=Islam</i><br><br><i>3=Traditional</i><br><br><i>4=No religion</i><br><br><i>5=Other (Specify)</i>                          |                   |
| 1.8 What is your tribe    | <i>1=Ngonde</i><br><br><i>2=Lambya</i><br><br><i>3=Tumbuka</i><br><br><i>4=Chewa</i><br><br><i>5=Ngoni</i><br><br><i>6=Lhomwe</i><br><br><i>7=Manga'anja</i> |                   |

| <i>Questions</i>                        | <i>Response options</i>                                                                                                                                                                                            | <i>Skip logic</i> |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
|                                         | <i>8=Sena</i><br><br><i>9=Tonga</i><br><br><i>10=Yao</i><br><br><i>11=Nyanja</i><br><br><i>12=Others (specify)</i>                                                                                                 |                   |
| 1.9 What is your marital status?        | <i>1=Single (Never married)</i><br><br><i>2=Married</i><br><br><i>3=Divorced/Separated</i><br><br><i>4=Widowed</i>                                                                                                 |                   |
| 1.10 Source of income of the respondent | <i>1= Crocodile farming</i><br><br><i>2= Farmer</i><br><br><i>3= Formal employment</i><br><br><i>4= Skilled employment</i><br><br><i>5=Petty trader</i><br><br><i>6= Casual Labour</i><br><br><i>7=Remittances</i> |                   |

| <i>Questions</i>                                                                                | <i>Response options</i> | <i>Skip logic</i> |
|-------------------------------------------------------------------------------------------------|-------------------------|-------------------|
|                                                                                                 | 9=Others (specify)      |                   |
| 1.11 What is your personal monthly income?<br>(In Malawi Kwacha)                                |                         |                   |
| 1.12 Including you, how many members of the household earn income?                              | /.../                   |                   |
| 1.13 Is the household head the main income earner?                                              | 1=Yes<br><br>0=No       |                   |
| 1.14 Including income from other household members, what is the household total monthly income? | /..../                  |                   |

## SECTION II:

### OBJECTIVE 1: TO ANALYSE THE VALUE CHAIN MAP OF COMMERCIAL CROCODILE FARMING.

| #   | Questions                                                                                                         | Responses                                     | Skip Logic |
|-----|-------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|------------|
| 2.1 | What are the primary stages involved in the commercial crocodile value chain, from breeding to the final product? | 1=Breeding<br><br>2=Hatchery<br><br>3=Nursery |            |

|     |                                                                   |                                                                                                                                                                 |  |
|-----|-------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|     |                                                                   | 4=Grow-out farms<br>5=Processing<br>6=Manufacturing<br>7=Distribution<br>8=Retail.<br>9=Others                                                                  |  |
| 2.2 | What are the key processes involved in crocodile processing?      | 1=Skinning<br>2=Tanning<br>3=Grading and sorting<br>4=Finishing<br>5=Cutting<br>6=Stitching and assembly<br>7=Quality control<br>8=Others                       |  |
| 2.3 | Who are the main actors involved in commercial crocodile farming? | 1=Farmers<br>2=Suppliers<br>3=Exporters<br>4=Government agencies<br>5=Wholesalers<br>6=Retailers<br>7=Processing plants<br>8=Local communities<br>9=Restaurants |  |

|     |                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                          |  |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|     |                                                                                                                                                    | 10=Conservation organizations<br>11=Non-governmental Organizations (NGOs)<br>12=International partners<br>13=Research institutions<br>14=Others                                                                                                                                                                                                          |  |
| 2.4 | What roles do different actors play in the supply chain of commercial crocodile farming, from breeding and rearing to processing and distribution? | <b>Farmers</b><br>1=Breeding and hatchery management<br>2=Feeding and nutrition<br>3=Habitat maintenance<br>4=Healthcare and disease control<br>5=Harvesting and processing<br>6=Regulatory compliance<br>7=Marketing<br>8=Others<br><b>Suppliers</b><br>1=Supplying feed<br>2=Supplying hatchery management services<br>3=Supplying healthcare services |  |

|  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |
|--|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  |  | <p>4=Supplying habitat management services</p> <p>5=Supplying processing and packaging equipment and materials</p> <p>6=Offer logistics and transportation services</p> <p>7=Offer consulting and training services</p> <p>8=Others</p> <p><b>Exporters</b></p> <p>1=Accessing markets</p> <p>2=Regulatory compliance</p> <p>3=Quality control</p> <p>4=Logistics and transportation</p> <p>5=Market intelligence</p> <p>6=Promotion and marketing</p> <p>7=Value addition</p> <p>8=Financial transaction</p> <p>9=Others</p> <p><b>Government agencies</b></p> <p>1=Regulatory oversight</p> <p>2=Licencing and permitting</p> |  |
|--|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

|  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |
|--|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  |  | 3=Environmental management<br>4=Health and disease control<br>5=Fund or conduct research and development<br>6=Market access and trade promotion<br>7=Training and extension services<br>8=Monitoring and enforcement<br>9=Others<br><b>Wholesalers</b><br>1=Accessing market<br>2=Distribution<br>3=Inventory management<br>4=Quality control<br>5=Pricing and negotiation<br>6=Marketing and promotion<br>7=Risk management<br>8=Customer support<br>9=Others<br><b>Retailers</b><br>1=Distribution<br>2=Product presentation |  |
|--|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

|  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |
|--|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  |  | 3=Customer education<br>4=Sales and transactions<br>5=Inventory management<br>6=Marketing and promotion<br>7=Customers services<br>8=Compliance and regulation<br>9=Others<br><br><b>Processing plants</b><br>1=Skin processing<br>2=Meat processing<br>3=Value addition<br>4=Quality control<br>5=Packaging and labelling<br>6=Exportation<br>7=Waste management<br>8=Research and development<br>9=Others<br><br><b>Local communities</b><br>1=Supply of raw materials<br>2=Egg collection<br>3=Providing food to the tourists<br>4=Employment<br>5=Environmental stewardship |  |
|--|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

|  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |
|--|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  |  | 6=Advocacy and awareness<br>7=Tourism and education<br>8=Consumption<br>9=Others<br><b>Restaurants</b><br>1=Creating demand for crocodile products<br>2=Product promotion<br>3=Culinary innovation<br>4=Education and awareness<br>5=Support for local producers<br>6=Tourism and hospitality<br>7=Collaboration and partnership<br>8=Others<br><b>Conservation organizations</b><br>1=Research and monitoring<br>2=Habitat conservation<br>3=Species protection<br>4=Community engagement<br>5=Policy advocacy<br>6=Certification and standards<br>7=Capacity building |  |
|--|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

|  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |
|--|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  |  | <p>8=Collaborate with commercial crocodile farms</p> <p>9=Others</p> <p><b>Non-governmental Organizations (NGOs)</b></p> <p>1=Advocacy and policy influence</p> <p>2=Research and development</p> <p>3=Capacity building</p> <p>4=Certification and standards</p> <p>5=Community engagement</p> <p>6=Market access and promotion</p> <p>7=Monitoring and evaluation</p> <p>8=Collaboration and partnership</p> <p>9=Others</p> <p><b>International partners</b></p> <p>1=Technology transfer</p> <p>2=Provide loans</p> <p>3=Provide investment capital and financial resources</p> <p>4=Accessing market</p> <p>5=Capacity building</p> |  |
|--|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

|  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |
|--|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  |  | 6=Research and development<br>7=Policy advocacy<br>8=Certification and standards<br>9=Environmental and social<br>impact assessment<br>10=Others<br><b>Research institutions</b><br>1=Breeding and genetics<br>research<br>2=Health and disease<br>management<br>3=Nutrition and feed<br>development<br>4=Habitat and environmental<br>management<br>5=Reproductive and hatchery<br>management<br>6=Behaviour and welfare<br>studies<br>7=Product development and<br>processing |  |
|--|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

|     |                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                        |  |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|     |                                                                                                                                                         | 8=Sustainability and environmental impact assessment<br>9=Extension and training<br>10=Others                                                                                                                                                                                                                                          |  |
| 2.5 | What is the annual volume of crocodile meat, skin, teeth and other crocodile-derived products move from downstream to upstream part of the value chain? | _____                                                                                                                                                                                                                                                                                                                                  |  |
| 2.6 | What are the main challenges faced by different actors in the commercial crocodile farming sector?                                                      | 1=Market volatility<br>2=Disease outbreaks<br>3=Environmental degradation<br>4=Regulatory compliance<br>5=Predation and poaching<br>6=Public perception<br>7=Resource constraints such as capita, land, water, suitable habitats<br>8=Technological advances<br>9=Community relations<br>10=Climate change<br>11=High compliance costs |  |

|     |                                                                                                    |                                                                                                                                                                                                                                                                                                                                                          |  |
|-----|----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|     |                                                                                                    | 12=Others                                                                                                                                                                                                                                                                                                                                                |  |
| 2.7 | What strategies do key actors employ to manage challenges in the commercial crocodile value chain? | 1=Diversifying product offerings<br>2=Insurance<br>3=Supply chain management<br>4=Regulatory compliance<br>5=Financial risk management<br>6=Investing in research and development<br>7=Establishing contingency plans<br>8=Maintaining strong relationships with suppliers, customers and stakeholders<br>9=Collaboration and partnerships<br>10=Others. |  |

**OBJECTIVE 2: TO ASSESS THE CURRENT STATUS OF THE CROCODILE PRODUCTION, MARKETING AND CONSUMPTION.**

| #   | Questions                                                         | Responses                                                                                                                                                                                                                                                                                                           | Skip Logic |
|-----|-------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 3.1 | How many crocodile farms are currently operational?               | _____                                                                                                                                                                                                                                                                                                               |            |
| 3.2 | What are the major crocodile species being farmed for production? | 1=Nile crocodile<br><i>(Crocodilus niloticus)</i><br><br>2=American crocodile<br><i>(Crocodilus acutus)</i><br><br>3=Saltwater crocodile<br><i>(Crocodilus porosus)</i><br><br>4=Indian crocodile<br><i>(Crocodilus palustris)</i><br><br>5=Philippine crocodile<br><i>(Crocodilus mindorensis)</i><br><br>6=Others |            |
| 3.3 | What are the primary purposes of crocodile farming?               | 1=meat<br><br>2=Skin<br><br>3=Live crocodile<br><br>4=Teeth<br><br>5=Oils<br><br>6=Bones                                                                                                                                                                                                                            |            |

| #   | Questions                                                                                    | Responses                                                                                                                                                | Skip<br>Logic |
|-----|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 3.4 | Can you describe the current attribute of crocodile products' market?                        | 1=Limited supply<br>2=Growing demand<br>3=Competition                                                                                                    |               |
| 3.5 | What is the annual production volume of crocodile meat and other crocodile-derived products? | _____                                                                                                                                                    |               |
| 3.6 | What are the primary methods of crocodile farming utilized for production?                   | 1=Intensive farming in captivity,<br>2=Semi-intensive systems in natural or artificial habitats<br>3=Extensive farming in large open spaces.<br>4=Others |               |
| 3.7 | What are the prevailing market prices for various crocodile products?                        | 1=Live crocodile<br>2=Skins (grade 1, grade 2, grade 3)<br>3=Meat/kg<br>4=Oils/Lt<br>5=bones                                                             |               |

| #    | Questions                                                                                                | Responses                                                                                                                                           | Skip Logic      |
|------|----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| 3.8  | How is crocodile meat and related products marketed to consumers, both domestically and internationally? | 1=Wholesalers, retailers<br>2=Specialty stores<br>3=Online platforms<br>4=Direct sales to consumers.<br>5=Restaurants<br>6=Supermarkets<br>7=Others |                 |
| 3.9  | What are the emerging consumer preferences or trends influencing crocodile consumption?                  | 1=Luxury and status<br>2=Fashion trend<br>3=Versatility<br>4=Celebrity endorsement<br>5=Alternative materials<br>6=Others                           |                 |
| 3.10 | Are there any factors influencing their purchasing decisions?                                            | 0=No<br>1=Yes                                                                                                                                       | If 1, go to Q11 |
| 3.11 | What are the factors influencing their purchasing decisions?                                             | 1=Culture<br>2=Income levels<br>3=Availability                                                                                                      |                 |

| #    | Questions                                                                                                           | Responses                                                                                                                                                                                       | Skip Logic |
|------|---------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
|      |                                                                                                                     | 4=Personal preference and lifestyle<br>5=Social influence<br>6=Design and colour<br>7=Quality<br>8=Brand reputation<br>9=Price<br>10=Awareness<br>11=Others                                     |            |
| 3.12 | What are the emerging opportunities or potential areas for growth in the crocodile production and marketing sector? | 1=Expanding into new markets<br>2=Diversifying product offerings<br>3=Adopting sustainable farming practices<br>4=Leveraging marketing strategies to target niche consumer segments<br>5=Others |            |

| #    | Questions                                                                                                            | Responses                                                                                                                                                                                                      | Skip<br>Logic |
|------|----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 3.13 | What regulatory frameworks govern crocodile production, marketing, and consumption in the respective regions?        | 1=Wildlife protection laws<br>2=Food safety regulations<br>3=Trade agreements<br>4=Import/export restrictions<br>5=Others                                                                                      |               |
| 3.14 | Can you identify any challenges or barriers hindering the growth of the crocodile production and marketing industry? | 1=Environmental concerns<br>2=Regulatory restrictions<br>3=Competition from other meat products<br>4=Consumer perception<br>5=Market access issues<br>6=Supply chain issues<br>7=Price fluctuation<br>8=Others |               |

**OBJECTIVE 3: TO EXAMINE TYPES OF INVESTMENT REQUIRED IN CROCODILE COMMERCIALIZATION.**

| #   | Questions                                                                                                           | Responses                                                                                                                                                                                                                                                       | Skip Logic       |
|-----|---------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| 4.1 | Are there critical investments necessary to establish and operate a successful crocodile commercialization venture? | 1=Yes<br><br>0=No                                                                                                                                                                                                                                               | If 0, go to Q4.7 |
| 4.2 | What are the investments necessary to establish and operate a successful crocodile commercialization venture?       | 1=Land and infrastructure<br>2=Crocodile stock<br>3=Feed and nutrition<br>4=Labor<br>5=Security measures<br>6=Regulatory compliance<br>7=Marketing and sales<br>8=Research and development<br>9=Infrastructure and utilities<br>10=Risk management<br>11=Others |                  |

| #   | Questions                                                                                                           | Responses                                                                                                                                                                                                                                                          | Skip Logic       |
|-----|---------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| 4.1 | Are there critical investments necessary to establish and operate a successful crocodile commercialization venture? | 1=Yes<br><br>0=No                                                                                                                                                                                                                                                  | If 0, go to Q4.7 |
| 4.3 | What are the primary cost centers in crocodile commercialization that require significant investment?               | 1=Infrastructure development (ponds, hatcheries, processing facilities)<br><br>2=Land acquisition<br><br>3=Breeding programs<br><br>4=Operational expenses (feed, labour, veterinary care)<br><br>5=Marketing<br><br>6=Compliance with regulations<br><br>7=Others |                  |
| 4.4 | What are the ongoing operational expenses associated with crocodile farming?                                        | 1=Feed procurement<br><br>2=Veterinary care<br><br>3=Labor                                                                                                                                                                                                         |                  |

| #   | Questions                                                                                                                             | Responses                                                                                                                             | Skip Logic       |
|-----|---------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|------------------|
| 4.1 | Are there critical investments necessary to establish and operate a successful crocodile commercialization venture?                   | 1=Yes<br><br>0=No                                                                                                                     | If 0, go to Q4.7 |
|     |                                                                                                                                       | 4=Utilities (such as water and electricity)<br><br>5=Security<br><br>6=Administrative costs<br><br>7=Disease control<br><br>8=Others  |                  |
| 4.5 | Are there specific technology investments crucial for enhancing efficiency and productivity in crocodile farming and processing?      | 0=No<br><br>1=Yes                                                                                                                     | If 1, go to 4.6  |
| 4.6 | What are these specific technology investments crucial for enhancing efficiency and productivity in crocodile farming and processing? | 1=Temperature-controlled incubators<br><br>2=Water management systems<br><br>3=Feed processing equipment<br><br>4=Veterinary supplies |                  |

| #   | Questions                                                                                                           | Responses                                                                                                                                                           | Skip Logic       |
|-----|---------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| 4.1 | Are there critical investments necessary to establish and operate a successful crocodile commercialization venture? | 1=Yes<br><br>0=No                                                                                                                                                   | If 0, go to Q4.7 |
|     |                                                                                                                     | 5=Specialized tools for leather processing<br><br>6=Transportation vehicles<br><br>7=Others                                                                         |                  |
| 4.7 | Are there any government incentives or grants available to support investments in crocodile commercialization?      | 0=No<br><br>1=Yes                                                                                                                                                   | If 1, go to 4.8  |
| 4.8 | What are the government incentives or grants available to support investments in crocodile commercialization?       | 1=Subsidies for habitat<br><br>2=Environmental conservation projects<br><br>3=Tax incentive/Tax breaks for eco-friendly practices<br><br>4=Funding for research and |                  |

| #   | Questions                                                                                                           | Responses                                                                                                                                                                                             | Skip Logic       |
|-----|---------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| 4.1 | Are there critical investments necessary to establish and operate a successful crocodile commercialization venture? | 1=Yes<br><br>0=No                                                                                                                                                                                     | If 0, go to Q4.7 |
|     |                                                                                                                     | development initiatives<br><br>5=Export assistant programs<br><br>6=Training and education programs<br><br>7=Grants/loans<br><br>8=Others                                                             |                  |
| 4.9 | Could you detail the regulatory requirements and associated compliance costs involved in crocodile farming?         | 1=Fees for permits and licenses for breeding and trading<br><br>2=Adhering to animal welfare standards<br><br>3=Environmental assessments<br><br>4=Compliance with local, national, and international |                  |

| #   | Questions                                                                                                           | Responses                                                                                                              | Skip Logic       |
|-----|---------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|------------------|
| 4.1 | Are there critical investments necessary to establish and operate a successful crocodile commercialization venture? | 1=Yes<br><br>0=No                                                                                                      | If 0, go to Q4.7 |
|     |                                                                                                                     | regulations governing wildlife management and trade.<br><br>5=Inspections<br><br>6=Ongoing monitoring.<br><br>7=others |                  |

#### **Appendix 4: Interview Guide/Checklist**

1. How many crocodile farms are currently operational, and where are they located geographically?
2. What are the primary purposes of crocodile farming?
3. What is the annual production volume of crocodile meat and other crocodile-derived products?
4. Can you provide insights into the export and import trends of crocodile products, if any for the past 10 years?
5. What are the prevailing market prices for various crocodile products, and how have they fluctuated recently?
6. What regulatory frameworks govern crocodile production, marketing, and consumption in the respective regions?
7. Can you explain challenges or barriers hindering the growth of the crocodile production and marketing industry?
8. What are the primary stages involved in the commercial crocodile value chain, from breeding to the final product?
9. What are the key processes involved in crocodile processing?
10. Who are the main stakeholders involved in commercial crocodile farming?
11. What roles do different actors play in the supply chain of commercial crocodile farming, from breeding and rearing to processing and distribution?
12. What are the main challenges faced by different stakeholders in the commercial crocodile farming sector?
13. What strategies do key actors employ to manage risks such as market fluctuations, disease outbreaks, and environmental impacts?

14. What are the investments necessary to establish and operate a successful crocodile commercialization venture?
15. What are the ongoing operational expenses associated with crocodile farming?
16. What are the specific technology investments crucial for enhancing efficiency and productivity in crocodile farming and processing?
17. What are the government incentives or grants available to support investments in crocodile commercialization?

**THANK YOU**

## Appendix 5: Introduction Letter



**MZUZU UNIVERSITY**  
**OFFICE OF HEAD OF DEPARTMENT**  
**AGRISCIENCES**

Private Bag 201  
Luwingu  
Mzuzu 2  
MALAWI  
Tel.: (265) 01 320 722/575

**To : WHOM IT MAY CONCERN**

**Date : 7<sup>th</sup> October 2024**

The bearer of this letter is Mr. Hope Ngilazi registration number MTCD1623 is a student at Mzuzu University in the Faculty of Environmental Sciences, Department of Agri-sciences. Hope is conducting a study on ‘Business opportunities along crocodile value chain in Malawi’ as part of the requirements for the MSc degree program he is pursuing and any assistance rendered to him will be greatly appreciated. The information he collects will only be used for academic and not for profit making of any kind.

Dr Ulemu Msiska

Postgraduate Coordinator, Department of Agri-Sciences

## Appendix 6: Letter of Intent



**MZUZU UNIVERSITY**

**DIRECTORATE OF RESEARCH**

Mzuzu University  
Private Bag 201  
Luwinga  
Mzuzu 2  
MALAWI  
TEL: 01 320 722  
FAX: 01 320 648

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### **MZUZU UNIVERSITY RESEARCH ETHICS COMMITTEE (MZUNIREC)**

**Ref No: MZUNIREC/DOR/24/73**

**20/08/2024.**

Hope Ngilazi

Mzuzu University,

P/Bag 201,

Luwinga,

Mzuzu 2.

Email: [hopenzilazib@gmail.com](mailto:hopenzilazib@gmail.com)

Dear Hope,

### **LETTER OF INTENT TO ISSUE A RESEARCH ETHICS AND REGULATORY PERMIT FOR PROTOCOL REF NO. MZUNIREC/DOR/24/73: BUSINESS OPPORTUNITIES ALONG CROCODILE VALUE CHAIN IN MALAWI.**

The Mzuzu University Research Ethics Committee (MZUNIREC) reviewed your submission. The committee is now pleased to inform you that the protocol is at the stage at which the Principal Investigator is being required to pay the stipulated 10% regulatory fee of the actual budget as

indicated in the research protocol being a regulatory **compliance and capacity building fee** before ethics approval and regulatory permit could be issued. This fee is required to be paid to the Committee. The mode of payment is either a cash or cheque deposit into the following bank account:

| Description                  | Details                                                        |
|------------------------------|----------------------------------------------------------------|
| Beneficiary name and address | Mzuzu University, Private Bag 201, Luwinga,<br>Mzuzu 2, Malawi |
| Beneficiary account name     | MZUNIREC                                                       |
| Beneficiary account No.      | 1007578888                                                     |
| Bank name and address        | National Bank of Malawi, Mzuzu Branch, PO<br>Box 20, Mzuzu     |
| Swift code or ABA number     | N/A                                                            |

Once payment is made, send a deposit slip/wire transfer slip for the verification of our Accounts Department.

Yours Sincerely,



Wanangwa K. Msowoya

**MZUNIREC Secretariat**

**FOR: MZUNIREC CHAIRPERSON**

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Mzuzu University Research Ethics Committee

Directorate of Research

Mzuzu University

P/Bag 201

Luwinga

Mzuzu 2

Email: [mzunirec@mzuni.ac.mw](mailto:mzunirec@mzuni.ac.mw)

## Appendix 7: Ethical Approval



**MZUZU UNIVERSITY**

**DIRECTORATE OF RESEARCH**

Mzuzu University  
Private Bag 201  
Luwinga  
Mzuzu 2  
MALAWI  
TEL: 01 320 722  
FAX: 01 320 648

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**MZUZU UNIVERSITY RESEARCH ETHICS COMMITTEE (MZUNIREC)**

**Ref No: MZUNIREC/DOR/24/73      25/10/2024.**

Hope Ngilazi,  
Mzuzu University,  
P/Bag 201, Luwinga,  
Mzuzu 2.

Email: [hopengilazib@gmail.com](mailto:hopengilazib@gmail.com)

Dear Hope,

**RESEARCH ETHICS AND REGULATORY APPROVAL AND PERMIT FOR  
PROTOCOL REF NO. MZUNIREC/DOR/24/73: BUSINESS OPPORTUNITIES ALONG  
CROCODILE VALUE CHAIN IN MALAWI.**

Having satisfied all the relevant ethical and regulatory requirements, I am pleased to inform you that the above referred research protocol has officially been approved. You are now permitted to proceed with its implementation. Should there be any amendments to the approved protocol in the course of implementing it, you shall be required to seek approval of such amendments before implementation of the same.

This approval is valid for one year from the date of issuance of this approval. If the study goes beyond one year, an annual approval for continuation shall be required to be sought from the Mzuzu University Research Ethics Committee (MZUNIREC) in a format that is available at the Secretariat. Once the study is finalized, you are required to furnish the Committee with a final report of the study.

The Committee reserves the right to carry out compliance inspection of this approved protocol at any time as may be deemed by it. As such, you are expected to properly maintain all study documents including consent forms.

Wishing you a successful implementation of your study.

Yours Sincerely,



Wanangwa K. Msowoya

**MZUNIREC Secretariat**

**FOR: MZUNIREC CHAIRPERSON**



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Mzuzu University Research Ethics Committee Directorate of  
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Mzuzu University

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