

**SILVERFISH CHAIN MANAGEMENT PRACTICES AT MASESE LANDING SITE IN  
JINJA DISTRICT, EASTERN UGANDA**

**BY**

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**A DISSERTATION SUBMITTED TO THE DIRECTORATE OF RESEARCH  
AND GRADUATE SCHOOL IN PARTIAL FULFILMENT OF THE  
REQUIREMENTS FOR THE AWARD OF THE DEGREE OF  
MASTER OF ARTS IN DEVELOPMENT STUDIES  
OF KYAMBOGO UNIVERSITY**

**OCTOBER 2024**

## DECLARATION

I, **Shimon Aijuka**, hereby affirm that this dissertation is entirely my original work and has never been submitted or published for any other award where scholarly works by others have been referenced, and proper credit has been given both in the text and the list of resources.

Signature .....

Date .....

## **APPROVAL**

We confirm that the work in this dissertation was done by the candidate under our supervision on behalf of Kyambogo University.

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## **DEDICATION**

This dissertation is dedicated to my beloved family, my friends, and the entire body of research at Kyambogo University, my bosses at Shoma Christian Academy, and my spiritual family at Kakumba Chapel. You have been of extremely immeasurable commitment, sacrifice, and high moral support, thus bringing me this far! May the Almighty God keep you favored and blessed.

## **ACKNOWLEDGEMENT**

A study of this kind could only be compiled with external guidance and support. It is against this background that I wish to extend my sincere gratitude and appreciation to the following:

I start by appreciating God, who was above the height of this work and gave His sufficient grace and mercy for this task to be accomplished amidst many challenges through which He sustained me. I would also like to convey my heartfelt gratitude to my university supervisors, Dr. Judith Nagasha and Asimwe Florence. Appreciation goes to Dr. Bikolimana Muhihi for his immense support during his visit to Kyambogo University. Their professional, unconditional guidance and sacrifice made this work a reality. May the Almighty God reward them for the great work done! I equally convey my appreciation to Kyambogo University for the research grant that was given to me because my research financial expenses were met.

A special acknowledgement goes to all my course mates that I joined the course with way back in 2022. It is with them that I have struggled to pursue this program. I equally acknowledge all those not mentioned for the encouragement, all kinds of support, counselling, and guidance that were given to me. All their wise words made this task fruitful.

## TABLE OF CONTENTS

<b>DECLARATION.....</b>	<b>i</b>
<b>APPROVAL .....</b>	<b>ii</b>
<b>DEDICATION.....</b>	<b>iii</b>
<b>ACKNOWLEDGEMENT.....</b>	<b>iv</b>
<b>TABLE OF CONTENTS .....</b>	<b>v</b>
<b>LIST OF TABLES .....</b>	<b>x</b>
<b>LIST OF FIGURES.....</b>	<b>xi</b>
<b>ABSTRACT.....</b>	<b>xii</b>
<b>CHAPTER ONE .....</b>	<b>1</b>
<b>INTRODUCTION.....</b>	<b>1</b>
1.1 Overview.....	1
1.2 Background of the Study .....	1
1.3 Statement of the Problem.....	5
1.4 Purpose of the Study .....	6
1.4.1 Specific Objectives.....	6
1.5 Research Questions and Hypothesis .....	7
1.6 Scope of the Study .....	7
1.6.1 Geographical Scope.....	7
1.6.2 Content Scope .....	8
1.6.3 Time Scope.....	8
1.7 Significance of the Study .....	8
1.7.1 The policymakers in government .....	8

1.7.2 The Research Field.....	9
1.7.3 The Community .....	9
1.8 Limitations of the Study.....	9
1.9 Organization of the Study .....	9
1.9.1 Definition of Terms .....	10
1.10 Conceptual framework.....	10
<b>CHAPTER TWO .....</b>	<b>12</b>
<b>LITERATURE REVIEW .....</b>	<b>12</b>
2.1 Overview.....	12
2.2 Theoretical Review .....	12
2.2.1 Resource-Based Theory.....	12
2.2.2 Porter’s Value Chain Framework.....	13
2.3 Empirical Literature Review.....	14
2.3.1 Safety and Storage Practices of Fish and Fishery Products .....	14
2.3.2 Demographic characteristics and silverfish chain management practices .....	18
2.3.3 Value Addition Practices in Fish and Fishery Products .....	19
2.3.4 Marketing and Transportation Techniques of Fishery products .....	23
2.4 Summary of Literature and Research Gaps .....	26
<b>CHAPTER THREE .....</b>	<b>28</b>
<b>METHODOLOGY .....</b>	<b>28</b>
3.1 Overview.....	28
3.2 Research approach and design .....	28

3.3 Study population .....	28
3.4 Sample size .....	29
3.5 Sampling Methods .....	29
3.6 Data Collection Instruments .....	30
3.6.1 Questionnaire .....	30
3.6.2 Interview Guide .....	30
3.6.3 Focus Group Discussion Guide .....	30
3.7 Quality Control .....	31
3.7.1 Validity .....	31
3.7.2 Reliability .....	31
3.8 Data Management and Analysis .....	32
3.9 Ethical Considerations .....	33
<b>CHAPTER FOUR.....</b>	<b>34</b>
<b>DATA PRESENTATION, ANALYSIS AND INTERPRETATION .....</b>	<b>34</b>
4.0 Overview.....	34
4.1 Background Characteristics of Respondents .....	34
4.2 The safety and Storage Practices .....	38
4.2.1 Safety and Handling Practices.....	38
4.2.2 Storage Methods at Masese.....	42
4.3 Demographic Factors and Chain Management.....	45
4.3.1 Age and Chain Management.....	45
4.3.1 Gender and Chain Management .....	47
4.3.3 Education Level and Chain Management .....	48

4.3.4 Marital Status and Chain Management.....	50
4.3.5 Experience in the Chain and Chain Management .....	51
4.3.6 Employment Type and Chain Management.....	52
4.4 Value Addition Practises at Masese Fish Landing Site .....	54
4.5 Marketing and Transportation Methods at Masese Fish Landing Site .....	57
4.5.1 Marketing Methods .....	57
4.5.2 Transportation Mechanisms .....	60
<b>CHAPTER FIVE .....</b>	<b>64</b>
<b>DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS .....</b>	<b>64</b>
5.0 Introduction.....	64
5.1 Discussion of the Findings.....	64
5.1.1 Objective one: To explore the safety and storage practices used by silverfish dealers at the Masese landing site in Jinja District .....	64
5.1.2 To find out whether demographic characteristics influence silverfish chain management practices at various points at the Masese landing site in Jinja. ....	67
5.1.3 To find out the silverfish value addition techniques used at the Masese Fish Landing site at various points.....	68
5.1.4 To explore the silverfish marketing and transportation methods used at the Masese fish site in Jinja.....	70
5.2 Conclusion .....	72
5.3 Policy and Practical Recommendations.....	72
<b>REFERENCES.....</b>	<b>75</b>

<b>APPENDICES</b> .....	<b>87</b>
Appendix A: Porter’s Value Chain.....	87
Appendix B: Matrix for Data Analysis.....	88
Appendix C: Questionnaire for Silverfish Chain Management Dealers.....	89
Appendix D: Interview Guide for Silverfish Chain Management Dealers.....	93

## LIST OF TABLES

Table 4.1: Background Characteristics of Respondents .....	35
Table 4.2: Silverfish Safety and Handling Practices Table .....	39
Table 4.3: Summary table Results for Safety .....	42
Table 4.4: Storage Methods .....	43
Table 4.5: Summary table for storage methods .....	45
Table 4.6:ANOVA Tests Results of Age Influence on Chain Activities .....	46
Table 4. 7: Student’s t-Test Results for Gender and Silverfish Chain Activities .....	47
Table 4.8: ANOVA Tests Results of Education Level Influence on Chain Activities.....	49
Table 4.9: ANOVA Results of Marital Status Influence on Chain Activities .....	50
Table 4. 10: ANOVA Results of Experience’s Influence on Silverfish Chain Management.....	51
Table 4.11: ANOVA Results of Employment Types Influence on Silverfish Chain Activities ..	53
Table 4. 12: Value Addition practices .....	54
Table 4.13: Marketing Strategies .....	57
Table 4.14: Summary for Marketing Methods .....	60
Table 4. 15: Transportation Methods.....	61
Table 4. 16: Summary for Transport Mechanisms .....	63

**LIST OF FIGURES.**

Figure 1.1: Conceptual framework in the fish value chain..... 11

## ABSTRACT

The study aimed to determine silverfish chain management practices at Masese landing site in Jinja district, eastern Uganda. The objectives of the study were to explore the silverfish safety and storage practices used at the Masese Fish Landing site, find out whether demographic characteristics influence perceptions about silverfish chain management practices, find out the silverfish value addition techniques used at Masese fish site and explore the silverfish marketing and transportation strategies used at the Masese fish site. The study adopted a mixed approach though the qualitative was dominant on 200 fisher women, fishermen, input providers, the fishing community, landing site leaders, registrars, and tax collectors. The study found out that at Masese fish landing site, safety and storage practices to preserve silverfish are used. These are quality control, cleaning, moisture removal, sacks, baskets, refrigerators and tins. Some demographic characteristics do influence perceptions about silverfish management at Masese landing site in Jinja. Age, sex, marital status, education level and experience have no influence on the perceptions of the women about silver fish management. There is use of social networks, word of mouth, phones, and packaging strategies to market silverfish at Masese landing site. Participants in the fish value chain employ various marketing strategies to sell silverfish. They often use word-of-mouth marketing, where they rely on personal networks to inform potential customers about their products.

# CHAPTER ONE

## INTRODUCTION

### 1.1 Overview

This chapter presents the background of the study; it also covers the statement of the problem, which shows the existing gap, and the objectives, which are both general and specific. The chapter also highlights the aspects of the significance of the study, the scope of the study, its limitations, and the organisation of the study thereafter.

### 1.2 Background of the Study

Scientists and fisheries policymakers have, for a long time, been interested in silverfish chain management (Belton, 2018). Madeleine (2021) elaborated on the practical and research responsibilities of women working in the seafood business throughout Europe, Latin America, Asia, and Africa, where small-scale artisanal fisheries and aquaculture value chains are vital for the livelihoods of coastal people worldwide. The minor marginalised have an essential role in small-scale fisheries chain management all over the world, accounting for about half of the 40 million people employed in small-scale fisheries (Kusakabe et al., 2021). They regulate post-harvest seafood handling, processing, selling, packaging, and marketing. However, gender disparities are persistent in the fish business, and youth's and women's work is still mainly disregarded, invisible, concealed, and underestimated (Calhoun et al., 2016).

Vergis (2021) discovered that an extensive range of risks (biological, chemical, and environmental) existed in the sector from production to the supply chain worldwide in research about the safety and storage methods in the fish industry with the World Health Organization. The WHO and FAO study on silver fish on the Antarctic Peninsula raised concerns regarding human safety and storage systems. The presence of human infections and histamine production caused by

spoilage bacteria were the primary problems, making management of both pathogenic and spoilage microorganisms crucial for fish product safety (Caccavo et al., 2018). Tesfaye (2022) noted, however, that these issues could also be caused by the world's inadequate farming practices, environmental degradation, and socio-cultural habits prevalent in many countries. As a result, with a growing worldwide population and demand for aquacultural products, assessing and regulating food safety risks became increasingly important (Hasimuna et al., 2020).

Nair and Madhu (2018) examined the Indian mackerel value chain in Kerala, India. The study discovered that the chain included several intermediates, including fishermen, traders, wholesalers, and retailers, as well as a significant number of less advantaged women at the value-added level. Some researchers, such as Tavares et al. (2021), Getu et al. (2015), and Gemert et al. (2018), identified several challenges in the chain, such as a lack of infrastructure for handling and storing fish, the use of outdated technology, the use of toxic technology for preservation, and the dominance of intermediaries who controlled prices (FAO, 2022; Koehn et al., 2021). As a result, various stakeholders were called upon to step up, pay attention to the situation, and implement policies that could improve the status of the value addition level in the chain (Audun et al., 2014).

Arulanandam et al. (2019) studied the Indian mackerel value chain in Tamil Nadu, India. According to the study, the chain involved a variety of players, including fishermen, collectors, processors, traders, and retailers. The study highlighted various problems in the marketing and transportation chains, including a lack of quality standards, a lack of processing and storage infrastructure, and significant levels of post-harvest losses (Pereggreen et al., 2018). Lean logistics has been utilised to address challenges in the fish sector at the marketing and transportation levels, and the Norwegian marine food supply chain has improved significantly (Towers, 2016). However, for third-world countries, the lean logistics technique is exorbitantly costly (FAO, 2020).

The United Nations (2015) recognises that many in the world's fisheries industry earn a living due to gender or conventional roles. For these rural women, who must execute reproductive, productive, and community tasks, multitasking is a strain. Given the disparities in economic status and social and cultural circumstances, their roles in the fishing business vary by location, country, and community (Solano et al., 2021). Their involvement is often limited to handling, with little involvement in profitable activities such as marketing and value addition (Siles et al., 2019; Kruijssen et al., 2020). According to the FDA's Code of Federal Regulations Title 21 (21CFR), over 88% of global silverfish production is collected for human consumption, with more than 56% undergoing modest processing, storage, or value addition. The majority of the output is processed, with 35% being frozen, 11% being prepared and preserved, and 10% being dried, salted, smoked, or otherwise cured (Sheng et al., 2020). This is before exiting markets where they are most favoured; however, many of these marketplaces are not highly priced (FAO, 2020).

In Africa, the supply chain management system for silverfish is still quite remote and is thriving in the face of numerous challenges ranging from political, social, economic, and cultural factors (Mpomwenda et al., 2022). One example is the exchange of sexual services for access to fish by fish processors and mongers, known as "fish-for-sex," as described in other African locations. This implies that female traders lack the negotiating power to decline such transactions with fishermen who have the ability to supply them with high-quality silver fish (Matsue et al., 2014). This obviously makes them vulnerable to a variety of issues that affect their health and self-esteem in the community. As a result, there is a gap to fill in the value chain management of silverfish.

There is also a shortage of economic opportunities for several dealers at fish-landing sites, which has been identified as a major contributor to their vulnerability in fisheries. Mojola (2017)

neatly summarized this as "men fish and women sell fish." This means that women only participate in the later stages of the chain, which may not generate enough income for them in comparison to men, who begin at the early phases of the chain and work their way to the end of the fish value chain. However, women's economic vulnerability stems from more than just the disparity in profit generated between these two activities; it also emerges from women's ability, or lack thereof, at the landing site to negotiate access to the fish to sell (Medard, 2012).

Some individuals interested in fishing tend to work on the outskirts (Derbyshire, 2019). This was because of their inability to participate in the capture fishery, which was dominated by the capable ones, or compete with factories, which could provide considerably higher prices. As a result, they were limited to buying and selling fish that were not required by more powerful industry actors, making the activities they had access to even less profitable (Petermall et al., 2004). The lack of credit also made it difficult for those with little or no capital to start a business, and the lack of access to land on some landing sites meant that they were completely unable to meet their subsistence needs without acquiring cash (Lwenya et al., 2012).

Small-scale fishing activities dominate the silverfish sector in Uganda, with minor dealers contributing to the value chain as they aim for self-economic development (Timmers, 2012). These work in all sectors of the silverfish industry, including harvesting, handling, processing, value addition, marketing, and sales (Ssetala et al., 2013). Despite their major contribution to the business, however, the industry remains remote and underdeveloped, with many concerns that seem to require being addressed by evaluating the current gaps (Kigongo et al., 2021). As a result, the study tries to bridge the existing gaps, as stated in the objectives, and to confirm the hypotheses, as stated in the objectives.

Fishing is a major activity at the Masese landing site, with marginalised groups engaged at practically every level of the fish chain (Solano et al., 2021). Those managing the silver fish chain at the landing site are involved in numerous parts of the supply chain. Their involvement is often focused on handling, with little involvement in profitable activities such as marketing and value addition (Siles et al., 2019; Kruijssen et al., 2020). While men fish, women are frequently involved in roles such as cleaning the fish, smoking it using indigenous knowledge, transporting and selling it, and so on. This leads to a lack of awareness of how to develop and maintain safe fish food along the fish supply value chains, as well as how to raise the value of their fish products and get access to sustainable markets. They also lack the necessary credit to launch viable silverfish value addition businesses (Ameyaw et al., 2020). Furthermore, heightened competition in the fishing industry due to seasonality leaves many women without alternative sources of income. Unanswered questions consequently exist in the gaps within the chain management of silver fish by women at Masese, where the study seeks answers.

### **1.3 Statement of the Problem**

Chain management of fish and fishery products, especially silverfish, is important for income generation among communities that are marginalised in opportunities for economic empowerment and growth (Harper et al., 2020). Some scholars, like Kamaylo (2021) and Bolman et al. (2018), have studied various prevailing fish chain management practices. Baz et al. (2019) studied the handling processes of fish before the supply chain, while Abwao (2019) & Oga (2022) studied fish chain management and value addition in Japan, China, South Africa, and Malawi. They found that the common safety and storage practices were: carrying sufficient water and food; lifesaving apparatus like first aid kits; and some thermal protective blankets. Other scholars, like Alvina

(2022) and Garrido et al. (2023), found that the common value additions in England and France were freezing, advanced drying, and the application of preservatives, among others.

In Uganda, the chain management of fish faces various challenges. These include poor technology for processing, which leads to continuous adulteration and mishandling of silverfish; cultural beliefs; and a less extensive distribution network that disables them from reaching customers in different regions (Kwarazuka et al., 2016). There are also unfair trade practices and exploitative relationships with middlemen, value addition, and access to lucrative markets (Manyungwa et al., 2019). The government, through Youth and Women Livelihood Programmes and other development programmes like the Youth Livelihood Fund and Parish Development Model, has reinforced various trainings on income generation initiatives, including value addition among small businesses in the fishing industry by women and youth.

However, the gaps in the fish chain still remain, and the results from many studies cannot be generalized to Uganda due to contextual and economic differences; some did not consider youth and women at all levels as they continue to face income insecurity (UN Women, 2020). Thus, it is a fact that in Uganda, issues of fish chain management, especially concerning women, are not clearly established in the literature. This study is therefore motivated to examine the chain management with a clear cut on silverfish against both men and women in Masese landing sites.

#### **1.4 Purpose of the Study**

The main objective was to examine the chain management practices of silverfish at Masese fish landing site.

##### **1.4.1 Specific Objectives**

The specific objectives of this study were to:

1. Explore the silverfish safety and storage practices used at the Masese Fish Landing site.
2. Find out whether demographic characteristics influence silverfish chain management practices.
3. Find out the silverfish value addition strategies used at the Masese Fish Landing site at various points.
4. Explore the silverfish marketing and transportation strategies used at the Masese fish site.

### **1.5 Research Questions and Hypothesis**

The study was guided by the following research questions:

1. What are the silverfish safety and storage practices used at the Masese Fish Landing site?
2. H<sub>a</sub>: Demographic characteristics influence the silverfish chain management practices.
3. What are the silverfish value addition practices used at the Masese landing site?
4. What are the silverfish marketing and transportation methods used at the Masese fish site?

### **1.6 Scope of the Study**

The study scope focused on the area scope, the content/subject scope, and the time scope.

#### **1.6.1 Geographical Scope**

The geography of the study was the Masese Fish Site. Masese Fish Site lies on the shores of Lake Victoria in Jinja district, located 87 kilometres east of Kampala in the Busoga subregion. It is located on Walukuba-Masese Road in Jinja, Uganda. Commercial fishing and hunting are the principal categories at Masese Landing Site. Masese was studied because it is rich in silverfish, unlike other fish sites, which are dominated by other species of fish that are not largely engaged

### **1.6.2 Content Scope**

The content scope was based on the thematic areas indicated in the objectives, which were: exploring the safety and storage practices of silverfish used at the Masese Fish Landing Site, finding out the influence of demographic factors on the silverfish chain management practises, finding out the silverfish value addition strategies at different points at the Masese Fish Landing Site and exploring the marketing and transportation strategies of silverfish employed at the Masese Fish Landing Site.

### **1.6.3 Time Scope**

The study fell within a period of two years, that is, 2022–2024. This period was considered good enough to enable the researcher to collect adequate information regarding the topic under study. In time, there were reconnaissance sessions, data collection, analysis, and dissemination of information in the different phases as they were structured. This time was selected because it entails the exact year the president launched development support programmes, and therefore it is a time suitable for the assessment of their effectiveness in the silverfish chain.

## **1.7 Significance of the Study**

The findings of this proposed study will be of significance to different stakeholders, as follows:

### **1.7.1 The policymakers in government**

The findings provided information on challenges faced in the silverfish industry. This is a foundation on which to frame appropriate policies and decisions that affect the area of study and places with related trials for the promotion of sustainable and inclusive economic growth. Also, it will contribute to the broader Ugandan policy discourse on gender-sensitive value chain development and gender-responsive fisheries management (Siles et al., 2019).

### **1.7.2 The Research Field**

There is limited published literature on this topic in Uganda and Africa, so this study has contributed to the body of knowledge across the country and in countries that depend on fishing as an economic activity.

### **1.7.3 The Community**

It has eased and enabled the operationalization of the development strategies laid out in different movements to achieve the National Development Plan 2040. It was achievable through the dissemination of feedback to give insights about findings on the study objectives and propose strategies to enhance economic empowerment by improving chain management practices for access to higher-value markets in the chain. This will lead to improved livelihoods for the women and their families and contribute to overall economic development. The study will also add to the body of knowledge, especially on the ongoing debates over fish chain management.

### **1.8 Limitations of the Study**

The study made various contributions to the fish value chains and women's empowerment in the fishing industry. However, there were limitations such as basing on one fishing site, Masese fish landing site, yet other fishing sites were not represented. Furthermore, the study's use of bivariate analysis was restricted to the quantitative research component; as a result, multivariate analyses may be used in further research.

### **1.9 Organization of the Study**

The study was organised into five chapters. The first chapter covered the introduction of the study, and the second chapter is about the review of literature related to the study. Chapter three covered the methodology and tools of the research; the fourth chapter contains data presentation and

discussion; and chapter five entails a summary of other findings, conclusions, and recommendations from the study.

### **1.9.1 Definition of Terms**

Chain management refers to processes and activities involved in managing the flow of goods and services from the point of production to the point of consumption (Chaoran et al., 2017).

Value addition is the doing of activities within a company or supply chain that directly contribute to satisfying end consumers, or those activities consumers would be happy to pay for (Nasrudin, 2022).

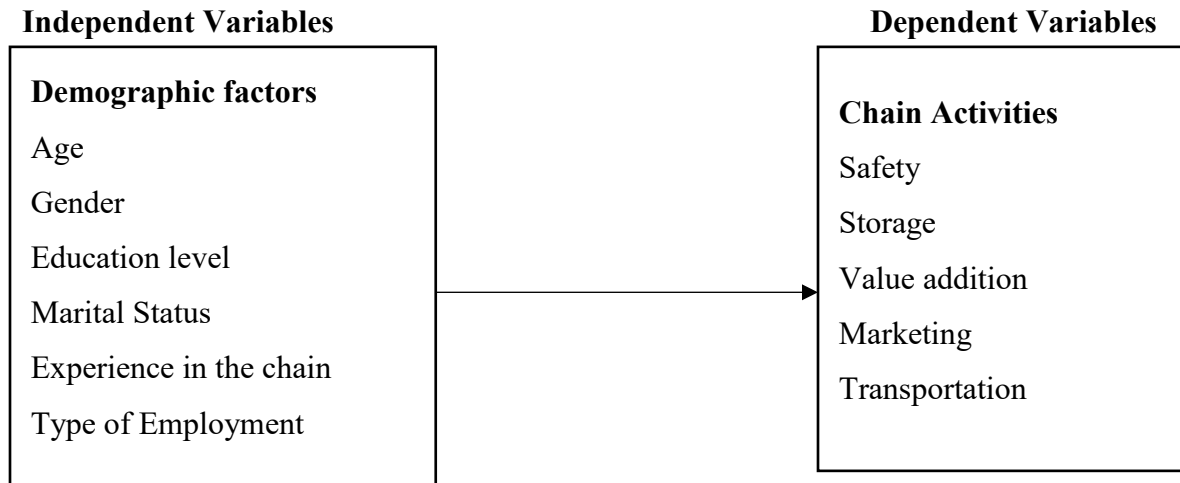
Transportation is the movement of goods from place to place and the various mechanisms by which such movement is accomplished (Gupta, 2021).

Marketing refers to the activities a company undertakes to buy or sell a product or service (Twin, 2023).

### **1.10 Conceptual framework**

The conceptual framework in the figure 1.1 describes the several activities in the fish value. It also shows the relationship between chain management activities and demographic factors as adopted from the work of Simpson et al., (2012)

### *Silverfish Value Chain Management 1*



**Figure 1.1: Conceptual framework in the fish value chain management**

**Source:** Conceptualized from the works of Simpson et al. (2012).

The above conceptual framework shows the different activities in the silverfish value chain. It shows the connection between different activities in the chain and demographic factors. According to the framework above, silverfish chain management practices will be determined by demographic factors.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Overview**

This chapter presents the literature reviewed. In the theoretical review, the chapter highlights resource-based theory and Porter's value chain framework. The chapter further discusses the empirical literature review on different dimensions of fish and fishery products in relation to the value chain, value addition, marketing, and transportation. Finally, it explains the research gap and the conceptual framework of the study.

#### **2.2 Theoretical Review**

##### **2.2.1 Resource-Based Theory**

The Resource-Based Theory (RBT) was propounded by Wernerfelt in 1984. The theory did not become popular until Jay Barney worked on it in 1991 (Clark et al., 2007). It determines strategic resources for a firm's sustainable competitive advantage. It assumes that a firm's resources and abilities are the key drivers of its competitive advantage and long-term performance. It also assumes that not all resources are equally valuable, rare, inimitable, or non-substitutable (Edwards, 2014; Kozlenkova et al., 2013). The theory has been used by scholars such as Miller (2019), Muhihi & Lusambo (2022), and Barney (2018) in their different areas of study. The theory, however, limits a firm's growth to only resources, not any other factors, and neglects the difficult determination of an appropriate level of analysis due to the broad definitions of resources (Kraaijenbrink et al., 2015; Lemamsha, 2017).

Despite RBT's weaknesses, this study considered it relevant in guiding the analysis of key driving resources and abilities used at Masese for safety and storage, value addition, marketing, and transportation of silver fish (Edwards, 2014). This study borrowed from the key variables of

resources that determine the competitiveness of silverfish dealers in the work of value addition (Bhasin, 2020). In the context of the silver fish chain, the resources were the traders' access to the fishing grounds, their fishing kit, knowledge of techniques, and social capital (Nakimbugwe et al., 2022; Howard, 2019). They became valuable and rare, as not all dealers had access to the fishing grounds or the necessary knowledge and equipment to catch and process the fish (Bertheussen, 2021). This theory overlooked the fact that growth is not entirely about resources but also about other factors (Kraaijenbrink et al., 2015). In this study, individual participants were regarded as independent firms that needed to strive for value addition using various resources such as funds, technology, and skills.

### **2.2.2 Porter's Value Chain Framework**

This value chain framework was introduced in 1985 by Michael Porter. It expanded Leontief's input/output model by emphasizing links between primary and support business activities (Ebe, 2018). Porter's value chain is a framework for developing an analytic structure that follows all interdependent activities in the value chain from fish acquisition, handling, processing, and finally into the hands of a customer at the land site (Tarver et al., 2021). Porter's framework (**Appendix A**) was classified into primary activities and secondary activities for competitive advantage. It showcases that the way to successful value chain analysis is to identify which processes to run more efficiently and implement fixes in a timely fashion (Eisenreich et al., 2022). It has been used by scholars such as Stuchey et al. (2022), Ghoshal et al. (2018), and Mateer (2015) in their various studies.

In the context of fisheries, this framework was relevant and guided the study to identify alliances or linkages between the activities that contribute to silver fish value addition for reasonable advantage (Kuperan et al., 2008). It guided the study in identifying the primary

activities that influence the marketing and transportation strategies at Masese. Also, by following Porter's primary chain activities, the study ensured to determine whether there is a relationship between social economic factors and creating value for safe storage of silver fish (Beers, 2021). However, the framework was limited because other fish chain strategies could get lost or muddled when operations were broken down into fine segments (Merchant, 2012). This justified the use of the two theories.

## **2.3 Empirical Literature Review**

### **2.3.1 Safety and Storage Practices of Fish and Fishery Products**

The proper handling of fish and fishery products is critical to ensuring that the fish is safe for human consumption. Silverfish dealers should wash their hands thoroughly before and after handling the fish to remove any bacteria or other contaminants that may be present (Beverly, 2019). By following these safety practices, they can help ensure that the silverfish they process and sell is of good quality and safe for their customers to eat. Zewdie et al. (2021) found that proper handling and storage practices of pelagic fish were crucial to maintaining the quality and safety of the fish in Ethiopia. The study found that fishermen and processors who followed good handling practices, such as wearing gloves and washing their hands frequently, were less likely to contaminate the fish with bacteria and other contaminants.

Similarly, Balasubramanian et al. (2019) in India found that proper handling and storage practices were critical to maintaining the quality of the fish. The study found that fishermen and processors who followed good handling practices, such as cleaning the fish thoroughly and storing it in clean, dry containers, were able to maintain the freshness of the fish for a longer period of time. Thoroughly cleaning silverfish is an important step in ensuring that it is safe for human consumption (Denis et al., 2022). Before processing, silverfish should be cleaned to remove any

dirt or debris that may be present on the fish (Erkinharju, 2021). This can be done by washing the fish with clean water and removing any visible dirt or debris with a clean knife or other tools. It is important to use clean water to wash the fish, as contaminated water can introduce bacteria or other contaminants to the fish.

Adhikari et al. (2020), on the microbial quality of silver fish sold in markets in Nepal, found that proper cleaning practices were critical to ensuring the safety of the fish. The study found that fish samples that were not properly cleaned had higher levels of bacterial impurities, including harmful bacteria such as Salmonella and Vibrio species. Similarly, a study by Zhang et al. (2018) on the microbiological quality of silverfish in China found that cleaning practices were important in reducing bacterial contamination. It found that fish samples that were washed with clean water had lower levels of bacterial infection than samples that were not well handled and washed with the right water and containers. These findings, however, are not sufficient because they did not examine other safety and storage practices that the study seeks to determine.

Another practice that helps keep fish safe is drying through several mechanisms. It is valuable to remove excess moisture to prevent the growth of bacteria and fungi that can cause spoilage by drying the fish in the sun or in a dryer (Bwamiki, 2018). This helps to remove any remaining moisture and also helps to preserve the fish by reducing the risk of bacterial growth. Jeyasekaran et al. (2015) in India found that drying in the sun for four hours effectively reduced the fish's moisture content and inhibited bacterial growth. Asante et al. (2020) found that sun-drying effectively reduces the water activity of dried fish, inhibiting the growth of microorganisms that can cause spoilage. Furthermore, proper drying practices can also have a significant impact on the nutritional quality of fish. For instance, Hussain et al. (2019) in Pakistan found that sun-drying improved the protein and amino acid content of dried fish.

Proper storage is critical to ensuring that silverfish remains fresh and safe for human consumption, for example, by tinning, storing in refrigerators, and storing in places far from infants, among others (Hanson et al., 2022). Silverfish should be stored in a cool, dry place to prevent moisture buildup, which can cause bacterial growth and spoilage (Loconti et al., 2022). Storing the fish in clean, dry containers or bags is also important to protect them from insects and other pests that may contaminate them. Namwanza (2015) reported that if stored improperly, silverfish can quickly spoil and become unsafe to eat because it is a vulnerable specie to so many conditions in terms of temperature. This greatly relies on the sanitation of the environment where the silver fish is stored as well (FDA, 2022).

Yorksaw (2017) found that proper packaging of fish is crucial to prevent contamination during transportation and to ensure that the fish remains fresh and safe for human consumption. Individuals and groups who trade in fish should ensure that the fish is properly packaged by using clean, dry containers and sealing them properly to prevent moisture and air from entering (Perch et al., 2022). This helps to maintain the quality of the fish and prevent spoilage. Contamination during transportation can occur if the fish is not properly packaged, which can lead to health risks for consumers. Therefore, it is important for fish traders at Masese Fish Landing Site to follow these packaging practices to ensure that the silver fish they process and sell is of good quality and safe for their customers to eat (Ling et al., 2019).

A study conducted in Bangladesh found that improper packaging and storage of fish products resulted in spoilage and reduced product quality, which led to significant economic losses for fish mongers (Rahman et al., 2022). Proper packaging, such as vacuum-sealing or using moisture-resistant materials, was found to be effective in extending the shelf life and maintaining the quality of fish products (Sylvester, 2019). Daayo (2014) found that the use of inappropriate

packaging materials, such as plastic bags, led to the growth of bacteria and other microorganisms on the surface of the fish, which reduced its quality and safety for human consumption. The study recommended the use of clean, dry, and moisture-resistant packaging materials to prevent contamination and spoilage during transportation and storage.

Regular quality control checks are essential for individuals at the Fish Landing Site to ensure that their silverfish is of good quality and safe for human consumption (Cyriac, 2017). Quality control checks should be conducted regularly to check for any signs of spoilage or contamination (Punjab et al., 2017). Any fish that does not meet the required standards should be discarded or sold at a lower price to prevent any risks to consumer health. By conducting regular quality control checks, silverfish dealers can maintain their reputation for selling high-quality silverfish and ensure customer satisfaction (Hastings, 2013). Additionally, regular quality control checks can help identify any potential problems early, allowing them to take corrective action before the fish becomes unsuitable for consumption.

A study conducted on the quality of dried small fish found that regular quality control checks can help improve the safety and quality of fish products (Hashanuzzaman et al., 2020). When vendors implement regular quality control checks, they are able to identify and remove contaminated fish from their stock, resulting in higher-quality and safer products for consumers (Madalla et al., 2021). However, many of the dried small fish sold in local markets are contaminated with bacteria, fungi, and other microorganisms that can cause illness in humans (Kose et al., 2010). This study will therefore focus on the safety and storage factors that still lead to the contamination of silverfish.

### **2.3.2 Demographic characteristics and silverfish chain management practices**

Silverfish merchants who have higher levels of education are more likely to have knowledge and awareness about safe handling and storage practices for fish (Hicks, 2016). They may be more likely to adopt these practices to ensure the quality and safety of their product. A study conducted in Tanzania found that fish dealers with higher levels of education were more likely to adopt safe fish handling practices, such as using gloves and aprons, washing hands thoroughly, and cleaning equipment properly, compared to dealers with lower levels of education (Tavares et al., 2021). Similarly, a study conducted in Nigeria found that those with higher levels of education had better knowledge and awareness of good hygiene practices during fish processing, handling and storage (Adeyeye, 2015).

The educated ones may be more likely to invest in proper storage facilities and equipment to preserve the quality of their fish (Rahman et al., 2019). They may also be more likely to prioritize quality control checks and adopt other safety practices to maintain the value of their product (Sumaila et al., 2013). There is limited research on the relationship between individuals' income and their adoption of safe handling and storage practices for fish (Egero, 2016). However, studies on the role of income in food safety practices suggest that individuals with higher incomes may have more resources to invest in food safety practices, such as purchasing appropriate equipment and materials for storage and investing in training to improve their knowledge of safe food handling practices.

Demographic issues like age, fisheries work experience, marital status, health condition, and number of children a fish dealer has also determined her choice of safety and storage in the fish value chain (Rawool et al., 2021). It was expounded that dealers who are advanced in experience around fish sites know better storage practices, and women who stay with their infant

children around the site are likely to encounter losses (Charlton et al., 2016). They should therefore employ storage practices that separate children from access to the products. Rusells (2016) also affirmed that there is a relationship between the health conditions of individuals in fisheries and the storage strategies they use. The findings in these studies were generated using a qualitative research design, which makes it hard to depend on the reliability of these findings.

Traditional gender roles and cultural practices may impact attitudes and behaviours towards handling and storing fish (Torell, 2021). For example, in some societies, it may be more common for men to handle and sell fish while women are responsible for home tasks. These norms impact their choice to adopt safe handling and storage practices. Naveena (2022) found that cultural and social norms limited men's and women's input in the fish trade. This lack of membership and resources may also limit women's ability to adopt safe practices. A study conducted in Bangladesh by Rahman (2018) found that gender norms and cultural expectations played a major role in shaping women's attitudes towards the fish chain. Women reported feeling embarrassed or stigmatized for engaging in work traditionally done by men, which may discourage them from adopting safe handling and storage practices (Mwanza, 2011). The gap that remains to be studied is the transportation means for several species and the affordability of storage instruments for larger fish.

### **2.3.3 Value Addition Practices in Fish and Fishery Products**

Value addition is an important strategy for improving the economic outcomes of small-scale producers, especially in developing countries (Venugopal, 2006). By processing raw materials into higher-value products, producers can capture a larger share of the value chain and earn higher prices for their goods (Taabeah et al., 2016). This can help to increase their income, improve their standard of living, and reduce poverty (Olorunfemi et al., 2019). In the case of women at fish

landing sites, value addition strategies such as cleaning and drying silver fish can significantly increase the market value of their products (Modirwa et al., 2019). This is because these processed products are more visually appealing, have a longer shelf life, and are easier to transport to markets further away.

Furthermore, value addition can help reduce post-harvest losses and increase the overall sustainability of the local fishing industry (Srinivas et al., 2021). By utilizing all parts of the catch and reducing waste, fish dealers at fish landing sites can help create a more efficient and environmentally friendly supply chain (Naveena et al., 2022). Muthukumar (2022) showed that the cleaned and gutted fish fetched higher prices in local and regional markets compared to those that were not processed. Kakembo et al. (2016) in Uganda examined the fish value chain and found that the value addition activities carried out, such as cleaning and gutting, were essential for increasing the market value of fish. The value addition strategies used at fish landing sites, including cleaning, gutting, and removing scales from fish, have been studied in various empirical reviews (Diyzee et al., 2022).

In Italy, Germany, Norway, and other countries, they adopted methods like the addition of preservatives and dyes, making fillets, making pickled fish meat, freezing, and many others to add value to fish (Silva et al., 2021). The European fish consumer surveys proved evidence that most consumers showed an above-average Willingness to Pay (WTP) for fish produced locally (Searles et al., 2018). The emerging question from this study is whether these advanced methods of value addition are affordable in African fisheries. Also, this study was done specifically about tilapia and other fish in the same category, yet the value addition methods of different species differ. While tilapia can be filleted, silverfish are too small for this.

Sekabira et al. (2020) investigated the contribution of fish value addition to socio-economic development. It found that the people involved in value addition activities like cleaning, gutting, and removing scales, not only increased the market value of fish but also created employment opportunities for them. They were able to earn more income and improve their living standards through these value addition activities (Denis et al., 2022). Similarly, a study by Mwebaza et al. (2019) examined the impact of value addition on fish marketing at fish sites. It was found that they made the fish more visually appealing and easier to prepare for intake, and those involved in these activities were able to negotiate better prices for their products in the market. These studies didn't examine how these value addition methods compare in terms of cost. The income and technology levels of the areas studied are incomparable to the area of study.

Some dealers at the site also add flavor to the fish by marinating it in spices, which can make it more desirable to buyers (Rahman, 2016). One study by Rahman et al. (2019) investigated the effect of marination on the quality and sensory attributes of fish fillets. The study found that marinating fish in a mixture of spices improved its sensory attributes, making it more desirable to consumers. The study also showed that marination improved the texture and tenderness of the fish, making it easier to chew and digest. Similarly, while examining the effect of marination on the shelf life and quality of fish, it was found that marinating fish in a mixture of spices helped to extend its shelf life by reducing the growth of microorganisms that can cause spoilage (Eltholth et al., 2015). The study also revealed that marination improved the sensory attributes of the fish, making it more desirable to consumers. Banerjee et al. (2019) explained that the effect of marination on the nutritional quality of fish was investigated.

The study found that marination with spices significantly increased the antioxidant activity of the fish, which is beneficial for human health. The study also showed that marination improved

the overall sensory quality of the fish, making it more desirable to consumers. However, cases of accessibility to the third world weren't well represented by the above studies (Okpei, 2022). Only the advantages were talked about, but access to these services, especially by women, was not considered. This therefore justifies the contextualization of this study to the Masese Landing Site for purposes of addressing this gap. Another value addition strategy used is drying the silver fish (Masete, 2013). This increases fish shelf life and makes it easier to transport to markets further away.

One study by Asikiya et al. (2018) investigated the effect of drying on the nutritional quality and shelf life of silverfish. It found that drying significantly increased the shelf life of silverfish, making it easier to transport to markets further away. The study also showed that drying did not significantly affect the nutritional quality of the fish, making it a viable option for preserving the fish (Namwanje, 2020). The studies above were not specific about the specific shelf life of dried fish species or indicate whether it's the best option to adopt by those engaged. The studies did not examine the factors behind this choice.

Similarly, a study by Ssebisubi et al. (2019) examined the impact of dried silver fish on the socio-economic development in Uganda. The study found that drying silverfish was an important value addition strategy at fish landing sites, as it increased the shelf life of the fish and allowed them to access markets further away. The study also revealed that the practice of drying silverfish created employment opportunities for women and helped to improve their livelihoods. In another study by Ogwang et al. (2021), the effect of drying on the microbial quality and safety of silverfish was investigated. The study found that drying significantly reduced the microbial load of silverfish, making it safer for human consumption. The study also showed that dried silverfish had a longer shelf life than fresh fish, making it a viable option for preserving the fish.

The value addition strategies used at fish landing sites not only increase their income but also help to reduce waste and increase the sustainability of the local fishing industry by utilizing all parts of the catch. A study by Amponsah et al. (2019) in Ghana found that women at fish landing sites were actively involved in value addition activities, such as smoking and drying fish. These activities increased the shelf life of fish products and contributed to reducing post-harvest losses. Another study by Berdegué et al. (2015) in Latin America found that women in the fish value chain had developed innovative value addition strategies, such as using fish scraps to produce fish meal and fish oil. These strategies not only added value to fish products but also contributed to reducing waste and improving the sustainability of the fishing industry (Muhame, 2020). This is not the case for Ugandan landing sites.

#### **2.3.4 Marketing and Transportation Techniques of Fishery products**

Participants in the fish value chain employ various marketing approaches to sell silverfish. They often use word-of-mouth marketing, where they rely on personal networks to inform potential customers about their products (Egeru et al., 2016). The study also found that word-of-mouth marketing is a common practice among fish traders. The critique of this study, however, is that it did not look into the unreliability issues related to this method and did not do in-depth studies about how to improve the marketing strategy (Namwanje, 2015). The study only noted that they often rely on their personal networks to inform potential customers about their products.

Nakimbugwe et al. (2022) also noted that mobile phones are used to advertise and market fish products. A study by Sowman and Fraga (2018) in South Africa found that fisher men and women used mobile phones to communicate with buyers, suppliers, and other sellers, facilitating their businesses' growth. Musa et al. (2019) in Nigeria also found that fishmongers used social media platforms like WhatsApp and Facebook to advertise and market their fish products to a

wider audience, including potential buyers outside their local communities. It found that the use of social media platforms increased their sales and income, as well as their bargaining power in the market. This is, however, not realistic in the context of Ugandan fish sites, which suffer network issues, no electricity, and technical illiteracy, among others, hence, the relevance of the study (Adhlaka, 2020).

Another marketing strategy employed at several fish sites is use of attractive packaging to make products stand out from the competition (Williamson, 2017). There is the use of transparent plastic bags to showcase the quality and freshness of the silverfish (Katunze et al., 2012). Katunze et al. (2012) examined the market chain of silverfish in Uganda and found that packaging is an important factor in determining the market value of the fish. The study notes that fishmongers often use transparent plastic bags to showcase the quality and freshness of the fish. This is because customers can see the fish and assess its freshness before purchasing. The above studies did not examine problems of access to the improved packaging materials on the market and were silent on transportation. This calls for this study to take place. In addition to marketing at the fish site, there is also use various transportation strategies to move products. They use bicycles, motorcycles, and taxis to transport their silver fish to different markets. the existing gaps (Stanton, 2023) The sellers at the fish site not only rely on marketing techniques to sell their products but also employ a variety of transportation strategies to move their silver fish to different markets (Psaraderis, 2022). They utilize bicycles, motorcycles, and taxis to transport their goods, demonstrating their resourcefulness and determination in ensuring that their products reach a wider consumer base.

Despite all this, the fish industry is still stagnating, and this study seeks to establish why and identify the gaps that exist. In advanced fish sites, specialized means like refrigerated trucks are used to transport silverfish over long distances (Adhlaka, 2020). This ensures that the fish

remain fresh and of high quality, even after long journeys. Several studies have highlighted the importance of proper transportation methods for fish products to maintain their quality and freshness. Tsironi et al. (2018) found that the use of refrigerated trucks during transportation significantly reduced the microbiological growth of fish products and improved their quality. Villarroel et al. (2020) in Chile also found that the use of refrigerated trucks during transportation significantly reduced the deterioration of fish products, thus improving their shelf life and maintaining their quality. Conversely, the gap that exists in these studies is that they were not done in the context of remote landing areas like Masese, which have no access to such advanced transportation methods, hence the necessity of this study.

To reduce transportation costs, fish traders at several fishing sites often pool their resources and share transportation costs (Twinamasiko et al., 2012). This allows them to transport larger quantities of silverfish at a lower cost. Fish dealers also have established relationships with wholesalers and retailers in different markets (Bukonya, 2011). They often work together to transport silverfish to different markets and share the profits. A deep look at these existing studies identifies a gap in the organizational structures of these dealers. The legalistic nature of such relationships and partnerships was not examined by these studies, and most are personal. The study seeks to study the legal gap in these marketing strategies in the case of Masese.

Finally, at fish sites, there is use of knowledge about local and regional markets to identify the best markets to sell their silver fish (Ocheke, 2014). This helps to maximize their profits and reduce transportation costs. Nalugala et al. (2011) examined the marketing and value chain and found that fish traders rely on their knowledge of local and regional markets to identify the best markets to sell their products. The study notes that this approach helps traders maximize their profits and reduce transportation costs by avoiding markets where demand is low or where

competition is high (Gonga, 1999). The studies were qualitative, which could limit a deeper understanding of reliability in their knowledge and factors of transportation in the fish market system.

Kikomeko et al. (2013) also found that fish dealers use their knowledge of local and regional markets to identify the best markets to sell their silver fish and which means of transport to use in accessing the markets. The study noted that this approach helps fishmongers maximize their profits and reduce transportation costs by targeting markets where demand is high and competition is low. Mapfumo (2019), also found that women who were able to identify and exploit nice markets were able to command higher prices for their products. The gap in these studies is that they left out women who were unable to access these better markets due to several reasons. This study will concentrate on examining these gaps.

## **2.4 Summary of Literature and Research Gaps**

Literature about the fish chain management activities has been reviewed, basically from the handling level to the final consumer in the market. Among the studies reviewed are Nalugalo et al. (2011), Williamson (2017), Oloyo & Egeru (2016), and Namwanje (2020), among others. However, these studies did not contextualize down to the third world, which faces several challenges in the fish sector. The studies by Pierce (2014), Nhung et al. (2022), and Sylvester (2019) were generic and non-gender sensitive, which the study seeks to address. Ardianto (2022) & Adhalka (2020) also ignored the differences in several fishing communities in terms of handling methods, safety and storage practices, value addition strategies, marketing, and transportation means.

Most studies reviewed, such as Rahman et al. (2019), Diyzee (2022), and Taabeah (2016), looked into other species such as tilapia, pelagic, and catfish, which are difficult for women to engage in. This study therefore focuses on silverfish because it is the most affordable in low-income homes, it is commercially important, and it is nutritious, yet fewer studies have concentrated on it. Also, most were either qualitative or quantitative, which could limit understanding of all issues around the fish chain. These gaps are therefore what the study will focus on, and a mixed design will be adopted to exploit the issues around the fish value chain deeply. The mixed design will help to counteract the weaknesses of each design that were employed by other studies.

## **CHAPTER THREE**

### **METHODOLOGY**

#### **3.1 Overview**

This chapter is about the detailed research methodology of the study. The chapter presents the research design, study population, and sample size. It also covers sampling methods, data collection instruments, quality control, data analysis, and ethical considerations.

#### **3.2 Research approach and design**

A mixed approach was used in this research, though the qualitative was dominant. In this study, the Convergent Mixed Methods Approach was used because it allows for gathering both qualitative and quantitative data with separate analyses and comparisons of results (Sunderji et al., 2018). The mixed research design was used because it allows analyses in both directions and offers stronger inference than using either approach on its own (Wasti et al., 2022). The qualitative involved the analysis of qualitative data collected through interviews, while the quantitative involved the analysis of descriptive and inferential statistics (McLeod, 2023).

#### **3.3 Study population**

The population studied involved fisherwomen, fishermen, input providers, the fishing community, landing site leaders, registrars, and tax collectors. It was also comprised of leaders at every point in the chain of fish and all people engaged in the value chain of fish at the Masese fish landing site. In this population, those engaged in fishing activities for five or more years became the unit of observation because it was enough time for them to gain experience around the study area (Fix et al., 2021). They provided the necessary data on the study problem at the landing site.

### 3.4 Sample size

The sample size for this study was 200 respondents. The size was calculated using the Cochran formula of 1977 because the population engaged in this study is infinite. The formula aided in the quick determination of respondents with low cost and high accuracy (Wiley, 2018). The Cochran formula also allowed calculating an ideal sample size given a desired level of precision, a desired confidence level, and the estimated proportion of the attribute present in the population (Deksissa et al., 2018).

$$n_o = \frac{z^2 pq}{e^2}$$

Z is the critical value

e is the desired level of precision (the margin of error)

p is the (estimated) proportion of the population which has the attribute in question,

q is 1 – P

$$n_o = 338 / (1 + 338/528)$$

$$n_o = 338 / 1.69$$

$$n_o = 200$$

The sample size included people who deal with fish in different levels of the chain

### 3.5 Sampling Methods

In this study, both probability and non-probability sampling were used. Under probability sampling, the study involved a simple random sampling strategy. This strategy was used for purposes of generalization because it gives all individuals an equal and just chance to be selected (Reeger et al., 2019). Also, simple random sampling avoids bias, so results were valid (Horton, 2023). Under non-probability sampling, the study adopted the purposive strategy (Turnur, 2020). This technique was used to obtain key informants (Liu et al., 2010). The key informants included landing site leaders, registrars, and tax collectors, among others. (Palinkas et al., 2015). Input

providers, labor providers, silver fish buyers, fish processors, marketers, and transporters were selected this way.

### **3.6 Data Collection Instruments**

#### **3.6.1 Questionnaire**

The study used a semi structured questionnaire that had both open-ended and close-ended questions. This data collection tool was administered by the researcher because it offers a fast, efficient, and inexpensive means of gathering large amounts of information from sizeable sample volumes (Jones et al., 2013). The questionnaire was used to collect quantitative data on the second objective of the study and objective three.

#### **3.6.2 Interview Guide**

There was interactive use of an interview guide to ascertain answers related to experiences and opinions about the study problem. This tool was applied to objectives one and four. Interviews sought information in great detail, and the researcher talked to each participant directly. The interview guide contained two questions on the variables (Roberts, 2020). The question items were structured according to the study objectives.

#### **3.6.3 Focus Group Discussion Guide**

Focus Group Discussions were used. Each group consisted of eight to ten members, as had been recommended in the works of many scholars (Nyumba et al., 2018). Every group was moderated by the researcher and lasted for forty-five to sixty minutes (Kuhn, 2018). Focus Group Discussions were used because they yield a richer amount of data in a short time and were established from every ten participants. This is because they helped to ascertain a diverse set of data based on interviewee profiles and confirmed insights obtained from other methodologies (Miller, 2020).

The information obtained was supplemented by information from other interviews and questionnaires.

### **3.7 Quality Control**

#### **3.7.1 Validity**

This study considered face and content validity. For face validity, the questionnaire was reviewed by two experts in the fish value chain from the Department of economics at Moshi University and two from the Economics Department at Kyambogo University (Mousazadeh et al., 2017). Under content validity, it was ascertained using the Content Validity Ratio as studied in a paper by Lawshe (1975), where Content Validity Ratio =  $(n_e - N/2) / (N/2)$  (Zach, 2021). The content validity index, denoted as CVI, is the mean content validity ratio of all questions on a test. The closer the CVI was to 1, the higher the overall content validity of a test. Validation of the instrument focused on the clarity, completeness, and relevance of the questions in relation to the study (Halek et al., 2017).

#### **3.7.2 Reliability**

Reliability was attained both for the qualitative and quantitative data. For qualitative data, reliability was checked through the use of triangulation and refutational analysis. Triangulation established reliability by ensuring credibility, transferability, dependability, and confirmability (Turner, 2016). Refutational analysis supported the claim of reliability by exploring and explaining contradictions between individual studies (Thakur et al., 2020). Credibility was aimed at guaranteeing that the research findings epitomize the views of the interviewees (Korstjens et al., 2017). With dependability, the findings, interpretation, and recommendations were supported by the data collected, while conformability aimed to ensure that the data and analyses of the findings were clearly derived from the collected data (Moon et al., 2016).

For quantitative data, reliability was ensured by the test-retest method. Test-retest Reliability refers to the consistency of the results obtained when the measuring instrument is applied to the same sample group at different times (Giavarina, 2015). The questionnaire prepared to test the reliability of the measuring instrument is first applied to a sample group. Then, the same questionnaire is applied again to the same sample group after a specific time (Surucu et al., 2020). A high correlation between comparable survey data obtained at different times was an indication that the measuring instrument had internal consistency and reliability. Under this study, twenty questionnaires were administered for testing. After fourteen days, more were given for testing. After that, a comparison of the two sets was made. The Pearson correlation coefficient was used for comparison (Oluwatayo, 2012). Correlation value of 7.0 and above indicated that the measuring instrument provided test-retest reliability (Boateng et al., 2018).

### **3.8 Data Management and Analysis**

The researcher carried out data processing after the data have been collected. The processing of quantitative data involved coding, entering the data into the computer using the Statistical Package for Social Sciences (SPSS 24.0), summarising them using frequency tables to identify errors and editing them to remove errors. Quantitative data were analysed at Univariate and bivariate level. At univariate level, data analysis involved calculating descriptive statistics that was frequencies, percentages, and means. At bivariate, Students t-test and one - way ANOVA analyses were carried out to test statistical difference among the means of the groups. This produced results required for generalisation of the findings. Qualitative data analysis is an inductive focus on meaning and approaches in analysis that are interpretive and explanatory in nature (Noble et al., 2013). NVivo was used for the qualitative analysis because it has sophisticated code and retrieved functions and modeling capabilities. This sped up the process of managing large data sets and data retrieval

(Zamawe, 2015). Repetitions within the data were quantified, and memos and hyperlinks were attached to the data. Analytical processes were mapped and tracked, and linkages across data were visualized, leading to theory development (Dolla et al., 2017).

### **3.9 Ethical Considerations**

The study ensured ethical issues such as, informed consent, anonymity, confidentiality, privacy, balancing risks and benefits, and dissemination, as adopted from the works of Bhandari (2022). Informed consent was observed by making it a point that the study participants got involved knowingly and freely. To ensure anonymity, the researcher made sure that at no point, the features of the research made the subjects that provided data easy to identify (Bhandari, 2022). Confidentiality was fulfilled by making sure that no information offered by the respondents was revealed. Respondents were assured that their information would not be shared without their knowledge or consent. For those selected respondents who refused to report personal information on the grounds of invasion of privacy, their views were respected (Resnik, 2020). In the compilation of the study, information obtained from the works of others was acknowledged by citing the authors (Fleming, 2018).

## **CHAPTER FOUR**

### **DATA PRESENTATION, ANALYSIS AND INTERPRETATION**

#### **4.0 Overview**

This chapter presents and analyses the realistic findings of the study, which comprises a comprehensive interpretation of collected data based on the research topic “Assessing the Chain Management of Silverfish at Masese Fish Landing Site in Jinja District, Eastern Uganda.” This chapter analyses the study findings in line with the study objectives, which included exploring the silverfish safety and storage practices used at the Masese Fish Landing site, determining the influence of socioeconomic factors on the choice of safety and storage practices at the Masese Fish Landing site, determining the silverfish value addition strategies used at the Masese Fish Landing site at various points, and examining the silverfish marketing and transportation strategies used at the Masese Fish Landing site. The analysis and interpretation were done in a tabular presentation, where the sample size was 200 and all the 200 questionnaires were fully filled out and returned by the respondents. This enabled the researcher to come up with a report based on accurate statistics.

#### **4.1 Background Characteristics of Respondents**

The tables involve respondents of different ages, genders (male and female), education level, marital status, experience in the silverfish chain, and type of employment in the chain. This was because collecting data from different categories gives quality, standard information based on how different groups with differing characteristics respond. This was also because it would enable the collection of data based on the different reasoning capacities of several respondents at the Masese fish landing site.

**Table 4.1: Background characteristics of Respondents**

<b>Gender of Respondents</b>	<b>Frequency</b>	<b>Percent</b>
Male	115	57.5
Female	85	42.5
Total	200	100.0

<b>Education Level of Respondents</b>	<b>Frequency</b>	<b>Per cent</b>
Primary	97	48.5
Secondary	85	42.5
Tertiary	12	6.0
University	6	3.0
Total	200	100

<b>Age of Respondents</b>	<b>Frequency</b>	<b>Per cent</b>
Below 21	13	6.5
21-30	94	47.0
31-40	61	30.5
41 and above	32	16.0
Total	200	100.0

<b>Marital status of Respondents</b>	<b>Frequency</b>	<b>Per cent</b>
Single	50	25.0
Married	122	61.0
Widowed	19	9.5
Divorced	9	4.5
Total	200	100.0

<b>Experience of Respondents</b>	<b>Frequency</b>	<b>Per cent</b>
Below 5 years	42	21.0
5-10 years	82	41.0
10-15years	56	28.0
above 15 years	20	10.0
Total	200	100.0

Source: Primary Data 2023

The study sought to establish the gender of the participants; the findings are presented in the table above. In the results from Table 4.1 above, it was found that 115 (57.5%) of the respondents were males, while 85 (42.5%) were females. The highest percentage of respondents participating in the chain was males because they dominated the activities in the silverfish chain. The women were the minority of respondents because they were burdened with multitasking traditional gender roles

at home and economically fending for their homes in the silverfish chain. According to the leader of female fish dealers at the Masese fish landing site, the majority women only participated in the lower and later stages of the silverfish value chain. On the other hand, males, who were the largest number of respondents, participated in almost every activity in the chain, starting from input provision to market activities.

This study also sought to establish the age of the 200 respondents, and the findings are presented in Table 4.1 as above. Results from the table found that respondents below 21 years were 13 (6.5%), 21–30 were 94 (47.0%), 31–40 were 61 (30.5%), and 41 and above were 32 (16.0%). The highest percentage of respondents participating in the chain was between the ages of 21 and 30, because they are the majority that is done with school and seeking employment. The least were those below 21 years old because the majority of them were still pursuing education and had little time to settle in the silverfish chain. According to the fisheries' office at Masese Fish Landing Site, most of the children below 21 years old are school-going and have no time to participate a lot in the value chain, while those between 21 and 30 years old are available and ready to fend for their families in the silverfish value chain.

As indicated in Table 4.1, it was discovered that respondents who studied up to the primary level were 97 (48.5%), those who stopped at the secondary level were 85 (42.5%), and the respondents that stopped at the tertiary level were 12 (6.0%), while only 6 respondents (3.0%) attained university-level education. The highest percentage of respondents participating in the silverfish chain were those that had only studied up to the primary level because most of the participants in the silverfish chain always join the industry at a tender age, and it becomes hard to balance education and participation in the industry. The least were those who had attained education at the university level, because few of them were able to proceed with education

alongside participation in the value chain. According to the fisheries' office at Masese Fish Landing Site, most of the participants in the silverfish value chain drop out at the primary and secondary levels to concentrate on those activities as opposed to spending their greater time at school.

The researcher also sought to establish the marital status of the respondents, and according to the results in Table 4.1, it was found that respondents who were single were 30 (23.0%), the married ones were 122 (61.0%), and the widowed were 19 (9.5%), while the divorced respondents were 9 (4.5%). The respondents with the highest percentage participating in the silverfish chain were married, because they are the majority that is done with school and seeking employment. The least number were the divorced ones because most participants in the silverfish chain are in marriage and only a few cases of dysfunctional homes are available in the chain. According to different fisheries authorities at Masese, the greatest participation is as a result of many of the married couples having homes to take care of out of economic survival based on the activities engaged in the silverfish value chain.

The study sought to establish the distribution of respondents as per their experience in the silverfish value chain. Table 4.1 indicates that it was found out that respondents with experience of below five years were 42 (21%), those with 5–10 years of experience were 82 (41.0%), those with 10-15 years in the silverfish chain were 56 (28.0%), and those above 15 years were 20 (10.0%). The greatest percentage of respondents participating in the chain was those between the ages of 5 and 10, because they are the majority that are still trying to make it and seeking employment in the chain. The least were those above 15 years of experience in the chain because the majority of them are advanced in age and are undergoing health conditions that do not allow them to participate in some activities in the chain.

The researcher also sought to establish the highest level of participants based on their employment type, and results in Table 4.1 indicate that 129 (64.5%) respondents were self-employed, 58 (29.0%) were employees, and 13 (6.5%) were both self-employed and employee status. The highest percentage of employment forms in the silverfish chain was those under self-employment because they could easily put themselves to work in the activities since they require small start-up capital. The least were those under both forms of employment because it was hard to divide their time between serving other masters in the silverfish as well as doing their own work in the chain. In an interview with the fisheries officer at Masese fish landing site;

Most participants in the silverfish chain activities were self-employed because employers were not many and yet majority of the participants could not pursue being employees because it was less paying (Masese Landing Site-24<sup>th</sup>-June-2023).

## **4.2 The safety and Storage Practices**

### **4.2.1 Safety and Handling Practices.**

The study sought to establish the handling and safety practices of the participants; the findings are presented in the table below.

**Table 4.2: Silverfish Safety and Handling Practices Table**

<b>Safety practices</b>	<b>SD</b>	<b>D</b>	<b>NS</b>	<b>A</b>	<b>SA</b>	<b>Mean</b>
	3	5	10	79	108	4.39
Regular Quality Control	(1.5%)	(2.5%)	(5.0%)	(38.0%)	(53.0%)	
	3	-	10	76	12	4.41
Thorough Cleaning	(1.5%)	-	(5.0%)	(38.0%)	(6.5%)	
	6	9	23	85	77	4.09
By Moisture removal	(3.0%)	(4.0%)	(11.5%)	(42.5%)	(38.5%)	
By preservatives addition	26	35	13	56	80	3.74
	(8.0%)	27.5%)	(6.5%)	(8.0%)	(40%)	
Keeping in a dry safe	5	13	14	70	98	4.22
Containers	(2.5%)	(6.5%)	(7.0%)	(35.0%)	(49.0%)	
	-	3	124	27	42	3.50
By salting	-	(1.5%)	(62.0%)	(13.5%)	(21.0%)	

**Source: Primary Data, 2023**

The study examined the safety methods employed at Masese Fish Landing Site. The above Table 4.2 indicates that (53.0%) agreed that they practice regular quality control. 10(5.0%) were neutral, 5(2.5%) disagreed while 3(1.5%) strongly disagreed to the safety method. Therefore, 53.0% of the respondents agreed that the safety of silverfish is observed by regular quality control. The mean was high (4.39) and this showed that most dealers agreed to use regular quality control. This is in line with the FGDs narration;

Regular quality control is the only way to ensure that silverfish dealers are not subject to loss by many factors since it helps to counteract any conditions that are likely to cause losses. (Masese Landing Site-23<sup>rd</sup>-June, 2023).

The study analysed whether there is observance of silverfish safety at Masese by thorough cleaning of the species. It was discovered in Table 4.2 that 12 (6.5%) of the respondents strongly agreed that there is thorough cleaning, 76 (38.0%) agreed to the same, 10 (5.0%) were neutral, 3 (1.5%) disagreed, and 3 (1.5%) strongly disagreed with the safety method. The mean was high 4.41, meaning the women fairly agreed to use thorough cleaning. This therefore indicates that 44%

of the respondents agreed that thorough cleaning of silverfish is done at the Masese fish landing site. This corresponds with respondents in the women's FGD who noted: "Thorough cleaning is essential because the silverfish will get affected if it is not thoroughly washed in water" (FGDs held on 24<sup>th</sup> June-2023-Masese Landing Site).

The study sought to determine whether there is a safety risk to silverfish through moisture removal. Table 4.2 indicates that 77 (38.5%) of the respondents strongly agreed, 85 (42.5%) agreed, and 23 (11.5%) were neutral. However, 9 (4.5%) disagreed and 6 (3.0%) strongly disagreed with the fact that moisture removal is done for the safety of silverfish. Therefore, 81% of the respondents agreed that moisture removal protects their silverfish from spoilage. The mean was high (4.09), which showed that participants use moisture removal to preserve fish. The fisheries officer noted:

"Generally, silverfish dealers, mostly women, use semi-structured shelters or raised racks made of wire mesh to dry the fish in a cleaner environment" (Fisheries officer-Masese Landing Site Market-24<sup>th</sup> June-2023).

In a Focus Group Discussion held at the market, one semi structured rack owner said; "Silverfish dried on a wire mesh comes with a different price due to the clean environment in which it is dried" (Masese Fish Market-24<sup>th</sup> June-2023)

This goes hand in hand with the fact that majority female respondents in the outlet market were cognizant of the fact; "there is a need to keep silverfish in places with pallets to keep them from accumulating moisture from the ground that can lead to spoilage at the Masese fish landing site" (Masese Fish Market-24<sup>th</sup> June-2023).

The study also analysed whether there is a practice of safety for silverfish through the addition of preservatives to the silverfish at the Masese fish landing site. Table 4.2 indicates that

of the 200 respondents, 80 (40.0%) strongly agreed, 56 (28.0%) agreed, and 13 (6.5%) were neutral about it. However, 35 (17.5%) disagreed and 16 (8.0%) strongly disagreed. The mean was high (3.74), meaning that the women use preservatives in addition to silverfish. Therefore, this means that the majority of the respondents (68%) agreed with the fact that preservatives are added to silverfish as a safety practice at the Masese fish landing site.

Respondents were also asked whether the safety of silverfish at Masese is observed by keeping silverfish in dry containers, and Table 4.2 indicates that 98 (49.0%) strongly agreed, 70 (35.0%) agreed, and 14 (7.0%) kept neutral. The table, however, indicates that 13 (6.5%) disagreed, whereas 5 (2.5%) of the respondents strongly disagreed. This therefore indicates that 84% of the respondents, who were the majority, agreed with the fact that the safety of silverfish is observed by keeping silverfish in safe, dry containers. This agreed with what one of the key respondents explained: “Keeping silverfish in dry containers is a sure way to avoid moisture entering the fish, but it also helps to keep the fish away from pests” (Masese Fish Market-June 24<sup>th</sup>-2023).

The study also sought to establish whether there is a practice of ensuring the ensuring the safety of silverfish by salting. Table 4.2 expresses that 42 (21.0%) of the respondents strongly agreed, 27 (13.5%) agreed, and 124 (62.0%) were neutral. The table also shows that 3 (1.5%) disagreed while 4 (2%) strongly disagreed. Therefore, only 34.5% of the respondents agreed with the safety practice, while the majority, 62.0%, was unsure whether salting is done as a safety practice at the Masese fish landing site.

**Table 4.3: Summary table Results for safety**

<b>Descriptives</b>			<b>Statistic</b>	<b>Std. Error</b>
Storage practices	Mean		4.06	0.05
	95% Confidence Interval for Mean	Lower Bound	3.97	
		Upper Bound	4.15	
	5% Trimmed Mean		4.09	
	Median		4.00	
	Variance		0.43	
	Std. Deviation		0.65	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		0.67	
	Skewness		-0.85	0.17
	Kurtosis		2.07	0.34

The results in the table above show a high mean = 4.06 (close to the median = 4.0) with a negative skew (-0.9), which suggests that the results were normally distributed. The low standard deviation (0.653) also indicated a normal distribution of the responses. The mean is high (4.06), meaning that the respondents rated their storage practices for silverfish as good.

#### **4.2.2 Storage Methods at Masese**

The researcher sought to establish the storage methods employed by silverfish dealers and the results are as follows in table 4.4

**Table 4.4: Storage Methods**

<b>Storage Methods</b>	<b>SD</b>	<b>D</b>	<b>NS</b>	<b>A</b>	<b>SA</b>	<b>Mean</b>
Tinning	60 (30.0%)	40 (20.0%)	18 (9.0%)	46 (23.0%)	36 (18.0%)	4.22
Refrigeration	123 (61.5%)	43 (21.5%)	29 (14.5%)	1 (0.5%)	4 (2.5%)	1.06
Bags	9 (4.5%)	18 (9.0%)	28 (14.0%)	77 (38.5%)	68 (34.0%)	3.39
Sacks	9 (4.5%)	8 (4.0%)	15 (7.5%)	75 (37.5%)	93 (46.5%)	3.61

**Source: Primary data 2023**

The study sought to find out the storage methods used at the Masese fish landing site. Table 4.4 indicates that 60 (30.0%) of the respondents strongly disagreed with tinning as a storage method, 40 (20.0%) disagreed, and 18 (9.0%) were neutral, whereas 46 (23.0%) agreed and 36 (18.0%) strongly agreed that tinning is an employed storage method. Therefore, those that agreed to tin were 41%, which shows that the greater number of 50% do not use tinning as a storage method in the silverfish chain at Masese. The mean (4.22) showed that most participants in the chain use tins to store silverfish.

The study also sought to establish whether refrigeration is used as a storage method at Masese. Table 4.4 indicates that 123 (61.5%) strongly disagreed, 43 (21.5%) disagreed, and 29 (14.5%) were neutral, whereas 1 (0.5%) agreed and 4 (2.5%) strongly agreed. Therefore, the table indicates that those who agreed to refrigeration were only 3%, while the greater 83% disagreed. The mean was low 1.06, meaning that very few dealers use refrigeration to store fish.

The study also analyzed the use of bags for storage of silverfish, and Table 4.4 indicates that 9 (4.5%) of the respondents strongly disagreed, 18 (9.0%) disagreed, 28 (14.0%) were neutral, 77 (38.5%) agreed, and 68 (34.0%) strongly agreed. This therefore indicates that 72.5% were in agreement that bags are used for storage of silverfish at the Masese fish landing site. The mean was high (3.89), which showed that most respondents agreed to using bags for storing silverfish.

The respondents were asked whether baskets are used to store silverfish; in Table 4.4, 15 (7.5%) strongly disagreed, 29 (14.5%) disagreed, and 30 (15.0%) were neutral. In the same table, 70 (35.0%) agreed and 56 (28.0%) strongly agreed to the use of baskets for storage of silverfish at Masese. The results in the table therefore show that 63% of the total respondents were in agreement that baskets are used for the storage of silverfish at Masese.

The study sought to determine whether sacks are used for storage, and Table 4.4 indicates that 9 (4.5%) strongly disagreed, 8 (4.0%) disagreed, and 15 (7.5%) remained neutral. 75 (37.5%) agreed to the use of sacks for storage, while 93 (46.5%) strongly agreed. This therefore means that 83% of the total respondents agreed that sacks are a means of storing silverfish at Masese. The mean was high (3.61), which showed that the participants agreed to using sacks for storing silverfish because of their affordability and accessibility. They also used sacks majorly for transit and not for so long after drying.

**Table 4.5: Summary table for storage methods**

Descriptive		Statistic	Std. Error	
Storage methods	Mean	3.21	0.05	
	95% Confidence Interval for Mean	Lower Bound	3.13	
		Upper Bound	3.30	
	5% Trimmed Mean		3.24	
	Median		3.40	
	Variance		0.41	
	Std. Deviation		0.64	
	Minimum		1.00	
	Maximum		4.80	
	Range		3.80	
	Interquartile Range		0.80	
	Skewness		-0.59	0.17
	Kurtosis		0.70	0.34

The results in the table above show average mean = 3.21 (close to the median = 3.4) with a negative skew (-0.59), which suggests that the results were normally distributed. The low standard deviation (0.64) also indicated a normal distribution of the responses. The mean was fair (3.21), meaning that respondents rated their storage methods for silverfish to be fair.

### **4.3 Demographic Factors and Chain Management**

The study also sought to establish whether there were significance perceptions on the silverfish chain management activities according to demographic factors. Student's t-Test and ANOVA were run on each demographic characteristic.

#### **4.3.1 Age and Chain Management**

An ANOVA test was run to analyse whether age influences perceptions on activities in the silverfish chain management. The results are presented in the table 4.6 below;

**Table 4.6: ANOVA Tests Results of Age Influence on Chain Activities**

Age Groups	Sample Size	Sample Means	Std Dev	F	Sig.
21 and below	13	3.437	0.39	.705	.550
21-30	94	3.545	0.48		
31-40	61	3.536	0.49		
41 and above	32	3.584	0.65		
Total	200	3.499	0.51		

**Source: Primary Data 2023**

The results in Table 4.6 suggest that the mean scores for those above 41 years (mean = 3.584) was the highest, those between 21-30 years (mean = 3.545) were second highest, these were followed by those 31- 40 years (mean =3.536) while those below 21 years (mean = 3.437) had the lowest mean scores. The observed F = 0.705 was less with the level of significance ( $p = 0.550$ ,  $p > 0.05$ ). This meant that the variations in silverfish chain management by age groups were statistically insignificant.

However, this conflicted with qualitative findings in FGDs where respondents were asked to give their comments on whether age influences perceptions on chain management where majority explained;

Most youth below 21 years of age are still in school and have limited time to fully participate in the chain activities, while those aged 21–30 are done with school and can readily participate (Masese Landing Site Market-24<sup>th</sup> June-2023).

A female youth in an FGD held at the Masese landing site remarked;

Because it is difficult for an aged person to participate in the difficult manual activities in the chain, age typically has an impact on how much time a person must devote to the chain activities as well as which activities they choose to do. For tasks in the chain like loading and unloading silverfish bags and moving the fish to internal and external marketplaces and shops, the younger age groups supply more sporadic work (Masese Landing Site Market-24<sup>th</sup> June-2023).

Therefore, the interviews in disagreement with the findings of the study ascertained why there were differences in the silverfish chain management activities according to age.

### 4.3.1 Gender and Chain Management

A Students T-Test was used to analyse whether gender influences perceptions on activities in the silverfish chain management. The results are as presented in the table below;

**Table 4.7: Student’s t Test Results for Gender and Silverfish Chain activities**

<b>Gender</b>	<b>Sample Size(n)</b>	<b>Sample Mean</b>	<b>Std Dev</b>	<b>T</b>	<b>Sig.</b>
Male	115	3.76	0.534	4.110	.000
Female	85	3.66	0.427		

**Source: Primary Data 2023**

The results in Table 4.7 show that, on average, the silverfish chain management of males (mean = 3.76) was higher than that of females (mean = 3.66). The visible student’s t was (t = 4.110) with a level of significance (p = 0.00) greater than p = 0.05 (p < 0.05). Therefore, the chain management of males significantly varied from that of females, with males having a higher management level.

To acquire explanations of disparities in chain management according to gender, in the interviews, the respondents were asked to give their remarks on the fact that there was variation in silverfish chain management according to gender. In their responses, they gave opinions, which suggested that they were in agreement with the test statistic results.

One woman in the FGD held at the marketplace on stated; Men own and operate boats, go fishing, and purchase goods that men bring in from the lake. These activities are dominated by men in the supply chain (Masese Landing Site-Wednesday 21<sup>st</sup>. June 2023).

An interview with the only woman that does slightly improved value addition at her home revealed;

A few women constituted the only agents engaged in silverfish value addition at Masese and yet women's access to technology limited their market (Masese Landing Site-Wednesday-21<sup>st</sup>. June-2023).

She clarified;

Concerning women's skills, knowledge, and appropriate use of technology in relation to silverfish value addition, there was a glaring gender disparity and an evident crisis of male engagement in the value addition node (Masese Landing Site-21<sup>st</sup>-June-2023).

An elderly man remarked in an interview held on at the landing site,

Both male and female silverfish dealers cannot put the same time into the high-value chain activities because women are more burdened with domestic homework and chores, which males don't engage in. Women can only largely participate in chain activities like traditional value addition, which can run alongside their gender roles like children rearing (Masese Landing Site-23<sup>rd</sup>-June-2023).

Therefore, there are significant differences in silverfish chain management activities between males and females since the above opinions showed that there is lack of equal ability and resources among the two. These views above also proved that there were differences in the silverfish chain management of males and females at the study site which agreed with the student's Test results.

#### **4.3.3 Education Level and Chain Management**

The study sought to determine the influence of levels of education and perceptions on silverfish chain management at Masese fish landing site. An ANOVA test was operated and the results are as below;

**Table 4.8: ANOVA Tests Results of Education Level Influence on Chain Activities**

Level	Sample Size	Sample Mean	Std Dev	F	Sig.
Primary	97	3.516	0.47	.945	.004
Secondary	85	3.451	0.52		
Tertiary	12	3.706	0.38		
University	06	3.477	0.99		
Total	200	3.499	5.11		

**Source: Primary Data 2023**

The results in Table 4.8 suggest that the mean scores for those that studied up to tertiary level (mean = 3.70) were highest, followed by those in primary (mean = 3.51), then university (mean = 3.47), and secondary (mean = 3.45) respectively. The observed value was (F = 0.945) with a level of significance of ( $p = 0.04$ ,  $p < 0.05$ ). This meant that the differences in silverfish chain management activities due to level of education were statistically significant. Therefore, level of education determines perceptions of silverfish chain management activities.

To provide an explanation as to why there are variations in the silverfish chain management activities at Masese, according to level of education, the respondents were asked to give their annotations on the fact that there were differences in silverfish chain management because of the education level. In a FGD, most of the respondents had this to say:

One's level of education determines the kind of work one does in the chain, and how well they do it. When someone is highly educated, they participate in high value activities of the chain like, wholesale trade (Masese Landing Site-23<sup>rd</sup>-June-2023).

A silver fish seller had this to say;

My observation is that the few highly educated people are the ones who buy large stocks and transport their silverfish with more modern means. They are, in fact, the ones that take to bigger and better markets (Masese Landing Site-23<sup>rd</sup>-June-2023).

These views above also proved that there were differences in the silverfish chain management according to the education level of respondents at the study site. This matches with the ANOVA Test results in Table 4.8.

#### 4.3.4 Marital Status and Chain Management

The study sought to determine whether the marital status affects the perceptions on silverfish chain management at Masese fish landing site. An ANOVA test was operated and the results are as below;

**Table 4.9: ANOVA Results of Marital Status Influence on Chain Activities**

<b>Marital Status</b>	<b>Sample Size</b>	<b>Sample Mean</b>	<b>Std Dev</b>	<b>F</b>	<b>Sig.</b>
Single	50	3.470	0.43	1.728	.163
Married	122	3.467	0.55		
Widowed	19	3.742	0.42		
Divorced	09	3.574	0.39		
Total	200	3.499	0.51		

**Source: Primary Data 2023**

The results in Table 4.9 suggest that the mean scores for those widowed (mean = 3.74) were highest, followed by divorced (mean = 3.57), single (m = 3.47), and then married (m = 3.46) respectively. The observed F = 1.728 with the level of significance ( $p = 0.163$ ,  $p > 0.05$ ). This meant that the influence of marital status on chain management was statistically insignificant. Therefore, there are no differences in chain management activities due to one's marital status.

To obtain a qualitative explanation as to why there was no influence the marital status had on the chain management, the authorities were requested to give their opinion on the stated finding. Their responses, both local government workers and those from the fisheries office at the

site, suggested contrarily that the greatest population in the chain participating in almost all activities were the marrieds because they have homes to take care of out of economic survival based on the activities engaged in the silverfish value chain. One of the officers remarked,

The married had family responsibilities and expenses to meet which subjected them to diversely participate in all activities of the chain so that they can earn more to meet these expenses and needs (Masese Landing Site-23<sup>rd</sup>-June-2023).

Therefore, the influence of marital status on the chain activities was largely defended and justified against the quantitative findings in the Table 4.9 above.

#### 4.3.5 Experience in the Chain and Chain Management

The study sought to establish whether the perceptions on the silverfish chain management is influenced by individual's experience in the silverfish chain the perceptions on silverfish chain management at Masese fish landing site. An ANOVA test was operated and the results are as below;

**Table 4. 10: ANOVA Results of Experience's Influence on Silverfish Chain Management**

Experience	Sample Size	Sample Means	Std Dev	F	Sig.
Below 5 years	42	3.526	0.48	.383	.766
5-10 years	82	3.461	0.44		
10-15years	56	3.546	0.48		
Above 15 years	20	3.460	0.84		
Total	200	3.499	0.51		

**Source: Primary Data 2023**

The results in Table 4.10 suggest that the mean scores show that those with experience of 10-15years (mean = 3.546) were the highest, proceeded by those below 5 years (mean = 3.526), those with 5-10 years' experience were third highest, and these were followed by those above 15 years (mean =3.460) who had the lowest mean scores. The observed Fisher' value was (F = 0.383) with

the level of significance ( $p = 0.766$ ,  $p > 0.05$ ). This means that the influence of experience on silverfish chain management was statistically insignificant.

The results in the Table 4.10 agree with qualitative findings of key informants who were asked to give their clarifications on whether experience influences perceptions on chain management and most of them explained;

The time one has spent in the chain does not determine what strategies they use while doing the silverfish chain activities. The storage strategies used actually depend on other factors, not the experience one has (Masese Landing Site-23<sup>rd</sup>-June-2023).

The head of the school tours at the fisheries office in Masese said “The chain activities done, the methods and strategies used there within absolutely have nothing to do with the experience one has but the resources owned by that individual (Masese Landing Site-23<sup>rd</sup>-June-2023).

Similarly, a leader of a private women’s association that deals in silverfish at Masese landing site explained;

The experience one has doesn’t influence the means they use in chain management because there are people who have been in the chain for so long yet cannot afford a private modernized sun drying rack. It’s only those with financial resources that can afford it, and most still use traditional drying on the natural rock, irrespective of their experience in the chain (Masese Landing Site-23<sup>rd</sup>-June-2023).

Therefore, the interviews were in agreement with the findings of the Table 4.10.

#### **4.3.6 Employment Type and Chain Management**

An ANOVA test was functioned to determine whether the perceptions on the silverfish chain management are influenced by respondents’ type of employment in the silverfish chain at Masese fish landing site.

**Table 4.11: ANOVA Results of Employment Types Influence on Silverfish Chain Activities**

Employment Type	Sample Sizes	Sample Mean	Std Dev	F	Sig.
Self-employment	129	3.65	0.51	3.549	.031
Employee	58	3.35	0.49		
Both	13	3.60	0.47		
Total	52.021	3.49	0.51		

**Source: Primary Data 2023**

The results in Table 4.11 show that the mean scores express that those who are self-employed (mean = 3.65) were the highest, those under both employment types (mean = 3.60) were the second major, and employees (mean = 3.35) were the least. The observed Fisher's value was (F = 3.549) with a level of significance of (p = 0.031, p < 0.05). This means that the influence of employment type on silverfish chain management was statistically significant.

The results in Table 4.11 agree with the qualitative findings of key informants who were asked to give their clarifications on whether employment status influences perceptions of chain management, and the majority of them responded;

Employed individuals work based on what their employers have and what they want. Therefore, if one is underpaid employment, their participation in chain activities is determined by the employer's needs (Masese Landing Site-June 23-2023).

Also, an FGD held at the shores with boat owners brought forth a comment: "It is only employers that inform employees in the chain on what to do and when to do it at the Masese landing site" (Masese Landing Site, June 23, 2023).

These views above proved that there were differences in the management of the management of the silverfish chain based on employment status at the study site, which agreed with the results in Table 4.11

#### 4.4 Value Addition Practises at Masese Fish Landing Site

The study sought to establish the value-addition techniques used at the Masese fish landing site.

The findings are presented in Table 4.12 below;

**Table 4.12: Value Addition practices**

<b>Value addition practices</b>	<b>SD</b>	<b>D</b>	<b>NS</b>	<b>A</b>	<b>SD</b>	<b>Mean</b>
Preservatives and dyes	22 (11.0%)	48 (24.0%)	36 (18.0%)	57 (28.5%)	37 (18.5%)	3.07
Marinating with spices	60 (30.0%)	48 (24.0%)	31 (15.5%)	38 (19.0%)	23 (11.5%)	3.95
Deboning and gutting	58 (29.0%)	41 (20.5%)	45 (45.5%)	65 (32.5%)	46 (23.0%)	4.07
Appealing Packaging	8 (4.3%)	0 (00%)	5 (2.7%)	100 (54.3%)	71 (38.6%)	4.04
Sun drying	5 (2.5%)	32 (16.0%)	24 (12.0%)	65 (32.5%)	74 (37.0%)	3.87
Pounding and crushing	30 (15.0%)	34 (17.0%)	31 (15.5%)	61 (30.5%)	44 (22.0%)	3.33
Deep-frying	7 (3.5%)	12 (6.0%)	154 (77.0%)	19 (9.5%)	8 (4.0%)	3.07

**Source: Primary Data, 2023**

The study sought to establish the value addition techniques used at the Masese fish landing site, and Table 4.12 indicates that 37 (18.5%) of the respondents strongly agreed to the addition of preservatives and dyes as a value addition method, 57 (28.5%) agreed that they do add value that way, and 36 (18.0%) were neutral. However, 48 (24.0%) disagreed and 22 (11.0%) strongly disagreed that they do not add preservatives and dyes for value addition. Therefore, those that agreed to value addition by preservative addition were only 47%, which shows that the addition of preservatives and dyes is remotely employed at Masese. The majority of the responses from interviews turned out to show that the addition of preservatives and dyes to the silverfish is

expensive, yet with a lesser local market. This limits many participants from engaging in it against the larger, readily available market for fresh and sundried silverfish.

The study also pursued to establish whether silverfish is marinated in spices as a valued addition method at Masese. Table 4.12 specifies that 23 (11.5%) strongly agreed and 38 (19.0%) agreed that they do silverfish marination with spices as a value-added method. 31 (15.5%) were neutral, whereas 48 (24.0%) disagreed and 60 (30.0%) strongly disagreed. Therefore, the table points out that those who agreed to marination were only 30%, while the greater 54% disagreed with the value addition strategy. This accounts for why marinated silverfish is more expensive than the common sundried fish at the site of the study, as reliably found in the qualitative study.

The study also investigated silverfish value addition by deboning and gutting. In Table 4.12, it is indicated that 20 (10%) of the respondents strongly agreed, 47 (23.5%) agreed, and 34 (17.0%) were neutral to the fact that deboning and gutting are a value-added strategy, while 41 (20.5%) disagreed and 58 (29.0%) strongly disagreed with it. This therefore specifies that 35.5% were in agreement that they do deboning and gutting of silverfish as a value-added strategy at the Masese fish landing site. According to the qualitative findings, deboning and gutting were not a famous practice in the chain of silverfish at Masese.

The respondents were required to tell whether they do appeal packaging as a value-addition technique, and Table 4.12 indicates that 46 (24.0%) strongly agreed, 65 (32.5%) agreed, and 45 (22.5%) were neutral on whether they do appeal packaging. Similarly, the table shows that 31 (15.5%) disagreed and 13 (6.5%) strongly disagreed with the use of packaging silverfish appealingly at Masese. The results in the table therefore show that 55.5% of the total respondents were in agreement that they package silverfish appealingly as a value-added method. According

to the findings in FGDS and key interviews, a balanced number at Masese packages their silverfish in a way that adds value to it, for example, in transparent sachets, branding the sacks, and many other ways.

The study pursued to establish whether sun drying of silverfish is a value-added method used at Masese. Table 4.12 points out that 74 (37.0%) strongly agreed, 65 (32.5%) agreed, and 24 (12.0%) remained neutral. Nevertheless, 32 (16.0%) disagreed and 5 (2.5%) strongly disagreed with sun-drying silverfish as a value-added method. For that reason, 69.5% of the total respondents agreed that sun drying is a value-added method employed at Masese.

According to the chairperson of silverfish dealers at Masese,

Sundried silverfish costs more than freshly caught one. A basin of fresh silver fish ranges from UGX 25000 (6 \$) to UGX 30,000 (7 \$) whereas the sun-dried fish starts at UGX 30,000 (7 \$), going up depending on the season (Masese Landing Site-June 23-2023).

The study investigated whether pounding and crushing silverfish is a value-adding strategy at Masese. Table 4.12 shows that 44 (22.0%) of the respondents strongly agreed, 61 (30.5%) of them agreed, and 31 (15.5%) remained neutral about it. Nonetheless, 34 (17.0%) disagreed and 30 (15.0%) strongly disagreed with the pounding and crushing. Consequently, 52.5% of the respondents agreed that they pound and crush silverfish to make powder. According to the FGD of women at Masese, silverfish can be pounded or taken for crushing by the machine owners. They expressed that

.....pounded silverfish flour costs more than the silverfish itself. The silverfish powder is sold in spoons and weighed in kilograms at a fairer price, though it is not done by everyone at the landing site..... (Masese Landing Site-June 23-2023).

The study sought to establish whether there is deep-frying at Masese to add value to the silverfish. Table 4.12 indicates that 8 (4.0%) of the respondents strongly agreed, 19 (9.5%) agreed, and 154 (77.0%) were neutral. On the other hand, the table also indicates that 12 (6.0%) disagreed and 7

(3.5%) strongly disagreed. Thus, 13.5% of the respondents agreed that they deep-fry silverfish to add value. The greater 77.0% were neutral on this strategy because they noted that there is a more ready market for the sundried silverfish than the one that is deep-fried. According to findings from the discussion in the FGDs at the Masese fish landing site, women remarked:

Deep frying is done remotely because it requires a number of ingredients, yet there are fewer local markets around the site of study. It is for this reason that many of the participants do not add value in this way. Deep-fried silverfish has a higher value than the sundried one because it is sold in smaller quantities of spoons and cups, which are packaged in transparent, appealing sachets. Two nice cups of packed sundried silverfish cost 10,000 UGX (2 \$), while a similar-sized cup of sundried silverfish goes for 2000 UGX (0.5 \$) (Masese Landing Site-June 23-2023).

## 4.5 Marketing and Transportation Methods at Masese Fish Landing Site

### 4.5.1 Marketing Methods

The study explored to establish the marketing methods at Masese employed by silverfish dealers at the site of study. The table 4.13 presents the findings on the same

**Table 4.13: Marketing Strategies**

Marketing strategies	SD	D	NS	A	SA	Mean
Social networks	28 (14.0%)	34 (17.0%)	30 (15.0%)	59 (29.5%)	49 (24.5%)	3.33
Word of mouth marketing	2 (1.0%)	6 (3.0%)	5 (2.5%)	57 (28.5%)	130 (65.0%)	4.54
Attractive packaging	24 (12.0%)	33 (16.5%)	22 (11.0%)	50 (25.0%)	71 (35.5)	3.56
Use of phones	10 (5.0%)	12 (6.0%)	19 (9.5%)	55 (27.5%)	104 (52.0%)	4.16
Radio adverts	162 (81.0%)	33 (16.5)	- -	- -	1 (0.5%)	1.22

**Source: Primary data, 2023**

The study explored to establish the marketing methods at Masese and Table 4.13 indicates that, 49(24.5%) of the respondents strongly agreed that social networks are used, 59(29.5%) agreed

to the same while 30(15.0%) were neutral. However, 34(17.0%) disagreed and 28(14.0%) strongly disagreed to that. Therefore, those that agreed to employment of social networks for marketing were 54% of the respondents at Masese. According to responses from interviews, it is very cost effective and yet easy to market using established social networks like daily customers who tell others about where they buy from. This though relies on how consistent and reliable the seller is in terms of the quality of the silverfish he supplies.

The study also pointed to establishing whether word of mouth marketing is an applied practice in the silverfish chain at Masese. Table 4.13 indicates that 130(65.0%) strongly agreed and 57(28.5%) agreed that silverfish is marketed by word of mouth. 5(2.5%) of the respondents were neutral about it whereas 6(3.0%) disagreed and 2(1.0%) strongly disagreed. The table therefore agrees that the greater 93% of the respondents use word of mouth marketing. This agrees with the qualitative findings that

The most effective way of marketing silverfish is by individually talking convincingly to people who come to buy the silverfish at the site. By doing so, the seller is able to explain to the customer the reasons why they ought to prioritize their silverfish over the rest in the market (Masese Landing Site-June 24-2023).

The study also sought to establish whether attractive packaging is applied as a marketing method for silverfish at Masese. Table 4.13 indicates that 71 (35.5%) of the respondents strongly agreed, 50 (25% agreed), and 22 (11.0%) were neutral. 33 (16.5%) disagreed, and 24 (12.0%) strongly disagreed, that they do not package attractively as a marketing strategy. Therefore, 60.5% of the respondents agreed that they package silverfish attractively in transparent sacs, open tins, and branded sacks. According to findings in interviews, packaging silverfish attractively is a famous practice at different levels in the chain of silverfish at Masese.

However, it is challenged at the weighing and measuring of the fish since only buckets, basins, tins, and cups are used. Individuals enterprising in silverfish packaging lack

weighing scales of fish in the area,” said an elderly woman in an interview held on the landing site (Masese Landing Site-June 24-2023).

The study investigated whether silverfish is marketed using phones at Masese. Table 4.13 shows that 104 (52.0%) strongly agreed, 55 (27.5%) agreed, and 19 (9.5%) remained neutral about it. Nonetheless, 12 (6.0%) disagreed and 10 (5.0%) strongly disagreed that they don't use phones to market silverfish. This means that 79.5% of the total respondents' practice phone usage as a marketing strategy. This corresponds with the findings from the qualitative results. The most common mode of communication between buyers and sellers of silverfish is phone communication. Whenever a silverfish dealer has stock, they call their clients using phones from far and nearby.

The study investigated whether radio advertisements are used to market silverfish at Masese. Table 4.13 shows that 1(0.5%) of the respondents strongly agreed, 4(2.0%) of them remained neutral about it, 33(16.5%) disagreed and 162(81.0%) strongly disagreed to the marketing by radio adverts. This indicates that a minority of 2.5% of the respondents agreed that they market silverfish using radio advertisements. The greater 97.5% disagreed that marketing silverfish doesn't require radio advertisements. According to the all FGDs conducted at Masese,

Silverfish Market is always readily available and doesn't need to make radio advertisements. The only marketing silverfish Masese needs is the local and strategic one, which is affordable ((Masese Landing Site-June 24-2023).

**Table 4.14: Summary for Marketing Methods**

Descriptives		Statistic	Std. Error
Marketing strategy	Mean	3.3610	.04480
	95% Confidence Interval for Mean	Lower Bound 3.2726	
		Upper Bound 3.4494	
	5% Trimmed Mean	3.3800	
	Median	3.4000	
	Variance	.401	
	Std. Deviation	.63363	
	Minimum	1.00	
	Maximum	5.00	
	Range	4.00	
	Interquartile Range	.80	
	Skewness	-.463	.172
	Kurtosis	.251	.342

The results in the table above shows a mean = 3.4 (close to the median = 3.40) with a negative skew (-0.46), which suggests that the results were normally distributed. The low standard deviation (0.63) also indicated a normal distribution of the responses. The mean is fair (3.4), meaning that respondents rated their marketing strategies fair.

#### 4.5.2 Transportation Mechanisms

The study explored to establish whether there are transportation means used for silverfish movement at Masese and other markets. The results are as follows in the table 4.15

**Table 4. 15: Transportation Methods**

<b>Transport strategy</b>	<b>SD</b>	<b>D</b>	<b>NS</b>	<b>A</b>	<b>SA</b>	<b>Mean</b>
Bicycle	51 (25.5%)	40 (20.0%)	17 (8.5%)	42 (21.0%)	50 (25.0%)	3.00
Walking to the marketplace	12 (6.0%)	8 (4.0%)	23 (11.5%)	58 (29.0%)	99 (49.5%)	4.12
Taxis	51 (25.5%)	52 (26.0%)	20 (10.0%)	43 (21.5%)	34 (17.0%)	2.78
United Transport Costs	30 (15.0%)	46 (23.0%)	21 (10.5%)	54 (27.0%)	49 (24.5%)	3.23
Motorcycles	12 (6.0%)	7 (3.5%)	9 (4.5%)	51 (25.5%)	121 (60.5%)	4.31
Boats	4 (2.0%)	1 (0.5%)	4 (2.0%)	32 (16.0%)	159 (79.5%)	4.71

**Source: Primary Data, 2023**

The study aimed to discover whether bicycles are used for transportation at Masese. The above Table 4.15 indicates that 50 (25.0%) of the respondents agreed, and 42 (21.5%) also agreed. 17 (8.5%) were neutral, 40 (20.0%) disagreed, and 51 (25.5%) strongly disagreed with the transportation method. Therefore, 46.5% of the respondents agreed that they transport silverfish using bicycles. According to FGDs, bicycles are used but not very famous since they are not weather-protective when it rains. They can only be used when the weather is friendly and for short distances.

The study explored whether walking to the marketplace is a transportation method at Masese. Table 4.15 indicates that 99 (49.5%) of the respondents strongly agreed that they walk to the market with silverfish, 58 (29.0%) agreed to the same, and 23 (11.5%) were neutral. However, 8 (4.0%) disagreed, while 12 (6.0%) strongly disagreed with the type of transportation. It is therefore indicated that 78.5% of the respondents agreed that they walk to the market place at Masese and other nearby markets.

This is in line with respondents who noted during a FGD with silverfish sellers

Walking to the market place is a good way to reduce transport costs to the nearby markets, though it is not safe with unfriendly weather. It also only favours small-scale silverfish luggage (Masese Landing Site-June 24-2023).

The study also analysed whether there is transportation by taxi at the Masese fish landing site. Table 4.15 points out that of the 200 respondents, 34 (17.0%) strongly agreed and 43 (21.5%) agreed to it. However, 20 (10%) of them were neutral about it, 52 (26.0%) disagreed, and 51 (25.5%) strongly disagreed. Therefore, this means that a minority 38.5% of the respondents agreed that they use taxis for the transportation of silverfish to the market. According to interviews, taxis are a preferred means of transportation but are used by few dealers because they delay delivery of the silverfish since they must first get filled up.

Respondents were also asked to establish whether silverfish dealers at Masese pull together transport costs. Table 4.15 indicates that 49 (24.5%) strongly agreed and 54 (27.0%) agreed that they pulled together costs. Of the 200 respondents, 21 (10.5%) kept neutral, 46 (24.0%) disagreed, and 30 (15.0%) strongly disagreed with it. Therefore, 51% of the respondents agreed that they always pull together transport costs at Masese. During FGD, a silverfish seller noted:

“Associations often pull together transport costs in cases where they need a big vehicle to transport silverfish to faraway markets” (FGD held on 23<sup>rd</sup> June 2023).

However, this was proved to be only seasonal when need arises.

The study also sought to establish whether there is use of motorcycles for transportation of silverfish at Masese and Table 4.15 points out that 121(60.5%) strongly agreed and 51(25.5%) agreed. 9(4.5%) were neutral while 7(3.5%) disagreed and 12(6.0%) strongly disagreed. The table therefore indicates that 86% of the respondents agreed that they use motorcycles for silverfish transportation.

Another one explained;

I use motorcycles to transport my silverfish because they are one of the quick yet cheap means to markets, and they can easily reach hard-to-access places. However, they also rely on the weather's friendliness (Masese landing site-June-24-2023).

The study explored to establish whether boats are used for silverfish transportation at Masese. Table 4.15 points out that, 159(79.5%) of the respondents strongly agreed that boats are used, 32(16.0%) agreed to the same. 4(2.0%) of them were neutral while 1(0.5%) disagreed and 4(2.0%) strongly disagreed to that. Therefore, the total respondents that agreed that they use boats for transportation were 95.5%.

In accordance with the interviews held with the available boat owners, it was confirmed that most people in the silverfish chain prefer using boats from one market at a landing site to another landing site market. Boat owner one emphasised, "Boats are the most preferred means of transport because they do not take long while sailing on water. They are not affected by congestion on the lake like cars on the road, which are delayed by heavy traffic jams." In an interview, a female dealer in silverfish remarked that "She preferred only boats to transport her silverfish from Masese to other markets in nearby landing sites because they are weather-friendly (Masese landing Site-June-24-2023).

**Table 4. 16: Summary for Transport Mechanisms**

Descriptives		Statistic	Std. Error
Transport	Mean	3.6917	.05257
	95% Confidence Interval for Mean	3.5880	
	Lower Bound	3.7953	
	Upper Bound	3.7139	
	5% Trimmed Mean	3.6667	
	Median	.553	
	Variance	.74343	
	Std. Deviation	1.00	
	Minimum	5.00	
	Maximum	4.00	
	Range	1.17	
	Inter quartile Range	-.435	.172
	Skewness	.066	.342
Kurtosis			

The results in the table above show a high mean = 3.69 (close to the median = 3.67) with a negative skew (-0.44), which suggests that the results were normally distributed.

## CHAPTER FIVE

### DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

#### 5.0 Introduction

Chapter five covers the discussion, conclusion, and recommendation of the study on the chain management of silverfish at the Masese landing site in Jinja district, Eastern Uganda. The chapter also covers the limitations and suggestions for further research. This section of the study presents the conclusion based on the objectives. Thus, the following conclusions were drawn from the study objectives:

#### 5.1 Discussion of the Findings

This section presents the discussion of the findings of the study on the on the chain management of silverfish at the Masese landing site in Jinja district, eastern Uganda. The discussion involves cross-referencing the findings of the study and related literature by previous scholars.

##### **5.1.1 Objective one: To explore the safety and storage practices used by silverfish dealers at the Masese landing site in Jinja District**

The first objective sought to find out the safety and storage practices used by silverfish dealers at the Masese landing site in Jinja district. The test results revealed that the use of sacks, baskets, and tins was a vital mechanism for cleaning and moisture prevention to keep the silverfish safe and well stored. This was consistent with the findings of previous scholars like Zewdie et al. (2021), who found that proper handling and storage practices of pelagic fish were crucial to maintaining the quality and safety of the fish in Ethiopia. Balasubramanian et al. (2019) in India found out that proper handling and storage practices were critical to maintaining the quality of the fish. Denis et al. (2022), who noted that thorough cleaning of silverfish is an important step in ensuring that it is safe for human consumption; Erkinharju (2021), who discovered that silverfish should be cleaned

to remove any dirt or debris that may be present on the fish; and Adhikari et al. (2020), on the microbial quality of silverfish sold in markets in Nepal, found that proper cleaning practices were critical to ensuring the safety of the fish.

Also in agreement with the findings of the study, drying through several mechanisms (Bwamiki, 2018) is valuable to remove excess moisture to prevent the growth of bacteria and fungi that can cause spoilage by drying the fish. Asante et al. (2020) found that sun-drying effectively reduces the water activity of dried fish, inhibiting the growth of microorganisms that can cause spoilage. Hussain et al. (2019) in Pakistan found that sun-drying improved the protein and amino acid content of dried fish. Hanson et al. (2022) found out that proper storage is critical to ensuring that silverfish remains fresh and safe for human consumption. For example, by tinning, storing in refrigerators, and storing in places far from infants, Loconti et al. (2022) noted that silverfish should be stored in a cool, dry place to prevent moisture buildup, which can cause bacterial growth and spoilage.

Namwanza (2015) reported that if stored improperly, silverfish can quickly spoil and become unsafe to eat because it is a vulnerable species to so many conditions in terms of temperature. This greatly relies on the sanitation of the environment where the silverfish is stored as well (FDA, 2022). Yorksaw (2017) found that proper packaging of fish is crucial to prevent contamination during transportation and to ensure that the fish remains fresh and safe for human consumption. Women who trade in fish should ensure that the fish is properly packaged by using clean, dry containers and sealing them properly to prevent moisture and air from entering (Perch et al., 2022). This helps to maintain the quality of the fish and prevent spoilage. Contamination during transportation can occur if the fish is not properly packaged, which can lead to health risks for consumers. Therefore, silverfish dealers at Masese Fish Landing Site need to follow these

packaging practices to ensure that the silverfish they process and sell is of good quality and safe for their customers to eat (Ling et al., 2019).

Also, a study conducted in Bangladesh found that improper packaging and storage of fish products resulted in spoilage and reduced product quality. According to Rahman et al. (2022), proper packaging, such as vacuum-sealing or using moisture-resistant materials, was found to be effective in extending the shelf life and maintaining the quality of fish products. As noted by Sylvester (2019), the use of inappropriate packaging materials, such as plastic bags, led to the growth of bacteria and other microorganisms on the surface of the fish, which reduced its quality and safety for human consumption. In accordance with Daayo (2014), regular quality control checks are essential at the Fish Landing Site to ensure that their silverfish is of good quality and safe for human consumption, as studied by Cyriac (2017). This agrees with the main concepts in the resource-based theory.

In agreement with the results of the study, quality control checks should be conducted regularly to check for any signs of spoilage or contamination. Punjab et al. (2017) found that by conducting regular quality control checks, women can maintain their reputation for selling high-quality silverfish and ensure customer satisfaction, according to Hastings (2013). Additionally, a study of regular quality control checks can help improve the safety and quality of fish products, according to Hashanuzzaman et al. (2020). Regular quality control checks help remove contaminated fish from their stock, resulting in higher-quality and safer products for consumers, as noted by Madalla et al. (2021).

### **5.1.2 To find out whether demographic characteristics influence silverfish chain management practices at various points at the Masese landing site in Jinja.**

Objective two of the study sought to establish whether demographic characteristics influence silverfish chain management practices at various points at the Masese landing site in Jinja. This was consistent with the findings of previous scholars like Hicks (2016), who found out that silverfish merchants who have higher levels of education are more likely to have knowledge and awareness about safe handling and storage practices for fish. Tavares et al. (2021) discovered that fish dealers with higher levels of education were more likely to adopt safe fish handling practices, such as using gloves and aprons, washing hands thoroughly, and cleaning equipment properly, compared to dealers with lower levels of education. Similarly, a study conducted in Nigeria by Adeyeye (2015) found that those with higher levels of education had better knowledge and awareness of good hygiene practices during fish processing and storage.

More still, Rahman et al. (2019) noted that educated ones were more likely to invest in proper storage facilities and equipment to preserve the quality of their fish, more likely to prioritise quality control checks, and adopt other safety practices to maintain the value of their product, according to Sumaila et al. (2013), and Rawool et al. (2021) pointed out that demographic issues like age, fisheries work experience, marital status, health condition, and number of children a fish dealer has also determined the choice of safety and storage in the fish value chain. Charlton et al. (2016) expounded that dealers who are advanced in experience around fish sites knew better storage practices, and women who stayed with their infant children around the site were likely to encounter losses. Russells (2016) also affirmed that there was a relationship between the health conditions of individuals in fisheries and the storage strategies they use.

Torell (2021) found out that traditional gender roles and cultural practices could impact attitudes and behaviours towards handling and storing fish; Naveena (2022) noted that cultural and social norms limited men's and women's input in the fish trade; and a study conducted in Bangladesh by Rahman (2018) found that gender norms and cultural expectations played a major role in shaping women's attitudes towards the fish chain. Additionally, according to Mwanza (2011), women reported feeling embarrassed or stigmatised for engaging in work traditionally done by men, which may discourage them from adopting safe handling and storage practices.

### **5.1.3 To find out the silverfish value addition techniques used at the Masese Fish Landing site at various points.**

This objective sought to find out the silverfish value addition techniques used at the Masese Fish Landing site at various points. The research found that there is a use of value addition practices to preserve silverfish at the Masese landing site, which is primarily dominated by women with low levels of expertise and Indigenous technology. This finding was consistent with the findings of previous scholars. Venugopal (2006) found out that value addition is an important strategy for improving the economic outcomes of small-scale producers, especially in developing countries. Taabeah et al. (2016) noted that by processing raw materials into higher-value products, producers can capture a larger share of the value chain and earn higher prices for their goods, and value addition strategies such as cleaning and drying silverfish can significantly increase the market value of their products, according to Modirwa et al. (2019).

Furthermore, value addition can help reduce post-harvest losses and increase the overall sustainability of the local fishing industry, according to Srinivas et al. (2021). By utilising all parts of the catch and reducing waste, fish dealers at fish landing sites can help create a more efficient

and environmentally friendly supply chain, as noted by Naveena et al. (2022). This corresponded well with the key tenants of Porter's Value Chain Framework. Muthukumar (2022) showed that the cleaned and gutted fish fetched higher prices in local and regional markets compared to those that were not processed. More still, Kakembo et al. (2016) in Uganda examined the fish value chain and found that the value-additional activities carried out, such as cleaning and gutting, were essential for increasing the market value of fish, Diyzee et al. (2022) found out that the value addition strategies used at fish landing sites, including cleaning, gutting, and scale removal, have been studied in various empirical reviews.

Sekabira et al. (2020) found out that the people involved in value addition activities like cleaning, gutting, and removing scales not only increased the market value of fish but also created employment opportunities for them. This corresponds with the main tenants of the Porters value chain framework. similarly, a study by Mwebaza et al. (2019) found that value addition strategies they made the fish more visually appealing and easier to prepare for intake, Rahman, (2016) discovered that some women at the site also added flavor to the fish by marinating it in spices, which can make it more desirable to buyers and a study by Rahman et al. (2019) found out that marinating fish in a mixture of spices improved its sensory attributes, making it more desirable to consumers and while examining the effect of marination on the shelf life and quality of fish, Eltholth et al., (2015) found that marinating fish in a mixture of spices helped to extended its shelf life by reducing the growth of microorganisms that can cause spoilage and Banerjee et al. (2019) explained that the effect of marination on the nutritional quality of fish was investigated.

Okpei (2022) found that marination with spices significantly increased the antioxidant activity of the fish, which is beneficial for human health; one study by Asikiya et al. (2018) found

out that drying significantly increased the shelf life of silverfish, making it easier to transport to markets further away; Ssebisubi et al. (2019) found out that drying silverfish was an important value-added strategy for women at fish landing sites, as it increased the shelf life of the fish and allowed them to access markets further away; and Ogwang et al. (2021) noted that drying significantly reduced the microbial load of silverfish, making it safer for human consumption.

Amponsah et al. (2019) noted that the value addition strategies used at fish landing sites not only increase their income but also help to reduce waste and increase the sustainability of the local fishing industry by utilising all parts of the catch. Berdegúe et al. (2015) in Latin America found that women in the fish value chain had developed innovative value addition strategies, such as using fish scraps to produce fish meal and fish oil and Muhame (2020) noted that strategies not only added value to fish products but also contributed to reducing waste and improving the sustainability of the fishing industry. This is not the case for Ugandan landing sites.

#### **5.1.4 To explore the silverfish marketing and transportation methods used at the Masese fish site in Jinja.**

Objective 4 of the study sought to find out the silverfish marketing and transportation methods used at the Masese fish site in Jinja. The Silverfish marketing and transportation strategies are social networks, word of mouth, phones, packaging styles, and radio announcements, while the transportation strategies include bicycles and motorcycles, taxis, walking, and pulling together transport costs. On the contrary, there were no proper marketing strategies and linkages for silverfish in the study area, as marketing was dominated by word-of-mouth methods. The results are consistent with the findings of Egeru et al. (2016), who found out that word-of-mouth

marketing is a common practice among fish traders, particularly women. The study only noted that fish dealers often rely on their networks to inform potential customers about their products. Nakimbugwe et al. (2022) also noted that mobile phones are used to advertise and market fish products. Sowman and Fraga (2018) in South Africa found that fishermen used mobile phones to communicate with buyers, suppliers, and other fishmongers, facilitating their businesses' growth.

Similarly, Musa et al. (2019) in Nigeria also found that fishmongers used social media platforms like WhatsApp and Facebook. Katunze et al. (2012) found that packaging is an important factor in determining the market value of the fish. Stanton (2023) found out that there is a need for bicycles, motorcycles, and taxis to transport silverfish to different markets. Psaraderis (2022) found out that silverfish dealers utilise bicycles, motorcycles, and taxis to transport their goods. Adhlaka (2020) noted that specialised means like refrigerated trucks are used to transport silverfish over long distances. Tsironi et al. (2018) found that the use of refrigerated trucks during transportation significantly reduced the microbiological growth of fish products and improved their quality.

Villarroel et al. (2020) in Chile also found that to reduce transportation costs, there is the pulling of resources and sharing of transportation costs, often according to Twinamasiko et al. (2012), and dealers at fish sites use their knowledge of local and regional markets to identify the best markets to sell their silverfish according to Ocheke (2014), and Kikomeko et al. (2013) also found that fish dealers use their knowledge of local and regional markets to identify the best markets to sell their silverfish and which means of transport to use in accessing the markets.

## **5.2 Conclusion**

(i) At the Masese Fish Landing site, safety and storage practices to preserve silverfish are used. These are quality control, cleaning, moisture removal, sacks, baskets, and tins. The available modes of packaging and storage were tough and faced many unbecoming conditions in the rainy season. This is because silverfish are subject to moisture and start to rot and smell, causing losses for owners.

(ii) Some demographic characteristics determine perceptions about silverfish management at the Masese landing site in Jinja. Age, gender, education level, and type of employment have a significant influence on the perceptions of silverfish dealers about silverfish management, while experience only has an insignificant influence.

(iii) At the Masese landing site, there is the use of drying, smoking, packaging, pounding, preservatives, and gutting to add value to the silverfish. However, from the preceding analysis, it was vivid that the value addition activities done largely fell on the side of females yet were not appreciated and characterized with only indigenous technology.

(iv) There is use of social networks, word of mouth, phones, and packaging strategies to market silverfish at the Masese landing site. Participants in the fish value chain employ various marketing methods to sell silverfish. They often use word-of-mouth marketing, where they rely on personal networks to inform potential customers about their products.

## **5.3 Policy and Practical Recommendations**

(i) Good safety and storage practices should be used to preserve silverfish. This is done by quality control, cleaning, moisture removal, sacks, baskets, and tins. Traders in silverfish should ensure

that the fish is properly packaged by using clean, dry containers and sealing them properly to prevent moisture and air from entering. The government should support the traders with bigger and better moisture removers for better silverfish safety and storage.

(ii) Since gender affects the chain management perceptions at Masese, there should be empowerment and interest for both genders to venture out at all possible points in the chain. Men should be supported and motivated to engage in the remote female dominated value addition activities, while ladies should be offered knowledge through basic training about better strategies for the same activity.

(iii) Social networks, word of mouth, phones, and packaging strategies are sources of market for silverfish. The government should come up with more ways of marketing silverfish to traders to hit both far and local markets.

(iv) The government should put up better drying mechanisms at the Masese landing site; the dealers in the market dry their silverfish on hard rocks which exposes them to pests and sand contamination, they use indigenous packaging, pounding, preservatives, and gutting instruments, but they need to be supported with advanced ones to contribute to safety and value addition for silverfish traders.

(v) There should be an emphasis on education for silverfish dealers at the Masese landing site since it influences the chain activities in terms of safety, storage, and value addition techniques. The educated ones should be empowered to offer basic skills to the other dealers in the chain.

(vi) Age, marital status and experience at Masese do not affect the silverfish perceptions at the Masese landing site in Jinja. The government should come up with programmes to encourage silverfish traders to manage their storage practices better.

(vii). Value addition should be emphasized and implemented to improve profitability, the production of safe fish products, and household income among women individuals and groups in fishing enterprises at the Masese fish landing site.

(viii). The temporary storage structure at Masese landing site should be renovated, given new roofing and maintained for the safety of the silverfish.

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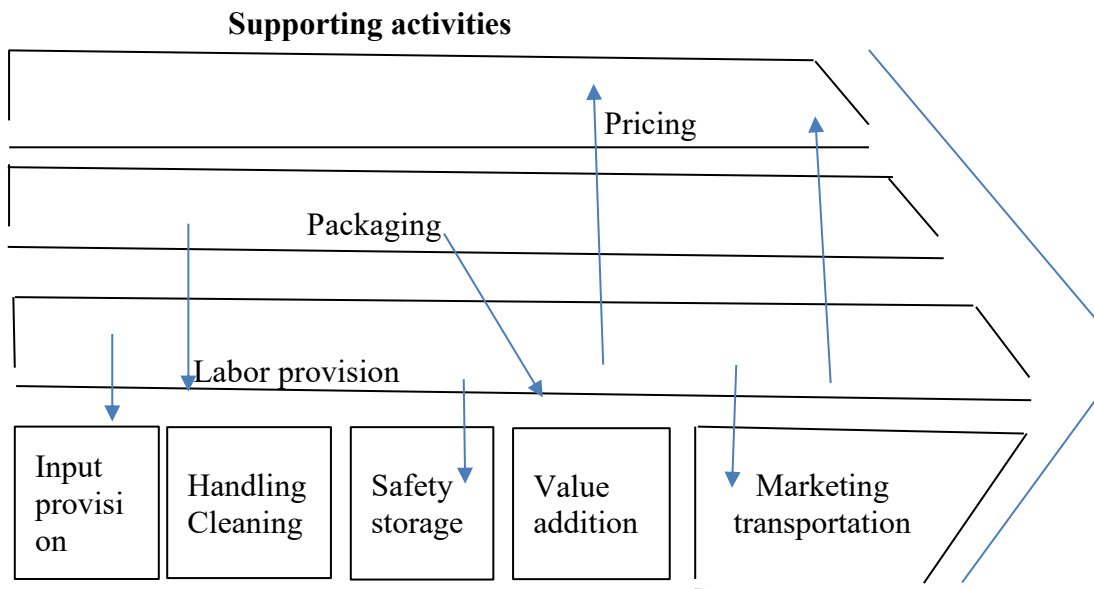
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## APPENDICES

### Appendix A: Porter's Value Chain

This Appendix A is a summary of Porters value chain framework in the context of activities in the value chain of silver fish.



#### Primary activities in the fish value chain

Source: Adopted from Tarver (2021)

### Appendix B: Matrix for Data Analysis

Objectives	Data to be collected	Method of Data Analysis
<p>Objective 1: To explore the safety and storage practices of silver fish used at Masese fish landing site</p>	<p>Safety and Storage practices</p>	<p>Descriptive statistics and Thematic analysis</p>
<p>Objective 2: To find out whether demographic characteristics influence silverfish chain management practices.</p>	<p>Age, Sex, marital status, education level, experience in the activity, and type of employment influence on chain practices</p>	<p>ANOVA, Students' T Test and Thematic analysis</p>
<p>Objective 3: To find out the silverfish value addition techniques at Masese fish landing site</p>	<p>Value addition techniques</p>	<p>Descriptive statistics and Thematic analysis</p>
<p>Objective 4: To explore the marketing and transportation methods of silverfish at Masese</p>	<p>Marketing and transportation methods</p>	<p>Descriptive statistics, and Thematic analysis</p>

### Appendix C: Questionnaire for Silverfish Chain Management Dealers

I am a student of Kyambogo University carrying out a study on “**Silverfish Chain Management Practices at Masese Landing Site in Jinja District, Eastern Uganda.**” Based on your position in the community, you are considered to be knowledgeable and can help in answering the questions for this study. In view of this recognition, you have been selected to take part in the study. The information offered will strictly be used only for academic purposes. Your participation in this study is out of your own volition. I request you to please accept to offer information for the success of this study. I guarantee that all information provided will be protected to ensure your confidentiality and anonymity.

#### Section A: Background Characteristics

Name of Respondent.....

Telephone Number.....

Tick (✓) in the appropriate place provided

**1. Age**

- |              |                          |                  |                          |
|--------------|--------------------------|------------------|--------------------------|
| (a) Below 21 | <input type="checkbox"/> | (c) 31-40        | <input type="checkbox"/> |
| (b) 21-30    | <input type="checkbox"/> | (d) 41 and above | <input type="checkbox"/> |

**2. Gender**

- |          |                          |            |                          |
|----------|--------------------------|------------|--------------------------|
| (a) Male | <input type="checkbox"/> | (b) Female | <input type="checkbox"/> |
|----------|--------------------------|------------|--------------------------|

**3. Your highest level of education**

- |               |                          |                |                          |
|---------------|--------------------------|----------------|--------------------------|
| (a) Primary   | <input type="checkbox"/> | (c) Tertiary   | <input type="checkbox"/> |
| (b) Secondary | <input type="checkbox"/> | (d) University | <input type="checkbox"/> |

**4. Marital status**

- |             |                          |              |                          |
|-------------|--------------------------|--------------|--------------------------|
| (a) Single  | <input type="checkbox"/> | (c) Widowed  | <input type="checkbox"/> |
| (b) Married | <input type="checkbox"/> | (d) Divorced | <input type="checkbox"/> |

**5. Your experience in the chain**

- (a) Below 5 years  (c) 11- 20 years   
 (b) 5- 10 years  (d) 21 and above

**6. Type of employment**

- a) Self-employed  (b) Employee

**Section B: Safety, Storage, Value Addition, Marketing and Transportation**

This section presents items on silverfish safety practices, storage methods, influence of demographic factors on silverfish chain management practices, value addition techniques, marketing and transportation strategies as per the objectives. You are kindly requested to indicate your opinion about it using the scale where, 1= Strongly Disagree, 2 = Disagree, 3 = Not Sure 4 = Agree and 5 = Strongly Agree.

Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
1	2	3	4	5

SP	Objective one: Safety Practices of Silver fish	1	2	3	4	5
SP1	I practice regular quality control of silver fish					
SP2	I thoroughly cleaning of silver fish					
SP3	I always remove moisture from silver fish					
SP4	I add preservatives to keep silver fish safe					
SP5	I keep fish in dry safe containers					
SM	Storage Methods	1	2	3	4	5
SM1	I do tinning of silver fish.					
SM2	I refrigerate silver fish at this site					
SM3	I prefer storing silver fish in bags.					

SM4	I prefer using baskets for storage					
SM5	I store fish in sacks at this site					
<b>VS</b>	<b>Value addition Strategies</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
VS1	I add preservatives and dyes to silver fish at Masese.					
VS2	I do marination of silver fish with spices.					
VS3	I do deboning and gutting of silver fish at this site.					
VS4	I package appealingly for value addition at this site.					
VS5	I smoke and sundry silver fish at this site.					
VS5	I do silverfish pounding at Masese.					
<b>DF</b>	<b>Demographic factors affecting silverfish chain management practices of</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
DF1	My education influences the value addition strategies I do					
DF2	My experience determines the value addition strategies I use					
DF3	My choice of value addition strategies is related to my health conditions					
DF4	The available legal structures influence the type of value addition I do					
DF5	My level of income influences the value addition I do					
DF6	The choice of my value addition strategies is dependent on my access to technology					
DF7	The market demands influence my choice of value addition strategies					
DF7	The available labour determines the value addition strategies I use					

<b>MS</b>	<b>Marketing Strategies</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
MS1	I use social networks to market my products					
MS 2	I do word of mouth marketing					
MS3	I package attractively					
MS4	I market using my phone					
MS5	I put radio adverts to market my products and services					
<b>TS</b>	<b>Transportation Strategies</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
TS1	I deliver my products using a bicycle					
TS2	I always walk to the market place					
TS3	I transport my silverfish in taxis					
TS4	I often pull a United transport cost					
TS5	I prefer using motorcycles to deliver my fish					

**Thank you for participating in this study**

## **Appendix D: Interview Guide for Silverfish Chain Management Dealers**

**To explore the silverfish safety and storage practices used at the Masese fish landing site.**

1. What are the safety practices employed by dealers in the silverfish chain?
2. How do they store silver fish at this site?
3. What challenges do they face at the level of safety and storage?
4. Are there any adopting techniques they use to counter the challenges and are there any suggestions on how best each could be addressed?

**Find out the silver fish value addition techniques used at the Masese fish landing site at various points.**

1. What silver fish value addition strategies are used by participants at Masese?
2. What challenges do they face at the value addition points?
3. Are there any existing adopting techniques and are there any suggested solutions that could help to address the issues?

**Explore the silverfish marketing and transportation strategies used at the Masese fish landing site.**

1. How do dealers in the silverfish chain market their produce and products?
2. What transportation mechanisms are used in the silverfish chain?
3. Are there challenges they face in the marketing and transportation points of the chain?
4. What mechanisms do they use to cope up in case of challenges and are there suggestions on how they could be addressed?