

**CONTRIBUTION OF FISH FARMING BUSINESS TO YOUTH
EMPLOYMENT IN KAMUTHANGA VILLAGE, MACHAKOS COUNTY,
KENYA**

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DECLARATION

I, the undersigned, declare that this thesis is my original work and has not been submitted to any other college or university for academic credit.

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DEDICATION

This work is dedicated to all the youth who are unemployed.

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ABBREVIATIONS AND ACRONYMS

ERPARDP:	Economic Recovery, Poverty Alleviation and Regional Development Program
ESP:	Economic Stimulus Program
FAO:	Food and Agriculture Organization
GDP:	Gross Domestic Product
GoK:	Government of Kenya
ILO:	International Labor Organization
KEMFRI:	Kenya Marine and Fisheries Research Institute
KNBS:	Kenya National Bureau of Statistics
MT:	Metric Tones
MTP:	Medium-Term Plan
CAGR:	Compound Annual Growth Rate
NEPAD:	New Partnership for Africa's Development
SPADA:	FAO Special Program for Aquaculture Development in Africa
FFEPP:	Fish Farming Enterprise Productivity Program
IMPACT:	International Model for Policy Analysis of Agriculture Commodities and Trade
BAU:	Business-As-Usual
HIGH:	High-growth scenario for capture fisheries and aquaculture with accompanying strong gross domestic product growth

ABSTRACT

Fish farming represents significant socio-economic opportunities that can address youth unemployment in various African countries, particularly in the case of Kamuthanga village, Machakos County, Kenya. Despite the presence of abundant fish farming resources in Africa and the efforts made by African governments to promote this sector, youth participation remains limited. This study examined the contribution of fish farming in generating sustainable employment for young people in Kamuthanga village. It had the objective to determine the extent to which the fish farming industry in Kamuthanga, Machakos County, Kenya, contributes to young people's employment. Two theories were used to develop the theoretical framework of the study namely, entrepreneurship theory and anthropological entrepreneurship theory. The research design adopted for this study is a qualitative case study approach. Triangulation ensured a comprehensive understanding, with in-depth interviews capturing individual perceptions and key informant interviews exploring business opportunities. The study used focus group interviews with unemployed youth, facilitating collective exploration, and employed purposive sampling to ensure valuable insights. A total of twenty-six (26) people participated in this study. Data was analyzed with Qualitative Data Analysis (QDA) Miner Lite software utilizing a thematic analysis approach, with data organization, coding, and theme development conducted sequentially to align with the study objectives. Results indicated significant opportunities in fish farming, including job creation, income generation, and food security enhancement. The study also identified factors hindering youth involvement, such as water scarcity, financial constraints, and some cultural barriers. Additionally, it revealed a strong demand for training, capacity building, and financial support among Kamuthanga's youth to enhance their engagement in fish farming. The findings reveal valuable insights into the potential of fish farming as a solution to youth unemployment and shed light on the necessary measures to promote greater youth involvement in the business. The study concludes that fish farming in Kamuthanga village holds promise in alleviating unemployment and poverty, providing economic empowerment, addressing nutritional deficiencies, and enhancing overall food security. The researcher's recommendations include simplifying the process and reducing the costs of obtaining business licenses, ensuring water availability, offering entrepreneurship and financial literacy training, and facilitating access to microfinance loans and funding opportunities through government or non-governmental organizations.

OPERATIONAL DEFINITION OF TERMS

Aquaculture – It refers to the controlled or semi-controlled cultivation of aquatic organisms, including fish, molluscs, crustaceans, and aquatic plants, with the aim of obtaining economic and social benefits. In this study, aquaculture refers to fish farming.

Fish farming – It is a specific category within aquaculture that focuses on the cultivation of fish in controlled or semi-controlled environments to achieve economic and social advantages. For the purpose of this study, fish farming is understood as the rearing of fish in a controlled condition for a socio-economic purpose. These socio-economic purposes can be job creation, income generation, and food security.

Fishery – It is the industry of fishing, processing, and selling fish. In this study, it is understood as the agricultural sector which deals with all that pertains to fish business. The fishery sector can be divided into three main categories, which are aquaculture, freshwater fisheries, and marine capture fisheries.

Business – It refers to the activities involved in producing, purchasing, and selling goods or services. In this research, it is considered as work or tasks performed as part of one's occupation rather than for mere enjoyment.

Employment – It is an occupation by which a person earns a living from work or business. It is a regular paid work. In this study, it is understood as a job or an activity that helps a person to get some income for his or her needs and helps the person to be self-sufficient. It is measured in this study by self-employment and employee.

Unemployment – It denotes the portion of the workforce that is currently jobless, yet actively seeking employment opportunities and readily available for work. In this study, it means a situation where a person is willing to work but does not get this opportunity. Unemployment is measured by the labour force and unemployment rate.

Self-employment - Self-employment involves individuals working independently instead of being employed by a particular company. In the context of this research, self-employment refers to a working setup where individuals run their own businesses or operate as independent contractors, freelancers, or sole proprietors.

Youth – The age range of 15 to 24 years is used by the United Nations to define the category of youth, while the International Labour Organization includes individuals aged between 15 and 29

in their definition. In this study, the definition of youth is aligned with the Constitution of Kenya 2010 (Article 260), which categorizes youth as individuals ranging from 18 to 35 years of age.

Youth employment - A situation where individuals aged 18-35 are earnestly working in a gainful activity. In this study, youth employment is about young people actively working in paid employment or self-employment. It is measured by self-employment, employee, and unemployment/underemployment

Job creation – It refers to the act of creating new job opportunities within an economy or industry, usually leading to a rise in the overall job availability for individuals in search of employment. In this study, job creation refers to the act of generating new employment opportunities, particularly for individuals who are currently without work.

Food security - Refers to the availability of food for all residents. In this study, food security is defined as the condition where individuals have consistent access to adequate and safe food supply that fulfils their nutritional requirements and personal preferences, without jeopardizing their ability to acquire food in the future. It is, therefore, understood that fish farming can provide a reliable source of protein for local communities and help to address food security issues.

Sustainable development – In this study, it is understood as a notion that incorporates economic, social, and environmental factors to fulfil the requirements of the current generation while safeguarding the capacity of future generations to satisfy their own needs. It aims to achieve a balance between economic growth, social equity, and environmental protection, recognizing that these three dimensions are interconnected and mutually reinforcing.

CHAPTER 1: INTRODUCTION

1.1. Introduction

This chapter describes the researcher's initial involvement and subsequent interactions with the fish farming business, leading to the idea of linking it with youth employment and self-employment.

The background of fish farming is presented in this chapter, emphasizing its connection with youth employment and self-employment. The research objectives and corresponding research questions are outlined in this chapter as well. The chapter also highlights the significance of the study to the Kamuthanga youth, Kamuthanga fish farm, and the representatives of Machakos County. It also provides information on the geographical location of the research area. Lastly, the chapter concludes with a section discussing the limitations and delimitations of the study.

1.2. Insertion

The researcher is a missionary brother and a member of a Catholic missionary congregation called Comboni Missionaries. During his first stage of formation (Postulancy) in Togo, he got the opportunity to be involved in a fish farming activity which was income-generating for the community. It was from this experience that he got his first knowledge about fish farming. Then, he had the opportunity to attend a fish farming training which was organized by a parishioner. That training had the purpose of supporting the youth who were jobless in the parish. The trainer was touched by the way the youth were standing in front of the office of the parish priest the whole day looking for any kind of support. He thought of helping the youth by organizing fish farming training for them. Surprisingly, it was only the researcher who attended that training from the parish. This also shocked some government officials in the fish farming sector he had informed and invited to join the training because they were expecting more participants. The researcher was puzzled why the youth were not interested in the training, despite several announcements in the church and the publicity around the planned training.

When the researcher arrived in Kenya, he decided to learn more about fish farming business and its contribution to youth employment and self-employment. He came across the Kamuthanga fish farm. This is one of the Aquaculture Academy Campuses, located in Machakos County and it offers practical vocational training in commercial aquaculture. The farm equips learners with the

knowledge of the entire fish value chain. However, he also observed that very few youth were attending the training. He was again puzzled by the lack of interest of the youth in fish farming which could provide them job opportunities. This research is the response to the puzzle.

1.3. Background to the study

Fish farming, also known as aquaculture, is a method of cultivating fish within enclosures. Goldberg and Naylor (2005) write that it is the fisheries diminution that has created new motivation to expand seafood production through fish farming, often known as aquaculture. According to Sangirova et al. (2020), fish farming has existed since ancient times, but compared to aquatic fishing and animal rearing, it has never received much attention. However, nowadays, fish farming is becoming an economic activity globally (Sangirova et al., 2020). This is because, it is viewed as a viable alternative (farmed fish instead of wild fish) for fishing and aquatic food production, and it has been suggested that it can reduce demands on ecosystems (Longo et al., 2019). There is a huge interest in fish farming sector's potential not only to reduce the demands on ecosystems but also to boost economic growth, alleviate poverty in developing nations and change the status of people (Filipski & Belton, 2018). Actually, fish farming sector can offer diverse range of employment opportunities, including farm technicians, hatchery workers, fish health specialists, fish biologists, aquaculture engineers, sales and marketing personnel, and the administrative staff. Starting fish farming business can be a great option for the unemployed youth today.

According to the Food and Agriculture Organization of the United Nations (FAO, 2009), fish farming offers numerous advantages to farmers, their households, and the communities involved in the practice (FAO, 2009; Mugah, 2020). Indeed, Asia has dominated the fish farming industry, accounting for 89 percent of the global production volume over the past two decades (FAO, 2020). In 2017, Indonesia emerged as the top producer in the region, contributing approximately 50.3% of the total fish production volume, followed by Vietnam (16.1%), Myanmar (12.5%), Philippines (9.5%), Thailand (5.3%), and Malaysia (4.2%). In terms of value, Indonesia also accounted for 55.7% of the region's fisheries production value (Kaewnuratchadasorn et al., 2020).

In Pakistan, Laghari (2018) highlighted the significant contributions of fisheries to employment, income, food production, and the national economy. Similarly, Das et al. (2018)

demonstrated the significant role of freshwater fisheries in rural and impoverished communities in Bangladesh. Fish farming has emerged as a lucrative and appealing venture in Bangladesh, surpassing rice cultivation and other agricultural activities (Islam et al., 2017). This shift has prompted a significant number of rice farmers to transform their fields into fishponds.

South America is renowned for its significant contribution to fishing and aquaculture industry. According to Valladão et al. (2018), aquaculture plays a crucial role in employment, food production, and the local economy in South America, while also making a substantial impact on the global economy due to its extensive international presence. A study conducted in Acre, Brazil by Alves et al. (2019) demonstrated that fish farming program implemented in the region is a practical initiative that effectively generates income and employment opportunities. The findings indicate promising potential of the program in regional, national, and international markets.

In various European countries, the fish farming industry offers youth numerous direct and indirect employment opportunities. Many governments have implemented policies and funding programs specifically designed to promote aquaculture and target youth employment. The European Union also provides substantial support through initiatives like the European Maritime and Fisheries Fund (EMFF), which includes provisions for training and employing young people in the sector. In Galicia, one of Spain's most important maritime regions, Garza-Gil et al. (2017) found that the fishing and aquaculture sectors contribute significantly to job creation and provide income opportunities in other economic sectors. In 2013, the fishing and aquaculture production in Galicia was nearly one million euros, accounting for almost 2% of the regional economy's value added and providing more than 17,000 full-time jobs (Garza-Gil et al., 2017).

Across Africa, there is growing recognition among governments about the potential of the fish farming industry in job creation. The growing recognition of the benefits has encouraged the establishment of expansive commercial fish ventures, motivated by a range of factors including growing public backing, expertise, foreign direct investment, interest in aquaculture. It also heightened global awareness facilitated by the New Partnership for Africa's Development (NEPAD) (Obiero et al., 2019a). At present, Egypt, Nigeria, Uganda, and Ghana are experiencing a noticeable surge in substantial investments, leading to significant fish production (Cai et al., 2017).

In Kenya, the government recognises that fish farming business has great potential. It provides employment opportunities and improves the overall quality of life for citizens (Munguti

et al., 2014). As a result, a substantial aquaculture subsidy programme was introduced as part of the Economic Stimulus Programme (ESP) from 2009 to 2012 (Ole-Moiyoi, 2017). Furthermore, within the framework of the Kenya Vision 2030 and Medium-Term Plan III's (MTP) economic pillar, fish farming sector was identified as a viable avenue for youth employment, food security, and poverty alleviation.

The opportunities in the fish farming sector and the effort of the Kenyan government to promote it are encouraging. The Kenyan government supports young entrepreneurs, including those interested in starting fish farming business, by offering financial aid through the Youth Enterprise Development Fund (YEDF). This fund provides affordable financing options to enable youth to establish and grow their fish farming enterprises. The Economic Stimulus Programme (ESP) enhances fish farmers' and associated institutions' capabilities in various areas, including constructing ponds, providing fish feeds and fingerlings, managing post-harvest activities, and developing human resources (Ole-Moiyoi, 2017). With supportive government regulations and significant public funding, aquaculture output in Kenya experienced a rapid growth trajectory, soaring from under 1000 tonnes in 2006 to approximately 24,000 tonnes during the mid-2010s (Obiero et al., 2019b). It can therefore be argued that the growth of the fish farming sector has great potential for youth employment and self-employment.

Many youth have not fully embraced fish farming. Instead, young people are increasingly moving away from farming as a source of livelihood and migrating to urban areas in search of alternative activities (County Government of Machakos, 2018). This situation makes youth struggle to find fulfilling jobs that would allow them to be financially self-sufficient. According to the International Labour Organization (ILO, 2019), Kenya faces a situation where approximately five million individuals between the ages of 18 and 34 are unemployed, resulting in a youth unemployment rate of 38.9 percent as of 2018. This high rate of youth unemployment in Kenya is alarming, specifically in Machakos where several profitable opportunities such as agriculture and fish farming readily available.

The reality of youth shying away from existing opportunities to move out of poverty deserved attention and an in-depth understanding of factors contributing to this reality. Therefore, this study sought to investigate the contribution of fish farming to youth employment in Kamuthanga, an agricultural area in Machakos County. Kamuthanga fish farm is an excellent resource for supporting youth in fish farming activities and training. The study examined the

influence of fish farming on youth employment in Kamuthanga, and identified the factors that hinder youth involvement in the industry.

1.4. Statement of the problem

Fish farming plays a significant role as a strategy to combat unemployment and enhance the standard of living for many households (Mugah, 2020). For example, in Egypt, there has been a growing trend of young people entering the sector, either as employees in established fish farms or as entrepreneurs establishing their own fish farming businesses (Ferrando, 2023).

However, it has been noted in many other African countries that most youth are after administrative and other white-collar jobs, and there are strikingly few young people engaged in the fish farming sector (Oladiran et al., 2021). In Kenya, despite the aquaculture sector offering direct employment to more than 500,000 individuals and indirect support to over two million people, there is still a lack of interest among many youth in this business, leading to continued unemployment (Opiyo et al., 2018). Beyond the lack of interest, other factors such as insufficient training and limited access to capital may also be considered. The Kenya National Bureau of Statistics (KNBS, 2019) reported that the rate of unemployment among young people, is significantly higher than the overall national unemployment rate, which stands at 10%. In Kamuthanga, Machakos County, Kenya, despite the presence of an aquaculture training centre aimed at imparting fish farming skills, only a limited number of eight (8) youth are actively engaged in fish farming. Moreover, there are no other youth currently involved in personal fish farming endeavours within Kamuthanga region. This situation raises the question as to why youth are not embracing the fish farming business.

The factors that prevent young people from embracing fish farming sector are not yet well known. The problem this study set out to investigate is why very few young people in Kamuthanga are engaged in fish farming. Therefore, this study sought to examine employment opportunities that fish farming presents to the youth, as well as the constraints that are preventing young people from fully engaging in aquaculture.

1.5. Purpose of the study

The purpose of this study was to examine the contribution of fish farming business to youth employment in Kamuthanga village, Machakos County.

1.6. Objectives of the study

The general objective of this study was to determine the extent to which the fish farming industry in Kamuthanga, Machakos County, Kenya, contributes to young people's employment.

The specific objectives of the study were to:

1. Examine the opportunities of fish farming for youth employment in Kamuthanga, Machakos County.
2. Assess the factors restraining the Kamuthanga youth involvement in fish farming business.
3. Suggest strategies for enticing youth into fish farming business in Kamuthanga

1.7. Research questions

The study intended to answer the following questions:

1. What are the opportunities of fish farming for youth employment in Kamuthanga, Machakos County?
2. What are the factors preventing the Kamuthanga youth involvement in fish farming business?
3. Which strategies can help to entice youth into the fish farming business in Kamuthanga?

1.8. Significance of the study

The results of this research may have considerable significance for the Kenyan government, particularly the Ministry of Fisheries Development. Additionally, the outcomes of this study might assist the County government of Machakos, organizations working for youth employment, other stakeholders involved in fish farming, and the local community. The study might enable them to understand the contribution of fish farming business to youth employment and self-employment. It might also provide information on the relationship between fish farming and job creation, income generation, and poverty alleviation for all those stakeholders. Furthermore, the findings might contribute to formulating effective strategies to promote and support youth engagement in the fish farming sector. Finally, it might contribute to the existing literature on the socioeconomic impacts of fish farming and serve as a reference for future research endeavours in similar contexts.

1.9. Scope of the study

This study was conducted in Kamuthanga village, located in Machakos County, Kenya with a specific focus on examining the contribution of fish farming to youth employment in the area. It encompassed various aspects, including the extent of youth involvement in fish farming activities and the experiences of unemployed youth in Kamuthanga. Moreover, the study is limited to the socioeconomic benefits that fish farming offers to young people, such as entrepreneurial opportunities, income generation, and food security. By considering the potential of fish farming to create sustainable employment opportunities for the youth, the research aimed to contribute to the reduction of youth unemployment in Kamuthanga. Additionally, the study addressed some challenges faced by youth engaged in fish farming, as well as those who are unemployed, such as limited access to water, cultural influences, and limited access to capital.

In terms of literature review, this research primarily focused on relevant studies that specifically investigated fish farming businesses and their relationship with youth employment. Consequently, articles that did not specifically address fish farming or youth employment were excluded from the study to maintain its coherence and relevance.

1.10. Assumptions

Through this process of carrying out this research among the Kamuthanga youth fish farmers and some Kamuthanga unemployed youth, the researcher assumed that the study would help to know how the fish farming business can contribute to youth employment in Kamuthanga. By doing so, the study explored the different opportunities in fish farming business. The researcher also assumed that the study's instrument would elicit accurate responses, the respondents would understand the questions in their totality and would be truthful in sharing their information. Additionally, the researcher assumed that the findings would provide valuable insights for promoting sustainable youth employment opportunities, enhancing socioeconomic development, and informing policy interventions in the context of fish farming in the village and similar settings. Furthermore, the researcher assumed that the study would provide insights into the reasons behind the hesitancy of youth in Kamuthanga to participate in fish farming.

1.11. Limitations and delimitations of the study

First, the researcher faced a lack of sufficient literature on this topic in Kamuthanga village due to little research conducted in relation to the contribution of fish farming businesses to youth employment in the concerned area. This was addressed by consulting some fish farmers in Kamuthanga fish farm to access records and the few types of research that were not yet published. Additionally, the researcher had limited access to data because of the lack of the unemployed youth's cooperation, openness, and flexibility. This was overcome by the existence of distinctive written approvals from Tangaza University and NACOSTI. These respective approvals specified that the research was an academic one thus participants' lived experiences would be kept confidential. As a result, respondents' names were not mentioned because they were identified through some pseudonyms given by the researcher. Indeed, the Jiwakilishe Community Based Organisation, established to serve the community through various programmes in Machakos County, facilitated the identification and gathering of unemployed youth in Kamuthanga village.

Delimitation involves the act of narrowing down both the study population and the geographical area to a more manageable extent. In this research, delimitation was implemented to define the specific scope that was encompassed. The research excluded youth and fish farmers who were not in Kamuthanga village. According to the Kenyan 2010 constitution, defining the youth as being individuals between the ages of 18 and 35 years (Government of Kenya [GoK], 2010), the research excluded people under 18 and above 35 years old.

1.12. Chapter Summary

This chapter has demonstrated the potential of fish farming to address the challenge of youth unemployment globally. From the background of the study, it has been shown that the Kenya government has recognised the contribution of fish farming to youth employment and launched a nationwide fish farming sensitization drive through the Kenyan Government's Economic Stimulus Programme (ESP) between 2009 and 2013. However, despite the efforts of the government, many youth are still unemployed in Kenya, particularly in Machakos. The next chapter presents the literature on the study topic.

CHAPTER 2: LITERATURE REVIEW

2.1. Introduction

This chapter engages with literature related to fish farming, including its role in promoting youth employment, generating income, ensuring food security, identifying constraints faced by the youth in embracing fish farming and exploring methods for the sustainable development of fish farming among the youth. The review examines existing theoretical and empirical studies to highlight previous research conducted on these themes and identifies the knowledge gap that the present study aims to address. The theoretical framework is based on Entrepreneurship theory and Anthropological entrepreneurship theory. Furthermore, the conceptual framework is presented in showing fish farming business as an independent variable and youth employment as the dependent variable. The study derives its relevance from the basis of this conceptual framework on which it is anchored.

2.2. Review of theories

A review of theories is a comprehensive examination and synthesis of existing theories, concepts, and research findings that serve as the foundation for new research endeavours. It helps researchers understand the current state of knowledge, identify gaps, and develop hypotheses or frameworks for their own investigations (Abend, 2013). This study is anchored on the entrepreneurship theory and the anthropological entrepreneurship theory.

2.2.1. Entrepreneurship theory

The entrepreneurship theory is attributed to Joseph Alois Schumpeter and was first introduced in his book “The Theory of Economic Development,” published in 1911 (Alvarez & Barney, 2000). Since then, the concept has popularity in academia and across industries. According to Perrini et al. (2010), entrepreneurship theory is a field of study that explores the nature, dynamics, and processes involved in entrepreneurship. It focuses on understanding how entrepreneurs identify, create, and exploit opportunities to start new ventures or innovate within the existing organizations. Perrini et al. (2010) emphasize that entrepreneurship theory encompasses a wide range of perspectives, frameworks, and concepts that aim to explain and predict entrepreneurial behaviour and outcomes.

In this study, entrepreneurship theory provided a valuable lens to analyse the opportunities in fish farming for the unemployed youth in terms of job creation, income generation, and food security. In the case of fish farming, unemployed youth can explore entrepreneurial ventures by starting their own fish farms or becoming part of existing ones. By applying entrepreneurship theory, the unemployed youth can identify and pursue viable business opportunities in fish farming that have the potential to create jobs for themselves and for others in their communities.

Additionally, entrepreneurship theory focuses on wealth creation and profit maximization (Rumelt, 2005). In the context of fish farming, it helped to analyse the potential for income generation among the unemployed youth. Entrepreneurship theory provided a framework to assess the financial viability of fish farming ventures and develop innovative approaches to increase income streams.

Furthermore, entrepreneurship theory recognised the importance of addressing societal needs and creating value for stakeholders (Zahra & Wright, 2016). Concerning fish farming, entrepreneurship theory was applied to analyse its contribution to food security. By leveraging on entrepreneurship theory, youth can identify innovative approaches to enhance food security through sustainable and inclusive fish farming practices.

Entrepreneurship theory helped to understand how youth could adopt a comprehensive perspective when assessing the opportunities in fish farming. This encompasses evaluating the potential for job creation, income generation, and food security. However, it is important to note that entrepreneurship theory did not fully encompass the factors that hinder the youth from embracing fish farming, particularly cultural aspects. In order to address this limitation, the entrepreneurship theory was complemented by the anthropological entrepreneurship theory, which offered insights into the cultural influences and societal factors impacting entrepreneurial endeavours.

2.2.2. Anthropological Entrepreneurship Theory

Alex Stewart developed the theory of anthropological entrepreneurship in 1992 (Stewart, 1992). The theory emphasizes the importance of understanding the sociocultural context in which entrepreneurship takes place. It posits that entrepreneurship is not just an economic activity, but also a cultural and social one. This theory emphasizes the role of culture, tradition, and social relationships in shaping entrepreneurial behavior (Mitchell et al., 2002). In their research, Verver

and Koning (2024) shed light on the multifaceted essence of anthropological entrepreneurship, revealing its manifestation through intricate socio-cultural connections. They underscored its dynamic interplay across micro, meso, and macro levels, and its profound capacity to synthesize historical legacies with contemporary contexts, thereby shaping innovative pathways for societal advancement.

Regarding the contribution of fish farming business to youth employment in Kamuthanga village, Anthropological Entrepreneurship Theory provided insights into the cultural and social factors that influence youth engagement in this business. It examined how social relationships and cultural norms affect the willingness of young people to participate in fish farming. It also explored how the local community perceives and values fish farming as an economic activity, and how this perception affects youth's engagement in this business. Furthermore, Anthropological Entrepreneurship Theory helped to identify strategies to enhance the sustainability of fish farming businesses for Kamuthanga youth employment. For instance, it suggested ways to leverage local cultural and social practices to enhance the success of fish farming businesses, such as involving the youth in community decision-making processes or promoting the cultural value of fish farming. By incorporating these cultural and social factors, the Anthropological Entrepreneurship Theory strengthened the entrepreneurship theory and provided a more holistic understanding of fish farming entrepreneurship and its impact on youth employment in Kamuthanga village, Machakos County, Kenya.

2.3. Empirical literature review

In this section, a comprehensive review of literature focusing on the role of fish farming businesses in facilitating youth employment is presented. The literature has been reviewed in line with the specific objectives of the study.

2.3.1. Fish farming opportunities for youth employment

The fish farming industry offers numerous opportunities for youth employment, including job creation, income generation, and contributing to food security. This sector provides a valuable avenue for young people to engage in meaningful and sustainable work while supporting local economies and food systems.

2.3.1.1. Job creation opportunity in fish farming business

Jumatli and Ismail (2021) have demonstrated that aquaculture has emerged as a crucial sector for economic development of Malaysia. This recognition stems from widespread participation and progressive advancement across various regions of the country. Their research revealed that aquaculture's contribution to the national fish production has grown significantly, increasing from a mere 7% in 1992 to approximately 13% in 2003, and is expected to increase further in the foreseeable future. Moreover, they perceived a significant increase in the production of aquaculture, rising dramatically from under 80,000 metric tonnes in 1992 to surpassing 427,000 metric tonnes in 2017. Anticipating a rise in population, they also project a continuous growth in aquaculture demand. As a result, Jumatli and Ismail (2021) concluded that aquaculture not only generates employment opportunities but also opens doors for business ventures and investments throughout Malaysia. This study provides evidence that fish farming is a great venture for youth to get out of unemployment issues. While their research examined the broader economic development impacts of aquaculture in Malaysia, the current study focuses on Kenya, specifically investigating how fish farming affects youth employment.

Likewise, Chan et al. (2021) in their research examining the future outlook of fish in Africa, utilized the International Model for Policy Analysis of Agriculture Commodities and Trade (IMPACT) to evaluate two comprehensive Pan-African scenarios for the development of the fish industry. These scenarios included a business-as-usual (BAU) scenario and a high-growth scenario, which encompassed both capture fisheries and aquaculture. Their research findings revealed that by 2030, the fish sector in Africa is expected to provide employment opportunities for approximately 20.7 million individuals under the BAU scenario, and this number is projected to increase to 21.6 million by 2050. Moreover, within the fisheries and aquaculture value chains, it is estimated that approximately 2.6 people will be indirectly employed by every person directly involved in fish production. These results underscore the positive contribution of fish farming business to youth employment, making it a promising avenue for economic growth and development. Unlike Chan et al. (2021), who use scenario analysis for future projections and include both capture fisheries and aquaculture, the current study is localized to Kamuthanga and focuses on the present state of fish farming and its current contributions to youth employment.

Similarly, Nasr-Allah et al. (2020) assessed the employment generation across different phases of the aquaculture value chain in the key governorates responsible for around 80% of

Egypt's aquaculture output. The results of the research revealed that, on average, for every 100 tons of fish produced across the complete value chain, aquaculture generates approximately 19.56 Full-Time Equivalent (FTE) positions. Taking into account these findings on employment generation in the aquaculture value chain, the groundwork for investigating the potential impact of fish farming on job creation in Kamuthanga can be laid out.

Correspondingly, Munene and Wanjiku (2020) carried out both qualitative and quantitative research that examined how fisheries contribute to creating job opportunities for young people in Kenya. The research discovered that the maximum sustainable income of commercial fishing in Kenya's marine and coastal waters ranges from 15,000 to 300,000 metric tonnes. Nevertheless, the researchers put that the present level of production stands at a mere 9,000 metric tonnes annually, indicating that these resources are not fully utilized. They argued that fully exploiting these resources would lead to increased production, contributing to both GDP growth and create employment opportunities for young people. It is important to highlight that the study conducted by Munene and Wanjiku (2020) specifically examined the broad range of opportunities within the fisheries sector for the youth, encompassing the entire youth population of Kenya. It is important to note that the study did not specifically focus on the fish farming sector but rather on the fisheries sector as a whole.

Finally, Anjejo's (2019) research revealed that fishing at Anyanga Beach in Siaya County, Kenya is primarily occupied by individuals aged 35 years and younger, with males constituting the majority. The study demonstrated that farmers who invested in cage farming were primarily motivated by the prospects of higher returns, reliability, predictable harvests, flexibility, and limited time requirements. It should be noted that the study focused exclusively on cage fish farming on the beach and did not explore other types of fish farming practices or provide a comprehensive analysis of job creation aspects.

The preceding authors have explored job creation as a potential opportunity that fish farming can provide for the youth. The subsequent section delves into the second opportunity presented by fish farming for unemployed youth, which is income generation.

2.3.1.2. Fish farming and Income generation

Kabir et al. (2022) employed a mixed-methods approach to gather comprehensive data on the involvement of rural youth in catfish farming in the North-Central region of Bangladesh. Data

from 100 rural youth were collected through in-person interviews utilizing a structured questionnaire. The study examined the potential prospects and factors that affect the involvement of rural young individuals in catfish farming in the North-Central region of Bangladesh. Their study mainly evaluated the way rural youth view their socioeconomic conditions as a determinant for participating in catfish farming, aiming to pinpoint the factors shaping their engagement in this agricultural pursuit.

The research findings indicated that, despite being unemployed and considering their socioeconomic circumstances suitable to initiate a catfish farming venture, catfish farming presently does not offer them a significant income stream. Additionally, the study specified that the involvement of rural youth in catfish farming is influenced by both their perception of available opportunities within their social environment and various external and internal factors. These factors include the size of their families, the annual income of their families, their level of knowledge, their attitude towards catfish farming, their skills in catfish cultivation, and their participation in relevant organizations. Although the study by Kabir et al. (2022) specifically focused on catfish farming rather than the broader fish farming business, it offers valuable insights into the factor of income generation that can affect youth involvement and success in the aquaculture sector.

In Zambia, Avadí et al. (2022) conducted a comprehensive research on the aquaculture value chain using a mixed-methods approach. The primary objective was to provide relevant stakeholders with valuable information regarding the influence of the value chain on financial growth, inclusivity, and the social and environmental sustainability aspects. The study identified two categories of smallholder farmers, namely “semi-subsistence” and “commercial,” each facing different constraints that affect their level of sustainability. On the one hand, although semi-subsistence smallholders achieve minimal profit margins, they have an unsustainable production system that has negative environmental implications. Additionally, the value chain supporting this group performs below expectations on various social indicators. On the other hand, the “commercial” smallholder system demonstrates better economic viability and environmental sustainability compared to the semi-subsistence approach. Indeed, the outcomes of this study offered valuable perspectives on the significance of implementing sustainable approaches throughout the aquaculture value chain. Understanding the different categories of smallholder farmers and their respective challenges and opportunities can inform strategies for promoting

youth employment in fish farming while ensuring economic viability and environmental sustainability. While Avadí et al. (2022) examine the aquaculture value chain in Zambia with a focus on sustainability and financial growth, the current study focuses on youth employment impacts of fish farming in a specific Kenyan village.

Similarly, Twumasi et al. (2021) undertook a study focusing on the rising productivity of fish farms in Ghana. Utilizing survey data from two specific regions in Ghana and employing an econometric modelling approach, the study investigated the quantitative effects of internet usage on the productivity of fish farming. Their findings indicated that the impact of internet usage on efficiency is more pronounced for farmers who lack access to off-farm work compared to those who have access to off-farm work. This study highlighted the potential significance of technology, specifically internet access, in enhancing productivity and income opportunities for individuals solely engaged in fish farming activities. It focused on the impact of internet usage on productivity in Ghana, while the current study examines the broader employment contributions of fish farming in Kenya.

In Kenya, Abwao et al. (2021) argued that as worldwide capture of fisheries experiences a decline, aquaculture stands as a viable option to fill the gap and satisfy the demand for fishery products. Their research focused on the socioeconomic factors and description of land-based aquaculture in Western Kenya. The authors identified the absence of credit facilities as a significant challenge. However, the study did not provide a clear understanding of the degree to which aquaculture contributes income to the youth. So, it is crucial to provide a clear understanding of how the fish farming business can contribute to income growth.

Additionally, Nzevu and Mutua (2018) highlighted the importance of fisheries in Kenya's national and household economies. The researchers highlighted the insufficiency of comprehensive data concerning the socio-economic aspects that impact the acceptance of fish farming in Kitui Central sub-county, Kenya. According to their findings, a significant portion of fish pond farmers, amounting to 70.4%, had discontinued their operations resulting in only 29.6% of the ponds remaining functional. Despite the researchers' efforts to describe the socio-economic situation of fish farmers, the study did not effectively elucidate how fish farming can contribute to the generation of income for farmers.

The aforementioned authors have highlighted the potential of the fish farming business in creating income opportunities for those who choose to pursue it. In the following section, the focus

is on the importance of fish farming in addressing food security concerns, presenting it as an additional opportunity within the realm of fish farming business.

2.3.1.3. Food security through fish farming

Haque and Dey (2017) conducted a study to assess the effects of community-based fish farming in seasonal floodplains on fish production, household consumption, income, and food security in Bangladesh. Their findings indicated that there is an opportunity to replace traditional capture fishery activities in floodplain areas with fish culture systems. According to the authors, this shift has the potential to enhance fish production, provide essential diets to impoverished families, and enhance the general well-being of low-income and resource-limited families. Indeed, the study of Haque and Dey (2017) demonstrated the positive effects of community-based fish farming on fish production, household consumption, income, and food security. Their study focused on community-based fish farming in Bangladesh floodplains, whereas the current research investigates the contributions of fish farming to youth employment in Kamuthanga village, Kenya.

A study conducted in Ghana by Hasselberg et al. (2020) underscored the significance of fish as a critical provider of essential micronutrients in people's diets, especially in low- and middle-income nations. The authors emphasised the significance of proficient management of fish and fisheries in Ghana to guarantee food security, economic advancement, and enhanced nutrition. They also highlighted its pivotal role in attaining various United Nations Sustainable Development Goals, specifically those related to combating malnutrition, alleviating poverty, promoting gender equality, and ensuring the well-being of marine ecosystems. These findings underscore the potential significance of fish farming business in terms of providing job opportunities for the youth and also in contributing to the broader sustainable development objectives of the community in food security. Hasselberg et al. (2020) investigated the management of fisheries and its wide-ranging effects in Ghana, whereas the current study concentrates on the specific contributions of fish farming to youth employment in a Kenyan village.

Additionally, Fisher et al. (2017) conducted a study that focused on integrating fisheries and agricultural programmes with the aim of improving food security in 12 countries facing high levels of food insecurity. These countries comprise Bangladesh, Cambodia, Ethiopia, Ghana, Haiti, Malawi, Mozambique, Nepal, Rwanda, Senegal, Uganda, and Zambia. The research is qualitative in nature and employed a two-stage sampling design. Initially, clusters were selected by the

Demographic and Health Surveys (DHS), followed by the selection of households within these clusters. The survey instrument encompassed modules focusing on household health, education, wealth, and dietary habits. The research findings revealed that fish consumption constitutes a significant portion (ranging from 10% to 45%) of the overall diet for a considerable percentage of the population in these countries. Among the sampled countries, households that heavily rely on fish in Cambodia, Ethiopia, Mozambique, and Zambia tend to have lower economic status compared to non-fish-reliant households. However, in Haiti, Malawi, Rwanda, Senegal, and Uganda, fish-reliant households demonstrate higher levels of household asset wealth. These nuanced perspectives highlight the importance of considering the personal experiences and voices of individuals and communities when examining the relationship between fish consumption, economic status, and food security. Fisher et al. (2017) study focused on fish consumption and food security across multiple countries, whereas the current research is localized to Kamuthanga village and focuses on youth employment through fish farming.

Moreover, Nguka et al. (2017) carried out a study in Western Kenya to explore the influence of fish farming on household food security. The study utilized a correlational research design to produce qualitative and quantitative data. The authors investigated the relationship between fish farming and instances of food shortages among households. The results of the study showed that households involved in fish farming experienced fewer instances of food shortages in comparison to those not engaged in fish farming. Additionally, the researchers observed that children from fish-farming households exhibited better nutritional status in comparison to children from non-fish farming households. It is essential to note that the study specifically focused on households of fish farmers and non-fish farmers within Siaya County, located in Western Kenya, emphasizing the geographical scope of the research. Furthermore, the study did not specifically target youth participants.

Finally, a study conducted by Aloo et al. (2017) revealed that inland capture fisheries accounted for over 90% of Kenya's total national fish production, whereas marine capture fisheries contributed approximately 5% during the previous decade. The authors emphasised that Kenya, with its rapidly growing population, is facing an increasing need for fish and fish products, resulting in a growing disparity between supply and demand. While Aloo et al. (2017) showcased the potential of aquaculture development in Kenya to alleviate poverty and enhance food security, they did not explicitly specify the specific ways in which the fish farming industry can contribute

to food security in the country. It is noteworthy that the study encompassed the entire nation of Kenya, indicating a comprehensive scope of analysis. There is a need to narrow down the importance of fish farming to food security to a particular village to really notice its impact.

The preceding section provided a comprehensive overview of the numerous opportunities associated with fish farming, including job creation, income generation, and food security. However, despite the evident merits of engaging in fish farming, it is often observed that many young individuals lack interest in pursuing this endeavour. The following section addresses the factors that restrain the youth from embracing the fish farming business, shedding light on the barriers that need to be overcome.

2.3.2. Factors constraining the youth involvement in fish farming business.

This section explores three pivotal factors that often limit youth engagement in the fish farming business: water access, finance, and cultural norms. The literatures mentioned in this part highlight the challenges young entrepreneurs face in this business. Limited access to water can hinder the ability to maintain and expand fish farms, while financial barriers restrict the resources needed for start-up and operational costs. Additionally, cultural norms can influence perceptions and participation in fish farming, affecting the willingness and ability of youth to pursue this career path.

2.3.2.1. Problem of water access in fish farming business

Muddassir et al. (2019) undertook a research to assess the degree of knowledge and implementation of recommended fish farming methods among fish farmers in Hafizabad, Pakistan. The results of their research revealed that a considerable portion (approximately 90%) of the population possessed awareness regarding fundamental fish farming practices, such as nursery management, feeding techniques, intercultural practices, fish stocking rates, the utilization of rice powder and fertilizers, as well as the harvesting process. Approximately half of the population demonstrated awareness of technical aspects related to quality production, such as maintaining water and soil quality, and half of them had actually adopted these practices. The study also revealed multiple challenges encountered by fish farmers. These challenges encompassed limited access to information, insufficient fisheries extension services, uncertainties in the market, frequent power disruptions, compromised quality of soil and water, concerns of feed adulteration, restricted availability of credit facilities, high construction expenses, and the absence of irrigation

water. These findings emphasize the pressing requirement for the Fisheries Department to promptly address these issues and implement policies aimed at educating and assisting fish farmers at every stage, from farm establishment to marketing. This study highlights the existence of significant challenges within the fish farming sector that require immediate attention. One of the identified challenges refers to the issue of water accessibility. While this study focused only on identifying challenges in fish farming, the current research focuses on the specific contributions of fish farming to youth employment in Kamuthanga village, Kenya.

Similarly, Ali et al. (2020 a) carried out research aiming to examine the primary risk factors associated with farming practices and the financial losses attributed to tilapia mortality in Egypt. Their study unveiled a significant correlation between the water source, including surface water and irrigation canals, and the frequency and severity of abnormal mortality occurrences. Furthermore, the researchers noted that elevated average water temperature, salinity levels, and the practice of polyculture, particularly the combination of tilapia with wild-sourced mullet, heightened the probability of encountering unusual mortality incidents. This study focused on risk factors and financial losses associated with tilapia farming in Egypt, while the current research examines the broader contributions of fish farming to youth employment in a Kenyan village.

Moreover, Adeleke et al. (2020) conducted a study that centred around the aquaculture sector in Africa, with a specific focus on Egypt, Nigeria, and Uganda, which served as benchmarks for South Africa's aquaculture development. The study examined significant elements that influence the success of aquaculture, encompassing production volume, cultured species, production methods, different forms of aquaculture, obstacles concerning fish seed, feed, land, and water availability, as well as market and trade policies and frameworks. This study is valuable because it highlights the factors that limit full participation in fish farming. One of the significant constraints identified is water availability. Indeed, Adeleke et al. (2020) research focused on broader factors influencing aquaculture success in Africa, whereas the current study specifically targets youth employment contributions of fish farming in Kamuthanga village, Kenya.

Likewise, Ngugi et al. (2019) examined the impact of water quality in fish ponds in Gatundu North and South Sub-Counties, Kenya. Their findings revealed that the wastewater from fishponds did not pose an immediate threat to aquatic systems as it complied with allowable limits. However, the researchers observed that aquaculture activities had a significant impact on the quality of pond water, leading to an increase in physico-chemical parameters, except nitrate-

nitrogen. This indicated a potential risk of untreated pond wastewater polluting receiving waters. Nevertheless, the study also found that implementing Good Aquaculture Practices could enhance pond water quality, as evidenced by the increased levels of dissolved oxygen and pH in the ponds compared to the inlets. It is important to note that Ngugi, et al.'s (2019) study focused specifically on water quality and did not address the accessibility of water for the population. So, it is important to consider how the availability of water can impact the participation of youth in fish farming.

Similarly, another study was conducted by Wairimu (2019) to examine the effects of aquaculture development on the water quality of fish ponds and the livelihoods of fish farmers in Gatundu in Kiambu County. The research findings indicated that both pond water and the inlet water met acceptable standards and did not pose an immediate threat to the ecosystem. However, the study emphasised the significant influence of aquaculture practices on the quality of fish pond water. It is worth noting that this study primarily focused on water quality concerns rather than water accessibility, which is a key challenge faced by the youth in the Kamuthanga village. Additionally, the study did not exclusively target the youth population, revealing a gap in the demographics of the study participants. Hence, conducting a study that takes into consideration the significance of water access in fish farming for youth can be highly valuable.

In summary, the authors mentioned earlier have identified a key factor that hinders the youth from embracing fish farming business, namely, water availability. The following section delves into financial constraint as a factor in fish farming.

2.3.2.2. Financial problems and fish farming business

Pantha (2022) conducted a research to explore the impact of cage fish farming on the livelihoods of the local population in Kulekhani, Nepal. The study also intended to identify the social and economic challenges confronted by individuals interested in engaging in cage fish farming. The findings indicated that the main obstacles to adopting cage fish farming were limited knowledge, insufficient capital, and social discrimination based on caste and economic disparities between the upper and lower classes. While the primary focus of this study was on cage fish farming, it notably emphasized financial constraints as one of the key obstacles to adopting fish farming business. Consequently, it would be beneficial to conduct a study that examines the impact of limited capital on youth engagement in the fish farming business.

Likewise, Mitra et al. (2019) studied the impact of credit limitations on the efficiency of aquaculture farmers in Bangladesh. The researchers highlighted the significance of credit in the aquaculture sector, which involves a production process requiring substantial capital. Access to credit is crucial for the establishment and effective management of farms, particularly in developing nations. However, they highlighted that the availability of credit is often limited. Therefore, just like in Bangladesh where aquaculture farmers face credit limitations, similar challenges can be expected among the youth in Kamuthanga Village. Limited access to credit can hamper their ability to invest in infrastructure, purchase equipment, acquire quality fish stock, and meet operational expenses.

Furthermore, the study conducted by Ifeonu et al. (2019) identified the difficulties encountered by young people involved in fish farming in Abuja, Nigeria's Federal Capital Territory. The results revealed that the main challenges faced by these individuals included the high expenses associated with fish feed and restricted availability of credit options. Indeed, the issues of high expenses for fish feed and limited access to credit options mentioned in this study resonate with the potential barriers that the youth may face in engaging in fish farming as a means of employment. While Ifeonu et al. (2019) discussed challenges faced by youth in Nigeria, the current study focuses on youth employment contributions in Kamuthanga, Kenya.

Additionally, Kwikiriza et al. (2018) carried out a study aimed at identifying the limitations and potential prospects of cage fish farming in Uganda. The researchers discovered that a significant constraint faced by farmers was lack of financial resources, which hindered their ability to acquire essential inputs for aquaculture, such as fish feed. With this study, it is becoming more evident that lack of financial resources can affect the contribution of fish farming business to youth employment in Kamuthanga Village, Machakos County, Kenya.

Similarly, Orinda et al. (2021) conducted a research focusing on the factors influencing the adoption, challenges, and opportunities of cage fish culture in the Lake Victoria region. The researchers identified gender representation, access to credit, and training as key determinants affecting the adoption of cage fish farming. They also emphasized that fish farmers in the region encounter significant challenges, including market accessibility, availability of high-quality seed and feed, high investment expenses, policy framework, and security concerns. Although the study by Orinda et al. (2021) did not directly focus on youth or the specific context of Kamuthanga Village in Machakos County, Kenya, it provides valuable insights into the broader challenges and

opportunities associated with cage fish farming. These findings can inform the main topic of the contribution of fish farming business to youth employment in Kamuthanga Village by highlighting potential challenges and opportunities that may be applicable in the local context.

Overall, the previously mentioned authors have identified financial problems as the second constraint that prevents the youth from embracing fish farming business. The following section presents the influence of cultural factors on fish farming business practices.

2.3.2.3. Influence of culture on fish farming business

Morgan et al. (2017) highlighted the impact of socio-cultural dynamics on the practice of aquaculture. They pointed out that cultural norms and values, and social relations shape how aquaculture can improve the availability of fish, access to employment and income, and the utilization of fish for nutrition. The study also showed that the nutritional outcomes of aquaculture depend on local preferences and customs regarding the preparation, preservation, cooking, and distribution of fish. They concluded that aquaculture interventions must consider the resource base and socio-cultural contexts to achieve sustainable benefits in income, food, and nutrition. This study provides clear evidence that without understanding and incorporating socio-cultural dynamics, achieving maximum income generation becomes challenging. Therefore, this research helps shed light on the influence of culture in the fish farming business. While Morgan et al. (2017) focused on socio-cultural dynamics in aquaculture, the current study specifically examines their influence on youth employment in fish farming in Kamuthanga.

Oloko et al. (2022) conducted a research study in Makoko, a coastal fishing community in Lagos, Nigeria. The study focused on women engaged in fish trade, considering businesses of varying sizes (small, medium, and large), and how they balanced their reproductive roles alongside their trading activities. The research revealed significant findings, highlighting the impact of factors such as limited formal education, restricted access to information, gender-based norms, and cultural practices that posed challenges to the sustainability of women's livelihoods in the community. Indeed, Oloko et al. (2022) focused on women in fish trade in Nigeria, while the current research focuses on youth employment in fish farming in Kenya.

Furthermore, Uduji and Okolo-Obasi (2020) contended that despite the significant roles played by women in the fisheries sector, they are often marginalized and excluded from participating in decision-making processes related to fisheries management, primarily due to

cultural norms. In their study, which sought to assess the impact of a new Corporate Social Responsibility (CSR) model implemented by multinational oil companies (MOCs) on the empowerment of women engaged in small-scale fisheries in Nigeria's Niger Delta region. The researchers discovered that the interventions specified in the General Memorandum of Understandings (GMOUs) for small-scale fisheries largely neglected the inclusion of artisanal fisherwomen. This exclusion was mainly attributed to cultural norms prevailing within the local community. While this study of Uduji and Okolo-Obasi (2020) differs in terms of location and the specific fisheries sector being examined, the issue of gender exclusion and cultural norms can have broader relevance. Their research focused on gender exclusion in fisheries in Nigeria, though the current study examines youth employment in fish farming in Kenya.

In Kenya, Odhone et al. (2020) carried out a research to assess gender dynamics within the Dagaa fishery value chain in fishing communities situated near Lake Victoria. The study's results revealed that a significant proportion of boats, fishing equipment, and motorized boats were owned by men, whereas a larger percentage of women relied on paddled boats. Additionally, the research highlighted the consistent trend of men generating higher profits compared to women at all stages of the Dagaa fishery value chain. Based on these observations, the study concluded that significant gender disparities still exist within the Dagaa fishery value chain, with men predominantly occupying most of the activities. The cultural aspect of gender roles in fish farming is emphasized in this research. However, the study did not adequately address the aspect of cultural practices that may hinder the youth or communities from embracing fish farming or consuming fish. This observation raises a crucial point concerning market demand and consumption patterns.

Andayi (2018) conducted research in Kwanza Constituency, Kenya, aiming to assess how farmer expertise, cultural elements, access to credit, and production expenses affect fish farming outcomes. Findings indicated that farmer expertise, credit access, and production costs strongly influenced fish farming success. However, cultural factors were found to have no notable impact on fish farming.

Having presented a thorough examination of the multiple constraints that hinder the youth from embracing fish farming, encompassing issues such as water scarcity, financial limitations, and cultural influences, the following section focuses on effective strategies aimed at enticing the youth to actively engage in the fish farming business.

2.3.3. Enabling conditions for fish farming business

Some of the conditions that are needed to enable profitable fish farming such as access to water resources, capacity-building initiatives, and financial assistance are discussed in the following sections.

2.3.3.1. Water resources management and fish farming business

The aquaculture industry's expansion has led to increased environmental impact and dependence on fishmeal in diets. Khanjani and Sharifinia (2020) suggest that Biofloc Technology (BFT) can help reduce these issues by absorbing inorganic nitrogen from wastewater, improving water quality, and producing microbial protein for aquatic animal feed. This approach is more sustainable than traditional aquaculture methods and results in minimal water exchange, reduced feed intake, and lower costs. The insights of this study can contribute to the environmental sustainability of fish farming activities by reducing water consumption and minimizing the release of pollutants into the ecosystem. This can help preserve natural resources and maintain a healthier aquatic environment. While Khanjani and Sharifinia (2020) focused on sustainable aquaculture methods, the present study examines the contribution of fish farming to youth employment in a Kamuthanga village.

Furthermore, Ahmed and Thompson (2019) acknowledged the significant role of blue water (surface and groundwater) in global fish production within the context of aquaculture. However, they also highlighted the multitude of environmental issues associated with the blue revolution in aquaculture. These issues include the destruction of habitats, contamination of water, excessive nutrient enrichment, depletion of biological resources, ecological consequences, and outbreaks of diseases. The authors highlighted the importance of achieving sustainable development in aquaculture to meet the increasing global demand for fish driven by population growth. However, they emphasized that such growth should be accompanied by significant reductions in environmental impact of the sector. Indeed, by incorporating sustainable development practices, such as responsible water management, proper waste disposal, and disease prevention measures, young individuals involved in fish farming can help to reduce the environmental impact of the sector. Ahmed and Thompson (2019) focused on environmental issues in aquaculture, while the current study looks at practical strategies which can enhance employment in fish farming in Kamuthanga village.

Similarly, Gephart et al. (2017), in their study, highlighted the importance of considering water use in seafood production systems as a means to enhance our understanding of freshwater usage in food systems. By examining the specific water use processes associated with seafood production, they provided a novel perspective on freshwater analysis within the broader context of food systems. The researchers found that there are only few studies that measure the amount of freshwater utilized in seafood production, and even among those, there is lack of consistency in the methods used to account for water usage. This lack of standardization poses a challenge in making meaningful comparisons of water consumption between different seafood products, as well as between seafood and agricultural or livestock products. Indeed, this study can help to explore the relevance of water use in fish farming and its implications for sustainable development. Water is a finite resource, and sustainable water management practices are essential for the long-term viability of fish farming businesses and the preservation of local water sources. Gephart et al. (2017) focused on water usage in seafood production, while the current study explores the implications of water management in fish farming for youth employment.

Moreover, Ogello et al. (2021) conducted a research exploring the potential of biofloc technology (BFT) in advancing sustainable development in aquaculture. The study presented a detailed procedure for implementing BFT and showcased its capacity to fulfil three primary objectives: augmenting fish production, strengthening the resilience of fish production systems, and optimizing the efficient utilisation of energy, water, and land while mitigating greenhouse gas emissions. While the researchers proposed strategies for achieving sustainability in fish farming, the aspect of water management received relatively less emphasis in their study. However, their study could help to establish efficient water management practices that minimize water consumption, prevent water pollution, and maintain water quality.

Additionally, in their research, Aura et al. (2018) conducted research with the objective of finding a middle ground between the utilisation of Lake Victoria and the advancement of aquaculture in Kenya. The researchers highlighted the significance of establishing policies and regulations to govern investment in cage culture. These measures were seen as crucial not only for safeguarding local economies through improved business practices but also for ensuring the long-term sustainability of the lake's ecosystem. The researchers expressed apprehensions regarding the potential decline in water quality at cage culture sites and emphasised the necessity of effective management to mitigate these risks. While the study effectively highlighted the significance of

sustainable fish farming and water resource management in Lake Victoria, it is important to note that it was specifically conducted in the context of Lake Victoria and not in Kamuthanga.

In summary, the authors mentioned above have emphasized water resource management as a key strategy to encourage youth engagement in the fish farming business. The following section delves deeper into training and capacity building for fish farmers.

2.3.3.2. Capacity building in fish farming business

Zohra et al. (2022) undertook a research to assess the current state of capacity development and its effects on the livelihoods of fish farmers in the Muktagacha upazila of Bangladesh. The results indicated that 50% of the respondents demonstrated a moderate level of capacity enhancement, while a significant portion (36%) exhibited a high level of capacity improvement. Moreover, the study noted considerable enhancements in various aspects of fish farmers' livelihoods (human, social, natural, physical, and financial) due to income-generating opportunities stemming from their engagement in fish farming. In summary, the research emphasizes the significant role played by fish farming in enhancing capacity and uplifting the livelihoods of fish farmers. This study can help to explore the potential impact of capacity building in fish farming on youth employment and livelihoods in Kamuthanga. While Zohra et al. (2022) focused on capacity building in Bangladesh, the current study examines its potential impact on youth employment in Kamuthanga village.

Moreover, Rege and Ochieng (2022) carried out a study aimed at examining Sub-Saharan African (SSA) nations concerning their capacity, conducive environments, and utilization of biotechnology in aquaculture. Results indicated that none of the SSA countries displayed high or very high capacity, with only four (4) nations showing moderate capacity. The bulk of the countries exhibited weak or very weak conducive environments, with only a handful falling into the moderate category. Additionally, most countries exhibited very low or low levels of biotechnology application, with only six countries classified as having medium application and none in the high or very high categories. This study provides an opportunity to examine the significance of capacity building, enabling environments, and the utilisation of biotechnology in fostering sustainable and efficient fish farming practices for youth employment. Rege and Ochieng (2022) focused on SSA countries' capacity and biotechnology use, while this present study explores these aspects in the context of youth employment in fish farming.

In addition, according to Namisi (2021), the depletion of fish stocks due to overfishing in East African waters is leading to shortage of fish. To address this issue, the author proposed that commercial aquaculture presents a viable solution. However, the development of a competitive commercial aquaculture sector is hindered by various structural limitations, such as limited access to commercial networks and vocational skills training. Namisi's study, which focused on the assessment of training needs in the fisheries sector, revealed that the existing aquaculture and fisheries courses are in demand and beneficial for the industry at various levels. This is evident from the gap observed between the number of skilled workers trained by the Fishery Training Institute (FTI) over the past decade and the actual number absorbed by the fisheries and aquaculture sector in Uganda. Indeed, Namisi's (2021) research could help to explore the relevance of vocational skills training and addressing the shortage of skilled workers in the fish farming sector. Namisi's (2021) study focused on vocational skills training in Uganda, while the current study explores its relevance to youth employment in Kamuthanga village.

Furthermore, Obiero et al. (2019 a) conducted a comprehensive analysis of the factors influencing the perceptions, attitudes, and behaviours of fish farmers regarding technology adoption. The researchers also analysed the effects of technology adoption on farmers' livelihoods. The findings indicated that several factors, such as secondary education, engagement in various on-farm activities, farm size, production levels, participation in extension training, and the ease of comprehending and utilizing technologies, played a notable and beneficial role in the acceptance of aquaculture technology. Nevertheless, it is important to acknowledge that this study identified a gap in terms of training and capacity development among fish farmers. Additionally, it is worth noting that the study encompassed the entire country of Kenya rather than focusing especially on the Kamuthanga village.

In essence, the previously mentioned authors have highlighted training and capacity building as crucial strategies for fostering youth involvement in the fish farming business. However, in order to offer a complete comprehension of its importance, the following section focuses on credit facilities and financial support for fish farmers.

2.3.3.3. Financial support in the fish farming business

Albasri and Sammut (2022) undertook a study to assess the role of small-scale fish farming, small-scale fisheries, and eco-tourism in promoting sustainable livelihoods within Indonesia's

Marine Protected Areas (MPAs). The study also evaluated the compatibility of these activities with the overall objectives of the MPAs. The findings revealed that small-scale fish farming, fishing, and eco-tourism all made comparable contributions to the sustainability of livelihoods. Additionally, the study found that the group involved in fish farming exhibited stronger human capital assets, primarily due to the development of a robust social network. Albasri and Sammut (2022) research focused on the sustainability of small-scale fish farming within Marine Protected Areas, unlike the current study which examines youth employment in a specific village.

In addition, Minh-Thu et al. (2021) conducted a research in the south-central region of Vietnam to examine the current status and future direction of mariculture toward sustainable development. Their findings indicated that, over an extended period, the aquaculture area had remained relatively stable and was predominantly located in inland, coastal, and off-coastal waters, with limited implementation in open seas. Additionally, the research uncovered that the presence of financial resources, the availability of credit options for stakeholders, and investments in enterprises were recognised as vital elements for the advancement of offshore mariculture. Minh-Thu et al. (2021) examined the status and future direction of mariculture in Vietnam, while this current study focuses on youth engagement in fish farming.

Furthermore, Oladiran et al. (2021) examined the perspectives of young individuals towards fish farming in the Oluyole Local Government area of Oyo State, Nigeria. The results demonstrated that a substantial majority of participants held a firm belief in the crucial role of fish farming in alleviating unemployment and improving the overall quality of life. Drawing from these findings, the study proposed recommendations calling for enhanced support from both the government and private sector, including financial assistance, to encourage greater youth engagement in the field. Additionally, the researchers suggested the organisation of orientation programs aimed at transforming the mind-set of young individuals regarding agricultural activities. Indeed, with this study, it is possible to explore the relevance of addressing youth perspectives, providing support, and transforming mind-sets to promote youth engagement in fish farming. Oladiran et al. (2021) explored the perspectives of young individuals in Nigeria, unlike the present study which focuses on youth in a Kenyan village

Similarly, Bradford and Katikiro (2019) conducted a study to explore the difficulties encountered by women in Tanzania regarding their access to the advantages offered by the fisheries sector, specifically in the realm of small-scale fisheries and aquaculture. These challenges

arise from cultural and economic factors, as well as restricted access to fisheries resources and policy constraints. The research suggested that gender-inclusive approaches, as demonstrated by the 2015 National Fisheries Policy and the FAO Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries, can effectively address these obstacles and enhance the situation of women engaged in fishing activities in Tanzania. Through this study, the relevance of addressing gender disparities and promoting gender-inclusive approaches in the fish farming sector to enhance youth employment opportunities can be explored. Bradford and Katikiro (2019) focused on gender disparities in Tanzania's fishery sector, unlike the current study which examines youth employment in fish farming.

Moreover, Gatonye (2017) conducted a study to investigate the factors influencing the sustainability of small-scale fish farming initiatives in Meru County, Kenya. The research found that the sustainability of these projects was significantly affected by the availability of extension services, access to markets, and the adoption of technology. However, the impact of input costs on the participants varied. Drawing from the findings, several recommendations were proposed. These include advocating for government subsidies to support farmers, increasing the number of extension officers, and allocating resources to enhance farmers' capabilities. Furthermore, the study suggests the formation of production and marketing groups among farmers to better address market demands. Gatonye's (2017) findings can contribute to understanding the importance of extension services, market access, and technological adoption in fostering sustainable and prosperous fish farming enterprises for youth employment opportunities. Gatonye's (2017) research focused on factors influencing small-scale fish farming sustainability in Kenya, unlike the current study which focuses on youth employment.

Additionally, in their case study, Nathenson et al. (2017) focused on a market-based solution that effectively empowered women in the fishing industry at Nyamware beach in Kenya. The project involved the construction of three boats for women's ownership and management, the provision of business skills training to 29 women and 20 men, and the establishment of local community savings and loans associations. The increased income generated by the participating women played a significant role in supporting their households, and businesses, and covering their children's school fees. The project's success brought about a shift in gender dynamics, as women began working on the boats alongside men, and it positively influenced the community's perception of women. This case study demonstrated that small and innovative approaches have the

potential to enhance the well-being of individuals and promote sustainable economic development. However, it is significant to note that this descriptive research by Nathenson et al. (2017) focused specifically on women in the fishing sector and did not address the empowerment of youth. Furthermore, the study centred on fishing rather than fish farming.

2.4. Research gap

Most of the literature or studies aforementioned focus on fish farming and others about youth employment. On the one hand, those about fish farming business argue that it has the potential for job creation, income generation, and food security. Literature even show that there are some important factors which are restraining most youth from embracing the fish farming business such as: problem of the water access, the influence of culture, and financial problems. On the other hand, literature on youth employment show that young people are facing a significant challenge of unemployment in Africa, with Kenya being particularly affected. However, very few studies linked fish farming business to youth employment, particularly in Kenya. Therefore, there is a gap in literature about fish farming and youth employment in Kenya. Particularly in Kamuthanga village, there is very little published literature which addresses fish farming. Additionally, the population gap has also been found. There were very few studies about fish farming and employment among the youth. Most of them were general or based on women.

In summary, the research gap lies in the lack of comprehensive literature that investigates the intersection between fish farming and youth employment in Kenya, specifically in Kamuthanga village. Additionally, there is a need for more studies in Kenya that specifically target the youth population in relation to fish farming and employment, as the existing research primarily focuses on broader or female-centric perspectives.

2.5. Conceptual framework

The relationship between study variables is represented by researchers using a conceptual framework, which they illustrate graphically or in a diagram (Wernerfelt, 1984). This section presents the relationship between fish farming business and youth employment in Kamuthanga village, Machakos County, Kenya. It focuses on two variables: the independent variable, fish farming business, and the dependent variable, youth employment. On the one hand, the category of fish farming business encompasses various factors, including fish farming opportunities,

constraints faced by the youth or the fish farmers, and methods to attract young people to engage in fish farming. On the other hand, youth employment includes self-employment, employment, and unemployment. Fish farming opportunities encompass aspects such as job creation, income generation, and food security. Constraints in fish farming involve challenges related to water management, cultural influences, and financial issues. The third category, strategies for enticing youth into fish farming, includes approaches such as water resource management, capacity building in fish farming, and financial support. Figure 1 below illustrates the relations between the variables.

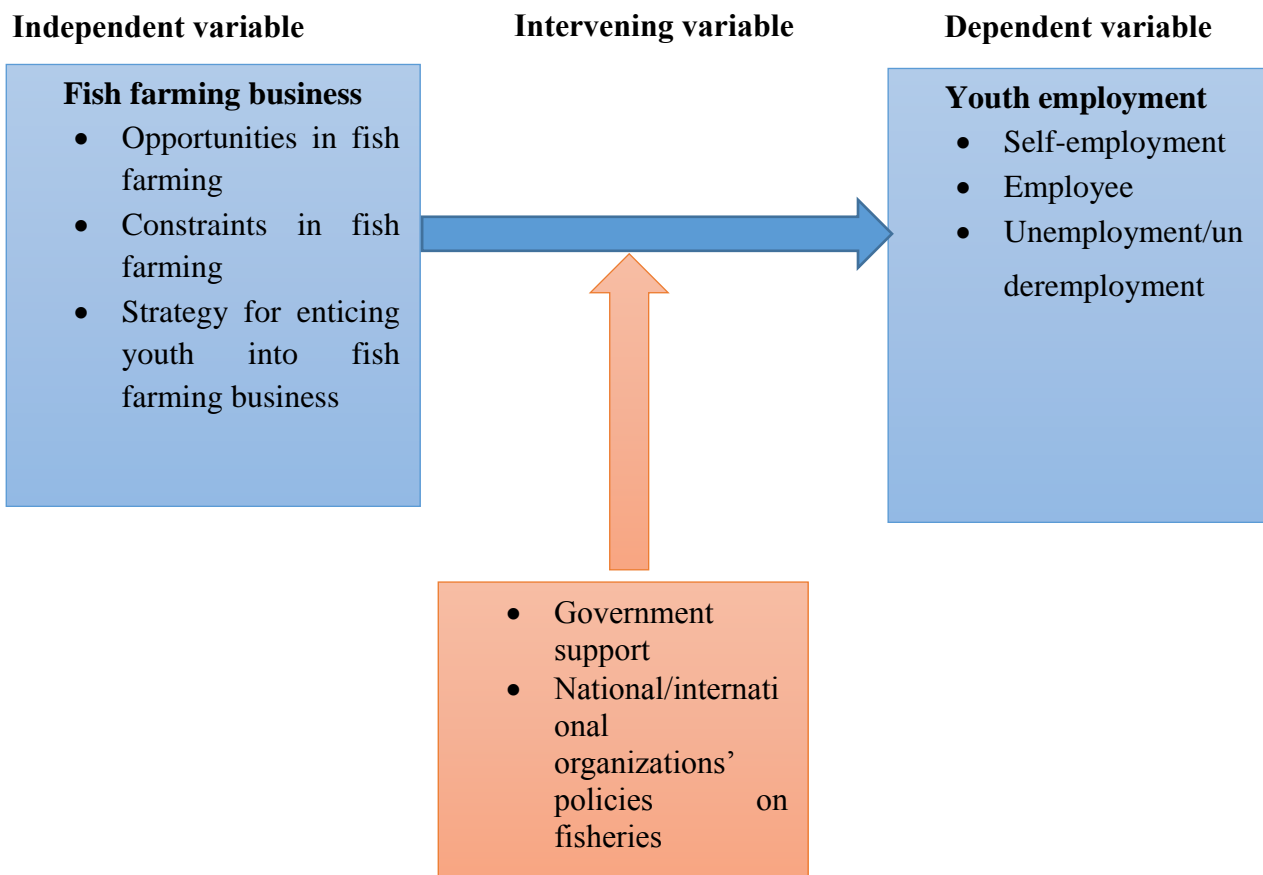


Figure 1: Conceptual framework

The independent and dependent variables of the study are shown in figure 1 above. Fish farming opportunities, constraints to fish farming and strategies for enticing youth into fish farming are the indicators of the independent variable (fish farming business) while youth

employment is the dependent variable. Indeed, if the three indicators are well considered, then, they will positively impact the youth employment. The intervening variables, are the assistance of the government and national/international organizations. Their assistance could be essential in assisting the Kamuthanga village to have more access of water and some credits facilities or financial support. Additionally, they can assist the youth in reducing their constant pursuit of white-collar jobs that are hardly available.

2.6. Chapter Summary

This chapter has discussed the use of Entrepreneurship Theory and Anthropological Entrepreneurship Theory in this study. It notes that fish farming is important due to rampant unemployment among the youth. However, youth in Kamuthanga are facing challenges such as water access, cultural issues, and financial support. The researcher notes a gap in the literature on the contribution of fish farming to youth employment, particularly in Kamuthanga. A conceptual framework is provided, illustrating the relationship between fish farming opportunities, constraints, sustainability strategies, and youth employment. In the next chapter, the research methods that guided this study are presented.

CHAPTER 3: RESEARCH METHODS

3.1. Introduction

This chapter outlines the rationale for selecting the research design and provides an overview of the methodology and tools that were employed in data collection. The choice of conducting the study in Kamuthanga village, located in Machakos County, Kenya, is explained, along with the identification of the target population. The chapter also delves into the sampling process and procedures, as well as the methods used for data collection. Additionally, it discusses the research instruments and addresses the credibility and trustworthiness of the study. Furthermore, this section elaborates on the techniques employed for data analysis and highlights logistical and ethical considerations.

3.2. Research design

According to Gray (2014), a research design encompasses the study's objectives, the nature of the questions being investigated, the methodologies employed for data collection, the methods for sample selection, and the planned data analysis techniques. The case study research design was used in this study to examine how the fish farming industry in Kamuthanga village contributes to youth employment. This research design was chosen because it helps to thoroughly and meticulously investigate a specific individual, group, organization, or phenomenon within its authentic context to gain a holistic understanding of its details and constraints (Schoch, 2020)

In this specific study, the case study design allowed the researcher to have a comprehensive exploration of the specific context, dynamics, and factors influencing the contribution of fish farming business to youth employment in Kamuthanga Village. Additionally, this case study design enabled the researcher to have an in-depth analysis of the fish farming business and its impact on youth employment within the study's setting. This provided a realistic understanding of the opportunities, challenges, and dynamics that are specific to Kamuthanga Village in Machakos County, Kenya.

3.3. Location of the study

The study was conducted in Kamuthanga village, located in Machakos County, one of the 47 counties in Kenya. The county has a population of 1,421,932 as reported in the 2019 Kenya Population and Housing Survey (KNBS, 2019). According to the County Government of

Machakos (2018), the entire Machakos County spans an area of 6,208.2 square kilometers, with approximately 3,720 square kilometers designated as arable land. The County is predominantly populated by the Akamba community, and its major urban centres exhibit a cosmopolitan nature.

Kamuthanga village in Machakos County was chosen because of the Kamuthanga fish Farm. Kamuthanga fish Farm is an Agricultural Company that is involved in the rearing of Tilapia and Catfish. It utilizes a modern recirculation aquaculture system (RAS) to conserve water while rearing fish. Kamuthanga fish farm breeds, rears, and sells fish at all life stages, including fingerlings, adult tilapia, and catfish. Additionally, the Kamuthanga fish farm stands out in the East African region for its adoption of the hormone-treatment technique, resulting in a 95% success rate in producing male stocks (Matolla, 2019).

Matolla (2019) states that Kamuthanga Fish Farm positions as the most extensive aquaculture venture in Kenya. The farm is situated on Kangundo Road on the way to Kyaani Secondary School, Machakos County, Kenya (a picturesque area on the foothills of Mua Hills). Also, Kamuthanga fish farm is an academic aquaculture. It helps people to get skills in fish farming and then be able to start a project and be self-reliant. Indeed, the considerable potential of Kamuthanga Fish Farm, coupled with the prevalent issue of youth unemployment in the area, motivated the selection of this location for the research study.

Moreover, logistical considerations such as travel distance, research permits, and on-the-ground support significantly influenced the choice of Kamuthanga fish farm over other fish farms in different countries with similar characteristics. Kamuthanga fish farm's accessibility and well-established infrastructure for academic collaboration make it a feasible option for an in-depth study.

3.4. Target population

The target population represents a smaller size of group of individuals from which the study collected data and made conclusions (Hossan et al., 2023). In this case, the study targeted the youth who are working at Kamuthanga fish farm, and the unemployed Kamuthanga youth. This study used the Kenyan 2010 constitution's definition of the youth as being individuals between the ages of 18 and 35 years. Indeed, the group of youth employed at Kamuthanga fish farm encompassed individuals actively engaged in various roles essential to its operation. These roles included workers at the hatchery, feeders, labourers tasked with cleaning filters or tanks, and personnel

ensuring the farm's security management. Among these workers, including the farm owner, there are a total of fourteen (14) individuals, with eight (08) being youth actively involved in the farm's activities. Their knowledge and experience in fish farming provided valuable insights into how the business can contribute to youth employment. Besides, Kamuthanga unemployed youth consists of young people within the Kamuthanga community who are currently unemployed. They are facing various challenges and barriers to employment, including limited job opportunities, and lack of education or skills training.

3.5. Sampling technique and sampling size

Sampling refers to the process of selecting a smaller group of individuals from a larger population to collect data and draw conclusions that represent the entire population (Singh & Masuku, 2014). Additionally, Singh and Masuku (2014) argue that sampling offers two primary benefits: it enables faster data collection and is cost-effective compared to collecting data from the entire population. This section delves into the discussion of the sampling frame, the various sampling techniques employed, and the determination of the appropriate sample size.

3.5.1. Sampling Frame

The sampling frame comprises a comprehensive list of sampling units from which the researcher intends to choose the sample (Selvam, 2017). It is the representative of the population. In this research, the sampling frame comprised three distinct groups. First, ten (10) youth aged 18-35 who are actively seeking employment opportunities to achieve self-sufficiency constituted the primary focus. Second, six (6) youth currently employed at Kamuthanga fish farm provided insight into the experiences of employed youth within the study context. Additionally, the sampling frame was expanded to encompass key informants from Kamuthanga fish farm, comprising the owner, the manager, and two (2) longstanding workers. These key informants were included to offer valuable perspectives and insights into the operations and dynamics of the fish farm.

3.5.2. Sampling Techniques

The study employed non-probability sampling, primarily focusing on purposive sampling. Purposive sampling involves the deliberate selection of participants based on their ability to provide relevant knowledge and insights (Creswell, 1998). As described by Maxwell (1996),

purposive sampling is a deliberate strategy where specific individuals, settings, or events are chosen to gather valuable information that cannot be obtained through alternative sampling methods. This approach allows the researcher to include cases or participants in the sample based on their perceived importance and relevance to the study.

Consequently, this research purposively sampled the Kamuthanga youth fish framers in order to have better knowledge about the contribution of fish farming to youth employment. Purposive sampling was used to sample six (6) young fish farmers' workers in Kamuthanga fish farm and sixteen (16) unemployed youth who are living in Kamuthanga village to get their personal experience about the unemployment issue and their perception of the fish farming business. The identification of the unemployed youth was based on certain criteria, including an age range of 18 to 35 years, at least a high school level of education, and active job-seeking. Priority was given to those who have been actively seeking employment for a longer duration, as their experience may provide them with an advantage. This involved collaboration with Jiwakilishe Community Based Organisation, dedicated to serving the community through programs in Machakos County. Additionally, purposive sampling was used to sample four (4) key informants. These key informants included the owner of the Kamuthanga fish farm, the manager and two other fish farmers who have worked since the creation of the Kamuthanga fish farm. This was done because of their long experience and their knowledge of the fish farming activity.

3.5.3. Sample size

Scholars recommend that any number between ten (10) and thirty (30) is sufficient for qualitative research as long as the sample size is large enough to describe the phenomena of interest (Sakshi, 2021). This indicates that the sample size is limited at the saturation point, where including more interviews in the study will not produce any further data (Creswell, 2013). The saturation point for this study's sample size was reached with (26) participants. By utilizing the selected data collection methods, the researcher had the opportunity to extensively investigate and analyze the prominent themes and patterns that have surfaced from the data. The extensive and detailed data gathered from the twenty-six (26) participants provided a profound understanding of the research subject and effectively addressed the research questions or objectives.

Table 1: Sampling size

Population description	Sampling technique	Number
Employed youth in Kamuthanga fish farm	Purposive sampling	6
Kamuthanga youth unemployed	Purposive sampling	16
Key informants	Purposive sampling	4
Total		26

3.6. Research instruments

A research instrument functions as a means to collect, observe, or record qualitative data (Creswell, 2012). It is important to carefully choose appropriate instruments that align with the type of qualitative data to be gathered. Therefore, in this study, a combination of primary and secondary data sources was utilized. Primary data, which involves first-hand information, was collected through an interview guide. Secondary data was gathered from various sources such as libraries, online databases, government files from Kenya or Machakos County, as well as books, journals, reports, and researches conducted by other scholars. Additionally, content analysis of project records from Machakos County and relevant studies on the topic conducted in Kenya was utilized.

The research also incorporated in-depth interviews and key informant interviews. In-depth interviews allowed the researcher to delve into individual perceptions, beliefs, feelings, and experiences of the participants. These interviews provided detailed information, uncovered personal experiences, contextualized the participants' lives, and proved valuable for addressing sensitive topics. The researcher conducted both in-depth and key informant interviews, following specific guides. These guides consisted only open-ended questions due to their adaptable nature, enabling interviewees to share their experiences in their own words. The questions were written in English and were verbally translated into Kiswahili or Akamba language for some youth who preferred to be interviewed in those languages.

3.6.1. In-depth interview guide

According to Creswell (2009), an in-depth interview serves as a qualitative data gathering tool, facilitating researchers in obtaining comprehensive insights into the subject of study. It is considered suitable for this research as it allows interviewees to articulate their experiences regarding fish farming business and youth employment effectively. In so doing, it gave the researcher detailed and first-hand information. The in-depth interviews took place at the Kamuthanga fish farm and was mostly administered to the unemployed youth, and the youth fish farmers.

3.6.2. Key informant guide

The Key Informant guide is a qualitative research technique that collects data from individuals with specialized knowledge or experience. In this study, the KIA guide gathered valuable insights about the Kamuthanga village context on fish farming, social and cultural factors, and employment challenges faced by young people. The Kamuthanga fish farm manager, owner, and two experienced farm workers were identified as key informants. The guide included open-ended questions to capture their experiences, perspectives, and recommendations. Overall, the Key informant guide was instrumental in understanding the link between fish farming and youth employment in Kamuthanga Village, Machakos County, Kenya.

3.7. Pilot Study

The purpose of pilot study was to test the trustworthiness and credibility of the research instruments for quality assurance purposes and to ensure that the findings of the study were free from any biases or preferences on the part of the researcher. As outlined by Blaxter et al. (2006), pre-testing involves the trial and evaluation of the chosen research techniques and methods to assess their effectiveness in practice, and if necessary, make adjustments to the plans. Accordingly, a pre-test was conducted targeting two (2) unemployed youth, one (1) youth worker at Kamuthanga fish farm and one (1) Key informant. This pre-test was a crucial aspect of the study as it helped identify any deficiencies in the research tool before its implementation in the field, allowing for corrections. Furthermore, it guaranteed that all participants understood the questions thoroughly, resulting in relevant and suitable responses.

3.7.1. Credibility

Credibility refers to the degree of accuracy and consistency of results over a long period of time (Joppe, 2000). This ensures that the methodology can be applied to similar studies. To establish credibility in this research, several approaches were employed. First, credibility was demonstrated through the validation of information provided by interviewees and the application of triangulation using qualitative methods such as content analysis, in-depth interviews, and key informant interviews. In order to enhance credibility, the participants were carefully selected and grouped into distinct categories, including young fish farmers, key informants, and unemployed youth. This grouping aimed to minimize potential data biases and facilitate the collection and analysis process.

Additionally, the credibility of the study's data collection tools, namely the in-depth interview and key informant interview guides, was ensured through pre-testing. This allowed the researcher to assess the effectiveness and reliability of these tools beforehand. Furthermore, the study involved a diverse range of participants, including youth who are unemployed, young fish farmers, a limited number of older fish farmers, as well as the manager and owner of the Kamuthanga fish farm. By incorporating different perspectives, the study aimed to strengthen its credibility.

Moreover, the research drew upon a variety of knowledge sources at global, continental, and local levels, relating to the topic of fish farming and youth employment. This included references to organizations' records, government documents, books, and journal articles. By incorporating a broad range of sources, the study aimed to ensure its credibility by grounding its findings in existing knowledge and expertise.

3.7.2. Trustworthiness

This section addresses the dependability, confirmability, and transferability of the study (Maykut & Morehouse, 1994). In order to establish dependability, the researcher relied on various documents as evidence of trustworthiness. These documents included hard copies or digital copies of records, such as consent forms, authorization letters from relevant departments, in-depth interviews, key informant interviews, and field notes.

Confirmability was demonstrated through the use of open-ended questions that encourage comprehensive and detailed responses. Additionally, the study employed content analysis, in-

depth interviews, and key informant interviews to further support confirmability. The research also referenced existing studies conducted at the global, continental, and local levels, contributing to the overall confirmability of the findings. Moreover, confirmability was strengthened by the involvement of multiple participant groups, including unemployed youth, young fish farmers at Kamuthanga, as well as the manager and owner of the Kamuthanga fish farm. This diverse participation enhanced the credibility of the study and provided different perspectives on the subject matter.

The researcher began with a pre-testing phase to validate and ensure the reliability of the research instruments. Open-ended questions were used to gather detailed insights into the topic, ensuring the study's applicability to various contexts. These questions aimed to capture diverse perspectives, enhancing the transferability of the findings.

In summary, the study aimed to establish trustworthiness through dependability, confirmed by relevant documents, and confirmability supported by open-ended questions, content analysis, and diverse participant groups. Transferability was facilitated by the comprehensive nature of the questions and the pre-testing phase. These measures collectively contribute to the overall trustworthiness of the study.

3.8. Data collection

The process of collecting data entailed carefully selecting effective tools for gathering information from participants in the field. The selection of appropriate data collection methods played a critical role in determining how data was acquired. Before collecting the data, the researcher obtained relevant documents from Tangaza University, the National Commission for Science, Technology, and Innovation (NACOSTI), and the County Director of Education, County Commissioner, and County Governor in Machakos. The researcher received support from a research assistant from Kamuthanga village, who was fluent in the local language. Before engaging in the research, participants were invited to carefully review and sign a consent form, signifying their voluntary consent to take part in the study.

In order to ensure the credibility of the research findings, in-depth interviews were conducted with both young fish farmers and youth who are unemployed. Conducting these interviews produced valuable insights into the experiences, viewpoints, and the influence of fish

farming on employment opportunities for both groups. By including both participant groups, the study obtained a comprehensive understanding of the topic.

Additionally, key informant interviews were conducted with individuals who possess expert knowledge and experience in fish farming business. These key informants included the owner, the manager, and some other old fish farmers of the Kamuthanga fish farm who provided valuable insights into the employment dynamics in the sector. Their perspectives contributed to a more holistic view of the topic and validated the findings through the convergence of information from different sources.

By employing in-depth interviews with young fish farmers and unemployed youth, and key informant interviews with fish farming experts, the study aimed to establish validity through triangulation. This approach ensured that multiple perspectives were considered, enhancing the overall credibility and trustworthiness of the research findings.

3.9. Data analysis

Data analysis is the crucial step of making sense of the information gathered during data collection (Merriam, 2014). In this study, the interpretation of data from content analysis, in-depth interviews, and key informant interviews played a central role. The data obtained from the interviews were examined in accordance with the study's objectives. A total of twenty-six (26) individuals were interviewed, comprising youth workers from Kamuthanga fish farm, unemployed youth, and key informants. The interviews, categorized into specific groups, were recorded and later transcribed for analysis. The Qualitative Data Analysis (QDA) Miner Lite software facilitated the computation and examination of the responses. Each objective was assigned a distinct label: the first objective focused on fish farming opportunities, the second on constraints hindering involvement in fish farming, and the third on methods for enticing youth into fish farming. Themes were derived from the variables of each objective, forming the basis for the interview guide. Notably, "job creation," "income generation," "food security," "problem of water," "culture problem," "financial problem," "water resources management," "training and capacity building," and "financial support/credit facilities" were employed as the main themes. Unexpected responses under the challenges that do not allow the youth to embrace fish farming led to the addition of supplementary points as "other constraints."

In order to ensure confidentiality, pseudonyms were assigned to the interviewees, safeguarding their identities. The written transcripts were grouped based on their nature, separating transcripts from in-depth interviews, key informant interviews, and content analysis. Each set of data was analyzed separately using the same qualitative methods, as they all possess a qualitative nature. The researcher read and re-read the written transcripts to extract meaning from the raw data. The researcher maintained objectivity and refrained from imposing personal views or ideas, allowing a true understanding of the interviewees' statements and ideas. These statements were subsequently coded to form clusters of themes, which were then reduced to emergent themes.

For this research, the use of triangulation methods was valuable. Triangulation in qualitative research refers to the utilization of various methods or sources of data to obtain a holistic comprehension of phenomena (Patton, 1999). It aims to enhance credibility (validity) by converging information from multiple sources. For this study, the method of triangulation was utilized, involving incorporating various participant groups and employing specific interview techniques. Also, the integration of key informant analysis guide and interview guide facilitated a structured and comprehensive exploration of the research questions, ensuring systematic gathering of insights from diverse perspectives.

Overall, the data analysis process in this study involved a systematic approach to understanding and categorizing the collected information, ensuring meaningful exploration of the research objectives. Table 2 below shows the alignment between the research questions for the interview and the specific objectives. It also outlines the corresponding data analysis methods employed.

Table 2: Data analysis

Research specific objectives	Research questions	Types of data analysis
Establish the opportunities of fish farming for youth employment in Kamuthanga, Machakos County.	Q 1, 2, 3, 4, 5, 6, 7, 8, 9, 10	Thematic analysis
Investigate the factors restraining the Kamuthanga youth involvement in fish farming business.	Q 11, 12, 13, 14, 15, 16, 17, 18, 19	Thematic analysis

Identify the strategies for the sustainability of fish farming business for Kamuthanga youth employment.

Q 20, 21, 22, 23, 24, 25, 26, 27

Thematic analysis

3.10. Logistical and ethical considerations

The researcher got the ethics clearance and research permit letters from Tangaza University. These letters, along with the signed research proposal, were used to apply for a research permit from the National Commission for Science, Technology, and Innovation (NACOSTI). Additionally, the researcher informed the relevant County Director of Education, County Commissioner and County Governor in Machakos before the commencement of the research. The researcher also got the authority to carry out research from the County government of Machakos at the office of the County secretary. These authorisations helped the interviewees to understand that the study's purpose was purely academic and that the researcher would safeguard their privacies. An authorisation was also sought from all interviewees through a consent form. Interviewees were informed about the purpose of the study and about their rights to terminate the interview sessions at any time without having to explain themselves. This is because they were participating voluntarily. Interviewees were assured that their responses would be used for academic purposes only. Confidentiality was maintained throughout the study. The researcher shared his understanding of the interviewees' experiences with them throughout the interview session. The researcher made sure that interviewees understood the questions and provided adequate responses to them. This was done by following through with the responses in a bid to confirm interviewees' specific responses.

3.11. Chapter summary

This chapter has explained the choice of a case study research design for this study and argued that it enabled a detailed examination of the intricacies and complexities of the phenomenon under investigation. Additionally, the chapter gave more details about the location of the study which was Kamuthanga village in Machakos County, Kenya. Furthermore, the target population, the sampling technique and sampling size have also been presented in this chapter. Then the research instruments have also been discussed. Moreover, content analysis of Machakos County

project records and relevant Kenyan studies on the topic, as well as in-depth and key informant interviews, were discussed in this chapter. The pilot study findings, which demonstrated the credibility and trustworthiness of the research, were also included in this chapter. The chapter concluded by outlining the data collection technique, data analysis approach, and addressed logistical and ethical considerations.

CHAPTER 4: RESULTS

4.1. Introduction

This chapter presents the research findings. The primary focus is on exploring the role of fish farming business on youth employment in Kamuthanga village, situated in Machakos County. The chapter presents also the demographic details of each participant. Subsequently, the data collected from the unemployed youth in Kamuthanga, the youth workers in Kamuthanga fish farm, and key informants have been analysed and presented. Data analysis is structured around distinct codes and themes derived from the study's objectives, variables, and insights collected from participants' interviews.

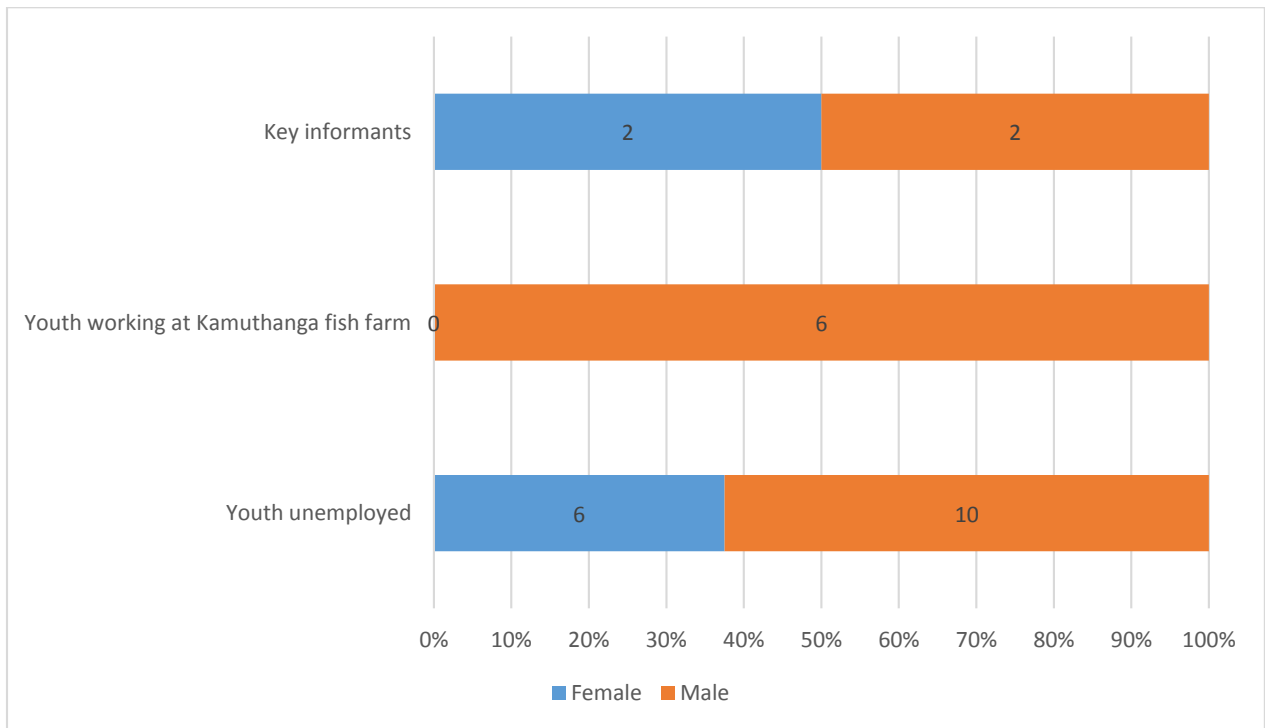
4.2. Demographic characteristics

In total, twenty-six (26) interviewees were involved in this study. Non-probability sampling, mainly purposive sampling was used to select sixteen (16) unemployed youth and casual workers, six (6) youth workers in Kamuthanga fish farm and four (4) key informants. Key informants included the owner of Kamuthanga fish farm, the manager and two (2) old Kamuthanga fish farm workers. With the help of the manager, six (6) youth workers in Kamuthanga fish farm were chosen according to the few numbers of youth who are working. The total number of youth working in the Kamuthanga fish farm is eight (8), and six (6) of them were chosen according to their availability and willingness to participate in the research.

Jiwakilishe Community Based Organisation, which is constituted to serve the community by offering programs in Machakos County, helped to find and gather the unemployed youth in Kamuthanga village. Ten (10) unemployed youth did the in-person interview and the other six (6) constituted the focus group discussion. The focus group discussion allowed the unemployed youth to discuss their perspectives, experiences, and opinions, providing rich and detailed information that the in-person interview might not capture. Additionally, it was to allow the participants of the focus group to build on each other's thoughts, leading to a collective exploration of their perception on fish farming that goes beyond what individual interviews might uncover. The saturation was attained at four (4) key informants, six (6) youth workers in Kamuthanga fish farm, and sixteen (16) unemployed youth. This was the situation when the researcher reached a saturation point, where there were no new insights from interviewees (Creswell, 2013).

The key informants were people who hold positions in Machakos County, and in the Kamuthanga fish farm, and possess detailed and deep knowledge of the fish farming business. The youth workers of Kamuthanga fish farm were chosen because of their occupation as Kamuthanga fish farm workers and their age bracket (18- 35 years old). Furthermore, the Kamuthanga unemployed youth or casual youth workers were chosen based on age range (18-35 years old), educational background, and current employment status, mostly their situation of looking for a stable or better job. All the interviewees lived in Kamuthanga village. The following figures show different information about the target population: gender, age bracket, level of education and marital status.

4.2.1. Presentation of respondents' gender



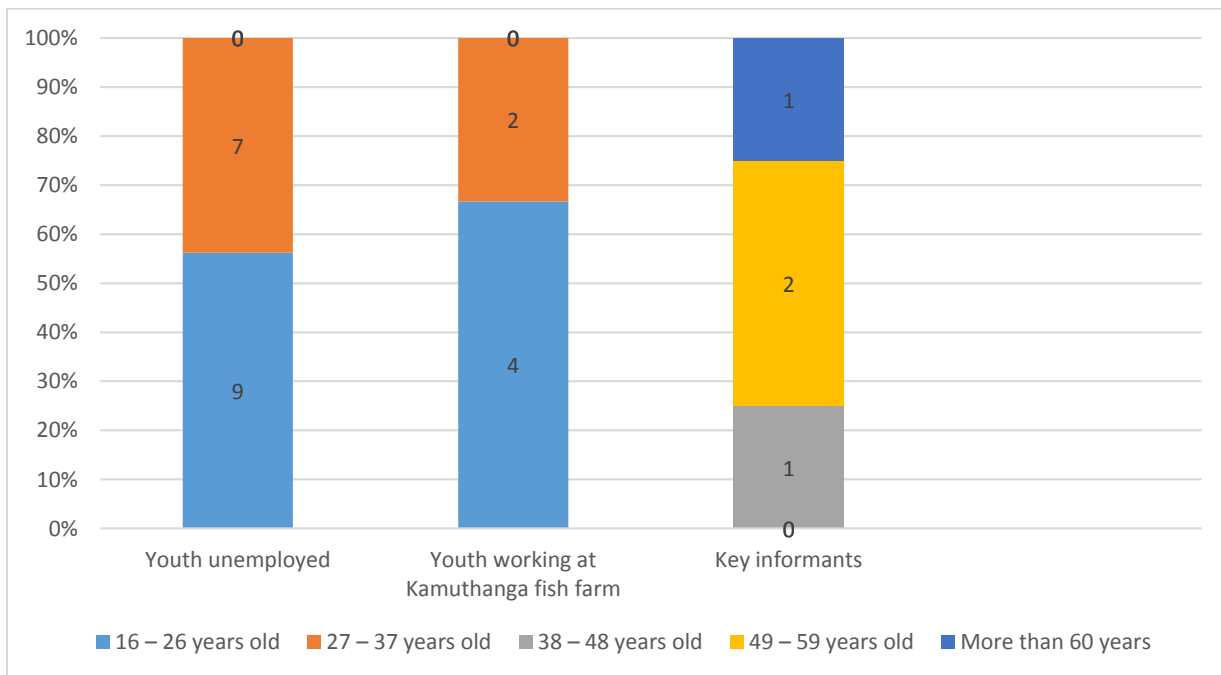
n = 26

Figure 2: Respondents' gender

This figure is showing the gender of the research respondents. Out of sixteen (16) unemployed youth surveyed, ten (10) were male and six (6) were female. In this case, the females represented at almost 38%, showing that males as well as the females are experiencing same situations of unemployment. For the youth working at Kamuthanga fish farm, the study

encompassed six (6) male respondents, as no young women were engaged at the fish farm during the data collection period. This underscores the disparity in gender representation within the fish farming business, with males being more prevalent. In terms of the key informants, the study interviewed two (2) males and two (2) females, with the females having been involved in fish farming work from the outset of the farm. This highlights the limited participation of females in fish farming activities.

4.2.2. Presentation of the respondents' age bracket



n = 26

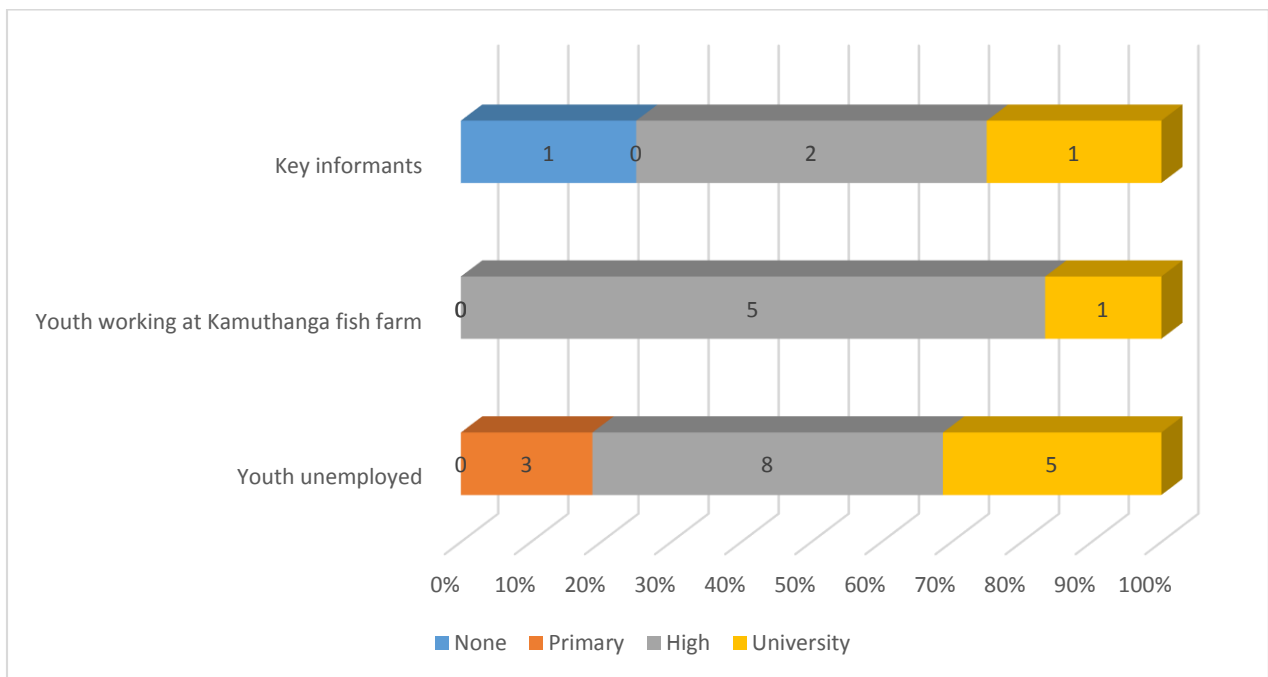
Figure 3: Respondents' Age bracket

The demographic breakdown of the respondents, extends various age brackets. Among the sixteen (16) unemployed youth interviewed, the majority, comprising nine (9) individuals, fell within the age range of 16 to 26 years. Seven (7) unemployed youth respondents were aged between 27 and 37 years, indicating a diverse age distribution within this group. At Kamuthanga fish farm, six (6) young workers were interviewed, with four (4) falling within the younger age bracket of 16 to 26 years, while the remaining two (2) were between 27 and 37 years old. This displays a concentration of younger individuals in the workforce, though with some representation from older age groups. Furthermore, among the key informants, there were two (2) female

participants aged between 49 and 59 years, providing insights from individuals with more experience and possibly different perspectives. The farm owner, who holds a pivotal role in the operation, surpasses 60 years of age, indicating a wealth of experience and knowledge in the industry. However, the manager falls within the age range of 38 to 48 years, representing a mid-career stage with a balance of experience and vigour.

Overall, the concentration of younger individuals (16-26 years) among both unemployed youth and young workers at Kamuthanga fish farm indicates that targeted interventions for this age group could effectively reduce youth unemployment. Additionally, the presence of older youth (27-37 years) highlights the need for adaptable programs that address varying needs and skill levels across age brackets, ensuring that all youth can benefit from fish farming opportunities.

4.2.3. Presentation of the respondents' level of education



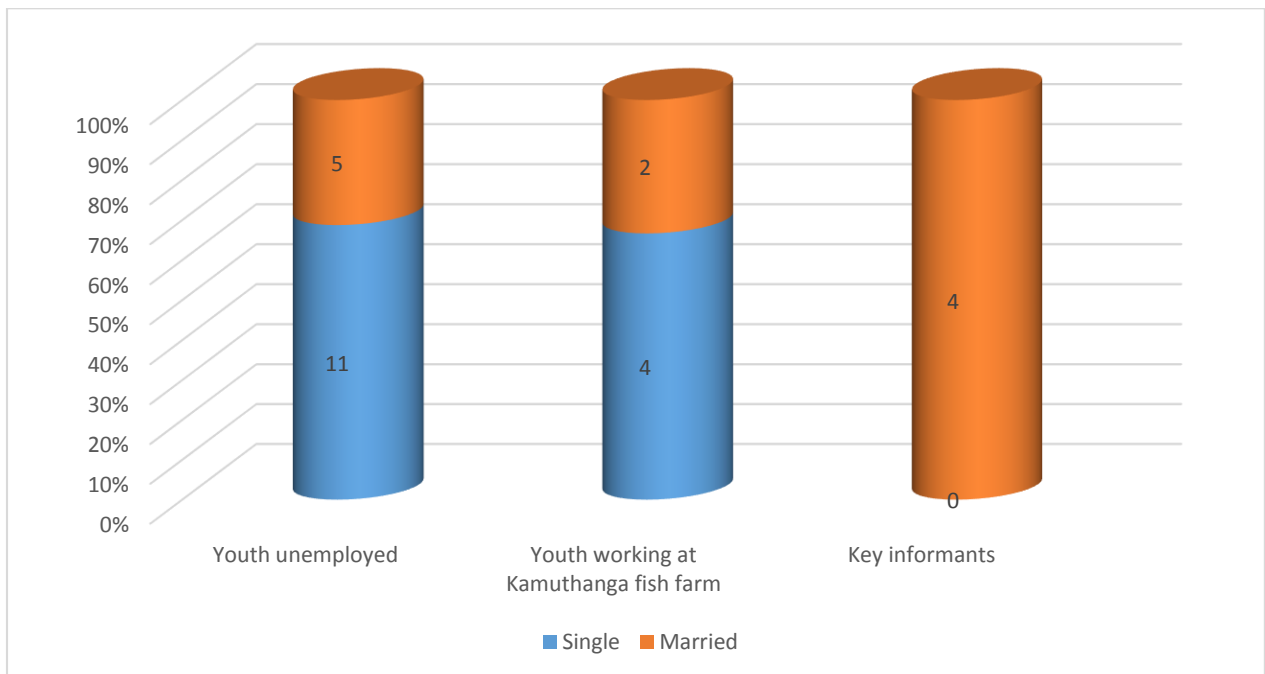
n = 26

Figure 4: Respondents' level of education

The study also delved into the educational background of the participants in order to measure its impact on their proficiency in fish farming. Among the unemployed youth interviewed, three (3) had completed primary school, eight (8) had finished high school, and five (5) had pursued higher education at the university level. This indicates a predominantly educated

demographic among the unemployed youth. This could facilitate quicker training and adaptation to fish farming practices, making targeted educational interventions potentially more effective. In the case of youth employed at Kamuthanga fish farm, five (5) out of the six (6) workers had attained a high school education, while one (1) held a bachelor’s degree. Notably, this last one specialized in aquaculture, providing meaningful expertise relevant to the farm’s operations. This highlights the potential benefits of promoting higher education and specialized training in aquaculture to improve employment outcomes and farm productivity. Regarding the key informants, the majority had completed high school education, except the first key informant, who did not undergo formal schooling. Key informants two (KI 2) and three (KI 3) had completed high school, while the fourth key informant (KI 4) had pursued higher education at the university level. The diverse educational backgrounds of key informants, ranging from no formal schooling to university education, offer a wide range of perspectives and expertise. This diversity can be leveraged to develop a comprehensive and inclusive skill development program for fish farming that integrates both practical experience and academic knowledge.

4.2.4. Presentation of the respondents’ marital status



n = 26

Figure 5: Respondents’ marital status

Marital status among the unemployed youth showed that eleven (11) youth are single, while five (5) are married. In the local context of Machakos County, this elucidates that a significant proportion of unemployed youth are unmarried. This suggests that fish farming initiatives could be particularly beneficial in providing economic stability for this group. Among the six (6) youth workers, four (4) were single, while two (2) were married, indicating a mix of family responsibilities within the workforce. Moreover, all key informants were married. This marital status prevalence among key informants implies a shared perspective shaped by family responsibilities and experiences, which could influence their insights into the impact of fish farming on households and communities.

Overall, the marital status of the participants underscores the importance of designing fish farming programs that are inclusive and responsive to the diverse needs of single and married youth. This approach can enhance the overall effectiveness and sustainability of youth employment initiatives in Kamuthanga village.

4.3. Presentation of the findings

Data analysis is an exploratory process used to extract knowledge, information and insights about reality by examining data (Grolemund & Wickham, 2014). Within this study, the researcher systematically categorized the data according to the three primary objectives, which were denoted as “fish farming opportunities,” “constraints inhibiting involvement in fish farming,” and “strategies for enticing youth into fish farming.” These labeled objectives are identified in the table as “Categories.”

Under each category, various aspects were identified as “Themes,” reflecting the diverse dimensions of the respondents’ perspectives. Notably, certain themes were further subdivided due to unexpected responses encountered during interviews. For instance, themes such as “Job creation (positive),” “Income generation (positive),” and “Food security (positive)” were separated to distinguish favorable views regarding fish farming’s potential benefits in these areas from contrasting opinions summarized under “negative” complements.

Similarly, within the second category, themes like “Problem of water (scarcity)” and “Problem of water (availability)” were established to capture divergent perspectives on water resources. Moreover, the segmentation of themes like “Culture problem (influence)” and “Culture problem (does not influence)” aimed to dissect the influence of cultural factors on youth

engagement in fish farming. Additionally, a category labeled “Other constraints” was introduced to encapsulate miscellaneous impediments identified during the interviews. Table 6 below presents metrics, comprising “Number of mentions” and corresponding percentages, alongside the “Number of respondents” and their percentages relative to the total number of respondents, offering a quantitative framework for comprehending respondents’ attitudes and perceptions towards various facets of fish farming.

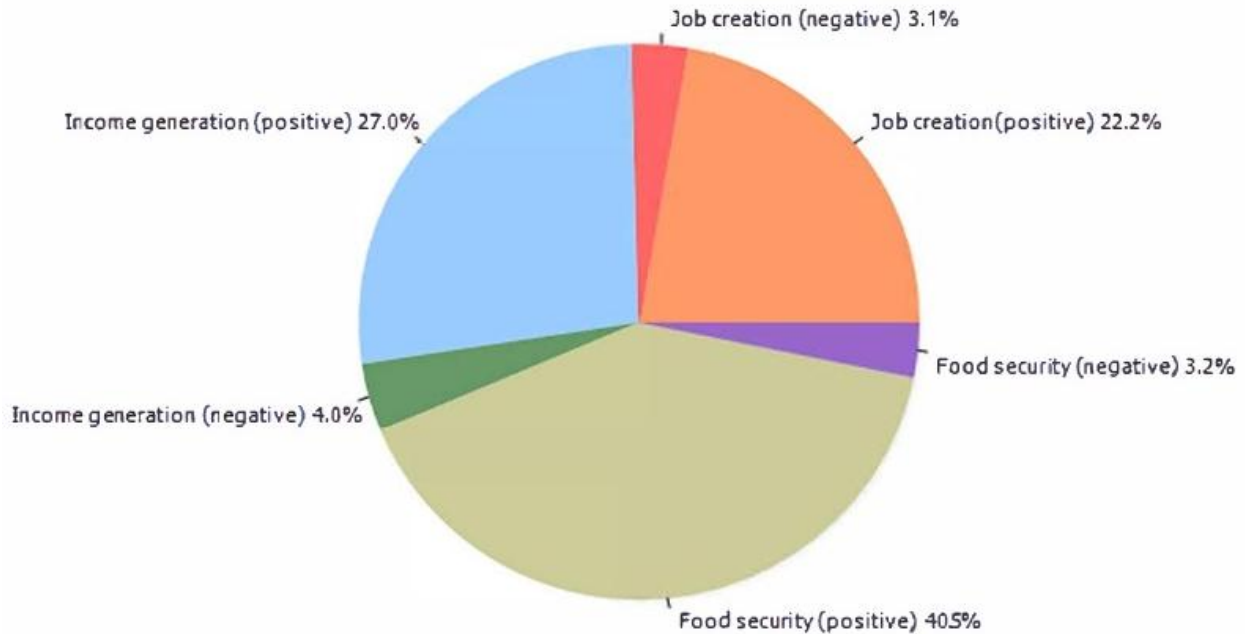
Table 3: Coding frequency of the interviewees’ responses

Categories	Themes	Number of mentions	Percentage of themes	Number of respondents (Cases)	Percentage of respondents
1. FISH FARMING OPPORTUNITIES	Job creation (positive)	28	6.70%	12	44.40%
	Job creation (negative)	4	1.00%	3	11.10%
	Income generation (positive)	34	8.10%	17	63.00%
	Income generation (negative)	5	1.20%	4	14.80%
	Food security (positive)	51	12.10%	19	70.40%
	Food security (negative)	4	1.00%	4	14.80%
2. CONSTRAINTS IN FISH FARMING	Problem of water (scarcity)	50	11.90%	20	74.10%
	Problem of water (availability)	10	2.40%	7	25.90%
	Culture problem (influence)	14	3.30%	7	25.90%

	Culture problem (does not influence)	24	5.70%	17	63.00%
	Financial problem	41	9.70%	21	77.80%
	Other constraints	21	5.00%	9	33.30%
3. STRATEGIES FOR ENTICING YOUTH INTO FISH FARMING	Water resources Management	36	8.60%	20	74.10%
	Training and capacity building	76	18.10%	22	81.50%
	Financial support/ credit facilities	23	5.50%	12	44.40%

4.3.1. Fish farming opportunities

Regarding the first category which is about fish farming opportunities, three themes emerged namely job creation, income generation, and food security. Among the three themes, food security was found with the highest case and the highest favorable response. It was followed by the theme of income generation, and finally, job creation.



n = 26

Figure 6: Distribution of Fish farming opportunities

Theme 1: Food Security

A substantial portion of 40.5% of respondents (19 cases, 70.4%) emphasized the positive impact of fish farming on food security, suggesting its role in addressing nutritional needs. Most of the unemployed youth recognized that many people in Kamuthanga like eating fish. Actually, they mentioned that fish is a “good source of protein” and others mentioned “it is a white meat and it does not have cholesterol”. Some said that it is “good for health” (FG YU).

Indeed, for many respondents, fish contributes very well to the local community of Kamuthanga, however, the affordability of the fish is not easy because of the high price of fish. The answer of the youth worker at Kamuthanga fish farm (YW 6) illustrated very well this situation and in the end, gave hope to the market soon. He said: “People like eating fish all over. The only problem is the affordability of these fish. But I am happy that in the last few months, fish has become cheaper than beef. Beef prices are going high. Like now, the beef price in one of the towns here is around 600 shillings and we are selling our fish at 550 per kilo.” (YW 6)

Additionally, a key informant (KI 4) said about the benefit of the expansion of fish farming to the local community, that:

By expanding fish farming in Machakos County, fish farming diversifies the diet, because there are so many cases of malnutrition. So, fish is a very good source of protein, of course, rich with omega 3, and omega 6, which are very important in the development stage of young life. So, it will be a very good source of nutrition for the youth and also the small households. (KI 4)

Some respondents, comprising 3.2% of the sample (4 cases, 14.8%), expressed the belief that fish does not contribute to local food security in Kamuthanga. This perception likely derives from the comparatively high market prices of fish in relation to other types of meat, as well as the limited access to fish in the area. For that, a key informant (KI 4) mentioned that:

In Kenya as a country, we are different, we have different cultures but there are areas of the country which we know are traditional fish eaters. At the moment, in the area of Machakos, the consumption of fish is luxurious because their main food is not fish. It is beans and maize (githeri), and maybe ugali and other things. So, you may go around and see some people who may not have eaten fish since they were born. So, eating fish at the moment is regarded as luxury to some extent. But the percentage of people who have not consumed fish is really going down with the time because when the farm started within this locality 10 years ago, a very big percentage had not even seen fish. (KI 4)

Theme 2: Income generation

About the theme of income generation, the majority of responses, 27% of the participants (17 cases, 63.0%), highlighted the positive impact of fish farming on income generation. Key informant one (KI 1) affirmed that: “I think it has helped me because the way I work is where I get my income. I have a family; I have kids to take care of.” (KI 1). Similarly, a youth worker at Kamuthanga fish farm said:

Yeah, at the moment, I am fully dependent on my job. It is the only income source; it is really sustaining me. I just thank God for this opportunity. Yeah, so it is the major contributor to my livelihood and giving me all that I need. I cannot complain much. Yeah, so my family, everything that I do is totally dependent on them, on the job and also through my interactions in job, I get to talk to farmers, they have challenges, some of these challenges, I console them in one way or the other and sometimes I am paid. So, it is just, all of it revolves around the job. (YW 6)

During personal interviews, all unemployed youth expressed the belief that fish farming could serve as a means to generate income for their households. For instance, one participant noted: “Yes, it can because the market is too wide here and the supply is low” (YU 1), while another simply stated, “Yes, I think it can be a valuable source of income” (YU 7).

However, divergent opinions emerged during the focus group discussion, with some unemployed youth expressing their doubt regarding the viability of fish farming as a lucrative venture. One participant remarked, “I can say that the market is low since many people do not consume fish” (FG YU), while another straightforwardly stated, “Fish farming is not a good source of income” (FG YU). Although these pessimistic viewpoints represented only a small proportion, comprising 4% of respondents (4 cases, 14.8%), delving into the underlying reasons behind such perspectives could offer insights to address any apprehensions.

Theme 3: Job creation

The data revealed a significant positive outcome, indicating that fish farming presents job opportunities for local communities, with 22.2% of respondents (12 cases, 44.4% of the responses) acknowledging this benefit. According to Youth Worker Six (YW 6), fish farming is viewed as a promising avenue for youth employment due to its available potential across the entire value chain. He emphasized the vast opportunities within fish farming, highlighting its multi-level value chain, (from production to processing and market distribution) which can accommodate numerous young individuals. He said:

I believe it is a good business for youth to create employment because it is a sector that is not well tapped into. It has a huge potential to employ a lot of youth because it is a whole value chain. It starts from the production level right from the parents, all the way to produce them to maturity then to the market. In each level of the value chain, a lot of people can be absorbed. (YW 6)

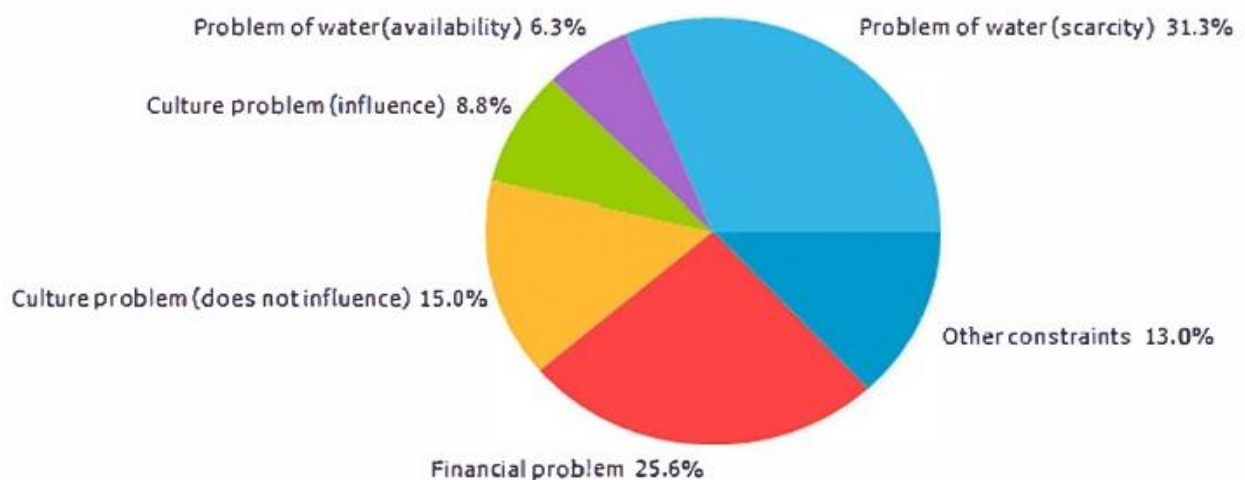
Additionally, drawing parallels to the dairy farming industry, YW 6 underlined the need for a similar structured chain in fish farming, suggesting that community-based initiatives could help bridge the gap in fish supply.

Moreover, another youth worker highlighted job security in fish farming, stating that longevity in the field depends on one’s conduct. Additionally, an unemployed youth stressed the importance of taking fish farming seriously as a potential source of employment (YU 10). These perspectives collectively underscore the significant employment potential inherent in fish farming.

However, some participants (3.1%) did not see the fish farming business as a worthy business for job creation. For example, a key informant woman said: “But it depends on the passion of that person. Because there are many challenges. Like here, the most challenge is water. And by so doing this area, they are not encouraged to do fish farming because of water.” (KI 1). Furthermore, she said that: “I think the agriculture has the benefits more than fish farming because they are local crops. But in the fish, it is specific fish. There are challenges like shortage of water, shortage of fish feeds. So, if you start a farm without capital, you cannot go through. But for other farm products, you can do better.” (KI 1). While the negative impact on job creation is minimal (3 cases, 11.1% of the responses), it is still worth exploring the reasons behind these responses to address potential concerns. Some reasons were that fish farming is costly, consequently does not allow youth to embrace it if there is not enough capital from the beginning. Another reason is that other jobs available in the region like farming or agriculture are better than fish farming because of the challenges which are more in fish farming.

4.3.2. Constraints in fish farming

Within this category, three key themes were explored: issues related to water, cultural challenges, financial constraints, and other factors that individuals identified also as influencing youth participation in fish farming.



n = 26

Figure 7: Constraints in fish farming

Theme 1: Problem of Water

For many respondents, water-related challenges are prominent, with 31.3% of participants (20 cases, 74.1% of the responses) pointing out the problem of water scarcity. In the unemployed youth focus group discussion, all youth agreed that water is scarce in Kamuthanga. One unemployed youth in the focus group said that “If there were more water, many people could get involved in fish farming because the fish farming could be easier.” Additionally, the key informants also agreed that water is scarce in the region and the situation affects a lot the involvement of youth in fish farming. Key informant two (KI 2) said: “First, you have to think of water, the source of water. Because without water, there is no fish farming.” Similarly, for most of the youth workers at Kamuthanga fish farm, water is not available in Kamuthanga village. The youth worker three (YW 3) said: “You know Kamuthanga is in Machakos County and Machakos County is semi-arid. So, the availability of water sometimes is so low. It is so low.”

However, few youth workers thought that water is available in the area. Approximately 6.3% (7 cases, 25.9% of the responses) of respondents indicated the availability of water. Youth worker one (YW 1) remarked: “We normally use boreholes. So, in water there is no problem because even in the villages, there is water from dams. They have the dams; they have the wells.” Furthermore, YW 1 emphasized about this availability of water that, “It is enough.” Similarly, Youth Worker five (YW 5) affirmed, “There are dams [...] There is a lot of water in this place.”

Theme 2: Culture Problem

Most of the participants did not find any influence of culture on the development or on the involvement of youth in fish farming business. There were 15% of respondents who thought that culture has no influence in fish farming (17 cases, 63.0% of the responses). Indeed, one youth said (YU 1) said that “there is no traditional impact which influences the fish farming business”. Additionally, key informant four (KI 4) said that: “even culturally they are not prohibited from eating fish. [...] It was just lack of exposure. Now that people are exposed, everybody is showing willingness to eat fish and to do fish farming.”

About how the gender roles and cultural norms affect the fish farming business, key informant four (KI 4) said that:

One of these fish farming businesses is not gender specific. It is open to any gender. Like in Kamuthanga, we have both genders, equally presented, almost 40-60%. Like female gender is 40, male gender is 60%. So, there is no gender limitation. It only comes during

the operation of getting into the water. It is only men who get into the water. The women take part in the feeding of fish, processing of fish, cleaning of the units, production units, and breeding of the fish. So, it is just like 50-50 operation. (KI 4)

However, some thought that there are some cultural aspects or perceptions that inhibit fish farming from developing in Kamuthanga village. There were just 8.8% of respondents (7 cases, 25.9% of the responses). Key informant two (KI 2) said: “Coffee brings money to the people. So, they do not see the need of going to fish farming. And also, the scarcity of water prevents them to think about fish farming.” Some youth in the focus group said that “Fish is more for Kisumu people”, some others said that “Many believe that the bones of fish can choke one to death.” Additionally, the youth worker six (YW 6) explained:

This village is not one of those known communities that grew up knowing fish. [...] Kamuthanga is far away from the natural water resources like Lakes on the side of Victoria, Naivasha, and Nakuru. So, for them, they were not appreciating fish that much. But in the recent past, because Kamuthanga fish farm is here, they have had a chance to know fish, taste it, and most of them like it now. (YW 6)

Furthermore, he further argued that:

Some cultural perceptions, like now we find people say, you know, like the catfish, they look like snake, they look ugly. Those kind of perceptions. The other perception or notion is, farmed fish is not sweet compared to natural fish. Farmed fish is not tasty compared to natural. But culturally, there is no culture that is against the eating fish. Maybe the perception, a few notions here and there against eating fish or farming fish. (YW 6)

About the gender roles affecting fish farming in Kamuthanga village, key informant two (KI 2) said that: “So, I think it has affected fish farming. Like here in Kamuthanga, the gender is a problem. It is a problem because most of the work is done by the men.”

Theme 3: Financial Problems

Financial constraints are a significant barrier, with 25.6% of participants (21 cases, 77.8%) indicating challenges related to funding. It was practically obvious for the participant that it is very difficult to start fish farming without money and they also recognized that fish farming is quite costly. One youth worker said that “Capital. It is also a huge limiting factor because it is money evolving ... You also need investment, capital, the capital expenditure for building the structures and also for the operation costs. So, you have to have money for it.” (YW 6). Additionally, key

informant one (KI 1) said that fish farming business is costly: “Yeah, the cost of the feeding. Getting the fish to breed. Yeah, if you have to get water from the boreholes, you have to cater for it. You have to pay for it, which it is not.”

Theme 4: Other Constraints

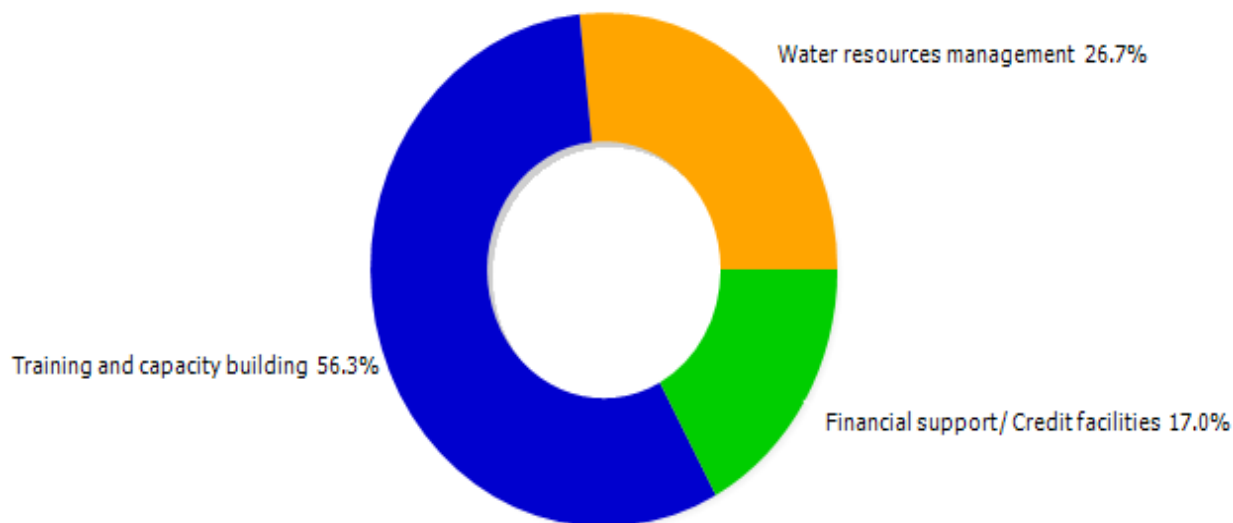
The researcher identified unforeseen constraints that differed from the initially planned variables but proved crucial to consider. These additional constraints were raised by 13% of the participants (9 cases, 33.3%). Key informant one (KI 1), on the significance of water accessibility influencing youth participation in fish farming, acknowledged that water is a factor but emphasized the impatience of youth as a more prominent issue. She expressed, “Water is one factor. But the youth are not patient enough with fish to grow and sell. Without patience, I do not think they can keep fish until they reach the average size. They are not patient enough.” Some unemployed youth also pointed out nepotism as a hindrance to engaging in fish farming unless they had a family member already involved (YU 2).

Additionally, issues of support and misconceptions were highlighted. Within this context, the unemployed youth eight (YU 8) pointed out significant misconceptions and challenges faced by young entrepreneurs in Kamuthanga, including the “lack of moral support, misconceptions based on gender, and a lack of necessary skills.” These issues are crucial as they hinder the confidence and progress of young entrepreneurs, potentially affecting the overall entrepreneurial ecosystem. There were also infrastructure challenges. Youth Unemployed nine (YU 9) highlighted challenges related to infrastructure, specifically “electricity shortages, and inadequate security measures.” These infrastructural challenges are essential as they directly impact the viability and sustainability of fish farming business ventures. The accessibility of land was also found as a serious impact. Respondent two (YU 2) emphasized the importance of land for successful fish farming, particularly in densely populated areas like Kamuthanga. Moreover, respondent YU 3 expressed concerns about the high costs associated with government requirements, such as obtaining licenses for starting a business. Additionally, respondent four (YU 4) highlighted poor transportation of goods as another significant challenge faced by entrepreneurs in Kamuthanga.

4.3.3. Strategies for enticing youth into fish farming

Following the discussion on the challenges hindering youth engagement in fish farming and the impediments to the growth of the fish farming business in Kamuthanga, it became crucial

to investigate strategies that can stimulate youth participation in this sector. Within the realm of strategies aimed at enticing the young into fish farming, three overarching themes have been identified: water resources management, training and capacity building, and financial support or credit facilities.



n = 26

Figure 8: Methods for enticing youth into fish farming

Theme 1: Water Resources Management

Water resources management was recognized as a strategy to attract youth to engage in fish farming, constituting 26.7% of respondents (20 cases, 74.1% of responses). This underscores an emphasis on the sustainable and efficient utilization of water. The majority of the unemployed youth expressed the importance of the expansion of water sources and the building of dams, digging boreholes, and rainwater harvesting. Key informant one (KI 1) suggested an increase in boreholes and the creation of dams. A youth worker (YW 6) asserted that addressing water challenges in Kamuthanga necessitates the installation of boreholes. Youth worker three (YW 3) highlighted the government's initiative to promote tree planting for increased rainfall in a short period.

Theme 2: Training and Capacity Building

Numerous responses comprising 56.3% of respondents (22 cases, 81.5%) underscored the significance of training and capacity building in the context of fish farming. This underscores the necessity for educational initiatives aimed at empowering the youth with the necessary skills for successful engagement in fish farming. The unemployed youth in focus groups, for example,

highlighted the importance of “training on fish farming” and “creation of awareness about fish farming.” Many unemployed youth emphasized the importance of sensitization, the formation of groups, and receiving training in fish farming business.

Similarly, when interrogating Kamuthanga fish farm youth workers about how the government or other organizations could support youth engagement in fish farming, one youth worker (YW 6) emphasized the pivotal role of the government in facilitating youth participation. This includes capacity building through training, sensitization of youth, providing affordable inputs, assisting with water sources such as boreholes, and incorporating programs that empower them to run their fish farming businesses effectively.

In order to evaluate the farm’s activities in promoting a varied workforce, the researcher investigated the initiatives undertaken by Kamuthanga fish farm. Youth worker six (YW 6) revealed that the farm is actively contributing to this goal. Notably, the farm operates an aquaculture academy dedicated to training young individuals in fish farming. Moreover, he said that, the farm willingly shares their knowledge and experience, opening their doors to anyone interested in their operations. This transparency extends to free access for students and interns, without any fees. Furthermore, this youth worker six (YW 6) expressed a strong belief that such interactions contribute significantly to knowledge exchange, observing positive transitions in the careers and lives of many young individuals who have availed themselves of these opportunities. Additionally, the youth worker six (YW 6) underlined the need for government assistance in addressing electricity problems within the sector.

Theme 3: Financial Support/Credit Facilities

Financial support is highlighted by 17% of respondents (12 cases, 44.4%). This underscores the necessity for easily accessible credit to stimulate youth involvement in fish farming. Respondents frequently expressed the absence of financial support or credit options for aspiring youth interested in venturing into fish farming in Kamuthanga village. Consequently, there is a strong endorsement for the provision of financial and credit facilities. Youth Unemployed ten (YU 10) emphasized the pivotal role of credit and financial support in fostering the growth of fish farming. Similarly, youth worker six (YW 6) stressed the importance of financial management training for anyone looking to engage in fish farming. According to YW 6, understanding market dynamics, accounting practices, sales record-keeping, and financial planning are essential aspects of running a successful fish farming business. Moreover, key informant four (KI 4) proposed a

strategic approach, suggesting that the focus should be on creating a credit facility specifically for starter funds. This facility would not only cater to established ventures but also welcome proposals from individuals seeking initial funds for their fish farming initiatives.

4.4. Summary of the findings

This section offers a summary of the study's results, structured based on each research objective. The primary objective was to assess the potential of fish farming for youth employment in Kamuthanga, Machakos County. The results underscored the abundant opportunities associated with fish farming, including job creation, income generation, and enhanced food security. Among the respondents, 40.5% affirmed the role of fish farming in ensuring food security, 27% acknowledged its contribution to income generation, and 22.2% recognized its impact on job creation. Conversely, a small percentage expressed scepticism regarding the connection between fish farming and income generation (4%), food security (3.2%), and job creation (3.1%).

The study also investigated the factors hindering youth involvement in fish farming in Kamuthanga. Notably, 31.3% attributed the challenges to the semi-arid nature of Kamuthanga, which poses water scarcity issues. Financial constraints were identified by 25.6% of respondents, while 8.8% cited cultural barriers against engaging in fish farming. An additional 13% highlighted various other impediments. Conversely, some respondents indicated that water availability was not a concern in Kamuthanga (6.3%), and 15% emphasized that cultural factors did not deter their participation in fish farming.

Lastly, addressing the third objective, the study revealed that Kamuthanga's youth expressed a considerable need for training and capacity building (56.3%). Water management emerged as a significant concern for 26.7% of respondents, while 17% highlighted the importance of financial support or access to credit facilities to foster their engagement in fish farming.

4.5. Chapter summary

This chapter has presented the results from data collection regarding the the contribution of fish farming business to the youth employment in Kamuthanga, Machakos County. A total of twenty-six people were interviewed and their responses were recorded. Subsequently, the recorded interviews underwent transcription, and the Qualitative Data Analysis (QDA) Miner Lite software was employed to generate codes and conduct data analysis. The demographic details of all research

participants were then presented. The presentation of data analysis adhered closely to the research objectives. In essence, the findings revealed considerable opportunities in fish farming, encompassing job creation, income generation, and improved food security. While most respondents recognized these advantages, a minority expressed their doubts. Moreover, the research identified obstacles impeding youth participation, including water scarcity, financial limitations, and cultural constraints. Additionally, it revealed a notable demand among Kamuthanga's youth for training, capacity development, and financial assistance to strengthen their involvement in fish farming. The following chapter presents a discussion that further elucidate the insights presented in this fourth chapter.

CHAPTER 5: DISCUSSION OF RESULTS

5.1. Introduction

This chapter presents the discussion of the findings obtained from the workers of Kamuthanga Farm and the Kamuthanga unemployed youth. The primary objective of this discussion is to interpret and analyse the results in the context of the research objectives outlined at the inception of this study: opportunities of fish farming for youth employment in Kamuthanga, Machakos County; factors restraining the Kamuthanga youth involvement in fish farming business; strategies for enticing youth into fish farming business in Kamuthanga. By critically evaluating the data collected and examining the implications of the findings, the researcher aims to shed light on the broader significance of the research. Additionally, the researcher explores any discrepancies or unexpected outcomes, providing possible explanations and theoretical interpretations to deepen the understanding of the topic.

5.2. Opportunities of fish farming for youth employment in Kamuthanga, Machakos County

The discussion of the first objective's findings is organized around three central themes: job creation, income generation, and food security. It begins with the study's revelation that fish farming offers a promising solution to youth unemployment, presenting significant and sustainable employment opportunities. Indeed, youth unemployment is a significant global challenge in many countries. It refers to the situation where a significant proportion of young people are unable to secure employment despite actively seeking it. This finding suggests that fish farming could be an effective means to employ the youth. In the context of Kamuthanga village, the finding implies that the unemployed youth in the area can rely on fish farming to get out of their situation. This finding is in accordance with Nasr-Allah et al. (2020) research findings, which demonstrated that the aquaculture value chain presents significant opportunities for employment generation, including for women and young people. Their study successfully evaluated the employment generation across various stages of the aquaculture value chain in the principal governorates responsible for approximately 80% of Egypt's aquaculture output (Nasr-Allah et al., 2020). Furthermore, they approximated that aquaculture generates 19.56 Full-Time Equivalent (FTE) jobs per 100 tons of fish produced throughout the value chain.

Additionally, the study found that fish farming proves to be a viable means for youth to generate income, contributing positively to their financial well-being. It means that fish farming can empower Kamuthanga young people, mostly those unemployed, by providing them with opportunities to become economically self-sufficient. Instead of relying only on traditional employment avenues, such as formal jobs or informal labour, these youth involved in fish farming can take control of their economic destinies by running their own small fish farming business or participating in related entrepreneurial activities.

This finding aligns with the findings of Angermayr et al. (2023), who explored the connection between small-scale freshwater aquaculture, income generation, and food security in rural Madagascar. Their research indicated that extension services, integrated production systems, and higher education are linked to increased income from fish-related activities. Additionally, their study revealed that while health plays a crucial role in food security, factors such as female decision-making, fish consumption, and education also positively influence food security (Angermayr et al., 2023). Hence, the conclusion that fish farming contributes positively to food security, providing a sustainable source of nutrition for the community, is in line with the findings of Angermayr et al. (2023).

Indeed, food security is achieved when every individual consistently has both the physical means and financial access to an ample, safe, and nourishing diet that aligns with their nutritional requirements and personal food choices, enabling them to lead active and healthy lives. Fish farming plays a significant role in enhancing food security by augmenting the supply of fish, a valuable protein source packed with essential nutrients. Moreover, fish contains vital fatty acids, vitamins, and minerals crucial for human well-being. Therefore, by promoting fish farming business among the Kamuthanga youth, and the consumption of locally farmed fish, people can improve their overall nutritional status, potentially reducing the prevalence of malnutrition and associated health problems.

Supporting the conclusion regarding fish farming's role in ensuring food security, a study undertaken in Ghana by Hasselberg et al. (2020) underscored the importance of fish as a critical provider of necessary micronutrients in the diets of individuals, especially in nations with low to moderate income levels. Additionally, the study done by Fisher et al. (2017) indicated that fish consumption accounts for a notable portion (ranging from 10% to 45%) of the total diet for a substantial proportion of the population in Bangladesh, Cambodia, Ethiopia, Ghana, Haiti, Malawi,

Mozambique, Nepal, Rwanda, Senegal, Uganda, and Zambia. Overall, Ali et al.'s research (2020 b) revealed that fish farming remains a substantial contributor to Egypt's gross domestic product (GDP), employment rates, and food security, while also playing a crucial role in nutritional health, economic stability, and the overall welfare of the populace.

Despite the potential benefits of fish farming, a minority of respondents did not acknowledge its valuable opportunities for employment, income generation, and food security. They hold the view that fish farming cannot fulfil these roles effectively. This perspective can be related to the lack of knowledge and interest in the business. Specifically, within Kamuthanga village, fish farming is not adequately understood or promoted among the youth, resulting in misconceptions and underestimation of its potential benefits. On this matter, Boase et al. (2019) investigated in the United Kingdom whether the limited consumption of local shellfish could be due to misconceptions or insufficient understanding of the potential health and environmental implications associated with their consumption. They identified ten (10) main misconceptions and gaps in knowledge, such as mistaken beliefs about health risks and a lack of understanding regarding the environmental benefits compared to alternative food choices. Additionally, the survey results suggested that the prevalence of these misconceptions and knowledge gaps had a notable impact on people's willingness to consume shellfish, even when demographic factors, food-related values, and past consumption patterns were taken into consideration. While their research did not effectively highlight the repercussions of misunderstandings and knowledge gaps on potential opportunities of fish farming business, it underscored how these misconceptions can influence preferences within the realm of fish farming. This demonstrates that the findings concerning the negative perception of fish farming as viable avenues for employment, income generation, and food security are intricately linked to the misunderstandings and knowledge gaps prevalent among the youth in Kamuthanga regarding the fish farming industry.

In summary, despite the negative aspects related to the opportunities of fish farming, the sector, in general, has proved to be a promising and viable activity that can boost the livelihood of Kamuthanga youth. Therefore, the subsequent discussion explores the specific findings related to the factors restraining the Kamuthanga youth's involvement in the fish farming business.

5.3. Factors restraining the Kamuthanga youth involvement in fish farming business

Four key themes emerged from this specific research objective. These themes are namely the problem of water, financial problems, culture problems and other constraints. Concerning the first theme, the study findings revealed that the scarcity of water resources poses a significant challenge to the viability of fish farming as a sustainable enterprise for the youth. Indeed, in regions where water resources are limited, establishing and maintaining fish ponds or other aquaculture facilities becomes inherently more difficult. Also, inadequate water availability can compromise water quality, affecting the health and growth of fish stocks. Research by Mehrim and Refaey (2023) underlined the impact of climate change on fish farming in Egypt. Among these impacts, there was the scarcity of water which was highlighted. They recognized that water scarcity in aquaculture operations affects production levels and overall sustainability. Similarly, among the constraints that influence the success of fish farming highlighted by Adeleke et al. (2020), there was also the problem of water availability. For instance, without water, there is no possibility of fish farming.

Additionally, regarding the second theme, the study findings showed that financial constraint is a significant barrier for youth interested in entering the fish farming industry. Financial constraints can be understood as limited access to capital or resources needed to start and sustain a fish farming operation. The majority of youth in Kamuthanga lack the necessary funds to purchase or lease land or water bodies, acquire equipment and infrastructure (such as fish ponds or tanks), purchase fingerlings or fish feed, and cover other operational expenses. Research by Arulingam et al. (2019) stressed this financial barrier that youth usually face to start their business of fish farming. They acknowledged the importance of overcoming financial barriers for small-scale aquaculture entrepreneurs, showing that lack of capital can impede the growth of fish farming ventures.

Furthermore, while numerous respondents claimed that cultural and traditional practices do not influence the involvement of youth in fish farming within Kamuthanga village, a marginal noted that the village's reputation as non-consumers of fish impact the youth's inclination towards engaging in the fish farming industry. Since the Kamuthanga village is known for not being fish consumers, youth, for instance, perceive fish farming as less relevant or lucrative compared to other agricultural or economic activities. Hence, this finding is in agreement with Morgan et al. (2017) findings which showed that cultural norms and values, and social relations can shape how

aquaculture can improve the accessibility of fish, employment, income, and the utilization of fish for nutrition.

Moreover, various other obstacles surfaced during participant interviews, including issues related to land availability, electricity challenges, security concerns in the area, the exorbitant costs associated with government license requirements, and the impatience observed among the youth. Notably, some of these hindrances were also underscored in a study conducted by Arulingam et al. (2019), which revealed that the youth face constraints in acquiring land, financial services, and other resources, while also encountering barriers within decision-making circles due to prevailing gerontocratic systems (Arulingam et al., 2019). Indeed, the findings regarding the various factors hindering youth participation in fish farming underscore the necessity of identifying strategies to attract young people to this business.

5.4. Strategies for enticing youth into fish farming business in Kamuthanga

The study revealed three (3) themes in relation to the third specific objective: water resources management, training and capacity building, and financial support. Concerning the first theme, study findings revealed that effective management of water resources is pivotal for the sustainable and productive operation of fish farming initiatives. Actually, implementing adaptive water management strategies, such as water conservation measures, diversification of water sources, and investment in climate-resilient infrastructure, can help fish farmers alleviate the effects of climate challenges and maintain the resilience of their operations. Additionally, enhancing the management and accessibility of water resources in Kamuthanga holds significant importance in encouraging youth to participate in fish farming business. This finding is consistent with that of Mramba and Kahindi (2023) which explored the associations between water availability, management practices, pond water parameters, fish yield, and disease occurrence in small-scale aquaculture operations. It emphasizes the importance of careful planning and management of water resources for sustainable aquaculture development (Mramba & Kahindi, 2023).

Concerning the training and capacity-building theme, the study findings highlighted that adequate training and capacity-building programmes are crucial for equipping youth with the skills and knowledge needed to succeed in fish farming. Fish farming requires specific technical skills and knowledge related to pond or tank management, water quality monitoring, fish health

management, feeding practices, and marketing strategies. The offering of special training programs to the needs of Kamuthanga youth interested in getting into fish farming can empower them with the practical skills and expertise required to effectively get involved and manage fish farming operations.

An example of this finding was elucidated in the research conducted by Argade et al. (2023), where an assessment of skill development training's influence on the knowledge and attitude of fish farmers across various districts of Bihar was undertaken. The study underscored the profound significance of structured training programs in augmenting farmers' capabilities, thereby contributing to their overall success in the intricate realm of fish farming (Argade et al. 2023). Consequently, the profound impact of these training initiatives transcends the individual farmer, acting as a catalyst to elevate the productivity and sustainability of the entire fish farming industry. Indeed, such initiatives not only can fortify the existing knowledge base but also serve as a convincing enticement for the youth of Kamuthanga to embrace fish farming entrepreneurship.

In reference to the third theme of financial support, the results of the study indicated that youth-led fish farming enterprises must have access to credit facilities and financial support in order to overcome financial obstacles and ensure their long-term sustainability. This insight aligns with the findings of Pomeroy et al. (2020), whose investigation explored the existing impediments to financial inclusion for small-scale fishing households. The research not only identified these challenges but also proposed strategic solutions, including the promotion of financial literacy, the reduction of risks associated with financial institutions, the collection of comprehensive financial data, and the diversification of financial services beyond mere credit provision (Pomeroy et al., 2020). Such holistic measures empower fishing households to maintain control over their earnings and savings, fostering financial resilience. For instance, by making the financial support available, Kamuthanga youth can easily be attracted to embrace fish farming business.

5.5. Chapter summary

Overall, this chapter served as a platform for reflection, analysis, and interpretation, offering a nuanced understanding of the research findings and their broader implications. It has accentuated the pivotal role of fish farming business in boosting youth employment, thereby advancing knowledge within the field. The examination has underscored the profound significance

of fish farming enterprises in mitigating youth unemployment, emphasizing its potential as a lucrative avenue for empowering young individuals economically and socially.

CHAPTER 6: TRANSFORMATIVE ORIENTATIONS

6.1. Introduction

This chapter presents the theological reflection, which entails religious and spiritual perspectives on the role of fish farming in addressing youth unemployment in Kamuthanga. This reflection involves examining relevant scriptures, and theological doctrines, and their linkages with the purpose of this study. Furthermore, the chapter offers a comprehensive conclusion of the entire study, alongside practical recommendations. Additionally, it acknowledges the study's limitations and proposes avenues for future research. Moreover, the chapter outlines a ministerial action plan and reflects on the researcher's perspectives in relation to the findings.

6.2. Theological reflection

Kamuthanga, located in Machakos County, Kenya, is known for its diverse religious landscape, reflecting the cultural and historical influences in the region. In Kenya, religion plays a significant role in people's lives, shaping their beliefs, traditions, and community structures. While Christianity is the predominant religion in the country, Kamuthanga, like many other areas in Kenya, also has a mix of traditional African religions and Islam (Marshall, 2017).

This rich composition of religious diversity provides a rich ground for theological exploration and reflection on the intersection of faith and socio-economic development. Within this context, the phenomenon of fish farming emerges as, not only as an economic activity, but also a potential area of spiritual meaning and ethical engagement. By examining the religious beliefs and cultural practices of the community in Kamuthanga, the researcher aims to uncover how these factors influence perceptions of work, stewardship, and community well-being in the context of fish farming. For the sake of this presentation, some traditional, biblical foundations and encyclicals related to sustainable employment are presented.

6.2.1. Akamba traditional perception of work

Before the arrival of major world religions like Christianity and Islam, Africans followed various faiths collectively known as African Traditional Religion (ATR). When Christianity was introduced, it was anticipated that these traditional beliefs and practices would fade away. However, this did not occur; instead, these beliefs and practices have continued to endure, even as

Christianity spread across much of Africa (Muliro, 2016). This persistence of traditional beliefs is exemplified by the Akamba people in Machakos. Despite the widespread adoption of Christianity in the region, many Akamba still adhere to their traditional religious practices and beliefs, blending them with Christian rituals in a unique cultural synthesis (Kitema, 1987).

The traditional religion of the Akamba significantly influences their way of working. The Akamba believe in a supreme being, Mulungu, and various spirits who are thought to inhabit natural elements such as rivers, mountains, and forests (Ndeti, 1972). This belief system fosters a deep respect for nature and the environment, which in turn affects their agricultural practices and land use. For instance, before cultivating land, the Akamba perform rituals to appease the spirits and seek blessings for a bountiful harvest. They also hold ceremonies to honor ancestors, believing that the spirits of the departed can influence the success of their endeavors. This spiritual connection to the land encourages sustainable farming practices, as they aim to maintain harmony with the environment. Additionally, the Akamba's traditional beliefs emphasize community and cooperation. Work is often done collectively, with communal labor being a common practice during planting and harvesting seasons. This communal approach not only strengthens social bonds but also ensures that work is done efficiently and effectively (Mutunga, 1994).

Both animal husbandry and arable farming were integral to the work in and around Akamba homes. They raised cattle for milk and butter, and occasionally for meat. Their crops included finger-millet (*uinbi*), sorghum (*mwee*), and various types of beans. Food preparation was primarily the responsibility of the women, who ground the sorghum into a fine flour using a grindstone. This flour was then mixed with curdled milk to make a raw dish called *Kinaa* (Nzioki, 1982). Indeed, this hardworking nature of the Akamba, exemplified by their meticulous farming and food preparation practices, reflects their deep cultural values and traditional beliefs. Their dedication to agriculture and livestock not only highlights their industrious spirit but also shows the influence of their traditional religion, which emphasizes respect for nature and communal cooperation. These values are evident in the way they manage their resources and work together to sustain their livelihoods.

The research on the contribution of fish farming businesses to youth employment in Kamuthanga village, Machakos County, Kenya, can be seen as an extension of these traditional values and work ethics. Fish farming, like traditional agriculture, requires diligent care and management. It is now providing at a small level a new avenue for youth employment, and if more

attention is given it can provide more employment opportunities harnessing the Akamba's innate industriousness and respect for natural resources. This modern adaptation of their traditional agricultural practices not only can boost the local economy but also keep the youth engaged in productive and sustainable work, continuing the legacy of hard work and community cooperation.

6.2.2. Biblical foundations of sustainable youth employment: The role of fish farming in Kamuthanga

The research findings underscore the significance of fish farming as a viable avenue for youth empowerment and self-sufficiency. By embracing fish farming, youth are actively contributing to the stewardship of resources highlighted in Genesis. Their involvement echoes the mandate bestowed upon humanity to “subdue the earth” as outlined in Genesis 1:28. This mandate serves as a profound call to responsibly manage and nurture the earth's resources, emphasizing the crucial role of the youth in fulfilling this responsibility. Engaging in fish farming can be seen as a way to responsibly utilize natural resources to provide employment opportunities for youth while also promoting sustainability. This engagement can also be seen as a call to environmental stewardship. Youth interested in engaging in fish farming will be taught about fish farming practices that employ sustainable and environmentally friendly practices that demonstrate a commitment to stewardship of the earth, ensuring that resources are preserved for future generations. Indeed, Kamuthanga fish farm uses and teaches the Recirculating Aquaculture Systems (RAS), which is a system that recirculates and reuses water within the fish farm, minimizing water wastage and waste discharge into the environment.

Additionally, the wisdom from Proverbs 12:11 extols the virtue of hard work and diligence. The passage highlights that “those who till their own land have food in plenty, but those who engage in idle pursuits lack sense.” By developing opportunities for young people to participate in fish farming initiatives, Kamuthanga is encouraging the principles of hard work and dedication. Engaging in such activities allows them to cultivate valuable skills that contribute to their personal and professional advancement. In light of the prevalence of illicit and unworthy activities among Kamuthanga's youth, such as the sale of the herbs known as “mirah,” which fails to elevate them, involvement in the fish farming industry presents a more reliable and conscientious enterprise. Through this, they can invest their energies into a meaningful and productive pursuit, thereby promoting their own well-being and that of their community.

Furthermore, in Matthew 25:40, there is a call to care for the poor and vulnerable. Jesus teaches that caring for the least among us is equivalent to caring for Him. Fish farming businesses that prioritize employing youth from disadvantaged backgrounds in Kamuthanga align with this principle by providing opportunities for economic empowerment and improving livelihoods in the community. The letter of Saint Paul to the Galatians (Gal 6:2) calls for community building and support. The passage emphasizes the importance of bearing one another's burdens and supporting each other in the community. Fish farmers who foster a sense of community among themselves and invest in their well-being contribute to the fulfilment of this biblical principle.

Moreover, in advocating for the Thessalonian Christians to work diligently with their own hands (1Thes 4: 11-12), Saint Paul underscores the importance of productive labour and self-sufficiency. This biblical principle aligns with the spirit of fish farming as a means of livelihood and economic empowerment for the youth in Kamuthanga village. By engaging in fish farming, young individuals are not only fulfilling their mandate to work diligently but also contributing to the well-being of their community through the creation of employment opportunities. Just as Saint Paul encourages the Thessalonians to "do your own business" and "work with your own hands," the youth in Kamuthanga are encouraged to take ownership of their economic futures by actively participating in the fish farming industry.

The story of Jesus calling some of His disciples, who were fishermen, to become "fishers of men" (Matthew 4:18-19), can serve as an inspirational parallel to the modern-day initiative of fish farming in Kamuthanga village. This call can symbolize a shift from a traditional livelihood to a purpose-driven mission, offering a new perspective on skills and societal impact. Similarly, the introduction of fish farming as a viable occupation in Kamuthanga can transform the lives of young people. It can provide an alternative means of livelihood, enabling them to become self-sufficient and positively contribute to their community. Additionally, the success of fish farming among the Kamuthanga youth, can impart moral and ethical lessons to the youth, emphasizing the importance of hard work, responsibility, and the sustainable use of natural resources.

In John 21:1-14, the disciples, uncertain about their future following Jesus' crucifixion, returned to the familiar and dependable trade of fishing. This moment underscores how fishing has historically been a reliable source of income and sustenance. Indeed, this return to fishing illustrates the essential role this activity played in their livelihood and survival. Similarly, fish farming can offer a stable and reliable source of income for the youth in Kamuthanga. Fish farming

can present opportunities for economic empowerment, reducing dependency on external job markets and fostering local development. Additionally, fish farming can create jobs not only in farming but also in related sectors such as processing, marketing, and distribution. The promotion of fish farming business among Kamuthanga's youth can also strengthen community ties, as young people collaborate, share resources, and support each other's ventures.

In summary, fish farmers in the village, along with unemployed youth interested in starting a fish farming business, can ensure that their efforts reflect scriptural values and positively impact the community's overall well-being. By aligning the fish farming business's contribution to youth employment in Kamuthanga with these biblical principles, they can create a meaningful and sustainable impact. The next section explores how this main topic aligns with key Catholic social teachings.

6.2.3. Catholic social teachings' perspective on youth employment and fish farming business

Catholic Social Teaching (CST) offers a framework rooted in moral principles that guide the evaluation of the contribution of fish farming business to youth employment in Kamuthanga, village. Here are how various principles of the Catholic Social Teaching might apply to this scenario.

About the human dignity, the CST emphasizes the inherent dignity of every person. Pope Francis (2020) in the encyclical *Fratelli Tutti*, addresses themes of fraternity and social friendship, calling for a renewed commitment to solidarity and the common good. He emphasizes the intrinsic dignity of every human being and calls for a more inclusive and just society that respects and promotes the rights and dignity of all, especially the poor and vulnerable (Francis, 2020). Indeed, by investigating the contribution of fish farming business to youth employment, the research aims to uphold the dignity of young individuals by providing them with opportunities to earn a sustainable livelihood and to support both themselves and their families. The research findings show that fish farming business can enable individuals, mostly youth, to support themselves financially, allowing them to meet their basic needs such as food, shelter, and clothing without relying on others. This fosters a sense of independence and self-sufficiency, which can enhance one's self-esteem and sense of dignity.

The findings of this study have also shown that fish farming can be a source of employment. It can particularly benefit disadvantaged youth who may face barriers in accessing

education or those who after their schooling, are pursuing a meaningful job. By offering work and a source of income, fish farming business helps to address the needs of the poor and the vulnerable in the community. Indeed, the apostolic exhortation *Evangelii Gaudium* (The Joy of the Gospel) of Pope Francis, emphasized that the Church's mission is to reach out to the poor and marginalized, advocating for social justice and solidarity. He called for a renewed commitment to addressing poverty, inequality, and injustice, and emphasized the importance of caring for the most vulnerable members of society (Francis, 2014).

Moreover, Pope John Paul II's encyclical on "Solidarity in globalization" provides also a lens through which, the interconnectedness of issues like employment and fish farming within the context of a globalized world is viewed. According to Pope John Paul II, solidarity requires individuals and societies to take responsibility for the common good, both locally and globally (Pope John-Paul II, 1991). This means considering the impact of economic activities like fish farming on communities and ecosystems, as well as on broader issues such as employment opportunities for young people. It also means advocating for policies and practices that promote justice, sustainability, and human dignity in all aspects of globalization.

Additionally, at the heart of Pope John Paul II's message on solidarity is a commitment to upholding the dignity of every person. This includes ensuring that young people have access to meaningful employment opportunities that allow them to support themselves and contribute to society. It also means promoting ethical practices in businesses like fish farming that respect the rights and well-being of workers, communities, and the environment.

Overall, the employment opportunities that can offer the fish farming business, can play a crucial role in affirming and enhancing the dignity of youth. Providing them with the necessary means to support themselves and their families can contribute to society, personal fulfilment, and empowerment. This can stimulate them to pursue their aspirations and lead meaningful lives. Such endeavour aligns closely with the fundamental principles espoused in various encyclicals, apostolic exhortations, and Catholic social teachings. Indeed, the principles of Catholic Social Teaching affirm the positive impact of a fish farming business on youth employment in Kamuthanga.

6.3. Conclusion

The present study investigated the intersection of entrepreneurship and anthropological entrepreneurship theories, exploring the diverse potentials of fish farming business in relation to youth employment in Kamuthanga village, Machakos County. The research focused on assessing the impact of the fish farming industry in Kamuthanga on young people's employment opportunities. Drawing on the specific objectives outlined in the study, the following conclusions were reached:

First, in analysing the potential of fish farming for youth employment in Kamuthanga, Machakos County, the findings indicated that the fish farming business holds promise in alleviating unemployment and poverty, providing economic empowerment, addressing nutritional deficiencies, and enhancing overall food security. Second, when investigating the factors hindering the involvement of Kamuthanga youth in the fish farming business, it was observed that the scarcity of water, financial challenges, and certain cultural barriers emerge as significant constraints preventing the youth from participating in the fish farming sector. Finally, in the pursuit of identifying strategies to attract youth to the fish farming business in Kamuthanga, the study concluded that effective water resources management, targeted training and capacity-building initiatives, and the availability of financial support or credit facilities play crucial roles in motivating and encouraging the youth to embrace fish farming as a viable and sustainable livelihood option.

In summary, this research highlights the potential of fish farming as a venture for positive socio-economic change in Kamuthanga, providing valuable insights into both the opportunities and challenges faced by the youth in engaging with the fish farming industry. The identified constraints and proposed solutions contribute to the formulation of informed strategies and interventions aimed at fostering youth participation and success in the field of fish farming.

6.4. Recommendations

Based on the challenges identified within the study findings (scarcity of water, financial problems, cultural problems, issues related to land availability, electricity challenges, security concerns in the area, the exorbitant costs associated with government license requirements, and the impatience observed among the youth), the researcher makes the following recommendations

addressed to various stakeholders such as: County and national government, Non-Governmental Organizations (NGOs), leaders of the Kamuthanga local community, and Kamuthanga fish farm.

6.4.1. Machakos County and national government

The researcher recommends that the County and national government provide supportive regulations that address the challenges faced by youth interested in fish farming or other types of business, such as simplifying the process and reducing the costs associated with obtaining business licenses. There is, also, a definite need for investing in infrastructure development, particularly in water access and electricity provision, to alleviate the challenges faced by Kamuthanga fish farm and motivate more youth to embrace fish farming business. The government initiatives should focus on developing irrigation systems, promoting rainwater harvesting techniques, digging boreholes, and advocating for efficient water usage to ensure a consistent water supply for the community's needs. Another important practical implication is to offer training programs and extension services to educate the youth on modern fish farming techniques, financial management, and business skills in Kamuthanga.

6.4.2. Non-Governmental Organizations (NGOs)

Non-Governmental Organizations can provide capacity-building initiatives tailored to the needs of youth in Kamuthanga, offering training on entrepreneurship, financial literacy, and sustainable farming practices. Moreover, NGOs can facilitate access to microfinance loans and funding opportunities for the youth interested in starting their fish farming enterprises. Additionally, the NGOs can engage with local communities to raise awareness about the benefits of fish farming and to foster community support for youth involvement in the sector. Furthermore, collaborative efforts with educational institutions, vocational training centres, and industry experts can help design effective training programmes covering various aspects of fish farming, from technical skills to business management.

6.4.3. Leaders of Kamuthanga communities

The leaders of local communities can promote awareness about the benefits of fish farming among the youth through community meetings, workshops, and educational campaigns. About the issue of land accessibility, they can encourage landowners to lease or allocate land for the youth

interested in starting fish farms, ensuring access to suitable farming sites. Moreover, there is need to foster a supportive environment for youth engagement in fish farming by providing encouragement, mentorship, and networking opportunities within the community.

6.4.4. Kamuthanga fish farm

Kamuthanga fish farm can offer technical assistance and mentorship programs to youth interested in fish farming, providing guidance on farm management, disease control, and market access. Additionally, the farm can establish its demonstration facility where the youth can learn and gain hands-on experience in fish farming techniques under the supervision of experienced farmers. Moreover, it can facilitate market linkages for youth farmers by establishing partnerships with local markets, restaurants, and supermarkets to ensure a steady demand for locally produced fish.

6.5. Suggestions for further research

The study has brought to focus the various opportunities in fish farming and the strategies to overcome some constraints which are hindering the youth from getting involved in it. Exploring additional avenues beyond the scope of the current investigation could yield valuable insights in four ways. First, researchers may consider conducting an in-depth study in Kamuthanga village utilizing a mixed-method approach (qualitative and quantitative). By adopting this approach, not only would the sample size be augmented, but a more comprehensive understanding of the research area could also be attained. Qualitative data could provide rich insights into the experiences and perceptions of individuals involved in fish farming, while quantitative data could offer statistical validation and deeper insights into patterns and trends of people's ideas on fish farming.

Second, researchers could explore the possibility of a comparative study examining how fish farming impacts youth employment in Kamuthanga compared to other businesses within the region. Such a comparative analysis could shed light on the unique contributions of fish farming in addressing youth unemployment, as well as identify potential challenges and opportunities inherent in other economic sectors.

Third, an investigation could be undertaken in a different geographic location abundant in water resources, employing similar qualitative techniques to gather a diverse range of perspectives. This comparative approach would allow for the examination of how contextual factors influence

the dynamics of youth employment in fish farming across different regions, thereby enriching the understanding of the broader socio-economic implications of fish farming.

Fourth, highlighting the significance of participatory research methods in fostering collaboration and enhancing the relevance and applicability of research findings is crucial. By actively involving stakeholders, such as youth, local communities, and policymakers, in the research process, researchers can ensure that the findings resonate with the needs and priorities of the target audience. Participatory research methods can facilitate co-creation of knowledge, promote ownership of solutions, and ultimately lead to more sustainable and impactful interventions aimed at addressing youth unemployment in the context of fish farming.

6.6. Transformative ministerial action plan

This ministerial action plan outlines concrete steps to be taken by relevant government ministries and stakeholders to promote youth employment through fish farming initiatives. Each action is accompanied by specific strategies, responsible parties, timelines, and expected outcomes to ensure effective implementation.

ACTION	WHO	STRATEGY/ HOW	WHEN	OUTCOME
Empowering Kamuthanga fish farm for sustainable growth	Ministry of Agriculture, Department of Fisheries, Kamuthanga Fish Farm Management, Energy Regulatory Authority, Water Resource Management Authority, Fish Feed Suppliers.	Address Kamuthanga Fish Farm challenges by focusing on electricity shortage, water availability, and affordable fish feed access. Collaborate with authorities for swift resolution of electricity issues, utilizing upgrades or alternative energy. Improve water availability via sustainable practices and	Engage stakeholders immediately to develop and implement tailored solutions. Electricity and water infrastructure improvements should commence within the next 6-12 months, while partnerships with fish feed suppliers and youth engagement	By addressing these critical needs, Kamuthanga Fish Farm will experience enhanced operational efficiency and productivity. This comprehensive support will enable the farm to thrive sustainably, serving as a model for other youth-led enterprises in the aquaculture sector.

		<p>infrastructure development. Foster partnerships with fish feed suppliers for reliable access to quality feed. Promote Kamuthanga Aquaculture Academy to boost youth participation through specialized training and incentives.</p>	<p>initiatives should be ongoing.</p>	<p>Additionally, increased youth participation in the Kamuthanga Aquaculture Academy will foster a new generation of skilled aquaculturists, driving innovation and growth in the industry, and reducing the youth unemployment rate.</p>
<p>Access to capital for youth entrepreneurs</p>	<p>Ministry of Finance, Banks, Microfinance Institutions, Ministry of Agriculture.</p>	<p>Create subsidized loan programs specifically tailored for young entrepreneurs interested in starting their own business. Provide technical assistance in developing business plans.</p>	<p>Launch within the next fiscal year.</p>	<p>Increased youth participation in fish farming or other businesses as a viable entrepreneurial opportunity, leading to job creation and economic growth.</p>
<p>Investing in water infrastructure development</p>	<p>Ministry of Agriculture, Ministry of Infrastructure, Development Banks.</p>	<p>Allocate funds for the construction and rehabilitation of water infrastructures such as reservoirs, dams, and irrigation channels to support fish farming activities.</p>	<p>Begin infrastructure development projects within the next fiscal year.</p>	<p>Improved water storage and distribution infrastructure will enhance the easy availability of water in the region. Therefore, there will be a resilience of fish farming operations to</p>

				seasonal variations in water availability, contributing to stable employment opportunities for youth.
Promoting youth engagement in aquaculture research	Ministry of Education, Research Institutions, Fisheries Departments.	Fund research projects focusing on innovative and sustainable fish farming practices. Encourage youth participation through scholarships and grants	Initiate calls for research proposals within the next 3 months.	Generation of new knowledge and technologies in aquaculture, fostering youth interest and expertise in the sector.
Strengthening supportive policy environment	Ministry of Fisheries, Policy Think Tanks, Youth Associations.	Review existing policies and regulations to identify more barriers hindering youth participation in fish farming. Advocate for policy reforms to address these barriers and create an enabling environment.	Begin policy review process immediately; advocate for reforms over the next 12 months.	Improved policy frameworks that support and incentivize youth involvement in fish farming, leading to sustainable employment opportunities.

6.7. Reflexivity

As a researcher investigating the contribution of fish farming business to youth employment in Kamuthanga village, Machakos County, Kenya, it is essential to acknowledge personal biases, assumptions, and perspectives that may influence the research process and outcomes. Reflexivity plays a crucial role in ensuring the integrity and validity of the study. First, the background and experiences of the researcher shape the understanding of the research topic.

As a researcher who is experienced in the fish farming business at a small scale, he brings certain preconceptions about the potential benefits of fish farming for youth employment in rural areas. It is important to recognize how personal perspectives may influence the interpretation of the data and findings.

Second, the positionality of the researcher as an outsider to the community of Kamuthanga village introduces potential power dynamics and cultural differences that may affect the interactions with research participants. As a researcher from another country, the imbalance when engaging with the local community was noticed. This required sensitivity, tact, respect, and a willingness to listen to the voices and perspectives of the youth and other stakeholders in Kamuthanga village.

Moreover, reflexivity extends to the research methodology and data collection techniques. The researcher acknowledged the limitations and biases inherent in qualitative research methods such as interviews and focus group discussions. Despite efforts to maintain neutrality and objectivity, the presence of the researcher during the data collection may influence the responses of the participants. Therefore, the researcher strived to be transparent about the research objectives and methods, while also recognizing the subjectivity involved in data interpretation.

Furthermore, reflexivity prompts us to critically examine our role as researchers and the potential implications of our findings. While our study aims to shed light on the opportunities and challenges of fish farming for youth employment in Kamuthanga village, we must be cautious not to oversimplify or generalize the experiences of individuals within the community. We have an obligation to make sure that recommendations are based on a thorough understanding of the local context and realities, as the research findings may have practical ramifications for policy and practice.

In conclusion, reflexivity serves as a guiding principle throughout the research process, prompting the researcher to continuously reflect on his biases, assumptions, and positionality as researchers. By acknowledging and addressing these factors, the researcher strived to conduct a rigorous and ethical study that contributes to a deeper understanding of the role of fish farming in promoting youth employment and rural development in Kamuthanga village, Machakos County, Kenya.

6.8. Chapter summary

This chapter has given a general conclusion and recommendations on the contribution of fish farming business to youth employment in Kamuthanga, Machakos County, Kenya. Drawing insights from Scriptures and fundamental principles outlined in various encyclicals, apostolic exhortations, and Catholic social teachings, the significance of this study is underscored. Some suggestions for further research have also been presented in this chapter. The chapter has concluded with a ministerial action plan and the reflexivity.

REFERENCES

- Abend, G. (2013). *The Meaning of Theory: Sociological Theory*.
- Abwao, J., Musa, S., Ondiba, R., & Ogari, Z. (2021). Socioeconomic dynamics and characterization of land-based aquaculture in Western Kenya. *Aquatic Ecosystem Health & Management*, 24(1), 64-72.
- Adeleke, B., Robertson-Andersson, D., Moodley, G., & Taylor, S. (2020). Aquaculture in Africa: A comparative review of Egypt, Nigeria, and Uganda vis-a-vis South Africa. *Reviews in Fisheries Science & Aquaculture*, 29(2), 167-197.
- Ahmed, N., & Thompson, S. (2019). The blue dimensions of aquaculture: A global synthesis. *Science of the Total Environment*, 652, 851-861.
- Albasri, H., & Sammut, J. (2022). A comparative study of sustainability profiles between small-scale mariculture, capture fisheries and tourism communities within the Anambas Archipelago Small Island MPA, Indonesia. *Aquaculture*, 551, 737906.
- Ali, S. E., Jansen, M. D., Mohan, C. V., Delamare-Deboutteville, J., & Charo-Karisa, H. (2020 a). Key risk factors, farming practices and economic losses associated with tilapia mortality in Egypt. *Aquaculture*, 527, 735438.
- Ali, A. M., ElSayed, M. A., Radwan, R. I., & Hefny, R. M. (2020 b). An economic study of the fish production system in Egypt. *Sinai Journal of Applied Sciences*, 9(1), 105-116.
- Aloo, P. A., Charo-Karisa, H., Munguti, J., & Nyonje, B. (2017). A review on the potential of aquaculture development in Kenya for poverty alleviation and food security. *African Journal of Food, Agriculture, Nutrition and Development*, 17(1), 11832-11847.
- Alvarez, S. A., & Barney, J. B. (2000). *Toward a creation theory of entrepreneurship*. Working Paper, Ohio: Fisher College of Business.
- Alves, M. R., Codeço, C. T., Peiter, P. C., & Souza-Santos, R. (2019). Malaria and fish farming in the Brazilian Amazon Region: a strengths, weaknesses, opportunities, and threats analysis. *Revista da Sociedade Brasileira de Medicina Tropical*, 52.
- Andayi, v. L. (2018). *Socio-economic factors influencing performance of fish farming in Kwanza Constituency-Trans-nzoia County, Kenya* (doctoral dissertation, doctoral dissertation, University of Nairobi).
- Angermayr, G., Palacio, A., & Chaminade, C. (2023). Small-scale freshwater aquaculture, income generation and food security in rural Madagascar. *Sustainability*, 15(21), 15439.

- Anjejo, K. O. (2019). *Cage Fish Farming and Its Effects on Livelihoods of Fisherfolk Within Anyanga Beach, Siaya County, Kenya* (Doctoral dissertation, University of Nairobi).
- Argade, S., Pailan, G. H., Mahapatra, B. K., Dutta, S., Munilkumar, S., Dasgupta, S., ... & Xavier, K. M. (2023). Impact of skill development trainings on fish farmers' knowledge and attitude: A case study from Bihar, India. *Indian Journal of Fisheries*, 70(1).
- Arulingam, I., Nigussie, L., Senaratna Sellamuttu, S., & Debevec, L. (2019). *Youth participation in small-scale fisheries, aquaculture and value chains in Africa and the Asia-Pacific*. CGIAR Research Program on Fish Agri-Food Systems.
- Aura, C. M., Musa, S., Yongo, E., Okechi, J. K., Njiru, J. M., Ogari, Z., ... & Oucho, J. A. (2018). Integration of mapping and socio- economic status of cage culture: Towards balancing lake- use and culture fisheries in Lake Victoria, Kenya. *Aquaculture Research*, 49(1), 532-545.
- Avadí, A., Cole, S. M., Kruijssen, F., Dabat, M. H., & Mungule, C. M. (2022). How to enhance the sustainability and inclusiveness of smallholder aquaculture production systems in Zambia?. *Aquaculture*, 547, 737494.
- Blaxter, L., Hughes, C., & Tight, M. (2006). How to research (3rd ed.). *Maidenhead, UK: Open University Press*.
- Boase, N. J., White, M. P., Gaze, W. H., & Redshaw, C. H. (2019). Why don't the British eat locally harvested shellfish? The role of misconceptions and knowledge gaps. *Appetite*, 143, 104352.
- Bradford, K., & Katikiro, R. E. (2019). Fighting the tides: A review of gender and fisheries in Tanzania. *Fisheries Research*, 216, 79-88.
- Cai, L., Wang, J., Peng, J., Tan, Z., Zhan, Z., Tan, X., & Chen, Q. (2017). Characteristic of microplastics in the atmospheric fallout from Dongguan city, China: preliminary research and first evidence. *Environmental Science and Pollution Research*, 24(32), 24928-24935.
- Chan, C. Y., Tran, N., Cheong, K. C., Sulser, T. B., Cohen, P. J., Wiebe, K., & Nasr-Allah, A. M. (2021). The future of fish in Africa: Employment and investment opportunities. *PLoS ONE*, 16(12 December). <https://doi.org/10.1371/JOURNAL.PONE.0261615>
- County Government of Machakos. (2018). *Machakos County Integrated Development Plan 2018 2022* 2 PDF. [https://www.scribd.com/document/449067961/Machakos-County-Integrated-Development-Plan-2018-2022-2-pdf\[3\]](https://www.scribd.com/document/449067961/Machakos-County-Integrated-Development-Plan-2018-2022-2-pdf[3])

- County Government of Machakos. (2023). *Machakos County Integrated Development Plan 2023-2027*. [https://repository.kippra.or.ke/handle/123456789/4336\[1\]](https://repository.kippra.or.ke/handle/123456789/4336[1])
- Creswell, J. (2013). *Qualitative Inquiry Research Design. Choosing among five approaches*. University of Nebraska, Lincoln, *Sage Publications*, 3rd Edition.
- Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (4th ed.). Boston, MA: Pearson Education, Inc.
- Creswell, J. W. (1998). *Qualitative inquiry and research design: Choosing among five traditions*. *Sage Publications, Inc.*
- Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). Thousand Oaks, CA: Sage Publications.
- Creswell, J. W. (1998). *Qualitative inquiry and research design: Choosing among five traditions*. Thousand Oaks, CA: Sage.
- Das, M., Islam, M. R., Akter, T., Kawser, A. Q. M. R., & Mondal, M. N. (2018). Present status, problems and prospect of fish farming at Gazipur Sadar upazila in Bangladesh. *Progressive Agriculture*, 29(1), 53-63.
- FAO. (2020). *The State of World Fisheries and Aquaculture 2020*. FAO. <https://doi.org/10.4060/ca9229en>
- Ferrando, M. (2023). *Fish Farmers in the Nile River Delta: Empty Lakes and Dirty Waters*. Middle East Institute. <https://www.mei.edu/publications/fish-farmers-nile-river-delta-empty-lakes-and-dirty-waters>
- Filipski, M., & Belton, B. (2018). Give a man a fishpond: modeling the impacts of aquaculture in the rural economy. *World Development*, 110, 205-223.
- Fisher, B., Naidoo, R., Guernier, J., Johnson, K., Mullins, D., Robinson, D., & Allison, E. H. (2017). Integrating fisheries and agricultural programs for food security. *Agriculture & Food Security*, 6(1), 1-7.
- Food and Agriculture Organization (FAO). (2009). *The state of world fisheries and aquaculture, 2008*. FAO Fisheries and Aquaculture Department, Food and Agriculture Organization of the United Nations. Rome, Italy: FAO.
- Francis, P. (2020). *Fratelli Tutti: Encyclical on Fraternity and Social Friendship*. Orbis Books.
- Francis, P. (2014). *Evangelii Gaudium-the Joy of the Gospel*. Word Among Us Press.

- Garza-Gil, M. D., Surís-Regueiro, J. C., & Varela-Lafuente, M. M. (2017). Using input–output methods to assess the effects of fishing and aquaculture on a regional economy: The case of Galicia, Spain. *Marine Policy*, 85, 48-53.
- Gatonye, M. W. (2017). *Factors influencing sustainability of small scale fish farming projects in Kenya: the case of south Imenti Sub-County, Meru county*.
- Gephart, J. A., Troell, M., Henriksson, P. J., Beveridge, M. C., Verdegem, M., Metian, M., ... & Deutsch, L. (2017). The sea food gap' in the food-water nexus literature—issues surrounding freshwater use in seafood production chains. *Advances in Water Resources*, 110, 505-514.
- Goldburg, R., & Naylor, R. (2005). Future seascapes, fishing, and fish farming. *Frontiers in Ecology and the Environment*, 3(1), 21–28. [https://doi.org/10.1890/1540-9295\(2005\)003\[0021:FSFAFF\]2.0.CO;2](https://doi.org/10.1890/1540-9295(2005)003[0021:FSFAFF]2.0.CO;2)
- Government of Kenya. (2010). *The Constitution of Kenya 2010*. Nairobi: Government Printer.
- Gray, D. E. (2014). *Doing Research in the Real World* (3rd ed.). Sage Publications.
- Grolemund, G., & Wickham, H. (2014). A cognitive interpretation of data analysis. *International Statistical Review*, 82(2), 184-204.
- Haque, A. M., & Dey, M. M. (2017). Impacts of community-based fish culture in seasonal floodplains on income, food security and employment in Bangladesh. *Food Security*, 9, 25-38.
- Hasselberg, A. E., Aakre, I., Scholtens, J., Overå, R., Kolding, J., Bank, M. S., ... & Kjellefold, M. (2020). Fish for food and nutrition security in Ghana: Challenges and opportunities. *Global Food Security*, 26, 100380.
- Hossan, D., Mansor, Z. D., & Jaharuddin, N. S. (2023). Research population and sampling in quantitative study. *International Journal of Business and Technopreneurship*, 13(3), 209-222.
- Ifeonu, C. F., Chukwuemeka, V., & Agwu, E. A. (2019). Challenges of Youths Involved in Fish Farming in the Federal Capital Territory, Abuja, Nigeria. *Journal of Agricultural Extension*, 23(3), 156-171.
- International Labour Organization. (2019). *World Employment and Social Outlook: Trends 2019*. Geneva: International Labour Office.

- Islam, M. M., & Jentoft, S. (2017). Addressing disaster risks and climate change in coastal Bangladesh: Using the Small-Scale Fisheries Guidelines. *The Small-Scale Fisheries Guidelines: global implementation*, 521-539.
- Joppe, G. (2000). Testing reliability and validity of research instruments. *Journal of American Academy of Business Cambridge*, 4(1/2), 49-54.
- Jumatli, A., & Ismail, M. S. (2021). Promotion of sustainable aquaculture in Malaysia. In *Proceedings of the International Workshop on the Promotion of Sustainable Aquaculture, Aquatic Animal Health, and Resource Enhancement in Southeast Asia* (pp. 31-40). Aquaculture Department, Southeast Asian Fisheries Development Center.
- Kabir, K. H., Uddin, M. N., Rahman, S., Darr, D., & Drubo, M. A. Z. S. (2022). Opportunities and determinants for rural youth engagement in catfish farming: empirical evidence from north-central Bangladesh. *Aquaculture International*, 30(5), 2557-2578.
- Kaewnuratchadasorn, P., Smithrithee, M., Sato, A., Wanchana, W., Tongdee, N., & Sulit, V. T. (2020). Capturing the impacts of COVID-19 on the fisheries value chain of Southeast Asia. *Fish for the People*, 18(2), 2-8.
- Kenya National Bureau of Statistics (KNBS) (2019). *Statistical Abstract*. Nairobi
- Kenya National Bureau of Statistics (KNBS). 2019 Kenya Population and Housing Census Volume I: Population by County and Sub-County; KNBS Publications: Nairobi, Kenya, 2019.
- Khanjani, M. H., & Sharifinia, M. (2020). Biofloc technology as a promising tool to improve aquaculture production. *Reviews in aquaculture*, 12(3), 1836-1850.
- Kitema, L. K. (1987). *A comparative study of Akamba and Christian worship* (Doctoral dissertation).
- Kwikiriza, G., Mwesigwa, T., Barekye, A., Abaho, I., Rwaheru Aheisibwe, A., & Mwesige, R. (2018). Prospects of cage fish farming in South Western Uganda.
- Laghari, M. Y. (2018). *Aquaculture in Pakistan: Challenges and opportunities*.
- Longo, S. B., Clark, B., York, R., & Jorgenson, A. K. (2019). Aquaculture and the displacement of fisheries captures. *Conservation Biology*, 33(4), 832-841. <https://doi.org/10.1111/cobi.13295>.

- Marshall, K. (2017). *Kenya's Complex and Vibrant Religious Landscape: Features and Prospects*.
<https://berkeleycenter.georgetown.edu/publications/kenya-s-complex-and-vibrant-religious-landscape-features-and-prospects>
- Matolla, G. K. (2019). Integrated aquaculture: Balancing food production systems and livelihoods in Kenya. In *Multifunctional Land Uses in Africa* (pp. 78-95). Routledge.
- Maykut, P. S., & Morehouse, R. E. (1994). *Beginning qualitative research: A philosophic and practical guide* (Vol. 6). Psychology Press.
- Maxwell, D. G. (1996). Measuring food insecurity: the frequency and severity of “coping strategies”. *Food policy*, 21(3), 291-303.
- Mehrim, A. I., & Refaey, M. M. (2023). An overview of the implication of climate change on fish farming in Egypt. *Sustainability*, 15(2), 1679.
- Merriam, R. E. (2014). *Dark December: The Full Account Of The Battle Of The Bulge [Illustrated Edition]*. Pickle Partners Publishing.
- Minh-Thu, P., Minh Sang, H., & Thai An, H. (2021). Mariculture in southern central region, Vietnam: Status and orientation toward sustainable development. *Journal of Agriculture and Ecology Research International*, 22(5), 28-37.
- Mitchell, R. K., Busenitz, L., Lant, T., McDougall, P. P., Morse, E. A., & Smith, J. B. (2002). Toward a theory of entrepreneurial cognition: Rethinking the people side of entrepreneurship research. *Entrepreneurship theory and practice*, 27(2), 93-104.
- Mitra, S., Khan, M. A., & Nielsen, R. (2019). Credit constraints and aquaculture productivity. *Aquaculture Economics & Management*, 23(4), 410-427.
- Morgan, M., Terry, G., Rajaratnam, S., & Pant, J. (2017). Socio- cultural dynamics shaping the potential of aquaculture to deliver development outcomes. *Reviews in Aquaculture*, 9(4), 317-325.
- Mramba, R. P., & Kahindi, E. J. (2023). Pond water quality and its relation to fish yield and disease occurrence in small-scale aquaculture in arid areas. *Heliyon*, 9(6).
<https://doi.org/10.1016/J.HELIYON.2023.E16753>
- Muddassir, M., Noor, M. A., Ahmed, A., Aldosari, F., Waqas, M. A., Zia, M. A., ... & Jalip, M. W. (2019). Awareness and adoption level of fish farmers regarding recommended fish farming practices in Hafizabad, Pakistan. *Journal of the Saudi Society of Agricultural Sciences*, 18(1), 41-48.

- Mugah, M. S. (2020). The Perceived benefits of Fish Farming to Rural Communities: The Demotivating Factors of The Sector's Development in Busia County, Kenya. *Beyond Borders: Advances in Global Welfare*, 1(1), Article 1. <https://ejournals.bc.edu/index.php/bbagw/article/view/13049>
- Muliro, M. N. (2016). *Persistence of traditional oathing among Kamba Christians in Machakos County* (Doctoral dissertation, Egerton University).
- Munguti, J. M., Kim, J. D., & Ogello, E. O. (2014). An overview of Kenyan aquaculture: Current status, challenges, and opportunities for future development.
- Munene, B. & Wanjiku, A. (2020). *Contribution of Fisheries to Job Creation Among the Youth in Kenya*. <https://doi.org/10.13140/RG.2.2.17588.37764>
- Mutunga, R. (1994). *The Akamba traditional religion and Christianity: a philosophical study* (Doctoral dissertation).
- Namisi, P. (2021). Fisheries training institute (FTI) training needs assessment.
- Nasr-Allah, A., Gasparatos, A., Karanja, A., Dompok, E. B., Murphy, S., Rossignoli, C. M., ... & Charo-Karisa, H. (2020). Employment generation in the Egyptian aquaculture value chain: implications for meeting the sustainable development goals (SDGs). *Aquaculture*, 520, 734940.
- Nathenson, P., S., Hgdon, P., & Ostheimer, E. (2017). No sex for fish: empowering women to promote health and economic opportunity in a localized place in Kenya. *Health promotion international*, 32(5), 800-807.
- Ndeti, K. (1972). *Elements of Akamba life*.
- Ngugi, C. C., Kitur, E., Wairimu, T. O., Mwangi, B. M., & Nzeve, J. K. (2019). Impact of aquaculture development on water quality of fish ponds in gatundu North and south sub-counties, Kenya.
- Nguka, G., Shitote, Z., Wakhungu, J., & China, S. (2017). Effect of fish farming on household food security in Western Kenya. *African Journal of Food, Agriculture, Nutrition and Development*, 17(1), 11657-11672.
- Nzevu, J. M., Amwata, D. A., & Mutua, A. K. (2018). Status of socio-economic parameters of fish farmers in Kitui Central Sub-County, Kitui County. *Journal of Research in Agriculture and Animal Science*, 5(1), 28-41.
- Nzioki, S. (1982). Kenya's people: Akamba. *London: Evans Brothers Limited*.

- Obiero, K. O., Waidbacher, H., Nyawanda, B. O., Munguti, J. M., Manyala, J. O., & Kaunda-Arara, B. (2019a). Predicting uptake of aquaculture technologies among smallholder fish farmers in Kenya. *Aquaculture International*, 27(6), 1689–1707. <https://doi.org/10.1007/s10499-019-00423-0>
- Obiero, K., Cai, J., Abila, R., & Ajayi, O. (2019b). Kenya: high aquaculture growth needed to improve food security and nutrition. Rome, Italy. Retrieved from <http://www.fao.org/3/ca4693en/ca4693en.pdf>
- Obiero, K., Munguti, J., Ani, J., & Liti, D. (2019). *Inventory of climate smart agriculture technologies, innovations and management practices (timps) for aquaculture value chain Compiled By*. <http://www.fao.org/3/na401en/na401en.pdf>
- Odhone, A. O., Mahiri, I. O., & Onsongo, F. O. (2020). Assessing Gender Roles in Daga Fishery Value Chain among Fishing Communities on Lake Victoria, A Case Study of Lake Victoria Beaches In Siaya County, Kenya. *International Journal of Current Aspects*, 4(2), 13-32.
- Ogello, E. O., Outa, N. O., Obiero, K. O., Kyule, D. N., & Munguti, J. M. (2021). The prospects of biofloc technology (BFT) for sustainable aquaculture development. *Scientific African*, 14, e01053.
- Oladiran, S. S., Agude, T., Adeosun, D. G., Adediji, B. A., & Yilson, J. (2021). Perception of youth towards fish farming in oluyole local government area of oyo state, Nigeria.
- Ole-Moiyoi, L. K. (2017). *Fishing for answers: can aquaculture transform food security in rural Kenya* (Doctoral dissertation, Stanford University).
- Oloko, A., Fakoya, K., Ferse, S., Breckwoltd, A., & Harper, S. (2022). The challenges and prospects of women fisherfolk in Makoko, Lagos State, Nigeria. *Coastal Management*, 50(2), 124-141.
- Opiyo, M. A., Marijani, E., Muendo, P., Odede, R., Leschen, W., & Charo-Karisa, H. (2018). A review of aquaculture production and health management practices of farmed fish in Kenya. *International Journal of Veterinary Science and Medicine*, 6(2), 141-148.
- Orinda, M., Okuto, E., & Abwao, M. (2021). Cage fish culture in the lake victoria region: Adoption determinants, challenges and opportunities. *International Journal of Fisheries and Aquaculture*, 13(2), 45-55.
- Pantha, B. (2022). Cage fish farming for the livelihood improvement of the local people in Kulekhani, Nepal (Master's thesis, UiT The Arctic University of Norway).

- Patton, M. Q. (1999). Enhancing the quality and credibility of qualitative analysis. *Health services research, 34*(5 Pt 2), 1189.
- Perrini, F., Vurro, C., & Costanzo, L. A. (2010). A process-based view of social entrepreneurship: From opportunity identification to scaling-up social change in the case of San Patrignano. *Entrepreneurship & Regional Development, 22*(6), 515-534.
- Pomeroy, R., Arango, C., Lomboy, C. G., & Box, S. (2020). Financial inclusion to build economic resilience in small-scale fisheries. *Marine policy, 118*, 103982.
- Pope John Paul II. (1991). Centesimus Annus, *The Hundredth Year: Vol. II*.
- Rege, J. E. O., & Ochieng, J. W. (2022). The State of Capacities, Enabling Environment, Applications and Impacts of Biotechnology in the Sub-Saharan Africa Aquaculture Sector. In *Agricultural Biotechnology in Sub-Saharan Africa: Capacity, Enabling Environment and Applications in Crops, Livestock, Forestry and Aquaculture* (pp. 145-171). Cham: Springer International Publishing.
- Rumelt, R. P. (2005). Theory, strategy, and entrepreneurship. In *Handbook of entrepreneurship research: Interdisciplinary perspectives* (pp. 11-32). Boston, MA: Springer US.
- Sakshi, G. (2021). Effectiveness of transport guidelines on intra hospital transport practices of nurses and occurrence of mishaps among critically ill patients. *Indian Journal of Forensic Medicine & Toxicology, 15*(1), 87-94.
- Sangirova, U., Khafizova, Z., Yunusov, I., Rakhmankulova, B., & Kholiyorov, U. (2020). The benefits of development cage fish farming. *E3S Web of Conferences, 217*, 09006. <https://doi.org/10.1051/e3sconf/202021709006>
- Schoch, K. (2020). Case study research. *Research design and methods: An applied guide for the scholar-practitioner, 245-258*.
- Selvam. S.G. (2017). *Empirical Research: A Study Guide*. Pauline Publications. Nairobi, Kenya.
- Shane, S. (1994). Cultural values and the championing process. *Entrepreneurship Theory and Practice, 18*(4), 25-41.
- Singh, A. S., & Masuku, M. B. (2014). Sampling techniques & determination of sample size in applied statistics research: An overview. *International Journal of Economics, Commerce and Management, 2*(11), 1–22.
- Stewart, A. (1992). A prospectus on the anthropology of entrepreneurship. *Entrepreneurship Theory and Practice, 16*(2), 71-92.

- The Fish Site. (2023). Kamuthanga: East Africa's first Eco Mark fish farm. <https://thefishsite.com/articles/kamuthanga-east-africas-first-ecomark-fish-farm>
- The new African Bible*. (2012). Paulines Publications Africa.
- Twumasi, M. A., Jiang, Y., Zhou, X., Addai, B., Darfor, K. N., Akaba, S., & Fosu, P. (2021). Increasing Ghanaian fish farms' productivity: Does the use of the internet matter? *Marine Policy*, 125, 104385.
- Uduji, J. I., & Okolo-Obasi, E. N. (2020). Does corporate social responsibility (CSR) impact on development of women in small-scale fisheries of sub-Saharan Africa? Evidence from coastal communities of Niger Delta in Nigeria. *Marine policy*, 118.
- Valladão, G. M. R., Gallani, S. U., & Pilarski, F. (2018). South American fish for continental aquaculture. *Reviews in Aquaculture*, 10(2), 351-369.
- Verver, M., & Koning, J. (2024). An anthropological perspective on contextualizing entrepreneurship. *Small Business Economics*, 62(2), 649-665.
- Wairimu, t. O. (2019). *Influence of aquaculture development on fish pond water quality and livelihoods of fish farmers in gatundu, kiambu county* (doctoral dissertation, kenyatta university).
- Wernerfelt, B. (1984). A resource- based view of the firm. *Strategic management journal*, 5(2), 171-180.
- Zahra, S. A., & Wright, M. (2016). Understanding the social role of entrepreneurship. *Journal of management studies*, 53(4), 610-629.
- Zohra, F. T., Haque, S. M., Sheheli, S., & Rana, M. M. (2022). Capacity strengthening of fish farmers for improving their livelihood in Mymensingh district of Bangladesh. *Archives of Agriculture and Environmental Science*, 7(2), 156-165.

APPENDICES

APPENDIX I: Consent form for all interviewees

Title of the Research: Contribution of fish farming business to youth employment in Kamuthanga village, Machakos County, Kenya.

<ul style="list-style-type: none">• The research is being carried out by a Tangaza University College student from the Institute for Social Transformation.• There are no known dangers to participants, and no deceit is used in the study.• In order to explore the contribution of fish farming business to youth employment in Kamuthanga village, Machakos County, Kenya, attendees must complete a set of questions.• Feedback will be kept private.• There will be no monetary remuneration for participating in this study.• Interviewees have the right and ability to withdraw at any moment because they are volunteers.
Name of the researcher: BAISSA ATAKPA
Position of the researcher: Master’s student in Social Transformation specializing in Sustainable Human Development
Contact of the college: Tangaza University College; PO Box 15055 (00509), Langata South Road, Nairobi-Kenya. Tel. +254 722204724
Contact of the researcher: Email; mariusatakpa92@gmail.com . Tel No. +254112239351
Signed by the researcher:
Date:
Statement to be signed by the interviewee <ul style="list-style-type: none">• I confirm that the organizer has fully explained the nature of the research and the range of activities that will be required of me, and that I have received an information sheet.• I confirm that I have had ample opportunity to inquire about this investigation.• I understand that my participation is entirely voluntary and that I may withdraw at any time during the interview session without explanation.• I agree to participate in this research.
Signed by the interviewee:
Date:

APPENDIX II: Demographic information (for all participants)

1. Gender:
2. Age:
 - a. Less than 15 years old?
 - b. 16 to 26 years old?
 - c. 27 to 37 years old?
 - d. 38 to 48 years old?
 - e. 49 to 59 years old?
 - f. More than 60 years old
3. Level of education:
4. Occupation:
5. Marital status:
6. Family size:

APPENDIX III: In-depth interview guide (for youth who are working in Kamuthanga fish farm)

No	Research objectives	Variables of the study	In-depth schedule
1	Examine the opportunities of fish farming for youth employment in Kamuthanga, Machakos County.	Job creation	<ol style="list-style-type: none"> 1. What motivated you to get involved in fish farming? 2. Do you think that fish farming is a worthy business for youths to be enrolled in? 3. How do you think the expansion of fish farming could benefit the local community in terms of job creation and economic development? 4. How do you see fish farming compare to other types of jobs in the region in terms of pay, benefits, and job security?
		Income generation	<ol style="list-style-type: none"> 5. What is your experience with fish farming, and how has it contributed to your income and livelihood? 6. How have you seen the fish farming industry change in recent years in terms of income generation opportunities? 7. What is the average income generated by fish farming?
		Food security	<ol style="list-style-type: none"> 8. Do many people like to eat fish? 9. How does fish farming contribute to local food security? 10. What types of fish products are most important for local food security, and how are they typically consumed or distributed?
2.	Assess the factors restraining the Kamuthanga youth involvement in fish farming business.	Problem of water	<ol style="list-style-type: none"> 11. How is the availability of water in the village? 12. How does access to water impact the success of fish farming operations? 13. Do you think that the accessibility of water is an important issue for youth to get involved in fish farming business?
		Culture influence	<ol style="list-style-type: none"> 14. What is the traditional perception of fish in Kamuthanga village? 15. Are there any cultural practices in Kamuthanga village that affect fish farming practices? 16. How do gender roles and cultural norms affect fish farming in Kamuthanga village?

		Financial problem	<p>17. Are there any financial management challenges associated with running a fish farming business in Kamuthanga village?</p> <p>18. Do you think that youth are facing financial problem to embrace fish farming business?</p> <p>19. Are there any government programs or incentives available to support fish farming in Kamuthanga village, and how accessible are these programs to farmers?</p>
3	Suggest the strategies for enticing youth into fish farming business in Kamuthanga	Water resources management	<p>20. What role do you see youth playing in addressing water challenges in the village?</p> <p>21. How can the government or other organizations support youth engagement in fish farming while also addressing water challenges?</p>
		Training and capacity building	<p>22. What efforts the Kamuthanga fish farm is making to attract and retain a diverse workforce in fish farming, and what strategies have been successful?</p> <p>23. Do you think that training and capacity building are important for the fish farming business sustainability among the Kamuthanga youths?</p>
		Financial support /Credit facilities	<p>24. What strategies can be implemented to overcome financial challenges faced by fish farmers and youth who would like to embrace fish farming business in Kamuthanga village?</p> <p>25. What role do community leaders play in promoting or inhibiting the development of fish farming in Kamuthanga village?</p> <p>26. What efforts have been made to support small-scale fish farmers in accessing markets and increasing their income, and what strategies have been successful?</p>

APPENDIX IV: In-depth interview guide (for key informants)

No	Research objectives	Variables of the study	In-depth schedule
1	Examine the opportunities of fish farming for youth employment in Kamuthanga, Machakos County.	Job creation	<ol style="list-style-type: none"> 1. What motivated you to get involved in fish farming? 2. What is your view about fish farming a business option for the youth? 3. How do you think the expansion of fish farming could benefit the local community in terms of job creation and economic development? 4. How do you see fish farming jobs compare to other types of jobs in the region in terms of pay, benefits, and job security?
		Income generation	<ol style="list-style-type: none"> 5. What is your experience with fish farming, and how has it contributed to your income and livelihood? 6. How have you seen the fish farming industry change in recent years in terms of income generation opportunities? 7. What is the average income generated by fish farming? 8. What factors contribute to the profitability of fish farming, and what strategies have been successful for increasing income?
		Food security	<ol style="list-style-type: none"> 9. What are your observations or insights regarding the preferences of people when it comes to consuming fish? 10. How does fish farming contribute to local food security? 11. What types of fish products are most important for local food security, and how are they typically consumed or distributed?
2.	Assess the factors restraining the Kamuthanga youth involvement in fish farming business.	Problem of water	<ol style="list-style-type: none"> 12. How is the availability of water in the village? 13. How does access to water impact the success of fish farming operations? 14. Do you think that the accessibility of water is an important issue for youth to get involved in fish farming business?
		Culture problem	<ol style="list-style-type: none"> 15. What is the traditional perception of fish in Kamuthanga village? 16. What cultural practices within Kamuthanga village do you believe have an impact on fish farming practices?

			17. How do gender roles and cultural norms affect fish farming in Kamuthanga village?
		Financial problem	18. What financial management challenges do you believe are associated with operating a fish farming business in Kamuthanga village? 19. In what ways do you believe youth may encounter financial challenges when considering involvement in the fish farming business? 20. What insights can you provide regarding the availability and accessibility of government programs or incentives designed to support fish farming in Kamuthanga village?
3	Suggest the strategies for enticing youth into fish farming business in Kamuthanga	Water resources management	21. What role do you see youth playing in addressing water challenges in the village? 22. How can the government or other organizations support youth engagement in fish farming while also addressing water challenges?
		Training and capacity building	23. What efforts the Kamuthanga fish farm is making to attract and retain a diverse workforce in fish farming, and what strategies have been successful? 24. How do you perceive the importance of training and capacity building for ensuring the sustainability of fish farming businesses among the youth in Kamuthanga?
		Financial support /Credit facilities	25. What strategies can be implemented to overcome financial challenges faced by fish farmers and youth who would like to embrace fish farming business in Kamuthanga village? 26. What role do community leaders play in promoting or inhibiting the development of fish farming in Kamuthanga village? 27. What efforts have been made to support small-scale fish farmers in accessing markets and increasing their income, and what strategies have been successful?

APPENDIX V: In-depth interview guide (for unemployed youth)

No	Research objectives	Variables of the study	In-depth schedule
1	Examine the opportunities of fish farming for youth employment in Kamuthanga, Machakos County.	Job creation	<ol style="list-style-type: none"> 1. What are some of the key challenges that young people in Kamuthanga face when it comes to finding employment or starting their own businesses? 2. What do you know about fish farming business? 3. Have you or anyone you know engaged in fish farming? If yes, what were their experiences? 4. How interested are you and your peers in pursuing a career in fish farming or aquaculture? 5. What kind of training or support do you feel is needed to succeed in the fish farming business?
		Income generation	<ol style="list-style-type: none"> 6. Which business in Kamuthanga help more youth to generate valuable income? 7. Do you think that fish farming business can help youth to generate some income for their household?
		Food security	<ol style="list-style-type: none"> 8. Do you like eating fish? 9. What do you think are the benefits of eating fish? 10. What are your personal views on fish farming as a means of improving food security in Kamuthanga?
2	Assess the factors restraining the Kamuthanga youth involvement in fish farming business.	Problem of water	<ol style="list-style-type: none"> 11. How is the availability of water in the village? 12. What challenges have you or anyone you know faced in accessing adequate water for fish farming in Kamuthanga? 13. Do you think that if there were easy accessibility of water you could be involved in fish farming business?
		Culture problem	<ol style="list-style-type: none"> 14. What is the traditional perception of eating fish in Kamuthanga village? 15. Is the any traditional practice which does not allow you to do fish farming? 16. What are your personal views on the importance of addressing cultural challenges in fish farming, in Kamuthanga?
		Financial problem	<ol style="list-style-type: none"> 17. What do you think are some of the biggest misconceptions or challenges that young people in Kamuthanga face when it comes to starting their own businesses? 18. What do you know about the financial aspect of fish farming and the challenges faced by fish farmers in Kamuthanga?

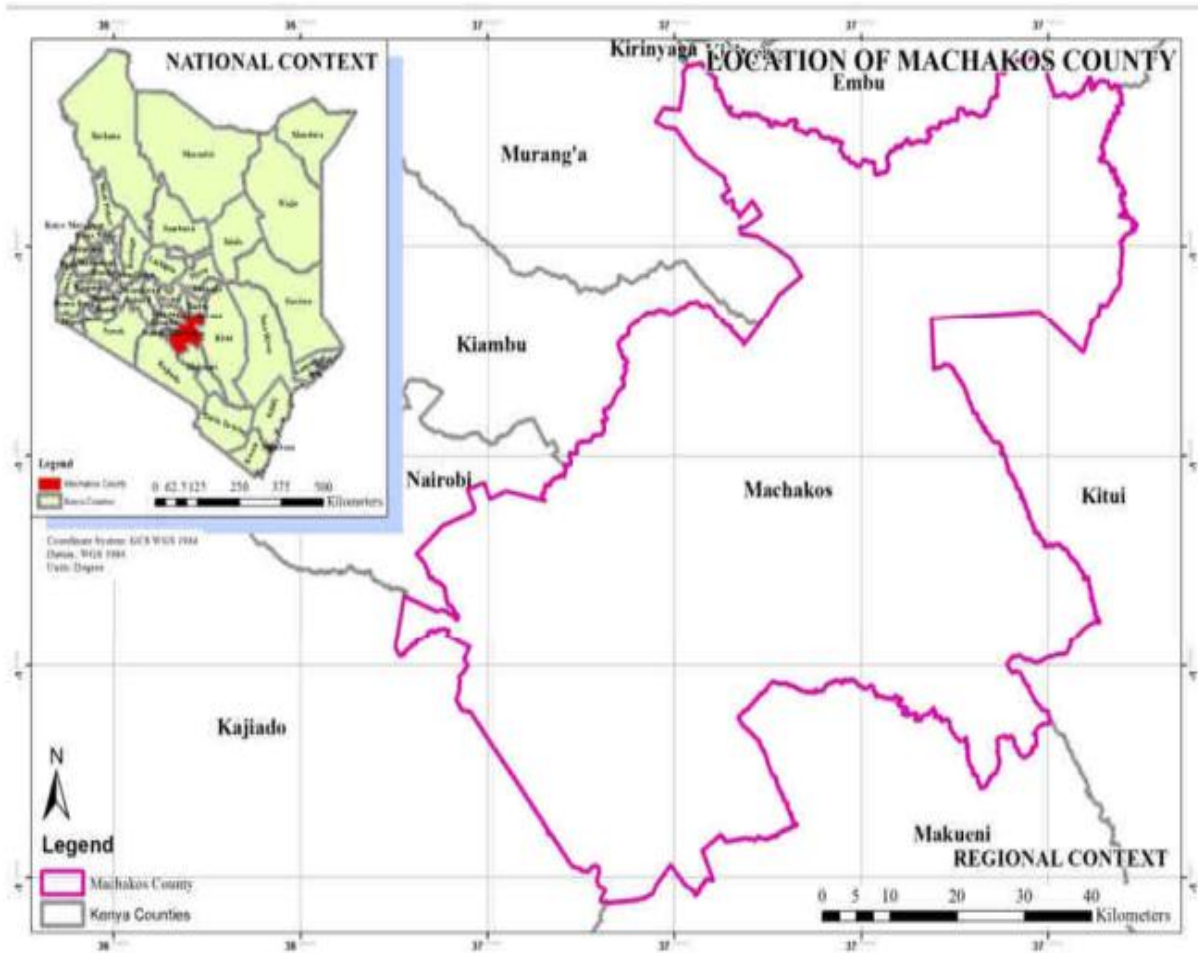
			19. Do you think that with some financial support you could start the fish farming business?
3	Suggest the strategies for enticing youth into fish farming business in Kamuthanga	Water resources management	20. What steps do you think can be taken to improve water availability and management in Kamuthanga? 21. Have you or anyone you know considered alternative water sources, such as rainwater harvesting or pond construction, for fish farming? If yes, what were the outcomes?
		Training and capacity building	22. What do you think should be done to encourage more young people in Kamuthanga to engage in fish farming? 23. Do you think that with some training support someone can get interested in the fish farming business?
		Financial support	24. What role can the government or other organizations play to help Kamuthanga youth embrace fish farming business? 25. What is the role of access to credit and financing in supporting the growth and the sustainability of fish farming in Kamuthanga, and how accessible are they to young people?

APPENDIX VI: In-depth interview guide (for unemployed youth focus group)

No	Research objectives	Variables of the study	In-depth schedule
1	Examine the opportunities of fish farming for youth employment in Kamuthanga, Machakos County.	Job creation	<ol style="list-style-type: none"> 1. What inspired your interest in fish farming? 2. How do you perceive the practicality and potential benefits of youth involvement in fish farming as a means of seeking employment? 3. How do you think expanding fish farming could positively impact job opportunities within the local community? 4. In your opinion, how do jobs in fish farming compare to other job opportunities in the region regarding pay, benefits, and job security?
		Income generation	<ol style="list-style-type: none"> 5. What is your experience with fish farming contribution to income and better livelihood? 6. What is the typical monthly income for a fish farmer?
		Food security	<ol style="list-style-type: none"> 7. What observations or insights can you share about the popularity of fish as a food choice within the local population? 8. How does fish farming contribute to enhancing local food security?
2	Assess the factors restraining the Kamuthanga youth involvement in fish farming business.	Problem of water	<ol style="list-style-type: none"> 9. What is the current status of water availability in the village? 10. In what ways does having access to water influence the overall success of fish farming operations? 11. To what degree do you believe that the accessibility of water serves as the primary challenge for youth participation in the fish farming business?
		Culture problem	<ol style="list-style-type: none"> 12. How is fish traditionally viewed in Kamuthanga village? 13. What are the specific cultural practices within Kamuthanga village that impact the way fish farming is carried out? 14. In what ways do gender roles play a role in shaping the dynamics of fish farming in Kamuthanga village?
		Financial problem	<ol style="list-style-type: none"> 15. Are there any challenges related to financial management when operating a fish farming business in Kamuthanga village? 16. To what degree do you believe that youth encounter financial difficulties when

			<p>considering involvement in the fish farming business?</p> <p>17. What are the existing government programs or incentives designed to support fish farming in Kamuthanga village?</p> <p>18. How easily can farmers access these initiatives?</p>
3	Suggest the strategies for enticing youth into fish farming business in Kamuthanga	Water resources management	<p>19. In what capacity do you envision youth contributing to resolving water challenges in the village?</p> <p>20. What measures can the government or other organizations take to facilitate youth involvement in fish farming while simultaneously addressing water challenges?</p>
		Training and capacity building	<p>21. How is the Kamuthanga fish farm actively working to draw in and maintain a diverse workforce in fish farming?</p> <p>22. Which strategies have proven effective in building the capacity of young individuals for fish farming?</p> <p>23. How do you perceive the training and capacity-building initiatives for youth involved in the fish farming business?</p>
		Financial support	<p>24. What approaches can be employed to overcome financial obstacles encountered by youth aspiring to venture into fish farming in Kamuthanga village?</p> <p>25. How do community leaders contribute to either advancing or hindering the progress of fish farming development in Kamuthanga village?</p>

APPENDIX VII: Geographical location of Machakos County in Kenya



Source: Machakos County Spatial Database

Figure 9: Geographical location of Machakos County in Kenya

APPENDIX VIII: University ethics clearance letter



TANGAZA UNIVERSITY COLLEGE

The Catholic University of Eastern Africa

OFFICE OF THE DIRECTOR OF RESEARCH & POST-GRADUATE STUDIES

E-mail: dir.pgsr@tangaza.ac.ke

Website: www.tangaza.ac.ke

OUR Ref: DPGSR/ER/08/2023

Date: 9th August 2023

Baissa Atakpa
Institute for Social Transformation
School of Arts & Social Sciences
Tangaza University College

Dear Baissa,

RE: ETHICS CLEARANCE FOR BAISSA ATAKPA, REG. NO. 20/00689

Reference is made to your letter dated 21st July 2023 requesting for ethical clearance of your research proposal to carry out a study on "*Contribution of fish farming business to youth employment in Kamuthanga Village, Machakos County*".

I am pleased to inform you that, your research proposal has been reviewed and you can apply for research permit from the National Commission for Science, Technology and Innovation (NACOSTI). This should be done before commencing the data collection. You are also advised to adhere to the code of ethics as regards the protection of human subjects during the entire process of your study.

This approval is valid for one year from **9th August 2023**.

Please, ensure that after the data analysis and final write up, you submit a soft copy of the thesis to the Director of Research & Post-Graduate Studies – Tangaza University College for records purposes.

Yours sincerely,



DR. DANIEL M. KITONGA (Ph.D.)
Director, Research & Post-Graduate Studies
Tangaza University College

CC: **Dr. Aloys O. Ojore** – Programme Leader, M.A. Social Transformation (IST)

APPENDIX IX: University research permit letter



TANGAZA UNIVERSITY COLLEGE

The Catholic University of Eastern Africa

OFFICE OF THE DIRECTOR OF RESEARCH & POST GRADUATE STUDIES

E-mail: dir.pgsr@tangaza.ac.ke Website: www.tangaza.ac.ke

OUR Ref: DPGSR/ER/08/2023

Date: 9th August 2023

To The Commission Secretary,
National Commission for Science, Technology and Innovation
P.O. Box 30623,
Nairobi – Kenya.

Dear Sir/Madam,

Re: Research Permit for Baissa Atakpa

This is to confirm that the person named in this letter is a student at Tangaza University College (TUC). He is registered in the Institute for Social Transformation (Reg. No. 20/00689) and he is pursuing M.A degree in Social Transformation.

Baissa has met all our provisional academic requirements leading to data collection. However, he cannot proceed to the field before getting a Research Permit from the National Commission for Science, Technology and Innovation (NACOSTI). Kindly assist him to process the permit for data collection for his M.A. Thesis.

Thanking you in advance for your cooperation

Yours sincerely,



Dr. Daniel M. Kitonga (Ph.D.)

Director, Research & Post-Graduate Studies

CC:

Dr. Aloys O. Ojore – Programme Leader, M. A. Social Transformation (IST)

THE SCIENCE, TECHNOLOGY AND INNOVATION ACT, 2013 (Rev. 2014)
Legal Notice No. 108: The Science, Technology and Innovation (Research Licensing) Regulations, 2014

The National Commission for Science, Technology and Innovation, hereafter referred to as the Commission, was established under the Science, Technology and Innovation Act 2013 (Revised 2014) herein after referred to as the Act. The objective of the Commission shall be to regulate and assure quality in the science, technology and innovation sector and advise the Government in matters related thereto.

CONDITIONS OF THE RESEARCH LICENSE

1. The License is granted subject to provisions of the Constitution of Kenya, the Science, Technology and Innovation Act, and other relevant laws, policies and regulations. Accordingly, the licensee shall adhere to such procedures, standards, code of ethics and guidelines as may be prescribed by regulations made under the Act, or prescribed by provisions of International treaties of which Kenya is a signatory to
2. The research and its related activities as well as outcomes shall be beneficial to the country and shall not in any way:
 - i. Endanger national security
 - ii. Adversely affect the lives of Kenyans
 - iii. Be in contravention of Kenya's international obligations including Biological Weapons Convention (BWC), Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO), Chemical, Biological, Radiological and Nuclear (CBRN).
 - iv. Result in exploitation of intellectual property rights of communities in Kenya
 - v. Adversely affect the environment
 - vi. Adversely affect the rights of communities
 - vii. Endanger public safety and national cohesion
 - viii. Plagiarize someone else's work
3. The License is valid for the proposed research, location and specified period.
4. The license any rights thereunder are non-transferable
5. The Commission reserves the right to cancel the research at any time during the research period if in the opinion of the Commission the research is not implemented in conformity with the provisions of the Act or any other written law.
6. The Licensee shall inform the relevant County Director of Education, County Commissioner and County Governor before commencement of the research.
7. Excavation, filming, movement, and collection of specimens are subject to further necessary clearance from relevant Government Agencies.
8. The License does not give authority to transfer research materials.
9. The Commission may monitor and evaluate the licensed research project for the purpose of assessing and evaluating compliance with the conditions of the License.
10. The Licensee shall submit one hard copy, and upload a soft copy of their final report (thesis) onto a platform designated by the Commission within one year of completion of the research.
11. The Commission reserves the right to modify the conditions of the License including cancellation without prior notice.
12. Research, findings and information regarding research systems shall be stored or disseminated, utilized or applied in such a manner as may be prescribed by the Commission from time to time.
13. The Licensee shall disclose to the Commission, the relevant Institutional Scientific and Ethical Review Committee, and the relevant national agencies any inventions and discoveries that are of National strategic importance.
14. The Commission shall have powers to acquire from any person the right in, or to, any scientific innovation, invention or patent of strategic importance to the country.
15. Relevant Institutional Scientific and Ethical Review Committee shall monitor and evaluate the research periodically, and make a report of its findings to the Commission for necessary action.

National Commission for Science, Technology and
Innovation(NACOSTI),
Off Waiyaki Way, Upper Kabete,
P. O. Box 30623 - 00100 Nairobi, KENYA
Telephone: 020 4007000, 0713788787, 0735404245
E-mail: dg@nacosti.go.ke
Website: www.nacosti.go.ke

APPENDIX XI: University letter to confirm the student registration



TANGAZA UNIVERSITY COLLEGE

The Catholic University of Eastern Africa

8th January 2024

To Whom It May Concern

This is to confirm to you that the bearer of this note, Atakpa Baissa, is our registered student in the Institute for Social Transformation Reg. No. IST/20/00689. Atakpa has been cleared by NACOSTI via permit Ref. No. 481169 dated 3rd January 2024, to carry research on: *Contribution of Fish farming Business to Youth Employment in Kamuthanga Village, Machakos County, Kenya*. Kindly assist him with all he needs to complete the research.

Yours Faithfully,

A blue circular stamp of Tangaza University College, Institute for Social Transformation, Postgraduate Programs, with a handwritten signature in blue ink over it.

Dr. Aloys Otieno Ojore
IST MA Programme Leader.

APPENDIX XII: County commissioner research authorization permit



REPUBLIC OF KENYA
COUNTY GOVERNMENT OF MACHAKOS
OFFICE OF THE COUNTY SECRETARY

Telephone: +254734525402, +2540112344966

Email: countysecretary@machakos.go.ke

Machakos Highway
P.O. Box 1996-90100
Machakos, Kenya

When replying please quote:

OUR REF: GMC/2/CS/GEN/VOL. III/149

10th January, 2024.

To,
Baissa Atakpa
Passport No. EB751148
Tangaza University College (TUC)

RE: AUTHORITY TO CARRY OUT RESEARCH.

I trust this finds you well.

Reference is made to your letter dated 5th January, 2024 on the above subject.

This is to inform you that authority is hereby granted to you to collect data for your research at Kamuthanga area in Machakos County.

You are also requested to share the findings with the Chief Officer- Department of Livestock & Fisheries Development after the end of your research.

Thank you.



DR. MUYA NDAMBUKI (PhD)
COUNTY SECRETARY AND HEAD OF PUBLIC SERVICE

CC CECM- Agriculture, Food Security & Cooperative Development.
 Chief Officer- Department of Livestock & Fisheries Development

