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# EVALUATING THE IMPACT OF POND MANAGEMENT PRACTICES ON FISH PRODUCTIVITY IN LUWERO DISTRICT

**BY**

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**BU/UG/2022/1227**

**A DISSERTATION SUBMITTED TO THE FACULTY OF NATURAL RESOURCES AND ENVIRONMENTAL SCIENCES IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF BACHELOR'S DEGREE IN FISHERIES AND WATER RESOURCE MANAGEMENT OF BUSITEMA UNIVERSITY.**

**AUGUST, 2025**

## DECLARATION

I NABIRYE JOYCE BU/UG/2022/1227, do hereby declare that this is my original work and has not been submitted to any institution of learning or university for the award of Bachelor degree in fisheries and water resource management at Busitema University

Signature: Date: 28th/08/2025

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## APPROVAL

This is to certify that NABIRYE JOYCE developed this under our supervision and guidance. We therefore, recommend her to submit.

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## DEDICATION

I dedicate this report to my beloved parents Mr. Walubo Richard and Mrs. Edith Walubo for their tireless support throughout the course and my research. God bless them.

## ACKNOWLEDGEMENT

Firstly, I would like to appreciate the almighty God for protection, life and provision throughout the whole course and everything he has done in my life.

Special thanks go to my beloved supervisors Dr. Chloe Kemigabo and Madam Sarah Nakyazze, who have been with me from the time of the proposal development to this time when the thesis is accomplished. I am really thankful for your guidance, encouragement throughout my research.

I appreciate Mr. Simon who provided a list of fish farmers in Luwero district and the farmers of Luwero district for responding to me and also my friends who ensured I kept my truck on my research journey. Thank you so much.

Lastly, I am humbled to appreciate my family, more especially my parents, Mr. Richard Walubo, Mrs. Edith Walubo and Ms. Phelister Mudondo whose encouragement and financial support was a great driver in the completion of my course.

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LIST OF ACRYNOMS

BU: Busitema University

℃: Degrees Celsius

DO: Dissolved oxygen

FAO: Food and Agriculture Organization

Mg/L: Milligrams per Liter

M: Meters

NEMA: National Environmental Management Authority

%: Percentage

PH: potential for hydrogen

SPSS: Statistical Package for Social Sciences

FWR**:** Fisheries and Water Resource Management

EC: Electrical Conductivity

L: liters

ANOVA: Analysis of Variance

## ABSTRACT

Pond management practices are among the key factors influencing aquaculture production in Uganda. As aquaculture continues to play a vital role in food security and income generation, understanding effective pond management strategies is essential. This study evaluated the impact of pond management practices on fish productivity in Luwero District. The specific objectives were to determine the gender involvement aspects within pond fish production system in Luwero District, to identify major pond management practices carried out by pond fish farmers in Luwero district, and to determine the relationship between the fish pond management practices used by farmers and fish productivity. Data collection took place in the entire sub counties of Luwero district although it was limited by a number of farmers who dropped off from the business due to limited capital, insecurity and lack of land. Quantitative analysis was using SPSS IBM version 26 and the average of water quality parameters (Ph, temperature and DO) was got. SPSS was also used to obtain gender involvement in pond fish farming and the relationship between pond management practices and productivity in terms of number of fish at harvest through descriptive analysis and running a Pearson correlation coefficient respectively and the total yields were determined using excel. From the findings, pond fish production in Luwero district is mostly practiced by men who cover 87.1% and 12.9% for women. The pond management practices carried out by pond fish farmers are feeding, stocking, water quality management, predator control and findings show that 25.8% of the fish farmers in Luwero district practice the required or proper pond management practices which improved their yield. The findings also show that there was a high positive correlation between the pond management practices and the number of fish at harvest (P-value =0.014). Conclusions were made that gender aspects should be emphasized, pond management practices should be periodized and recommended that further studies should be done to address gender equity and equality in enterprises and also extension work and motivation should be done for fish farmers to remain focused for improved production.

# CHAPTER ONE: INTRODUCTION

## 1.0 INTRODUCTION

This chapter includes; introduction, background, statement of the problem, objectives, research hypotheses/questions, conceptual framework, significance of the study, justification of the study, scope, limitations of the study, operational definitions of the key terms and concepts, and organization of the study.

### 1.1 BACKGROUND

Aquaculture plays a crucial role in food security and economic development in Uganda (FAO, 2024). Pond management practices significantly influence fish productivity, yet their effectiveness varies across different regions (Atukunda et al., 2021). Despite its potential, the region has been grappling with low productivity in fish ponds, a problem that has persisted since the early 2000s. This decline in fish production is alarming, especially given the increasing demand for fish as a primary source of protein in local diets. In Uganda, fish consumption is critical, with fish contributing approximately 4.3 grams of protein per capita per day, (FAO, 2021) highlighting the importance of enhancing aquaculture productivity to meet nutritional needs. Low fish productivity in Luwero District can be traced back to several interrelated factors. Initially, the rapid expansion of aquaculture in the region outpaced the development of adequate management practices. Many small-scale fish farmers lack the necessary training and resources to implement effective pond management strategies, leading to suboptimal growth rates and yields. Poor water quality, inadequate feeding practices, and insufficient disease management have been identified as significant contributors to low productivity. Climate variability, including changes in rainfall patterns and temperature fluctuations, has adversely affected water quality and fish health. Additionally, pollution from agricultural runoff and urban development has further degraded aquatic ecosystems, compounding the challenges faced by fish farmers.

The persistence of low productivity in fish ponds can be attributed to several systemic issues. There is a lack of accessible education and training programs for fish farmers, which limits their understanding of best practices in pond management. Furthermore, financial constraints often prevent farmers from investing in necessary inputs, such as quality feed and water treatment solutions. The absence of a supportive regulatory framework and market access also hampers the growth of the aquaculture sector,

making it difficult for farmers to adopt improved practices has also led to the persistence of the problem in Luwero district.

And due to the persistence of the problem of low productivity in Luwero district, various stakeholders, including government agencies and non-governmental organizations, have attempted to address these challenges through initiatives aimed at improving aquaculture practices. Programs have been established to provide training and resources to fish farmers, focusing on water quality management, feeding strategies, and disease control. However, the impact of these interventions has been inconsistent, often failing to reach the broader community or address specific local conditions effectively.

Proper pond management is critical for enhancing fish productivity. Effective management practices include regular monitoring of water quality parameters, such as temperature, dissolved oxygen, and pH levels, which are essential for the health and growth of fish. Additionally, implementing optimal feeding practices and maintaining a balanced ecosystem within the pond can significantly improve fish yields. By adopting these practices, farmers can create a more sustainable aquaculture system that not only increases productivity but also enhances the resilience of their operations against environmental changes.

Therefore this research has filled a critical gap by evaluating the specific pond management practices currently employed in Luwero District and their direct impact on fish productivity. By identifying effective strategies and potential barriers to implementation, this study has provided actionable recommendations for enhancing fish farming practices in the region. Ultimately, the goal is to contribute to improved livelihoods and food security for local communities, addressing the pressing issue of low fish productivity in Luwero District. And this study has focused on Luwero district, where fish farming represents a vital agricultural activity (MAAIF, 2023).

## 1.2 PROBLEM STATEMENT

Effective pond management is essential for sustaining fish productivity and promoting ecological balance in aquatic systems. However, the variability in management practices and their outcomes often leads to inconsistent fish yields and despite the potential of aquaculture in Uganda, there is limited empirical evidence on how different pond management practices affect fish productivity (kasozi et al., 2022) and yet sustainability is at stake due to the already dwindled capture fisheries and low productivity of aquaculture production systems especially in ponds. This knowledge gap hampers the development of

effective strategies for sustainable aquaculture development (World Fish, 2023) hence the need for research to evidence how pond management practices affect productivity.

## 1.3 OBJECTIVES OF THE STUDY

### 1.3.1 GENERAL OBJECTIVE

To evaluate the impact of pond management practices on fish production in Luwero district

### 1.3.2 SPECIFIC OBJECTIVES

1. To determine the gender involvement aspects within pond fish production system in Luwero District.
2. To identify major pond management practices carried out by pond fish farmers in Luwero district.
3. To determine the relationship between the fish pond management practices used by farmers and fish productivity

## 1.4 RESEARCH QUESTIONS

1. What is the gender involvement aspects within pond fish production system in Luwero District
2. What are the predominant pond management practices utilized by fish farmers in Luwero district?
3. What is the relationship between pond management practices and fish productivity in terms of growth and overall yield?

## 1.5 CONCEPTUAL FRAMEWORK

A conceptual framework for this research integrates the relationship between pond management practices and fish productivity in Luwero district through a multi-dimensional approach:

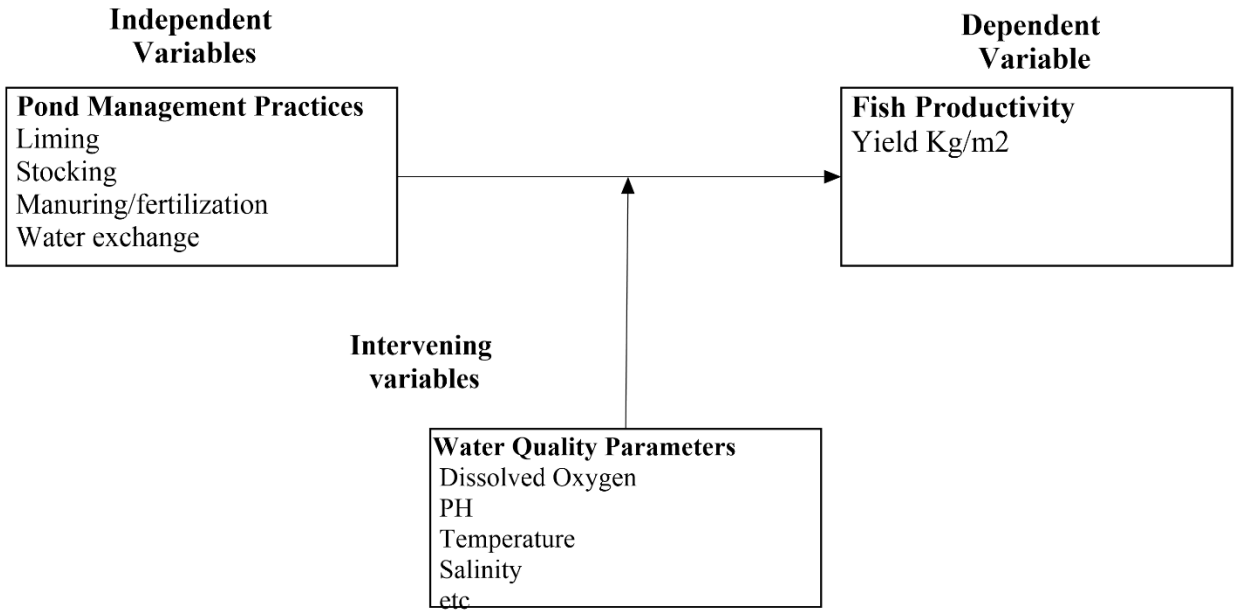


Figure 1 : Showing the Conceptual Framework

### 1.6 THEORETICAL FRAME WORK

The study adopted a Fisheries Management Theory by Lackey T. Robert (1978) which encompasses management practices through analyzing, making, and implementing decisions to maintain or alter the structure, dynamics, and interactions of habitat, aquatic biota, and man to achieve specified human goals and objectives through the aquatic resource.(Lackey T. Robert 1978).

### 1.7 JUSTIFICATION OF THE STUDY

The increasing demand for fish as a primary source of protein and essential nutrients for animal health is global. However, the sustainability of fish production is under threat due to decline in capture fisheries and the low productivity of aquaculture systems, particularly pond-based production. This research focuses on addressing the underperformance of ponds in Luwero District, Uganda, where pond management practices is a key factor.

### 1.8 SIGNIFICANCE OF THE STUDY

The study addresses a critical knowledge gap regarding the effectiveness of pond management practices on fish productivity in Luwero district, where empirical evidence is currently limited. Furthermore, the findings of this research are vital whereby it avails stakeholders, including policymakers, fish farmers,

and agricultural extension services, with information on the development of effective adaptation strategies for a productive aquaculture system.

## 1.9 SCOPE OF THE STUDY

**Content scope**

The study assessed the impacts of pond management practices on fish productivity in Luwero district

**Time scope**

This research was carried out with in a period of three months from May to July.

## 1.10 LIMITATIONS OF THE STUDY AND HOW THEY WERE OVERCOMED

I encountered difficulties in accessing farmers due to long distances since at the district did not have data about all fish farmers. This limitation was overcome by hiring a motorcycle to move me around the whole district making it easy to reduce on the transportation costs and easily reaching out to the fish farmers.

I faced a challenge of decline in responses because some fish farmers had dropped from the business. This was overcome by collecting data from the farmers who were doing the business and also from farmers who left the business in order to avoid bias and know the actual reasons for their dropping off.

# 2.0 CHAPTER TWO: LITERATURE REVIEW

## 2.1 INTRODUCTION

This chapter reviews the existing literature on pond aquaculture, focusing on management practices and their impact on fish productivity. The review is organized into two main sections: theoretical literature and empirical literature. Theoretical literature discusses frameworks and models relevant to pond management and fish productivity, while empirical literature evaluates specific studies that address the objectives of this research. By synthesizing findings from various sources, this chapter aims to identify best practices and highlight gaps in the current understanding of pond management in Luwero Sub-County.

## 2.2 The gender involvement aspects with pond fish production systems in Luwero District

Aquaculture has emerged as a vital sector in global food production, yet it remains heavily influenced by gender dynamics. According to the Food and Agriculture Organization (FAO), women make up approximately 39% of the workers in aquaculture and 51% in processing. Gender equality in aquaculture especially pond fish production is a consequential, economic, social, and human rights global issue. Women and men engage in diverse areas of aquaculture which vary by region. Most of the fish production activities are dominated by men leaving women to only participate in higher levels of the fish production value chain especially in processing and marketing (FAO, 2025). This has resulted into women frequent devaluing in formal pond fish production systems Kumar et al., 2016. Programs aimed at improving women's access to training and resources have shown positive impacts on both productivity and community well-being (Thorpe et al., 2020). Gender equality is central to realizing the potential of aquaculture to increase fish production and to improve livelihoods and enhance nutrition security Béné et al., 2018 such as the Southeast Asia project that focused on women’s training in sustainable aquaculture practices which resulted in increased fish production and improved family incomes (FAO, 2018).

## 2.3 The major pond management Practices used by Fish Farmers in Luwero district

Pond management practices refer to the systematic set of activities and techniques applied in the operation of fish ponds to optimize water quality, fish growth, and overall productivity (Boyd & Tucker, 2012). Pond management practices determine the productivity and sustainability of fish farms (Hussain et al., 2021). Common pond management practices include water quality management, feeding strategies, habitat enhancement and maintaining optimal water quality parameters, such as dissolved oxygen, temperature, and water pH, turbidity which are essential for fish health and growth (Hussain et al., 2021). In Luwero, farmers often utilize local resources for pond management, including organic fertilizers and natural feed sources, which have been shown to improve fish growth rates (Hussain et al., 2021). Additionally, the integration of traditional knowledge with modern aquaculture techniques has been observed to enhance the effectiveness of pond management practices in increasing productivity (Ndyabahika et al., 2020).

**Stocking rate**

Stocking rate refers to the number of fish stocked for unit volume of water (MAAIF Manual, 2020). Stocking rate is a crucial pond management practice that influences other factors that supports fish productivity such as water quality and it can as well lead to stress hence low fish productivity (MAAIF Manual, 2020). Overstocking can lead to competition for oxygen and food, resulting in stunted growth, while under stocking leads to underutilization of resources (Boyd & Tucker, 2012). In semi-intensive systems, recommended stocking densities for Nile tilapia (Oreochromis niloticus) range from 2–4 fish/m², whereas in intensive systems, densities may exceed 20 fish/m² if supported by aeration and supplemental feeding (FAO, 2020).

**Feeding**

Feeding is important in pond culturing systems, as it determines growth rates and overall productivity of fish. Fish obtain nutrients from both natural pond productivity (plankton, benthic organisms) and supplementary feeds. In semi-intensive systems, supplementary feeds such as rice bran, maize bran, or formulated pellets are provided to complement natural food (FAO, 2020). Feeding frequency and ration depend on fish size and biomass; for instance, fingerlings may be fed 5–10% of body weight daily, while larger fish may require 2–3% (Tacon & De Silva, 1997). Use of nutritionally balanced feeds with adequate protein, lipids, and vitamins promotes rapid growth and high survival (El-Sayed, 2006).

Overfeeding should be avoided, as uneaten feed decomposes and deteriorates water quality and under feeding can affect the growth rate of fish (MAAIF Manual, 2020). Predator Control

**Predator Control**

Predator control is essential in pond fish farming to prevent losses from natural predators such as birds (kingfishers, herons), snakes, frogs, and carnivorous fish which can significantly reduce fish survival and yields. Birds can consume up to 30% of stocked fingerlings if uncontrolled (FAO, 2020). Effective control measures include fencing around ponds, netting ponds, bird control using scarecrows, and regular pond surveillance (Hepher & Pruginin, 1981). Before stocking, ponds should be dried or treated to eliminate predatory or unwanted fish species (Boyd & Tucker, 2012).

**Water quality monitoring**

Water quality monitoring is important in fish farming, and regular monitoring can help to identify potential water quality issues. Water quality parameters significantly affect fish growth and health and the key parameters include; dissolved oxygen, pH, salinity, temperature, turbidity, ammonia (Bhatnagar & Devi, 2013). Water quality monitoring can be done daily, weekly, or monthly according to the capacity of the farm. Poor water quality reduces feed efficiency, increases disease risks, and causes mortalities (Boyd & Tucker, 2012).

**Effects of Water Quality Parameters on Fish Growth**

Dissolved oxygen: this is the most important water quality parameter as its essential for fish respiration, fish growth and fish survival. Levels below 3 mg/L can stress fish, while prolonged exposure below 1 mg/L causes mass mortality (Boyd, 1990). Optimal DO levels are above 5 mg/L for most species (Bhatnagar & Devi, 2013). Oxygen is replenished through photosynthesis and atmospheric diffusion but consumed through respiration and decomposition. Aeration, water exchange, and maintaining good feeding practices help prevent oxygen depletion, particularly at night and early morning (Boyd & Tucker, 2012).

PH: pH affects fish metabolism and pond productivity. Most cultured species thrive in a pH range of 6.5–9. Levels below 5 or above 10 are stressful and may be lethal and can hinder fish growth and health

(Bhatnagar & Devi, 2013). Low pH reduces nutrient availability and plankton growth, while high pH increases ammonia toxicity (Boyd, 1990). Regular liming and monitoring can help to maintain stable pH.

Salinity: Salinity affects fish growth and survival as it influences osmoregulation and metabolic performance. Most freshwater pond species such as tilapia and catfish tolerate salinity levels of 0–5 ppt, but growth declines at higher levels (El-Sayed, 2006). However, tilapia has moderate salinity tolerance up to 15 ppt, making it suitable for brackish water aquaculture (FAO, 2020). Extremely high or fluctuating salinity stresses fish, reduces feeding efficiency, and can lead to mortalities. Regular monitoring is important where saline groundwater or coastal intrusion affects pond water.

Temperature: pond water temperature influences fish metabolism, feeding, reproduction, and survival. Each species has an optimal temperature range for growth. For example, Nile tilapia grows best at 25–30 °C, with growth slowing below 20 °C and mortalities occur below 12 °C (El-Sayed, 2006; FAO, 2020). Warmwater fish such as catfish (*Clarias gariepinus*) also thrive within 26–32 °C (Hepher & Pruginin, 1981). Temperature fluctuations outside the optimal range can reduce feed intake, impair immunity, and increase susceptibility to diseases (Boyd & Tucker, 2012). Proper pond design and management, such as maintaining adequate water depth and shading, help buffer against temperature extremes.

Turbidity: this refers to the cloudiness of water caused by suspended particles, plankton, or organic matter. Moderate turbidity (30–80 cm Secchi depth) is beneficial, as it reduces light penetration, controls excessive aquatic weeds, and supports plankton growth as natural fish food (Boyd & Tucker, 2012). Excessive turbidity from soil erosion reduces photosynthesis and oxygen production, while very low turbidity limits natural food availability (FAO, 2020). Preventive measures include vegetative buffer strips, proper dike construction, and controlling inflow runoff. Affects fish growth and survival and the ideal turbidity levels should be low to promote light penetration, enhancing natural food production.

Ammonia Levels**:** Ammonia is a nitrogenous waste product from fish metabolism and feed decomposition. It exists in two forms: ionized ($NH_4^+$) and unionized ($NH_3$). The unionized form is toxic, and its proportion increases with higher pH and temperature (Boyd, 1990). Safe total ammonia nitrogen (TAN) concentrations are below 0.05 mg/L for most cultured species (Bhatnagar & Devi, 2013). Elevated ammonia reduces oxygen uptake, damages gills, and suppresses growth hence leading to death. Control measures include avoiding overfeeding, regular water exchange, aeration, and maintaining optimal pH

## 2.4 The relationship between pond management practices and fish productivity.

Fish productivity is measured through various parameters including growth rate, survival rate, and feed conversion ratio (El-Sayed, 2021). Research report that effective management results into improved fish growth rates and overall productivity (Zhou et al., 2020; Morris et al., 2020). In addition, the study has demonstrated that effective management practices lead to significant improvements in fish by Miao et al. (2020) found that farms implementing rigorous water quality monitoring and management practices achieved higher fish growth rates compared to those that did not. Identifying the most effective pond management practices is essential for maximizing fish production (Lackey T. Robert 1978). A combination of water quality management, proper fish feeding, and habitat enhancement is reported to yields the best results (Lackey T. Robert 1978). For instance, studies have shown that regular monitoring of water quality parameters, along with timely interventions, can prevent issues that negatively affect fish health and growth (Sharma et al., 2019). Additionally, the use of high-quality commercial feeds, supplemented with local feed alternatives, has been found to significantly enhance growth rates and overall productivity (Nwanna et al., 2019). Furthermore, the adoption of best management practices, including the use of integrated pest management and selective breeding for disease resistance, has been shown to enhance sustainability and productivity in pond systems (Bamunoba et al., 2019).

# CHAPTER THREE: METHODOLOGY

## 3.0 INTRODUCTION

This chapter outlines the methodology used to investigate the impact of pond management practices on fish productivity in Luwero District. The chapter is arranged to provide a clear understanding of the research design, study population, sample size and sampling procedure, data types and collection methods, validity and reliability of data collection instruments, ethical considerations, and data analysis procedures

### 3.1 STUDY AREA

**Location:** Luwero district is located in central Uganda, 30KM North of Kampala the capital city of Uganda and is bordered by Nakasongola district in the north, Kayunga district in the east, Mukono district and Wakiso district in the south and Nakaseke district in the west. Luwero district is about 2,557 square kilometers in size. It lies between Latitude 0° 49' N - 1° 10' N, Longitude 32° 25' E - 32° 45' E, and elevation of 1,100 - 1,200 meters above sea level. It is composed of Katikamu sub-county, Bombo sub-county, Makulubita sub county, Nyimbwa sub county, Ndejje sub county, Busiika sub county, Kalagala sub county, Zirobwe sub county, Luwero sub county, Kamira sub county, Kabunyatta sub county and Kikyusa sub county.

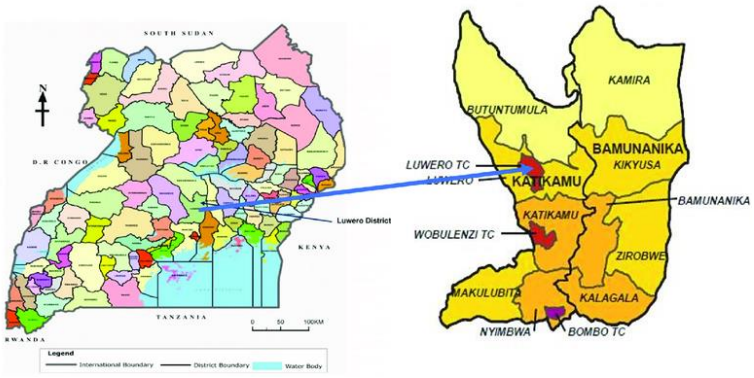


Figure 2: showing the map of Luwero district

## 3.2 RESEARCH DESIGN

This study employed a mixed methods approach (Creswell and Creswell, 2023), combining quantitative and qualitative data collection techniques to provide comprehensive insights into pond management practices. A cross sectional study design has been used to collect data from a selected sample of fish farmers in Luwero district at a single point in the year. Both quantitative and qualitative data was collected to provide a comprehensive understanding of the factors influencing fish productivity

## 3.3 TARGETED POPULATION

The study population consisted of fish farmers engaged in pond fish production in Luwero District. The population included of both small-scale and large-scale fish farmers. In this district, there are seventy eight (78) fish farmers carrying out aquaculture according to records of the District Fisheries Officer and the list of fish farmers given to me by the fisheries officer.

## 3.4 SAMPLE SIZE AND SAMPLING PROCEDURE

### 3.4.1 Sample Size

A sample size of 65 fish farmers was selected for the study using the Solvens formulas 1960. This sample size is considered sufficient to provide reliable estimates of the population parameters. This is shown in the calculation below;

Equation 1…….. n = N /1 + N (e^2)

Where:

n = sample size

N = population size (78 in this case)

e = margin of error (expressed as a decimal), assuming a common margin of error of 5% (I.e. e=0.05; confidence level of 95%)

Therefore;

n=?

N = 78

e = 0.05

Sample size is;

n = 78/1 + 78(0.05^2)}

n =78/1 + 78(0.0025)}

n = 78/1 + 0.195

n =78/1.2

= 65

Therefore the recommended sample size for a population of 78 fish farmers in Luwero Sub County, assuming a 5% margin of error, is approximately 65 farmers.

### 3.4.2 Sampling Technique and Procedure

A combination of random and purposive sampling will be used to ensure representation from different types of farms (small, medium, and large-scale). This technique will be used to select farmers from different communities within Luwero district. Stratified Random sampling was used (Thompson,2023)to select approximately 65 fish farmers from the list of registered fish farmers in Luwero district based on pond size and management intensity (following guidelines by Yamane, 2022).

## 3.5 DATA TYPES

### 3.5.1 Data Types

**Quantitative Data**

This type of data is numerical was measured and analyzed statistically. For example; Fish Yields, Water Quality Parameters, quantitative ratings or scores for management practices, farm size, and others.

**Qualitative Data**

This type of data is descriptive and provides context and insights into the experiences and perceptions of fish farmers. For example; information on pond management practices, challenges and recommendations.

### 3.5.2 Data collection methods

Data was collected using both interviews and observations methods of data collection. Interviews involved use of questionnaire and observation involved using my eyes to identify information from the selected fish farmers.

## 3.6 VALIDITY AND RELIABILITY OF DATA COLLECTION INSTRUMENTS

The interview guide was pre-tested to ensure its validity and reliability. The questionnaire was gone through by my supervisors to test its clarity and effectiveness. The results of the pre-test were used to refine the questionnaire.

## 3.7 ETHICAL CONSIDERATIONS

I got an introductory letter from the university which was presented to the district local government officials prior to data collection exercise as they allowed me conduct my research from there. In addition, farmers consent was also obtained before data collection to ensure confidentiality and anonymity of respondents.

## 3.8 DATA ANALYSIS

**Quantitative Analysis**:

Data was analysed using SPSS IBM version 26, average of water quality parameters (Ph, temperature and dissolved oxygen) and total yields was determined using excel whereas gender involvement in pond fish farming and the relation between pond management practices and productivity in times of number of fish at harvest was obtained using SPSS through descriptive analysis and running a Pearson correlation coefficient respectively.

# CHAPTER FOUR: RESULTS AND DISCUSSIONS

## 4.0 RESULTS

### 4.1 The gender involvement aspects within pond fish production system in Luwero District.

Most of the pond fish farmers in Luwero District were male contributing to 87.1% and 12.9% were female (**figure : 3)**

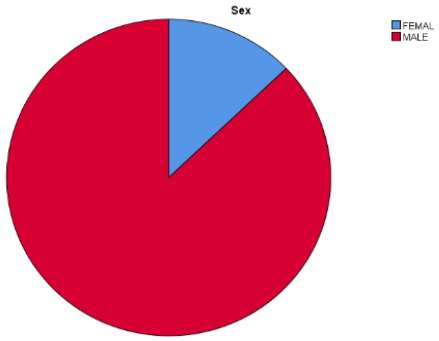


*Figure 3 a pie chart showing the gender percentage*

*Table 1 showing the gender percentage of fish farmers in Luwero district*

**Sex**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | FEMAL | 4 | 12.9 | 12.9 | 12.9 |
| | MALE | 27 | 87.1 | 87.1 | 100.0 |
| | Total | 31 | 100.0 | 100.0 | |

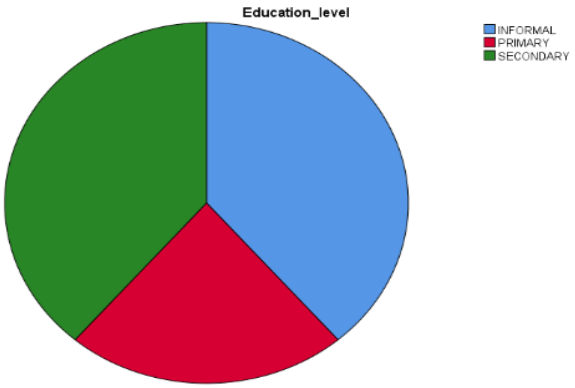


*Figure 4 a pie chart showing the education level of fish farmers in Luwero district*

*Table 2 showing the education level of fish farmers in Luwero district*

Education level

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | INFORMAL | 12 | 38.7 | 38.7 | 38.7 |
| | PRIMARY | 7 | 22.6 | 22.6 | 61.3 |
| | SECONDARY | 12 | 38.7 | 38.7 | 100.0 |
| | Total | 31 | 100.0 | 100.0 | |

*in*

### 4.2 The major Pond management practices carried out by pond fish farmers in Luwero district.

Most of the pond management practices carried out by fish farmers in Luwero district are feeding, stocking, water quality management, predator control.

***Table 3 showing the pond management practices used***

| **Pond management practices** | **Number of farmers** | **Percentage rate** | **Ranking** |
|---|---|---|---|
| Proper stocking<br>Proper feeding<br>Water quality management<br>Security at the pond | 8 | 25.8% | Best |
| Proper stocking<br>Proper feeding<br>Predator control | 9 | 29.0% | Good |
| moderate feeding<br>improper stocking<br>moderate predater control | 11 | 35.5% | Fair |
| Poor feeding<br>Improper stocking<br>No predator control | 3 | 9.7% | Poor |
| Total | 31 | 100% | |

### 4.3 The relationship between the fish pond management practices used by farmers and fish productivity

There was a significantly high positive correlation between the pond management practices and the number of fish at harvest (**P-value =0.014;** Table: 4)

*Table 4 showing the relationship between pond management practices and fish productivity*

**Correlations**

| | | Pond management practices | Number of fish harvest |
|---|---|---|---|
| Pond management practices | Pearson Correlation | 1 | .443* |
| | Sig. (2-tailed) | | .014 |
| | Sum of Squares and Cross-products | 15.367 | 54550.500 |
| | Covariance | .530 | 1881.052 |
| | N | 30 | 30 |
| Number of fish harvest | Pearson Correlation | .443* | 1 |
| | Sig. (2-tailed) | .014 | |
| | Sum of Squares and Cross-products | 54550.500 | 985069088.710 |
| | Covariance | 1881.052 | 32835636.290 |
| | N | 30 | 31 |

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

## 4.4 RESULTS DISCUSSION

**The gender involvement aspects within pond fish production system in Luwero District.**

Results revealed that most of the pond fish farmers in Luwero District were male contributing to 87.1% and 12.9% for female. This is in line with the findings of FAO 2025 and Bene et al where they found that most of the activities in fisheries and pond fish farming are mostly dominated by men and women take part in few activities.

**The major Pond management practices carried out by pond fish farmers in Luwero district.**

Results revealed that the pond fish farmers in Luwero district who were practicing proper feeding, proper stocking, monitoring the water quality and controlling predators at their ponds had improved fish yield, growth rate and survival rate. This is in line with the findings of Hussain et al (2022) where he found that water quality management, proper feeding strategies and pond fertilization can improve fish yield, growth rate and survival rate.

**The relationship between the fish pond management practices used by farmers and fish productivity**

Results revealed that there was a significantly high positive correlation between the pond management practices and the number of fish at harvest (P-value =0.014). The research findings are similar to the study conducted by Kumar and Singh (2021) who found that proper feeding management improves fish productivity by 25–30%. Furthermore, the study also concurs with the finds which were reported by Olawepo et al. (2022) whose findings demonstrated strong correlations between pond management practices and fish growth rates.

# CHAPTER FIVE: RECOMMENDATIONS AND CONCLUSIONS

## 5.0 Recommendations and Conclusions

### 5.1 Conclusions

Based on the research findings discussed above, we therefore conclude that gender aspects in pond fish farming should be emphasized to improve pond management practices given their nature characters. Furthermore, we conclude that in order to best results to be realized in pond fish farming, pond management practices such as water quality management, proper feeding, proper stocking, pond fertilization and manuring, sampling and predator control should be periodized.

### 5.2 Recommendations

Based on the above conclusions we recommend further studies about women involvement along the aquaculture value chain in order to address issues of gender equity and equality among enterprises.

In addition, we also recommend that the government create fish farmers stakeholder platforms where fish farmers can be helped through extension work and motivated to remain focused for a productive aquaculture sector.

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# APENDICES

*figure 5 showing photos of the farmers and i during data collection/ measuring water quality parameters*