# ****CHAPTER ONE**** ****INTRODUCTION****

1.1 Background of the Study

Agricultural sustainability and food security are critical concerns in Nigeria, especially in the face of climate change, soil fertility depletion, and declining crop productivity. Okra (Abelmoschus esculentus), a widely cultivated vegetable crop in tropical and subtropical regions, is valued for its nutritional and economic benefits. It belongs to the *Malvaceae* family and is rich in essential nutrients, including vitamins A, C, and K, minerals, dietary fiber, and bioactive compounds with antioxidant, anti-inflammatory, and antimicrobial properties (Oyelade *et al.,* 2020). Okra is an important vegetable crop in Nigeria, contributing significantly to food security, income generation, and health benefits.

Despite its importance, okra production in Nigeria, particularly in the Mubi North, is constrained by poor soil fertility, which limits its growth and yield potential. Many Nigerian soils are inherently deficient in essential nutrients such as nitrogen (N), phosphorus (P), and potassium (K), which are crucial for plant development. Continuous cropping, erosion, and low organic matter content exacerbate soil fertility depletion. Farmers often resort to synthetic fertilizers to replenish soil nutrients, but these fertilizers pose challenges such as high costs, limited accessibility, and negative environmental impacts, including soil degradation, nutrient leaching, and greenhouse gas emissions (Fageria *et al.,* 2019). This necessitates sustainable soil fertility management practices to enhance crop yield while maintaining environmental integrity.

Poultry manure, an organic fertilizer derived from poultry waste, has gained attention as a viable alternative to synthetic fertilizers due to its ability to improve soil fertility and crop productivity. It is a rich source of nitrogen, phosphorus, potassium, and micronutrients, making it highly beneficial for soil amendment (Hossain et al., 2021). Unlike chemical fertilizers, poultry manure enhances soil structure, increases organic matter content, improves microbial activity, and enhances water retention capacity, all of which contribute to sustainable agricultural practices. Additionally, organic fertilizers reduce nutrient leaching into groundwater, mitigate soil acidity, and support long-term soil fertility restoration (Atiyeh et al., 2020).

Despite these benefits, optimal poultry manure application rates for specific crops such as okra remain largely understudied in Nigeria. Many farmers apply organic fertilizers indiscriminately, leading to either suboptimal nutrient supply or excessive nutrient loading, which can result in reduced plant growth, nutrient imbalance, or environmental pollution. Additionally, variations in soil types, climatic conditions, and crop nutrient requirements make it essential to establish appropriate manure application rates to maximize okra production.

Research has shown that organic manure significantly influences the growth, yield, and quality of vegetables, including okra (Gupta *et al.,* 2022). However, limited studies have evaluated the effect of different poultry manure rates on okra performance, particularly in Mubi North, Adamawa State, Nigeria, where okra cultivation is common. Understanding the relationship between poultry manure application rates and okra growth parameters such as plant height, number of leaves, leaf area, and fruit yield is crucial for optimizing production and ensuring sustainable agricultural practices.

Given the increasing demand for sustainable agricultural practices, it is essential to explore organic fertilizers like poultry manure in enhancing soil fertility and crop productivity. This study, therefore, seeks to evaluate the influence of varying poultry manure rates on okra growth, yield, and nutritional composition in Mubi North Local Government Area, Adamawa State.

## ****1.2 Statement of the Problem****

Okra cultivation in the Mubi North Local Government Area is constrained by declining soil fertility, which negatively impacts crop yield and quality. Many farmers rely on inorganic fertilizers to enhance productivity; however, these fertilizers are expensive and contribute to soil degradation and environmental pollution. Organic fertilizers, such as poultry manure, offer an eco-friendly alternative, but their appropriate application rates for optimal okra growth and yield remain unclear.

Farmers often lack precise guidelines on the suitable poultry manure rates required for maximum productivity, leading to either under-application, resulting in poor crop performance, or over-application, which may cause nutrient toxicity. Additionally, the impact of poultry manure on the nutritional composition of okra has not been well-documented, limiting its potential as a functional food for addressing micronutrient deficiencies.

Given these challenges, this study aims to determine the optimal poultry manure rates that enhance the growth and yield of okra while maintaining soil health and sustainability in the Mubi North, Adamawa State, Nigeria.

1.3 Aim and Objectives of the Study

The aim of this study is to evaluate the effects of different poultry manure rates on the growth and yield of okra (Abelmoschus esculentus) in Mubi North Local Government Area. The specific objectives are:

1. To assess the impact of varying poultry manure rates on the growth parameters of okra.
2. To determine the effect of different poultry manure rates on the yield components of okra.
3. To analyze the nutritional composition of okra under different poultry manure treatments.

## ****1.4 Significance of the Study****

This study has significant implications for farmers, agricultural researchers, and policymakers in Nigeria. By identifying the optimal poultry manure rates for okra cultivation, the research will provide valuable recommendations that enhance crop yield and soil fertility.

For farmers, the study offers practical insights into the efficient use of poultry manure to maximize okra production, thereby improving income and food security. Researchers will benefit from the findings by gaining a deeper understanding of organic fertilizer interactions with crop physiology. Additionally, policymakers can use the research outcomes to develop sustainable agricultural policies that promote organic farming and environmental conservation.

The study also contributes to the broader goal of sustainable agriculture by reducing dependence on chemical fertilizers, improving soil health, and mitigating the environmental impact of synthetic inputs. Furthermore, enhancing okra production through optimized organic fertilization can support local industries that utilize okra in food processing and pharmaceuticals.

**1.5 Justification of the Study**

The justification for this study is based on the need to improve soil fertility and crop productivity using environmentally sustainable approaches. The declining soil fertility in Mubi North, Adamawa State necessitates alternative fertilization strategies that maintain long-term agricultural sustainability. Poultry manure, being a nutrient-rich organic fertilizer, has the potential to enhance okra growth and yield while reducing soil degradation and chemical fertilizer dependence.

Moreover, okra is a valuable crop due to its economic and nutritional importance. Enhancing its cultivation through appropriate manure management can help combat micronutrient deficiencies, particularly in rural areas where dietary diversity is limited. Understanding the interaction between poultry manure application rates and okra productivity will provide essential knowledge for optimizing crop management practices, ensuring food security, and supporting smallholder farmers in Nigeria.

**1.6 Scope and Limitation of the Study**

This study focuses on evaluating the effects of different poultry manure rates on the growth and yield of okra (Abelmoschus esculentus) in Mubi North Local Government Area. The research will be conducted under field conditions, examining parameters such as plant height, number of leaves, biomass accumulation, and yield components. The nutritional composition of okra under different manure treatments will also be analyzed.

Limitations of the study may include variability in soil properties, climatic factors, and the duration of the research. Additionally, differences in poultry manure composition may affect nutrient availability, necessitating further studies to standardize organic fertilizer application for okra cultivation. By addressing these aspects, this study aims to contribute to the optimization of organic fertilization practices for improved okra production in Nigeria’s agroecological zones.

# CHAPTER THREE

# RESEARCH METHODOLOGY

## 3.1 Study Area

The study was conducted within Mubi North Local Government Area of Adamawa State in Eastern region of Northern guinea savannah of Nigeria, latitude 90°20' and longitude 13°501 East and covers an area of 24,00km2. The rainfall range between 700 -900mm with highest in the month of August, the temperature is highest at 30dc during March and April, and the minimum is 15dc in January (Adebayo, 2014).

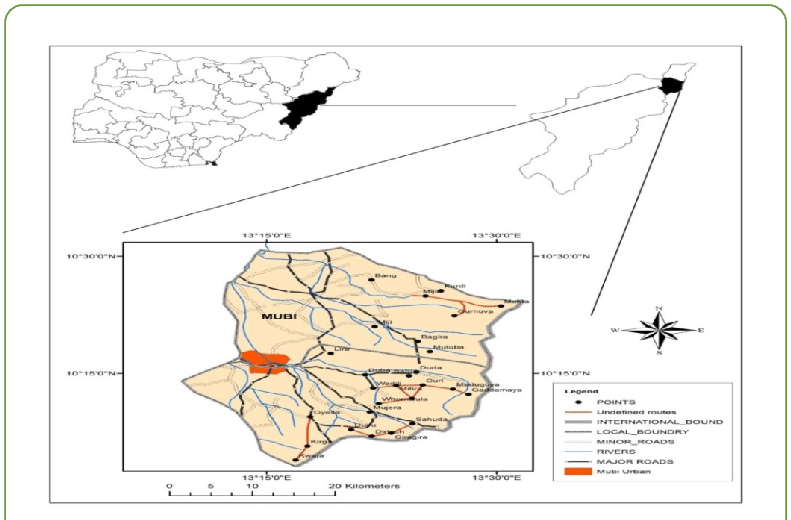


Figure 3.1: Map of the study area

Mubi North Local Government shares common borders with Mubi South, Hong Local Government Areas and it's also shares an international border with Cameroon Republic (Adebayo, 2014). Mubi North local government is inhabited by many tribes such as Fulani, Fali, Hausa, and others with Fali and Fulani as the predominant tribes, the people have rich cultural heritage and are predominantly farmers (Crop production and Animals like cattle).The climate condition helps the people to practice agriculture as the occupation particularly farming, cattle rearing and marketing. Because of the international border with Cameroon, this makes the study area a marketing, farming, and cattle route (Adebayo, 2014);

## 3.2 Experimental Design and Layout

The experiment consisted of four (4) treatments Viz, (T0=0kg of Poultry manure, T1=4kg of PM T2=8kg of PM, and T3= 12kg of PM). replicated three (3) times and was laid out in a Randomized Block Design (RCBD) as shown in figure one (1) below. A total number of 12 sub-plots were constructed with each sub-plot measured 2m X 3m with an alley of 0.5meters from each angle totalling 115.5m2. The beds were tilled manually with a hoe and treatments mixed off properly with the soil in each bed. Two (2) Seeds of Okra dropped at the depth of 2cm, covered with soil and firmed genteelly. Four (4) crop rows were made with six (6) stands on each row making the sum of 24 stands in each bed. Weeding commenced three (3) weeks after sowing and an interval of two (2) weeks, three (3) times throughout duration of this experiment.

0.5m

2m

0.5m

3m

REP 1

o.bm

0.5m

11m

0.5m

REP 2

REP 3

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0.5m

0.5m

10.5m

Figure 3.2: Field layout of the experiment

**Key:**

**Rep 1 -** means replication 1

**Rep 2 -** means replication 2

**Rep 3 -** means replication 3

**To** - 0kg of Poultry Manure (Control)

**T1** - 4kg of Poultry Manure

**T2** - 8kg of Poultry Manure

**T3** - 12kg of Poultry Manure

## 3.3 Cultural practice

The cultural practice employed for this experiment include the following

***3.3.1 Ploughing***

After clearing the field and demarcation each sub- plot was prepared manually with a hoe. The soil was dogged mixed with cow dung manure in each case and levelled flat. The experiment being conducted during the raining season raised beds were made.

***3.3.2 Sowing***

For the purpose of this research, a vegetable crop (Okra) a variety was selected. Two (2) seeds were 40+40cm both between crop row as well as between stands.

***3.3.3 Weeding***

It was also done manually with a simple farm tool (hoe). Weeding started three (3) week after sowing and continued at interval of two (2) week, three (3) times throughout the growing period.

***3.3.4 Harvesting***

Matured Okra will be harvested manually and carefully with the help of a very sharp knife to avoid causing injuring to parent crop at an interval of three (3) days for three (3) times in all.

**3.4 Data collection**

Data from the following growth andyield parameters with be taken during this experience.

**GROWTH** **PARAMETERS**

***3.4.1 Establishment count***

The number of established Seedling from each plot will be take and record three (3) week after planting.

***3.4.2 Plant height***

Three (3) seedlings with be randomly elected from the center of each plot and tagged. The height of plant will be taken from them with aid of ruler meter at an interval of two (2) weeks after planting, three (3) time in all, with the exception of first reading which will be taken three (3) weeks after planting. A ruler meter will be placed at the base of each seedling runs to the terminal End, reading will be taken and record appropriately.

* + 1. ***Number of leaves/plants***

The number of leaves appeared on the selected seedlings will be counted systematically and record.

* + 1. ***Stem diameter***

Data on stem diameter from the selected Okra seedling in each plot will be measured carefully using a digital Vanier calliper and will be record.

## 3.5 Yield Parameters

***3.5.1 Days to 50% Flowering***

The number of days to which half of the crop in each plot begin to flowers will be determined and record via physical counting.

***3.5.2 Days to 50% podding***

The number of days to which half of the crop in each plot commenced podding will also be determined and record.

* + 1. ***Number of pods/plots***

The number of pods or fruits for each plot will be collected and record properly.

* + 1. ***Grand yield***

The output collected from plot will be merged together, total will be taken and record.

## 3.6 Data Analysis

The collected data will be analyze using analysis of variance and means will be separated using the least significance difference (L.S.D) at 50% probability level.