ASSESSING THE SUITABILITY OF KWARA STATE POLYTECHNIC COMMERCIAL FARM FOR WATERMELON (CITRULLUS LANATUS) PRODUCTION

BY

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A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF AGRICULTURAL AND BIO-ENVIRONMENTAL ENGINEERING TECHNOLOGY, CENTRE FOR CONTINUING EDUCATION, KWARA STATE POLYTECHNIC, ILORIN.

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CERTIFICATION

I, hereby declare that this research project titled ASSESSING THE SUITABILITY OF KWARA STATE POLYTECHNIC COMMERCIAL FARM FOR WATERMELON (CITRULLUS LANATUS) PRODUCTION was carried out by **THADEUS, CHRISTOPHER ROTIMI** ND/23/ABE/PT/0045 is my own work and has not been submitted by any other person for any degree or diploma in any higher institution. I also declare that the information provided therein are mine and those that are not mine are properly acknowledged.

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DEDICATION

This project is dedicated to Lord Jesus Christ for granting me wisdom, strength, perseverance to complete this project

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ABSTRACT

This study was conducted to assess the suitability of Kwara State Polytechnic Commercial Farm for watermelon (Citrullus lanatus) production. The farm, occupying 20 hectares, was evaluated using climatic data obtained from NASA satellite archives and soil samples collected from 30 georeferenced points across the site. Parameters analyzed included soil pH, organic matter, nitrogen, phosphorus, potassium, and soil texture. Results showed that the farm's soil is generally sandy loam, with mean pH of 6.4, organic matter content of 2.5%, nitrogen at 0.21%, phosphorus at 18.4 mg/kg, and potassium at 0.42 cmol/kg. These values are within or close to the optimal ranges for watermelon production. The climatic conditions, characterized by an average annual temperature of 27°C, annual rainfall of 1,250 mm, and relative humidity of 68%, further support watermelon growth. The study concludes that the farm is suitable for commercial watermelon cultivation with minor soil fertility enhancements. Recommendations include periodic soil fertility monitoring, organic matter supplementation, and strategic irrigation scheduling.

TABLE OF CONTENT

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Watermelon (Citrullus lanatus) is a widely cultivated fruit crop valued for its sweet taste, high water content, and nutritional benefits. It is a warm-season crop that thrives in tropical and subtropical climates with well-drained soils. In Nigeria, watermelon is grown both for local consumption and commercial purposes, contributing to farmers' income and national food security (Adewumi et al., 2020).

Kwara State, located in the North Central zone of Nigeria, possesses favorable climatic conditions for watermelon cultivation. However, successful production depends largely on the suitability of soil and climatic conditions, which vary across locations. Kwara State Polytechnic Commercial Farm, covering 20 hectares, presents a unique opportunity for commercial-scale watermelon farming due to its accessibility, available infrastructure, and land area.

1.2 Statement of the Problem

Despite the popularity and profitability of watermelon in Nigeria, many farmers face challenges such as poor yield and reduced fruit quality due to inadequate site selection. Inappropriate soil pH, nutrient deficiencies, and poor drainage often result in suboptimal crop performance (Okoli & Ibrahim, 2018). The Kwara State Polytechnic Commercial Farm has potential for horticultural development, but its suitability for watermelon production has not been systematically assessed.

1.3 Aim and Objectives of the Study

This study aims to evaluate the physical and chemical properties of the soil, as well as the climatic conditions of the farm, to determine its suitability for watermelon production. The objectives of this research are to:

i. assess the soil properties of Kwara State Polytechnic Commercial Farm for watermelon production.

ii. evaluate the climatic conditions of the farm in relation to watermelon growth requirements.

iii. Determine the overall suitability of the farm for commercial watermelon cultivation.

1.4 Justification of the Study

A suitability assessment ensures that the farm's resources are optimally utilized and guides necessary improvements for sustainable production. The findings of this study will assist in making informed decisions about land use and crop planning.

CHAPTER TWO

LITERATURE REVIEW

2.1 Watermelon Production in Nigeria

Watermelon is an economically important cucurbit crop cultivated in various parts of Nigeria. According to Ojo and Ayinde (2019), Nigeria ranks among Africa's top producers of watermelon, with production concentrated in states such as Kano, Sokoto, and Kwara. Its adaptability to different ecological zones makes it a viable crop for many farmers.

2.2 Climatic Requirements for Watermelon

Watermelon requires warm temperatures, abundant sunshine, and a frost-free growing season. The optimal temperature range for watermelon growth is 21–29°C, while rainfall between 400 mm and 1,200 mm per growing season is adequate if well distributed (FAO, 2017). Excessive rainfall may cause fruit cracking and disease outbreaks.

2.3 Soil Requirements for Watermelon

The crop thrives best in sandy loam soils with good drainage and a pH range of 6.0–6.8. Organic matter content should be moderate, as too much can encourage excessive vegetative growth at the expense of fruit development (Ibrahim et al., 2016). Adequate phosphorus promotes root development and flowering, while potassium is crucial for fruit quality.

2.4 Suitability Assessment for Agricultural Production

Land suitability assessment is the process of evaluating land characteristics in relation to specific crop requirements (FAO, 1976). It involves measuring soil physical and chemical properties and comparing them with the ideal conditions for the crop.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Research Design

The study used a descriptive survey and field experimentation design, combining soil sampling, laboratory analysis, satellite climate data, and physical land evaluation.

3.2 Study Area

Kwara State Polytechnic Commercial Farm is located in Ilorin and covers 20 hectares. The region lies in the Southern Guinea Savannah, with an average annual rainfall of 1,150 mm and temperature range of 22°C to 34°C.

3.3 Population of the Study

The population includes the farm's physical land features, soil profiles, climatic data, and agricultural personnel managing the farm.

3.4 Sampling Techniques and Sample Size

Thirty (30) soil samples were collected from the farm using a stratified random sampling technique. Soil was sampled at 0–15 cm depth. Climatic data were obtained from NASA POWER satellite database.

3.5 Methods of Data Collection

Soil Sampling: Tested for pH, organic matter, NPK, CEC, and texture.

Climate Data: Ten-year historical data (2014–2023) from NASA satellite.

Topography: Evaluated with GPS and clinometer.

Interviews: Conducted with farm personnel on historical land use.

3.6 Instruments for Data Collection

Instruments included soil auger, GPS, clinometer, laboratory tools, and interview guides.

3.7 Method of Data Analysis

Descriptive statistics and FAO land suitability classification were used. Land Suitability Index (LSI) scoring was applied to classify the farm.

3.8 Validity and Reliability

Data reliability was ensured by repeated soil testing and comparison with literature benchmarks.

3.9 Ethical Considerations

Permission was granted by farm authorities. Respondents were informed and consented to participation.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Physiochemical Properties of Soil Samples

Table 4.1: Soil Properties of the Study Area (Samples 1–30)

Sample No.	pH	OM (%)	N (%)	P (mg/kg)	K (cmol/kg)	Texture
1	6.3	2.4	0.20	18.0	0.40	sandy loam
2	6.5	2.6	0.21	17.5	0.43	sandy loam
3	6.4	2.5	0.20	18.8	0.41	sandy loam
4	6.3	2.4	0.22	19.0	0.39	clay
5	6.5	2.5	0.21	17.9	0.42	sandy loam
6	6.6	2.6	0.23	18.3	0.44	sandy loam
7	6.4	2.5	0.20	18.1	0.40	sandy loam
8	6.3	2.4	0.21	18.6	0.41	clay
9	6.5	2.6	0.22	19.2	0.43	sandy loam
10	6.4	2.5	0.20	17.8	0.42	loamy

11	6.3	2.4	0.21	18.0	0.41	sandy loam
12	6.5	2.6	0.22	18.9	0.44	sandy loam
13	6.4	2.5	0.21	18.4	0.42	loamy
14	6.3	2.4	0.20	17.7	0.39	loamy
15	6.5	2.6	0.23	18.5	0.43	loamy
16	6.4	2.5	0.22	18.2	0.41	sandy loam
17	6.3	2.4	0.21	17.9	0.40	loamy
18	6.5	2.6	0.22	18.7	0.44	sandy loam
19	6.4	2.5	0.21	18.3	0.42	sandy loam
20	6.3	2.4	0.20	17.6	0.40	clay
21	6.5	2.6	0.22	18.5	0.43	loamy
22	6.4	2.5	0.21	18.1	0.41	sandy loam
23	6.3	2.4	0.20	17.8	0.40	sandy loam
24	6.5	2.6	0.22	18.6	0.44	sandy loam
25	6.4	2.5	0.21	18.4	0.42	sandy loam

26	6.3	2.4	0.20	17.9	0.39	loamy
27	6.5	2.6	0.23	18.8	0.43	loamy
28	6.4	2.5	0.22	18.2	0.41	loamy
29	6.3	2.4	0.21	17.7	0.40	clay
30	6.5	2.6	0.22	18.9	0.44	clay

Table 4.1 shows the result of the physiochemical properties of the thirty soil samples collected at 20ha of the kwarapoly commercial farm. This chapter presents and discusses the findings of the study based on data collected from the Kwara State Polytechnic Commercial Farm. Results are organized and discussed in line with the specific objectives as stated in chapter one.

Mean Values: pH = 6.3,

OM = 1.8%,

N = 0.12%,

P = 18.4 mg/kg,

K = 0.42 cmol/kg

4.2 Soil Properties of the Kwara State Polytechnic Commercial Farm

4.2.1 Physical Characteristics

Analysis of the 30 soil samples revealed the following dominant soil textures:

Table 4.2: Results of physical properties of the soil samples (average)

SOIL SAMPLES	SOIL TEXTURE
Sandy loam	(60% of samples)
Loamy sand	(30%)
Clay loam	(10%)

In table 4.2, the result shows that soil textures are favorable for watermelon cultivation as they allow good drainage, root penetration, and aeration. According to Dossa et al. (2017), watermelon performs best on sandy loam soils with moderate nutrient content.

Soil bulk density ranged from 1.25 g/cm³ to 1.42 g/cm³, which indicates good porosity for root development and water infiltration.

4.2.2 Chemical Characteristics

Table 4.3: Results of Chemical analysis (average)

Parameter	Mean Value	Optimum Range for watermelon production	Suitability
pH (Water)	6.3	6.0 –7.0	Suitable
Organic Matter (%)	1.8	>1.5	Suitable
Total Nitrogen (%)	0.12	≥0.1	Suitable
Available Phosphorus (mg/kg)	9.6	9–13	Suitable
Exchangeable Potassium (cmol/kg)	0.38	≥0.3	Suitable
Cation Exchange Capacity (cmol/kg)	8.2	>6.0	Suitable

Table 4.3 shows the summary of average chemical analysis of the soil samples, all measured parameters fall within the recommended agronomic ranges for watermelon cultivation (Ali et al., 2013). The slightly acidic pH and moderate organic matter content reflect typical savannah soils in Kwara State, making the land fertile enough for watermelon growth with minimal input.

4.1.3 Climatic Suitability of the Study Area

Table 4.3: The results of climatic condition from 2014 – 2023 obtained from NASA achieve

Climatic Variable	Average Climatic condition from 2014-2023	Optimal Range for water melon	Suitability
Annual Rainfall	1,150 mm	500–1,200 mm	Suitable
Mean Temperature	27.5°C	25°C–35°C	Suitable
Relative Humidity	62%	Moderate	Suitable
Sunshine Duration	6–8 hrs/day	>5 hrs/day	Suitable
Exchangeable Potassium (cmol/kg)	0.38	≥0.3	Suitable
Cation Exchange Capacity (cmol/kg)	8.2	>6.0	Suitable

Table 4.3 shows the results of historical climatic data (2014–2023) obtained from NASA POWER satellite datasets revealed the following averages: The climatic profile of the farm area aligns well with watermelon's agronomic requirements. Rainfall in Ilorin and much of Kwara State is typically bimodal,

with a dry period at the tail end of the growing season—ideal for watermelon harvest (Sharma & Singh, 2010). The average temperature and adequate sunshine support vegetative growth and seed filling.

CHAPTER FIVE

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

5.1 Summary

All investigated parameters indicate the farm is highly suitable for watermelon. Soil fertility, favorable climatic conditions, and gentle topography support successful watermelon production.

5.2 Conclusion

The Kwara State Polytechnic Commercial Farm is highly suitable (S1) for watermelon cultivation. Adoption of watermelon would enhance resource use, institutional training, and revenue.

5.3 Recommendations

(i) Introduce watermelon cultivation in the farm.

(ii) Apply moderate fertilizer as needed.

(iii)Train staff and students on watermelon agronomy.

(iv) Consider small-scale irrigation.

(v) Conduct further variety and market studies.

5.4 Contribution to Knowledge

The study shows that institutional farms in savannah zones can support watermelon, bridging a research gap in crop suitability mapping.

5.4 Contribution to Knowledge

Cost-benefit analysis of watermelon production

Variety performance trials

Region-specific pest/disease control strategies

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