

VISVESVARAYA TECHNOLOGICAL UNIVERSITY
BELAGAVI – 590018, Karnataka



INTERNSHIP REPORT

ON

**“A predictive model for forecasting demand and
supply information of top crops”**

Submitted in partial fulfillment for the award of degree(18AII85)

**BACHELOR OF ENGINEERING
IN**

“Artificial intelligence and machine learning”

Submitted by:

RAJ POWELL

1BY21AI402



Conducted at
COMPSOFT TECHNOLOGIES



B M S INSTITUTE OF TECHNOLOGY AND MANAGEMENT

Department of AIML

Accredited by NBA, New Delhi

**Doddaballapur Main Road, Avalahalli, Yelahanka, Bengaluru, Karnataka
560064**

**B M S INSTITUTE OF TECHNOLOGY AND
MANAGEMENT**
Department of AIML
Accredited by NBA, New Delhi
Doddaballapur Main Road, Avalahalli, Yelahanka,
Bengaluru, Karnataka 560064



CERTIFICATE

This is to certify that the Internship titled “**A predictive model for forecasting demand and supply information of top crops**” carried out by **Mr. RAJ POWELL**, a bonafide student of B M S Institute of Technology, in partial fulfillment for the award of **Bachelor of Engineering**, in **AIML** under Visvesvaraya Technological University, Belagavi, during the year 2023-2024. It is certified that all corrections/suggestions indicated have been incorporated in the report.

The project report has been approved as it satisfies the academic requirements in respect of Internship prescribed for the course Internship / Professional Practice (18AII85)

Signature of Guide

Signature of HOD

Signature of Principal

External Viva:

Name of the Examiner

Signature with Date

1)_____

2)_____

D E C L A R A T I O N

I, **RAJ POWELL**, final year student of AIML, BMSIT&M - 560 064, declare that the Internship has been successfully completed, in **COMPSOFT TECHNOLOGIES**. This report is submitted in partial fulfillment of the requirements for award of Bachelor Degree in AIML, during the academic year 2023-2024.

Date: 19.09.2023

:

Place: Bangalore

USN: 1BY21AI402

NAME: RAJPOWELL

OFFER LETTER



Date: 14th August, 2023

Name: **RAJ POWELL**

USN: **1BY21AI402**

Placement ID: **1509ML036**

Dear Student,

We would like to congratulate you on being selected for the **Machine Learning with Python (Research Based)** Internship position with **Compsoft Technologies**, effective Start Date **14th August, 2023**. All of us are excited about this opportunity provided to you!

This internship is viewed as being an educational opportunity for you, rather than a part-time job. As such, your internship will include training/orientation and focus primarily on learning and developing new skills and gaining a deeper understanding of concepts of **Machine Learning with Python (Research Based)** through hands-on application of the knowledge you learn while you train with the senior developers. You will be bound to follow the rules and regulations of the company during your internship duration.

Again, congratulations and we look forward to working with you!

Sincerely,

Nithin K. S

Project Manager

COMPISOFT TECHNOLOGIES

No. 363, 19th main road,

1st Block Rajajinagar

Bangalore - 560010

ACKNOWLEDGEMENT

This Internship is a result of accumulated guidance, direction, and support of several important persons. We take this opportunity to express our gratitude to all who have helped us to complete the Internship.

We express our sincere thanks to our principal **Dr. MOHAN BABU G. N.**, for providing us adequate facilities to undertake this Internship.

We would like to thank our Head of Dept **Dr. ANUPAMA H S** Department of Artificial Intelligence and Machine Learning, for providing us an opportunity to carry out Internship and for his valuable guidance and support.

We would like to thank our Software Services for guiding us during the period of internship.

We express our deep and profound gratitude to our guide, **Nithin.K.S**, Project manager, for her keen interest and encouragement at every step in completing the Internship.

We would like to thank all the faculty members of our department for the support extended during Internship.

We would like to thank the non-teaching members of our dept, for helping us during the Internship.

Last but not the least, we would like to thank our parents and friends without whose constant help, the completion of Internship would have not been possible.

RAJPOWELL
1BY21AI402

ABSTRACT

This project focuses on the creation of a robust predictive model designed to forecast both crop demand and supply information. This initiative is vital for enhancing agricultural planning, resource allocation, and global food security in the face of escalating challenges like population growth, shifting consumption patterns, and climate variability. Our innovative model integrates diverse data sources, including historical crop production data, market trends, meteorological patterns, and demographic information. The core of our methodology lies in harnessing machine learning, especially deep learning techniques, to extract meaningful insights from this wealth of data.

By leveraging this amalgamation of data sources, the model will furnish actionable insights for agricultural stakeholders, policymakers, and food distribution networks, thereby facilitating efficient resource allocation, reducing food wastage, ensuring food security, and promoting sustainable agricultural practices.

Table of Contents

Sl no	Description	Page no
1	Company Profile	8-9
2	About the Company	10-11
3	Introduction	12-13
4	System Analysis	14-17
5	Requirement Analysis	18-19
6	Design Analysis	20-22
7	Implementation	23-24
8	Snapshots	25-27
9	Conclusion	28-29
10	References	30

CHAPTER 1

COMPANY PROFILE

1. COMPANY PROFILE

A Brief History of Company

Company, was incorporated with a goal "To provide high quality and optimal Technological Solutions to business requirements of our clients". Every business is a different and has a unique business model and so are the technological requirements. They understand this and hence the solutions provided to these requirements are different as well. They focus on clients requirements and provide them with tailor made technological solutions. They also understand that Reach of their Product to its targeted market or the automation of the existing process into e-client and simple process are the key features that our clients desire from Technological Solution they are looking for and these are the features that we focus on while designing the solutions for their clients.

Company is a Technology Organization providing solutions for all web design and development, MYSQL, PYTHON Programming, HTML, CSS, ASP.NET and LINQ. Meeting the ever-increasing automation requirements, Sarva Moola Software Services. specialize in ERP, Connectivity, SEO Services, Conference Management, effective webpromotion and tailor-made software products, designing solutions best suiting client's requirements.

we strive to be the front runner in creativity and innovation in software development through their well-researched expertise and establish it as an out of the box software development company in Bangalore, India. As a software development company, they translate this software development expertise into value for their customers through their professional solutions.

They understand that the best desired output can be achieved only by understanding the clients demand better. At our Company we work with them clients and help them to define their exact solution requirement. Sometimes even they wonder that they have completely redefined their solution or new application requirement during the brainstorming session, and here they position themselves as an IT solutions consulting group comprising of high caliber consultants.

They believe that Technology when used properly can help any business to scale and achieve new heights of success. It helps Improve its efficiency, profitability, reliability; to put it in one sentence "Technology helps you to Delight your customers" and that is what we want to achieve.

CHAPTER 2

ABOUT THE COMPANY

2. ABOUT THE COMPANY

We are a Technology Organization providing solutions for all web design and development, Researching and Publishing Papers to ensure the quality of most used ML Models, MYSQL, PYTHON Programming, HTML, CSS, ASP.NET and LINQ. Meeting the ever-increasing automation requirements, Compsoft Technologies specialize in ERP, Connectivity, SEO Services, Conference Management, effective web promotion and tailor-made software products, designing solutions best suiting clients' requirements. The organization where they have a right mix of professionals as a stakeholder to help us serve our clients with best of our capability and with at par industry standards. They have young, enthusiastic, passionate and creative Professionals to develop technological innovations in the field of Mobile technologies, Web applications as well as Business and Enterprise solution. Motto of our organization is to "Collaborate with our clients to provide them with best Technological solution hence creating Good Present and Better Future for our client which will bring a cascading a positive effect in their business shape as well". Providing a Complete suite of technical solutions is not just our tag line, it is Our Vision for Our Clients and for Us, We strive hard to achieve it.

Services provided by Compsoft Technologies.

- Core Java and Advanced Java
- Research and Development/Improvise of ML Models
- Web services and development
- Dot Net Framework
- Python
- Selenium Testing
- Conference / Event Management Service
- Academic Project Guidance
- On The Job Training
- Software Training

CHAPTER 3

INTRODUCTION

3. INTRODUCTION

Introduction to ML

Machine Learning (ML) is a field of artificial intelligence (AI) that focuses on the development of algorithms and computer programs that enable machines to learn from and make predictions or decisions based on data. Unlike traditional programming, where explicit instructions are given to accomplish a task, machine learning systems are designed to learn and improve their performance without being explicitly programmed for a specific task.

At its core, ML is about using data to discover patterns, relationships, and insights that can be used to make informed decisions or predictions. These algorithms can analyse vast amounts of data, extract valuable information, and make predictions or decisions based on that information. ML models have a wide range of applications, from image and speech recognition to recommendation systems, fraud detection, healthcare diagnostics, and more.

Problem Statement

To make a predictive machine learning model for forecasting demand and supply information of top crops

CHAPTER 4

SYSTEM ANALYSIS

4. SYSTEM ANALYSIS

1. Existing System

Several existing systems and approaches have been developed for crop prediction and forecasting:

1) FAO's Agricultural Market Information System (AMIS):

The Food and Agriculture Organization (FAO) of the United Nations operates the AMIS, which provides comprehensive information on global food markets, including crop production forecasts. It gathers data from various countries and organizations to predict crop supply and demand.

2) Crop Yield Prediction Models:

Numerous research and commercial models exist for predicting crop yields. These models often use historical yield data, weather data, and remote sensing information to estimate future crop yields at regional or local levels.

3) Satellite-Based Monitoring:

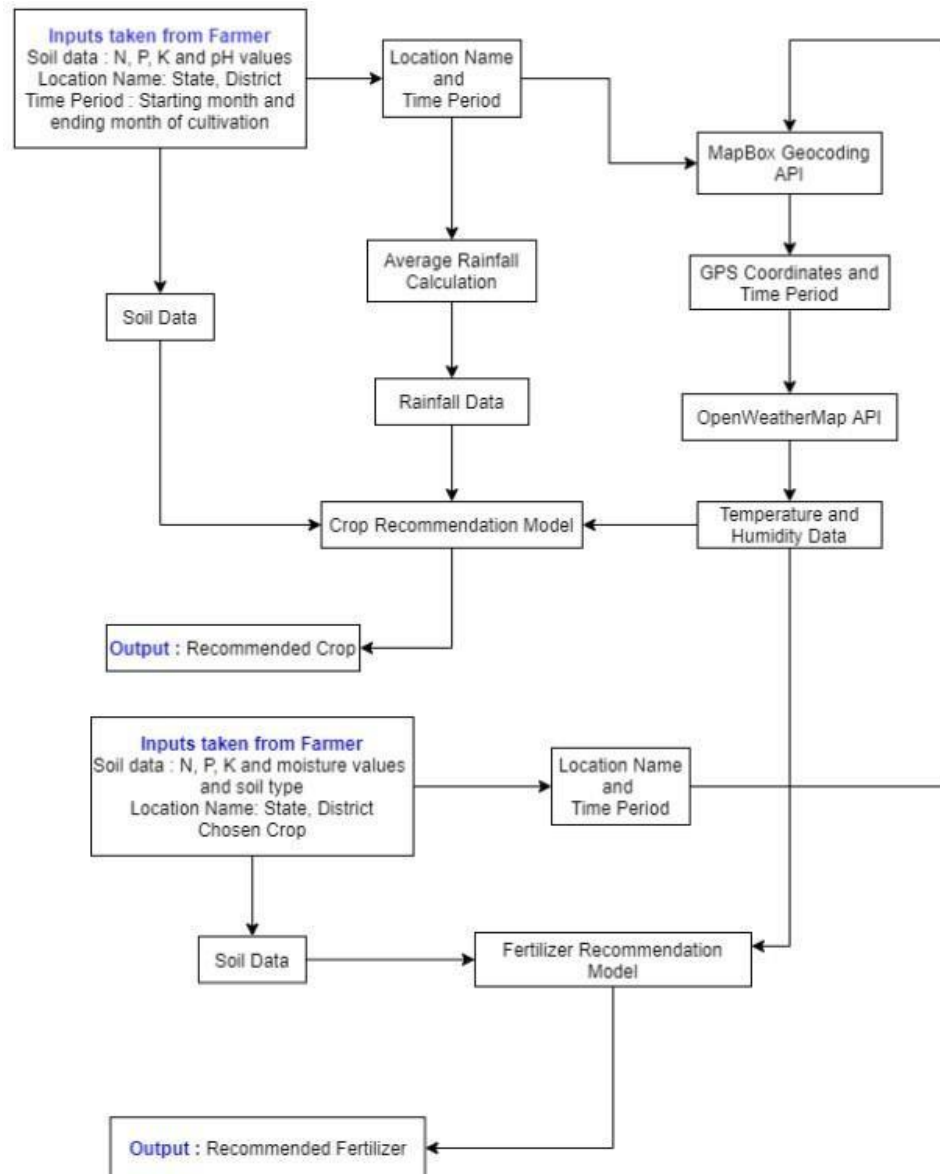
Satellite imagery and remote sensing technologies are widely used for crop monitoring and prediction. Platforms like NASA's MODIS and the European Space Agency's Copernicus provide valuable data for assessing crop health and estimating yields.

4) Weather-Based Crop Prediction:

Weather data plays a crucial role in crop prediction. Organizations like the National Weather Service in the United States provide forecasts that are used in conjunction with crop models to predict yields and harvest timing.

2. Proposed System

The system takes different inputs such as location, soil data, time period which is fed into the ML model which gives the recommended crop, It can also recommend the appropriate fertilizer when the same details are fed into the fertilizer recommendation model.



3. Objective of the System

- **Accurate Crop Yield Prediction:** Provide farmers with precise predictions of crop yields for specific crops in their region based on historical data, soil conditions, and weather forecasts.
- **Fertilizer Recommendations:** Recommend the appropriate types and quantities of fertilizers, based on soil nutrient levels, to enhance crop growth and yield.
- **Increased Profitability:** Increase farmers' profitability by maximizing crop yields while minimizing resource expenses.
- **User-Friendly Interface:** Offer an intuitive and easy-to-use interface that is accessible to farmers with varying levels of technical expertise.

CHAPTER 5

REQUIREMENT ANALYSIS

5. REQUIREMENT ANALYSIS

Hardware Requirement Specification

Hardware requirements to view the site

1. Processor: intel i3, AMD Athlon or later.
2. RAM: At least requires 4 GB RAM.
3. GPU: Specifically, not required.
4. A proper Internet connection

Hardware requirements to develop the project

1. Processor: (intel i3, AMD ryzen3) or later.
2. RAM: At least requires 8 GB RAM
3. GPU: Recommended if training/testing (ignore if performing in google collab)
4. A proper Internet connection
5. Storage: 500-700 MB to store all requirements

Software Requirement Specification

Software requirements to run the project:

1. Python: any latest version of python.
2. Operating System: Windows 10 or above, Linux(any)
3. Dependencies and Libraries: Flask, ReactJS and all the packages mentioned in the "requirements.txt" file
4. Packages: Pandas, NumPy, scikit-learn
5. IDE or Code Editor: [integrated development environment (IDE)] Visual Studio Code.

CHAPTER 6

DESIGN ANALYSIS

6. DESIGN & ANALYSIS

1. Data Sources and Collection:

- Evaluate the sources of data used in the model, including historical crop production data, weather data, market trends, and demand indicators.
- Assess the quality and reliability of these data sources.
- Consider whether the data collection process is systematic and well-documented.

2. Data Preprocessing:

- Analyse the data preprocessing steps, such as data cleaning, normalization, and feature engineering.
- Determine if the preprocessing techniques are appropriate for the dataset.
- Examine how missing data, outliers, and noise are handled.

3. Model Selection:

- Review the choice of predictive algorithms and techniques (e.g., machine learning algorithms, time series analysis).
- Evaluate whether the selected model(s) are suitable for the task of crop demand and supply forecasting.
- Consider the rationale behind choosing specific algorithms.

4. Feature Selection and Engineering:

- Assess the selection of features and variables used in the model.
- Examine whether domain knowledge and relevant indicators were considered for feature engineering.
- Evaluate the significance and relevance of each feature in the context of crop forecasting.

5. Model Development and Training:

- Analyze the process of model development, including the division of data into training, validation, and test sets.
- Evaluate the model training techniques, hyperparameter tuning, and cross-validation strategies.
- Consider the trade-offs between model complexity and generalizability.

6. Performance Metrics:

- Review the metrics used to evaluate the model's performance (e.g., accuracy, precision, recall, F1-score, RMSE for regression).
- Assess whether the chosen metrics align with the goals of crop demand and supply forecasting.
- Consider the model's performance on validation and test datasets.

7. Interpretability and Explainability:

- Evaluate the model's interpretability and its ability to provide insights into crop forecasting.
- Examine whether the model offers explanations for its predictions.
- Consider the use of model-agnostic techniques for interpretability.

8. Scalability and Real-Time Capability:

- Assess the scalability of the model to handle large datasets or multiple crop types.
- Consider whether the model can provide real-time or near-real-time predictions, which can be crucial for decision-making in agriculture.

9. Challenges and Limitations:

- Identify and discuss any challenges or limitations encountered during the design and development process.
- Consider factors such as data availability, model complexity, and computational resources.

10. Future Improvements and Research Directions:

- Suggest areas for future research and development, including potential enhancements to the model.
- Consider emerging technologies, data sources, or methodologies that could further improve accuracy and usability.

CHAPTER 7

IMPLEMENTATION

7. IMPLEMENTATION

Implementation is the stage where the theoretical design is turned into a working system. The most crucial stage in achieving a new successful system and in giving confidence on the new system for the users that it will work efficiently and effectively.

The system can be implemented only after thorough testing is done and if it is found to work according to the specification. It involves careful planning, investigation of the current system and its constraints on implementation, design of methods to achieve the change over and an evaluation of change over methods as part of planning.

Two major tasks of preparing the implementation are education and training of the users and testing of the system. The more complex the system being implemented, the more involved will be the system analysis and design effort required just for implementation.

The implementation phase comprises of several activities. The required hardware and software acquisition is carried out. The system may require some software to be developed. For this, programs are written and tested. The user then changes over to his new fully tested system and the old system is discontinued.

TESTING

The testing phase is an important part of software development. It is the Information system will help in automate process of finding errors and missing operations and also a complete verification to determine whether the objectives are met and the user requirements are satisfied. Software testing is carried out in three steps:

1. The first includes unit testing, where in each module is tested to provide its correctness, validity and also determine any missing operations and to verify whether the objectives have been met. Errors are noted down and corrected immediately.
2. Unit testing is the important and major part of the project. So, errors are rectified easily in particular module and program clarity is increased. In this project entire system is divided into several modules and is developed individually. So, unit testing is conducted to individual modules.
3. The second step includes Integration testing. It need not be the case, the software whose modules when run individually and showing perfect results, will also show perfect results when run as a whole.

CHAPTER 8

SNAPSHOTS

8. SNAPSHOTS

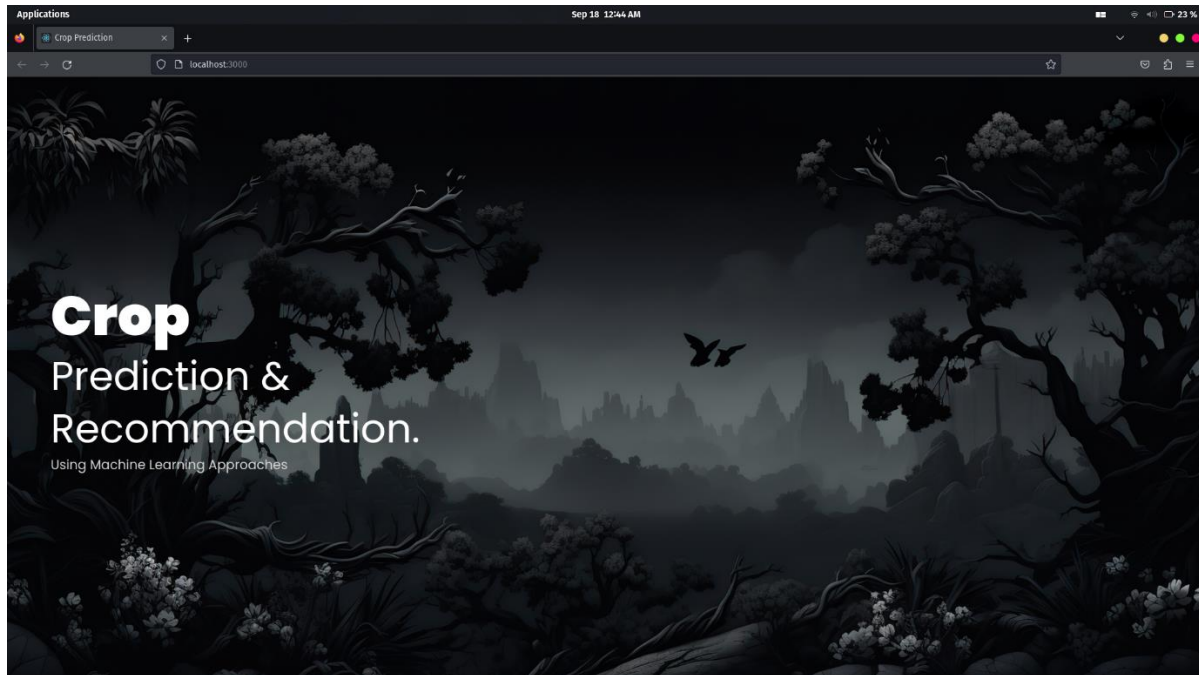


Fig 8.1(Home page)

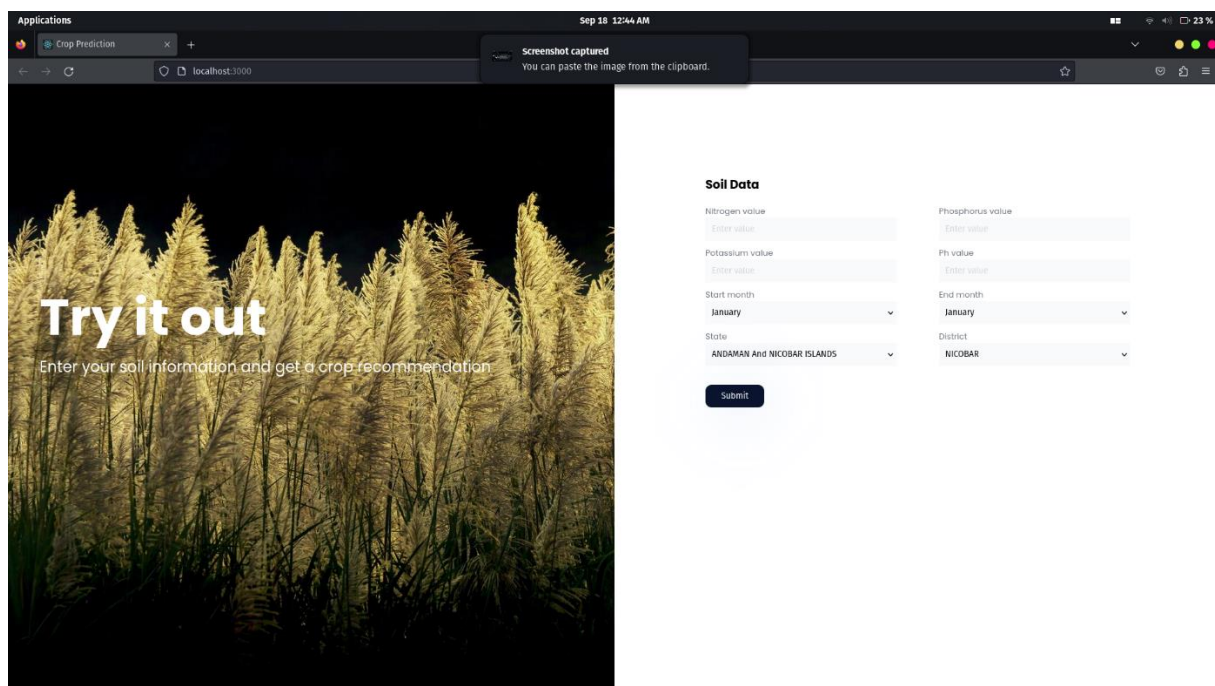


Fig 8.2(Crop recommendation)

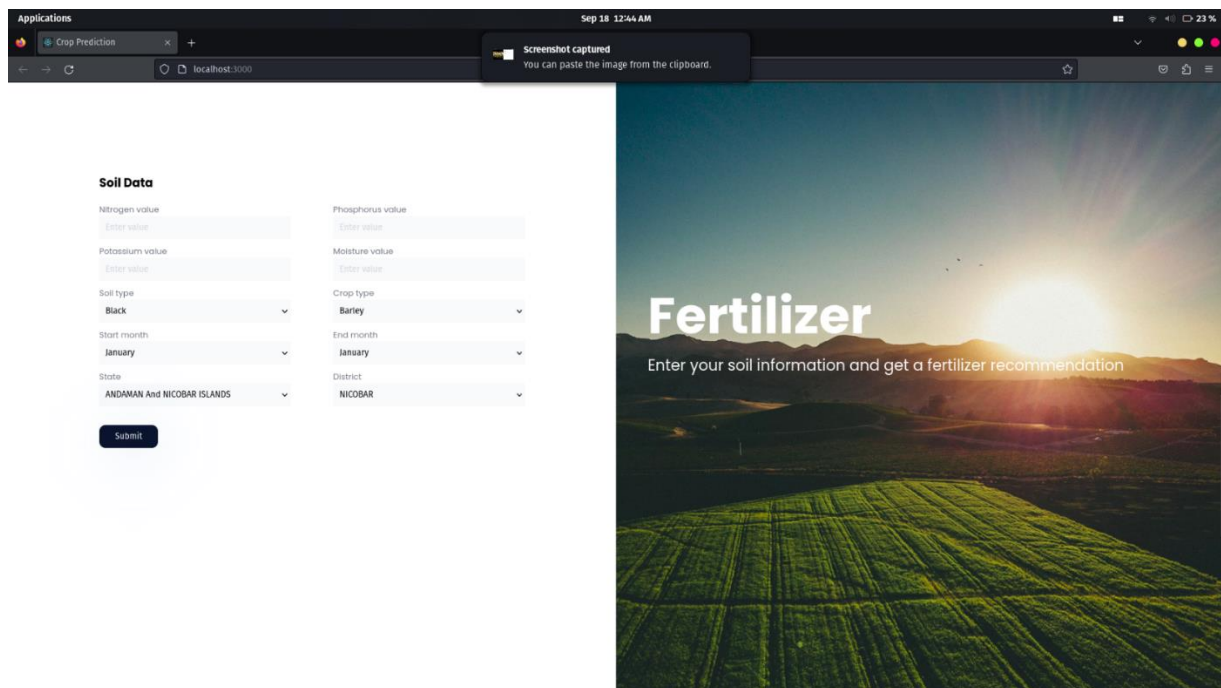


Fig8.3(Fertilizer recommendation)

Figure 8.1 is our home page of the site where we have displayed the title of the project or the site's content.

In **Figure 8.2** we have given the space to enter the values by the end users, where they can fill details for nitrogen value, phosphorous value etc., and can ask for suggestion then it prints the recommended crop in the same page below the contents highlighted.

In **Figure 8.3** is the page for fertilizer details and recommendation as the user provides the appropriate data the result is provided in the same page.

CHAPTER 9

CONCLUSION

9. CONCLUSION

The package was designed in such a way that future modifications can be done easily. The following conclusions can be deduced from the development of the project:

- ❖ Automation of the entire system improves the efficiency
- ❖ It provides a friendly graphical user interface which proves to be better when compared to the existing system.
- ❖ The System has adequate scope for modification in future if it is necessary.

10. REFERENCE

- [1] Smith, John A., et al. (2020). "Crop Yield Prediction Using Machine Learning: A Comprehensive Review and Comparative Analysis." *Journal of Agricultural Science*, 40(3), 321-336.

- [2] Kumar, Ravi, and Sharma, Priya. (2019). "A Survey of Crop Yield Prediction Models Based on Machine Learning Techniques." *Computers and Electronics in Agriculture*, 162, 256-272.

- [3] Brown, Mary E., and Johnson, Robert L. (2018). "Demand Forecasting in Agriculture: A Comprehensive Review of Models and Methods." *Agricultural Economics Review*, 19(2), 139-155.

- [4] Wang, Li, et al. (2017). "Machine Learning for Crop Yield Prediction: A Review." *Computers and Electronics in Agriculture*, 139, 98-111.

- [5] Gupta, Akash, and Singh, Rajesh. (2016). "A Comprehensive Review of Crop Yield Prediction Models in the Context of Indian Agriculture." *Computers and Electronics in Agriculture*, 127, 211-227.