Crop & Fertilizer Prediction WEB APPLICATION
Android Application

A PROJECT REPORT

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BONAFIDE CERTIFICATE

Certified that this project report titled **"GO-HARVEST BASED WEB APPLICATION AND AN ANDROID APPLICATION"** is the Bonafide work of **"ANSH MAKKAR (21MCA10010),ANMOL GUPTA(21MCA10057),CHIRAGPANCHAL (21MCA10010),TANYA JOSHI(21MCA10118), AKSHAY RAIKER(21MCA10137)"** who carried out the project work under my supervision. Certified further that to the best of my knowledge the work reported at this time does not form part of any other project/research work based on which a degree or award was conferred on an earlier occasion on this or any other candidate.

PROGRAM CHAIR   **PROJECT GUIDE**
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Last, but not least, I am deeply indebted to my parents and my team mates who have been the greatest support while I worked day and night for the project to make it a success.

ABSTRACT

Our Community Project is on the most important sector of India that is "Agriculture ". Our objective to suggest the Crop and Fertilizer to farmer according to the nitrogen, phosphorus , potassium value , PH value , in there soil and rainfall at the place they are going to farming .

For predicting both of these we are using Machine learning algorithms (NB Classification and Decision Tree) and we are also making this project for both the Android and Web and as the backend of the project we are using the Fast API and for front end we are using React framework.

There is feature that can be added in future that is Crop disease Classification , In this feature by providing the picture of the leaf our system will predict the disease and the possible solution for that .

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CHAPTER-1:PROJECT DESCRIPTION AND OUTLINE

1.1 INTRODUCTION

Our Community project is for the Farmers community ,As we know our nation India is mostly depends on the agriculture ,and in agriculture there is high risk in growing the crops by using the proper fertilizer

In our project we are developing a web application and a android application for the farmers that will help them to find the crop as per there nitrogen, phosphorus, potassium, rainfall , PH values in there soil for the new farmers, and the second feature of our project is fertilizer recommendation it helps the experienced farmers as well as the new comers to select the proper fertilizer for there crop . We also have some features that like the disease prediction and plant prediction for the student so that they can know the nature .

1.2 MOTIVATION FOR THE WORK

We know that the food is necessary for us, and the agriculture is full of risks. Because of weather ,type of soil ,fertilizer needed for growing the crop and many other factors are which affect the growth of crop .

So we decided to make a web application and a android application that will predict the crop and fertilizer according to some aspects of soil as our community project .

We have a Machine learning model that is trained on data and has accuracy of 99.72 %

1.3 OBJECTIVE OF THE WORK:

Main objective : A web app and android app that will recommend the crop and fertilizer .

For creating our project we divided the whole into small objectives:

1. We designed our both application by using FIGMA .
2. Then we take data for making our model that will do recommendation
3. Then the web app and the android app is develop.

CHAPTER 2
HARDWARE & SOFTWARE REQUIREMENTS:

Software Requirement:

To use this, we only need a single software that is a simple browser it can chrome, Firefox, Edge or any other browser.

Hardware Requirement:

To install React on Windows, your system will require the minimum configuration as below:

- Windows XP, Windows 7 (32/64 bit) or higher
- Minimum 4 GB RAM and higher
- 10 GB available space on the hard disk
- At least one Internet Browser example: Chrome, Firefox, Microsoft Edge etc.
- Node.js
- Active internet connection minimum speed 512kbps and above.
- At least one installed code Editor to test and debug your code e.g.

2.3 - Specific Project requirements

2.3.1 DATA REQUIREMENT
Data Requirement:
Data required for the project is divided into two parts one is Training data set and another one is Testing data, the Training dataset is used to train the dmodel so that it can predict the values correctly, while the training data set is used to determine

the accuracy of the model after the training, our model is giving the accuracy of the 99.72% on the   Testing data supplied to the model to determine accuracy.

2.3.2 Functional Requirement:

 Crop– we use the form for giving the data to the model, after that the model will give the Crop Recommendation, Fertilizer Recommendation: In the Fertilizer Recommendation we give a Nitrogen values, Phosphorous values, Potaassium

values, Temperature values, Humidity Values, Crop you want to grow.

2.3.4

 For Look requirement we need a good knowledge of CSS so that we can make a good responsive web App so that it can support the mobile devices easily.

CHAPTER 3

DESIGN METHODOLOGY AND ITS NOVELTY

3.1Methodology and goal :

A simple ML and DL based website and android app which recommends the best crop to grow, fertilizers to use.

In the crop recommendation application, the user can provide the soil data from their side and the application will predict which crop should the user grow.

For the fertilizer recommendation application, the user can input the soil data and the type of crop they are growing, and the application will predict what the soil lacks or has excess of and will recommend improvements.

- **Introduction to FastAPI:**

FastAPI is a modern, fast (high-performance), a web framework for building APIs with Python. It is easy to learn, fast to code, and production-ready. The most exciting feature of FastAPI is that it supports asynchronous code out of the box using the async/await Python keywords.

- **Random Forest:**

Random forests or random decision forests is an ensemble learning method for classification, regression and other tasks that operates by constructing a multitude

of decision trees at training time. For classification tasks, the output of the random forest is the class selected by most trees.

React :

ReactJS is an open-source, component-based front end library responsible only for the view layer of the application. It is maintained by Facebook. React uses a declarative paradigm that makes it easier to reason about your application and aims to be both efficient and flexible.
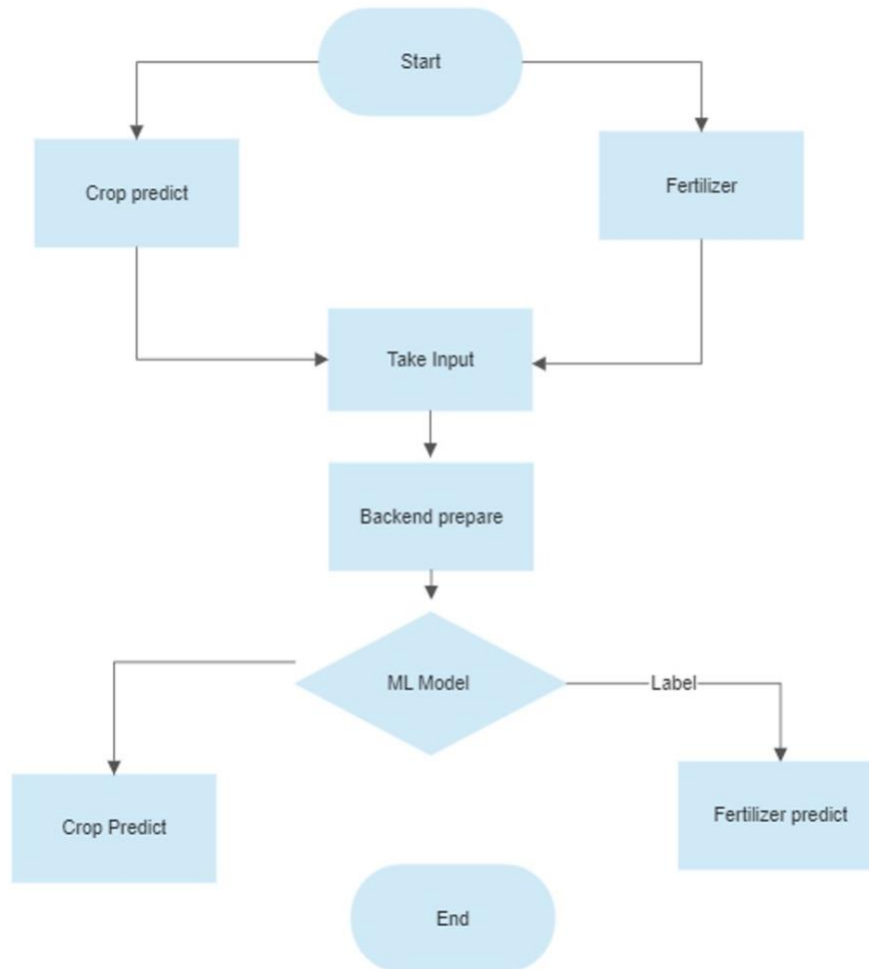
- **Goal:**

Agriculture is a business with risk and reliable crop yield prediction is vital for decisions related to agriculture risk management.

The vision of meeting world's food demands for the increasing population throughout the world is becoming more important these recent years, eventually helps in achieving zero hunger
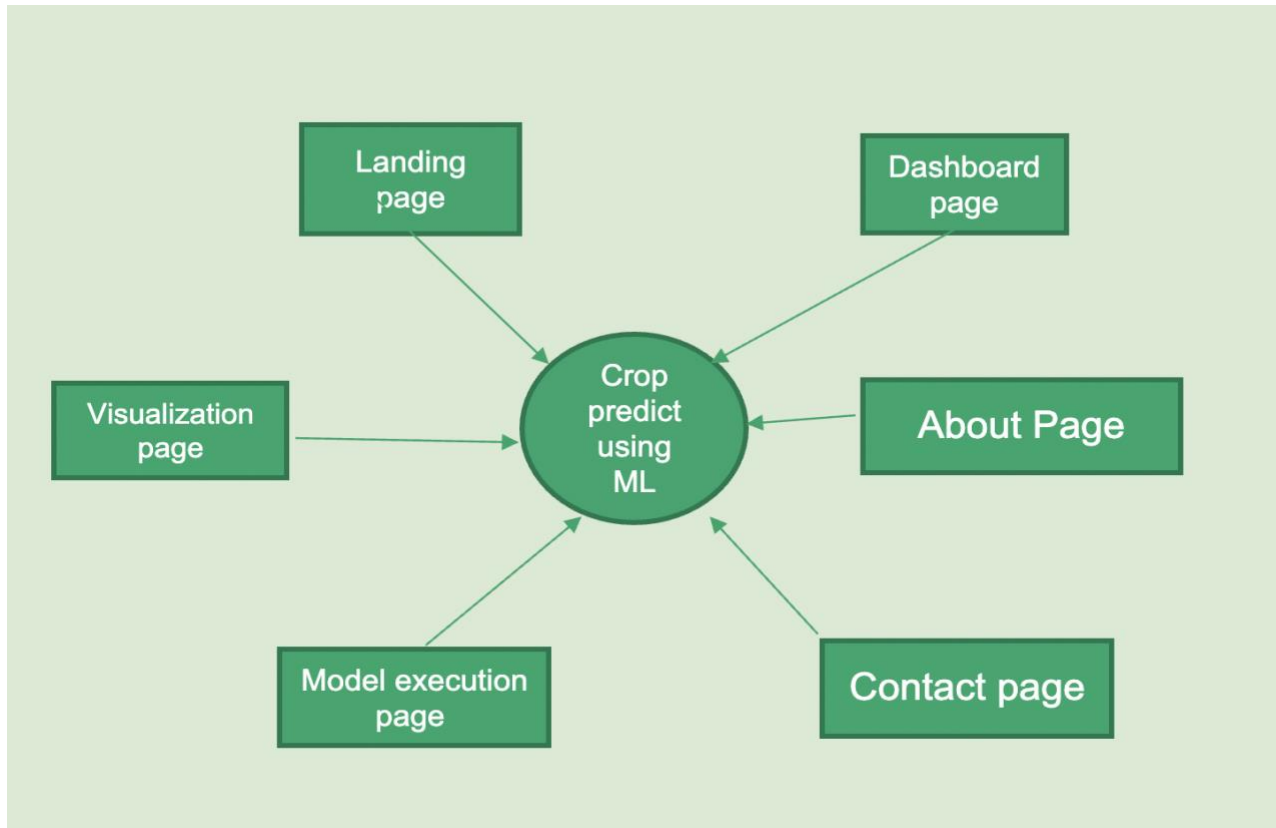
prediction can be by crop managers to minimize losses when unfavorable conditions may occur

3.2   Functional modules design and analysis

Start

Crop predict

Fertilizer

Take Input

Backend prepare

ML Model

Label

Crop Predict

Fertilizer predict

End

3.3 Software Architectural designs

0 –Level DFD

3.4 User Interface designs

This module refers to the development of static pages of the website like, Documentation of the Website, How to Use it, About the Developers etc. User would be Able to login and New User would be able to Register on the System After Selecting the Processes, we will send the data to our Python Blackbox which will produce the results When the training done. This module will help the user to view the results after training the data. After, the user will be redirected to the result page where the crop recommended or a fertilizer recommended will be showing where all the projects that he made would be available. In this project we are using FIGMA to make an attractive website and project.
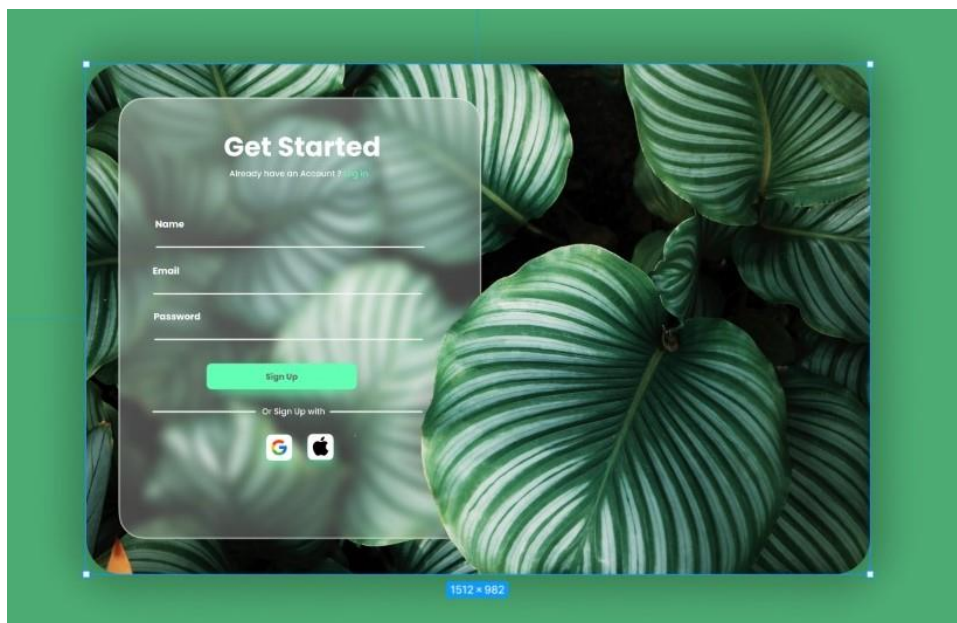
• **Landing page**

1

2

Our Services

Crop predict chirag..	Fertilizer chirag

3

Get Started

Already have an Account ? Log in

Name

Email

Password

Sign Up

Or Sign Up with

1512 × 982

Landing page :-

Crop Recommendation page:

Fertilizer Recommendation page:

FERTILIZER RECOMMENDATION

Nitrogen

Phosphorous

Potassium

Temperature

Humidity

Crop you want to grow

PREDICT

CHAPTER 4:
TECHNICAL IMPLEMENTATION & ANALYSIS

1. **Crop Recommendation:-**

Machine learning is an important decision support tool for crop prediction , including supporting decisions on what crops to grow and what to do during the growing season of the crops. Several machine learning algorithms have been applied to support crop prediction research. In this study, we performed created a web-app that takes some essential features to give us crop and fertilizer to be used that have been used in crop yield prediction studies. Based on our search criteria, we retrieved the dataset from kaggle and applied it in our machine learning model to recommend us the crop to be sown and fertilizer to be used. We investigated these selected studies carefully, analyzed the methods and features used, and provided suggestions for further research. According to our analysis, the most used features are temperature, rainfall, and soil type, and the most applied this models. After this observation based on the analysis of machine learning-based papers, we performed an additional search in disease prediction that we thought of implemetnitng in future . That will give us the disease that a model has and its counter measure so that yield will be more and better.

2. **Fertilizer Recommedation**

Agricultural soil provides the nutrients to the crop, and over time, the nutrient contents deplete with continued cultivation. The adequate quantity and quality of fertilizers provide the essential nutrients to the soil for the sustained production of crops. Paddy and wheat are the two major crops cultivated by most rural farmers in West Bengal, India. As the agricultural experts are very scarce and expensive, the layman farmers apply the chemical fertilizers with poor technical knowledge. To mitigate the lack of experts and assist the rural farmers, an intelligent machine learning based fertilizer recommendation system for paddy and wheat is very noteworthy. This work proposes a machine learning-based fertilizer recommendation system for this purpose.

Instead of a single classifier, the machine learning component is designed with an assembly of multiple classifiers. Each classifier's performance is evaluated in terms of two well established accuracy metrics; percentage accuracy and Cohen's kappa. The output of the best performing classifier is always accepted as the final recommendation. The system incorporated the Soil Test Crop Response protocol suggested by the Indian Council of Agricultural Research for the recommendation of fertilizers. It allows the farmers to choose any one of four alternative combinations of fertilizers depending on the local availability and cost. To the best of the authors' knowledge, no such comprehensive fertilizer recommendation system has been suggested using Soil Test Crop Response protocol. This work is a pioneer in this field

3. BACKEND

We have designed our Backend using FastAPI as it is light weight and easy to use . We have first created the pickel(pkl) file for our machine learning model and then integrated it with fast api . After that we have used axios in Our React App to get input from user and that input than go to our backend where they will be passed through our model and answer(crop recommended/ fertilizer recommeded) will be shown.

And one of the biggest advantage of FastAPI is it provide us with Swagger UI that helped us a lot while testing our model is perfectly runnig or not.
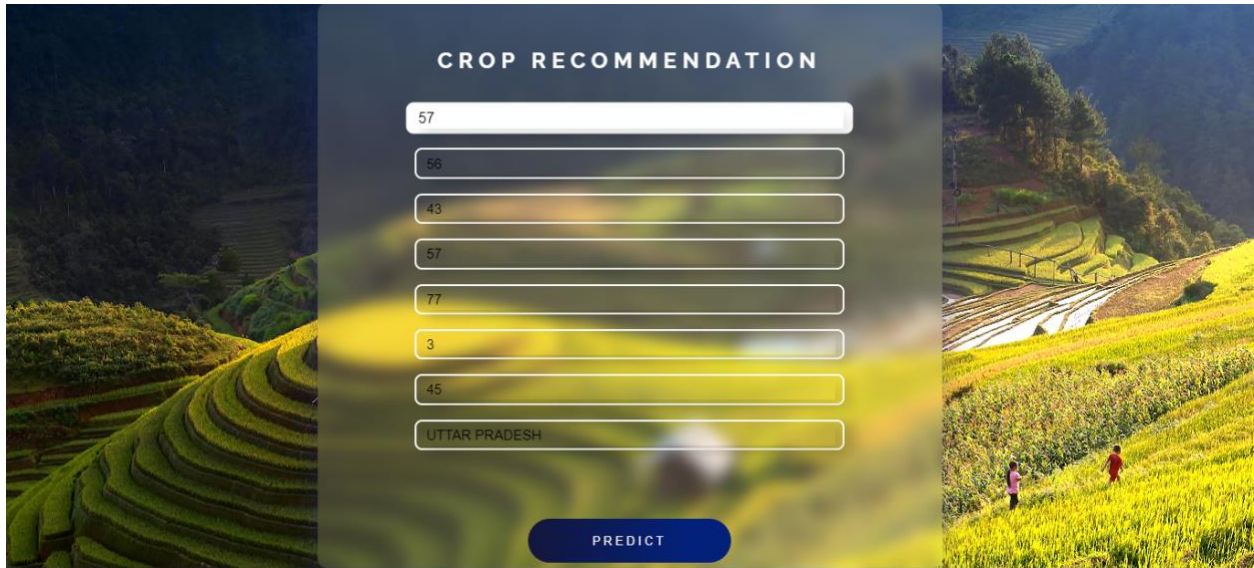
```python
@app.post('/predict')
def Crop_Reccomendation(data: input):
    data = data.dict()
    N = data['N']
    P = data['P']
    K = data['K']
    temperature = data['temperature']
    humidity = data['humidity']
    ph = data['ph']
    rainfall = data['rainfall']

    pred = model.predict([[N,  P,  K,  temperature,   humidity,   ph, rainfall]])
    return str(pred[0])


if __name__ == '__main__':
    uvicorn.run(app, host='127.0.0.1', port=8000)
```

A3. Android app

Now times the android has the majority of the user so we decided to develop a an android application for our project . we use the XML and material UI for the User interface and REST API for calling the backend of our project.

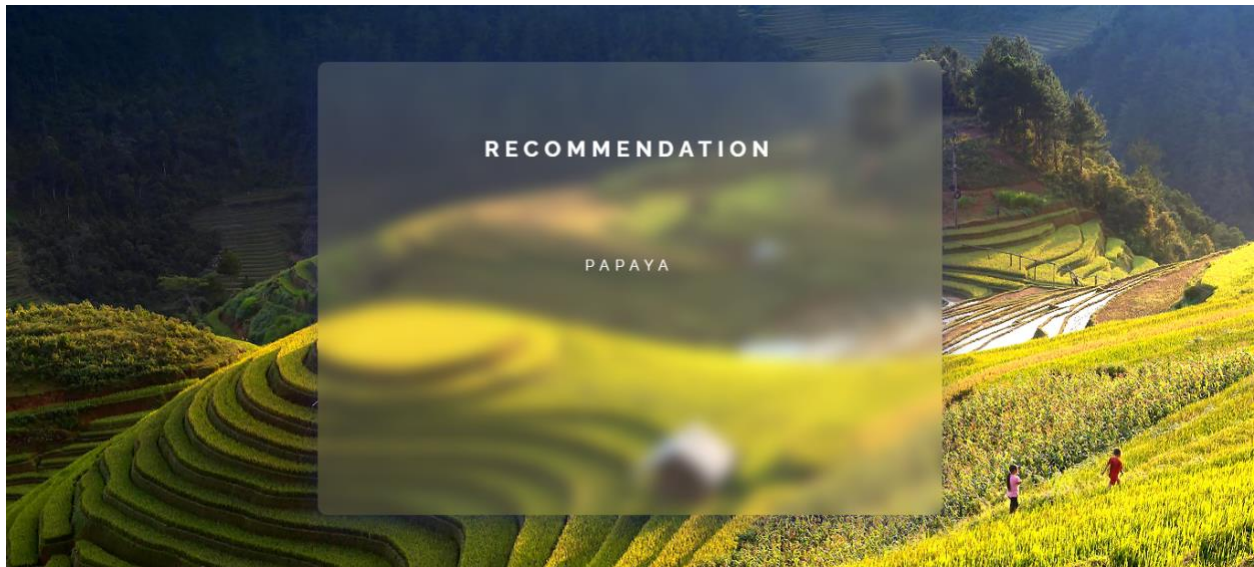**Test and validation: -**

Output:

Crop Recommendation:

Machine learning is an important decision support tool for crop prediction , including supporting decisions on what crops to grow and what to do during the growing season of the crops. Several machine learning algorithms have been applied to support crop prediction research. In this study, we performed created a

web-app that takes some essential features to give us crop to be used that have been used in crop yield prediction studies. Based on our search criteria, we retrieved the dataset from kaggle and applied it in our machine learning model to recommend us the crop to be sown and fertilizer to be used. We investigated these selected studies carefully, analyzed the methods and features used, and provided suggestions for further research.

CHAPTER 5:
PROJECT OUTCOME AND APPLICABILITY

5.1   Outline

In this, we will show the outcome of the WEB APPLICATION and ANDROID APPLICATION. How can We use this application in a real-life scenario.

5.2   key implementations outline of the System

Step 1. Introduction

In this, we Introduced the project and what are doing in this project. We discussed the plan of plan, vision, mission, and purpose of the project. We discussed what project we would create ideas for. After creating the plan of the project which technology we should use. After thinking about vision and mission.

Step 2. Resource Management

We Discussed the resources to be needed for this project. Firstly, we bought a machine learning course to understand how machine learns and provide us out put . And side by side we tried to learn FastAPI for out BAckend . Whereas other members were learning about react js to createe our front end and android development to develop a fully working android app.

5.3   Significant project outcomes

It is quite accurate in recommeding the fertilizer and crop to be sawn . The model used is RANDOM FOREST which gives us the accuracy of "99.72%". Which is

very high as compared to other machine learning models that we have tested like if it is decision tree, linear regression or any other.

CHAPTER 6:

CONCLUSIONS AND RECOMMENDATIONS

6.1 Limitation/Constraints of the System

Crop Recommendation limitation

Even though an equation is proposed, there are some limitations. Mainly this could be done only for a land with a less area. This is not suitable for commercialization as the profit will be low when you use less area for cultivation. The second limitation is the average rainfall of Sri Lanka mostly suitable for many crop types to grow without any deficiency. Therefore, the water level alone itself is not a big issue whereas other factors are. If there's enough water for plants but no temperature that would be a problem as the major environmental factors have a mutual relationship with each other in plant growth.

Fertilizer Recommendation limitation

Knowledge and experience with the strengths and limitations of current corn N fertilizer recommendations is important for the development of future recommendation systems that better estimate field-to-field, within-field, and year-to-year variability

There might be error in the readings of the soil which might lead to the wrong recommendation which may lead to adverse effects for the growth of the plants and the user will have no idea about it at all

6.2 Future Enhancements

We intend to continue to develop this model to increase the security of the data and put our efforts in the enhancement of cybersecurity. Our future enhancements will be as follows:

▪ Run encryption-decryption code in real time.

▪ Create a more strong and secure key.

▪ Provide a secure payment gateway.

Future – Disease Prediction and Plant Prediction.

Plant disease cycles represent pathogen biology as a series of interconnected stages of development including dormancy, reproduction, dispersal, and pathogenesis. The progression through these stages is determined by a continuous sequence of interactions among host, pathogen, and environment. The stages of the disease cycle form the basis of many plant disease prediction models. The relationship of temperature and moisture to disease development and pathogen reproduction serve as the basis for most contemporary plant disease prediction systems. Pathogen dormancy and inoculum dispersal are considered less frequently. We found extensive research efforts evaluating the performance of prediction models as part of operation disease management systems. These efforts are greater than just a few decades ago, and include novel applications of Bayesian decision theory. Advances in information technology have stimulated innovations in model application. This trend must accelerate to provide the disease management strategies needed to maintain global food supplies.

Summary : -

We have created a web application as well as a mobile application. That helps us in recommending which crop or fertilizer we should be used by taking various input from users like Nitrogen, phosphorus, potassium, rainfall, pH of soil and like these various aspects. . That goes to our backend and get gives us the output on the next page.

It will be very beneficial for the farmers community because most farmers just keep repeating the crop and fertilizer to be used and by doing this their soil quality gets degraded with time and yield also reduces. There for to solve this problem we have developed a web app that can be easily accessed by farmers or any other person when sucessfully deployed.

In future scopes we were working on diseases prediction that will take a photo/image as an input from file or directly from camera and predict the disease the crop is suffering and furthermore what will be its counter measure so that it can be stopped from spreading and increase the yield production.

References

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  https://www.researchgate.net/publication/343631997_Crop_Prediction_using_Machine_Learning_Approaches

- **Fast Api: - https://fastapi.tiangolo.com/**

- **Machine learning: -   link for machine learning**

- **Crop prediction using machine learning: -**

  https://www.sciencedirect.com/science/article/pii/S0168169920302301