Abstract

Chapter 1

Introduction

Agriculture is India's backbone. It makes a significant contribution to the growth of the Indian economy, accounting for more than 15% of the country's GDP. The “Crop recommendation system for farmers” is a web application. It helps the farmers to decide on the crop what they have to grow, suggesting the fertilizer suitable for the crop, and individual Farmers can post complaints in the portal and Class one officers who views the respective complaints posted by the farmers and go through the problem solution.

Agriculture is affected due to various reasons like Heavy rainfall, lack of water, market price, climate change, pests and diseases etc. Its productivity depends not only on natural resources but also on the system inputs. Therefore, the Technological solution is needed to solve these problems which can support the farmers.

The dataset of over past twenty years is considered in making the prediction more accurate. At the same time the present temperature, humidity, NPK values and ph. are also considered to predict the suitable crop which has to grow at the given time that gives the perfect yield to the farmers.

The Fertilizer recommendation module Analyses the crop patterns and find ways for increasing the crop yield by suggesting the suitable fertilizer for the crop. Fertilizer recommendations can be done using fertilizer data and crop data. Here the required fertiliser for the crop is recommended.

The Grievance Management System is an online tool that helps farmers solve their concerns. This application aids in the reduction of time and the elimination of corruption. The goal of the grievance redressal system is to make it simpler to coordinate, monitor, and address grievances, as well as to find a solution to the problem. The resolution and reaction to farmer concerns are recorded using complaint management software.

The project “Crop Recommendation system” is developed to support farmers and Class one officers at particular department. Farmers can get the suggestion of the crop suitable to their land by entering the soil test values. Farmers can also post complaints in the portal and keep track of its status. Whereas Class one officers views the respective complaints posted by the farmers and go through the problem solution and update the status of the complaint in the portal.

This research tries to forecast yield yields under certain weather circumstances and, as a result, propose a crop for that farm.

It entails following the instructions.

- Based on NPK levels, rainfall, temperature, humidity, and soil moisture, the chosen model forecasts yield.
- Analyze crop trends using historical data from sites such as mygov.com and Kaggle.com.
- Keep an eye on agricultural production and look for methods to improve them.
- Prior to training and prediction, the dataset was pre-processed and transformed to numbers.

Designers will be able to take the proper marketing and storage procedures if they can predict the harvest before it happens. This initiative will assist farmers in the agricultural industry in determining the yield of their crop prior to planting, allowing them to make informed decisions.

These techniques are applied for prediction

1.SVM

2.Multiple linear regression

3.Decision tree

4.KNN

Decision Trees, K-Nearest-Neighbors, Random Forests, and Support Vector Machines were used to build the model. The majority vote of all categories is deemed the Final Prediction. Finally, the forecast was produced with a precision of 98.728.

Agricultural data is included in the crop recommendation programme. Plants are recommended based on soil nitrogen (N), phosphorus (P), and potassium (K), as well as soil type, temperature, pH amount, rainfall, and humidity. The fertiliser recommendation system, on the other hand, employs crop information and fertiliser data as input rates.

1.1 Objectives

The proposed application aims to provide solution to current agriculture problems.it monitors agriculture process by the study with different parameters. the parameters are the soil's Nitrogen (N), Phosphorus (P) and Potassium (K) levels, soil type, temperature, ph. value, rainfall, humidity. the prediction is made based on these parameter values for crop decision.

Fertilizer recommendation module analyse the crop patterns and find ways for increasing the crop yield by suggesting the suitable fertilizer for the crop. Fertilizer recommendations can be done using fertilizer data and crop data. In this part, suitable crops and required fertiliser for the crop are recommended.

Complaint management system here individual Farmers can post complaints in the portal and keep track of its status. Class one officers can views the respective complaints posted by the farmers and go through the problem solution. then the status of the complaint is updated in the portal.

For example, the suggested system uses machine learning and algorithm guessing. Multiple Linear Regression (MLR) recognises patterns in data and uses them as input criteria. Depending on the natural circumstances, this will encourage the best plants.

1.2 Scope of the Project

The scope of the project is to determine the crop yield by considering the dataset. The dataset includes production details, details about climatic parameters, temperature, rainfall, humidity, soil moisture, soil type and suggesting suitable fertilizer for the particular crop.

As well as providing a better interactive system for the formers, where the individual formers can complaint their issues related to system and their fields.

1.2 STARVIC TECHNOLOGY - Web Design Company profile

1.2.1 Starvic is an online Upskilling platform that aims to assist people in improving their technical abilities in a more inclusive learning environment. Online education is a significant disturbance that will have far-reaching consequences. The team at Starvic is working hard to make this online education wave a tsunami! In high-level education, Starvic takes a comprehensive approach to content, technology, marketing, and services, collaborating with corporations and academia to develop a robust and relevant industry strategy. Starvic recognised Data Science, study equipment, and artificial intelligence as one of the most significant areas of service delivery based on their market research and industry discussion. Its mission is to create and offer a high-quality online curriculum in Data Science, Artificial Intelligence, and Machine Learning for post-graduate students. It helps expedite student work in Data Science and AI/ML to promote industry growth and make India a worldwide data science powerhouse. Starvic pledges to equip itself with the ideal mix of business and technological abilities in order to assist students reap the same benefits. Starvic also provides services in AI, data science, web development, and mobile app development.

1.2.2 Vision and Mission of Starvic Technology

Starvic can help you with any type of web development project. Our most active team does not build using state-of-the-art technology and as each market trend to improve our client's business. Web design, complex website development, custom programming, dynamic website does not mean that our most active team builds using state-of-the-art technology and as each market trend to improve our client's business. Starvic Technology is dedicated to providing high-quality services: We're building a high-quality online solution that helps businesses meet their goals. We've never promised to do a better job, especially when it comes to a customer project. All of our web development features have the right blend of excellent communication and quality level.

1.2.2 Starvic Technology Company Products/Services

- An Upskilling Platform for learning AI, Machine Learning and Data science.
- Mentorship for students
- Career Guidance.
- Learning Management System development

- Website Design and development
- Mobile Application Development
- UI/UX design
- Internships and Projects for Students
- Artificial Intelligence Solutions

1.2.3 Platforms Used in company

- Amazon AWS
- Google Cloud
- Learning Management System
- Skill test Platforms
- Figma
- WordPress

Chapter 2

Literature Survey

The crop recommendation system helps the farmers to decide on the crop what they have to grow. There are agricultural cropping systems on the market that don't consider numerous variables. The suggested system was created in response to the requirement for a multi-parameter system.

This field has been researched, and some of the sources are included below.

Mansi Shinde et al [1], developed a system that provides recommendations for farmers to recognize appropriate crops. Farmers can access the application, which will help to increase crop yield.

V.Sellam et al [2], Examined environmental parameters such as the annual rainfall, the area under cultivation food price index which influences agricultural productivity. The crop yield is a dependent variable that depends on the evaluation of all these environmental conditions used in this paper to validate their impact on crop yield.

U.K.Diwan et al [3], designed a weather-based model to provide a preliminary accurate crop yield forecast. This work focused on the crop yield prediction model, using weather conditions and crop yield history. Temperature (maximum and minimum) and relative humidity in all the districts were found to play a major role among all weather factors.

Rushika Ghadge et al [4], proposed a system to help farmers to monitor the soil quality based on data mining techniques. The system focuses on the soil quality inspection to predict soil-specific crops. This system also proposes an appropriate fertilizer for crop yield optimization. To best recommend the crops this analyses soil quality and soil-based crop productivity.

The relevance of agricultural data mining was investigated by B. MiloviC and V. Radojevic et al [5]. Maintain the growth of the chosen crop and develop a fertiliser system d to handle data that is dispersed throughout the nutrient levels that the plant requires at various periods. Using patterns and algorithms, use data mining techniques to organise a data set and obtain the needed data.

The numerous mechanical methods utilised to speed up the harvest are described by Rahul Katarya et al [6]. They have gone through different artificial intelligence approaches in this article, such as machine learning algorithms and accurate analysis of huge data in agriculture.They use KNN, Ensemble-based models, Neural networks, and other techniques to describe the crop marketing programme.

"Examination of Mechanical Learning Methods for Crop Estimates," by Renuka & Sujata Terdal et al [7], relates to the yield from rainfall and soil location. MSE is used to compare algorithms in order to achieve accurate crop predictions.

2.1 Existing and Proposed System

After referring to different articles, the existing system is studied from different clients. The following section summarizes how the system is executed to achieve the task and how it can be different from the previous works.

2.1.1 Existing System

The neuro-fuzzy system, which comprises of two sections of the aberrant brain and the neural network, conducts a thorough analysis of current rainfall estimations based on three factors: Humidity, temperature, and rainfall are all factors to consider.

The present system gives a thorough study of rainfall during the last two decades, but data mining techniques have yet to be successfully applied.

A system that includes crop suggestions, fertiliser recommendations, and a single-platform grievance management system simplifies farming for farmers.

Disadvantages

- No interactive system for farmers to predict crop.
- Soil moisture is not considered for prediction.
- ANN (Artificial neural network) used, which gives less accuracy.
- Only rainfall is considered.

2.1.2 Proposed System

The goal of this research is to forecast agricultural yields under certain weather circumstances so that farmers may increase their profit and yield. The system helps the farmers by recommending particular crop by using parameters like Temperature, humidity, rainfall, ph., soiltype, season, NPK values of particular field.

Prior to this, operations concentrated on utilising data mining approaches to estimate agricultural yields for diverse soil types and using the neural fuzzy system to monitor rainfall. Fertilizer suggestions aren't taken into account.

As a result, crop production and fertiliser recommendation systems that characterise crop yields based on soil nutrient, crop data, and prescribe fertiliser for a specific crop based on database data such as fertiliser data and crop yield data are required.

The proposed system of crop recommendation system is built by using many techniques and algorithms, which predict the crop by taking current values and by comparing with the dataset that is previously available. By taking those datasets and current values of the parameters we will predict the accurate crop. the data is pre-processed for the future reference and then feature selection is done by the user where he will enter the various values. then the classification of those data is done with the help of various algorithms and techniques such as Decision tree, KNN, linear regression. then the data goes in the recommendation model, there it shows the crop for the particular field and it also shows the suitable fertilizer for recommended crop. It also helps the farmers with providing complaint management system in which individual farmers can complaint their issues related to forming.

It involves following steps

1.Proposed model predict crop based on Rainfall, Temperature, Humidity, Soil moisture, Soil type, Season, NPK values.

2. Use prior records to analyse plant patterns and map them to calculate data.

3. Keep an eye on agricultural production and look for methods to increase them.

4. Prior to training and prediction, the dataset was pre-analyzed and transformed to numbers.

Fertilizer recommendations can be created based on fertiliser and crop information. The right crops and fertiliser for each plant are advised in this section.

Benefits

- Ensure that the data you're looking for is accurate.
- Accuracy Crop rotation's precision aids farmers in cultivating and harvesting their crops more effectively.
- Fertilizer recommendations specific to each crop

2.2 Feasibility Study

The possibility of the undertaking is bankrupt miserable during this phase and main comprehension is advanced with a really far reaching game-plan for the task and a couple of proclamations. During structure assessment the possibility assessment of the future context is to be supervised.

2.2.1 Functional Feasibility

This assessment is dashed to decide the specific common sense, that is, the particular requirements of the structure. If any structure made should have colossal enthusiasm on the open particular resources. This may cause levels of fame on the available specific resources. this may cause levels of ubiquity being determined to the client. This made structure has even most need with immaterial changes are adequate to realizing the system.

2.2.2 Operational Feasibility

Since the product is created on click an execute premise, each client serenely with each module. The computerization of everyday exchanges will supplant manual and blunder inclined work successfully. The task is easy to understand and with show an ordinary PC client chips away at the bundle, which doesn't require extra preparing. The operational possibility study portrays plan and gives the fulfillment to the customer's prerequisites given in the necessity investigation stage. The information is put away in the database and it keeps back up of the considerable number of information.

2.2.3 Financial Feasibility

The client must acquire information and data from the vendor to furnish them with the administration, including information that we need from the seller's API, FTP site access to gather information. The client needs to assess it in the wake of gathering information and make reports for the vendor. That will enable the vendor to settle on a choice.

2.2.4 Economic Feasibility

Economic recovery is the difference between the advantages or results we get from a product and the overall cost we spend to enhance it.
The creation of a new product enhances system correctness and speeds up application and reporting processing in the present system.

2.3 Tools and Technologies Used

2.3.1 Python

There are several language tools accessible to handle data in this system, which demands a Python that is constantly fast-growing and is recognised for its rapid processing speed and readability for its amazing usage of big input.

Python is a powerful and easy-to-learn programming language. It offers well-performing data structures and a basic yet effective technique of object-focused editing.

Python is a widely used, well-translated programming language. Its object-oriented approach and language structure are intended to assist editors in writing concise, logical code for small and big projects. Python is meant to be highly adaptable rather than having all of its features built into its theme (with modules). With the ability to add customised connectors to existing systems, your small modularity has made you particularly popular.

Python's large library, which is sometimes lumped together because of its enormous size, contains tools for a wide range of applications. Most standard formats and protocols, such as MIME and HTTP, are supported for Internet-based applications. Modules for developing graphical user interactions, linking to relevant information, producing pseudorandom numbers, computations with accurate decimals in conflict, managing common expressions, and unit testing are all included. Python has a large

number of modules (packages) that it hosts based on the needs of the user. Within the present system, the modules listed below are employed.

2.3.1.1 NumPy

NumPy is a Python package that adds multi-dimensional support as well as a collection of sophisticated mathematical functions that may be used with these arrays.

The implementation of the Python CPython reference, which converts to inactive bytecode, has been discovered by NumPy. The mathematical algorithms built for this version of Python are typically significantly slower than the sum of their similarities. NumPy addresses the issue of slowing down in part by ensuring that the same members, services, and providers are available to them.

Because they are both translated, using NumPy in Python gives equivalent capabilities to MATLAB, and both allow the user to create quicker programmes as long as many jobs operate on the same members or matrices instead of scalars.

2.3.1.2 Pandas

Pandas is a deception and data analysis software package built for the Python editing language. It offers data format and capabilities for organising numerical tables and time series in particular.

Pandas is a Python data set manipulation package. It enables us to examine large amounts of data and come to conclusions based on mathematical theories. It can clean up and make understandable and meaningful filthy data sets. Pandas is a programme for analysing data.

Pandas supports importing data from comma-separated values (CSV), JSON, SQL, and Microsoft Excel files. Pandas supports a wide range of data management functions, including integration, selection, data cleansing, and data conflict resolution.

2.3.1.3 Matplotlib

Matplotlib is a Python programming package that extends NumPy's arithmetic capabilities.Matplotlib is a Python library that includes static, animated, and interactive workshops. It makes basic tasks simpler and more difficult tasks possible.

Provides a site-specific API for apps built using common GUI tools like Scanter, wxPython, Qt, or GTK. There is also a cutting-edge "pylab" system, which is meant to be identical to MATLAB but utilises Matplotlib instead of SciPy.

Pyplot is a MATLAB interface for the Matplotlib library. Matplotlib was created to be used as a MATLAB replacement, with the flexibility to utilise Python and the potential to be free and open source.

2.3.1.4 Scikit-Learn

Skikit-learn is a free Python programming language learning application. Various categorization, deceleration, and integration methods, as well as vector support equipment are included.

Skikit-learn (previously skikarn; read also sklearn) is a free Python language learning application. It comprises vector support systems, random forests, gradient expansion, k techniques, and DBSCAN, among other classification, deceleration, and integration algorithms.

Skikit-learn is largely developed in Python and heavily relies on NumPy for high algorithm performance and equivalent member performance. In addition, to increase performance, certain basic algorithms have been implemented in Cython. The Cython wrapper over LIBSVM uses vector support equipment; systematic decomposition and vector support methods with comparable packing are used in LIBLINEAR. It may not be feasible to expand these functions with Python in such circumstances.

2.3.1.5 Pickle

For serialising and reconfiguring Python's serial structure, the pickle module use binary protocols.

Pickling is the process of converting the Python human category into a byte, while copy is the process of returning a byte stream (from a binary file or anything similar to

bytes) to the object category. For serialising and de-serialing Python object structures, the pickle module employs binary protocols.

Pickle is mostly used in Python for serialising and deserializing Python object structures. Pickle is mostly used in Python for serialising and deserializing Python object structures. To put it another way, it's the process of turning a Python object into a byte stream in order to save it to a file / database, keep track of system status, or send data over the network. By deconstructing the line in the stream, the byte stream may be utilised to reconstruct the initial phase of the object. The entire procedure is comparable to that done in Java using serialisation or.

When byte transmission is not enabled, the pickle module first builds the original object model before filling the sample with the appropriate data. To do this, the byte stream only carries particular data for the internal object.

2.3.1.6 Flask

Flask is a Python web framework that includes modules for creating web applications. Flask is a lightweight web framework based on Python. It is categorised as a simple assignment since it does not necessitate the usage of any special software or libraries. It has no experience with data extraction, form verification, or other tasks for which established third-party libraries already exist.

Flask, on the other hand, allows extensions that may be used to add app functionality as if they were created by Flask itself. Object-related mappers, form verification, upload management, several open-source verification technologies, and other types linked to the framework are all accessible as extensions. The flask may be customised. There is no need to utilise a special project or change any code. When you initially begin, though, it is beneficial to take a more structured approach. The flask may be customised. There is no need to utilise a special project or change any code. When you initially begin, though, it is beneficial to take a more structured approach.

Flask (source code) is a Python web framework with a focus on simplicity and extensibility. Because the Flask web application is obvious in most situations, it is regarded more Pythonic than Django's web architecture. Flask is equally as straightforward to learn as the first one because it includes boilerplate code for creating a basic and efficient project.

2.3.1.6 Seaborn

Seaborn is a matplotlib-based Python data visualisation toolkit. It delivers a high-resolution graphic representation for appealing and educational math. Seaborn is a Python visual library for graphic frame manipulation. It comes with stunning automatic styles and colour palettes to make mathematical websites more appealing. It's based on the matplotlib software, and it's extensively connected with pandas data structures.

Seaborn wants recognition to be an important component of data analysis and comprehension. Provides database-based APIs, allowing us to move between multiple presentations of the same variable views in order to have a better understanding of the database.

2.3.2 Visual Studio Code

Visual Studio Code is a freeware source code editor for Windows, Linux, and MacOS created by Microsoft. Debugging assistance, syntax highlighting, intelligent coding, captions, reuse code, and integrated Git are among the features. Users may customise their themes, keyboard shortcuts, and settings, as well as install extensions that offer new features.

Visual Studio Code is a source code editor for JavaScript, JavaScript, Go, Node.js, Python, and C++. Based on the Electron framework, which is used to create Node.js Web apps with a Blink architectural engine for language interaction.

It allows users to open one or more indexes instead of a project plan, which may then be saved in the workspace for future use. As a result, he may work as an agnostic language editor for any language. It supports a variety of programming languages, each with its own set of unique capabilities. With settings, unwanted files and folders can be deleted from the project tree. The command palette allows you to access several capabilities of Visual Studio Code that aren't visible in the menus or user interface.

2.3.3 MySQL (Relational Database)

MySQL is a structured query language-based relational database management system (SQL). The programme is used for data entry, e-commerce, and login applications, among other things. The web database is the most frequent use for MySQL.

MySQL is a database management system built on Structured Query Design, a widely used language for accessing and managing entries in databases. MySQL is an open source database management system licenced under the GNU General Public License. Oracle Corporation is a supporter of this project.

Before understanding MySQL, it's critical to comprehend the database. A database is a programme that keeps track of a set of records in a logical manner. It is simple for the user to access and administer. It enables us to arrange data into tables, rows, columns, and indexes so that we can find the information we need fast. Each database has its own API for conducting data-related operations such as data creation, management, access, and search.

Prons:

- Supports simple transactions with organised information (such as a relationship database with a specified scheme).
- It is appropriate for more difficult questions. better

Cons:

- In our system, invalid informal input generally necessitates tables with well-defined columns or characteristics.

2.3.4 Apache

Apache Server, often known as the Apache HTTP server, is an open-source web server that distributes online content over the Internet. Following the upgrade, the Apache server is now the most used HTTP client on the internet.

Apache is an application programme that will be utilised as a web server application by more than 50% of users globally. Around the world, Apache is commonly used in web development servers. In web development, Apache is a programme that runs on a variety of platforms, including Windows, UNIX, OS X, OS / 2, and others, but it is most popular on the Unix operating system. To utilise Python web apps, you'll need an Apache server that supports the WSGI module, such as mod wsgi, or a WSGI standalone server.

- Apache employs a process-driven approach, in which each application is given its own thread.

- Because there are more fibres in Ap Apache, it requires more RAM.

2.3.5 PHP

PHP is a written language that may also be referred to as a server-side scripting language that can be used for web development as well as general uses. PHP is used by about 245 million websites and 2 million web servers worldwide.

The PHP processor module has been used to parse php code that does not need integration and, as a result, generate an online page.

PHP may be used as a stand-alone server language in HTML. Manages dynamic content, information, and session monitoring, as well as creating all commerce sites. It works with a variety of databases, including MySQL, PostgreSQL, Oracle, Sybase, Informix, and Microsoft SQL Server.

PHP is a server-side scripting language that is open, translated, and targeted PHP is a fantastic language for web development. Hypertext Pre-processor. As a result, it is utilised to enhance online applications.

- (PHP) is an acronym for Hypertext Preprocessor.
- PHP is a translated language that does not need to be integrated.
- Other writing languages, such as ASP and JSP, are slower than PHP.
- PH PHP is a server-side programming language that is used to manage dynamic website content.
- PHP is a scripting language that may be embedded in HTML.
- PHP is the target language.
- PHP is a computer language that is both free and open source.
- PHP is a simple and easy-to-find language that is also simple to read.

2.3.6 XAMPP

Xampp is said to as a cross-platform since it supports Apache, MySQL, PHP, and Perl and allows you to construct a WordPress site on your computer's local web server. This straightforward and lightweight solution works on Windows, Linux, and Mac. As a result, Xampp is classified as "cross-platform."

- A web server is a system comprising one or more computers devoted to the usage

of this software that can handle HTTP client requests on the public Internet as well as private LANs and WANs.

- HTML files, XHTML files, picture files, style sheets, texts, and other basic file types that clients will download are also included in web content.
- XAMPP is a commonly used web server that works on all platforms, allowing developers to develop and test their applications on a local web server.
- Its source code may be updated or modified by end users, and it was created by Apache. It will be compatible with all programming languages and all running apps.

2.4 Hardware and Software Requirements

2.4.1 Hardware Requirements

- Intel Core i7, AMD Ryzen 5 or higher processors
- 1TB hard disc space is required, as well as a minimum of 8GB RAM.

2.4.2 Requirements for Software

- Windows 7, 10 or higher versions of the operating system, Linux
- Programming Language : Python
- Xampp is a server-side web browser.

Chapter 3

Software Requirement Specification

The demands of users who wish to follow a current programme or develop a new software system are at the heart of software programmes. The engineer's system is eventually put to use by the end user. As a result, there are two primary groups interested in the new user system: Software engineers and clients. Specifications for the system In order to establish a new system, the user must contact the developer.

The major issue is that most users are unaware of the software or processes involved in software development, and developers are often unaware of the client's problem or requirements. This will result in a communication gap between the user and the development project's engineer. The software requirement's main goal is to bridge the communication gap between the many stakeholders engaged in the development process. The process of correctly defining all user demands is known as software needs specification. SRS develops a sort of software development by transferring these user demands. All user needs should be met by a good SRS.

3.1 Users

The Intended users for the project “Crop Recommender system” are:

3.1.1 Individual Farmers

- To get the suggestion of the crop suitable to their land by entering different parameters. And also get suggestion of the fertilizer needed for the particular crop.
- Farmers can also post complaints in the portal and keep track of its status.
- Get the recommended crop.
- Write new complaint.
- View or delete complaint status.
- Track the complaint status.
- View class one officer details

3.1.2 Class one officers

- Who views the respective complaints posted by the farmers and go through the problem solution and update the status of the complaint in the portal?

3.1.3 Admin module

- View and update complaint status.
- Add new department.
- Add new class one officer.
- Change the status of the complaint.

3.2 Requirements for Operation

The product functionalities that founders should utilise to enable users to do their jobs are known as performance requirements. As a result, it's critical to create them and communicate with the development team and end users. In general, operating requirements will determine how a system behaves in specific situations. Login Functionality:

The login screen allows authenticated users to login to the page to access all of the features available in the accessing system. Firstly, they have to type their username and password and click on submit, then the user's login information's are validated and if the information's are correct, they are logged in. If the information's are incorrect, they got with an error message Shown. If the user currently not registered with the account, then they can register themselves by clicking on the register button and providing exact credentials that have to register themselves.

In this system there are two stages of logins:

1.Admin login.

2.Farmer login.

3.2.2 Registration Process

3.2.2.1 New farmer registration: the farmers are the main users of this system. They can firstly register themselves as a user of the system by providing basic information. then they can login into the system by using username and password.

3.2.3 Complaint management system module

Individual Farmers can post complaints in the portal and keep track of its status. Class one officers who views the respective complaints posted by the farmers and go through the problem solution and update the status of the complaint in the portal.

3.2.2.1 Write complaint: The individual formers can write their complaints.

3.2.2.2 View class one officer details.

3.2.2.3 View the department details.

3.2.2.4 Check the status: The farmers can check their complaint status.

3.2.2.5 Crop recommendation: The formers get recommended with a suitable crop.

3.2.2.6 View the formers details.

3.2.2.7 Update the complaint status.

3.2.2.8 Add new department.

3.2.2.9 Add new class one officer

3.2.4 Crop recommendation module

- By supplying specific characteristics, this module tries to estimate yield and, as a result, propose an appropriate yield for that location. Temperature, humidity, soil type, rainfall, and soil moisture are the variables. The parameters are Temperature, Humidity, Soil type, Rainfall, soil moisture. Crop prediction accuracy will help the farmers to decide on the crop what they have to grow in their fields.
- For the prediction process the system will use machine learning and prediction algorithms to obtain the result by providing input values.
- The goal of this research is to estimate harvest yields in a different environment so that farmers may increase their profit and yield. The system helps the farmers by recommending particular crop by using parameters like Temperature, humidity, Soil type, Rainfall, soil moisture, NPK values, season, ph. value.
- The proposed system of crop recommendation system is built by using many techniques and algorithms, which predict the crop by taking current values and by

comparing with the dataset that is previously available. By taking those datasets and current values of the parameters we will predict the accurate crop.

- the data is pre-processed for the future reference and then feature selection is done by the user where he will enter the various values. then the classification of those data is done with the help of various algorithms and techniques such as

  Decision tree, KNN, linear regression. then the data goes in the recommendation model, there it shows the crop for the particular field

3.2.5 Fertilizer recommendation module

This module Analyse the crop patterns and find ways for increasing the crop yield by suggesting the acceptable fertilizer for the crop. Fertilizer recommendations is be done by using fertilizer data. during this module, the particular crops and required fertiliser for the crop are recommended.

3.2.6 Data collection

The selection of the highest quality data for analysis is part of the data collecting process. We utilised data with particular characteristics such as NPK, Ph, temperature, humidity, soil moisture, soil type, season, and rain data in this example.

3.3 Non-Functional Requirements

Inaccurate requirements refer to system flaws or limits. They can be linked to new system structures like dependability, reaction time, and storage stay, as well as platform, implementation techniques, and tools.

Non-Functional requirements might be determined on a variety of factors, including user demands, financial constraints, and corporate regulations.

3.3.1 Economic Requirements

It refers to the advantages or outcomes we obtain from a product against the expenditures we invest to enhance it.

The creation of a new product enhances system correctness and speeds up application and reporting processing in the present system. Because the database utilised is a web-approved database, there is no need to spend money on a care client.

3.3.2 Operational Requirements

It denotes that the thing is capable of functioning. Some items may perform admirably during manufacture and usage, yet they may malfunction in real life. It entails researching the needed personalities as well as their technical knowledge.

The contained data, update information, and reports for generations are accurate and quick in the present system.

3.3.3 Technical Requirements

It refers to whether the present system is completely supported by the software available on the market.

It investigates the benefits and drawbacks of utilising certain development tools, as well as if it is even viable.

The user interface of the present system is usable and does not need a great deal of knowledge or training. Because consumers want rapid access to web sites with a high level of security, the software used to upgrade is best suited for current applications. This is accomplished by combining a web server and a data server in the same physical location.

Chapter 4

System Design

The process of system design entails both planning and programming, as well as the generation of needed reports and input.

4.1 System Architecture

The class one officer receives the compliant and transfers to department. The department officers process the compliant and the admin adds to the crop recommendation system and gives the best solution and process the compliant and gives the appropriate result to the farmer.

Crop recommendation system: In crop recommendation system the crop is recommended as per the details taken from the farmer such as NPK (N-Nitrogen, P-Phosphorus, K-Potassium) values and the rain fall occurred in the region and the max temperature recorded in the region is also considered for the crop recommendation and the humidity of the region and interest of the farmer is also considered for the crop recommendation.

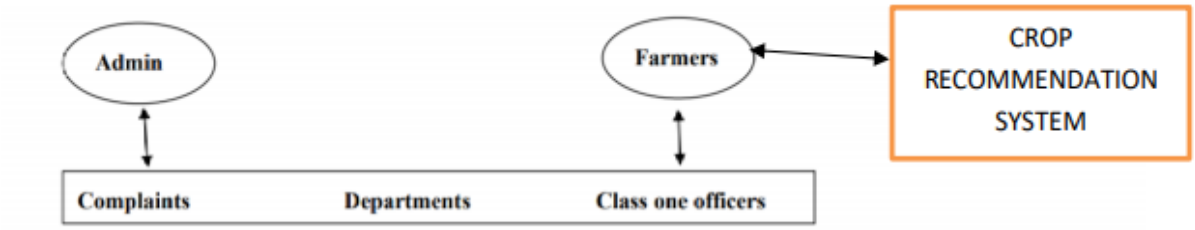


Figure 4.1 Architecture of the system

4.2 Entity Representation Diagram

An entity relationship diagram could be a diagram which indicates the relationships of entities present in aa exceedingly database. ER diagram provide the detail of the logical structure of databases by providing the details of the entities, attributes, and shows the relationships between the entities and the attributes. An ER diagrams are used to build the design of a database.

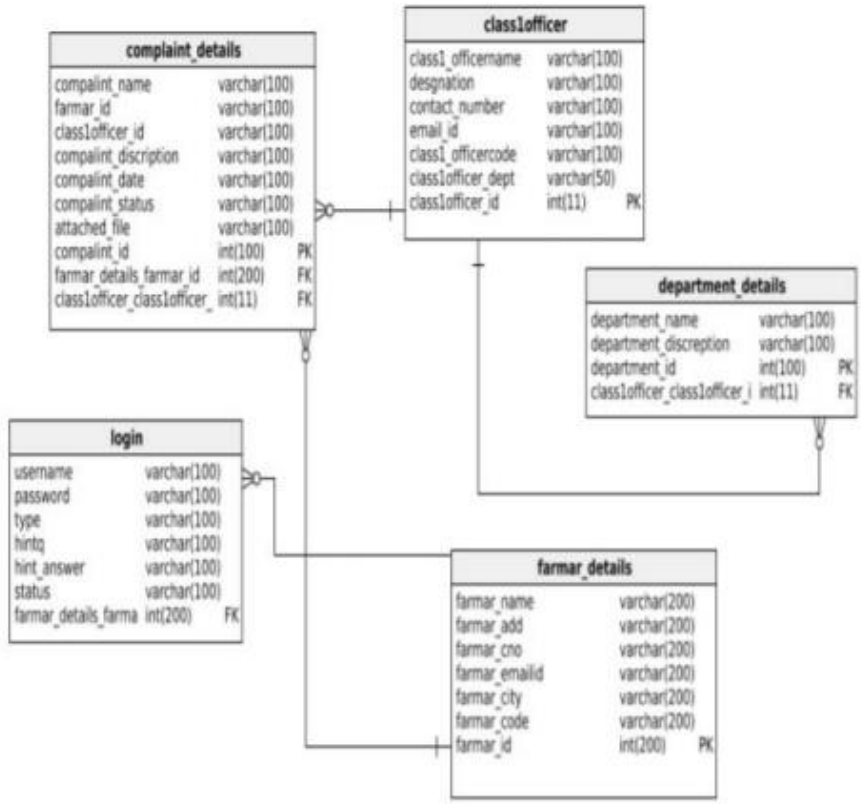


Figure 5.3 Entity relationship scheme of the database

The Figure 4.2 shows the logical level Entity representational diagrams. Most commonly an ER diagram is the combination of logical and physical aspects, which means both the logical and physical components are used in the visualization. Users and Class one officers are handled by the Admin. Admin is responsible for the Result displaying and training the data by applying several Machine Learning Algorithms based on their parameters.

4.3 Dataflow Diagram

Shows how the architecture handles the flow of data from different tools while the project is in execution state.

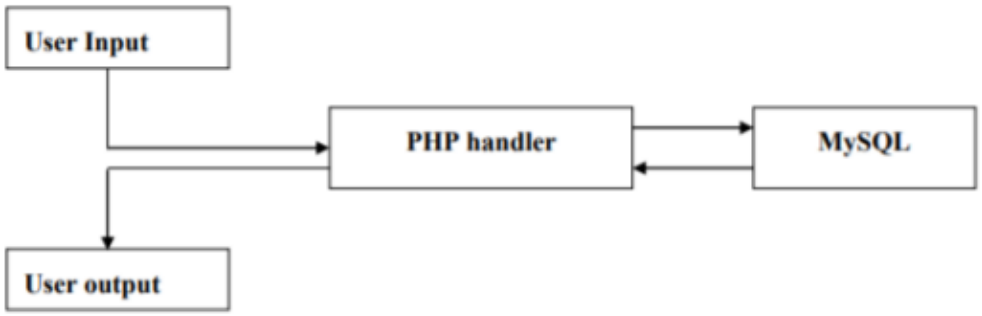


Figure 5.1 Data flow of the system

The Fig 4.3 illustrates the Dataflow diagram between the User to the Crop recommendation system Initially User enters to the System by Signup and Signing in and inputs the parameters occurring so that they can predict the result. This Data is Stored in the database and processed for the applied algorithms of Machine Learning Such as KNN, Decision Tree, CNN etc. And applying these algorithms the accurate result is predicted.

Chapter 5

Detailed Design

The Design Objectives include a number of different designs that we've used in our disease divination programme using learning equipment. Data flow diagrams, sequence diagrams, class diagrams, case diagrams, object diagrams, task diagrams, status chart diagrams, and deployment diagrams are all part of the software. We completed our assignment after creating these varied drawings and basing them on these designs.

We had designed our system in such a way that whenever user log in into the system, the user has to register to the system, and new user cannot use the system without registering in the system. for registration the user requires basic credentials such as username, email, phone, password. Then the user has to login to the system Using the same username and password.

5.1 Context diagram

In fig 5.1 (a), the process to file the compliant is done by the farmer for the future reference. The compliant is written by the farmer and the Class One Officer can access the complaint filed by the farmer from the compliant information module and process the compliant and change the status as per the laws and decisions from the higher officer

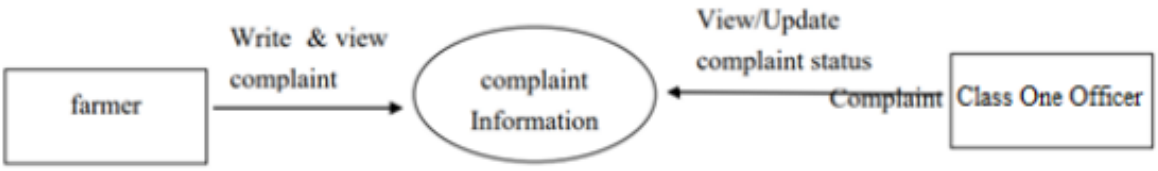


Figure 5.1(a)Adding Complaint details by farmer

In the fig 5.1 (b), there are 4 modules

1. Admin: the admin module is used to add the functionalities to the system and it acts as the main pillar of the system. Admin add the information about the department and class one officer information which is viewed by the farmer or client.

2. Farmer: who can view the information about departments and class one officer.

3. Department information: the information of the particular department is recorded in this module and the admin has the control on this module.

4. Class one officer: the job of class one officer is to receive the compliant from the farmer or the client and process the compliant if the compliant is simple and solvable he gives the solution to the farmer.

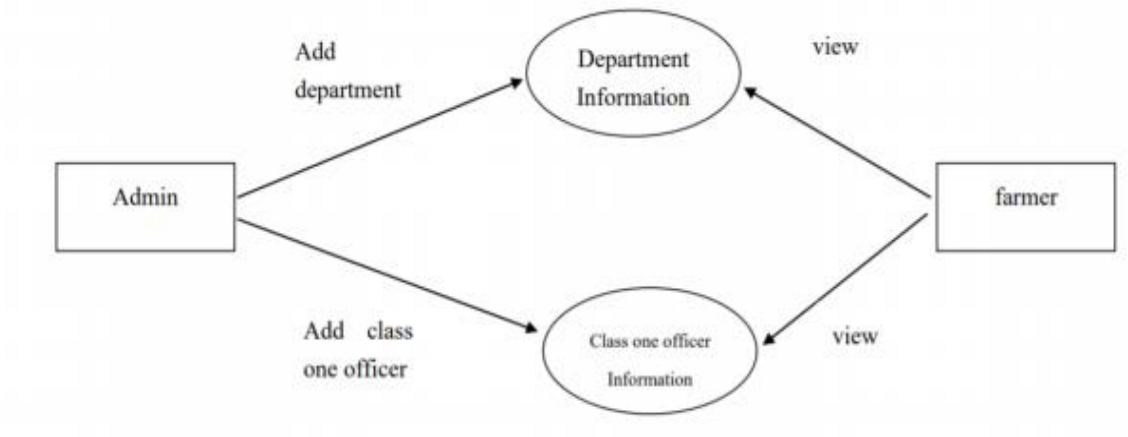
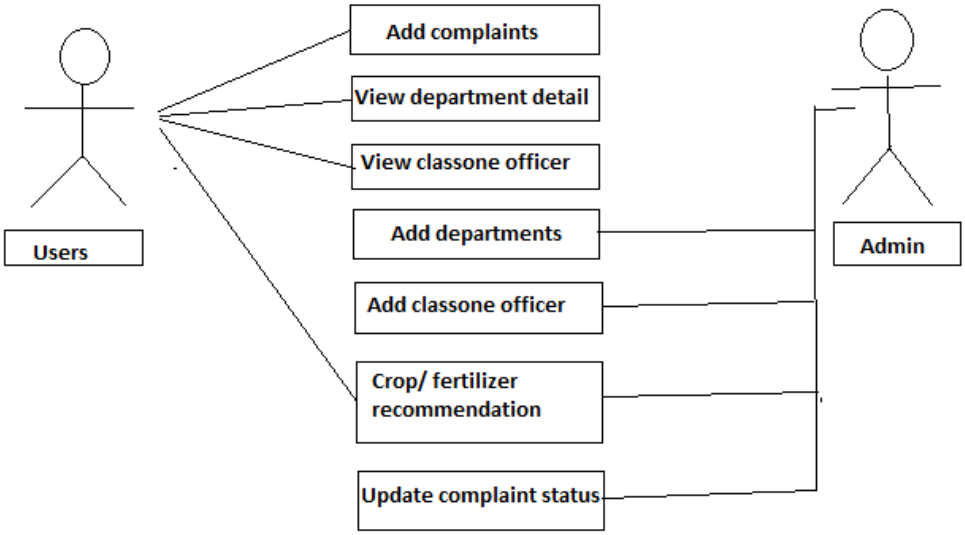


Figure 5.1(b) Adding department & class one officer details by admin

5.2 Use case diagram

The Project Crop Recommendation Program's project drawing includes all of the characteristics needed by the standard case diagram. This usage case diagram shows how the model flows from one step to the next from the beginning; it's like entering a system and entering all the details, as well as all other general information and parameters, into the system. This usage case diagram compares the truth to the training data model to see if the truth predicts the relevant results.



The Fig 5.2 illustrates the Use case diagram between the User to the Crop recommendation system Initially User enters to the System by Signup and Signing in and inputs the parameters occurring so that they can predict the result. This Data is Stored in the database and processed for the applied algorithms of Machine Learning Such as KNN, Decision Tree, CNN etc. And applying these algorithms the accurate result is predicted

5.3 Sequence Diagram

A Crop recommendation system's sequence diagram satisfies all of the requirements of a

typical sequence diagram. The flow of the model from one stage to the next is depicted in this sequence diagram.

The information, as well as other general data and parameters, are then loaded into the system. If true, a comparison with a trained data model predicts appropriate outcomes.

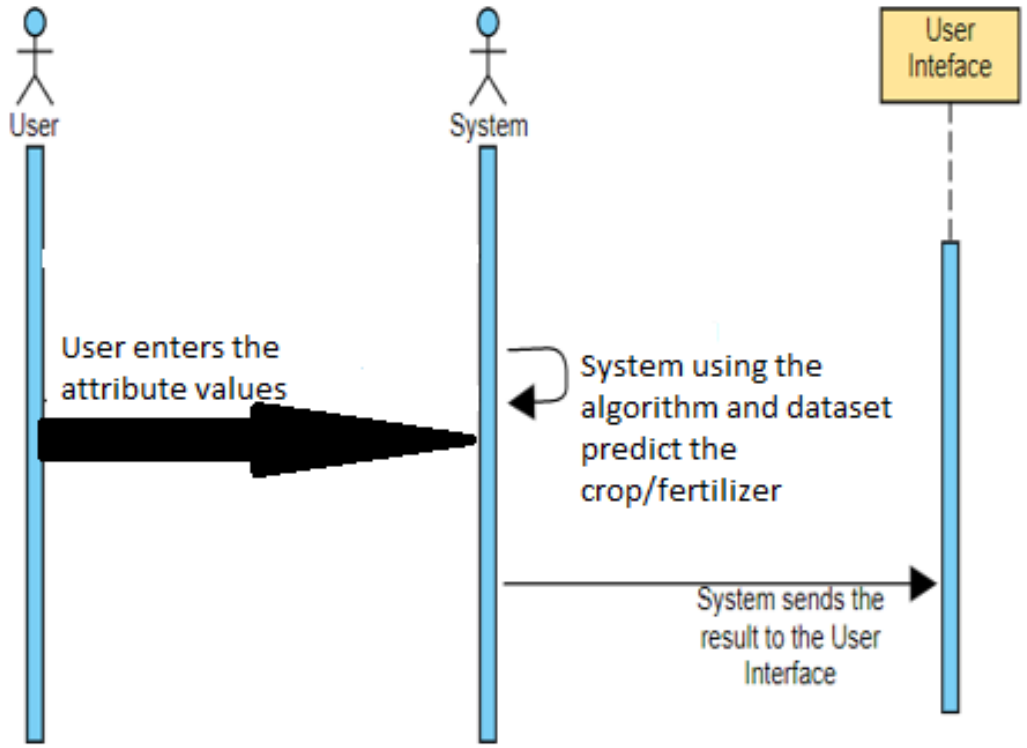


Fig 5.3 Sequence Diagram of Crop recommendation system

The Fig 5.3 illustrates the Sequence diagram between the User to the crop/fertilizer recommendation model. Initially User enters to the System by Signup and Signing in and inputs the parameters occurring so that they can predict the result.

5.4 Activity Diagram

A task diagram is a key diagram in the UML that is used to represent a program's powerful features. The flow from one action to the next is depicted in the activity diagram. A function is frequently defined as a program's function.

Figure 5.3 depicts the recommendation function, which shows how the database is processed and which is the model for building construction and plant work prediction.

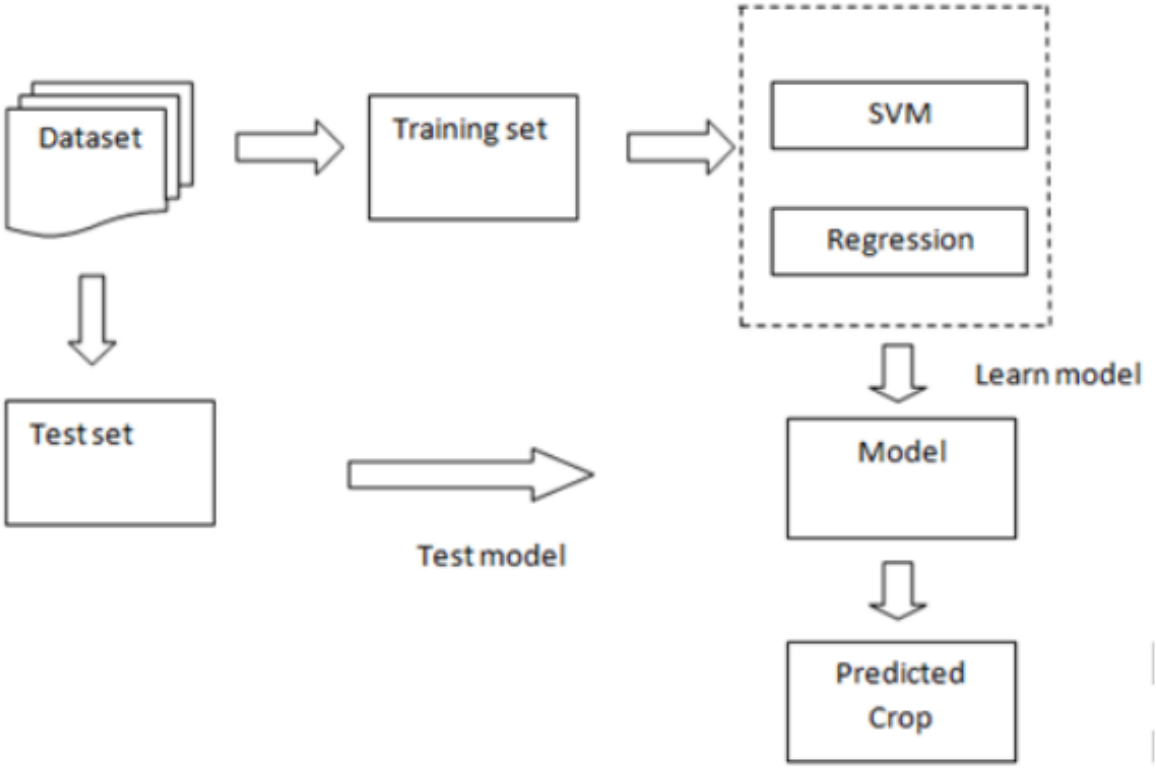


Figure 5.3 Activity diagram of crop recommendation

5.5 Class Diagram

Crop recommendation system consist of class diagram that all the other application that consists the basic class diagram, here the class diagram is that the basic entity that is required in order to carry on with the project. Class diagram consist information about all the classes that are used and all the related datasets, and all the other necessary attributes and their relationships with other entities.

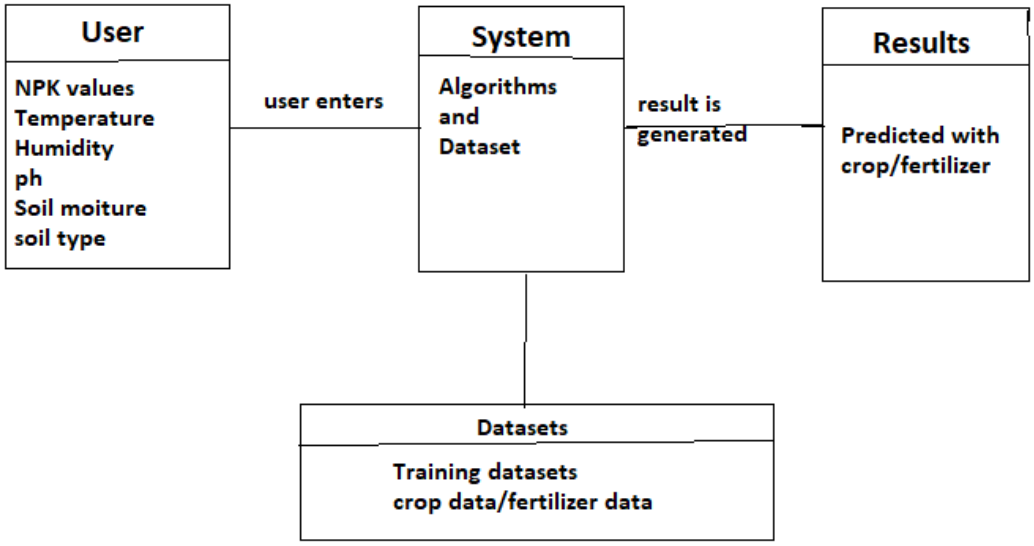


Fig 5.5 Class Diagram of Crop recommendation system

The Fig 5.5 illustrates the Class diagram between the User (Admin, Farmers) to the Crop recommendation model. Initially User enters to the System by Signup and Signing in and inputs the parameters occurring so that they can predict the result.

5.6 Component Diagram

The arrangement and connections of the material components of a system are described in an object diagram, also known as a UML object diagram. Component drawings are frequently used to help the data implementation model and double-check that the planned development covers all areas of the needed system function. The object diagram depicts all of the major components that make up the system. Design, Algorithm, File System, and Datasets are all linked in this way. The algorithm is used to process the results and offer accurate accuracy, while the UI is used to show the results appropriately in the system and the file system is used to store user data. Therefore, as all components are connected.

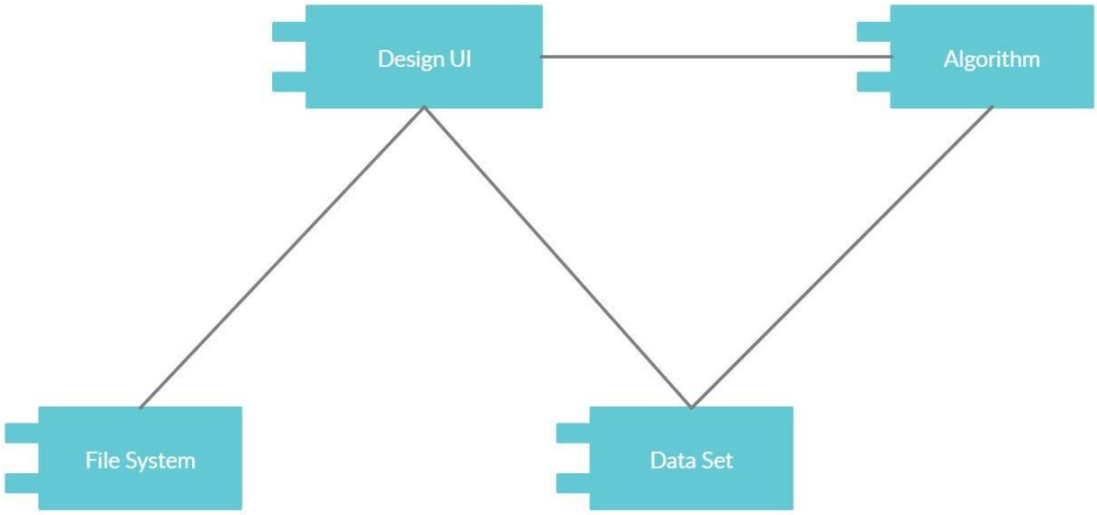


Fig 5.6 component diagram for crop recommendation system

The Fig 5.6 illustrates the Component diagram Which consists of the Design UI, Algorithms, File System and Data Set. Design UI is an Interface for the All the Users such as Admin and Farmer which is built on flask technology. Algorithms are Referred for Training the data some of the algorithms used for the Project to train the data were KNN, CNN and Decision Tree. Data Set are collected from the Mygov.com Websites and the Datasets stored in the kaggle.com. The User's authentications are stored in the File System which also consists of Dataset and Machine learning Algorithms.

5.7 State diagram

The efficacy of one object in responding to a sequence of events in a system is depicted in a diagram of the Government chart. Harel's status chart or state machine diagram are other names for it. The dynamic flow of control is moved from the status quo to the state of something within the system in this UML diagram. It is similar to the job diagram, but there are a few more rules, such as how to begin and terminate the programme. The programme begins with registration and login, and if login is successful, it will go to the next phase and. The user must then enter the symbols and hit the divination button after successfully logging in. Simultaneously, the retrieval process will complete its task and anticipate the relevant outcomes.

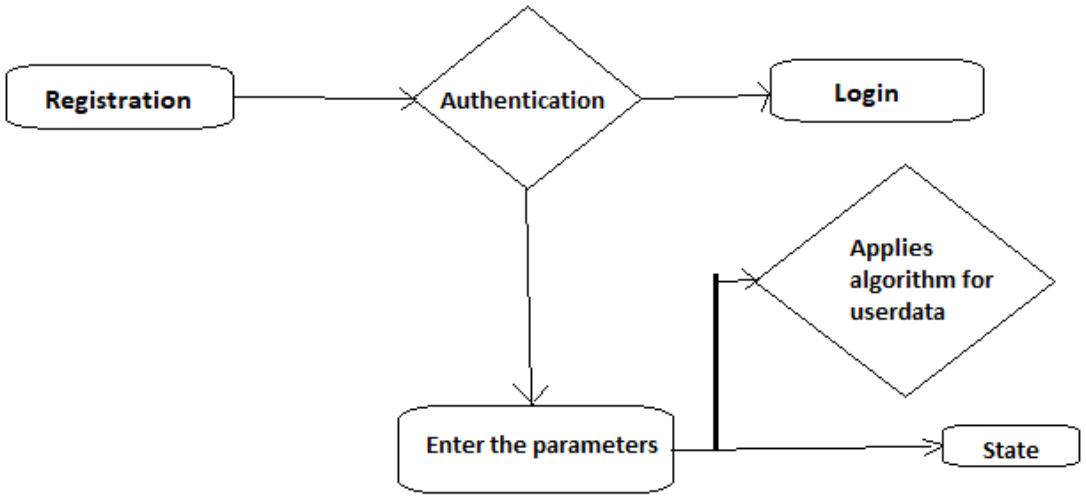


Fig 5.7 state diagram for crop recommendation system

The Fig 5.7 illustrates the State diagram between the User (Admin, Farmers) to the Crop recommendation model. Initially User enters to the System by Signup and Signing in and inputs the parameters occurring so that they can predict the result.

5.8 Collaboration Diagram

In the Unified Modeling Language, a collaborative drawing, also known as an interaction diagram, depicts the relationship and interaction between software pieces (UML). These diagrams may be used to describe the role of each object and show the dynamic function of a specific use case. The diagram shows how all the models are connected to show relevant results from the user, where they open the application and use the system, register, and the registration data is stored in the file system, and use that user information to log into the system and provide all the necessary information, and finally provide relevant results.

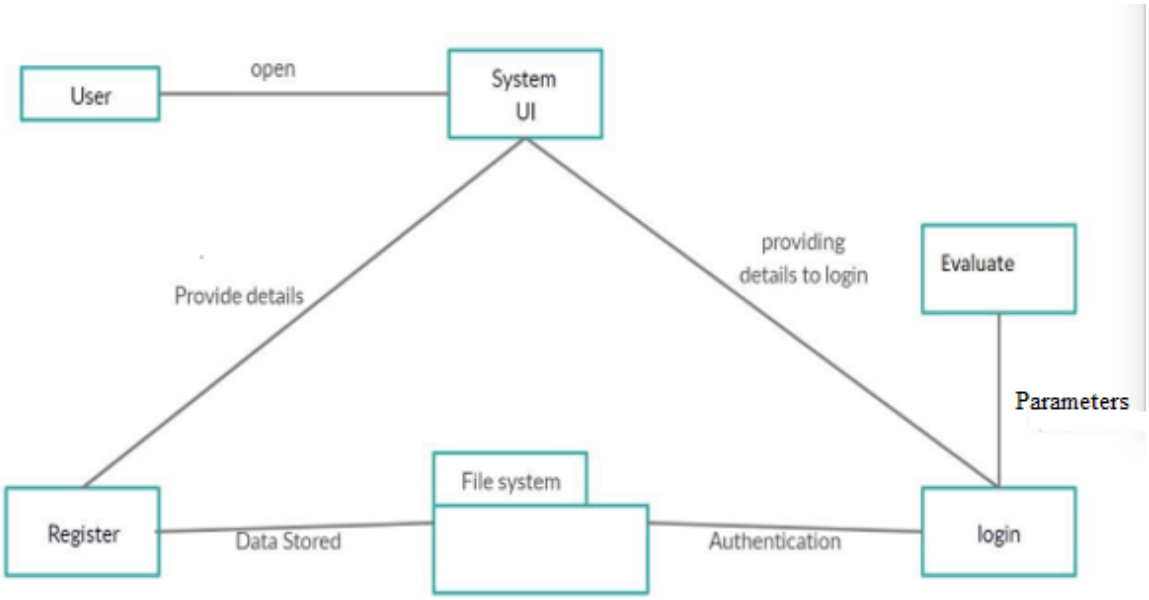


Fig 5.8 Collaboration Diagram of Crop recommendation system

The Fig 5.8 illustrates the Collaboration diagram between the User (Admin and Farmer) to the Crop recommendation system. All the User Such as Admin and Farmer Initially must register their information to the database and Proceed for the Stability login the Authentication will be Provided by the Login and Evaluated in the Database. The Dataset and Algorithms are implied for incoming inputs which will be stored in the Database.

Chapter 6

Implementation

6.1 Implemented Code

6.1.1 Ensemble.ipynb

Where the model is formed using the data given within the current dataset by using decision tree, SVM - Support Vector Machine and Random Forest classifiers. The model uses ensemble learning methods which use multiple learning algorithms to get better predictive performance than might be obtained from any of the constituent learning algorithms alone.

```
import pandas as pd
from sklearn import model_selection
from sklearn.tree import DecisionTreeClassifier
from sklearn.svm import SVC
from sklearn.ensemble import VotingClassifier, RandomForestClassifier
from sklearn.neighbors import KNeighborsClassifier
df = pd.read_csv('CropDataset.csv')
df.columns

#Feature selection
X = df.iloc[:, 3:7]
Y = df.iloc[:,7]

#Decision Tree
DecisionTree=
DecisionTreeClassifier(criterion='entropy',random_state=2,max_depth=
7)

#Support Vector Machine
svc = SVC(C = 10, gamma = 0.01, kernel = 'rbf')

#Random Forest
forest = RandomForestClassifier(n_estimators=20, random_state=0)
knn=KNeighborsClassifier(n_neighbors=6,algorithm='ball_tree')

#Splitting Ratio
seed = 101
kfold    =    model_selection.KFold(n_splits=20,    random_state=seed,
shuffle=True)
```

```
estimators.append(('Desicion Tree', DecisionTree))
estimators.append(('SVM', svc))
estimators.append(('Random Forest', forest))
estimators.append(('kneighbors', knn))
features = df[['N', 'P', 'K', 'temperature', 'humidity', 'ph',
'rainfall']]
target = df['label']
labels = df['label']
ensemble = VotingClassifier(estimators,voting='hard')
results = model_selection.cross_val_score(ensemble, X, Y, cv=kfold)
print(results.mean())
from sklearn.model_selection import train_test_split
Xtrain, Xtest, Ytrain, Ytest = train_test_split(features,target,
test_size = 0.25, random_state=101)
ensemble.fit(Xtrain,Ytrain)
ensemble.score(Xtest,Ytest)
ensemble.predict(Xtest)
model.save("ensemble_model.h5")
```

6.1.2 Model.ipynb

In the previous code we use decision tree and the decision tree is creating by using the K-Nearest Neighbor algorithm by calculating the information gain of the data and saving the data processed in the decision tree variable

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.metrics import classification_report
from sklearn import metrics
from sklearn import tree
df = pd.read_csv('CropDataset.csv')
df.head()
df.size
df.shape
df.columns
df['label'].unique()
features = df[['N', 'P', 'K', 'temperature', 'humidity', 'ph',
'rainfall']]
target = df['label']
labels = df['label']
accuracy = []
model = []
```

```
from sklearn.model_selection import train_test_split
Xtrain, Xtest, Ytrain, Ytest = train_test_split(features,target,
test_size = 0.25, random_state=101)
from sklearn.neighbors import KNeighborsClassifier
# Information Gain
knn=KNeighborsClassifier(n_neighbors=3,algorithm='ball_tree')

knn.fit(Xtrain,Ytrain)
prediction_vals = knn.predict(Xtest)
x = metrics.accuracy_score(Ytest, prediction_vals)
accuracy.append(x)
model.append('k nearest neighbours')
print('k nearest neighbor Accuracy: ', x*100)
print(classification_report(Ytest,prediction_vals))
```

6.1.3 App.py

For Abseil Python applications, app.py is a standard login. This is a significant distinction in the way python programmes are written, as you must provide a specific file as an access point.

```
from flask import Flask,request,render_template,redirect,jsonify,url_for
from model import result
app=Flask(__name__)

@app.route('/',methods=['GET','POST'])
def index():
    if request.method=='POST':
        n=request.form['n']
        p=request.form['p']
        k=request.form['k']
        temp=request.form['temp']
        hum=request.form['hum']
        ph=request.form['ph']
        rain=request.form['rain']

        res = result(n,p,k,temp,hum,ph,rain)
        return redirect(url_for('predict', res=[n,p,k,temp,hum,ph,rain,res[0]]))

    return render_template('index.html')

@app.route('/predict')
def predict():
    res = request.args.getlist('res')
    return render_template('predict.html',res=res)

if __name__ == "__main__":
    app.run(debug=True)
```

6.2 Screenshots

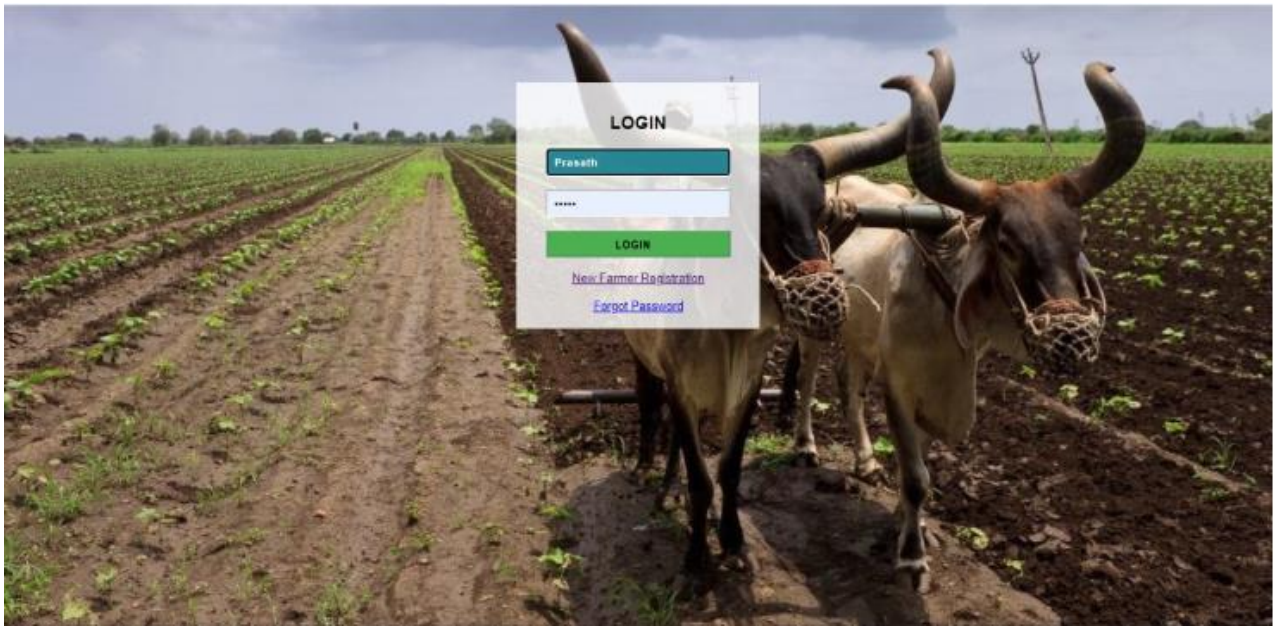


Fig 6.2.1 screenshot representing the Admin/ User login.

Fig 6.2.1 the gateway of the software where admin and farmer access to their console by logging in with their credentials.

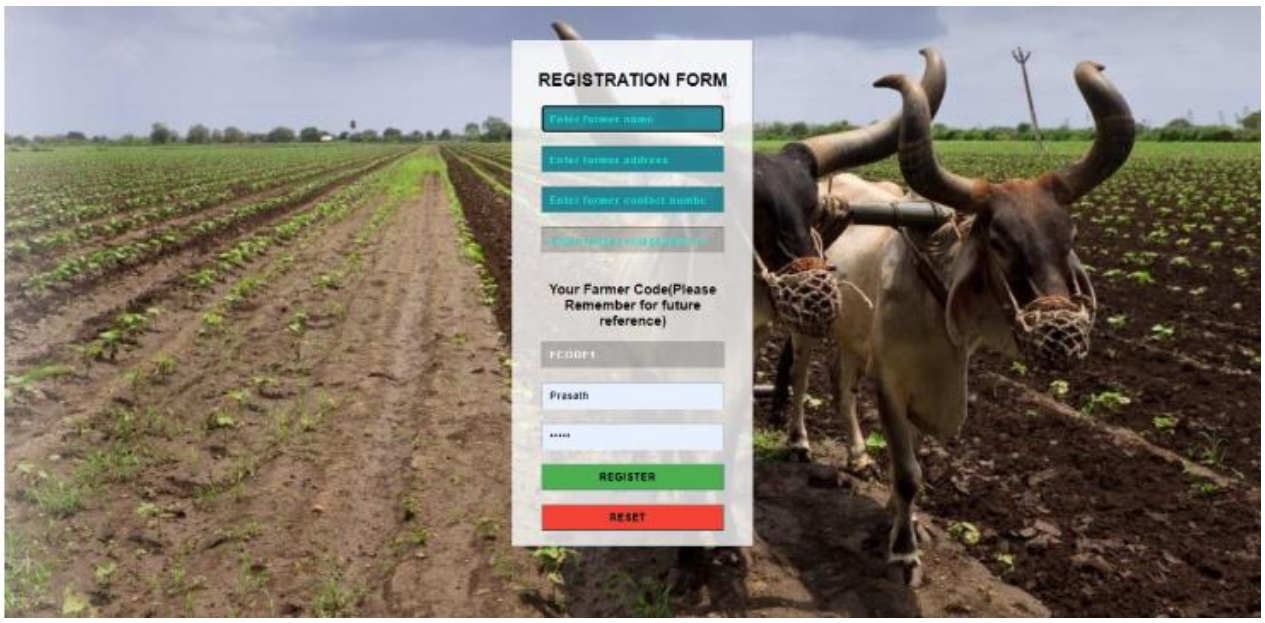


Fig 6.2.2 screenshot represents the registration form.

Fig 6.2.2 represents the user registration, here the main users are the farmer.

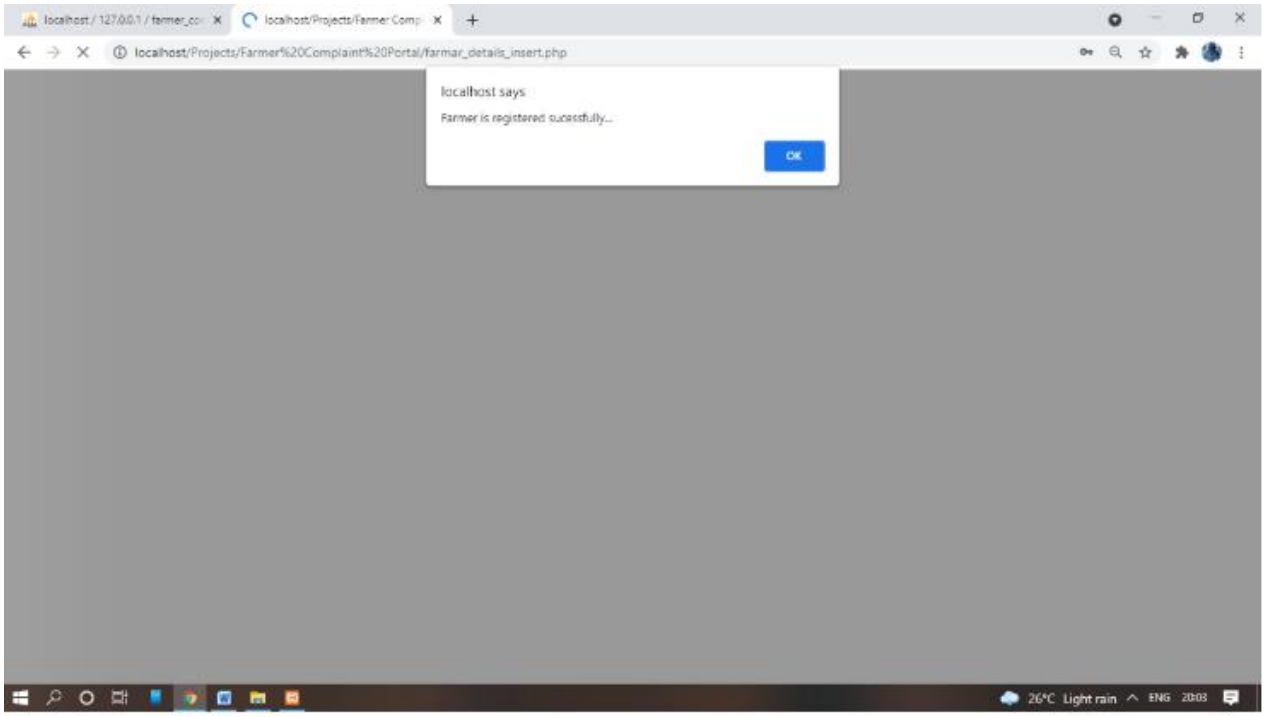


Fig 6.2.3 represents the registration form

Fig 6.2.3 the screen shot represents that the farmer registration criteria is successful.the user can enter into the system by using username and password.

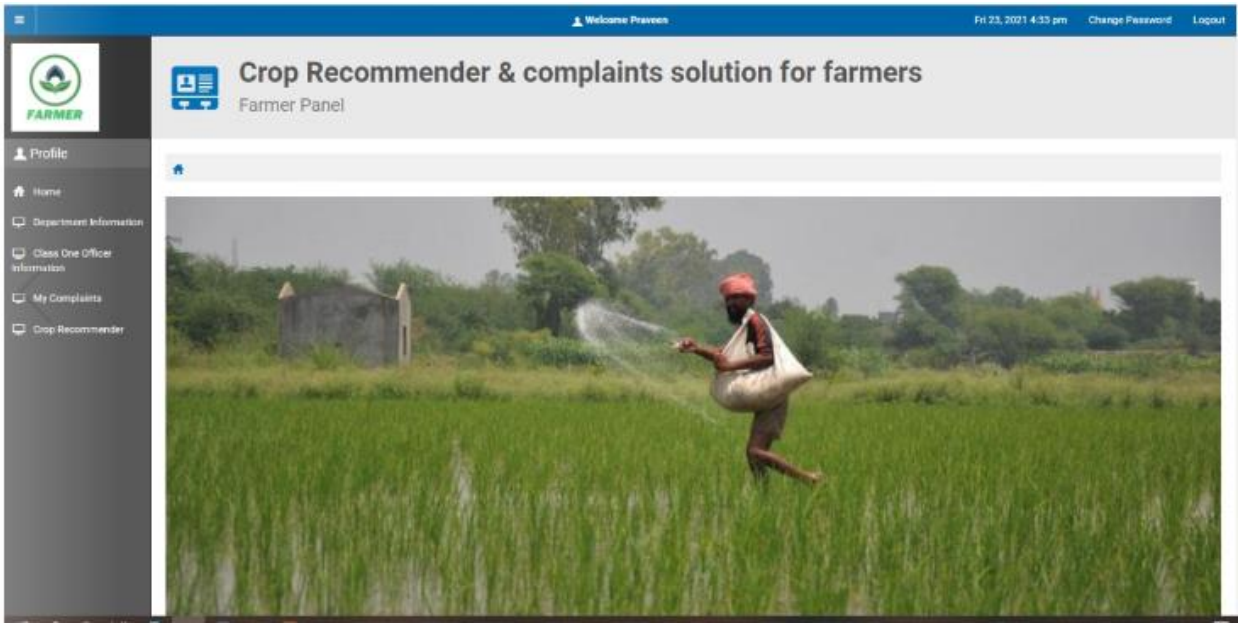


Fig 6.2.4 User Home page

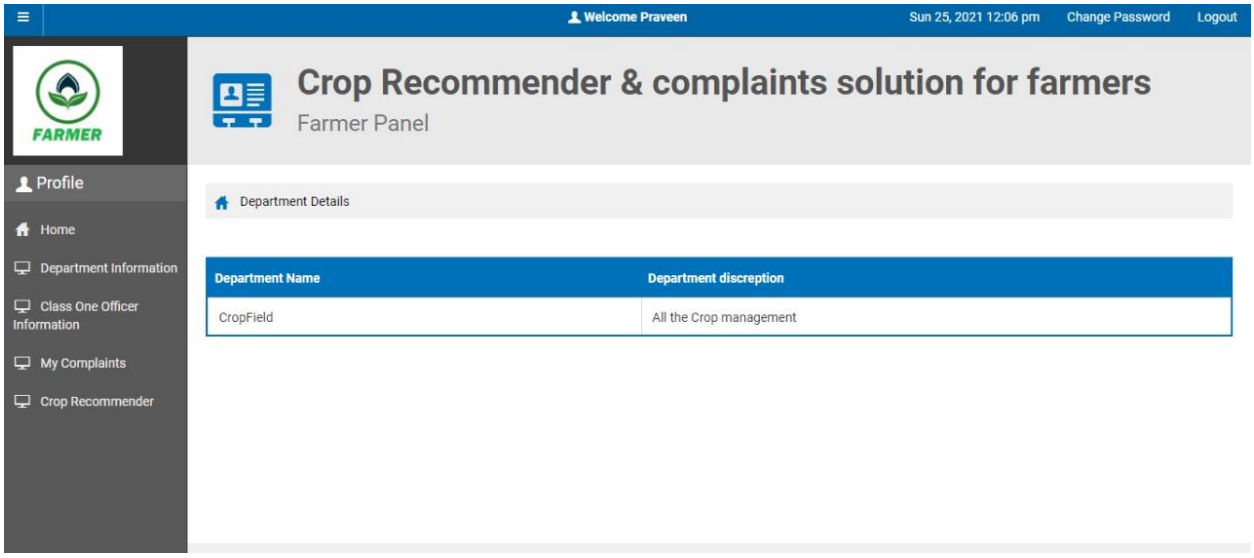


Fig 6.2.5 department details

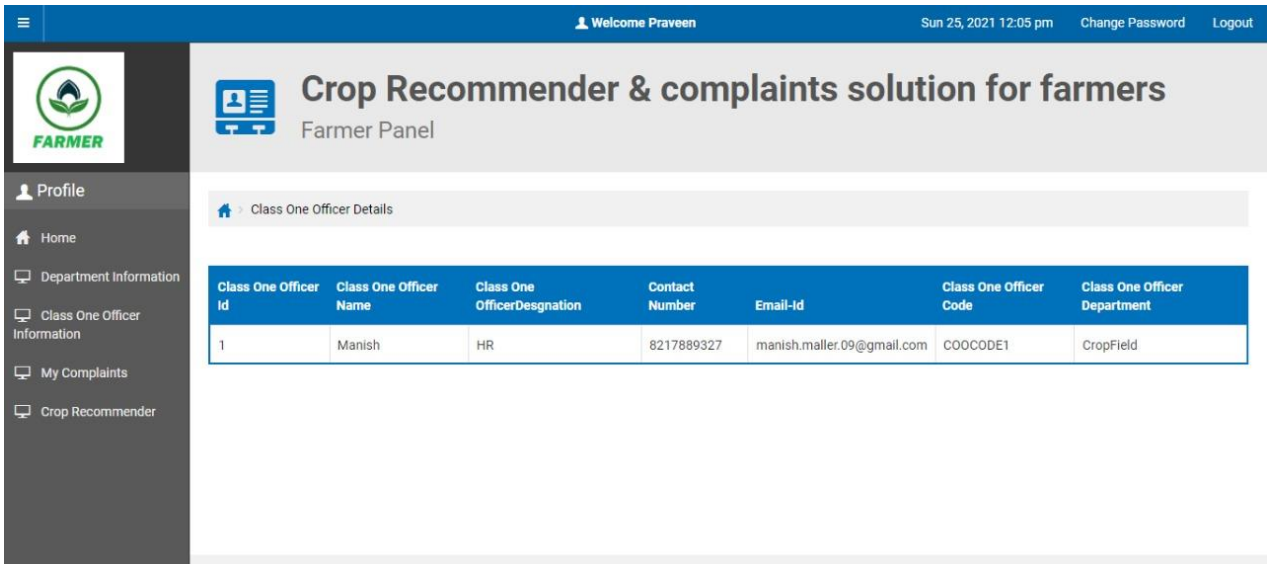


Fig 6.2.6 Class one officer details

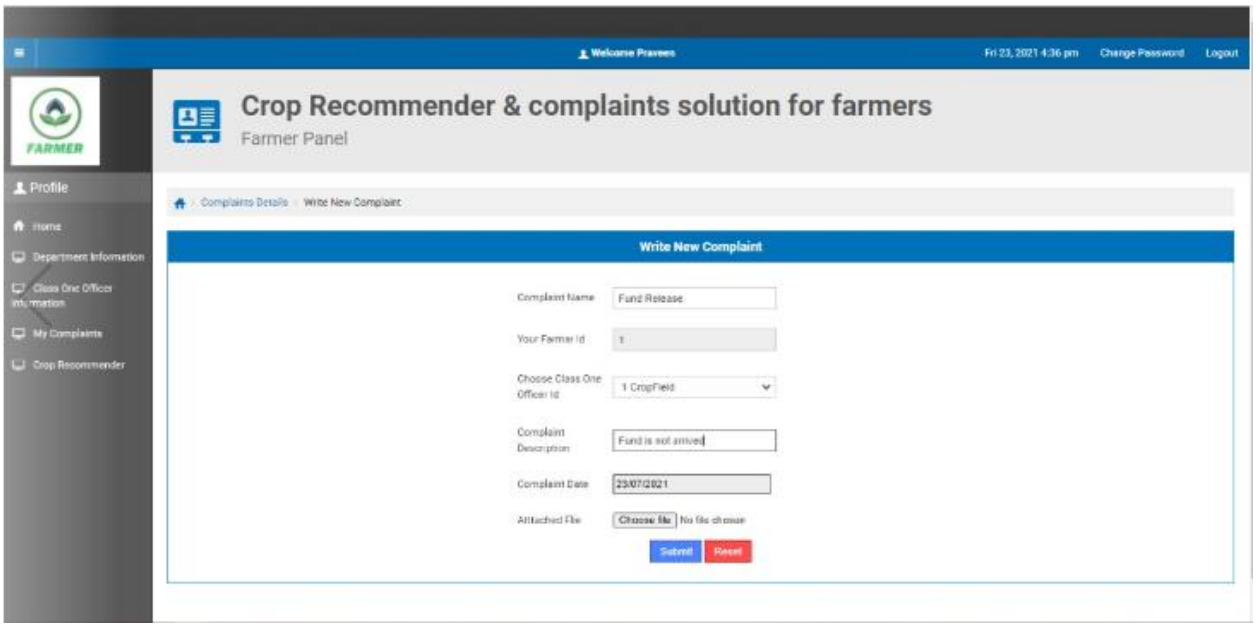


Fig 6.2.7 Farmer complaint page

Fig 6.2.7 the screen shot represents that, here the farmers can write their complaint by clicking on write new complaint button

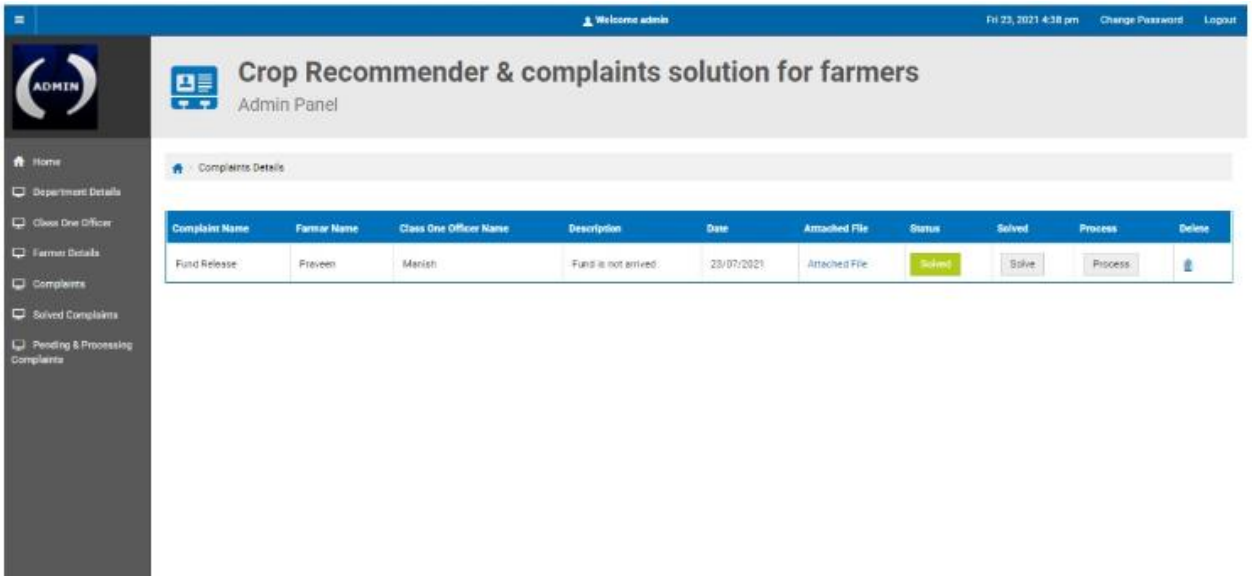


Fig 6.2.8 farmer complaint page

Fig 6.2.8 the screen shot represents the complaint details given by the farmers related to their fields. and also display the result weather the complaint is solved or not.

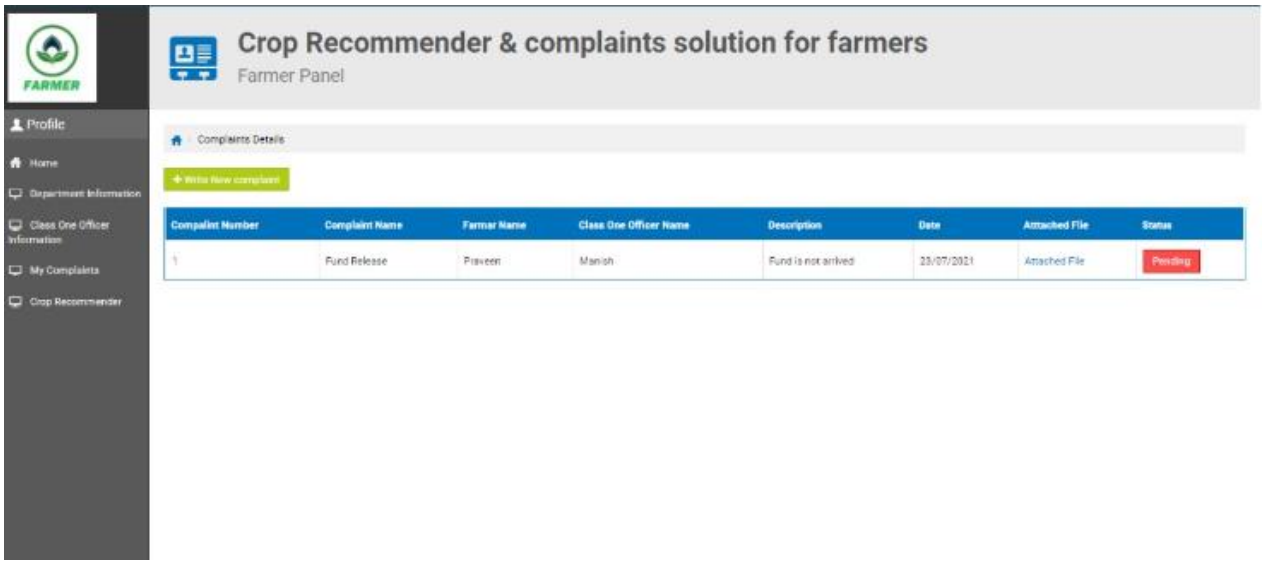


Fig 6.2.9 farmer complaint page

Fig 6.2.9 the screen shot represents the unsolved complaint given by the farmers

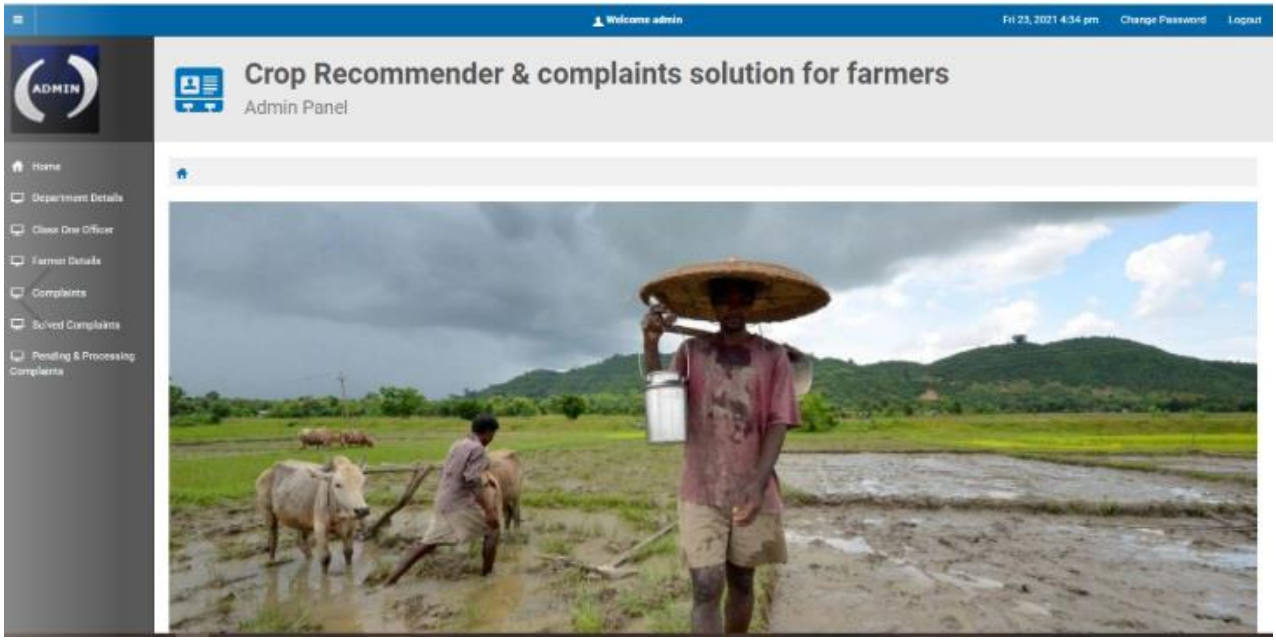


Fig 6.2.10 Admin Homepage

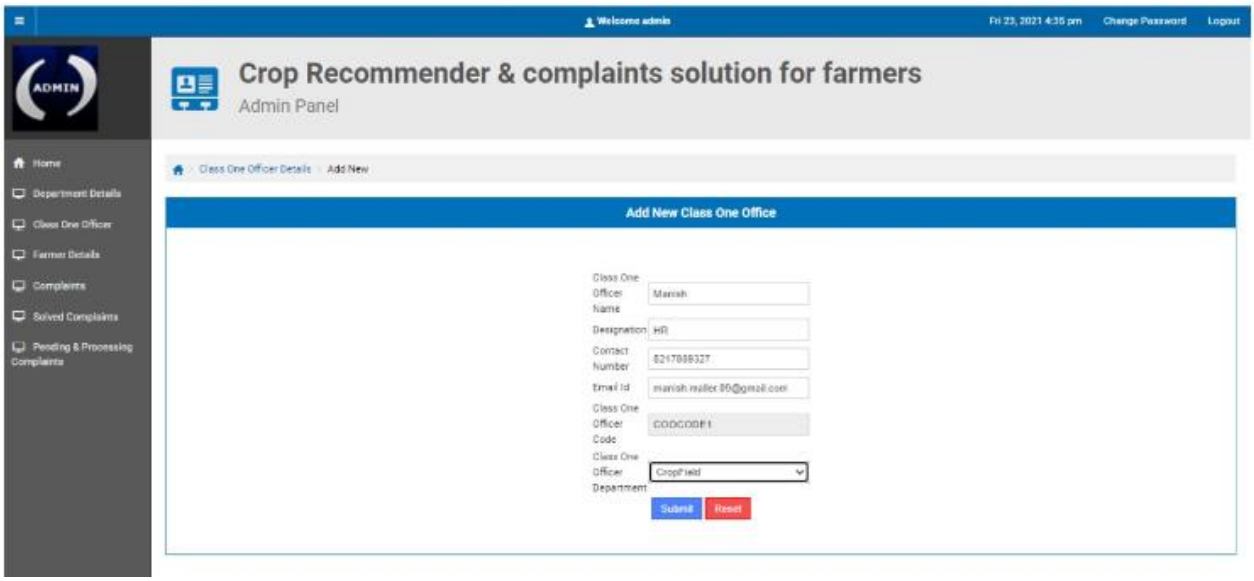


Fig 6.2.11 Add new class one officer

Fig 6.2.11 the screen shot represents that, here the admin can add new class one officer by providing credential details required.

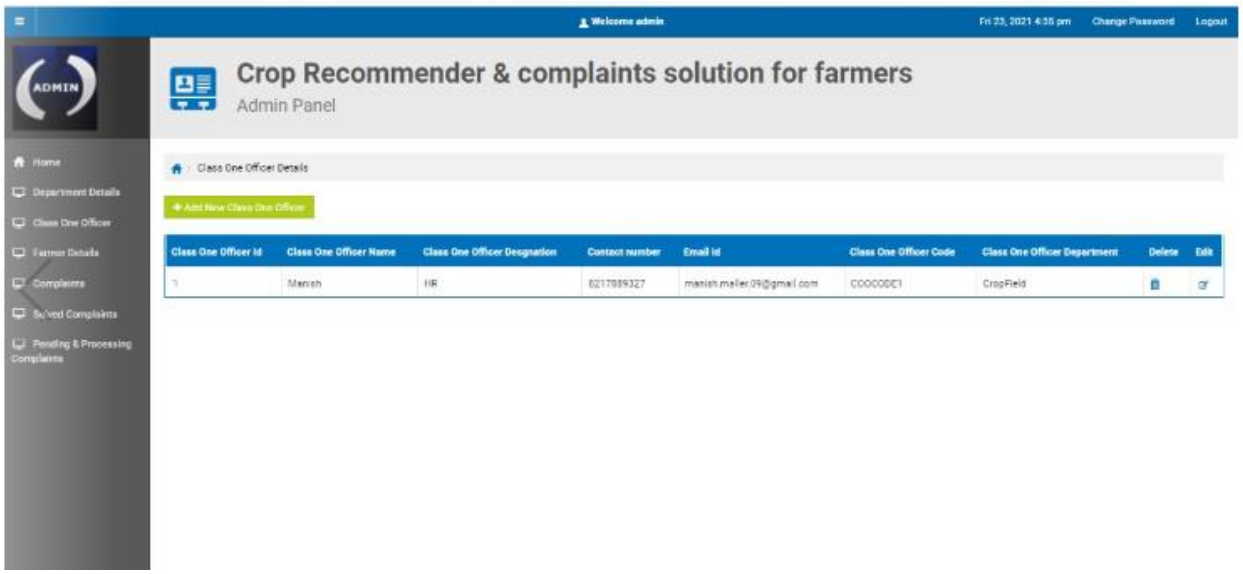


Fig 6.2.12 Class one officer details

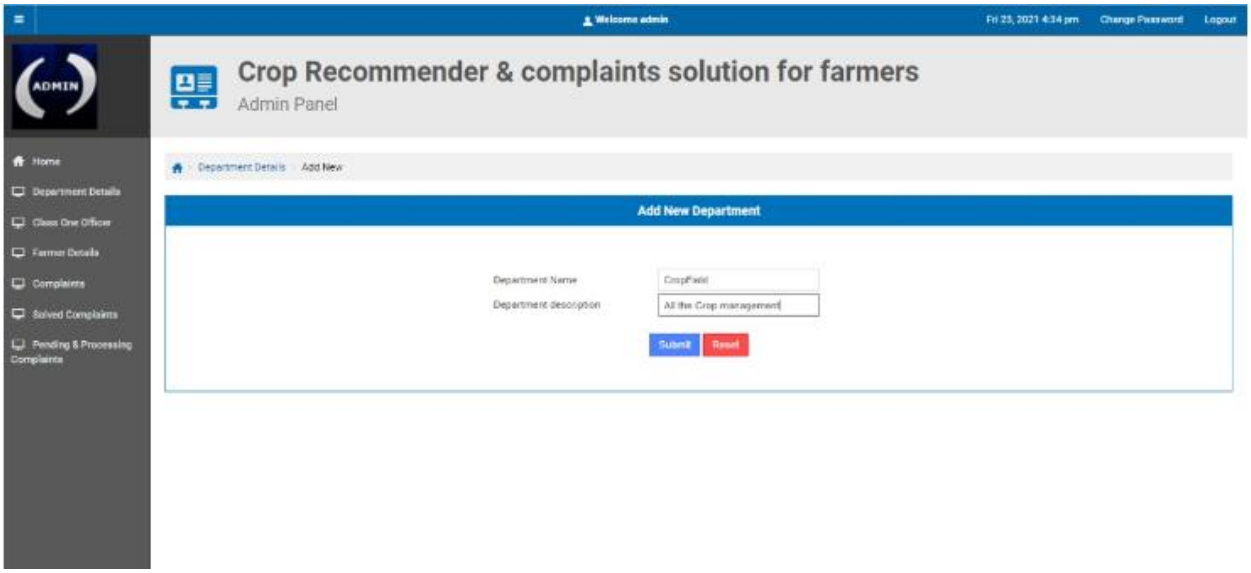


Fig 6.2.13 add new department

Fig 6.2.13 here the admin can add new department to the system by providing required details.

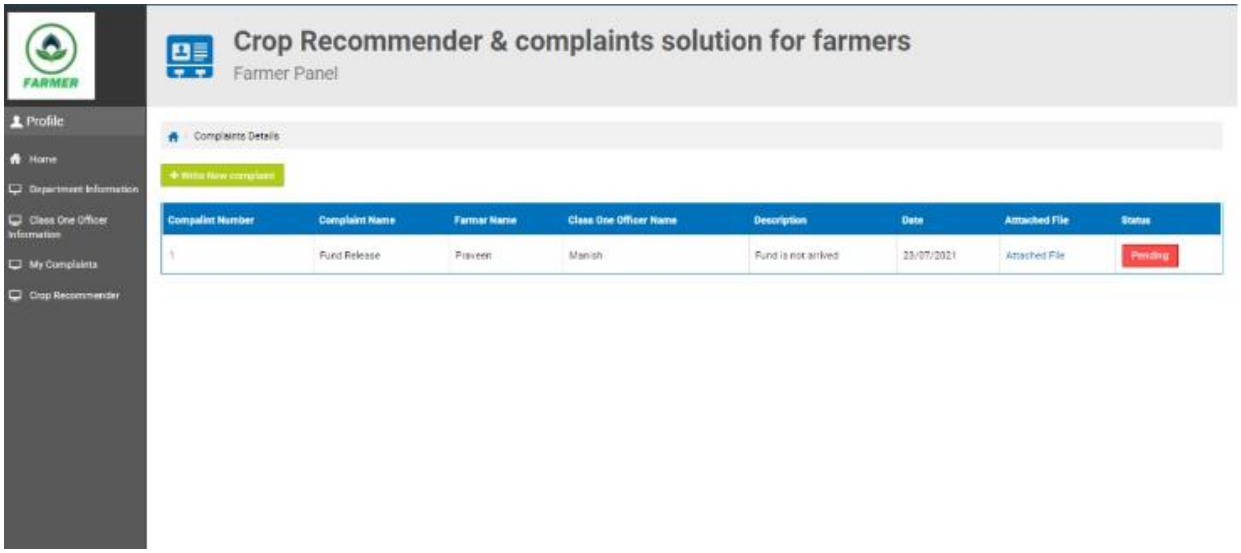


Fig 6.2.14 complaint details

Fig 6.2.14 The pending complaint details are displayed in detail

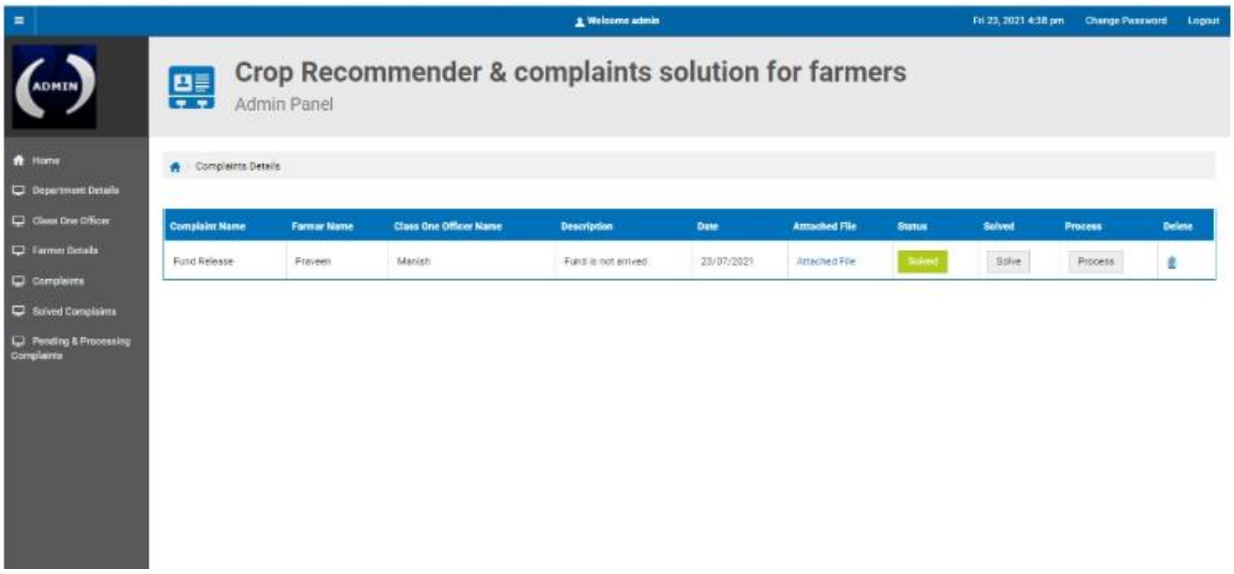


Fig 6.2.15 complaint details

Fig 6.2.15 the screen shot represents the solved complaint details

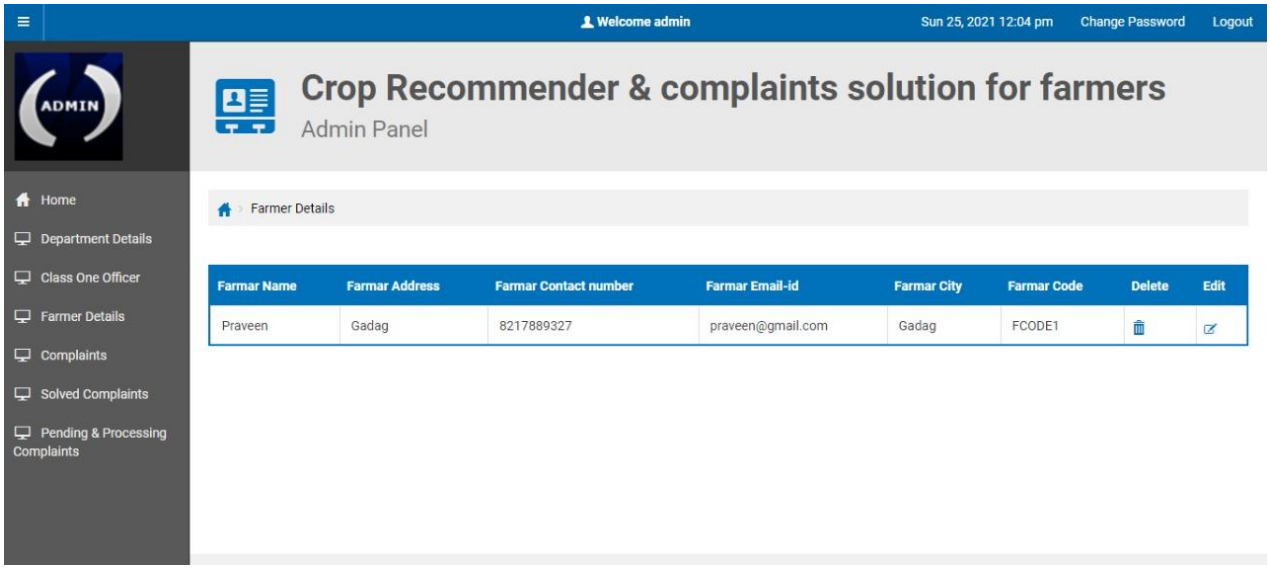


Fig 6.2.16 The screenshot represents the Farmers details

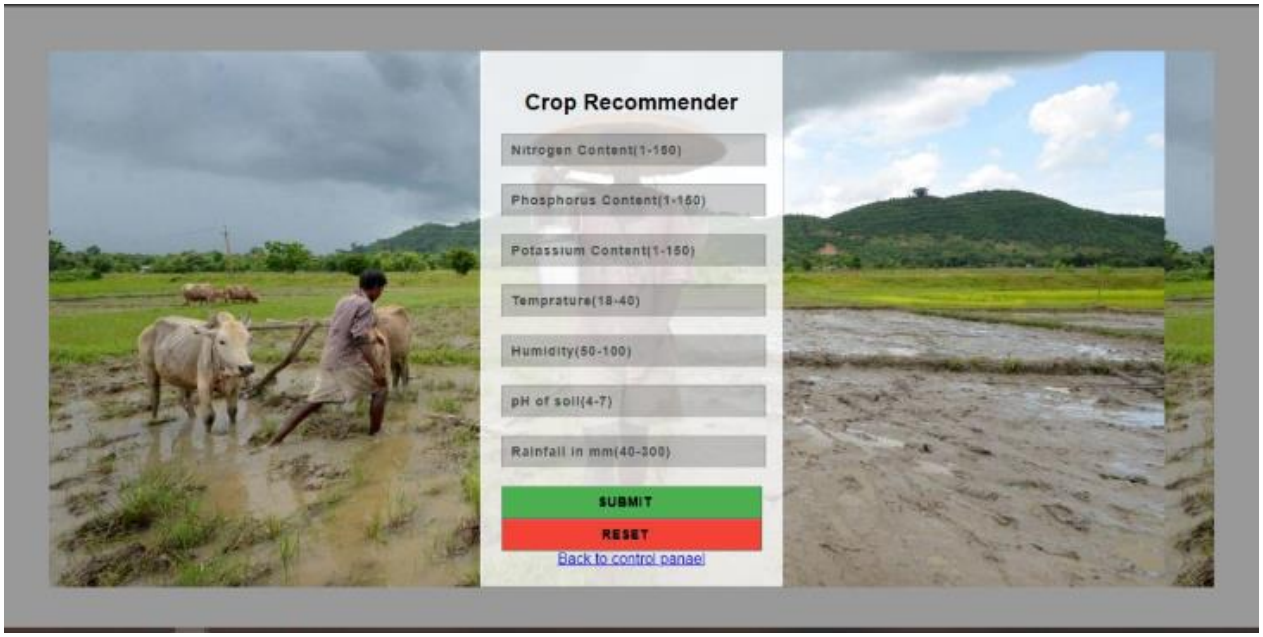


Fig 6.2.17 Crop recommender

Fig 6.2.17 The screen shot represents the crop recommender. This is the place where we input the soil test values like NPK, Temperature, Humidity and Rainfall values to get the recommended crop. With minimum controls submit, reset and back to control panel which returns back to the farmer console.

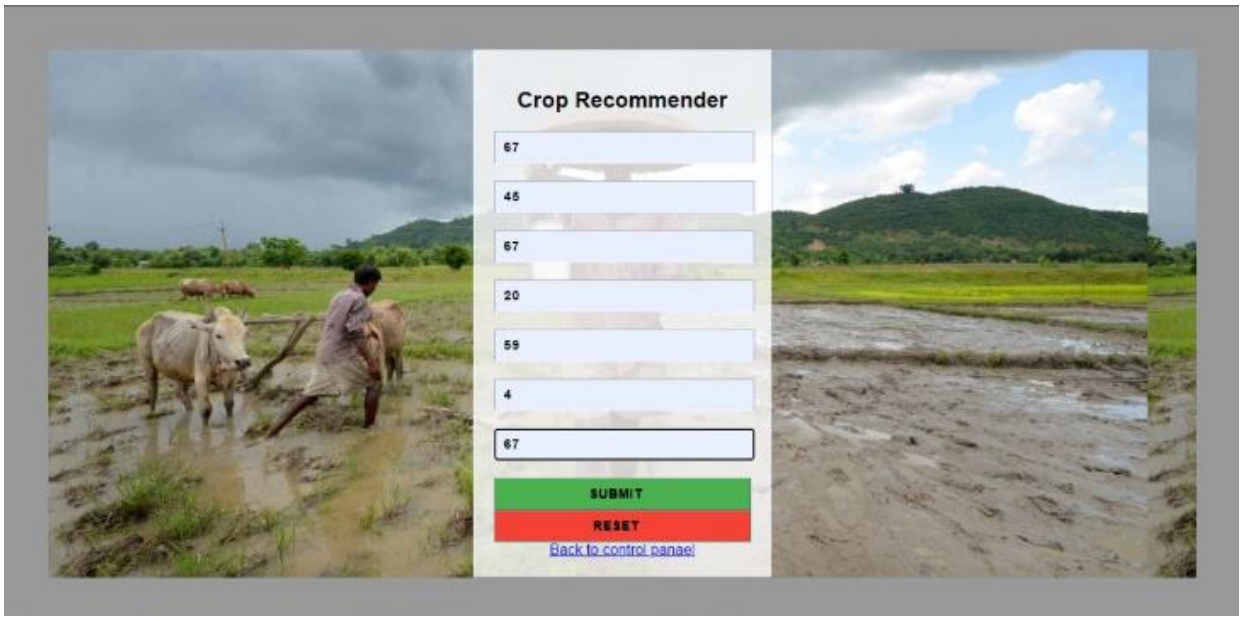


Fig 6.2.18 crop recommender

Fig 6.2.18 The screen shot representing the crop recommender with input values. Which describes the input values that has to be given you can see the sample input values.

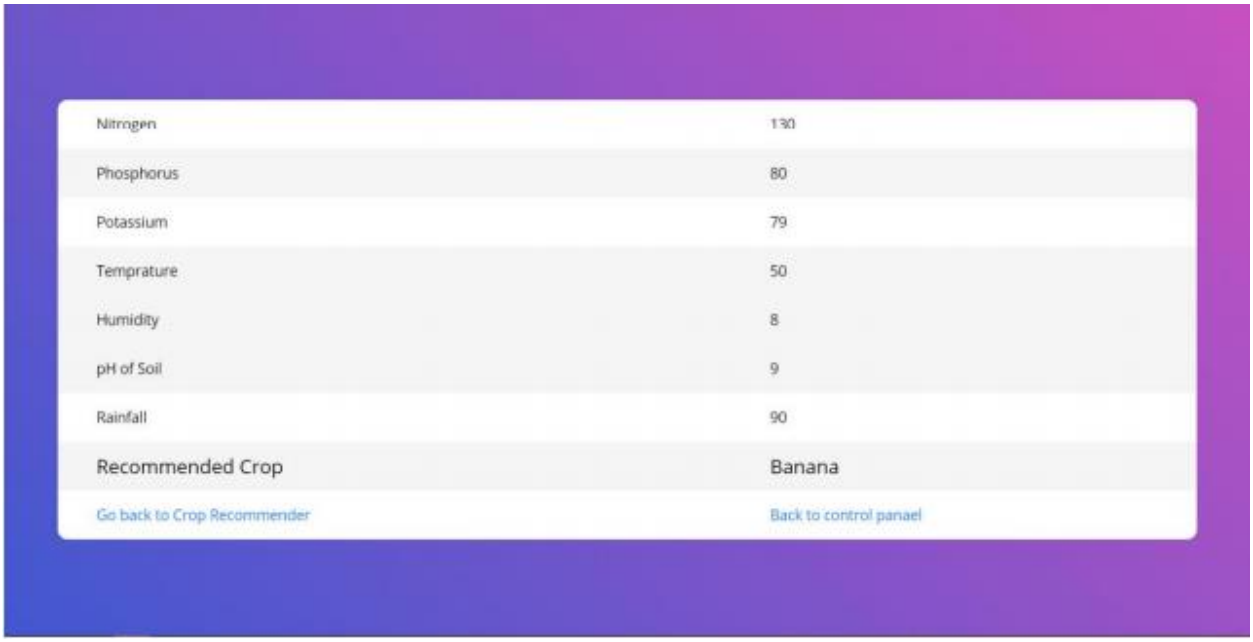


Fig 6.2.19 Crop recommender

Fig 6.2.19 the Screen shot representing Output of the recommended crop. It shows the result where we see the recommended crop and input parameters we have given and to controls to go back to crop recommender and to go back to farmer console.

Chapter 7

Software testing

7.1. Test Cases

i. Input validations

Test Case No	Description	Data as input	Expected output	Actual output
IP1	crop recommender input.	Skipping the input field and clicking submit button.	Error showing input parameter is required.	Error shown using JavaScript to enter the value.
IP2	User Login	Wrong Username and password.	Error message saying wrong password or Username	message saying wrong password or Username
IP3	Change Password	Wrong existing password and mismatch new password	Error message saying wrong password and new password mismatch.	message saying wrong password and password mismatch

Table 7.1. The Test cases verifying the input data to the Crop Recommendation & Complaint Management system for farmers.

ii. Core functionalities

Test Case No	Description	Data as input	Expected output	Actual output
IP1	Complaint form	Wrong mobile no and email.	Error message saying please enter valid mobile no & mail.	message saying please enter valid mobile no & mail.
IP2	Crop recommender	Parameters of a particular crop	Exact name of the crop to the given parameters	Correct crop name which matches the parameters.

Table 7.2. The Test cases verifying the core functionalities to the Crop Recommendation & Complaint Management system for farmers.

Chapter 8
Conclusion

So, Finally We conclude by saying that, this project Crop recommendation system will help the farmers to get more yield and more profitable by predicting the particular crop suitable for the field. Then suggested with a suitable fertilizer for the predicted crop. The prediction system gives the result accurate than the previous systems and helps in getting the better yield.

Here the farmers can complaint their problems directly to the officers. The particular department officer can resolve the problems of the farmers and get back with the exact solution. Then the farmers can check their complaint status.

The crop recommendation system mainly helps the farmers in selecting the crop to cultivate in their field. Then suggesting suitable fertilizer for predicted crop. and farmers can complaint the problems faced in their fields. And also get back with exact solutions for their problems.

Chapter 9

Future Enhancement

- Predicting the multiple crops supported to the environment.
- Displaying the fertilizer and devices that may occur to the suggested crop.
- Rainfall analysis based on the location instead of input.
- Adding SMS module to send and receive complaint information to farmers & respective officers.
- Train the farmers to use the portal by adding videos in their known language

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Abstract

A system that anticipates disease-related information or symptoms that it feeds into the system and gives correct findings based on that information is known as AI & ML Based Ailment Divination. It was over if the patient was not very ill and the user only needed to know the illness kind. It's an application that gives the user advice and methods for keeping their health plan in check, as well as a means to diagnose disease through divination. Nowadays, the healthcare industry plays an important role in treating patients' illnesses, so this is also a form of assistance in the healthcare industry to tell the user and also useful to the user in case he does not want to go to the hospital or other clinics, so by adding signs and all other useful information, they are already in control, and the healthcare industry can benefit from this programme by simply adding signs and all other useful information, they are already in control, and the healthcare industry can benefit from this programme by simply adding this programme.