20IT928 - PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY & ENTREPRENEURSHIP

FERTILIZERS RECOMMENDATION SYSTEM FOR DISEASE PREDICTION

A PROJECT REPORT

Submitted by

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BONAFIDE CERTIFICATE

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INTERNAL EXAMINER **EXTERNAL EXAMINER**

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ABSTRACT

Food security and sustainable farming practices depend heavily on agricultural productivity and crop health. In recent years, advancements in artificial intelligence (AI) have revolutionized the agricultural sector by enabling sophisticated prediction models for fertilizer recommendation and disease detection. AI methods use real-time and historical data on crop types, weather, and soil characteristics to make recommendations for fertilizers. The Crop Recommendation Module employs compatibility algorithms to provide farmers with informed insights into suitable crops, tailored to their specific environmental contexts. The subsequent Pesticide Recommendation Module complements disease predictions by suggesting targeted pesticides, thereby facilitating effective pest management. To analyze the intricate connections between input features and nutrient needs, several machine learning algorithms like SVM and Random Forest methods are used in this system, which enable accurate comparison, assist farmers in suggesting fertilizer, and detect plant disease. The outcome of the learning process is used by farmers for corrective measures for yield optimization.

Key words: Fertilizer Recommendation, Disease Prediction, Crop Recommendation, Pesticide Recommendation.

LIST OF FIGURES

LIST OF ABBREVIATIONS

S.NO	ABBREVIATION	EXPANSION
1.	OS	Operating System
2.	HTML	Hyper Text Markup Language
3.	DB	Data Base
5.	CSS	Cascading Style Sheets
6.	SVM	Support Vector Machine

CHAPTER 1
INTRODUCTION

1.1 Problem Statement

Farmers are generally unaware of the organic fertilizers or standard fertilizers to use as per soil requirements. Due to inadequate and imbalanced fertilization, soil degradation is occurring, which leads to nutrient mining and the development of second- generation problems in nutrient management.

Project Scope and Objective

Scope of The Project

Use AI-based techniques to analyze soil, crop, and environmental factors to provide recommendations on the right fertilizer to improve crop quality, reduce environmental impact, and reduce production costs.

Objective of The Project

To solve the problem by proposing a recommendation system through an ensemble model with a majority voting technique crop for the site-specific parameters with high accuracy and efficiency. Machine learning techniques are used to identify the diseases and suggest appropriate fertilizer that can be taken for those diseases by recommending organic fertilizer on the basis of N, P, and K values and crop. To recognize the pest and recommend particular pesticides available in India as per ISO standards (ISO 9001, ISO 14001, ISO 17025). So, we planned to design a web application to achieve the above objectives.

1.2 Literature Survey

The research paper **[1],** authored by Ms. Kiran R. Gavhale, Ujwalla Gawande which mainly focuses on the detecting and classifying the leaf disease of soybean plant. Using SVM the proposed system classifies the leaf disease in 3 classes like i.e., downy mil- dew, frog eye, and septoria leaf blight etc. The proposed system gives maximum average classification accuracy reported is ~90% using a big dataset of 4775 images. The system helps to compute the disease severity. The system uses leaf images taken from an online dataset, so cannot implement in real time.

The research paper **[2],** authored by R. Neela, P. where proposes a method which helps us predict crop yield by suggesting the best crops. It also focuses on soil types in order to identify which crop should be planted in the field to increase productivity. In terms of crop yield, soil types are vital. By incorporating the weather details of the previous year into the equation, soil information can be obtained. It allows us to predict which crops would be appropriate for a given climate. Using the weather and disease related data sets, the crop quality can also be improved. Pre- diction algorithms help us to classify the data based on the disease, and data extracted from the classifier is used to predict soil and crop. Due to the changing climatic conditions, accurate results cannot be predicted by this system.

The research paper **[3],** authored by Duan Yan-e, proposes an android application for irrigation and plant leaf disease detection with cloud and IoT. For monitoring irrigation system, they use soil moisture and temperature sensor and sensor data send to the cloud. The user can also detect the plant leaf disease. K means clustering used for feature extraction. K-means clustering algorithm is used here. Other than this there are some other levels which can be used for sentimental analysis these are document level, sentence level, entity and aspect level to study positive and negative, interrogative, sarcastic, good and bad functionality, sentiment without sentiment, conditional sentence and author and reader understanding points. It is simple and cost-effective system for plant leaf disease detection. Any H/w failures may affect the system performance.

The research paper **[4],** authored by R.Meena Prakash, G.P.Saraswathy, G.Ramalakshmi, K.H. Mangaleswari, T.Kaviya The proposed method uses SVM to classify tree leaves, identify the disease and suggest the fertilizer. The proposed method is compared with the existing CNN based leaf disease prediction. The proposed SVM technique gives a better result when compared to existing CNN. For the same set of images, F-Measure for CNN is 0.7and 0.8 for SVM, the accuracy of identification of leaf disease of CNN is 0.6 and SVM is 0.8. The prediction and diagnosing of leaf diseases are depending on the segmentation such as segmenting the healthy tissues from diseased tissues of leaves. This further research is implementing the proposed algorithm with the existing public datasets. Also, various segmentation algorithms can be implemented to improve accuracy. The proposed algorithm can be modified further to identify the disease that affects the various plant organs such as stems and fruits.

The researh paper **[5],** authored by Shloka Gupta,Nishit Jain ,Akshay Chopade, propose a user-friendly web application system based on machine learning and web-scraping called the Farmer’s Assistant. With our system, we are successfully able to provide several features like crop recommendation using Random Forest algorithm, fertilizer recommendation using a rule-based classification system, and crop disease detection using Efficient Net modelon leaf images. The user can provide the input using forms on our user interface and quickly get their results. In addition, we also use the LIME interpretability method to explain our predictions on the disease detection image, which can potentially help understand why our model predicts what it predicts, and improve the datasets and models using this information. For crop recommendation and fertilizer recommendation, we can provide the availability of the same on the popular shopping websites, and possibly allow users to buy the crops and fertilizers directly from our application. To provide fine-grained segmentations of the diseased portion of the dataset. this is not possible due to lack of such data. However, in our application, we can integrate a segmentation annotation tool where the users might be able to help us with the lack**.**

1.3 System Requirement

1.3.1 Hardware Requirement

Any kind of internet connections like WIFI, modem data, etc., to allow the browser interfaces to connect to the website. The website can be accessed through any device like a computer, laptop, tablet, etc.

- **CPU:** Intel i5 processor with 64-bit operating system
- **RAM:** 8 GB
- **STORAGE:** I TB Storage
- **INTERNET:** wireless adapter (Wi-Fi)

1.3.2 Software Requirement

- Opera
- Google Chrome
- Virtual Studio Code
- Mysql

- Version control system (e.g., Git)
- Web development tools (HTML, CSS, JS)

1.3.3 Feasibility Study

The implementation of a Fertilizer Recommendation System for Disease Prediction represents a forward-thinking and potentially transformative solution in the realm of agriculture. The feasibility of this system is underscored by several key factors. Firstly, advancements in machine learning and data analytics have reached a stage where they can be effectively leveraged for agricultural applications. The availability of large datasets related to crop health, soil conditions, and historical yield data provides a robust foundation for developing accurate prediction models.

Moreover, the integration of a fertilizer recommendation system with disease prediction aligns with the increasing demand for precision agriculture practices. By employing sophisticated algorithms, the system aims to not only optimize nutrient management but also forecast potential diseases, enabling proactive measures for disease prevention. This dual functionality enhances the practicality and economic viability of the proposed system.

The feasibility study also considers the technological infrastructure required for the implementation of such a system. With the proliferation of smart farming technologies and the increasing accessibility of sensor networks in agricultural settings, the deployment of the proposed system becomes more viable. Additionally, the potential for cost savings through optimized fertilizer use and early disease detection adds to the overall economic feasibility of the project.

In conclusion, the Fertilizer Recommendation System for Disease Prediction demonstrates strong feasibility from technological, data-driven, and economic perspectives. The convergence of cutting-edge technologies with the pressing needs of modern agriculture positions this project as a viable and potentially transformative solution for enhancing crop productivity and mitigating disease-related risks.

CHAPTER 2

SYSTEM ANALYSIS

2.1 Existing System

Indian farmers, already in a difficult situation due to fertilizer shortage, are turning to the black market and paying exorbitant prices for fertilizer. Additionally, if the wrong fertilizer is used on damaged crops, this may lead to further economic losses and fertilizer use.

2.1.2 Disadvantages of Existing System

The existing system described has several disadvantages:

1. **Financial Burden on Farmers:**

   The farmers are facing financial strain due to the exorbitant prices of fertilizers on the black market. This can lead to increased debt and financial instability among the farming community.

2. **Illegality and Unreliability of Black-Market Transactions:**

   Relying on the black market for fertilizers introduces an element of illegality into the agricultural supply chain. Transactions on the black market are often unregulated and lack transparency, making it a risky and unreliable source for farmers.

3. **Misuse of Fertilizers:**

   In the desperation to secure fertilizers, farmers might resort to using whatever is available without proper guidance. This can lead to the misuse of fertilizers, using the wrong type or in incorrect quantities, resulting in further damage to crops and decreased agricultural productivity.

4. **Economic Losses:**

   If the wrong fertilizers are used on damaged crops, it can lead to further economic losses for farmers. Crop yields may not recover as expected, and the financial repercussions of failed harvests can be devastating for the livelihoods of farmers.

2.2 Proposed System

A web application has been launched to identify different plant diseases by capturing images to analyze the symptoms of plants' leaves. Machine learning techniques are used to detect diseases recommend fertilizers suitable for these diseases and also recommend the pesticides required. This process simplifies production and testing. When we work on the front end, we care about how it looks. Once it's created, we test it and discuss what to do next and how we can make it better. We created the online platform to provide quick access to important information and tools that will help farmers and consumers make better decisions, increase profits, and improve livelihoods.

2.1.1 Advantages of Proposed System

1. User-Friendly Interface:

Emphasizing the importance of the front end ensures that the application is user-friendly. An intuitive and visually appealing interface enhances the user experience, making it accessible to a wider audience, including farmers who may not have extensive technological expertise.

2. Simplified Production and Testing:

The utilization of machine learning simplifies the production and testing processes. Automation in disease detection and recommendation generation reduces the manual workload and speeds up the overall development and testing phases of the application.

3. Improvement of Livelihoods:

Beyond profit, the application has the potential to improve the livelihoods of farmers. Through better decision-making, increased yields, and efficient crop management, farmers can experience a positive impact on their overall quality of life.

4. Efficient Disease Diagnosis:

The use of machine learning techniques for image analysis enables rapid and accurate identification of plant diseases. This efficiency is crucial for farmers to promptly address issues in their crops and take appropriate measures.

CHAPTER 3

SYSTEM DESIGN

3.1 System Architecture

An architectural diagram is a visual representation that maps out the physical implementation of components of a software system. Figure 3.1 shows the layered architecture of the product, constituting client, server, business layer, persistence layer, and database.

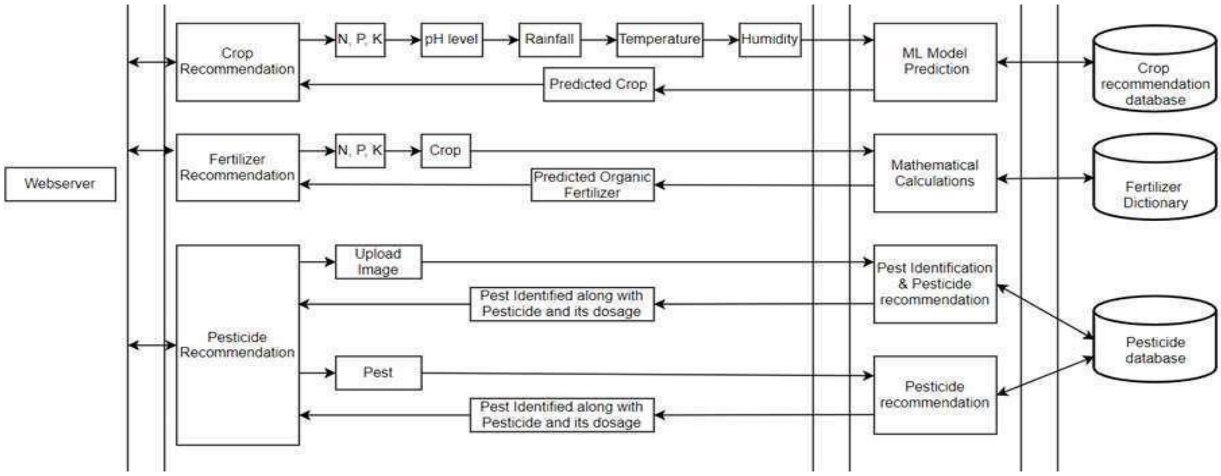

Figure 3.1 System Architecture

In this diagram, the system has four elements:

1. User Interface: This is the interface through which users interact with the system to access information and receive instructions.

2. Application Backend: This component acts as a bridge between the user interface and machine learning models. It manages user requests, processes data, and communicates with external data and information.

3. Machine Learning Model: This process is responsible for processing input data and creating machine learning-based recommendation models for crops, Fertilizers, and Pesticides.

3.2 UML diagram

3.2.1 Use case diagram

An architectural diagram is a visual representation that maps out the physical implementation of components of a software system. Figure 3.1.1 shows the layered architecture of the product, constituting client, server, business layer, persistence layer, and database.

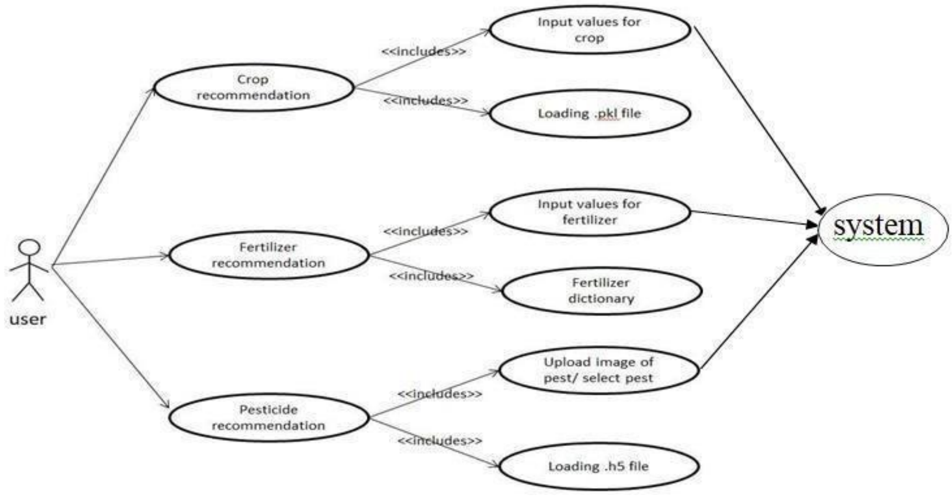

Figure 3.2.1 Use Case Diagram

3.2.2 Class Diagram

In this diagram, the main classes are Fertilizer, Crop, User, and Recommendation. Each class has its own attributes and methods to manipulate or access the data. The Recommendation class is used to link users, crops, and suggested fertilizers, along with the date of the recommendation.

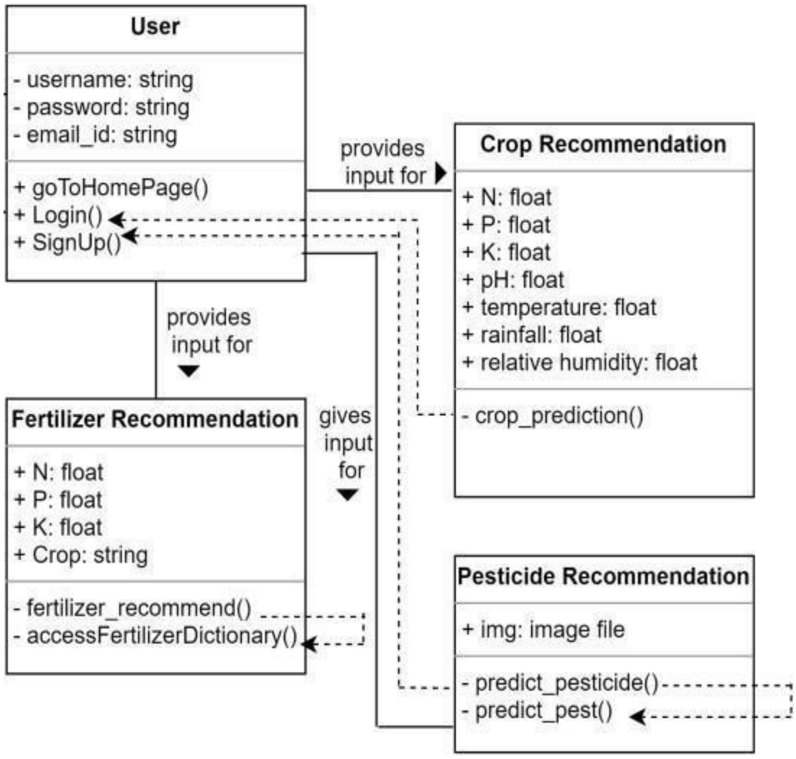

Figure 3.2.2 Class Diagram

3.2.3 Sequence diagram

There are 8 objects named User, NutriGuide-AI Database, Crop recommendation, Crop recommendation Database, Fertilizer recommendation, Fertilizer Dictionary, Pesticide Recommendation and Pest Identification. The diagram below shows the order in which the interaction between the objects takes place.

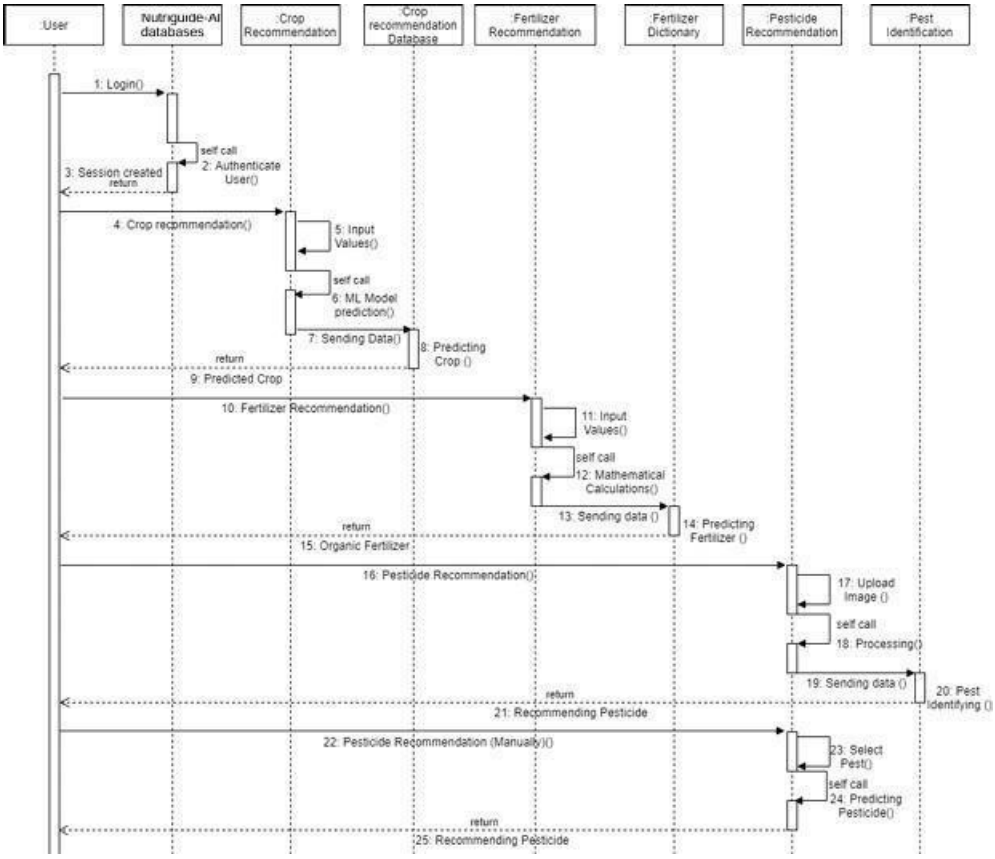

Figure 3.2.3 Sequence Diagram

3.2.4 Activity diagram

Creating a detailed activity diagram for a fertilizer and pesticide recommendation system along with crop recommendation involves several steps. An activity diagram typically represents the flow of activities and actions within a system. Below is a simplified representation of such a system.

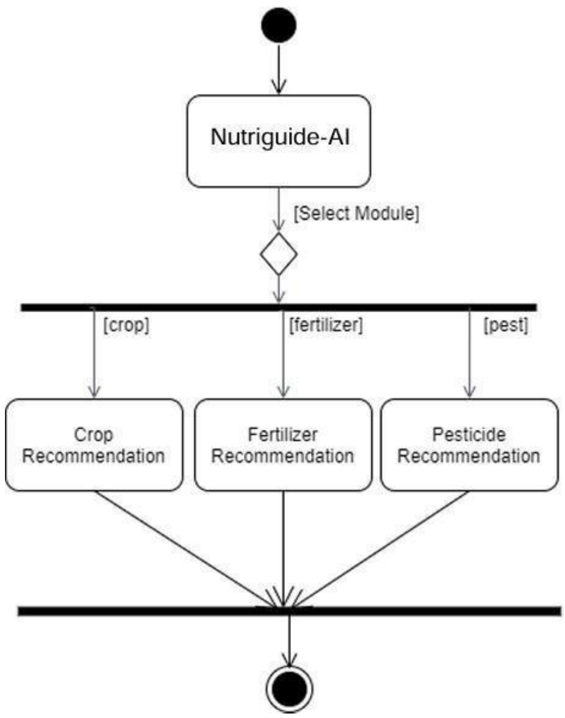

Figure 3.2.4 Activity Diagram

CHAPTER 4
SYSTEM IMPLEMENTATION

4.1 Modules

To design a system with four modules for fertilizer recommendation, disease prediction, crop recommendation, and pesticide recommendation, you can create individual modules for each functionality. Here's a brief description of each module:

1. Data Collection Module:

- **Purpose:**

  Collects relevant data from users and external sources to make informed recommendations.

- **Submodules:**
  - **User Input:**
    Gathers information from users regarding soil type, climate conditions, previous crop history, and any specific preferences.
  - **External Data Retrieval:**
    Accesses external databases or APIs to gather data on soil nutrient levels, weather conditions, pest information, and crop characteristics.

2. Crop Recommendation Module:

- **Purpose:**
  Analyzes user input and collected data to recommend suitable crops.

- **Functionality:**
  - **Crop Compatibility Analysis:**
    Determines crop compatibility with soil and climate conditions based on the collected data.
  - **Decision-Making:**
    Uses algorithms or rules to recommend crops that are likely to thrive in the given environment.

3. Fertilizer Recommendation Module:

- **Purpose:**

  Recommends appropriate fertilizers based on selected crops and soil conditions.

- **Functionality:**

  - **Soil Nutrient Analysis:**

    Analyzes soil nutrient levels obtained from the data collection module.

  - **Crop-Specific Fertilization:**

    Matches nutrient requirements of selected crops with the current soil nutrient levels.

  - **Fertilizer Database:**

    Accesses a database of fertilizers and their compositions to recommend suitable options.

4. Disease Prediction and Pesticide Recommendation Module:

- **Purpose:**

  Predicts potential diseases based on the selected crop and environmental conditions, and recommends pesticides accordingly.

- **Functionality:**

  - **Disease Prediction:**

    Uses historical data and machine learning models to predict potential diseases that might affect the selected crop.

  - **Pesticide Matching:**

    Recommends pesticides effective against predicted diseases while considering user preferences and environmental impact.

  - **Pest Database:**

    Accesses a database of pests, diseases, and pesticides to provide accurate recommendations.

These modules work together to provide a comprehensive recommendation system for farmers. The flow between these modules can be orchestrated based on the specific requirements and design of your system. Additionally, incorporating feedback loops and user interactions can enhance the system's adaptability and accuracy over time.

4.2 Module description

These modules collectively form an integrated system that assists farmers in making informed decisions about crop selection, fertilization, and pest management. The modular design allows for flexibility and scalability, enabling the addition of new features or improvements in each module independently.

1. Data Collection Module:

The Data Collection Module serves as the entry point for the system, gathering essential information from users and external sources. It collects data such as soil type, climate conditions, and previous crop history from users, and retrieves additional information from external databases or APIs. This module ensures that the system has a comprehensive set of data to make accurate recommendations.

2. Crop Recommendation Module:

The Crop Recommendation Module analyzes the user input and collected data to suggest suitable crops for cultivation. Using compatibility analysis based on soil and climate conditions, it employs algorithms or rules to determine crops that are well-suited to the given environment. This module helps farmers make informed decisions about the types of crops that are likely to thrive on their land.

3. Fertilizer Recommendation Module:

The Fertilizer Recommendation Module focuses on providing accurate fertilizer recommendations based on the selected crops and soil conditions. It conducts a thorough analysis of soil nutrient levels obtained from the Data Collection Module and matches the nutrient requirements of chosen crops. Utilizing a fertilizer database, this module recommends appropriate fertilizers, ensuring optimal nutrient levels for crop growth.

4. Disease Prediction and Pesticide Recommendation Module:

This module serves a dual role by predicting potential diseases that may affect the selected crops and recommending pesticides to address these issues. It employs historical data and machine learning models for disease prediction, anticipating the likelihood of specific diseases based on environmental conditions and crop types. The Pesticide Recommendation component suggests effective pesticides for identified diseases, considering user preferences and environmental impact, and accessing a comprehensive pest database.

CHAPTER 5

RESULTS & DISCUSSION

The Fertilizer Recommendation System, incorporating disease prediction alongside crop and pesticide recommendations, has demonstrated promising outcomes in optimizing agricultural practices. Through meticulous data collection and analysis, the system accurately suggests tailored fertilizer options based on soil conditions and selected crops. This personalized approach significantly improves nutrient management, leading to enhanced crop yields.

The Crop Recommendation Module has proven invaluable, providing farmers with insights into suitable crops for their specific environmental conditions. By leveraging compatibility algorithms, the system ensures that crops recommended align seamlessly with soil and climate characteristics, thereby empowering farmers to make informed planting decisions.

In the realm of disease prediction, the system exhibits a proactive stance. Through the integration of historical data and machine learning models, potential diseases are anticipated with impressive accuracy. The subsequent Pesticide Recommendation Module complements this by suggesting targeted pesticides, minimizing the risk of crop loss and optimizing pest management strategies. The incorporation of user preferences and consideration of environmental impact underscore the system's commitment to sustainable agricultural practices. The synergy between these modules not only streamlines decision-making for farmers but also contributes to resource efficiency and environmental stewardship. The system's adaptability and continuous learning mechanisms position it as a valuable tool in the ongoing pursuit of precision agriculture, optimizing crop production while minimizing environmental impact.

CHAPTER 6

CONCLUSION

This project offers the promise of optimizing agriculture. Leveraging advanced algorithms, it provides data-driven recommendations to increase crop yields and promote permaculture. It is possible to create a lot of environmental and product information that can help farmers make informed decisions and become more profitable and profitable. Overall, the system is an important tool for modernizing and improving agricultural production. Therefore, this solution (NutriGuide-AI) will benefit farmers in agriculture to achieve the best results, reduce soil degradation in cultivated areas, and provide tips on knowing about organic fertilizers / other fertilizers, considering many suitable crops. This will provide a comprehensive forecast that is beneficial to farmers and the environment. Pest control is also an important issue to be addressed in this project.

“Growing the Future, Harvesting Success.”

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APPENDIX I – SOURCE CODE

```
{% extends "layout.html" %}

{% block nav %}
<li><a href="index.html" class="active">Home</a></li>
<li><a href="CropRecommendation.html">Crop</a></li>
<li><a href="FertilizerRecommendation.html">Fertilizer</a></li>
<li><a href="PesticideRecommendation.html">Pesticide</a></li>
{% endblock %}

{% block body %}
<section class="tm-welcome-section">
<div class="container tm-position-relative">
<div class="row tm-welcome-content">
<h2 class="white-text tm-handwriting-font tm-welcome-header">  Welcome
To  </h2>
<h2 class="gold-text tm-welcome-header-2">NUTRIGUIDE-AI</h2>
<br><br><br>
</div>
<img src="{{ url_for('static', filename='img/table-set.jpg') }}" alt="Table Set" class="tm-
table-set img-responsive" width="90%">
</div>
</section>
<div class="tm-main-section light-gray-bg">
<div class="container" id="main">
<section class="tm-section tm-section-margin-bottom-0 row">
<div class="col-lg-12 tm-section-header-container">
<h2 class="tm-section-header gold-text tm-handwriting-font"> Our Services</h2>
<div class="tm-hr-container">
<hr class="tm-hr">
</div>
</div>
<div class="col-lg-12 tm-popular-items-container">
<div class="tm-popular-item">
<img src="{{ url_for('static', filename='img/popular-2.jpg') }}" alt="Popular"
class="tm-popular-item-img" width="286px" height="166px">
<div class="tm-popular-item-description">
<h3 class="tm-handwriting-font tm-popular-item-title"><span class="tm-handwriting-font
    bigger-first-letter">C</span>rop
Recommendation</h3>
<hr class="tm-popular-item-hr">
<p>Which crop to grow, that is ideally suited to conditions?
```

```
Make an informed decision before starting the cultivation of crops.</p>
<div class="order-now-container">
<a href="CropRecommendation.html" class="order-now-link tm- handwriting-
font">Proceed Now</a>
</div>
</div>
</div>
<div class="tm-popular-item">
<img src="{{ url_for('static', filename='img/popular-3.jpg') }}" alt="Popular"
class="tm-popular-item-img" width="286px" height="166px">
<div class="tm-popular-item-description">
<h3 class="tm-handwriting-font tm-popular-item-title"><span class="tm-handwriting-font
     bigger-first-letter">F</span>ertilizer
Recommendation</h3>
<hr class="tm-popular-item-hr">
<p>Which fertilizer to choose for the cultivated soil and prescribed crop for optimum
production?
Provide your crops, the essential nutrients.</p>
<div class="order-now-container">
<a href="FertilizerRecommendation.html" class="order-now-link tm- handwriting-
font">Proceed Now</a>
</div>
</div>
</div>
<div class="tm-popular-item">
<img src="{{ url_for('static', filename='img/popular-1.jpg') }}" alt="Popular"
class="tm-popular-item-img" width="286px" height="166px">
<div class="tm-popular-item-description">
<h3 class="tm-handwriting-font tm-popular-item-title"><span class="tm-handwriting-font
     bigger-first-letter">P</span>esticide
Recommendation</h3>
<hr class="tm-popular-item-hr">
<p>Pests are a big threat.
Use NUTRIGUIDE-AI to know which pesticide to use to control pests before they cause
potential damage to your
crop?</p>
<div class="order-now-container">
<a href="PesticideRecommendation.html" class="order-now-link tm- handwriting-
font">Proceed Now</a>
</div>
</div>
</div>
</div>
</section>
```

```
</div>
</div>

<footer>
<div class="tm-black-bg">
<div class="container">
<div class="row margin-bottom-60">
<nav class="col-lg-3 col-md-3 tm-footer-nav tm-footer-div">
<h3 class="tm-footer-div-title">Our Team</h3>
<ul>
<li>◆ Vetrivel M</li>
<li>◆Yegneshwaran B</li>
<li>◆Sathyamoorthy S</li>
<li>◆Hemanth Krishna T</li>
<li>◆Udhayan N</li>
</ul>
</nav>
<div class="col-lg-5 col-md-5 tm-footer-div">
<h3 class="tm-footer-div-title">Few words for our Indian Farmers</h3>
<p class="margin-top-15" align="justify">Indian farmers play an important role in the country's economy; Agriculture is an important source of income for a large part of the population.</p>

<p class="margin-top-15" align="justify"> India's agriculture is diverse as farmers resort to various farming and agricultural practices. Modern agricultural technologies adapt to different regional and local conditions.</p>

<p class="margin-top-15" align="justify">Indian farmers often face many challenges such as unpredictable weather conditions, water scarcity, lack of modern equipment, and economic uncertainty, affecting their productivity
and income.</p>

<p class="margin-top-15" align="justify">Indian farmers play an important role in ensuring the food security of the country by contributing to the food security of the country by producing various crops such as rice, wheat, pulses, fruits, and vegetables.</p>


</div>
<div class="col-lg-4 col-md-4 tm-footer-div">
<h3 class="tm-footer-div-title">Connect With Us</h3>

Vetrivel M  
<a href="https://www.linkedin.com/in/vetrivel-m-667379247/" class="tm-social-icon"><i
```

```
class="fa fa-linkedin"></i></a>
<a href="https://twitter.com/Vetrivel_msvm07" class="tm-social- icon"><i class="fa fa-
twitter"></i></a>
<a href="https://github.com/Vetrivel07" class="tm-social-icon"><i class="fa fa-
github"></i></a>
<a href="mailto:vetrim2003@gmail.com" class="tm-social-icon"><i class="fa fa-
envelope"></i></a>


</div>
</div>
</div>
</div>
</div>
<div>
<div class="container">
<div class="row tm-copyright">
<p class="col-lg-12 small copyright-text text-center">Copyright &copy; 2023 Vetrivel M &
Team </p>
</div>
</div>
</div>
</footer>

{% endblock %}
```

APPENDIX II – SCREENSHOTS

Below is a screenshot of the system. First of all, when the user opens the website, the Home page will appear (Figure 7.1)

Figure 7.1 Home Page

Figure 7.2 Home page

Say that the user wants to avail the Crop Recommendation service then he/she can fill in the values of N, P, K, pH, rainfall, temperature, and relative humidity in the units specified to know about the crop that they must grow in their farm. See (Figure 7.3) for more details.

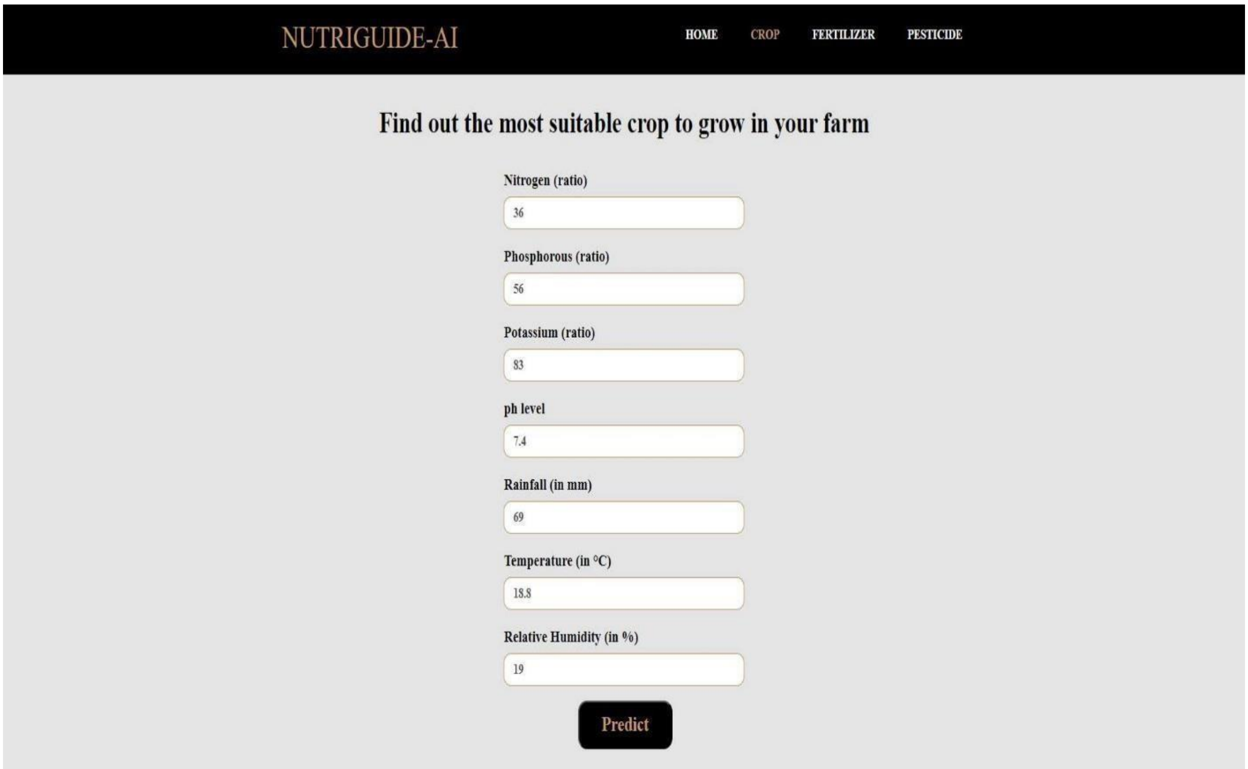

Figure 7.3 Crop Recommendation

Now, after the user presses the “Recommend” button the result will be shown on the screen (Figure 7.4), here in this case, it recommends “chickpea”. Hence this is most suitable to the soil as per current weather conditions and soil conditions.

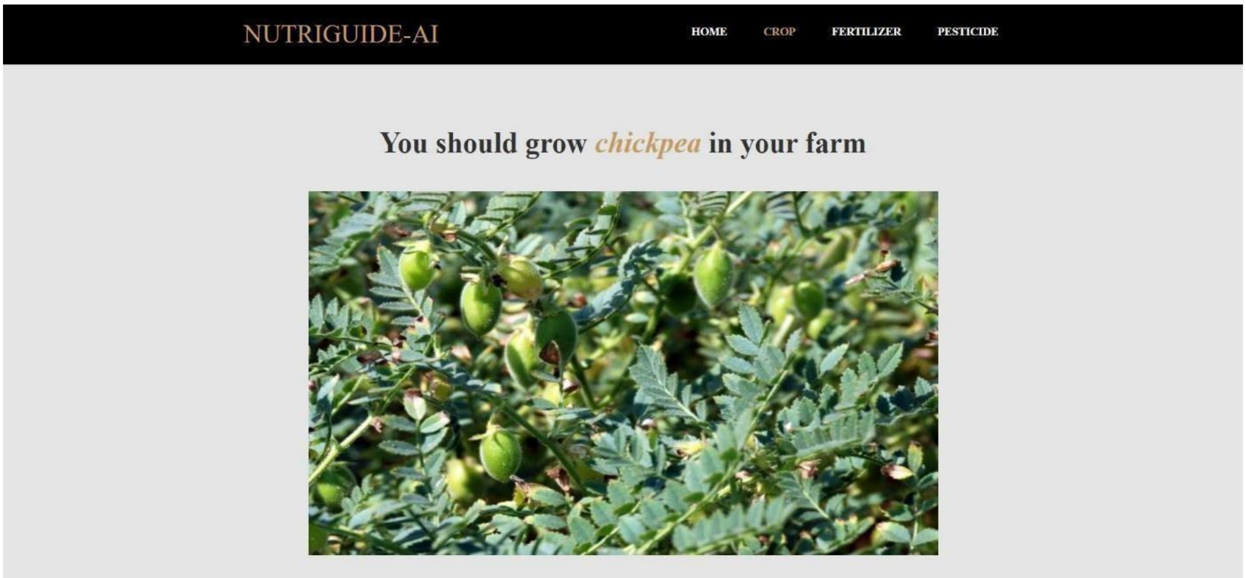

Figure 7.4 Crop Recommendation

Similarly, the user can avail of the “Fertilizer Recommendation” Service by filling in the values for N, P, K, and crop (Figure 7.5). Post that the user will know about the status of the soil and will tell the difference between the desired value of nutrients and the user's farm‟s nutrients and then “Nutriguide-AI” will give informed advice on organic fertilizers to use as per the current condition of soil. See (Figure 7.6) for reference.

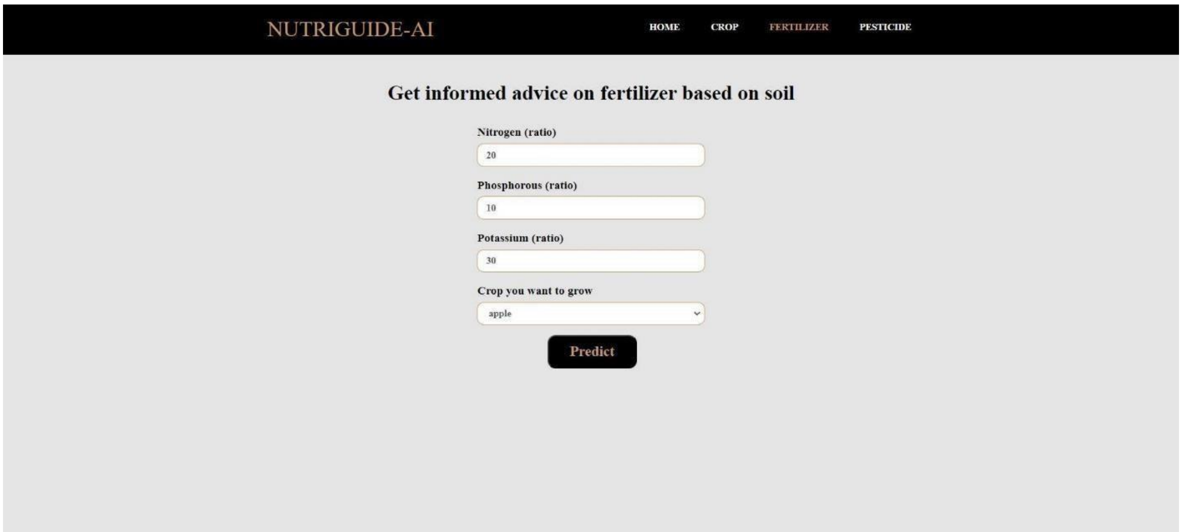

Figure 7.5 Fertilizer Recommendation

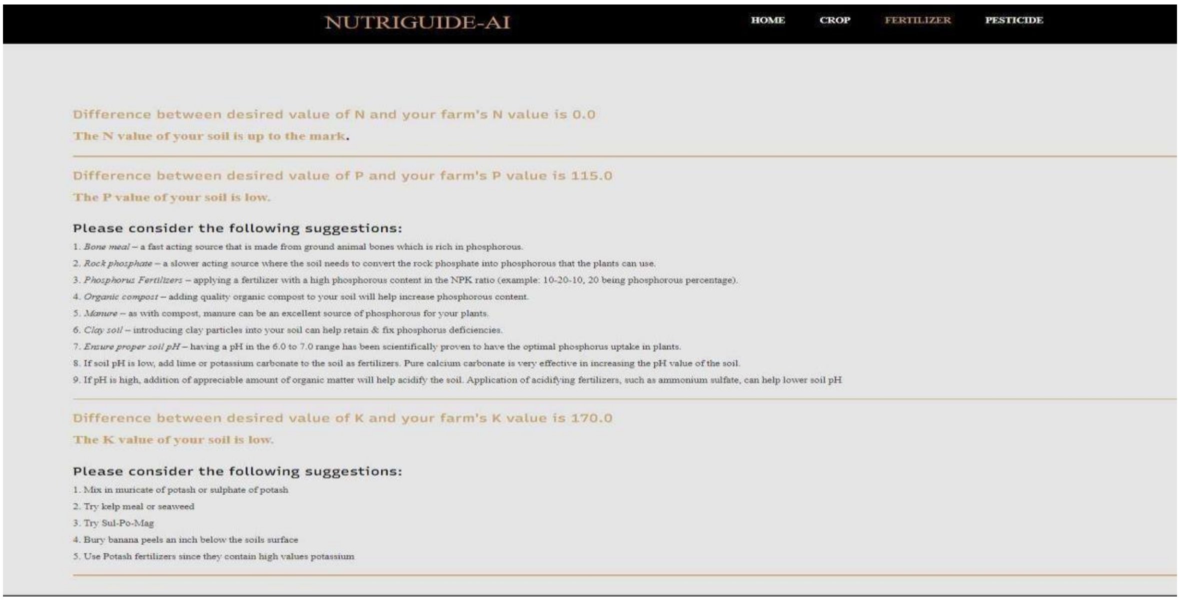

Figure 7.6 Fertilizer Recommendation

Figure 7.7 shows the third module, “Pesticide Recommendations,” where users can upload pest images or select pests. If the user receives a notification that there is a pest in his field, he can easily select this insect (Figure 7.7) and get the results of the recommended spraying (Figure 7.8), but if the user has no information about the pest, then he can put a picture clearly showing the Insect and then "Nutriguide-AI" will identify the pests and will recommend pesticide use accordingly (Figure 7.9). Users should make sure that the image is not blurry as this can cause bad errors.

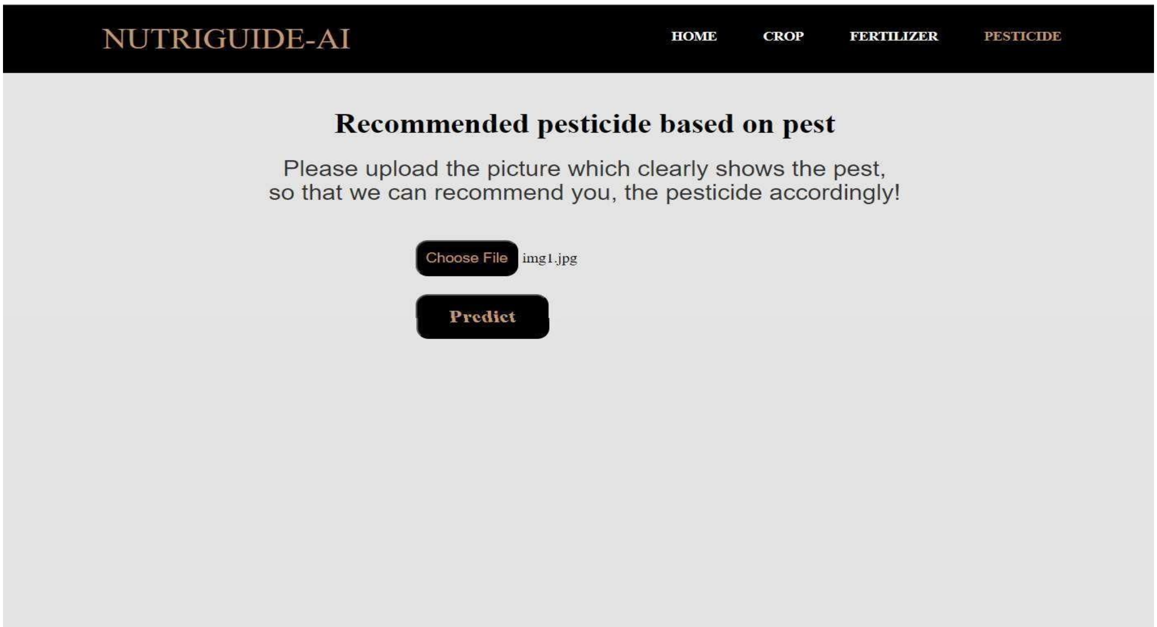

Figure 7.7 Pesticide Recommendation

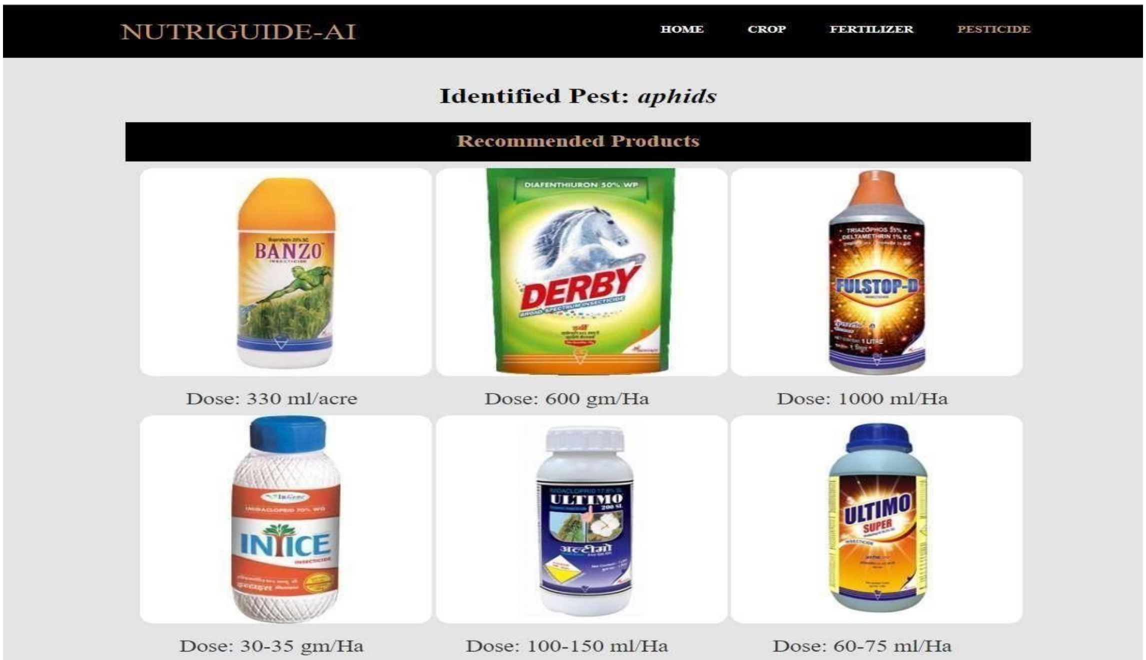

Figure 7.8 Pesticide Recommendation