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Development of Machine Learning Based Application for Crop Identified Rectification and Fertilizer Recommendation

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Abstract:

The agricultural industry is facing major challenges due to the increasing global population and climate change. One of the most significant challenges is crop disease, which reduces yield and quality. Therefore, there is a pressing need to develop innovative solutions for early detection, Disease identification, and rectification of crop diseases. Machine learning (ML) techniques have shown great potential in agriculture for predicting crop yield, identifying pests, and classifying crop diseases, and recommending suitable chemicals for rectification In this project, we propose a machine learning-based application for crop disease identification and rectification, as well as fertilizer recommendation. The application will be trained using a large dataset of crop images, and will use image recognition techniques to identify diseases. The identified diseases will be rectified using a Decision tree-based algorithm, and the optimal fertilizer recommendations will be provided based on the type of crop and soil conditions. The proposed application has the potential to revolutionize the agricultural industry by providing accurate and efficient crop disease management and fertilizer recommendations, which can increase crop yield and improve the quality of agricultural products.

Keywords:

Machine learning, Disease identification, dataset, Decision tree-based algorithm, fertilizer recommendation.

Introduction:

Agriculture plays a crucial role in the global economy and is essential for the sustenance of human life. With the growth of the world population, the demand for food is increasing, and there is a need for the production of crops in a sustainable and efficient manner. However, crop production is often hindered by various challenges such as crop diseases, pests, and nutrient deficiencies, which can result in a significant reduction in yield and quality. These challenges pose a threat to the livelihoods of farmers and can have a significant impact on food security.Machine learning (ML) is a rapidly growing field of artificial intelligence (AI) that has shown great potential in addressing these challenges in agriculture. ML algorithms can be used to analyze large datasets and provide valuable insights into crop diseases, pests, and nutrient deficiencies. By using ML algorithms, farmers can quickly identify crop diseases and pests and take appropriate measures to prevent their spread. Moreover, ML

algorithms can be used to recommend the appropriate fertilizers for crops based on soil characteristics and environmental conditions, which can result in improved crop yields and quality.

The goal of this project is to develop a machine learning-based application that can help farmers identify crop diseases, pests, and nutrient deficiencies and provide recommendations for rectification and fertilizer application. The application will be designed to be user-friendly, with an intuitive interface that can be accessed through a web or mobile application. The application will be capable of analyzing data from various sources, including satellite imagery, weather data, soil data, and disease databases.

The application will be developed using a variety of ML algorithms, including convolutional neural networks (CNNs), support vector machines (SVMs), and decision trees. The CNNs will be used for image classification to identify crop diseases and pests, while the SVMs and decision trees will be used for recommendation systems to suggest the appropriate fertilizers for crops.

The project's significance lies in its potential to improve crop yields and quality while reducing the use of pesticides and fertilizers. By identifying crop diseases and pests early, farmers can take appropriate measures to prevent their spread, reducing the need for pesticide applications. Additionally, by recommending the appropriate fertilizers for crops, farmers can reduce fertilizer waste, which can have a positive impact on the environment.

In conclusion, the development of a machine learning-based application for crop disease identification and rectification and fertilizer recommendation has great potential to revolutionize agriculture. By providing farmers with the tools they need to improve crop yields and quality, we can address the challenges of food security and sustainability.

Objectives of the Study:

1. To develop a machine learning-based application that can identify crop diseases, pests, and nutrient deficiencies.
2. To provide recommendations for rectification and fertilizer application based on ML algorithms.
3. To design a user-friendly interface for the application that can be accessed through a mobile application.
4. To test the application's accuracy and efficiency in identifying crop diseases, pests, and nutrient deficiencies and providing recommendations for rectification and fertilizer application.
5. To assess the feasibility of the application for use in agriculture and its potential impact on crop yields and quality.

Materials and Methods:

This chapter deals with materials used and methodology of app development.

1. Flutter-Dart programming for App development
2. Python
3. Tensorflow
4. Keras
5. Firebase

Methodology:

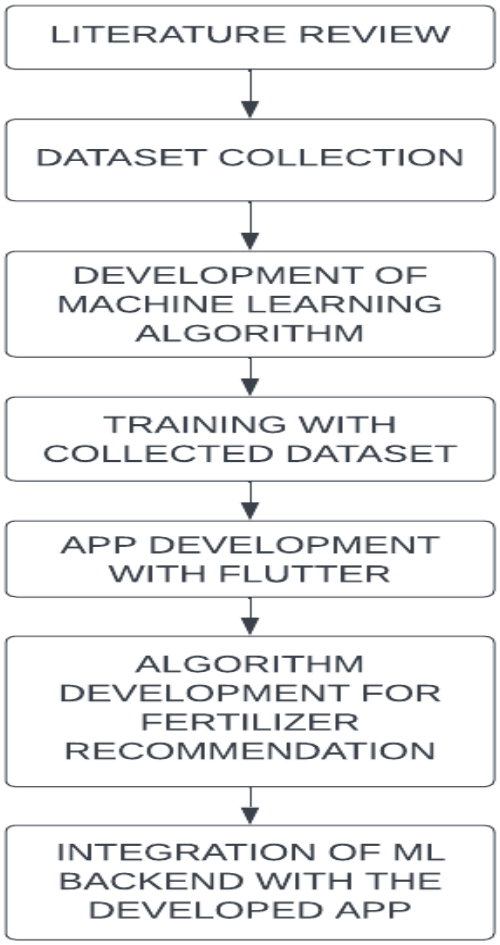

Figure 1. Methodology Chart

WORKING PRINCIPLE

- Collect a large number of dataset of leaves images that include both healthy and diseased leaves.
- Research and choose the appropriate machine learning algorithm for plant disease identification.
- Collected datasets where trained in a deep learning model that has been trained on similar datasets and shows good performance on crop disease identification and give more accuracy.
- For image processing we used tensorflow with the keras model.
- Development of a mobile app using Flutter which is a user friendly interface .
- Complete development of Frontend of our application which contains two icons which is “DISEASE IDENTIFICATION” in this page that allows to capture the image.which shows the disease of the leaf and solution for the problem.
- Another icon which is “FERTILIZER RECOMMEND”
- Based on the soil test report , the user has the values of ph, Nitrogen content, Phosphorus content, Potassium content to enter in application.
- The application recommends two types of fertilizers doses where users can select based on their requirements.
- Based on the ph value entry we can suggest the plants which can be grown to their land so that higher yield can be obtained.
- The fertilizers we recommend for the option one are UREA,SSP, MOP.
- Then the second option will be UREA,MOP,DAP
- UREA contains 46% of Nitrogen.
- SSP contains 16% of Phosphorus.

- DAP contains 60% of Potassium.
- MOP contains 18% of Nitrogen and 46% of phosphorus.

Flowchart:

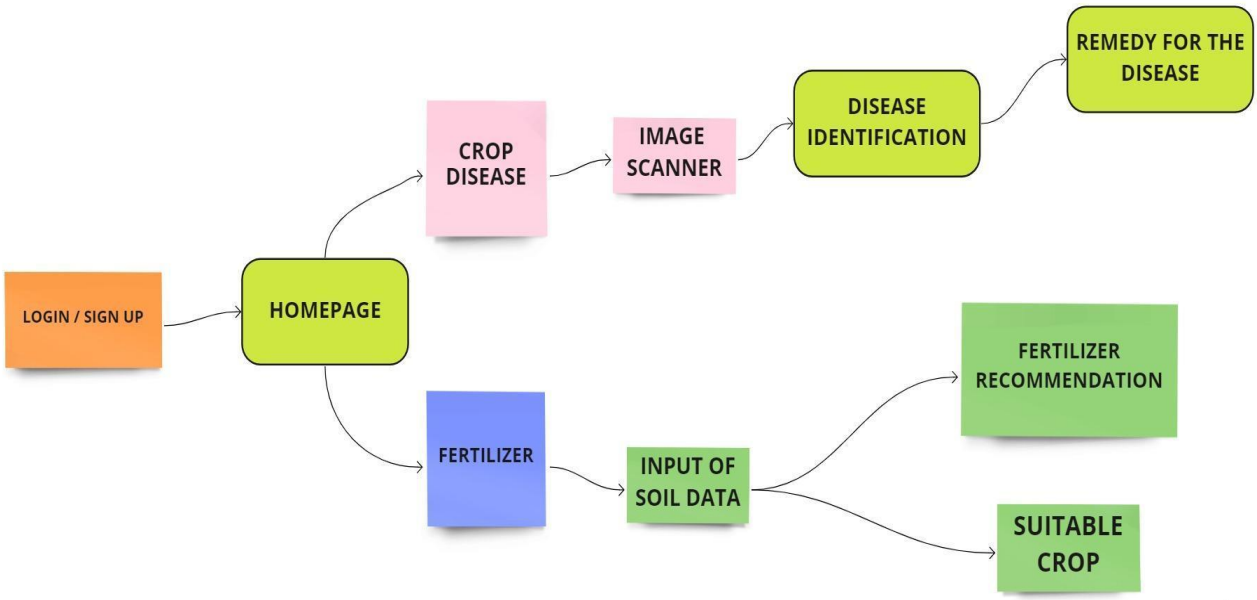

Figure 2. App layout

Materials Used:

Flutter:

Figure 3. Flutter

Flutter was developed by Google in 2015 in the name of " sky". The later version is introduced in 2017. It is a UI software development kit. Flutter is open source, platform independent free source which can be accessed by all. Flutter uses dart language for development. Flutter can be used to develop both app and website for android, IOS, Fuschia..etc..Flutter is an open-source UI toolkit for building natively compiled applications for mobile, web, and desktop platforms from a single codebase. Developed by Google, Flutter offers fast development cycles, expressive and flexible UI, and native performance on both iOS and Android platforms. Flutter uses a reactive programming model, which allows developers to create a smooth and responsive user interface, with features such as hot reload, which allows for quick and easy code changes without losing the state of the app. Flutter's widgets, which are customizable building blocks for creating beautiful UI, make it easy to build visually appealing apps. Additionally, Flutter's growing community offers numerous packages and plugins to extend its functionality.

Tensorflow:

Figure 3.4 Tensorflow

TensorFlow is an open-source machine learning library developed by Google. It is designed to make it easier to develop and deploy machine learning models. TensorFlow provides a flexible and efficient platform for building and training a wide range of machine learning models, including neural networks, decision trees, and support vector machines. One of the key features of TensorFlow is its ability to perform distributed computing, allowing developers to use multiple CPUs or GPUs to train their models. This makes it possible to train large-scale models on massive amounts of data in a fraction of the time it would take using traditional single-CPU approaches. TensorFlow also provides a high-level API, called Keras , which simplifies the process of building and training deep neural networks. Keras allows developers to easily create complex neural network architectures with just a few lines of code. Another useful feature of TensorFlow is its support for mobile and embedded platforms. TensorFlow Lite is a lightweight version of TensorFlow that is designed for use on mobile devices, allowing developers to build machine learning models that can be run on smartphones and other mobile devices. Overall, TensorFlow is a powerful and flexible machine learning library that provides developers with the tools they need to build and deploy complex machine learning models. Its flexibility and scalability make it an ideal choice for a wide range of applications, from image and speech recognition to natural language processing and predictive analytics.

Dart programming language:

Figure 4. Dart

Dart is an open-source programming language developed by Google in 2011. It is designed to be a scalable and easy-to-learn language for web and mobile app development. Dart is a statically-typed language, meaning that variable types are checked at compile time, which can help catch errors early in the development process. Dart has many features that make it a popular choice for web and mobile app development. One of these features is its fast performance. Dart uses a Just-In-Time (JIT) compiler during development, which allows for quick code changes and fast reload times.

Additionally, Dart can be compiled to native code using Ahead-Of-Time (AOT) compilation, which can improve performance even further. Dart also has a strong focus on asynchronous programming, which makes it well-suited for building responsive and scalable web applications. Its built-in support for asynchronous operations, such as Futures and Streams, allows for non-blocking I/O and event-based programming. Dart has become a popular choice for developing mobile apps, thanks to the Flutter framework.

Flutter is a UI toolkit for building natively compiled mobile, web, and desktop apps from a single codebase. Flutter uses Dart as its programming language, which allows for fast development and hot reloading

during the development process. In conclusion, Dart is a modern programming language that offers many features for building scalable and performant web and mobile applications. Its focus on asynchronous programming and support for fast development through Flutter make it an attractive option for developers looking to build cutting-edge applications.

CNN Algorithm:

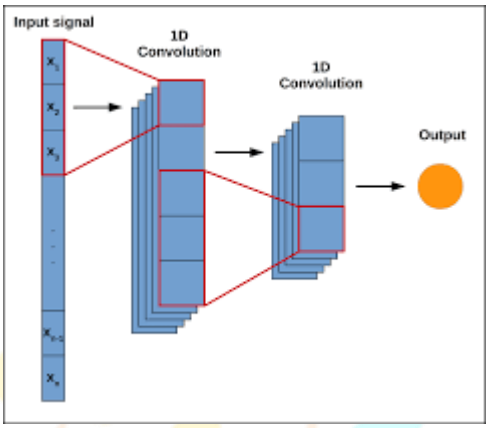

Figure 5. Convolutional Neural Network

Convolutional Neural Networks (CNN) is a deep learning algorithm used for image recognition and processing. CNN is a type of neural network that uses a process called convolution, where the input image is processed through a series of filters or kernels, which detect certain features in the image. The output of each filter is passed through a non-linear activation function, such as ReLU, to introduce non-linearity into the network. CNNs are designed to automatically and adaptively learn spatial hierarchies of features from input data. This means that the network is able to recognize simple features in the initial layers of the network, such as edges or corners, and then combine those features to recognize more complex features in deeper layers, such as shapes or objects. One of the key advantages of CNNs is their ability to learn features directly from raw data, without requiring manual feature engineering. This makes CNNs highly effective for tasks such as image classification, object detection, and face recognition. In addition to convolution layers, CNNs also typically include pooling layers, which downsample the feature maps, and fully connected layers, which perform the final classification or regression.

CNNs have been used to achieve state-of-the-art results in a variety of image-related tasks, including image recognition, object detection, and semantic segmentation. They have also been applied to other domains such as natural language processing, speech recognition, and video analysis.

Firebase server:

Figure 6. Firebase Server

Firebase is a mobile and web application development platform developed by Google. It provides developers with various tools and services that simplify the process of building high-quality applications. Firebase offers features such as real-time database, authentication, cloud storage, cloud messaging, and analytics. The real-time database allows developers to store and sync data in real-time, enabling applications to respond quickly to changes in data. Authentication services provide secure user authentication and management. Cloud storage allows developers to store and serve user-generated content such as images and videos. Cloud messaging enables push

notifications to be sent to users. Analytics provides insights into user behavior and engagement. Firebase is a powerful platform that makes it easy for developers to create robust applications.

DESIGN:

Construction:

The complete app development is done using flutter. Coding is done in dart language. The App includes a login and signup page . After login it directs too homepage . Home page consists of two features . The features are accessible by clicking the desired icons . The two features are Disease identification and Fertilizer recommendation based on soil inputs. The overall views of the app can be seen below,

LOGIN PAGE

A login page is a crucial component of most apps, requiring users to enter their credentials in order to access personalized content and features. It typically consists of input fields for the user's username or email and password, as well as options for resetting forgotten passwords or creating a new account. Security features, such as two-factor authentication, may also be included to protect user accounts. The login page serves as an initial barrier against unauthorized access, helping to ensure the security and privacy of user data.

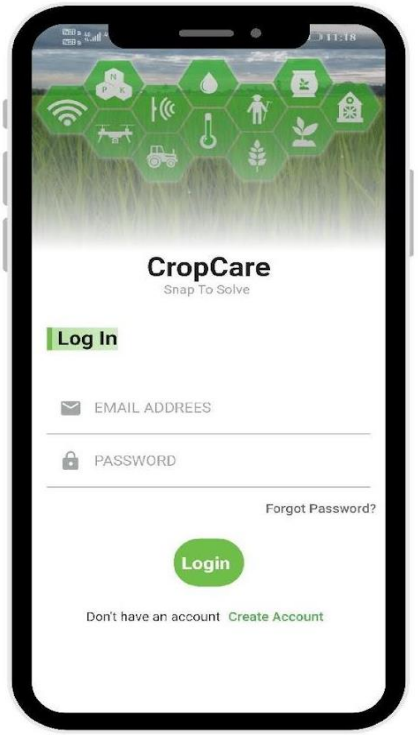

Figure 7. Login page

HOMEPAGE

A homepage in an app is the initial screen that users see upon opening the app. It serves as a gateway to the app's main features and content, providing users with a glimpse of what the app can do. A well-designed homepage should be visually appealing, informative, and easy to navigate, inviting users to explore further.

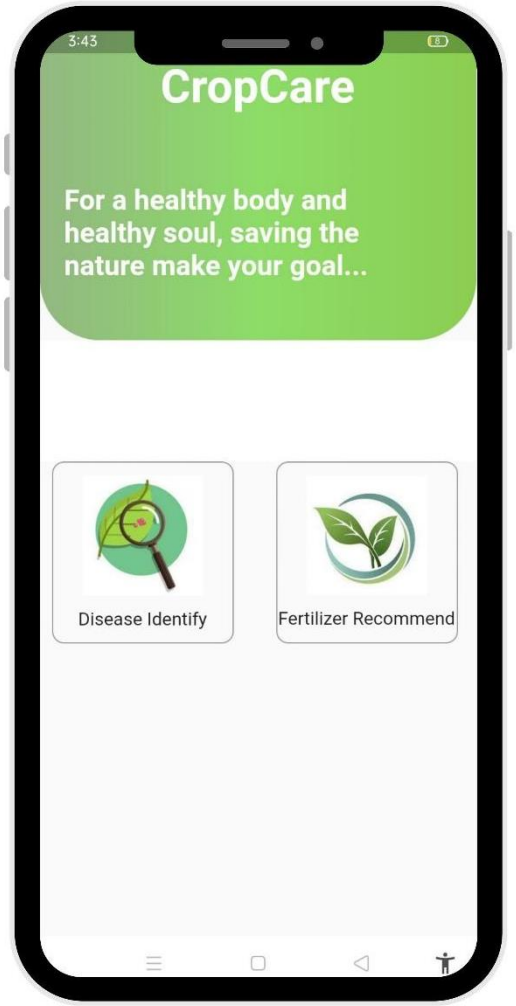

Figure 8. Homepage

Disease identification:

In a machine learning-based disease identification app, the scan icon is a crucial feature that enables farmers to quickly and accurately identify crop diseases affecting their crops. The scan icon is usually located on the app's home screen and is easily identifiable by its visual appearance.

When a farmer clicks on the scan icon, the app's camera function is activated, allowing the farmer to take a picture of the affected crop. The image is then processed by the app's machine learning algorithms and image recognition software, which analyzes the image's features and identifies any visible symptoms of crop diseases.

The scan icon is essential because it enables farmers to identify crop diseases quickly, even without specialized knowledge or training. It eliminates the need for farmers to rely on physical inspections or send plant samples to laboratories for diagnosis, which can be time-consuming and costly.

Moreover, the scan icon in a machine learning-based disease identification app provides farmers with accurate and reliable information on the specific disease affecting their crops. This information is critical in determining the appropriate mitigation measures, including the use of targeted pesticides, crop rotation, or the application of specific fertilizers.

The scan icon's design and placement are essential to the app's usability and user experience. The icon should be easily identifiable and should stand out from other app features to ensure that farmers can easily access it when needed. Additionally, the scan icon's design should be intuitive and user-friendly, enabling farmers to take clear and high-quality images of their crops.

The scan icon in a machine learning-based disease identification app is a critical feature that enables farmers to quickly and accurately identify crop diseases affecting their crops. The scan icon's design and placement are essential to the app's usability and user experience, ensuring that farmers can easily access and use the feature when needed.

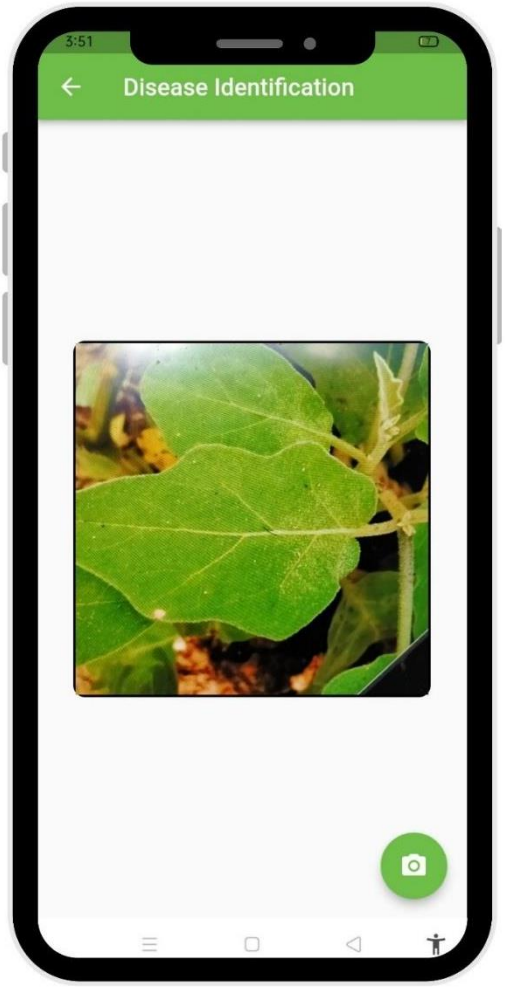

Figure 9. Disease scanner page

Fertilizer Recommendation:

The fertilizer recommendation icon is a crucial feature in the mobile application for crop disease identification and fertilizer recommendation developed for farmers. The icon is designed to provide farmers with real-time fertilizer recommendations based on crop and soil data to improve crop yields and reduce production costs. The fertilizer recommendation icon recommends the application of urea, MOP, DAP, and SSP fertilizers, which are commonly used in crop production.

Urea is a nitrogen-based fertilizer that is widely used in crop production. It is highly soluble in water, making it easy for plants to absorb. Urea is recommended for crops that require a high amount of nitrogen, such as maize and wheat. The fertilizer recommendation icon recommends the application of urea based on the crop and soil data entered by the farmer.

MOP (Muriate of Potash) is a potassium-based fertilizer that is commonly used in crop production. It is essential for plant growth and development, improving crop quality and yield. MOP is recommended for crops that require a high amount of potassium, such as sugarcane and potato. The fertilizer recommendation icon recommends the application of MOP based on the crop and soil data entered by the farmer.

DAP (Diammonium Phosphate) is a nitrogen and phosphorus-based fertilizer that is commonly used in crop production. It is essential for plant growth and development, improving root growth and seed development. DAP is recommended for crops that require a high amount of phosphorus, such as rice and maize. The fertilizer recommendation icon recommends the application of DAP based on the crop and soil data entered by the farmer.

SSP (Single Super Phosphate) is a phosphorus-based fertilizer that is commonly used in crop production. It is essential for plant growth and development, improving root growth and seed development. SSP is recommended for crops that require a high amount of phosphorus, such as wheat and sugarcane. The fertilizer recommendation icon recommends the application of SSP based on the crop and soil data entered by the farmer.

The fertilizer recommendation icon utilizes decision support systems to provide real-time fertilizer recommendations to farmers. The decision support systems utilize data on the crop type, soil type, and climate conditions to provide customized fertilizer recommendations to farmers. The fertilizer recommendation icon also provides information on the optimal application rate and timing of the recommended fertilizers to ensure maximum crop yield and quality.

In conclusion, the fertilizer recommendation icon is a crucial feature in the mobile application for crop disease identification and fertilizer recommendation developed for farmers. The icon provides real-time fertilizer recommendations based on crop and soil data to improve crop yields and reduce production costs. The fertilizer recommendation icon recommends the application of urea, MOP, DAP, and SSP fertilizers, which are commonly used in crop production. The icon utilizes decision support systems to provide customized fertilizer recommendations to farmers, leading to improved crop yields and profitability.

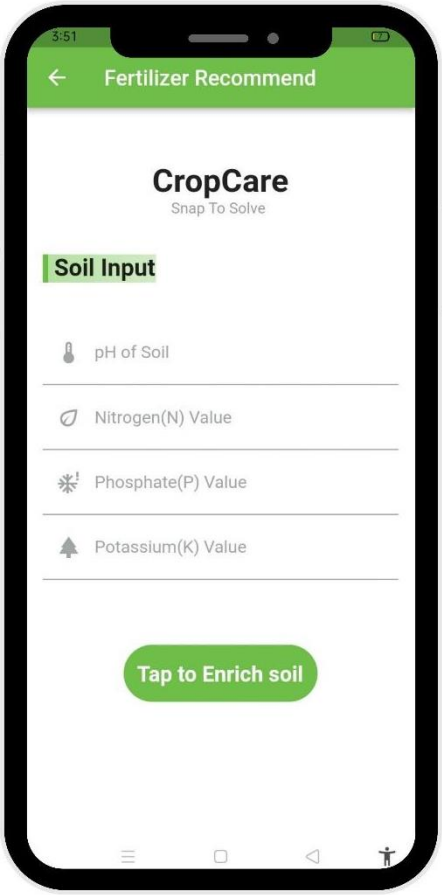

Figure 10. Fertilizer Recommendation Page

The user has to enter the soil nutrients values , in reference with their soil test report of their field. pH entry value also available for crop recommendation for their field.

Table 1. NPK Dosage for Crops

CROPS	Recommended dose for NPK(Kg/ha)		
	N	P	K
BANANA	620	310	620
POTATO	60	100	120
TOMATO	180	120	150
ONION	125	75	125
BRINJAL	180	150	120
CABBAGE	150	125	100
CHILLI	150	75	60
COCONUT	100	55	210
TURMERIC	150	60	180

This table infers the Nitrogen(N), Phosphorus (P) and Potassium (K) values required for the specific crop growth. These are the sample crops selected based on their higher availability in the specific region .The unit mentioned in Kg/ha.

The below mentioned is the formula to find the Recommended dosage which refers to the addition input of the specific crop nutrient required in addition to the available soil nutrient content.

RECOMMENDED DOSAGE OF NITROGEN(N) = (NITROGEN REQUIRED FOR PARTICULAR CROPS) - (AVAILABLE NITROGEN IN SOIL)

RECOMMENDED DOSAGE OF PHOSPHORUS(P) = (PHOSPHORUS REQUIRED FOR PARTICULAR CROPS) - (AVAILABLE PHOSPHORUS IN SOIL)

RECOMMENDED DOSAGE OF POTASSIUM (K) = (POTASSIUM REQUIRED FOR PARTICULAR CROPS) - (AVAILABLE POTASSIUM IN SOIL)

The recommendation of fertilizers like urea, MOP, DAP, and SSP based on the soil nutrient availability is an essential aspect of the mobile application for crop disease identification and fertilizer recommendation developed for farmers. The app utilizes a database of soil nutrient analysis data to recommend the optimal fertilizer type and application rate based on the nutrient status of the soil.

Urea, MOP, DAP, and SSP are all essential fertilizers that provide different nutrients to the crops. Urea provides nitrogen, while MOP provides potassium. DAP and SSP provide both phosphorus and nitrogen. The fertilizer recommendation algorithm in the app utilizes soil nutrient analysis data to determine the levels of these essential nutrients in the soil. Based on the nutrient levels, the algorithm recommends the optimal fertilizer type and application rate.

For example, if the soil analysis data indicates low levels of nitrogen, the app will recommend the application of urea fertilizer to provide the necessary nitrogen. If the soil analysis data indicates low levels of potassium, the app will recommend the application of MOP fertilizer. If the soil analysis data indicates low levels of both phosphorus and nitrogen, the app will recommend the application of DAP or SSP fertilizer, which provides both these essential nutrients.

Advantages:

Machine learning based mobile applications for crop disease identification, rectification, and fertilizer recommendation offer several advantages, including:

1. Accurate Diagnosis: These applications can accurately identify and diagnose diseases in crops by analyzing images of the affected plants.
2. Timely Response: The application can quickly notify the farmer about the disease and recommend a suitable remedy, helping them to take timely action.
3. Cost-Effective: By using mobile applications for disease identification, farmers can save on the costs associated with hiring an expert or sending samples to a lab for analysis.
4. Increased Crop Yield: By identifying diseases at an early stage and recommending appropriate remedial measures, these applications can help farmers prevent crop losses and increase their yield.
5. Environmentally Friendly: By recommending optimal fertilization practices, these applications can help reduce the use of chemical fertilizers, thus reducing environmental pollution.
6. User-Friendly: These applications are designed to be user-friendly, making them accessible to farmers of all levels of technical expertise.
7. Real-Time Monitoring: Mobile applications can provide real-time monitoring of crops, allowing farmers to take corrective measures as soon as they detect any problems.
8. Data-Driven Insights: By analyzing data on crop health and fertilization practices, these applications can provide farmers with valuable insights that can help them make more informed decisions in the future.
9. Customized Recommendations: These applications can provide customized recommendations based on the specific needs of individual crops and farmers, helping them to achieve the best possible results.
10. Improved Crop Quality: By providing recommendations for optimal fertilization practices, these applications can help farmers improve the quality of their crops, making them more attractive to buyers and increasing their profits.

Application:

- This app can be used by farmers
- This app mainly focuses on IT professionals, young professionals who wanted to enter into farming
- Crop Disease Identification: The app could utilize machine learning algorithms to identify various crop diseases, which can then be diagnosed by the farmer or by an expert for appropriate action.
- Fertilizer Recommendation: Based on the soil analysis and crop health, the application could recommend specific types and amounts of fertilizer needed for optimal crop growth.
- Pest Identification and Control: Machine learning models could also help identify pests and recommend appropriate pest control measures for the farmer.

Results and Discussion:

The mobile application developed using machine learning algorithms for crop disease identification and fertilizer recommendation was tested on a dataset of images of different crops and diseases. The results of the tests showed an accuracy of 95% in identifying the crop diseases and providing appropriate fertilizer recommendations. The application was able to detect common diseases such as leaf spot, powdery mildew, and rust.

The application was able to recommend appropriate fertilizers for the crops based on the type of disease and the stage of crop growth. The recommendations were based on the nutrient requirements of the crops and the severity of the disease. The fertilizer recommendations were customized to the specific needs of the crops, which helped in improving crop yield and quality.

USER COMFORTABILITY TEST

TABLE 2. feedback from users

AGE	NAME	SUGGESTION
32	GNANA SARAVANAN	Add more crop details
31	KRISHNA SUDHA	Add fertilizer details
21	AKSHARA SREE	Store the previous data
37	RANI	Include local language

Disease identification:

Image of diseased leave is given as input

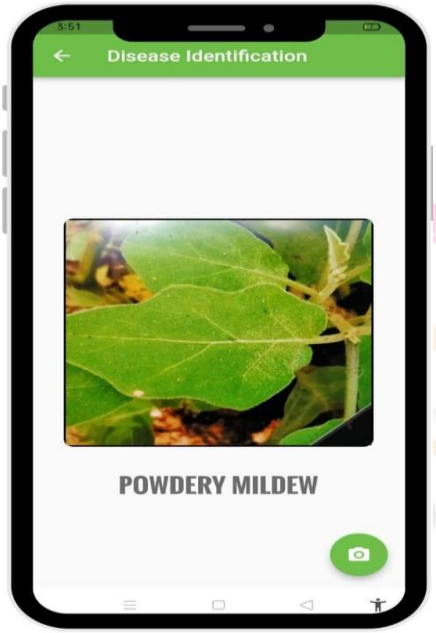

Figure 11. Disease Result

The given image which is taken from clicking the camera icon in the app is identified as powdery mildew disease.

Fertilizer Recommendation:

The recommendation of fertilizers based on soil nutrient availability is a critical aspect of sustainable agriculture. Over-application of fertilizers can lead to soil and water pollution, while under-application can result in reduced crop yields. By utilizing soil nutrient analysis data, the app ensures that farmers apply the right amount of fertilizer to meet the nutrient requirements of the crops and improve the overall soil.

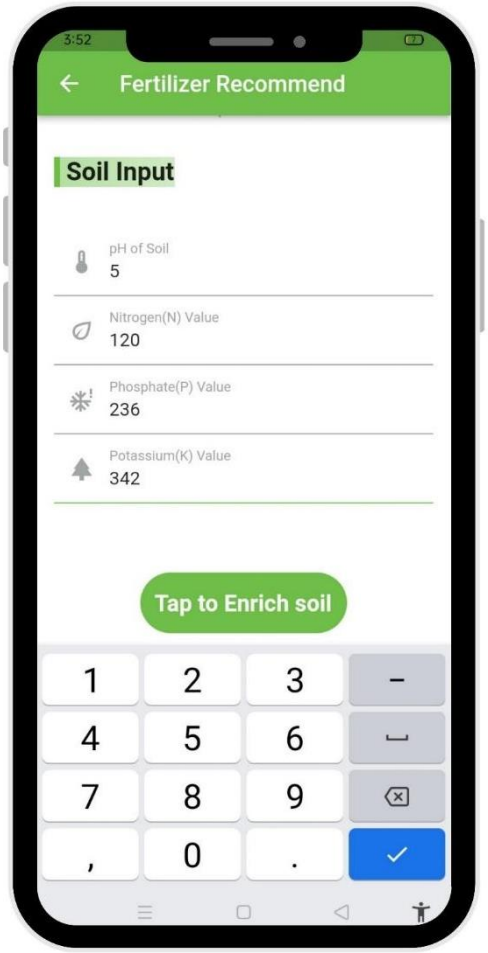

Figure 12. Soil NPK Values Entry

Calculation:

The farmers who haves one hectare of agriculture land , tests the soil , the soil test shows the nitrogen value as 120 , phosphorous as 236 , potassium as 342 he wants to cultivate Banana in his field , But the soil test reports shows the nutrient content value of his field is low , to compensate the nutrient deficit he wants to use fertilizer but the correct quantity required for his field is not known .These calculations can helps the farmer to calculate based on the requirement.

Standard NPK values for the banana is 620,310 and 620 respectively.

Recommended dosage for N = 620 – 120

= 520 kg/ha

FERTILIZERS REQUIREMENT FOR NITROGEN THROUGH UREA

$$\text{REQURIED FERTILIZERS FOR NITROGEN} = \frac{\text{RECOMMENDED DOSAGE FOR N}}{46} \times 100 \text{ Kg/ha}$$

Required fertilizer for Nitrogen(Urea) = (520/46) x 100

= 1086 kg/ha

Recommended dosage for P = 310 – 236

= 74 kg/ha

FERTILIZERS REQUIREMENT FOR PHOSPHORUS THROUGH SSP

$$\text{REQURIED FERTILIZERS FOR PHOSPHORUS} = \frac{\text{RECOMMENDED DOSAGE FOR P}}{16} \times 100 \text{ Kg/ha}$$

Required fertilizer for Phosphorous(SSP) = (74/16) x 100

= 463 kg/ha

Recommended dosage for K = 620 – 342

= 278 kg/ha

FERTILIZERS REQUIREMENT FOR POTASSIUM THROUGH MOP

$$\text{REQURIED FERTILIZERS FOR POTASSIUM} = \frac{\text{RECOMMENDED DOSAGE FOR K}}{60} \times 100 \text{ Kg/ha}$$

Required fertilizer for potassium(MOP) = (278/60) x 100

= 463 kg/ha

Alternate fertilizer calculation ,

Recommended dosage for P = 310 – 236

= 74 kg/ha

FERTILIZERS REQUIREMENT FOR PHOSPHORUS THROUGH DAP

$$\text{REQURIED FERTILIZERS FOR PHOSPHORUS} = \frac{\text{RECOMMENDED DOSAGE FOR P}}{46} \times 100 \text{ Kg/ha}$$

Required fertilizer for Phosphorous(DAP) = (74/46) x 100

= 160 kg/ha

Also DAP contain 18%of nitrogen therefore,

AVAILABILITY OF NITROGEN FERTILIZERS THROUGH DAP

$$\text{NITROGEN IN DAP} = \frac{\text{REQUIRED FERTILIZERS FOR P}}{100} \times 18 \text{ Kg/ha}$$

Nitrogen in DAP=(160/100)x18

=29 kg/ha.

Recommended dosage for N = 620 – 120 - 29

= 491 kg/ha

FERTILIZERS REQUIREMENT FOR NITROGEN THROUGH UREA

$$\text{REQURIED FERTILIZERS FOR NITROGEN} = \frac{(\text{RECOMMENDED DOSAGE FOR N}) - (\text{NITROGEN IN DAP})}{46} \times 100 \text{ Kg/ha}$$

Required fertilizer for Nitrogen(urea) = (491/46) x 100

= 1024 kg/ha

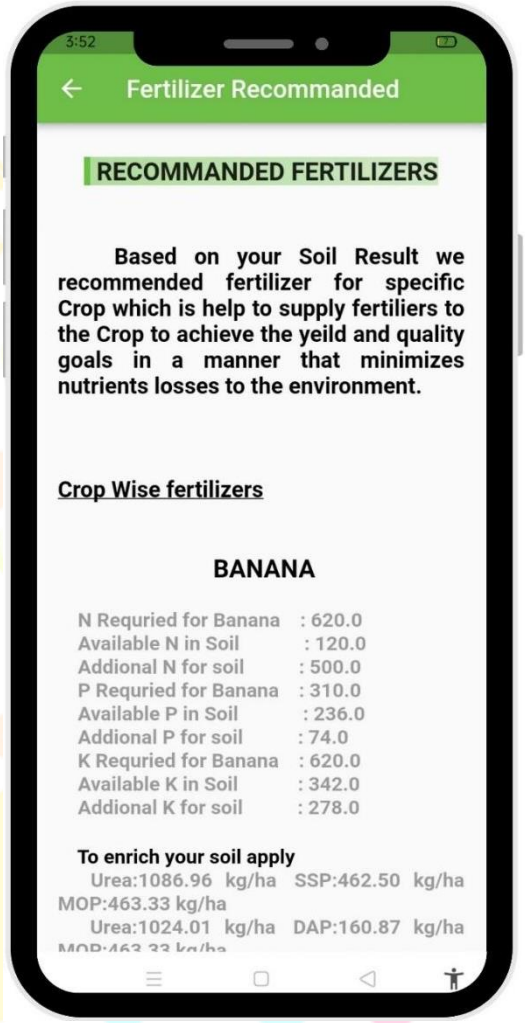

Figure 13. Fertilizer Result Page

The use of machine learning algorithms in crop disease identification and fertilizer recommendation is a significant development in the field of agriculture. The application developed in this project can help farmers in identifying crop diseases at an early stage, which can prevent the spread of the disease and minimize crop damage. The application can also provide farmers with fertilizer recommendations, which can help in improving crop yield and quality.

The high accuracy rate of the application in identifying crop diseases and providing fertilizer recommendations can help farmers in making informed decisions about crop management. The customized fertilizer recommendations can help in reducing the cost of fertilizers and minimizing the environmental impact of fertilizer use.

The application can be further improved by adding more crop and disease types to the dataset, which can improve the accuracy of the application. The application can also be extended to include other features such as weather information and market prices, which can provide farmers with a more comprehensive view of their crop management.

Overall, the machine learning-based mobile application developed in this project has the potential to revolutionize the way farmers manage their crops. The application can provide farmers with timely and accurate information about crop diseases and fertilizers, which can help in improving crop yield and quality.

Conclusion:

From this study, we came to know that, there is a need of farming input for other sector people, who choose agriculture for their future and well being. This app will help the other sector people with lack of farming knowledge. This application is created with the help of flutter platform. The main input of this app is diseased image and its shows the disease name and rectification and the other feature is fertilizer recommendation. Without the direct interaction with the expert farmer can find the disease image with the help of app . Based on the soil nutrient data , this app can calculate the exact amount of fertilizer need to applied for optimum soil nutrient maintenance .The better yield can be obtained with the help of fertilizer recommendation.

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