

# **FERTILIZER RECOMENTATION SYSTEM FOR DISEASE PREDICTION**

**TEAM ID: PNT2022TMID41513**

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**In**

**Computer Science & Engineering**

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## PROJECT REPORT

<b>TEAM ID</b>	<b>PNT2022TMID41513</b>
<b>PROJECT NAME</b>	<b>Fertilizer Recomentation System for Disease Prediction.</b>

### TEAM MEMBERS:

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Team member 1 : ABINAYA S

Team member 2 : ANCY A

Team member 3 : SOWMIYA S

# **Fertilizer Recommendation System for Disease Prediction.**

## **1.INTRODUCTION**

### **1.1 Project Overview**

Nowadays, artificial intelligence and sensor technology play a vital role in the agriculture field. The use of excess insecticides and fertilizers in farming poses a risk to human health. It is necessary to control them to ensure healthy crop production. Many techniques are used to identify the pest, suggest medications, and do soil nutrient analysis techniques separately. This paper applies the dual operator, Transition Probability Function (TPF), and Convolution Neural Network (CNN) to process the pest's image discretely and continuously for applying the recommended insecticide. The mathematical model with the objective function is derived in this paper. The soil nutrient analysis uses a soil NPK sensor with the recommendation of fertilizers according to the obtained nutrient values. On-spot results are obtained, and the time required for insecticide recommendation is within 10 s, and for fertilizer recommendation, it is within 80 s. Successful identification of five pests, namely aphids, bollworms, leaf folder, leaf miner, and green stink bug, was done with more than 90% accuracy.

The proposed approach is also compared with the other intelligent approaches, such as Artificial Neural Network (ANN), K-Nearest Neighbour (KNN), and Support Vector Machine (SVM), and it is observed that the proposed TPF-CNN approach gives higher accuracy in the shortest time.

### **1.2 Purpose**

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.

## **2.LITERATURE SURVEY**

### **2.1 Existing Problem**

[1] 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 0.7 and 0.8 for SVM, the accuracy of identification of leaf disease of CNN is 0.6 and SVM is 0.8.

#### **Advantages :**

The prediction and diagnosing of leaf diseases are depending on the segmentation such as segmenting the healthy tissues from diseased tissues of leaves.

#### **Disadvantages :**

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.

[2] Detection of Leaf Diseases and Classification using Digital Image Processing International Conference on Innovations in Information, Embedded and Communication Systems(ICIECS), IEEE, 2017.

#### **Advantages:**

The system detects the diseases on citrus leaves with 90% accuracy.

#### **Disadvantages:**

System only able to detect the disease from citrus leaves. 1 2 The main objective of this paper is image analysis & classification techniques for detection of leaf diseases and classification. The leaf image is firstly preprocessed and then does the further work. K-Means Clustering used for image segmentation and then system extract the GLCM features from disease detected images. The disease

classification done through the SVM classifier. Algorithm used: Gray-Level Co-Occurrence Matrix (GLCM) features, SVM, K-Means Clustering .

[3] Semi-automatic leaf disease detection and classification system for soybean culture IET Image Processing, 2018.

**Advantages:**

The system helps to compute the disease severity.

**Disadvantages:**

The system uses leaf images taken from an online dataset, so cannot implement in real time. This paper 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 mildew, 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. Algorithm used: SVM.

[4] Cloud Based Automated Irrigation And Plant Leaf Disease Detection System Using An Android Application. International Conference on Electronics, Communication and Aerospace Technology, ICECA 2017.

**Advantages:**

It is simple and cost effective system for plant leaf disease detection.

**Disadvantages:**

Any H/w failures may affect the system performance. The current paper 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. Algorithm used: K-means clustering, Other than this there are some other levels which can be used for sentimental analysis these are- document level, sentence level, entity and aspect.

[6] The current work examines and describes image processing strategies for identifying plant diseases in numerous plant species. BPNN, SVM, K-means clustering, and SGDM are the most common approaches used to identify plant diseases. Disadvantages : Some of the issues in these approaches include the impact of background data on the final picture, optimization of the methodology for a specific plant leaf disease, and automation of the technique for continuous

automated monitoring of plant leaf diseases in real-world field circumstances.

[7] 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 0.7 and

0.8 for SVM, the accuracy of identification of leaf disease of CNN is 0.6 and SVM is 0.8. Advantages : The prediction and diagnosing of leaf diseases are depending on the segmentation such as segmenting the healthy tissues from diseased tissues of leaves. Disadvantages : 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.

[8] In this paper, we 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 - crop recommendation using Random Forest algorithm, fertilizer recommendation using a rule based classification system, and crop disease detection using EfficientNet model on 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. Advantages : 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. Disadvantages : 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. Also, we can use some unsupervised

algorithms to pin-point the diseased areas in the image. We intend to add these features and fix these gaps in our upcoming work.



## 2.2.References

- [1] Semi-automatic leaf disease detection and classification system for soybean culture IET Image Processing, 2018
- [2] Cloud Based Automated Irrigation And Plant Leaf Disease Detection System Using An Android Application. International Conference on Electronics, Communication and Aerospace Technology, ICECA 2017.
- [3] Ms. Kiran R. Gavhale, Ujwalla Gawande, Plant Leaves Disease detection using Image Processing Techniques, January 2014.
- [4] Duan Yan-e, Design of Intelligent Agriculture Management Information System Based on IOT, IEEE, 4th, Fourth International reference on Intelligent Computation Technology and Automation, 2011
- [5] R. Neela, P. Fertilizers Recommendation System For Disease Prediction In Tree Leave International journal of scientific & technology research volume 8, issue 11, november 2019
- [6] Swapnil Jori<sup>1</sup>, Rutuja Bhalshankar<sup>2</sup>, Dipali Dhamale<sup>3</sup>, Sulochana Sonkamble , Healthy Farm: Leaf Disease Estimation and Fertilizer Recommendation System using Machine Learning, International Journal of All Research Education and Scientific Methods (IJARESM), ISSN: 2455-6211
- [7] Detection of Leaf Diseases and Classification using Digital Image Processing International Conference on Innovations in Information, Embedded and Communication Systems (ICIIECS), IEEE, 2017.
- [8] Shloka Gupta ,Nishit Jain ,Akshay Chopade, Farmer's Assistant: A Machine Learning Based Application for Agricultural Solutions.

## **2.2.Problem Statement Definition**


Mr.Munusamy is a 65 years old man. He had a own farming land and do Agriculture for past 30 Years , In this 30 Years he Faced a problem in Choosing Fertilizers and Controlling of Plant Disease. Mr.Munusamy wants to know the better recommendation for fertilizers for plants with the disease. He has faced huge losses for a long time.This problem is usually faced by most farmers. Mr.Munusamy needs to know the result immediately.

### 3.IDEATION & PROPOSED SOLUTION

#### 3.1.Empathy Map Canvas:



## 3.2.Ideation & Brainstroming



Fertilizer  
Recomentation  
System for  
Disease  
Prediction

Agriculture is the most important sector in today's life. Most plants are affected by a wide variety of bacterial and fungal diseases. Diseases on plants placed a major constraint on the production and a major threat to food security. Hence early and accurate identification of plant diseases is essential to ensure high quantity and best quality. In recent years, the number of diseases on plants and the degree of harm caused has increased due to the variation in pathogen varieties, changes in cultivation methods, and inadequate plant protection techniques

10 minutes  
1-6 Colaborate

→

**Before you collaborate**

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

🕒 15 minutes

---

**A** Team gathering  
Define who should participate in the session and send an invite.Share relevant information or pre-work ahead.

**B** Set a goal  
Think about the problem you'll be focusing on solving in the brainstorming session.

fungal diseases

**C** Interested in learning more?  
Check out the Meta Think Kit website for additional tools and resources to help your team collaborate, innovate and move ideas forward with confidence.

1

**Define your problem statement**

What problem are you trying to solve?Frame you problem as a How might We statement This will be focus of your brainstorm


🕒 5 minutes

---

**Problem**

1.Identify the disease on plants using deep learning techniques and to recommend the fertilizers for reducing the diseases.  
2.Provide website information for recommended fertilizer

---

  
**Key rules of brainstorming**  
To run an smooth and productive session

👉 Stay in topic.    💡 Encourage wild id  
👉 Defer judgment.    👂 Listen to others.  
👉 Go for volume.    🗣️ If possible, be vils



Need some inspiration?  
See a finished version of this template to kickstart your work.  
[Open example](#) →



→



→

Diseases on plants present a major constraint on the production and a major threat to food security. Hence early and accurate identification of plant diseases is essential to ensure high quantity and best quality. In recent years, the number of diseases on plants and the degree of losses caused has increased due to the variation in pathogen varieties, changes in cultivation methods, and inadequate plant protection techniques.

Draft  
 Free to all  
 25 people in attendance

**Before you collaborate:**  
A little bit of preparation goes a long way with this concept. Here's what you need to do to get going:

[10 minutes](#)

1. **Investigating**  
Define the exact requirement in the given situation or context. Gather relevant information or give useful data.
2. **Specifying**  
Make clear the problem you're focusing on, according to the functioning context.
3. **Experimenting**  
Use the test cases to facilitate the work. Use the data to test the hypothesis for the use of supply and production situation.

[Open article](#)

**Define your problem statement.**  
What problem are you trying to solve?  
What is a low-light fix? What are the  
factors of your investment?

- Identify the elements in plastic using deep-freezing method and to determine the features in order to identify the brand
- Provide students with samples for the assessment test sheet

Key notes at summarizing	
We can use several word production strategies	
Copy to text	Encourage self
Write progress	Write to others
Use the internet	It provides the link

**Brain storm**  
Write down any ideas that come to mind that address your problem statement.

Identify the business environment of	Identify the affiliates	Reconstructing the business	Identify and re- create
Business	Business	Business	Business

create learning theories	management of projects	evaluate theories	teach
develop the curriculum to support images	improve productivity	introduce new software to support images	use the system for images

[!\[\]\(6bb0e4f14c4133b37d2887cb37e67ddd\_img.jpg\) LinkedIn](#) 
[!\[\]\(5677a36a9444aca55c9ef7a9b7d8dd5c\_img.jpg\) Facebook](#) 
[!\[\]\(678dcfc0c73e5cf2048495727be3f5de\_img.jpg\) Twitter](#)

Group 100

Take turns, starting with those without coloring, and let all children make at least 10 to 15 dots in 45 minutes, give each cluster a sentence like "What if a cluster is bigger than a whole water, by and by?" and break it up into smaller sub-groups.

20 minutes

Networks for Fertilizer recommandation	Identify the disease	Cost of using this application is less	Pre-train model on a classification
--	-------------------------	---	--

Category 3	
Instant	Admin can view the

They can find the Smart solution to

**Keywords:** *Self-esteem, self-worth, self-concept, self-identity, self-esteem, self-worth, self-concept, self-identity*

Now you should all be on the same page about what's important moving forward. Place your stick in the grid to determine which ideas are important and which are feasible.

Better utilization of available resources

Importance  
 100% of those  
 who were asked  
 about the future  
 of agriculture  
 (2010-2011)

Cost of using this application is

### After you collaborate

You can expect the brand as an image or gift to share with members of your company who might find it helpful.

- **How is the event?**  
What is the likelihood that the event will materialize or change due to the long-term consequences of the event?
- **Repeat the event?**  
Repeat a range of the event as a risk or threat to another activity, or take measures, to ensure good results.

**Examine experience learning map**  
 Understand customer needs, motivations, and decision-making experience.

[Open the template](#)

Strategy, marketing, opportunities to think about it early, a different, opportunity.

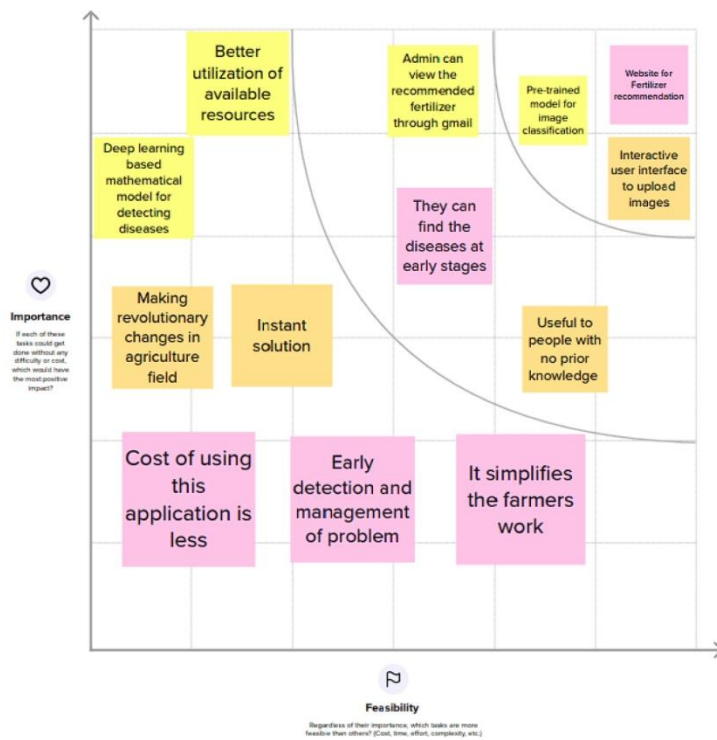
Share: [Facebook](#) [Twitter](#) [LinkedIn](#) [Email](#)

4

**Prioritize**

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

🕒 20 minutes



5

**After you collaborate**

You can export the mural as an image or pdf to share with members of your company who might find it helpful.

**Quick add-ons**

A

**Share the mural!**

Share a view link to the mural with stakeholders to keep them in the loop about the outcomes of the session.

B

**Export the mural**

Export a copy of the mural as a PNG or PDF to attach to emails, include in slides, or save in your drive.

**Keep moving forward**

A

**Strategy blueprint**

Define the components of a new idea or strategy.

Open the template →

B

**Customer experience journey map**

Understand customer needs, motivations, and obstacles for an experience.

Open the template →

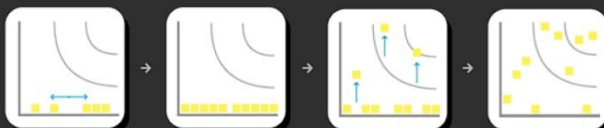
C

**Strengths, weaknesses, opportunities & threats**


Identify strengths, weaknesses, opportunities, and threats (SWOT) to develop a plan.

Open the template →

D

**Share template feedback**

### 3.3. Proposed Solution

 **FERTILIZER RECOMMENDATION USING DISEASE PREDICTION**

★ **VALUE FOR SOCIETY**

Consumers Farming is one of the major sectors that influences a country's economic growth. In country like India, majority of the population is dependent on agriculture for their livelihood. Many new technologies, such as Machine Learning and Deep Learning, are being implemented into agriculture so that it is easier for farmers to grow and maximize their yield.

**VALUE FOR ENVIRONMENT**

- ❑ In the crop recommendation application, the user can provide the soil data from their side and the application will predict which crop should the user grow.
- ❑ For the fertilizer recommendation application, the user can input the soil data and the type of crop they are growing, and the application will predict what the soil lacks or has excess of and will recommend improvements.
- ❑ For the last application, that is the plant disease prediction application, the user can input an image of a diseased plant leaf, and the application will predict what disease it is and will also give a little background about the disease and suggestions to cure it. These all are to improve the Agriculture, that's slightly reduces the poverty, climatic condition, soil erosion etc ...

★ **VALUE FOR BUSINESS**

Predicting the fertilizers, Analyzing the disease in a tap makes the life of farmers easy with minimal subscriptions would provide an acceptable return for the organization. This action adds a lot of value to the company and the business in society.

★ **FORM FACTORS**

Our Fertilizer Recommendation system for disease Prediction is in the form of web application to provide this valuable service to the environment and society.

★ **IT IS AN OPPORTUNITY ? (By public review)**

★★★★★

## ★ INTRODUCTION

Fertilizer Recommendation system for disease Prediction is a simple ML and DL based website which recommends the best crop to grow, fertilizers to use and the diseases caught by your crops.

## ★ PROBLEM STATEMENT

In India, the agriculture industry is extremely vital and crucial for economic and social development and jobs. In India, the agricultural sector provides a living for almost 48% of the population. As per the 2019-2020 economic survey, an Indian farmer's median wage in 16 states is Rupees 2500. Most of the Indian population depends on agriculture for their livelihood. Agriculture gives an opportunity of employment to the village people to develop a country like India on large scale and give a push in the economic sector. The majority of farmers face the problem of planting an inappropriate crop for their land based on a conventional or non-scientific approach. This is a challenging task for a country like India, where agriculture feeds approximately 42% of the population. And the outcomes for the farmer of choosing the wrong crop for land is moving towards metro city for livelihoods, suicide, quitting the agriculture and give land on lease to industrialist or use for the non-agriculture purpose. The outcome of wrong crop selection is less yield and less profit.

## ★ PROBLEM SOLUTION

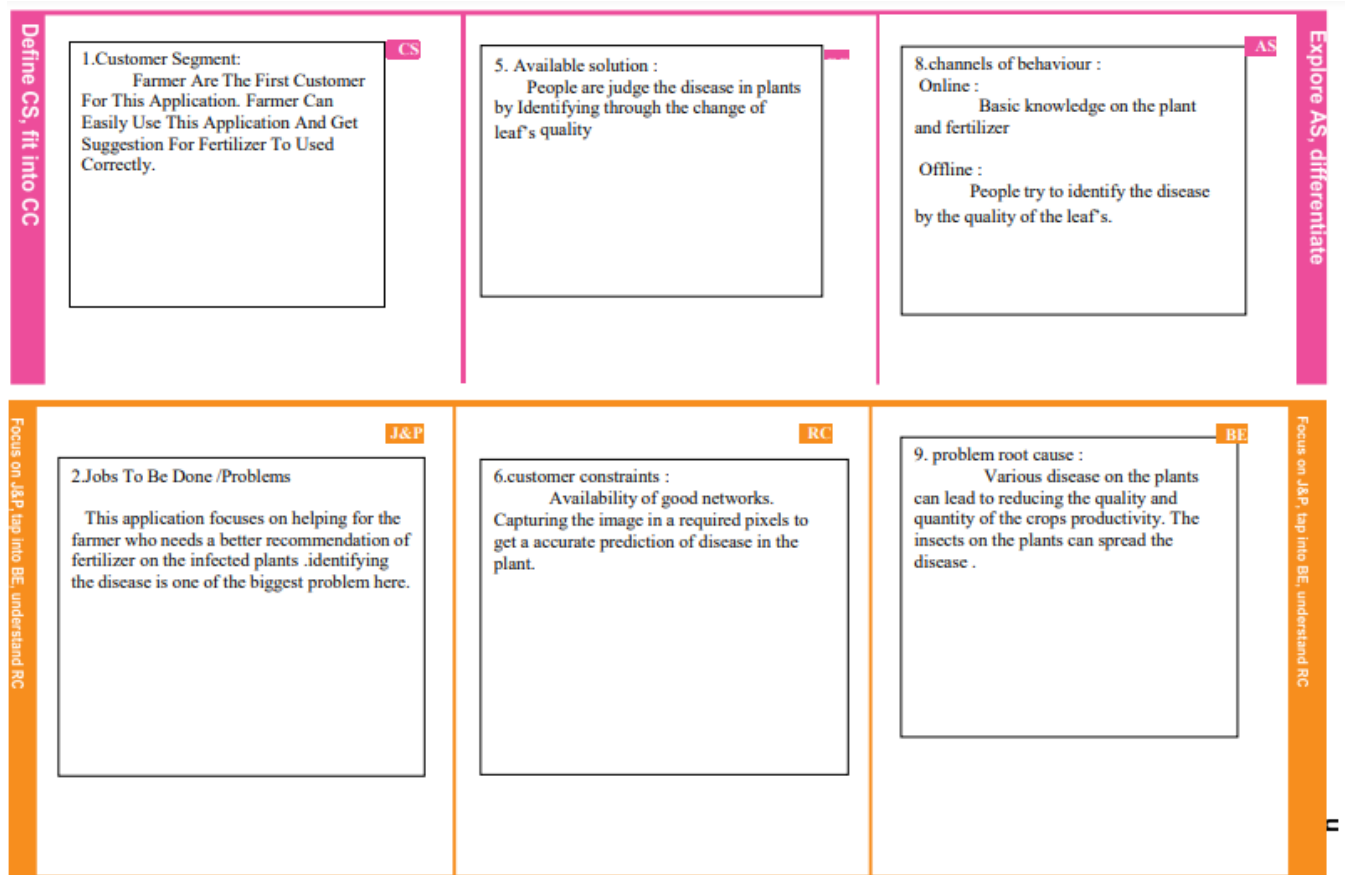
The solution to the problem is Machine learning, which is one of the applications of Artificial Intelligence, is being used to implement the proposed system. Crop recommendation is going to recommend you the best crop you can grow in your land as per the soil nutrition value and along with as per the climate in that region. And recommending the best fertilizer for every particular crop is also a challenging task. And the other and most important issue is when a plant gets caught by heterogeneous diseases that effect on less amount of agriculture production and compromises with quality as well. To overcome all these issues this recommendation has been proposed . Nowadays a lot of research and work is being implemented in the smart and modern agriculture domain. Crop recommendation is characterized by a soil database comprised of Nitrogen, Phosphorus, potassium. The ensembles technique is used to build a recommendation model that combines the prediction of multiple machine learning. Models to recommend the right crop based on soil value and the best fertilizer to use.

## ★ THE BENEFICIAL USERS

- ★ Farmer
- ★ Common People
- ★ Seller
- ★ Buyer
- ★ Employees
- ★ Industrial People



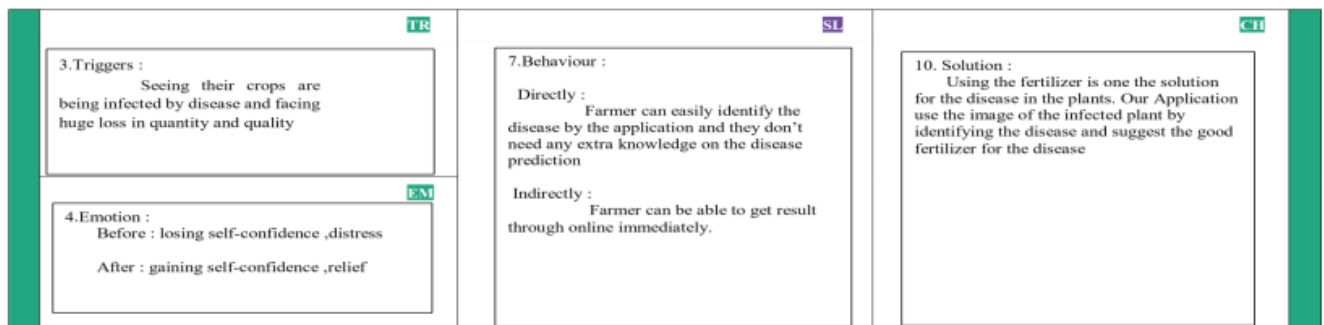
### 3.4 .Problem Solution fit.



Project Title : Fertilizers Recommendation System For Disease Prediction

Project Design Phase-I-Solution Fit

Team Id:PNT2022TMID41513



## 4.REQUIREMENT ANALYSIS

### 4.1.Functional Requirement:

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form
FR-2	User Confirmation	Confirmation via Email
FR-3	User Profile	Filling the profile page after logging in
FR-4	Uploading Dataset (Leaf)	Images of the leaves are to be uploaded
FR-5	Requesting solution	Uploaded images is compared with the pre-defined Model and solution is generated
FR-6	Downloading Solution	The Solution in pdf format which contains the recommendations of fertilizers and the possible diseases.

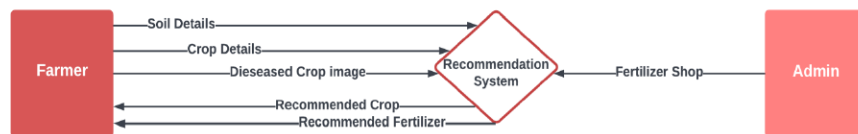
### 4.2.Non-Functional Requirement

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	The system allows the user to perform the tasks easily and efficiently and effectively.
NFR-2	Security	Assuring all data inside the system or its part will be protected against malware attacks or unauthorized access.
NFR-3	Reliability	The website does not recover from failure quickly ,it takes time as the application is running in single server
NFR-4	Performance	Response Time and Net Processing Time is Fast
NFR-5	Availability	The system will be available up to 95% of the time
NFR-6	Scalability	The website is scalable

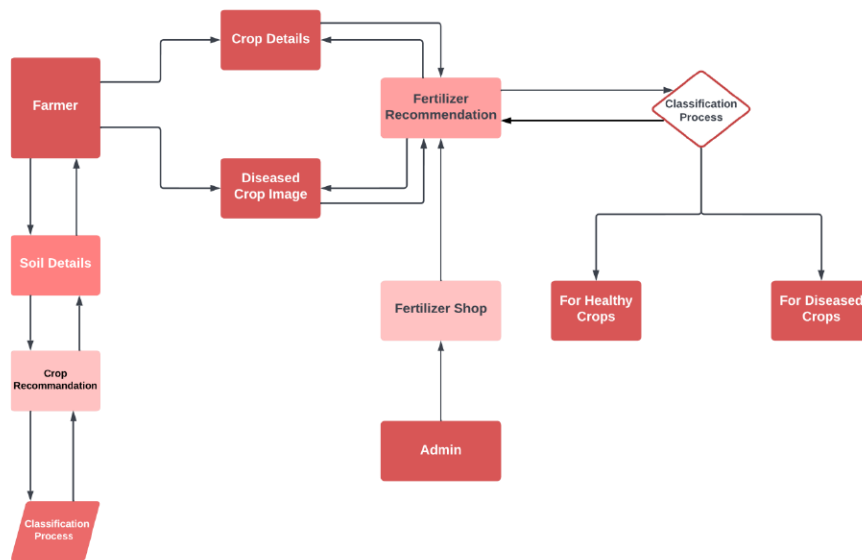
## 5.PROJECT DESIGN

### 5.2.Data Flow Diagram

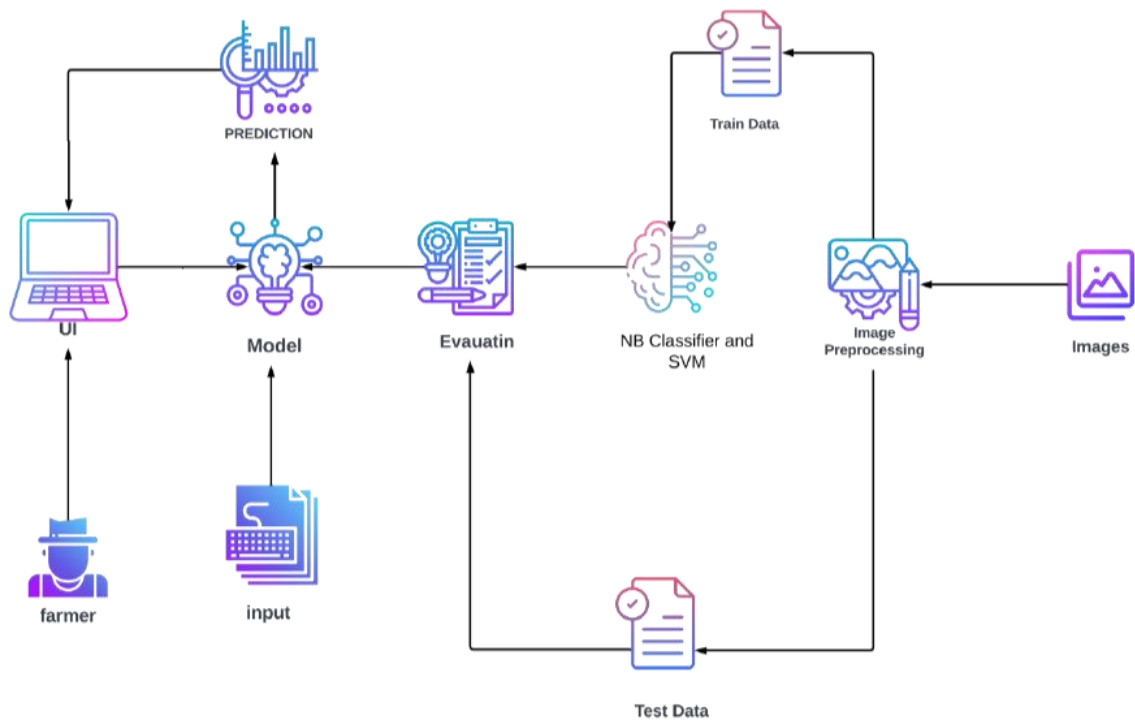
DFD LEVEL - 0



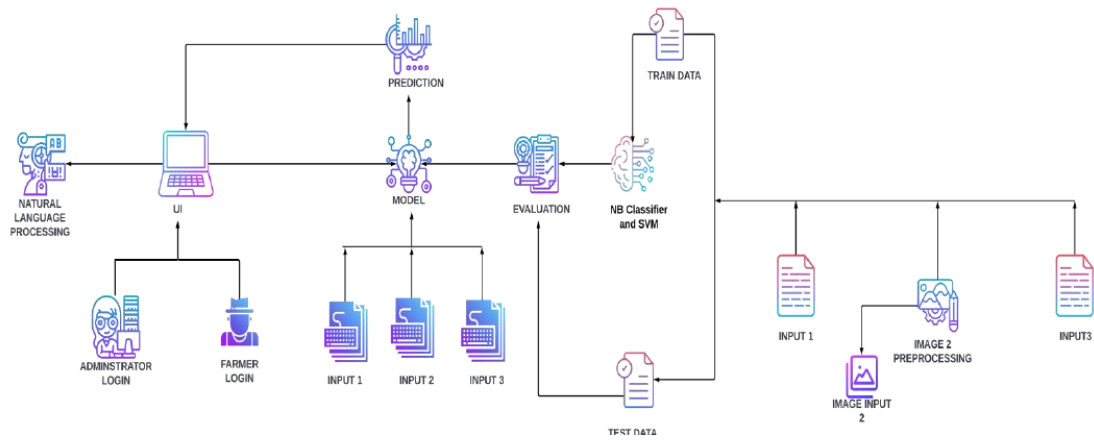
DFD LEVEL - 1



## 5.2.Solution & Technical Architecture



### 5.3. Technical Architecture



**Table-1 : Components & Technologies**



S.No	Component	Description	Technology
1.	User Interface	How the user interacts with the application .To depict the human-computer interaction and communication.	HTML, CSS, JSP
2.	Application Logic-1	A page to upload images as input	Python
3.	Application Logic-2	To use the Machine Learning model and predicting the result	Python
4.	Database	Structured data-images	MySQL
5.	Cloud Database	Database that typically runs on a cloud computing platform and access to the database is provided as-a-service	IBM Cloud Databases for MySQL
6.	File Storage	To store data in a hierarchical structure	Local File system
7.	Machine Learning Model	Here, we use a Support Vector Machine Algorithm that is used widely in Classification and Regression problems.	Random Forest ,XG Boost



**Table-2: Application Characteristics:**

S.N o	Characteristics	Description	Technology
1.	Open-Source Frameworks	Flaskmicro web framework	Written in Python.It is classified as a micro frame work because it does not requireparticular tools or libraries. It has nodatabase abstraction layer, form validation, or any other components where preexisting third-party libraries provide commonfunctions.
2.	Security Implementations	With all aspects of the job including detecting malicious attacks, analyzing the network endpoint protection and vulnerability assessment, Sign inencryption	IBM CloudApp ID Services
3.	Availability	Available for all data size	—
4.	Performance	Can extend the storage according to our needs	Python,AngularJS

## 6.User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story/ Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	US N-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		US N-2	As a user, I will receive confirmation email once I have Registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		US N-3	As a user, I can register for the application through G mail	I can receive confirmation Gmail & click confirm	Medium	Sprint-1
	Login	US N-4	As a user, I can login to the application by entering email & password		High	Sprint-1
	Dashboard	US N-5	As a user, I can view all the plans and methods in dashboard		High	Sprint-1
Customer (Web user)	Insurance claim	US N-6	As a user, I can register for claim my insurance	I can receive confirmation Email & claim my Insurance	High	Sprint-2

Customer Care Executive	Q/A services	US N-7	As a user, I can make a call to Support line to get help with a product or service.	Phone call, messages and Email	High	Sprint-3
Administrator	Insurance	US N-8	As a user, I can claim my insurance After getting confirmation from the administrator.	I can accept the insurance After verified the documents	High	Sprint-3



## 7.PROJECT PLANNING & SCHEDULING

### 7.1.Sprint Planning & Estimation:

Sprint	Functional Requirement(Epic)	User Story Number	User Story /Task	Story Points (Total)
Sprint-1	Model Creation and Training (Fruits)		Create a model which can classify diseased fruit plants from given images.I also need to test the model and deploy it on IBM Cloud	8
	Model Creation and Training (Vegetables)		Create a model which can classify diseased vegetable plants from given images	2

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points (Total)
Sprint-2	Model Creation and Training (Vegetables)		Create a model which can classify diseased vegetable plants from given images and train on IBM Cloud	6
	Registration	USN-1	As a user, I can register by entering my email, password, and confirming my password or via OAuth API	3
	Upload page	USN-2	As a user, I will be redirected to a page where I can upload my pictures of crops	4
	Suggestion results	USN-3	As a user, I can view the results and then obtain the suggestions provided by the ML model	4
	Base Flask App		A base Flask web app must be created as an interface for the ML model	2

Sprint-3	Login	USN-4	As a user/admin/shopkeeper, I can log into the application by entering email & password	2
	User Dashboard	USN-5	As a user, I can view the previous results and history	3
	Integration		Integrate Flask, CNN model with Cloudant DB	5
	Containerization		Containerize Flask app using Docker	2



Sprint	Functional Requirement(Epic)	User Story Number	User Story /Task	Story Points (Total)
Sprint-4	Dashboard(Admin)	USN-6	As an admin, I can view other user details and uploads for other purposes	2
	Dashboard (Shopkeeper)	USN-7	As a shopkeeper, I can enter fertilizer products and then update the details if any	2
	Containerization		Create and deploy Helm charts using Docker Image made before	2

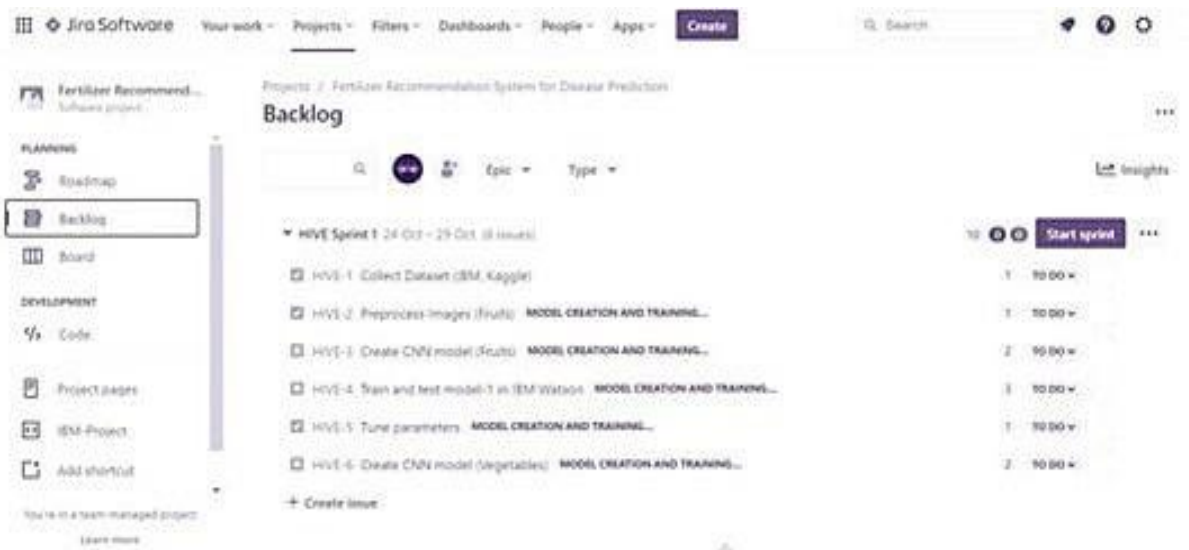
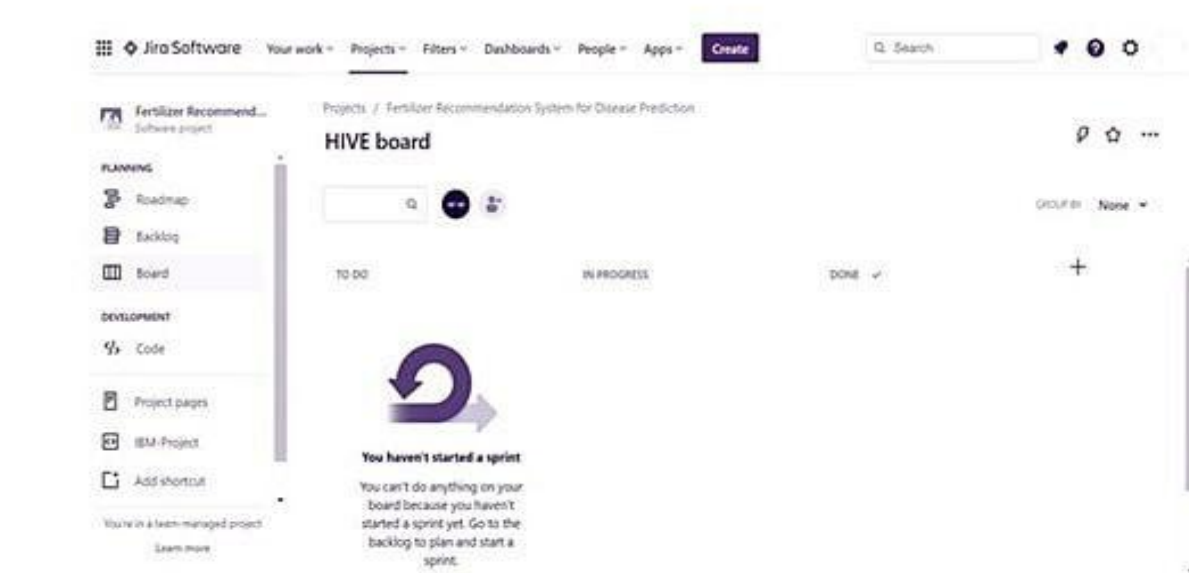
## 7.2.Sprint Delivery Schedule



<b>Sprint</b>	<b>Total StoryPoints</b>	<b>Duration</b>	<b>Sprint Start Date</b>	<b>Sprint End Date (Planned)</b>	<b>Story Points Completed (as on Planned End Date)</b>	<b>Sprint Release Date (Actual)</b>
Sprint-1	10	6 Days	24 Oct 2022	29 Oct 2022	10	30 Oct 2022
Sprint-2	15	6 Days	31 Oct 2022	05 Nov 2022	15	06 Nov 2022
Sprint-3	15	6 Days	07 Nov 2022	12 Nov 2022	15	13 Nov 2022
Sprint-4	12	6 Days	14 Nov 2022	19 Nov 2022	10	20 Nov 2022

## 8. Reports from JIRA

### Screenshots:



## **9.CODING &SOLUTIONING**

### **9.1.Features:**

Feature 1: Registration

Feature 2: Login

Feature 3: User interfaceFeature 4:

Store database

Feature 5: Send Alert Emailsto us.

## 10.TESTING

### 10.1.TEST CASE

#### 1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the [Fertilizer Recommendation system for plant disease prediction] project at the time of the release to User Acceptance Testing (UAT).

#### 2.Defect Analysis

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved.

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	10	6 Days	24 Oct 2022	29 Oct 2022	10	30 Oct 2022
Sprint-2	15	6 Days	31 Oct 2022	05 Nov 2022	15	06 Nov 2022
Sprint-3	15	6 Days	07 Nov 2022	12 Nov 2022	15	13 Nov 2022
Sprint-4	12	6 Days	14 Nov 2022	19 Nov 2022	10	20 Nov 2022

## 10.2. Test Case Analysis

This report shows the number of test cases that have passed, failed and untested



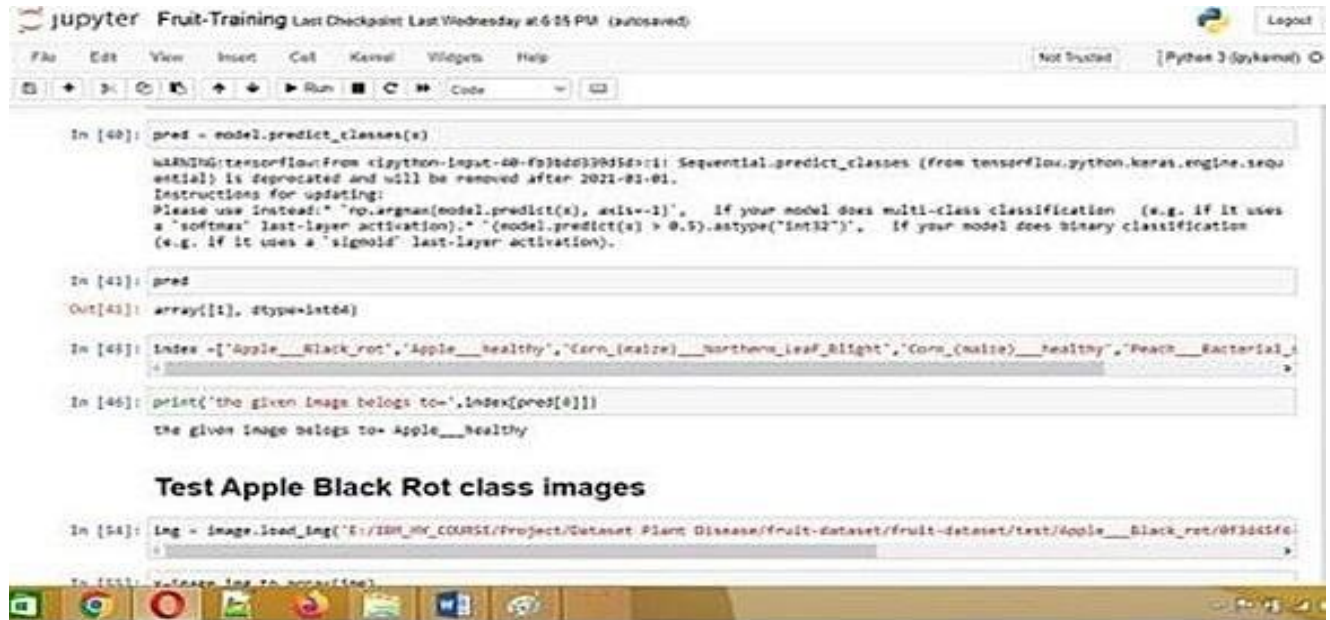
Section	Total Cases	Not Tested	Fail	Pass
Leaf spots	17	0	0	17
Mosaic leaf pattern	51	0	0	51
Misshapen leaves	20	0	0	20
Yellow leaves	7	0	0	7
Fruit rots	9	0	0	9
Fruit spots	4	0	0	4
Blights	2	0	0	2





# 11.RESULT

## 11.1.Performance Metrics



The screenshot shows a Jupyter Notebook titled "Fruit-Training" with the following code and output:

```
In [40]: pred = model.predict_classes(x)

WARNING:tensorflow:from <ipython-input-40-f93bdc390f5d>:1: Sequential.predict_classes (from tensorflow.python.keras.engine.sequ
ential) is deprecated and will be removed after 2021-01-01.
Instructions for updating:
Please use Instead: "np.argmax(model.predict(x), axis=-1)". If your model does multi-class classification (e.g. if it uses
a "softmax" last-layer activation)." (model.predict(x) > 0.5).astype("int32)". If your model does binary classification
(e.g. if it uses a "sigmoid" last-layer activation).

In [41]: pred
Out[41]: array([1], dtype=int64)

In [43]: Index = ['Apple__Black_rot', 'Apple__healthy', 'Corn_(maize)__Northern_leaf_blight', 'Corn_(maize)__healthy', 'Peach__Bacterial_
+

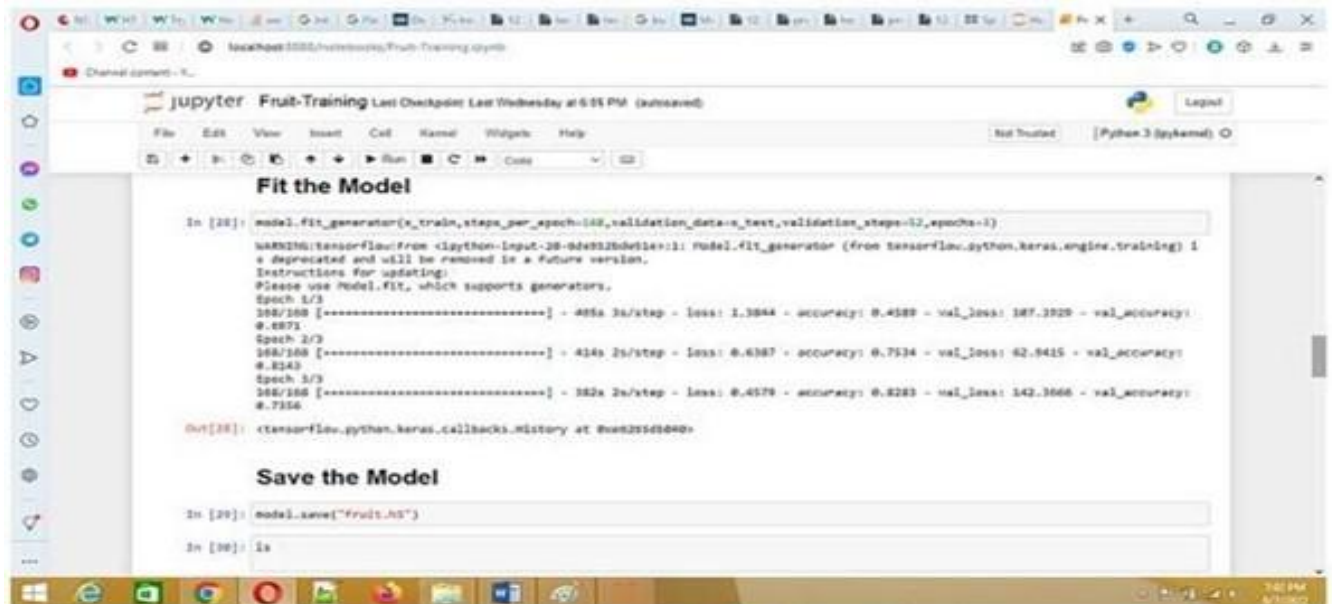
In [46]: print('the given image belongs to-', Index[pred[0]])
the given image belongs to- Apple__healthy
```

**Test Apple Black Rot class images**

```
In [54]: img = image.load_img('E:/IBM_MY_COURSE/Project/Dataset Plant Disease/fruit-dataset/fruit-dataset/test/Apple__Black_rot/0f3dd4f6-
+

In [55]: x = image.img_to_array(img)
```

Figure.6.2 Test the Fruit dataset



The screenshot shows a Jupyter Notebook titled "Fruit-Training" with the following code and output:

```
In [18]: model.fit_generator(x_train, steps_per_epoch=148, validation_data=x_test, validation_steps=12, epochs=1)

WARNING:tensorflow:from <ipython-input-20-0d4032b0b1e>:1: Model.fit_generator (from tensorflow.python.keras.engine.training) i
s deprecated and will be removed in a future version.
Instructions for updating:
Please use Model.fit, which supports generators.

Epoch 1/3
168/168 [-----] - 405s 3s/step - loss: 1.3844 - accuracy: 0.4589 - val_loss: 187.3929 - val_accuracy:
0.0071
Epoch 2/3
168/168 [-----] - 414s 2s/step - loss: 0.6387 - accuracy: 0.7534 - val_loss: 62.9415 - val_accuracy:
0.8243
Epoch 3/3
168/168 [-----] - 382s 2s/step - loss: 0.4578 - accuracy: 0.8283 - val_loss: 142.3666 - val_accuracy:
0.7356

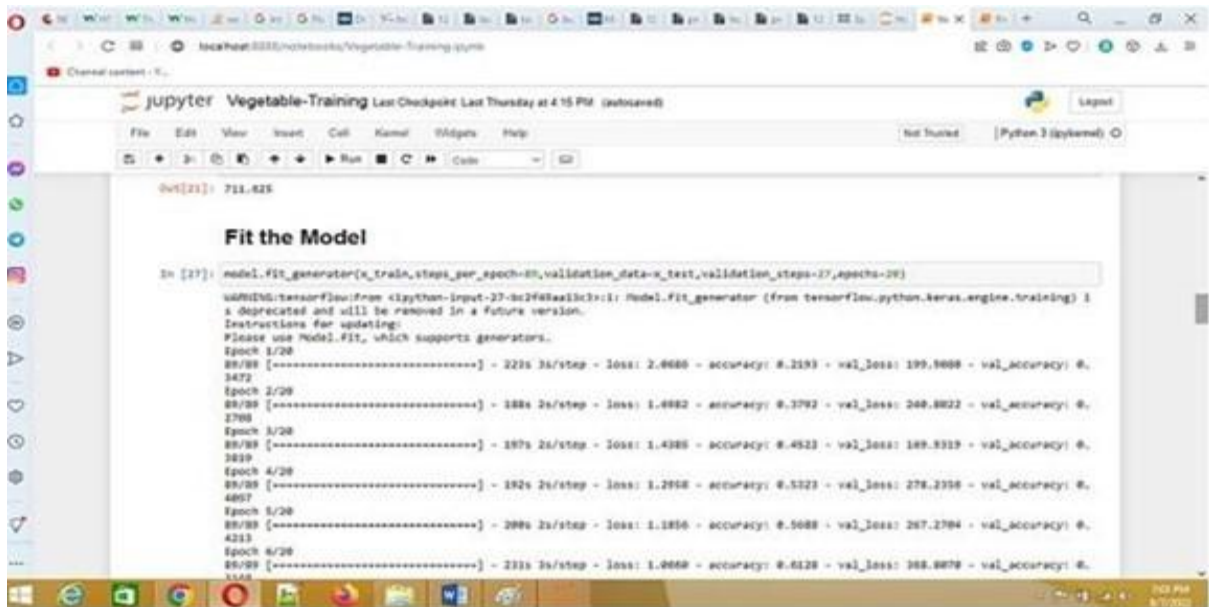
Out[18]: <tensorflow.python.keras.callbacks.History at 0x6255d9040>
```

**Save the Model**

```
In [20]: model.save("Fruit.h5")

In [20]: is
```

Figure.6.1. Fit a model for Fruit dataset



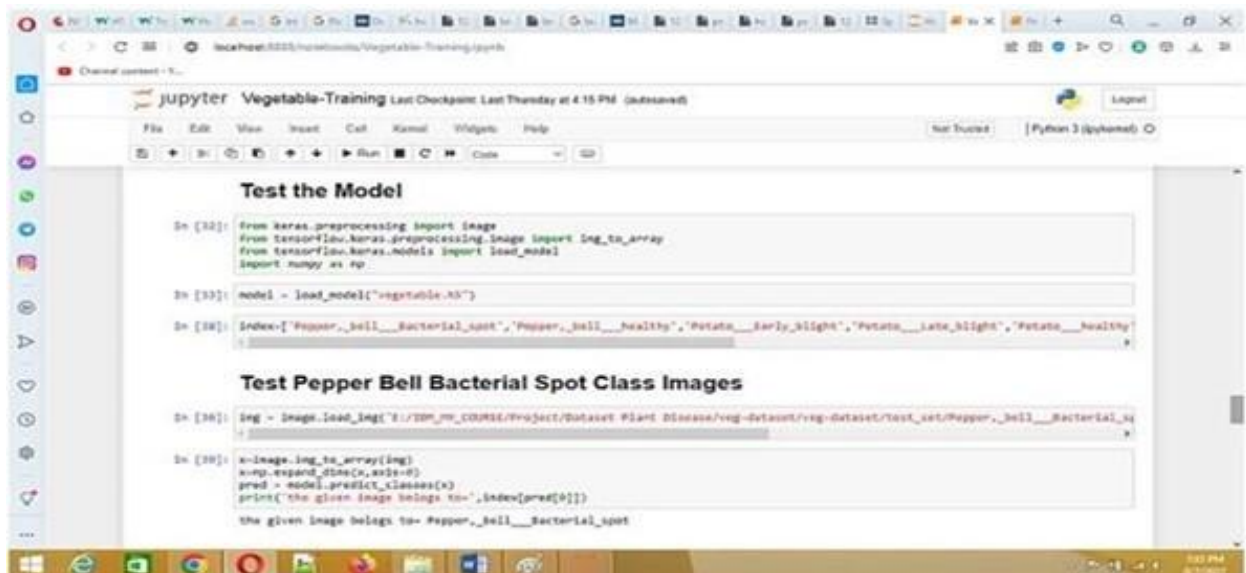
The screenshot shows a Jupyter Notebook titled "Vegetable-Training" with a code cell containing the following Python code:

```
In [27]: model.fit_generator(x_train, steps_per_epoch=80, validation_data=x_test, validation_steps=27, epochs=20)
```

The output of the code cell shows the training progress for 20 epochs. The output is as follows:

```
WARNING:tensorflow:from kiython-input-27-bc2f6a8a1b3c:1: Model.fit_generator (from tensorflow.python.keras.engine.training) is deprecated and will be removed in a future version.
Instructions for updating:
Please use Model.fit, which supports generators.
Epoch 1/20
80/80 [=====] - 221s 3s/step - loss: 2.4686 - accuracy: 0.2193 - val_loss: 199.9808 - val_accuracy: 0.3472
Epoch 2/20
80/80 [=====] - 188s 2s/step - loss: 1.4982 - accuracy: 0.3792 - val_loss: 248.8822 - val_accuracy: 0.2768
Epoch 3/20
80/80 [=====] - 187s 2s/step - loss: 1.4385 - accuracy: 0.4523 - val_loss: 189.9319 - val_accuracy: 0.3819
Epoch 4/20
80/80 [=====] - 182s 2s/step - loss: 1.2958 - accuracy: 0.5323 - val_loss: 274.2356 - val_accuracy: 0.4867
Epoch 5/20
80/80 [=====] - 200s 2s/step - loss: 1.1856 - accuracy: 0.5688 - val_loss: 267.2784 - val_accuracy: 0.4213
Epoch 6/20
80/80 [=====] - 231s 3s/step - loss: 1.0668 - accuracy: 0.6128 - val_loss: 388.8878 - val_accuracy: 0.3348
```

Figure.6.3. Train the Vegetable dataset



The screenshot shows a Jupyter Notebook titled "Vegetable-Training" with three code cells. The first code cell imports the necessary libraries:

```
In [32]: from keras.preprocessing import image
from tensorflow.keras.preprocessing.image import img_to_array
from tensorflow.keras.models import load_model
import numpy as np
```

The second code cell loads the model:

```
In [33]: model = load_model("vegetable.h5")
```

The third code cell defines the test data and performs the prediction:

```
In [38]: index = ["Pepper__bell__Bacterial_spot", "Pepper__bell__healthy", "Potato__early_blight", "Potato__late_blight", "Potato__healthy"]

In [39]: img = image.load_img('E:/DPM_CMS/Project/Dataset #Plant Disease/vgg-dataset/vgg-dataset/test_set/Pepper__bell__Bacterial_spot')

In [39]: x = image.img_to_array(img)
x = np.expand_dims(x, axis=0)
pred = model.predict_classes(x)
print("the given image belongs to-", index[pred[0]])
the given image belongs to- Pepper__bell__Bacterial_spot
```

Figure.6.4. Test the Vegetable dataset

### Train and Test Vegetable dataset IBM Cloud

Due to CUH limit exceeds, I have downloaded the notebooks and opened in Jupyter notebook

(i). Fruit dataset

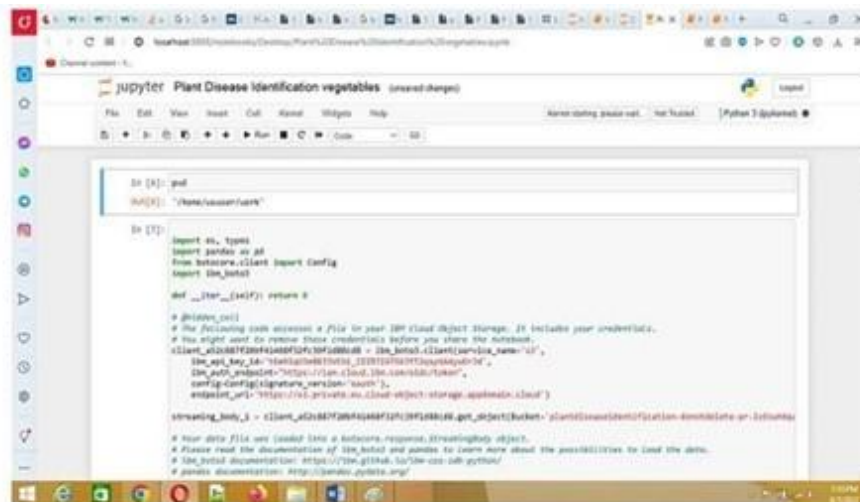
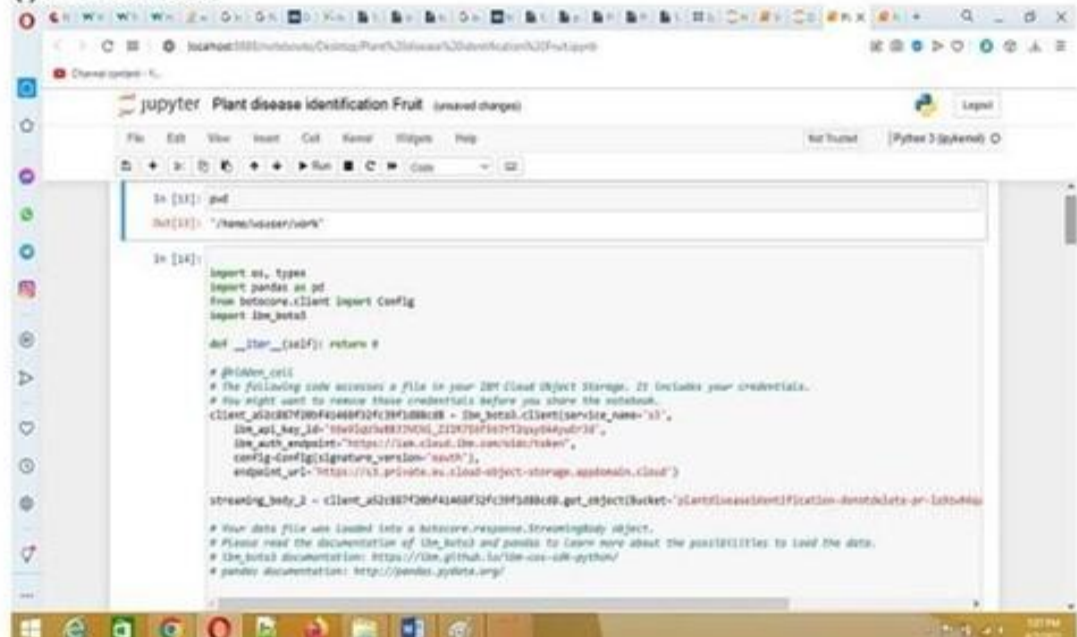
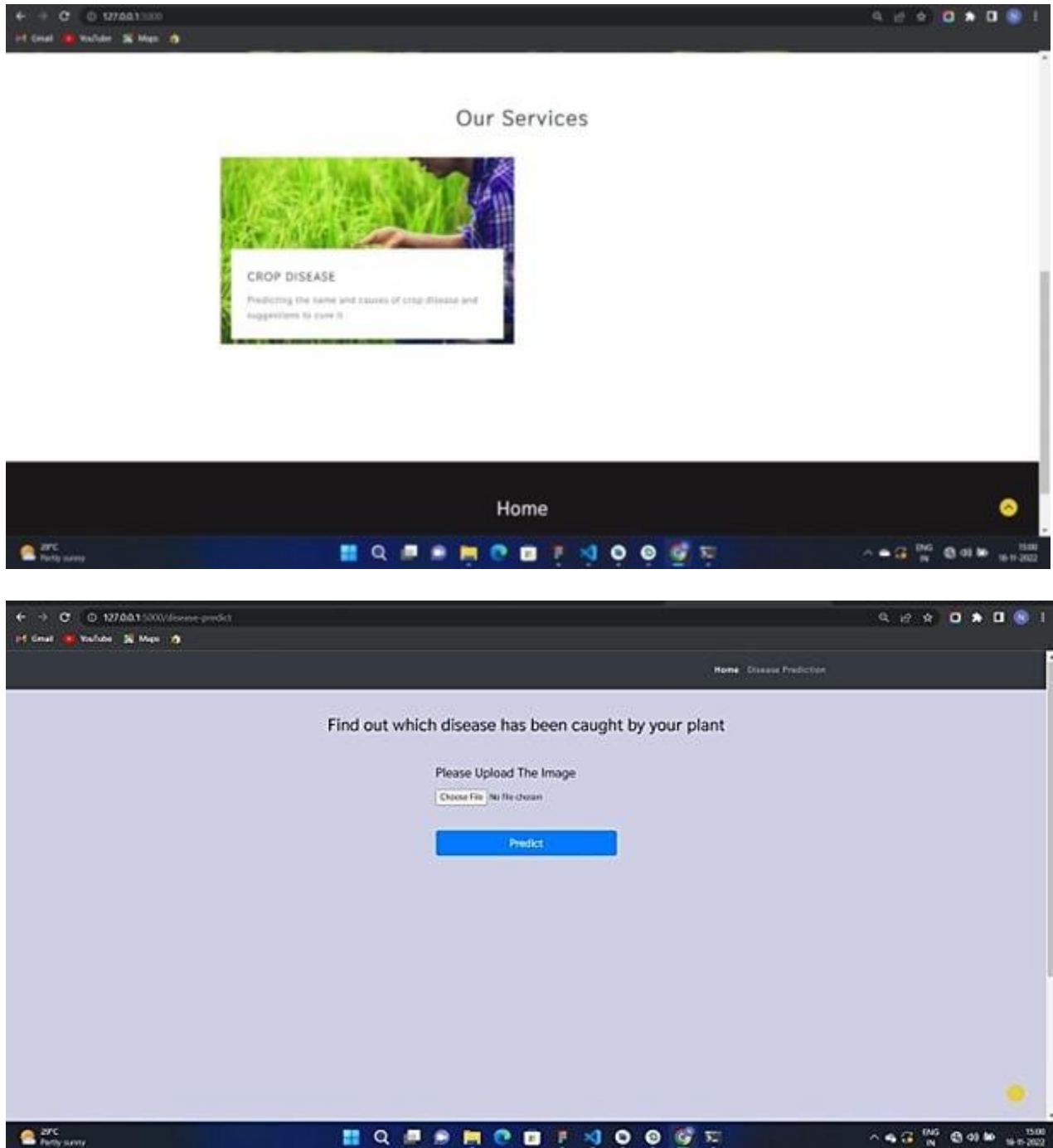
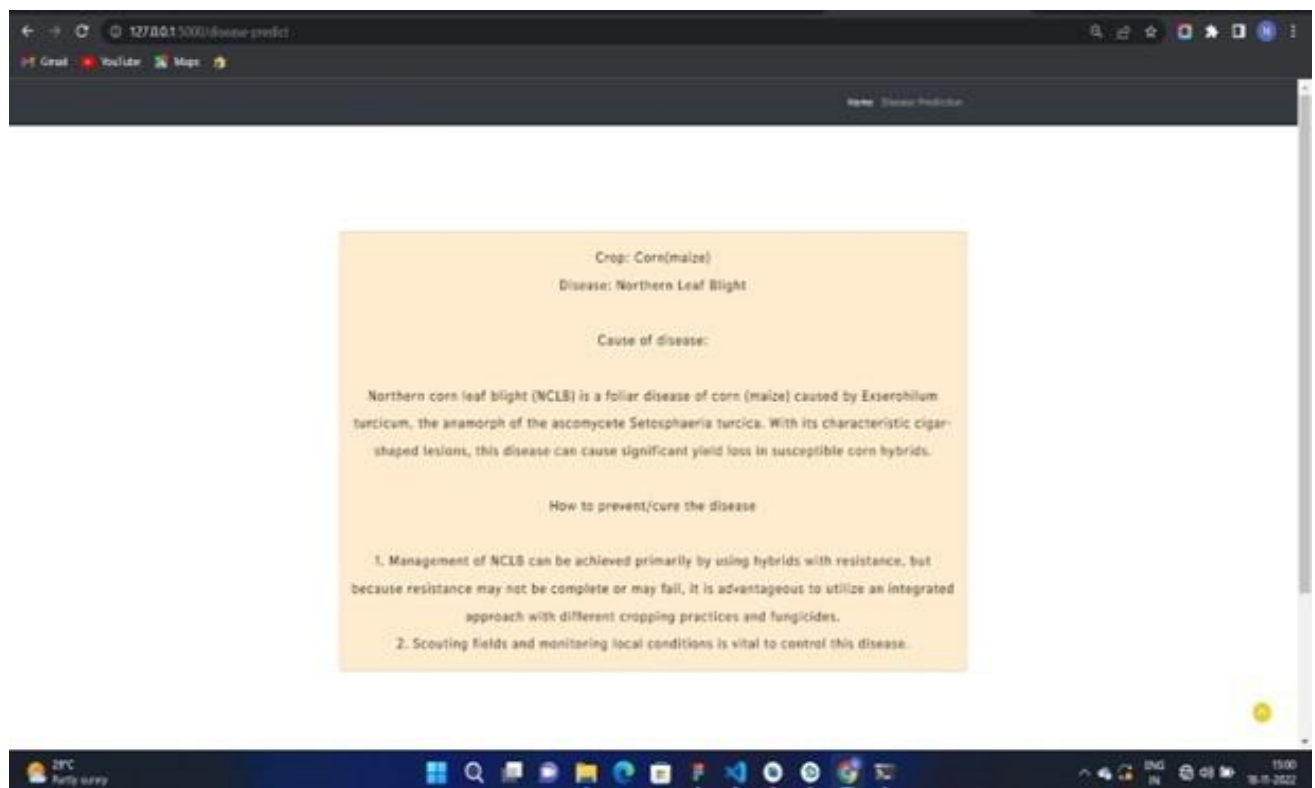
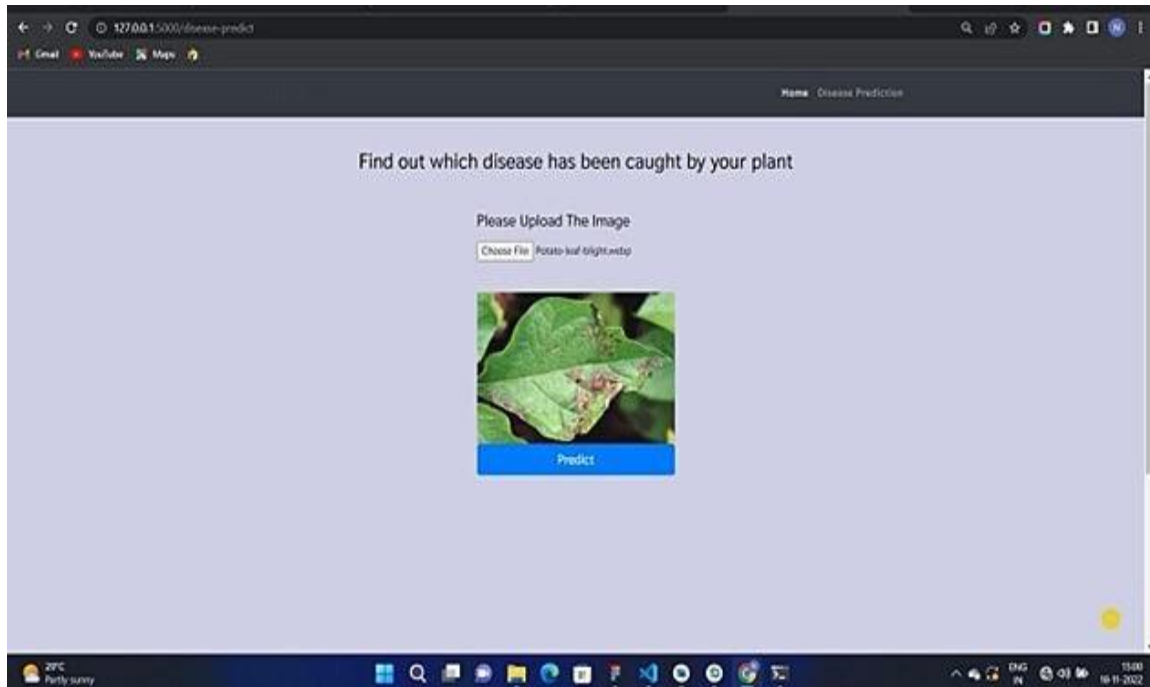


Figure.6.6. Training Vegetable Dataset in IBM Cloud

## OUTPUT:





## **11.ADVANTAGES & DISADVANTAGES**

### **ADVANTAGES**

Fertilizers have all nutrients required for plants growth.

It is soluble and easily absorbed by plants.

It enhances the metabolism of plants.

It is easily available in the market.

Highly needed for large production

### **DISADVANTAGE:**

- Fertilizers are more expensive than manure.
- Over fertilization can damage the plants.
- It is toxic and can harm humans.
- It affected the environment and echo system.
- Long term use reduce soil quality.



## 12.CONCLUSION

The core strategy of this project is to predict the crop based on the soil nutrient content and the location where the crop is growing. This system will help the farmers to choose the right crop for their land and to give the suitable amount of fertilizer to produce the maximum yield. The Support Vector Machine algorithm helps to predict the crop precisely based on the pre-processed crop data. This system will also help the new comers to choose the crop which will grow in their area and produce them a good profit.

A decent amount of profit will attract more people towards the agriculture. Also, the crop growth is based on the climate conditions in the particular area and these seasonal monsoons happens now are unpredictable, hence it is easy for the farmers when the prediction result is also based on the climatic conditions. Live weather prediction will also help the users to predict the crop water needs and also it will help the farmers to decrease the crop damage due to the rain or drought.

The prediction of crop yield based on soil data and proper implementation of algorithms have proved that a higher crop yield can be achieved.

From crop recommendation system provides 82% of accuracy. the above work, we conclude that for soil classification Random Forest is a suitable algorithm with an accuracy of 99.09% compare to Gaussian Naive Bayes. The work can be extended further to add the following functionality. Building a Website can be built to help farmers by uploading an image of farms. Crop diseases detection uses image processing in which users get pesticides based on disease images and Fertilizer prediction based on soil condition.

By categorizing the soil samples according to the soil type, land type and macro nutrients Nitrogen (N), Phosphorus (P) and Potassium (K) present in the soil the suitable crop along with its appropriate fertilizer is suggested to the agricultural stakeholder. The month in which the yield will be high is also suggested to the user. The yield calculation is also provided for the crop selected by the farmer.

## **13.FUTURE SCOPE**

The future work is to implement Machine Learning Algorithms like Ensemble Classifiers to predict the crop yield and recommend the crop with appropriate fertilizer. In the existing system only soil characteristics were considered to provide crop recommendations. In the future work the climatic parameters will also be taken into account to provide crop recommendations. Also the method can be extended to include diverse varieties of crop to be cultivated and to analyse its performance.

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.



## **APPENDIX**

### **SourceCode**

<https://github.com/IBM-EPBL/IBM-Project-48224-1660805745/tree/main/Application%20Building>

### **GitHub & Project Demo Link**

<https://github.com/IBM-EPBL/IBM-Project-21216-1659775253>