DEVELOPMENT OF FARMER ASSISTANCE SYSTEM USING SMART TECHNOLOGY

1. INTRODUCTION

1.1 Project Background and Objective

Agriculture has become much more than simply a means to feed an ever growing population. The main objective of the project is to provide assistance to the farmers using smart technology which helps in providing information to the farmers about the field requirements and its respective solution. It also helps to acknowledge the farmers with the condition of their field on an everyday basis and because of the smart technology usage in the farming techniques, it provides employment to the younger generation there by increasing the agriculture rate in the world. The problems of agriculture include irrigation, lack of mechanization, plant diseases, lack of knowledge of manures, fertilizers and seeds. Identification of plant disease is very difficult in the agriculture field. If identification is incorrect then there is a huge loss on the production of crops and economical value of the market. Leaf disease detection requires a huge amount of work, knowledge in the plant diseases, and also requires more processing time. So we can use image processing, simply image comparison technique to identify the problem and provide a solution to farmers.

1.2 Problem

Identifying plant disease wrongly leads to huge loss of yield, time, money and quality of product. Identifying the condition of the plant plays an important role for successful cultivation. In olden days identification is done manually by the experienced people but due to the so many environmental changes the prediction is becoming tough.

1.3 Solution

In order to provide sustainable farming practices to the farmers, a platform for mutual interface between farmers and control stations is provided. The farmers update the status of the field to the control station by capturing the images of the field. The control station analyses the data provided by the farmers by using image processing techniques. After processing the images, the required solution for field management and the respective precautions for the problems detected is provided. This project is helpful in reducing the problems such as irrigation, plant diseases and weather conditions there by providing assistance to the farmer.

1.4 Importance

Nowadays technology plays a vital role in all the fields but till today we are using some old methodologies in agriculture. Identifying plant disease wrongly leads to huge loss of yield, time, money and quality of product. Identifying the condition of the plant plays an important role for successful cultivation. In olden days identification is done manually by the experienced people but due to the so many environmental changes the prediction is becoming tough. So, we can use image processing techniques to identify the problem of plants. Early

identification of disease symptoms has become an important aspect of crop disease control. In some cases, disease control actions or remedial measures can be undertaken if the symptoms are identified early. Image processing technology in agricultural research has made significant development. Histogram approach can significantly support an accurate detection of leaf disease. We can use sufficient amounts of pesticides to effectively control the pests in turn the crop yield will be increased. Indian economy is highly dependent on agricultural productivity. Therefore in the field of agriculture, detection of plant problems plays an important role. So, we can use histogram technique in the leaf comparison process, which helps in assisting farmers with the condition of their field on an everyday basis.

Histograms have many uses. One of the more common is to decide what value of threshold to use when converting a grayscale to a binary one by thresholding. If the image is suitable for thresholding then the histogram will be bi-modal i.e. the pixel intensities will be clustered around two well-separated values. A suitable threshold for separating these two groups will be found somewhere in between the two peaks in the histogram. If the distribution is not like this then it is unlikely that a good segmentation can be produced by thresholding method. Thresholding is the simplest method of image segmentation. From a grayscale image, thresholding can be used to create binary images.

2. DESIGN (UML Diagrams)

2.1.1 Use Case diagram:

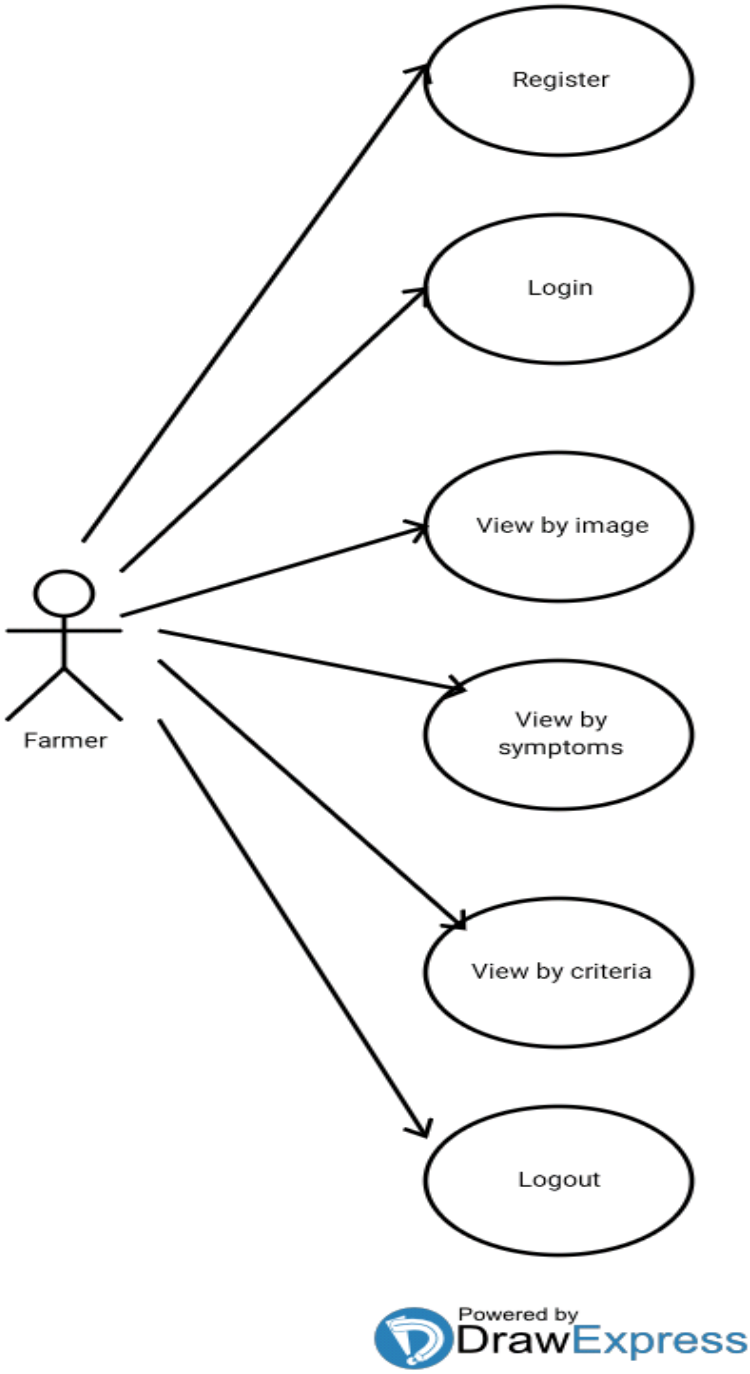


Fig 2.1 Usecase of farmer

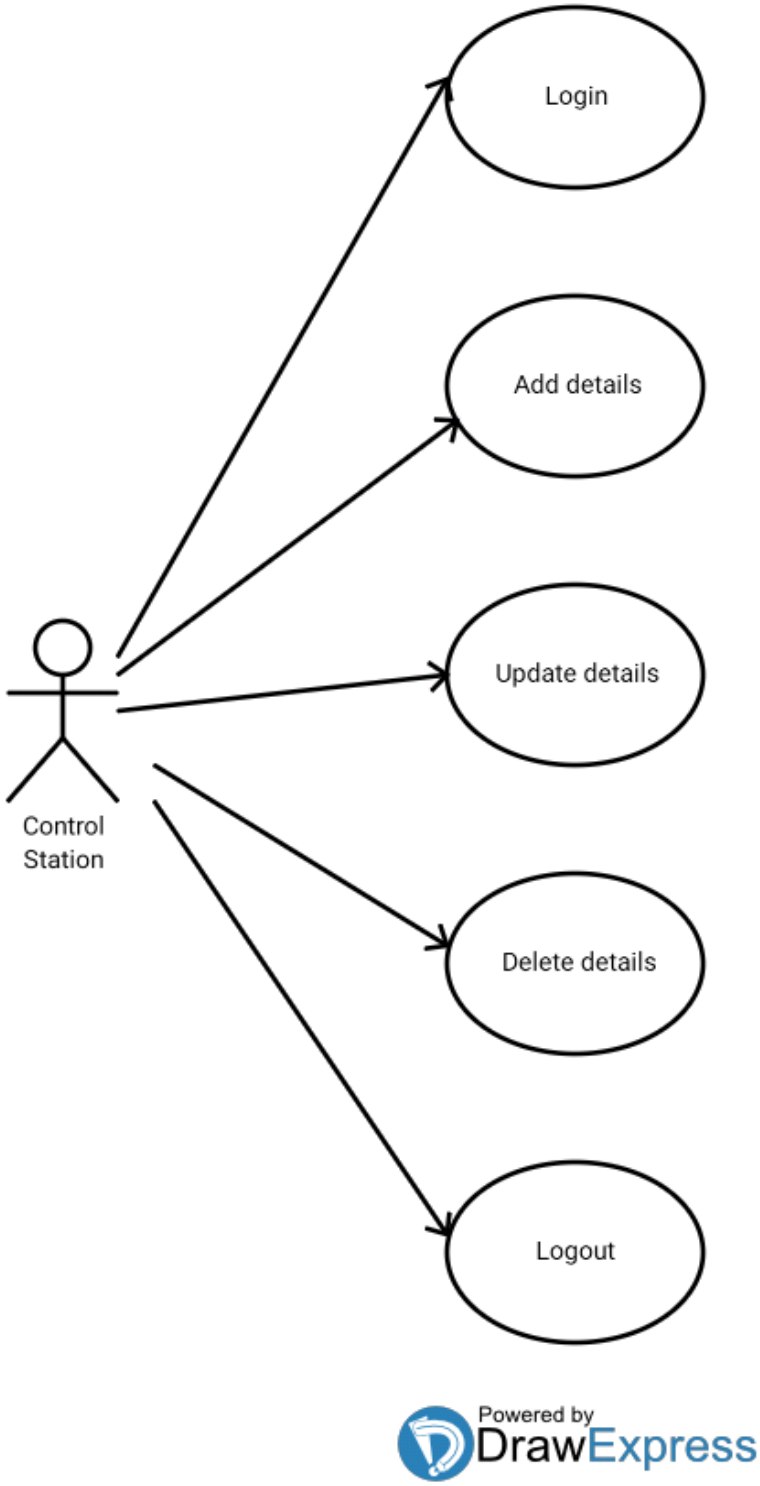


Fig 2.2 Usecase of control station

2.1.2 Sequence diagram:

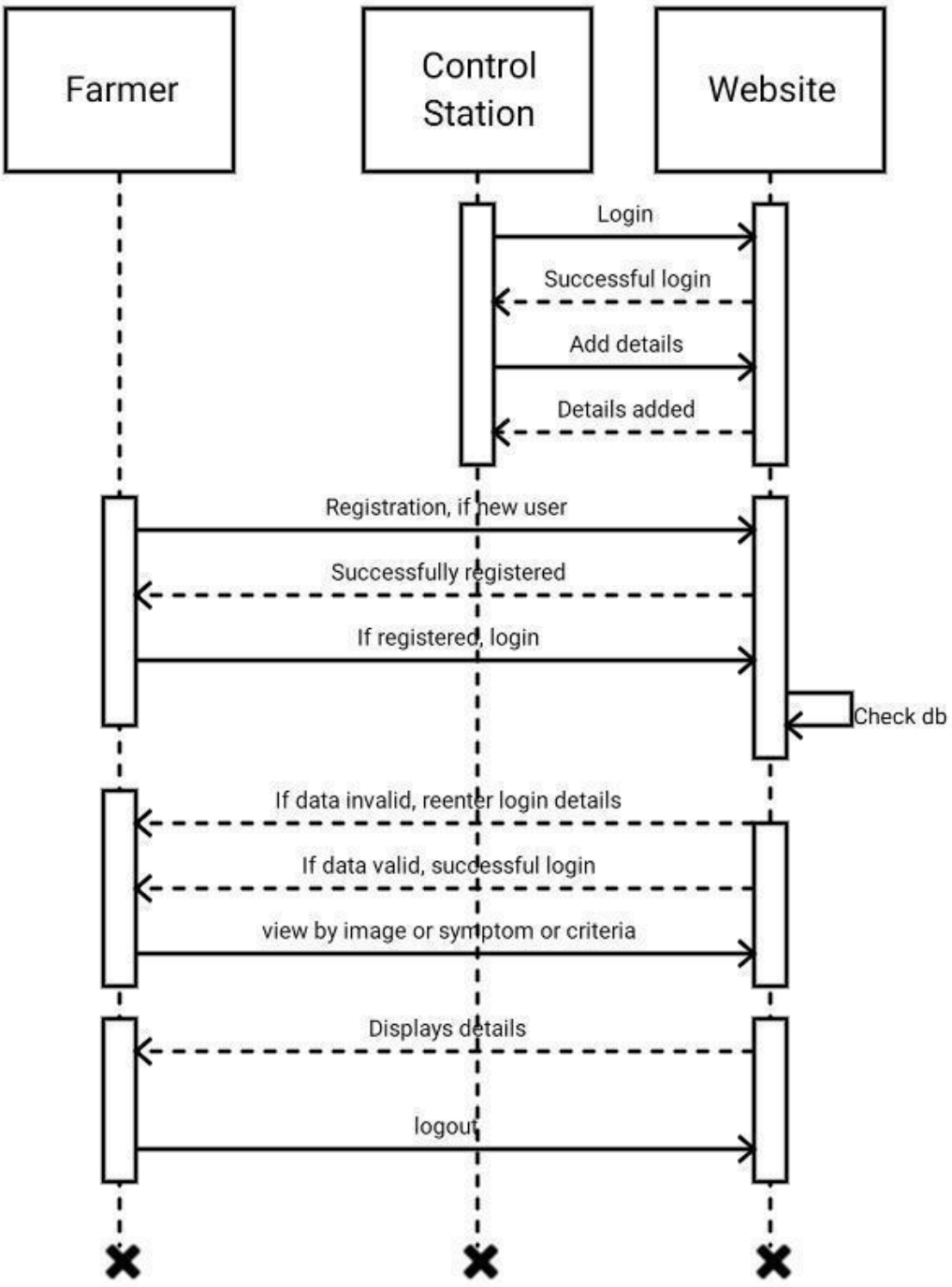


Fig 2.3 Sequence diagram

2.1.3 Activity diagram:

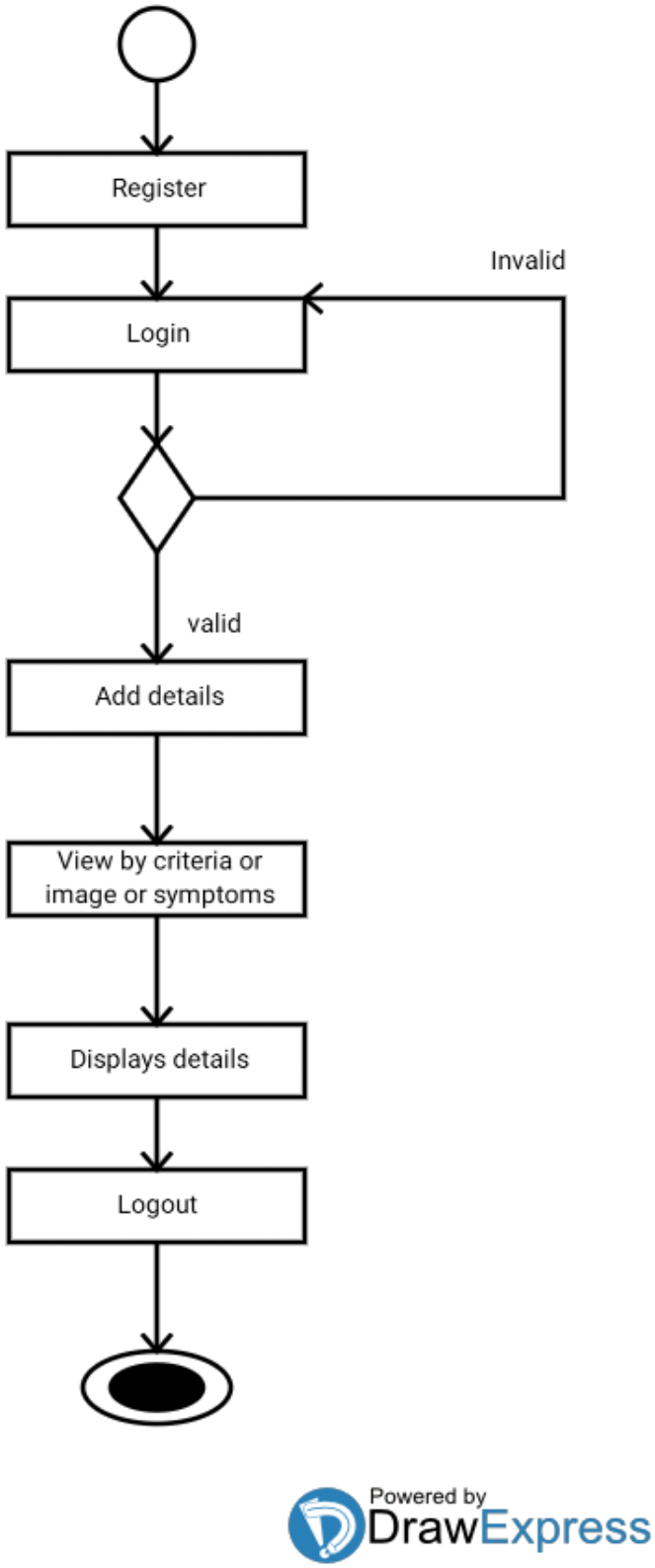


Fig 2.4 Activity Diagram

3. IMPLEMENTATION

3.1 Modules

The System after careful analysis has been identified to be present with the following modules:

- Registration - The farmer has to register himself with his/her phone details.
- Login - The farmer has to login into the website providing his username and password.
- Add details- The admin or control station adds the details like problem description, symptoms and its solution along with the image file related to it.
- Update details- Admin updates details like symptoms or solution or image file
- Delete details -Admin can delete details if they are duplicate or not required.
- View by criteria- Farmers can select either insects or plants or soil criteria to see the solutions or details related to particular criteria.
- View by symptoms- Farmer can give any text for searching the symptoms he has observed in his soil or plant. So the details related to the respective symptom being searched will be displayed.
- View by image- Farmer uploads the image file, where image comparison process takes place, next the website displays details which are approximately matched by the uploaded image file.

3.2 Process

1. Acquiring an image can be through a mobile phone (camera) or from any other sources. Here we are using file upload where a file gets uploaded to a website. Now the website knows what the file is.
2. Now the image file (in db) is compressed (as the image file could be a larger image, so we are compressing it to a smaller image). This is the level of pre-processing where we perform image compression.
3. After compression of image, now we compare the uploaded image with all other images available in the database using histogram approach.
4. After getting the resultant percentage difference, we compare the resultant with the threshold value assigned initially. If resultant value is less than or equal to threshold value then respective details of that image gets displayed on the website.

4. RESULTS

4.1 Application Workflow and Output Analysis:

The "Farmer Assistance system" was successfully implemented and tested, providing accurate identification of plant diseases and offering proper solutions. The process and output are explained in sequential steps with relevant figure references:

1. **Admin Login and Data Entry** *(Fig 4.1 & Fig 4.4)*:
   The administrator logs into the system securely (Fig 4.1) and adds disease-related information including criteria (e.g., Insects), description (e.g., Downy Mildew), symptoms, solution, and a sample image (Fig 4.4). This data populates the backend database for comparison.

2. **Farmer Registration and Access** *(Fig 4.2 & Fig 4.3)*:
   Farmers register using their basic contact information (Fig 4.2) and then log in to access the system features (Fig 4.3).

3. **Viewing Disease Information by Criteria** *(Fig 4.5)*:
   After login, farmers can select a category (e.g., Insects) and search for matching diseases. The system displays the description, symptoms, solution, and an image of the disease (Fig 4.5).

4. **Uploading Image for Visual Diagnosis** *(Fig 4.6)*:
   Farmers can upload a leaf image showing signs of infection using the file upload feature (Fig 4.6).

5. **Image Processing and Comparison** *(Fig 4.8)*:
   The uploaded image undergoes pre-processing such as compression to improve analysis speed (Fig 4.8 shows the compressed version). Then, it is compared with images stored in the database using a histogram-based technique.

6. **Image Difference and Matching** *(Fig 4.9)*:
   The percentage difference between the uploaded image and database images is calculated. Fig 4.9 shows the matrix of difference values used to determine similarity. If the result is within the acceptable threshold, it is considered a match.

7. **Results Display and Actionable Advice** *(Fig 4.7 & Fig 4.11)*:
   If a match is found, the system displays the associated disease details — including symptoms, treatment suggestions, and image reference (Fig 4.7 shows the result; Fig 4.11 confirms matched criteria-based results).

8. **Symptom-Based Search Option** *(Fig 4.10)*:
   As an alternative, farmers can search by typing observed symptoms (e.g., "yellow patches") in the symptom search field. Matching disease records are fetched from the database and shown to the user (Fig 4.10).

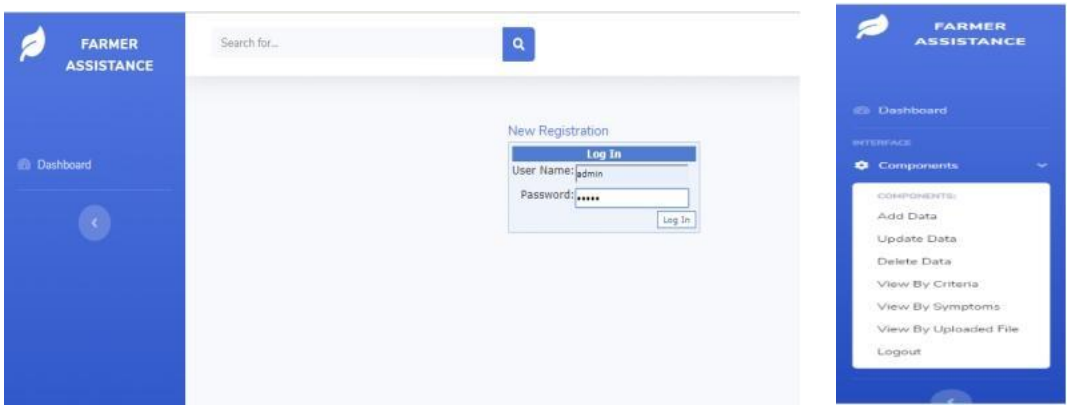


Fig 4.1 Admin login and page

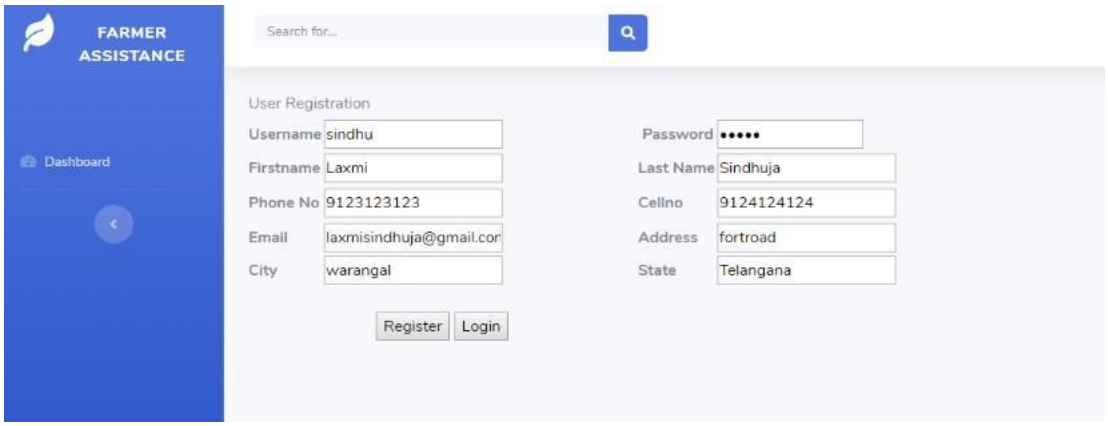


Fig 4.2 Registration page

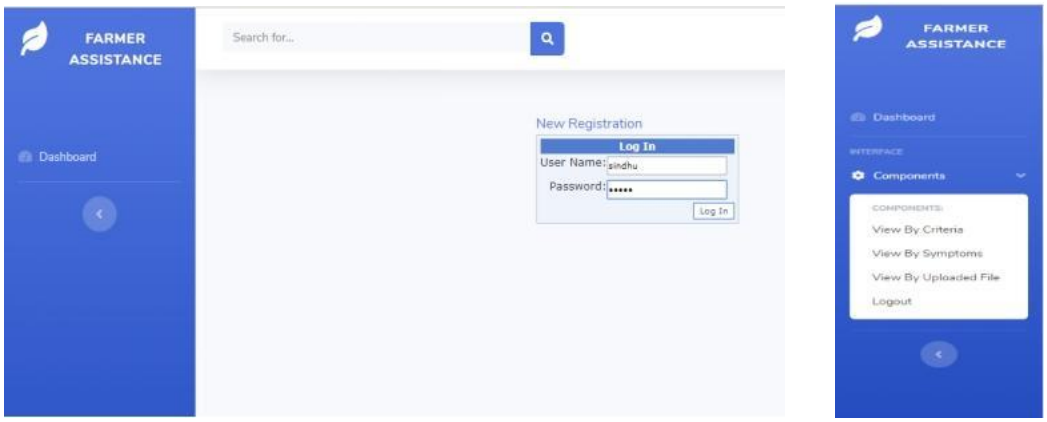


Fig 4.3 Farmer login and page

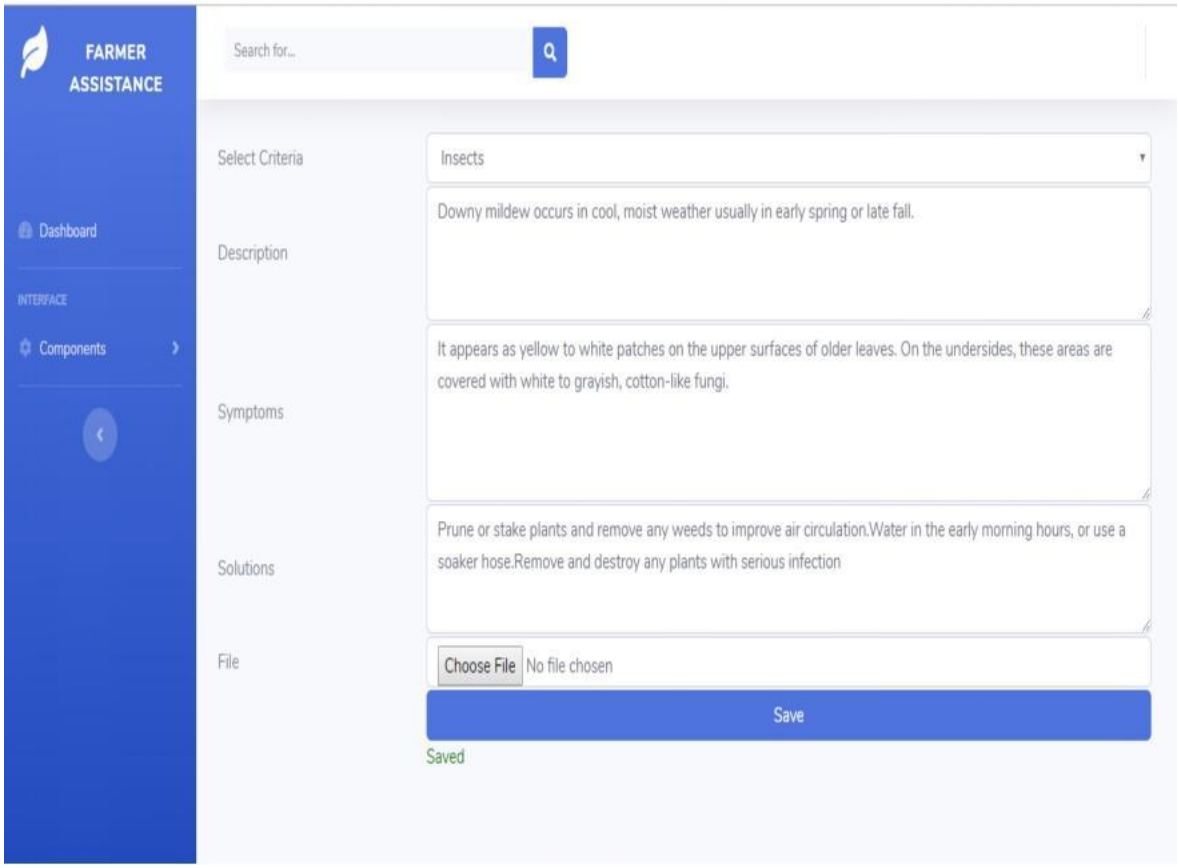


Fig 4.4 Add details page

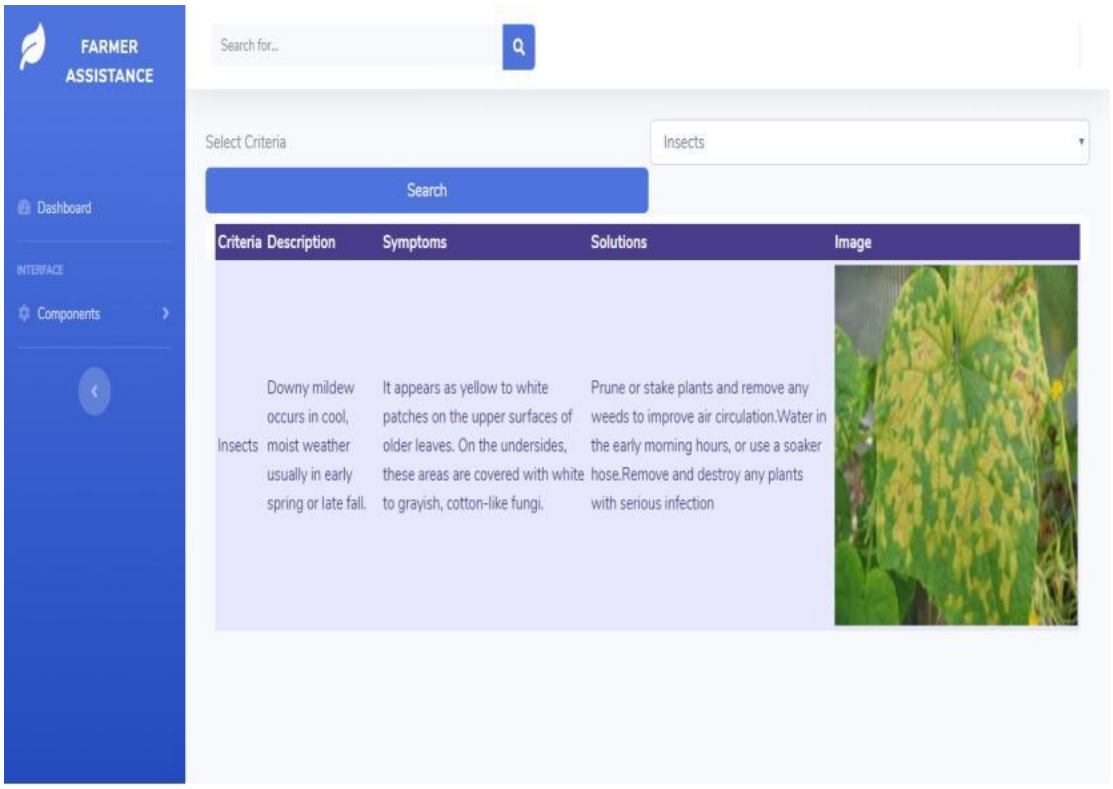


Fig 4.5 View by insects criteria

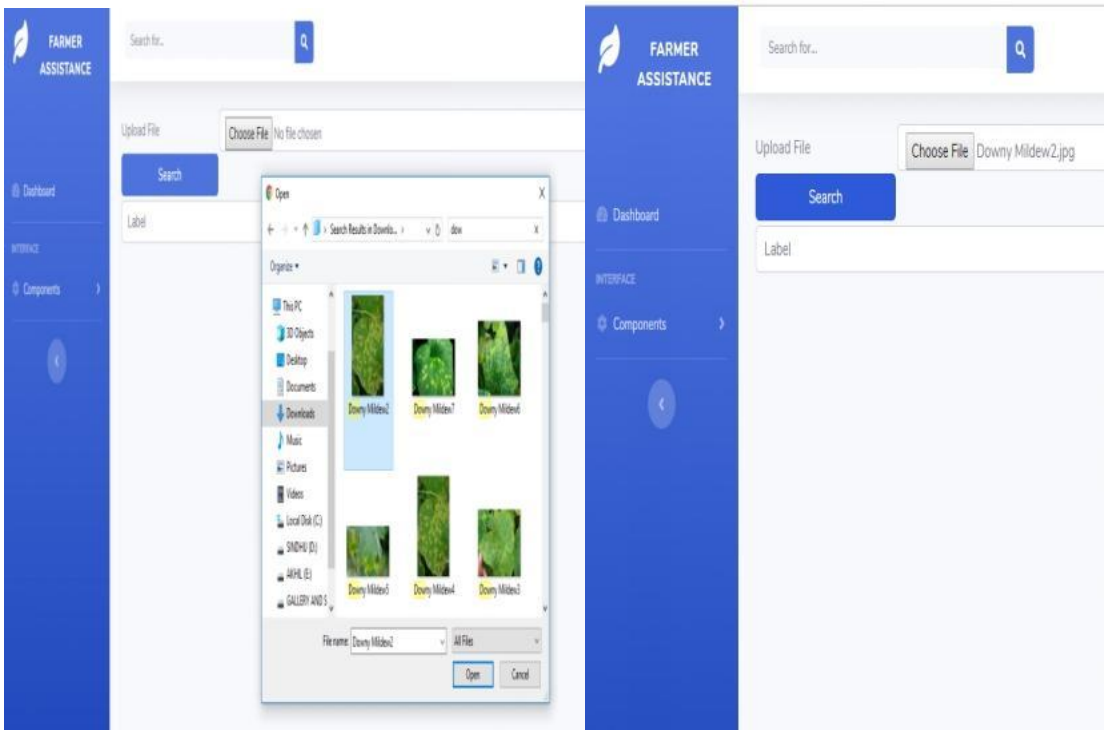


Fig 4.6 Image file upload

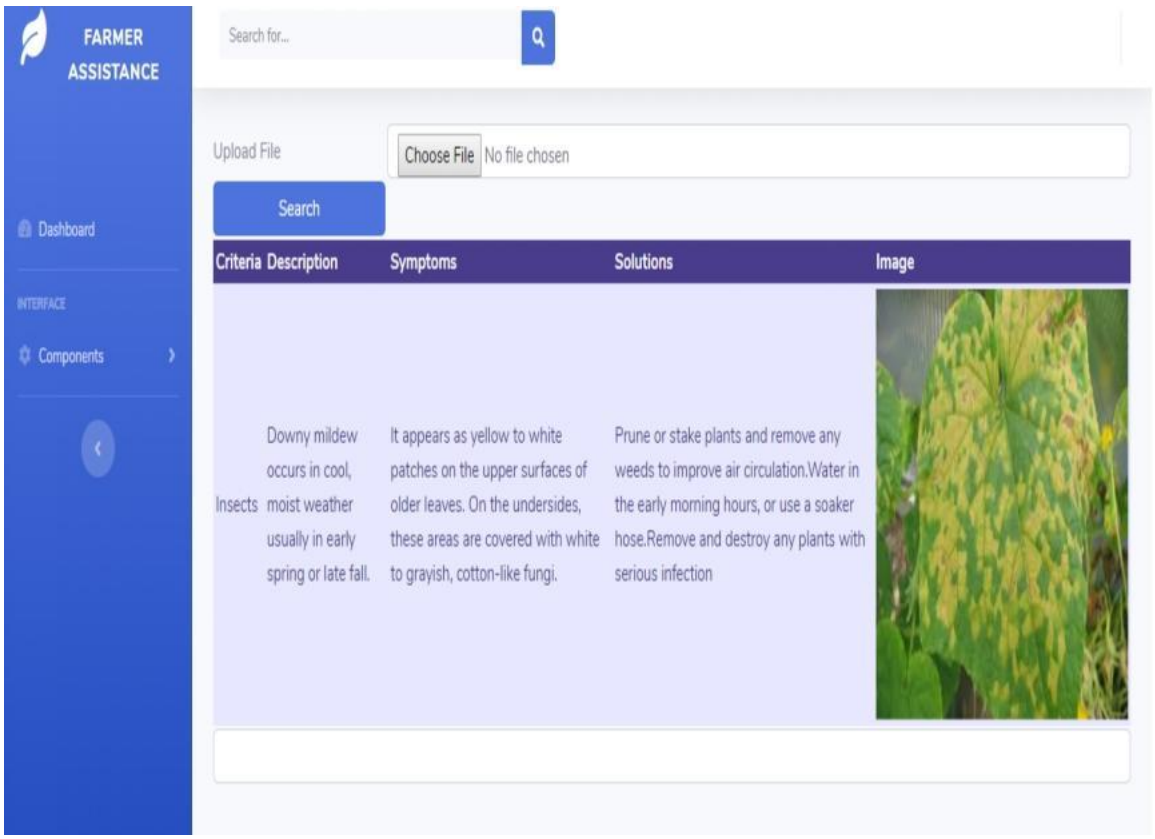


Fig 4.7 View by image page

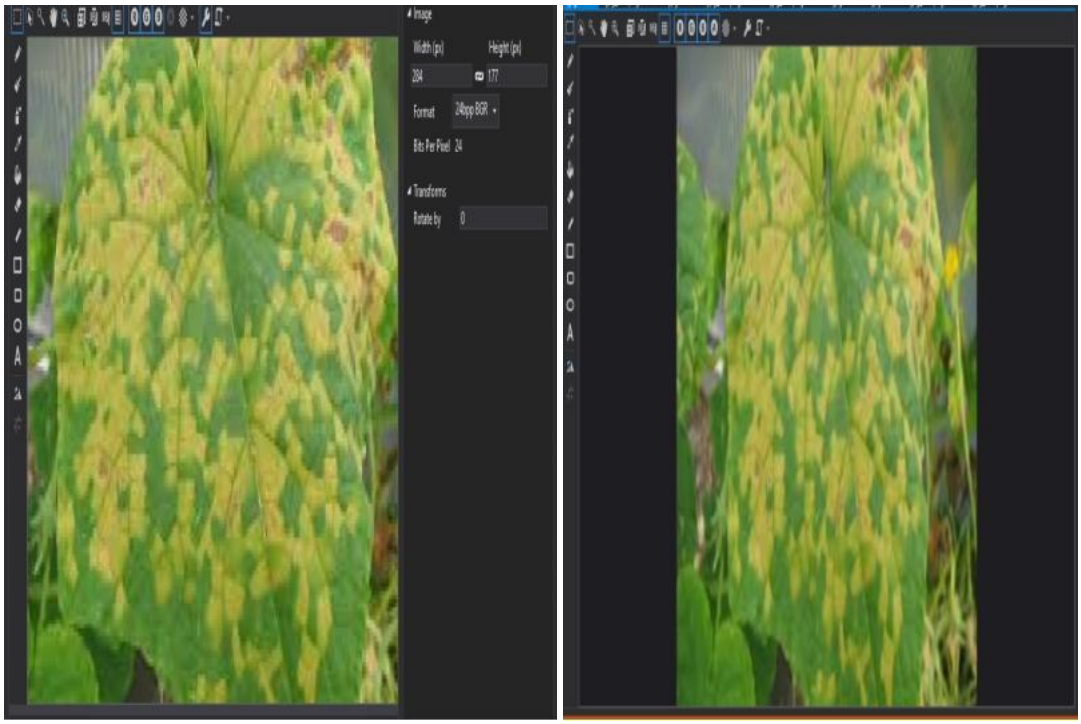


Fig 4.8 Uncompressed image and Compressed image

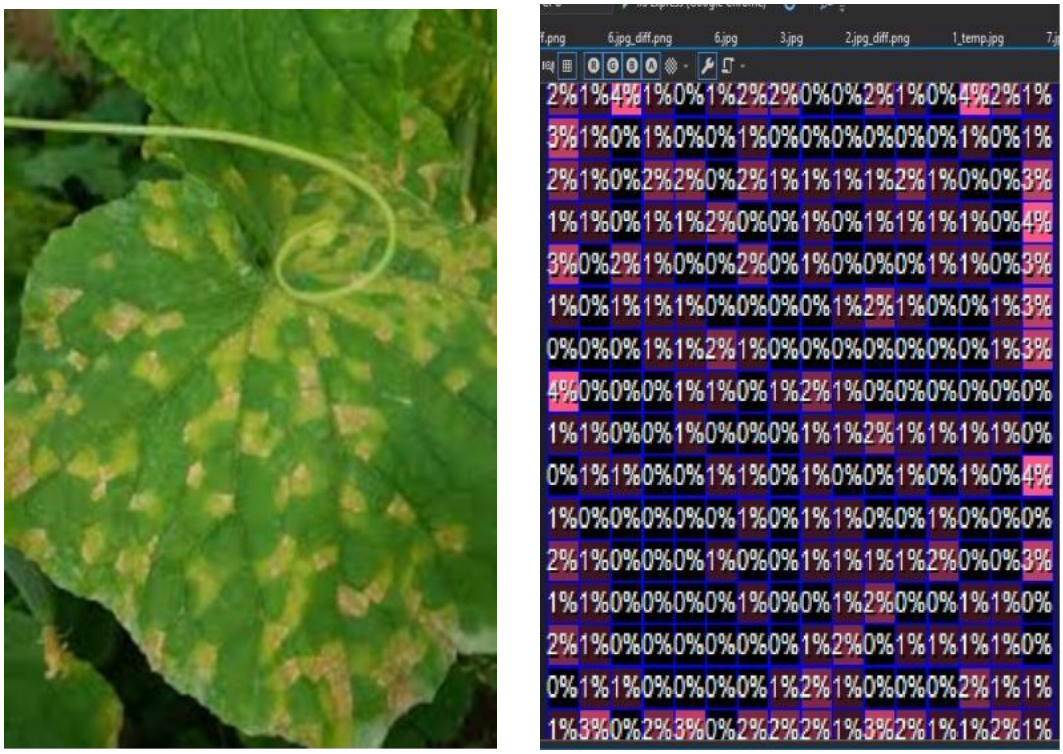


Fig 4.9 Uploaded image and image difference

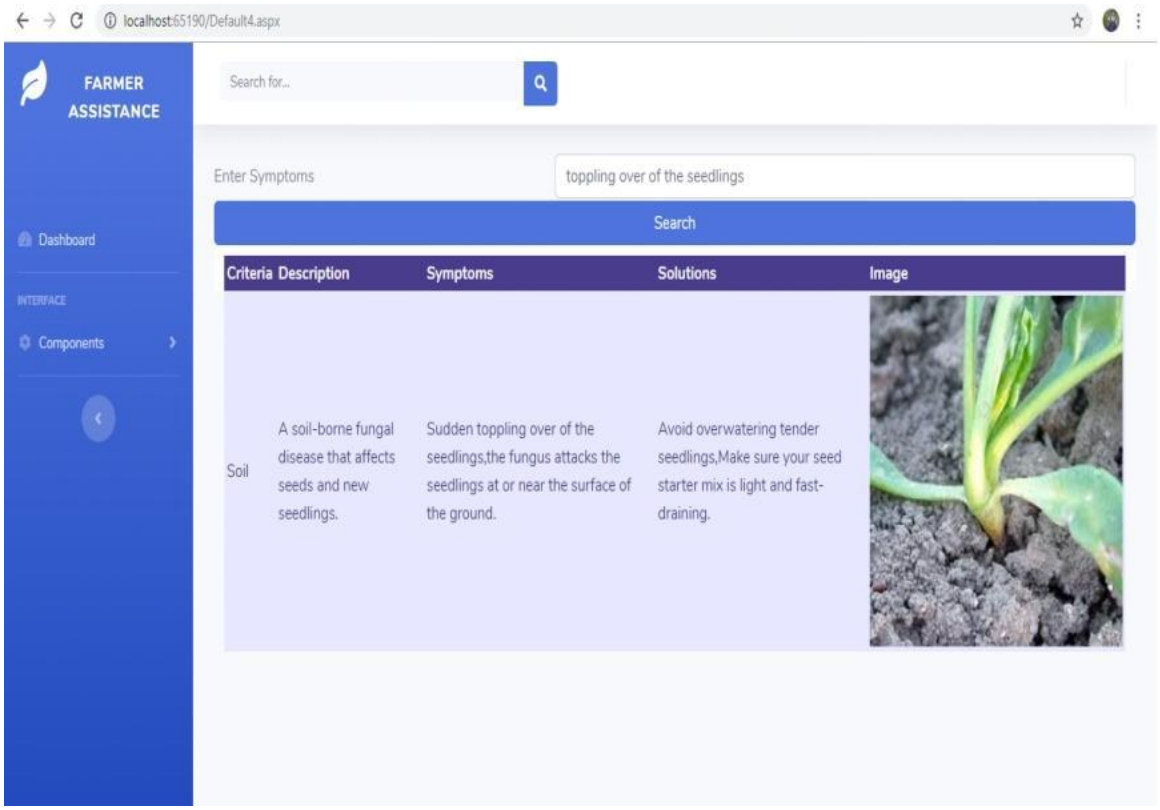


Fig 4.10 View by symptoms page

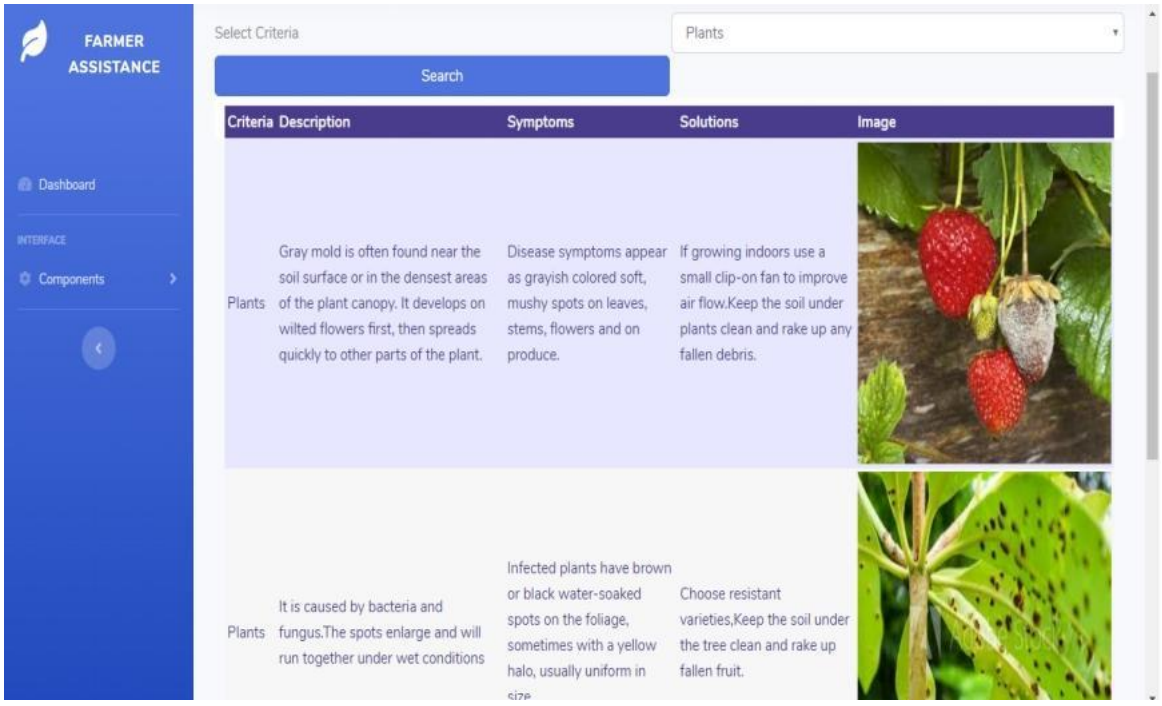
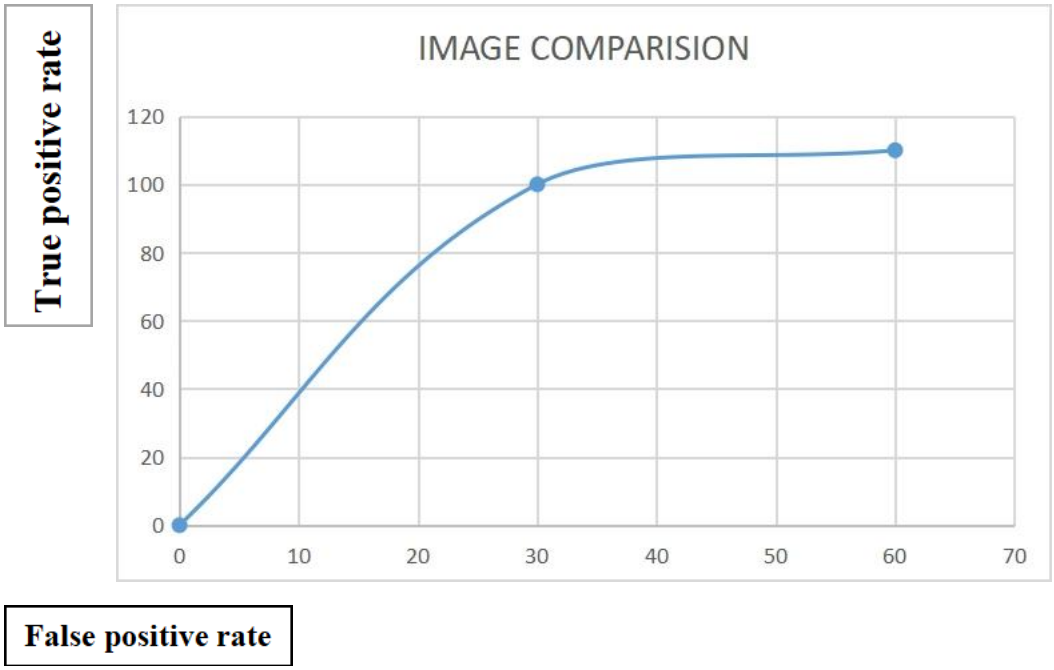


Fig 4.11 View by Criteria page

Performance graph:

These results confirm that the system effectively identifies plant diseases either through direct image upload or manual symptom input, and provides appropriate solutions — enabling smarter and faster farming decisions.



5. CONCLUSION

Indian economy is highly dependent on agricultural productivity. Therefore, in the field of agriculture, detection of disease in plants plays an important role. To detect a plant disease in the very initial stage, use of automatic disease detection technique is beneficial.

As agriculture struggles to support a rapidly growing population, plant disease reduces the yield and quality of food. The losses due to post harvest diseases are disastrous, especially when farms are a long way from markets and supply chain practices and infrastructure are poor. Many pathogens produce toxins that create serious health issues for consumers. Much greater measures are required to address reasons for the gap between potential and actual yields achieved by farmers, and the farmer assistance system is focussed on narrowing this gap. Farmers spend huge amounts on disease management, often without any technical support which results in poor disease control and harmful results. The farmer assistance system can be operative to fight the plant disease effectively. It uses emergent and accurate technique histogram to find the type of disease the plant is suffering from and intimating the farmer through a report on type of disease and its respective pesticide. It is cost effective and does not need the setup of complex machinery, it plays a major role in the agricultural sector.

Proper pesticides can be recommended by this accurate method of image comparison which leads to the decrease in the usage of unwanted pesticides. By maintaining effective communication with farmers, they can be guided and assisted regarding the specific requirements of their fields.