Project Proposal

DocLeafy

By TEAM ALAM(Malaysia)

for Microsoft Imagine Cup

Theme chosen: Earth

-> Solution for Agriculture

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Introduction of Team ALAM

"Alam" means Nature in Bahasa Malaysia, national language of Malaysia.

Team ALAM consists of 4 Universiti Malaysia Pahang's students from diverse backgrounds with a single goal.

Hailing from various parts of Malaysia, Team ALAM strives to contribute in solving environmental' and nature's problem by employing today's world technology.

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Reduction of yield due to plant disease

Plant disease is a threat to the world in an alarming rate. With the increasing demand due to rise of population, yield from farms should not be lower to fulfil the ever-rising demand.

There are times where various diseases struck humanity, causes mass starvation and famine. For instance, the Great Irish Famine, occurred in Ireland in 1845-49, due to a disease called late blight that destroy both leaves and edible roots of potatoes' plant, results in destruction of crop, hence a famine that results in death of millions. (1)

This famine is one of many of other "disaster" brought about by plant diseases. These catastrophically events still happened even though extensive research being carried constantly. The crop diseases cause average yield losses of 42% for the most important food crops yearly. In some cases, crop diseases destroy the whole crop production. (2)

Generally, there are two types of plant diseases, namely Abiotic and Biotic plant Diseases.

How Disease Occurs in Plant?

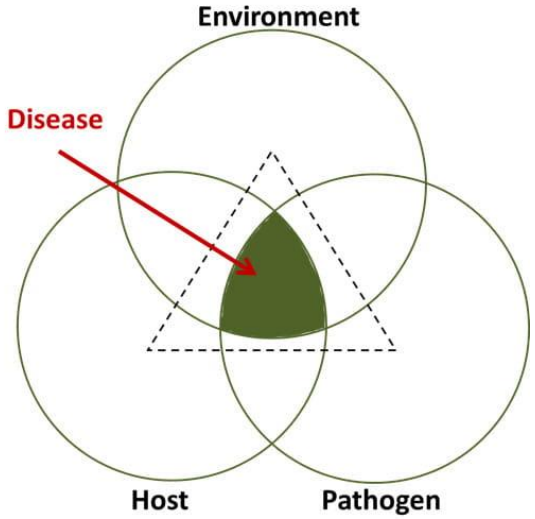


Figure 1

Source: Disease Triangle, Plant Disease, Pathogens and Cycles(Crop Watch) (3)

Before jumping into the solution, we must understand how do diseases occurs. Turns out, when these three components(Figure 1) are present at the same time, a disease (shaded region) will occur if a susceptible host plant is in intimate association with a virulent plant pathogen under favorable environmental conditions. This concept is represented by the shaded portion of the diagram above. When there is a high degree of overlap (as the shaded area becomes larger), there will be a moderate to high amount of disease. (3)

Additionally, from Figure 2, we can also see that, average of 26% of total food loss and wasted happened during the production phase. This includes, but not limited to, plant diseases, pests, external factors.

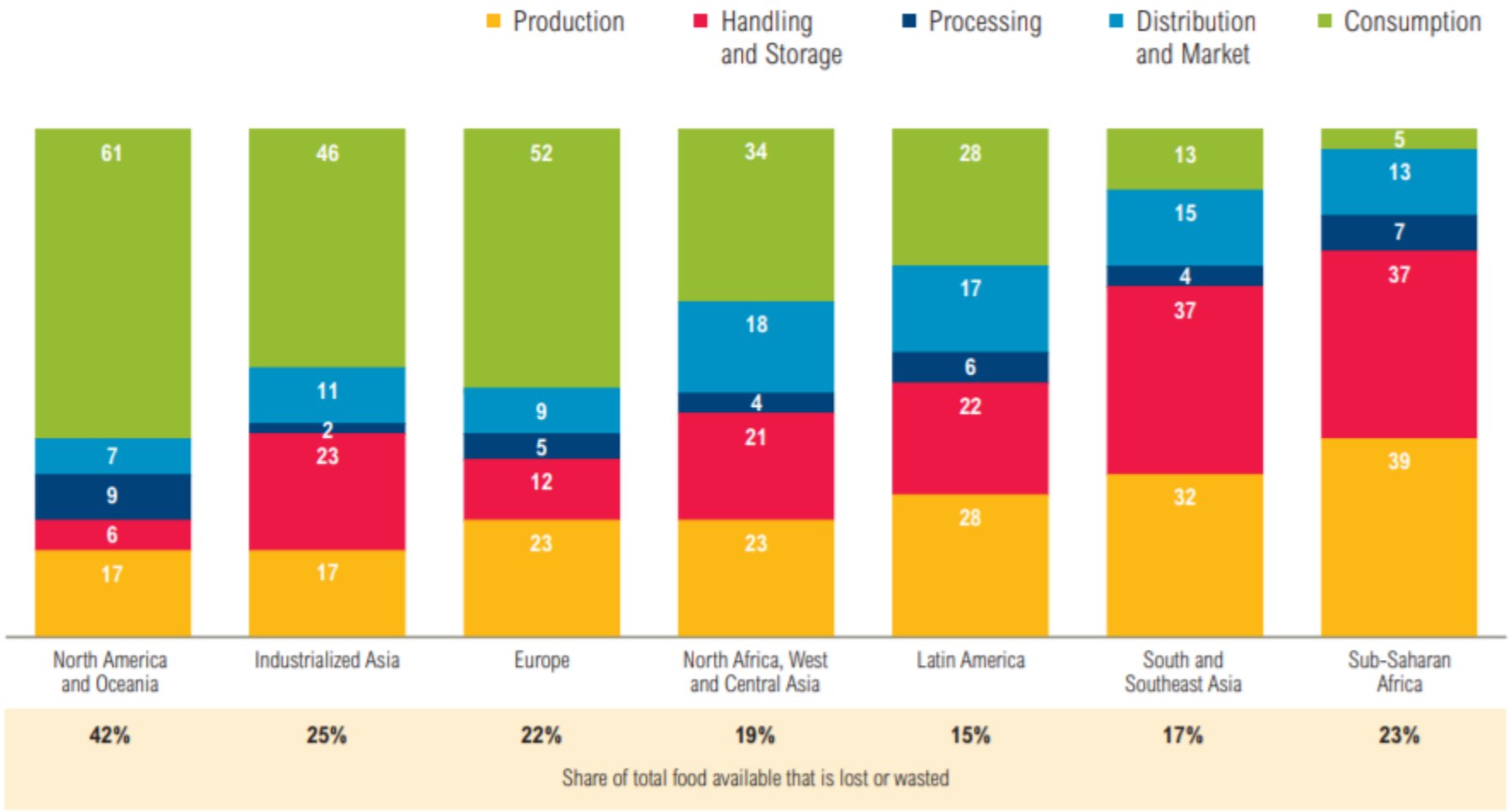


Figure 2

Note: Numbers may not sum to 100 due to rounding.

Source: Installment 2 of "Creating a Sustainable Food Future" Reducing Food Loss and Waste : UNEP: World Resources Institute. [(6)]

Why are these still happening?

Despite extensive research and solution provided by plant pathologists, these plant disease still rampant. This is due to, but not limited to:

- Diseases are extremely hard to control. (5)
- Poor understanding of diseases by farmers, especially poor farmers from underdeveloped & developing countries. (4)
- Farmers lack of technology and access to identify the causes of diseases and solution to it. (4)
- Ineffective of plant disease management by farmers. (4)

The Solution:

DocLeafy

Short intro of DocLeafy

What is DocLeafy?

DocLeafy is a cross-platform mobile application(currently only available for Android devices) Artificial Intelligence driven plant disease predictor by a snap of picture or choosing photo from local device of plant's leaf .

By identifying type of disease, the app will provide information, namely potential name, causes and solutions of the disease

The Purposes

- To curb recurring plant disease in farms and household's gardens.
- Reduce crop wastage, simultaneously increase yield to fulfil the ever-rising demand from the market.

Target Audience

Farmers

Photo by Kamala Saraswathi on Unsplash

Self-Sustain Gardener

Photo by www.zanda. photography on Unsplash

Home garden Hobbyist

Photo by CDC on Unsplash

Potential Collaborators

Food and Agriculture Organization of the United Nation

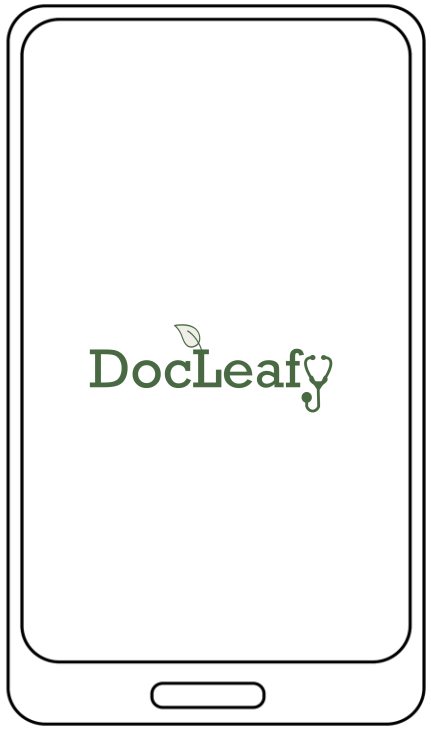
Nation's Department of Agriculture

- Universities that do plant disease research.
- Private plantation firms

DocLeafy in a nutshell

Predicts type of disease infected by the plant just by taking picture or upload from local device of the leaf of plant

Currently only support English.



User can read up other potential diseases

Predicts type of disease infected by the plant

Currently only support 2 types of plant, namely Tomato & Strawberry plant.

Has potential to scale to other types of plants

User can either take picture and make prediction on the spot or upload picture from local device. This is to cater for those who have bad internet connection in the farm.

Solution to the disease will be suggested to the user

Tools & Platform used

Cloud Computing Service:

Microsoft Azure:

Azure Virtual Machines

- Host Deep Learning Model
- Users' Database and Authentication Purposes

Dataset source:

kaggle

Deep Learning Model built with:

NumPy

TensorFlow

Keras

Mobile application framework:

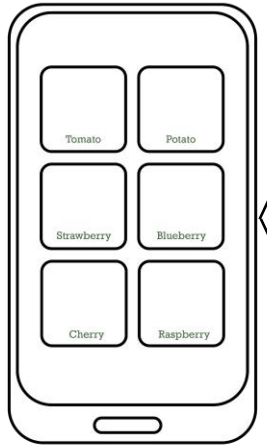
Flutter

Flow of usage of the app

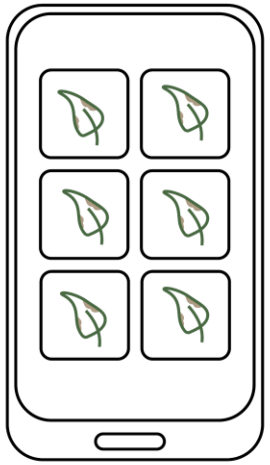
User prompts the app

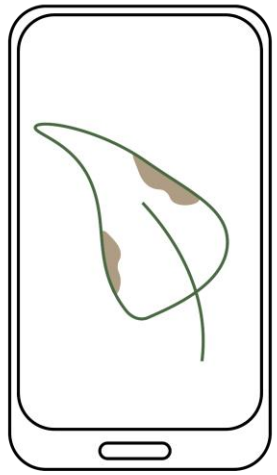
User login

Select type of fruits/vegetables



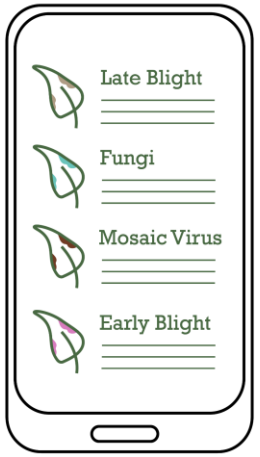
Select from device





Take picture of the leaf

The app predicts the potential disease

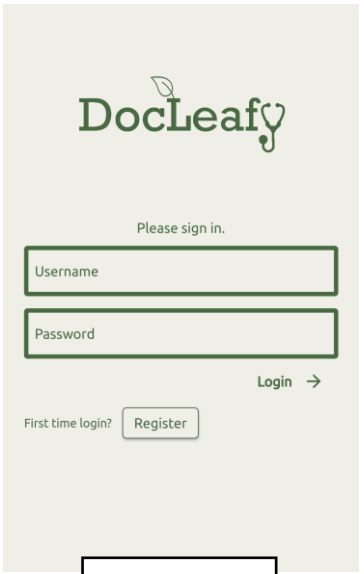


User can read about other potential diseases

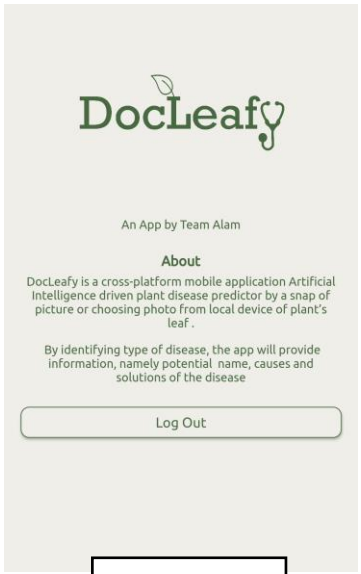
User can read about the disease predicted

Screenshots of the Application

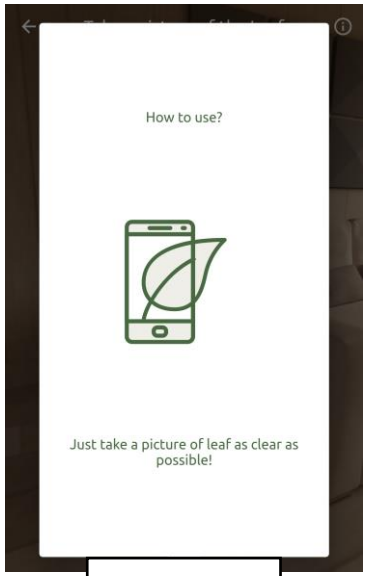
Prompting the app



Login

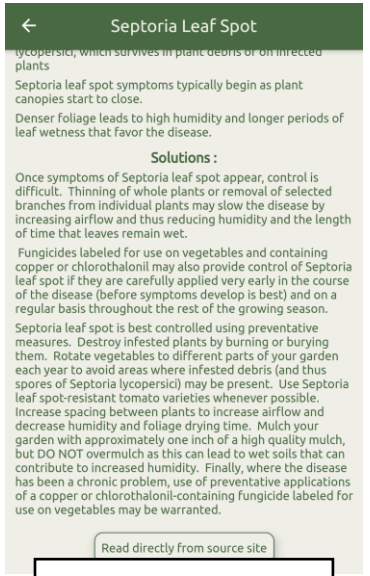


About

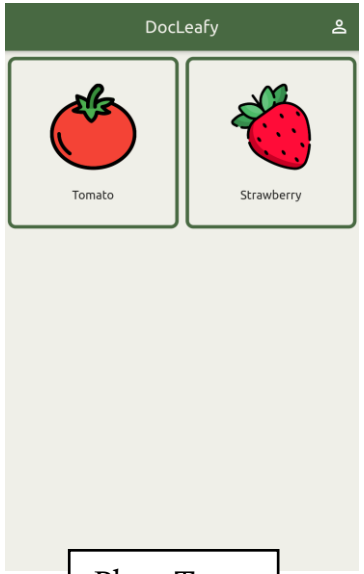


How-to

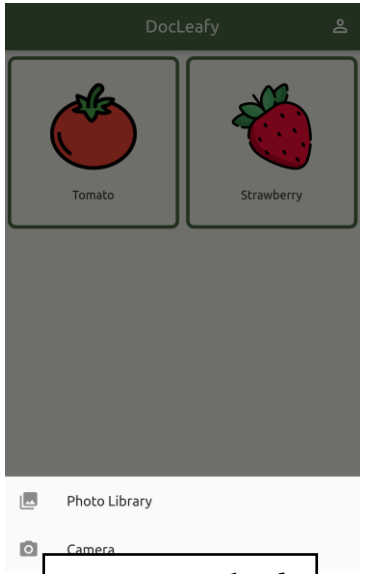
Other Plant Diseases



Plant Disease Info

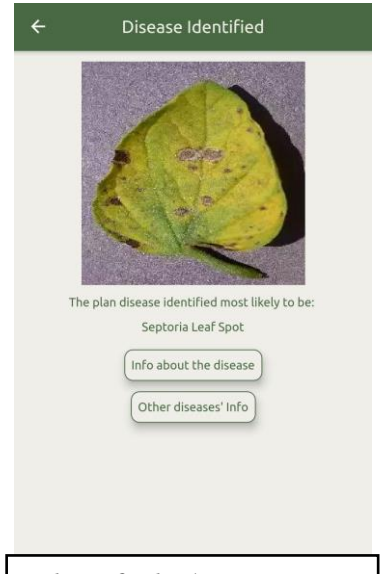


Plant Types



Snap or Upload

Snap



Identified Plant Disease

Plant Disease Info

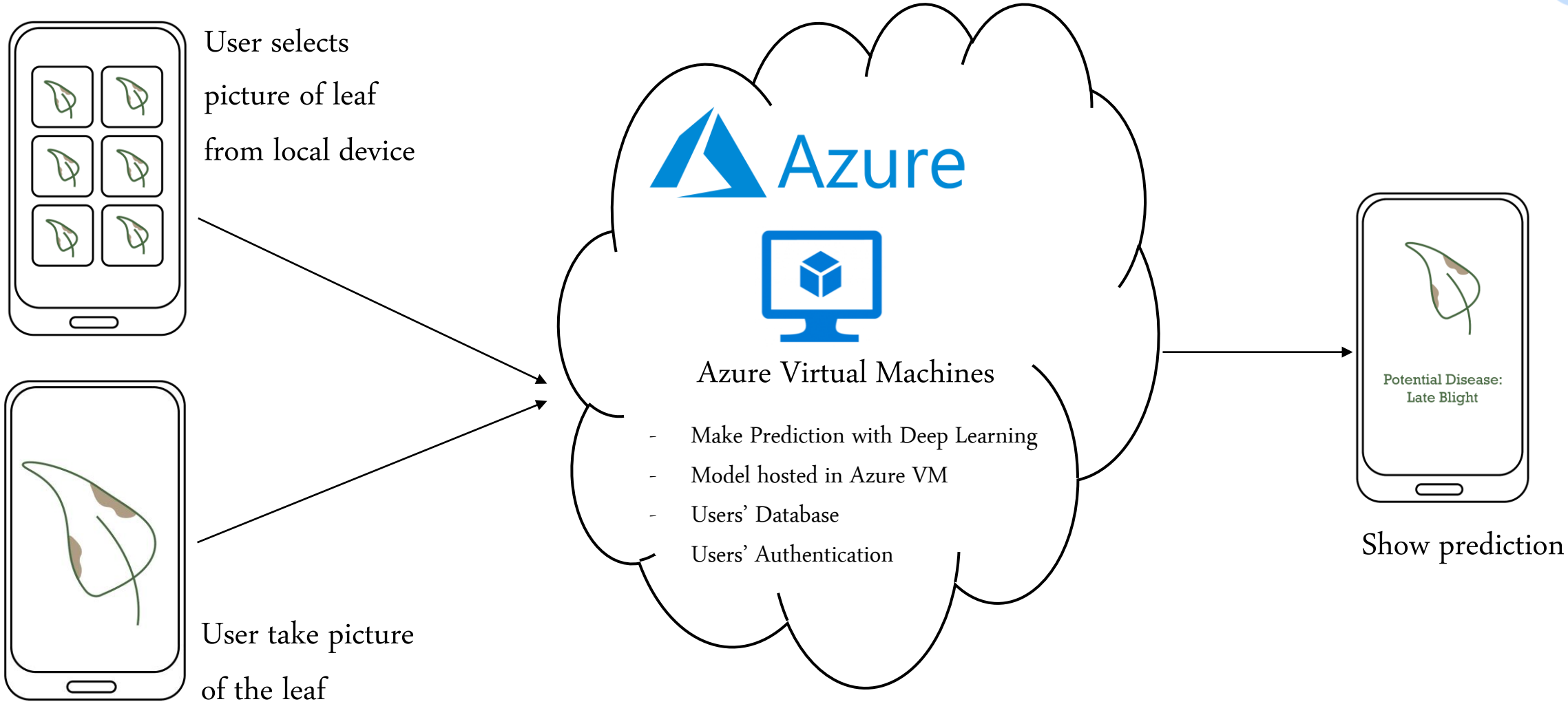
Information provided

- Name of the potential disease
- Sign & Symptom
- Solution to the disease
- Causes of the disease

Information provided is sourced by Team ALAM from various sources and references will be stated in the page

Currently all information provided only in English.

Behind the scene



Picture upload or taken will be uploaded to the cloud for computing and making predictions.

Predicted disease' data will be send back to user's device.

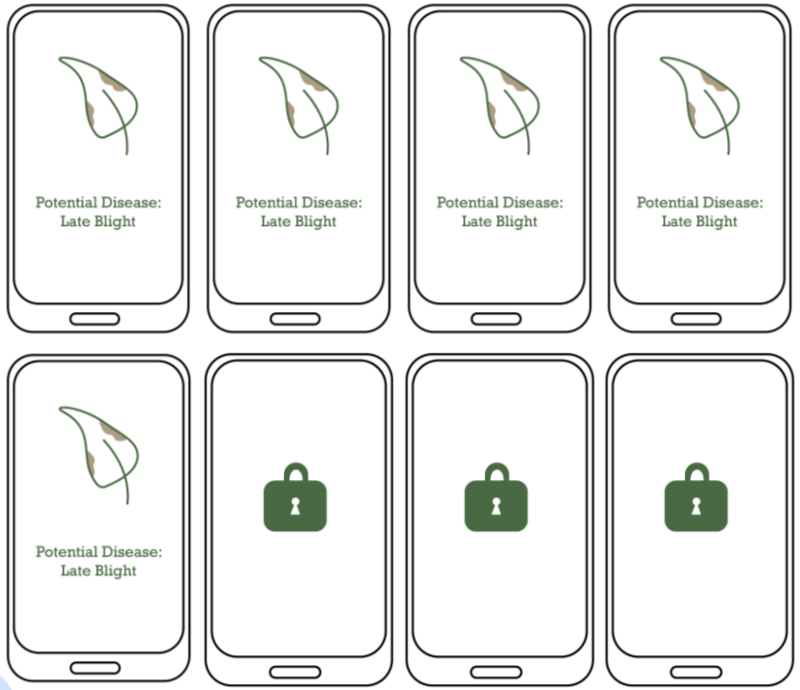
Business Model

As for the business model, we will implement the **Freemium Model**. Users can use it for free for limited predictions, however, for large amount of predictions to be made, Paid Version is needed.

This is to cater for both Home Gardener where Free Version is suitable and as for the Paid Version, it is suitable for farms or Agriculture sectors.

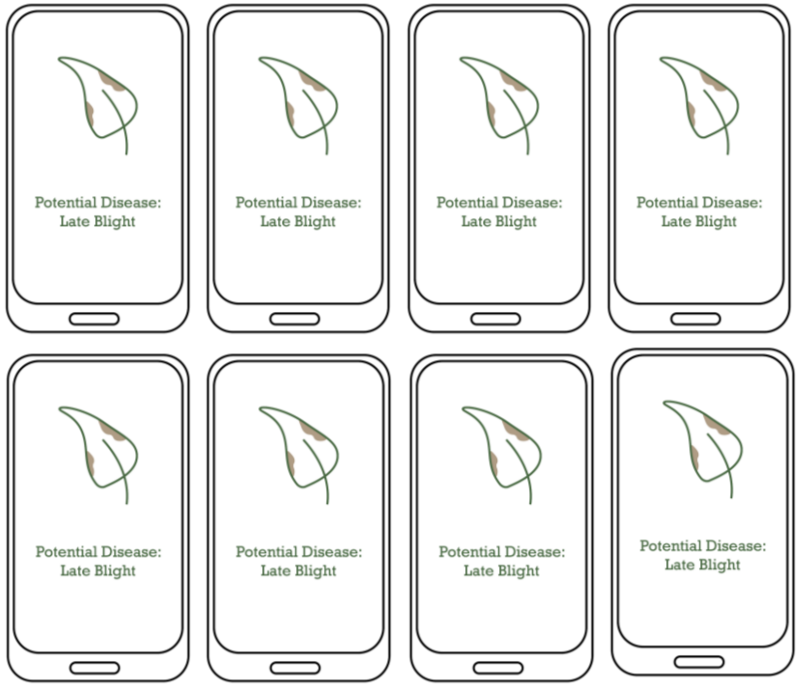
Free Version

Limited Predictions can be made



Paid Version

Unlimited Predictions can be made



Project Milestone

1. Deploying Application to the market & public

2. - Reach out to mentioned Target Audience to provide guide and receive feedbacks.
   - Increase types of Plants supported

3. - Collaborate with mentioned Potential Collaborators to scale in terms of users, types of plants and languages support.
   - Monetization

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Credits:

Graphics used in App:

1. Strawberry designed by Freepik from Flaticon 
2. Tomato designed by Pixel Perfect from FlaticonPixel