



TechFarm Solutions Product Proposal

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Real Time Sensor Monitoring
Irrigation Forecasting
Plant Health Vision



01

Problem Statement

Problem Statement

Small commercial crop farmers in Singapore face 3 key issues in scaling up their business operations. They are:

- Small agricultural workforce and
- Lack of technological implementation that will improve farmer's productivity
- Creating optimum environment for crop growing.



Solution

Designing a greenhouse chamber with IoT sensors. These sensors measure light, water, temperature, and plant health.

Companion application will help farmers to track the 4 criterias, allowing farmers to make informed decisions that will improve crop yield.



Food Safety, Food Supply

Future of farming

Singapore's agriculture sector needs to embrace technologies or innovations that can help to achieve quantum leaps in productivity.

By Agri-Food and Veterinary Authority of Singapore

Published 01 Jan 2017 | Updated 27 Feb 2020

With land and labour constraints, and imminent climate change, the approach to food production needs to transform and be more creative. Farmers need to leverage on technology and innovation. Our future in food security lies in a modern and technologically-savvy farm sector that is fuelled by agricultural professionals, or 'agri-technologists' and 'agri-specialists'.

A person wearing a blue and white checkered shirt is shown from the chest down, gesturing with their right hand towards the camera. They are standing in a field of tall green grass. A semi-transparent green rectangular box is overlaid on the right side of the image, containing the text '02 Company'.

02

Company

Vision

Help farmers to rethink farming using 21st century technology.

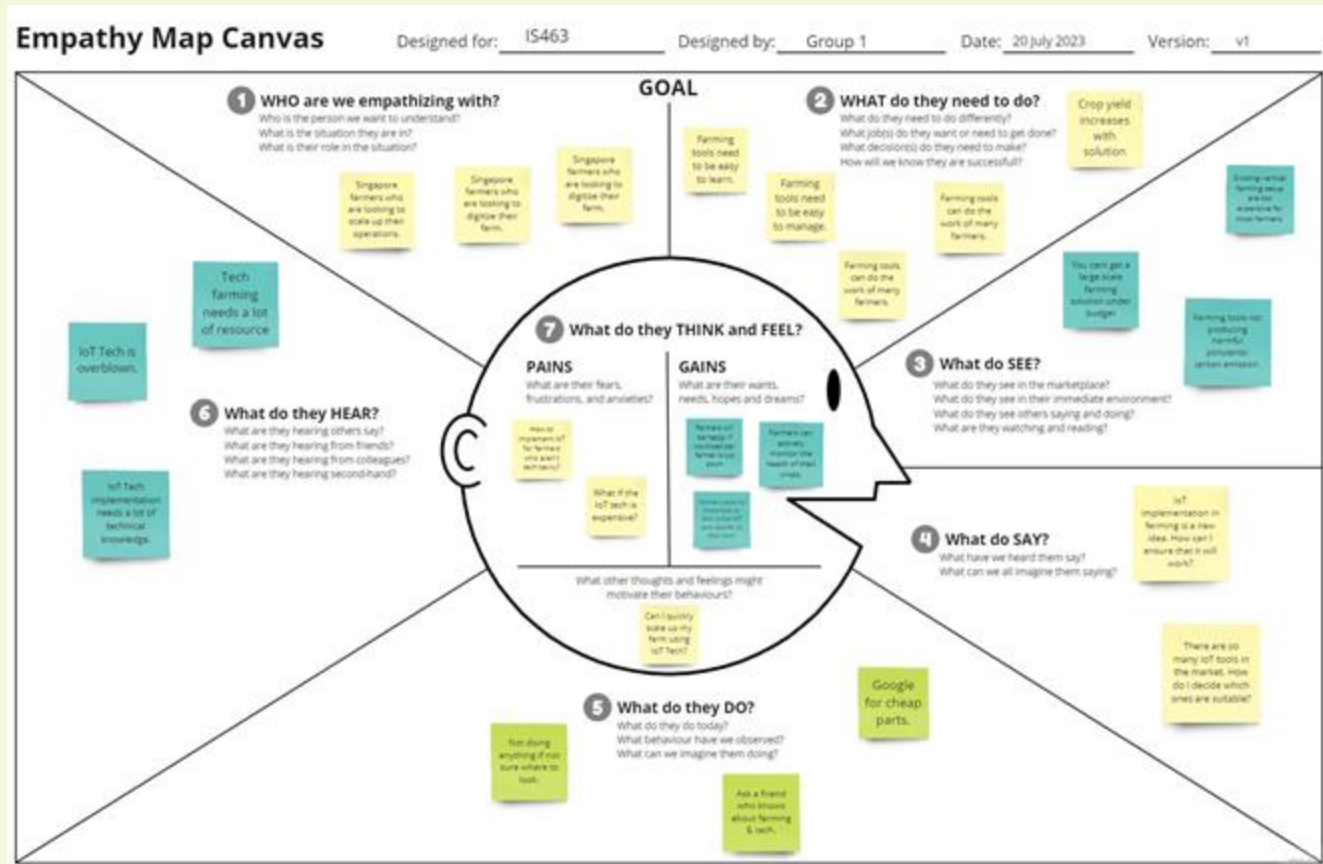


Mission

Develop comprehensive, scalable and cost effective agriculture tech solutions for SME farmers based in Singapore.



Empathy Map Analysis





03 Business Strategy

Porter 5 Forces Analysis

Threat Of New Entrants

Low Threat. Land scarcity and high land cost limits new entrants



Threat Of Substitutes

Low threat. Consumers prefer locally produced crops if its fresh and cheap to produce.



Bargaining Power Of Buyers

Medium Power. Consumers can easily switch suppliers if crop quality expectations are not met.



Intensity Of Rivalry

Low rivalry. High barriers to entry limits competition. Government push for food security via tech innovation will put pressure on farmers to innovate.



Bargaining Power Of Suppliers

Medium Power. Farmers can source/switch farming equipment suppliers relatively easily. International market.



Business Model Canvas

Key Partners

- Outsource IoT hardware to local/international vendors



Key Resources

- IoT agriculture consultants
- Low skilled labor
- IoT hardware
- Greenhouse chamber



Customer Relations

- Salesmen will represent group of farmers
- Specialist work with salesmen to solve tech specific problems



Key Activities

- Sale of IoT equipment
- Implementation advisory service
- Social media to raise awareness on FarmTech service and products



Value Proposition

- Low cost of implementation
- Scalable
- Lower reliance on manpower
- Intuitive mobile application user interface



Customer Segments

- SME commercial farmers in Singapore
- Young tech savvy farmers
- Older farmers willing and able to learn and integrate IoT tech



Business Model Canvas



Channel

- TechFarm Solution Website
- Product Support Customer Service
- Outreach Events for product demonstration



Cost Structure

- IoT hardware procurement (eg ard \$7/unit of soil hydrometer sensor)
- Hardware storage
- Skilled labor cost



Revenue Streams

- After sale support
- Implementation advisory
- Markup of IoT hardware sold

Global Expansion Plans



2023

Deployment of
prototype in Singapore



2025

Expand into Southeast
Asia, Cambodia &
Thailand



A close-up photograph of several small green seedlings with two leaves each, growing in dark brown, textured soil. The seedlings are arranged in a diagonal line from the bottom left towards the top right. The background is softly blurred, showing more of the same scene. A semi-transparent white rectangular box is overlaid on the right side of the image, containing the text.

04

Digital Technology

IoT Sensors, Microservices
and Computer Vision

Application Features

1

Real Time Sensor
Monitoring

2

Irrigation Forecasting

3

Plant Health Vision

Application Features



- Moisture, Light and Temperature Sensing
- Raw Data Collection
- Real Time Monitoring

Real Time Sensor
Monitoring



- Data Analysis on raw data collected
- Forecasts when groups of plant need watering
- Reduces the need for manual label

Irrigation Forecasting



- Computer Vision Plant Detection
- Reduces the need for manual label
- Detect if groups of plant is Healthy, Unhealthy or Dead

Plant Health Vision

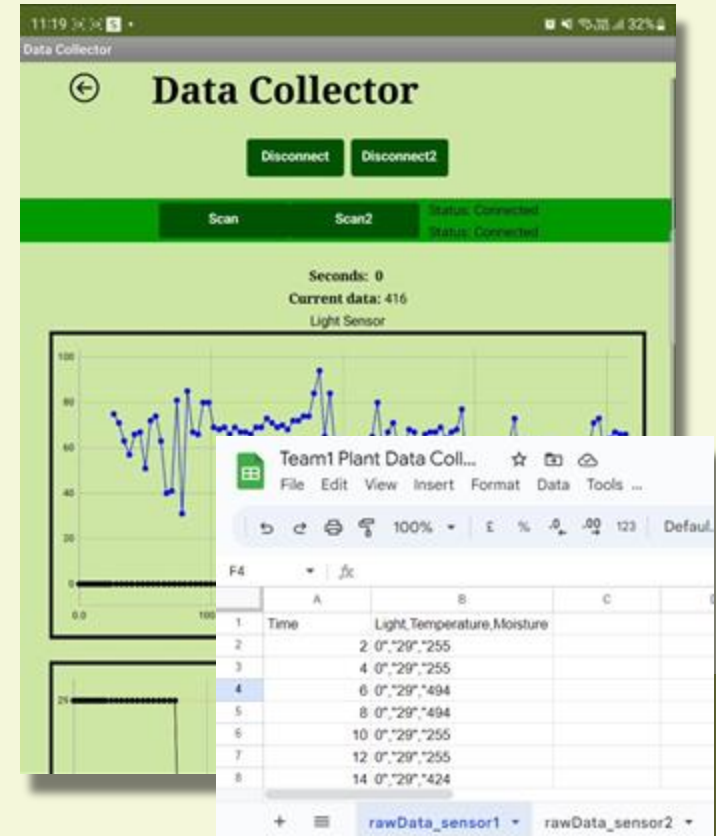
Real Time Sensor Monitoring

Technologies Used

1. **MicroBit (Bluetooth IoT Device)**
 - a. Light Sensor
 - b. Temperature Sensor
 - c. Moisture Sensor
2. **Microsoft Excel (SaaS)**
 - a. Raw Data Storage

Additional Information

1. **Low Cost** Sensors for **easy** and affordable **scaling capabilities**
2. Ability to **monitor and capture multiple plots of plants**
3. **Segregation of raw data** from different plots of plants
 - Cleaner Data
 - Different type of plants have different requirements



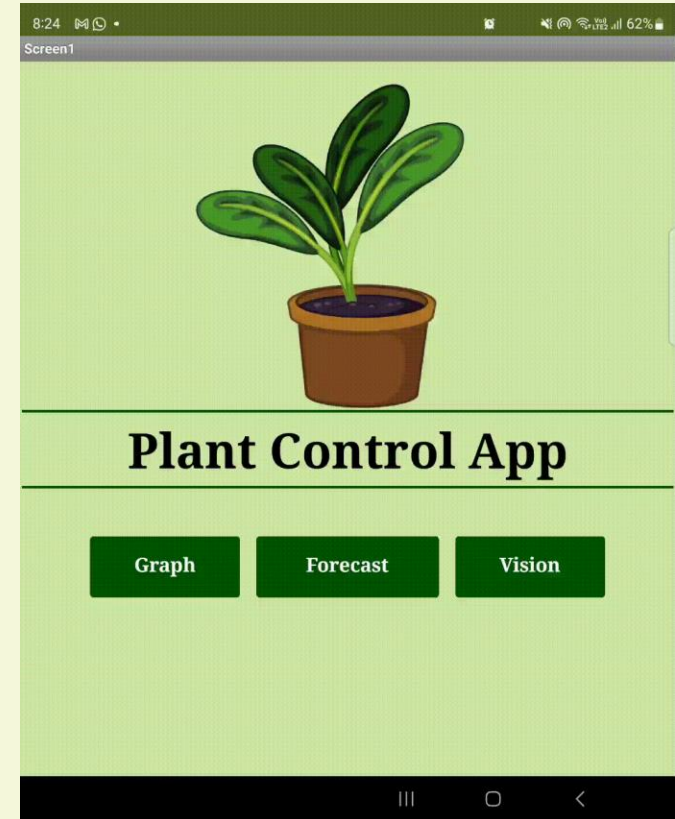
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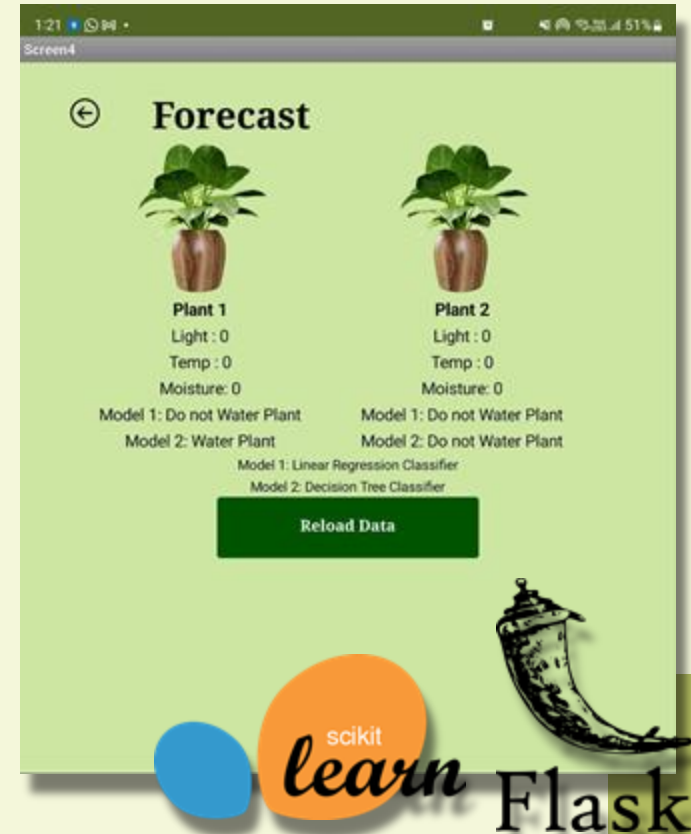
Irrigation Forecasting

Technologies Used

1. **Machine Learning (Forecasting)**
 - a. Linear Regression Classifier
 - b. Decision Tree Classifier
 - Trained with Mock and Processed Data from real time sensors
2. **Cloud-Deployable Microservice (Flask)**
 - a. Central data hub for mobile app and ML/AI models
 - b. Scalable
 - c. Offsite processing reduces mobile device demands

Additional Information

1. Ability to apply **different algo/models for different plant type**
2. Ability to **iteratively improve**
3. **Reduction in water waste**
 - With the ability to prepare for the future



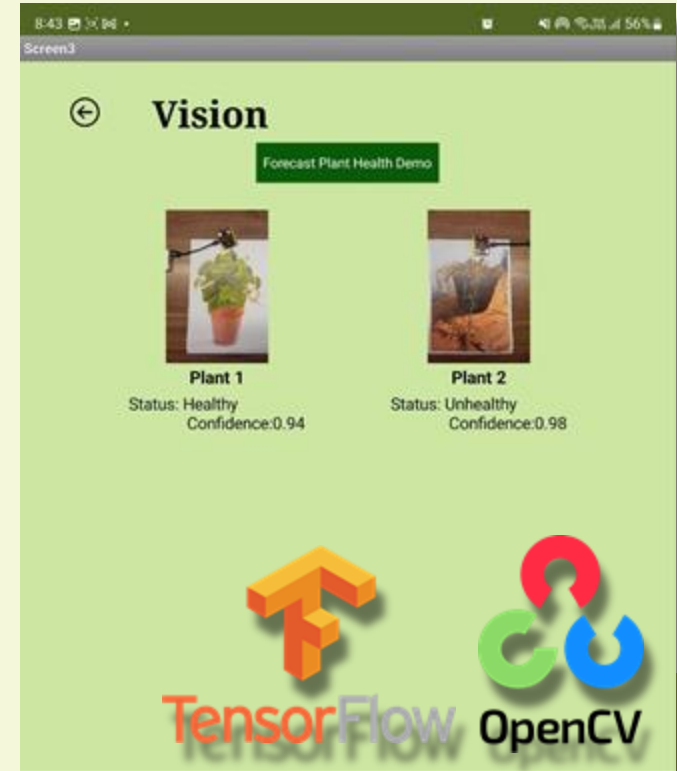
Plant Health Vision

Technologies Used

1. **Computer Vision** - Object Detection
 - a. OpenCV Model
 - i. To detect micro bit from it's LED pattern to identify plants in a image
2. **Computer Vision** - Image Classification
 - a. TensorFlow Model
 - i. To determine plant health by classifying them into 3 groups (Healthy, Unhealth, Dead)
 - ii. Trained with over 100 training data

Additional Information

1. Ability to scale easily as one camera is able to detect, ID and classify healthiness of different plant groups



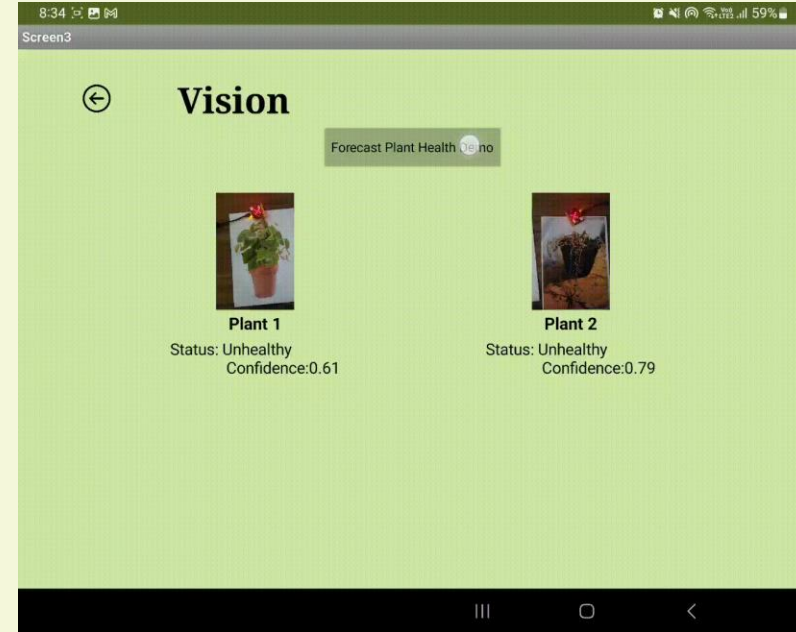
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Technologies Used

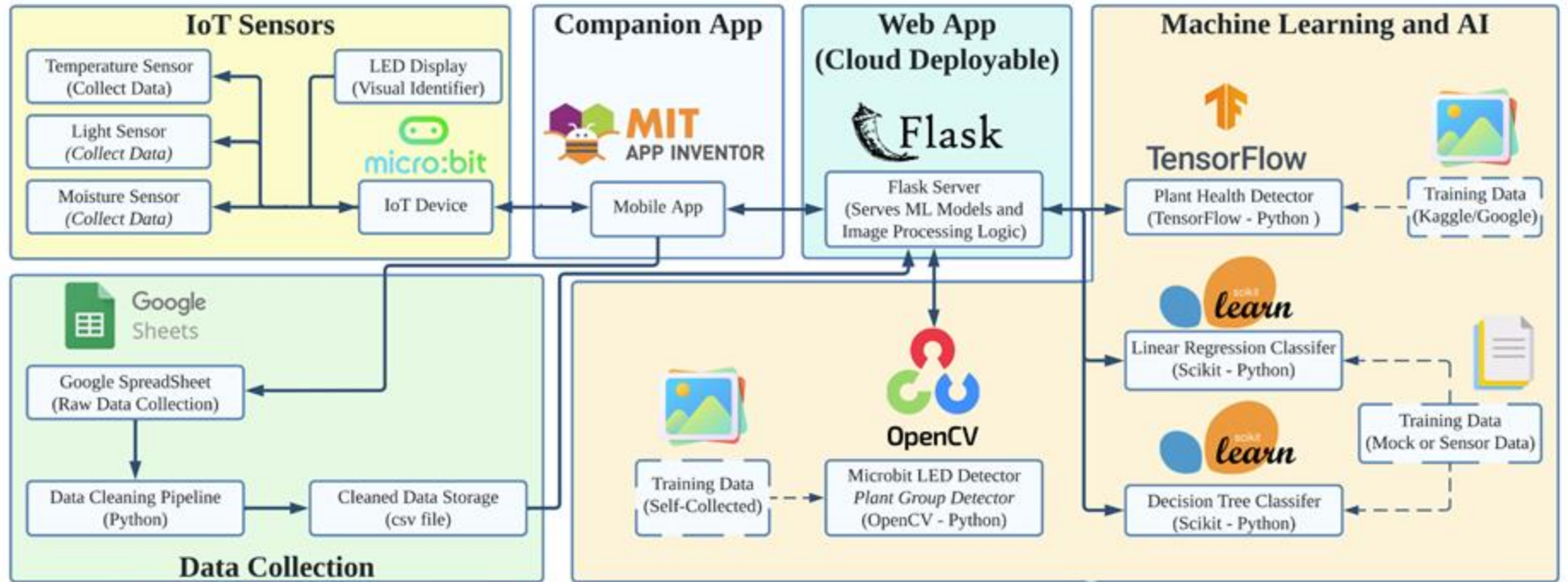
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Technology Stack





05

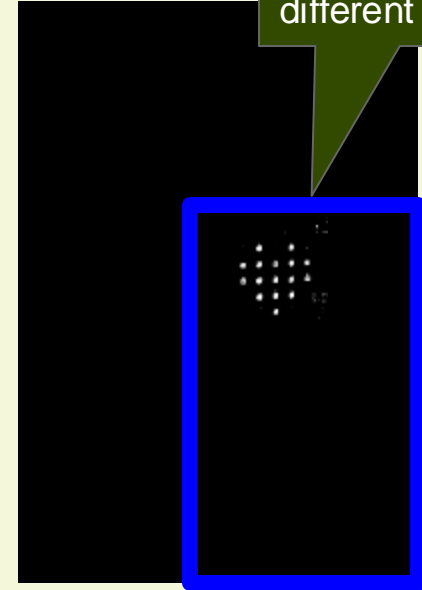
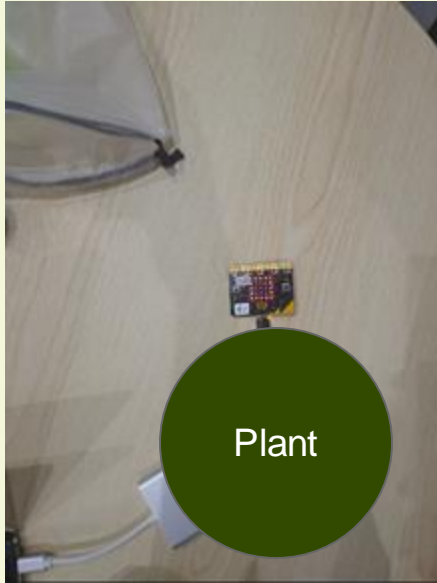
Product Demo

Using IoT sensors and
Machine Learning to help
farmers grow crops.

A collage of green vegetables including artichokes, zucchini, and mushrooms, with a central green overlay containing the text 'Q&A'.

Q&A

Appendix - How to detect plants



Count number of dots to determine different shape

Appendix - How to detect plants





End