



IoT Based Smart Tool to Recommend Crops

A U K Kaushalya
Reg. No.: MS18909838
M.Sc. in Information Technology

Supervisor: Ms. Shashika Lokuliyana

May 2021

**Faculty of Graduate Studies and Research
Sri Lanka Institute of Information Technology**

Declaration

I hereby declare that to the best of my knowledge, this submission is my own work and it neither contains direct material previously published nor written by another person or material, which to a substantial extent, has been accepted for the award of any other academic qualification of a university or other institute of higher learning except where the acknowledgment is made in the text.

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Signature

Date : 22/08/2021

The above candidate has carried out research for the M.Sc. thesis under my supervision.

Name of Supervisor : Ms. Shashika Lokuliyana

Signature :.

Date :

Abstract

Agriculture is always challenging, due to the uncertainty of the weather, soil nutrient levels, land suitability and various other factors. Hence, it is difficult to predict the growth and the yield of crops. The crops should have required level of soil nutrients mainly Nitrogen, Phosphorus and Potassium (NPK), rainfall and the temperature in the area to determine the yield. Some crops will not be grown or not providing the harvest as expected if certain criteria are not matching.

Domestic agriculture is required to support the demand of daily essentials. Domestic agriculture is becoming popular, due to improper distribution of products, rising of commodity prices amidst natural disasters (like flood/ draught), poor supply of imported commodities amidst global crisis & pandemic situations. However, domestic agriculture is restricted by land availability; it needs to utilize the spaces available thus the right crop needs to be identified beforehand. Further, people engage in domestic agriculture are novice or do not have sound background or technical knowledge of agriculture.

Colombo is considered the city with highest population density in Sri Lanka. Most of them live in apartments, condominiums or for rent where suitable lands are scarce yet the demand for daily essential commodities is high.

Hence, small scale domestic agriculture in Colombo demands a way to identify the suitability of crop to plant in order to achieve a successful plant growth and a better yield to satisfy the daily needs of the family by utilizing the spaces available.

The thesis elaborates the idea of encouraging domestic agriculture for people living in Colombo, Sri Lanka by developing an IoT based smart tool to recommend some suitable vegetables to grow based on soil NPK level, PH level, moisture level, temperature and the average rainfall in the area where the soil sample is taken. . A trained data set and a machine learning algorithm would be used create a model to predict a suitable crop to cultivate for the given input data.

This smart tool will be convenient to interact on the interface provided, not required a prior knowledge on agriculture. Recommended crop can be view on a mobile application by simply putting a soil sample to a container which is attached with a PH sensor, NPK sensor, temperature, humidity sensor and a GPS unit.

Real time data captured by the aforementioned sensors are sent to a microcontroller for processing. Machine Learning algorithm will be applied on those processed data along with trained data model analyze and recommend a suitable crop to grow which can be viewed the web user interface. A cloud platform will also be in use in order to store and send the output as a message on user's mobile application.

Keywords : *IoT (Internet of Things), Machine Learning algorithms, Crop Recommendation, Sensor data, Cloud platform, Mobile Application, Domestic Agriculture*

Acknowledgement

First, I would like to express my gratitude to my supervisor Ms. Shashika Lokuliyana for the support and valuable feedback given to me.

Next, I appreciate the inspiring comments and guidance given by Mr. Samantha Rajapaksha, the Co-coordinator of the M.Sc (IT) program. I'm always thankful for his advices.

In addition to that my heartiest gratitude is paid for my family members for endless support given, and for tolerating all the burdens made for them.

I value the support given by all my colleagues too.

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Abbreviations

- GDP – Gross Domestic Product
- NPK – Nitrogen, Prosperous, Potassium
- GPS – Global Positioning System
- MQTT - Message Queuing Telemetry Transport
- DNN – Deep Neural Network
- CBSL – Central Bank of Sri Lanka
- SVM - Support Vector Machine
- ANN – Artificial Neural Network
- DNN – Deep Neural Network