**Project Proposal**

**Project Name: Smart Farm Monitor**

**Participants**

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**Background**

Agriculture is the main economic activity for many people in sub-Saharan Africa. Many of these countries are still developing countries thus farmers still practice traditional farming methods. Crop yield is hindered by conditions such as drought, pests, diseases and lack of resources to shift to modern methods of farming. The good news is some farmers have moved to greenhouses for better crop yield but there still some challenges since running of farms and greenhouses is labor intensive. The 21st century has brought about rapid development in technology and we want to apply technology into the farms and greenhouses of local farmers

**Objectives**

Our main objective is to help out farmers to achieve greater crop yield by use of a cheap device that will do the following tasks:

* Automation of simple farm practices such as watering of plants and application of pesticides, fungicides and other farm chemicals
* Use of proximity sensors to monitor crop growth and detect growth of weeds
* Detecting plant diseases.

We also want to encourage farmers by making farming more fun and simpler. Since technology has been embraced in many of fields of our life, it is time for the local farmers to apply it in their farms and greenhouses.

If this project is successful, we would advice farmers to use this device in greenhouses since they provide a controlled environment where plant monitoring is much more convenient.

**Methodology**

The components required for this project include:

* A central microcontroller, Lora module.
* Proximity sensors
* Soil moisture sensors
* A near infrared spectral sensor: AS726X
* Sprayer nozzles
* Hosepipes and pumps
* Storage containers for water and farm chemicals
* Electronic valves and pumps
* Mobile app
* Internet connection
* Electrical wires

The project is divided into the following functional parts:

* **The Transducers part:** comprising of the various sensors that will be used to monitor the farm. These sensors include the proximity sensors, soil moisture sensors and light sensors.

The proximity sensors will be used to monitor plant growth and for detecting weeds. They can be programmed to indicate the position of the planted crops and to detect anything else that is growing except for the crops. The microcontroller will send data to the farmer to notify if weeding is needed or pruning is required.

Soil moisture sensors will be used to check for water levels in the soil. The microcontroller will interpret the signals from these sensors and if needed, initiate the sprayer nozzles automatically.

* **Disease detection system:** This system comprises of the infrared spectrometer that will scan the crop for any diseases. For this prototype, were using one spectral sensor, AS726X. The farmer will place samples of the plant to be analysed and the spectrometer will do the rest. Data from the spectral sensor will be analyzed by the microcontroller and the results will be sent to the farmer through the mobile app. The spectral characteristics of the diseases to be flagged by the system will have to be programmed into the microcontroller.

The number of sensors required will depend on the size of the farm or greenhouse.

* **The Control Unit:** Comprises of the microcontroller and the mobile application. The microcontroller will interpret the signals from all the sensors, initiate sprayer nozzles for spraying pesticides or any other farm chemicals and initiate the irrigation unit. The signals from the sensors will be compared to preset values that will be programmed into the microcontroller. This way the microcontroller will know when to automatically notify the farmers for any concerns and automatically initiate the irrigation unit.

The microcontroller communicates with the farmer through a mobile app that will be used by the farmer to remotely monitor the farm. The farmer can use the app to program information such as the minimum soil moisture, maximum soil moisture, spacing between the plants and duration of spraying farm chemicals and irrigation. The app will also allow the farmer to remotely activate the irrigation unit and the sprayer nozzles without the influence of the sensors.

The Microcontroller will also be in charge of analyzing data from the spectral sensors and sending results to the farmer.

* **The irrigation and farm chemicals dispenser unit:** This comprises of the sprayer nozzles, drip pipes, hosepipes and storage tanks. This system will have two separate tanks, one for water and another for the farm chemical such as pesticide, fungicide or insecticide. Water from the tank will be delivered to the drip pipes and the chemicals from the chemical tanks will be delivered to the sprayers. Flow of liquids from the tanks to their respective delivery systems is controlled by electronic water valves and pumps that are controlled from signals from the microcontroller.

The most important parts of this project are the microcontroller and the mobile app. The microcontroller will do all the automation and the mobile app will be the interface between the farmer and the system. The microcontroller and the mobile app will link up through an internet connection. For quality performance, we recommend that the system be deployed in a greenhouse.

A lot of programming is required to ensure all the components are working together. To avoid any accidents, all the wiring is waterproofed and the microcontroller is secured in a waterproof box that will be easily accessible.

**Conclusion**

We aspire that this project will be a success and be deployed in multiple farms and greenhouses throughout Kenya and other countries in Africa. Since land is becoming scarce, many farmers are resulting to intensive farming and this is a very suitable area to implement this system.

Further development of this system will make it possible for it to be deployed in large scale farms and greenhouses.