Smart Farming System

A Smart Farming System that is unlike anything you have ever seen before! Our innovative Smart Farm will deter pests and detect intruders!

Things used in this project

Hardware components

	Adafruit Ultimate GPS Breakout	×	1
	ElectroPeak 0.96" OLED 64x128 Display Module	×	1
	Seeed Grove - Dust Sensor（PPD42NS）	×	1
	DFRobot 6 DOF Sensor - MPU6050	×	1
	DFRobot Gravity: I2C BME280 Environmental Sensor	×	1
	Digilent Stepper Motor	×	1
	SparkFun Stepper motor driver board A4988	×	1

Ultrasonic Sensor - HC-SR04 (Generic)	×	1
DFRobot Gravity: Analog Capacitive Soil Moisture Sensor- Corrosion Resistant	×	1
Breadboard (generic)	×	1
Particle Argon	×	1
Battery Charger for 1 Cell of NiMH battery, 5.5V input	×	1
Development Kit Accessory, Solar Cell	×	1

Software apps and online services

Adafruit.IO
Hackster.io

Story

This innovative **smart** farm system will *alleviate* the tedious but **crucial** work that farmers all over the globe suffer from. The system will be able to *communicate with the farmers* anywhere that there is a smart device with **Bluetooth** capabilities. In comparison to previous farming systems, this **smart farming system** is the **tesla** of

farming systems because it utilizes the newest in *cutting edge technology* in order to boost yields and maintain farmer morale!

The **PURPOSE** of this project came about because of *real-life experiences* during **New Mexico's first hemp farming season** in 2019.

Hemp legalization occurred under the 2019 Farm Bill, which was passed on December 20, 2018; however, an approved USDA Domestic Hemp Production Program was not established until March 22, 2021. Since farmers had no established guidance from the USDA; the first 2 hemp farming seasons were negatively impacted. One of the *hardest hit aspects* of hemp farming was **PESTCONTROL**. This was because there were no approved pesticides to keep hemp crops free from diseases and pests. With more farms going organic, the pesticide problem needs to be addressed. Another *problematic* factor hemp farmers are dealing with is physical **SECURITY** and safe keeping of hemp. Hemp contains Delta 9 tetrahydrocannabinol (THC) which is listed under Schedule I by US federal law[16] under the Controlled Substances Act. The THC content creates a unique aspect, theft. Theft is problematic not only because of the loss in yield but also because of the farmer's legal responsibility to maintain control of all THC production. Another *factor* farmers dealt with and still are dealing with is controlling hemp **POLLINATION**. When hemp is pollinated, it begins the process of seed propagation and in turn **DECREASES** trichome production. Trichomes are the mechanism by which hemp produces *cannabinoids*, such as cannabidiol (CBD) Majority of New Mexican farmers grew high CBD hemp strains to produce, manufacture and sell high quality CBD hemp **OIL** not *seeds*.

The Smart Farming System houses a weather station and a plant monitoring system. The weather station is comprised of 2 components and a cloud- based website. The first component is the BME280 which is a temperature, humidity and pressure sensor. The second component is a monochrome I2C OLED Display unit with a 128 x 64 resolution dot matrix panel. The weather data can be accessed from anywhere in the world via Adafruit.io which provides real-time data on the status of the crop's environment. The plant monitoring system comprises of two components, a soil sensor and the Grove Dust sensor. Both of these components are rather simple in both implantation and function; however, they both play critical roles in alleviating burden from farmers. The soil sensor is implanted directly into the ground via stake, and gathers the moisture readings from the surrounding region in order to aid the farmer in determining plant health. The dust sensor sits inside of our fabricated box in order to gather pollen readings in a valiant attempt to aid the farmer in determining the overall pollination levels in the surrounding region. Both of these two systems can be monitored in a user friendly interface known as Adafruit.IO dashboard, in which, the data has already been collected, converted, and crafted to be aesthetically pleasing.

The Smart Farming System also houses a security system and pest deterrent system. The components necessary for these functions are the Ultrasonic Sensor, the Stepper motor and it's driver board. The Stepper motor's only function is to turn the Ultrasonic sensor 180 degrees and back to its starting position. The main magic comes from the Ultrasonic sensor! This advanced sensor coupled with our innovative code and thinking, can pulse out frequencies that will naturally deter pests from the given region (26 feet). Furthermore, the Ultrasonic sensor also has the capability to simultaneously count the amount of time between each given

pulse and its return in order to determine not only distance, but **INTRUDERS** as well! This component will notify the farmer about any changes in location pulsing via SMS text messaging through Zapier.com as well as by changing the colors on the Adafruit.IO dashboard.

Finally, the Smart Farming System has two vital functions! The second to last is GPS and fall detection systems. The GPS functions are utilized in determining the location of the unit but this function is catered more towards large farm field owners. Furthermore, the GPS constantly populates a street map of real time coordinates on the Adafruit.IO dashboard. The fall detection system utilizes the MPU 6050 component in order to constantly give back data as to the orientation of the box. This data is expected to consistently give back the same date (primarily because the box stays in place). However, if the MPU reads a change in data on any of the axis planes (Z, X, Y), it will notify the farmer via SMS text message as well as changing the colors on the Adafruit.IO dashboard.