



F. A. C. T

(Field Agronomic Condition Test Environmental sensing)

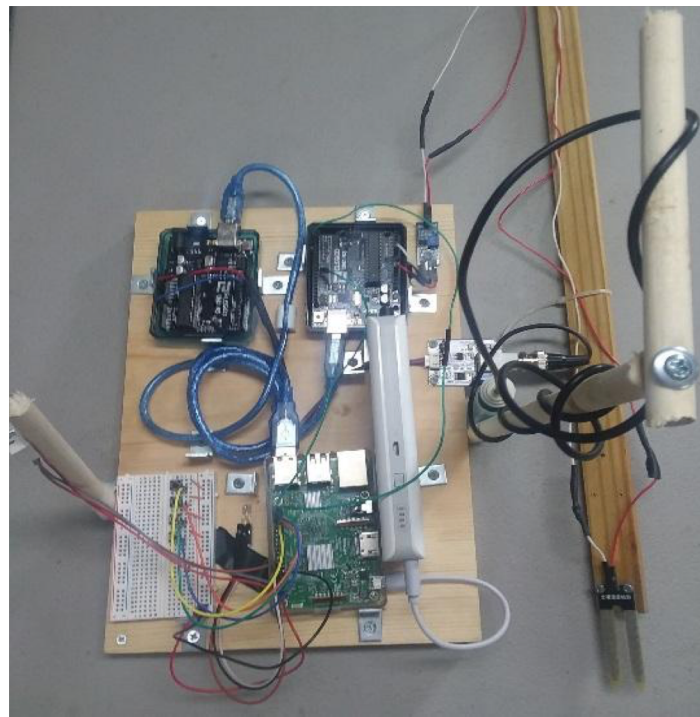
The Future of Agricultural and Conservation IOT

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Introduction

- Create low cost remote sensing device for agricultural purposes
- Use low cost hardware
- Utilize AWS cloud





Agricultural Issues Addressed

- Modern agriculture is a complicated activity
- Climate change is predicted to have large impacts on crop yield/nutritional quality
- Environmental data is difficult to collect
- Smart farming is the future



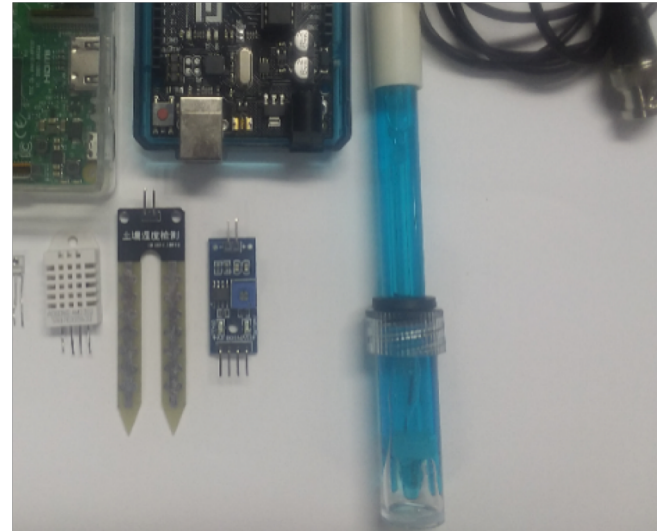
Specific Agricultural Problems

- Decreased yield and nutritional quality of food
- Phosphorus shortages
- Water use
- Environmental stresses
- Changing production landscape



Methodology

- Developed using Raspberry Pi R3, Elegoo uno microcontrollers, and assorted sensors
- Sensors collect data on soil Ph, moisture, temperature, humidity, and light intensity
- AWS cloud and GNUplot utilization



Top (from left to right): Raspberry Pi 3, Elegoo Uno Rev 3, Ph sensor. Bottom (from left to right): Light to Frequency Converter.) Temperature/Humidity sensor, Soil Moisture sensor.



Sensors

<i>Sensors Used</i>		
Sensor Type	Sensor Model	Sensor Data
PH	DFRobot Analog PH Sensor	Data provided as PH
Light to Frequency	TSL235R	Photons measured in uW/cm2
Moisture	Atomic Market Soil Testing Module	Provided in a standardized percent, high percent is wet and low percent is dry.
Temperature and Humidity	DHT22	Temperature in Degrees Centigrade and Humidity in percent



Use Cases

Case 1 - Mobile device and internet access

Case 2 - Lack of immediate access to internet



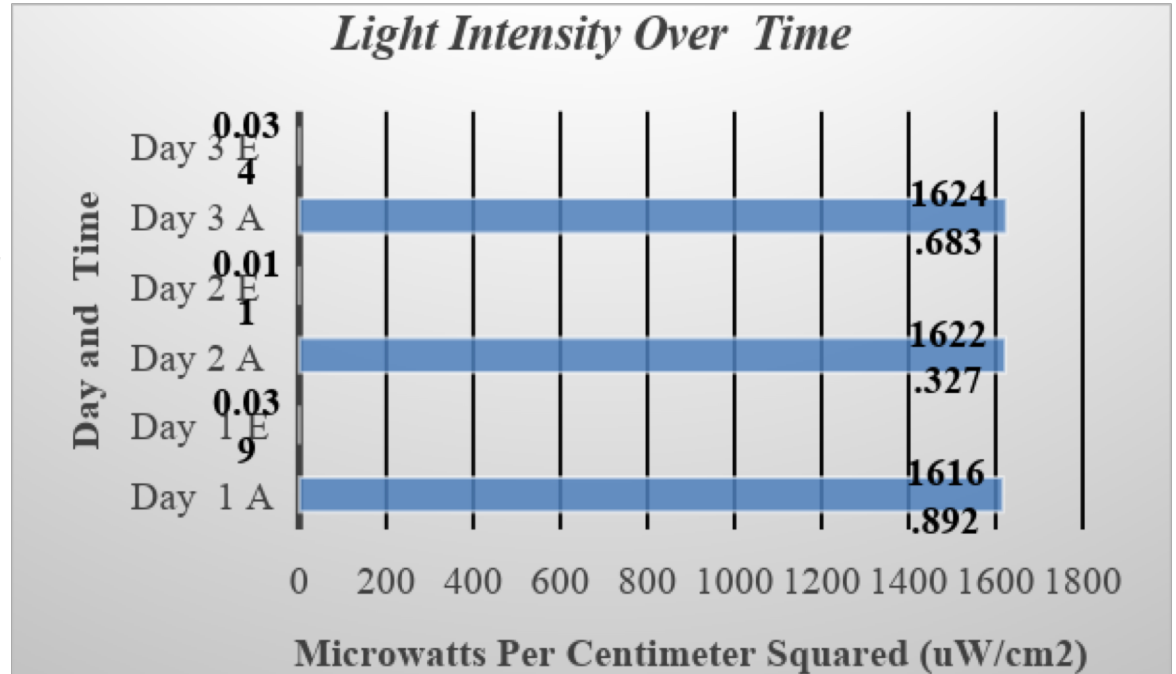
Testing

- Performed at Truman State University greenhouse
- Tests performed to show environmental changes



Light Intensity Data

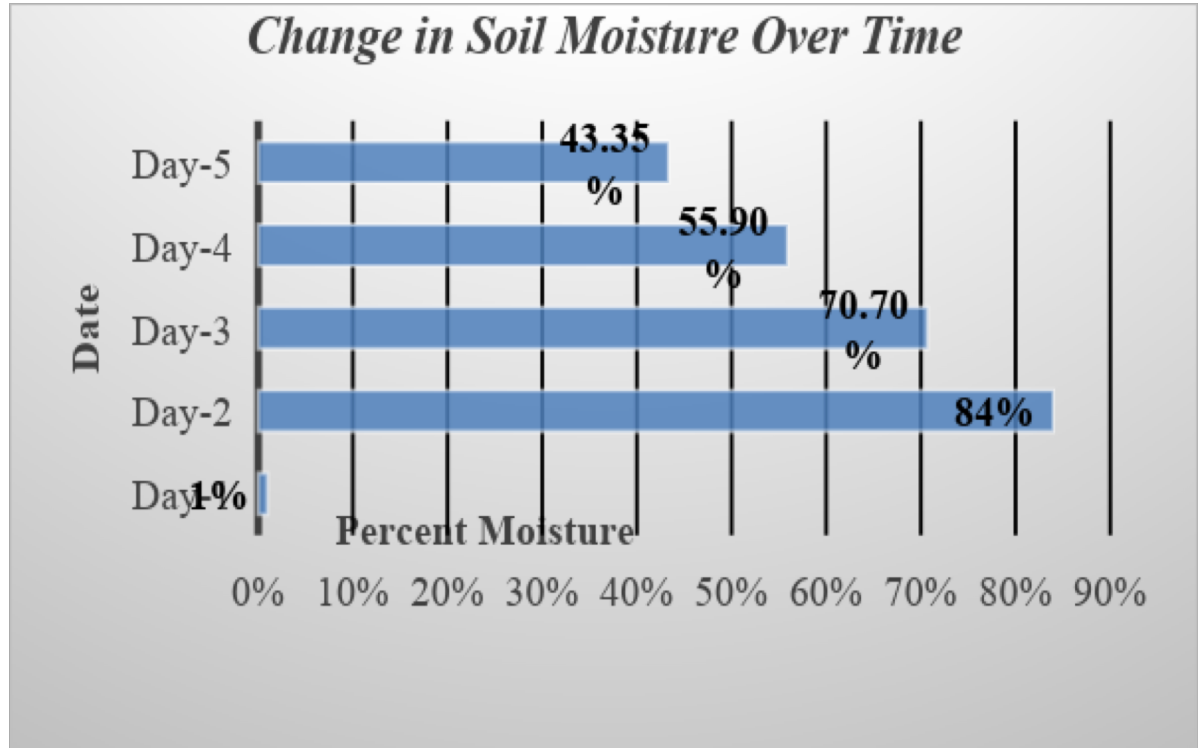
- Light intensity varies by location and time of year





Soil Moisture

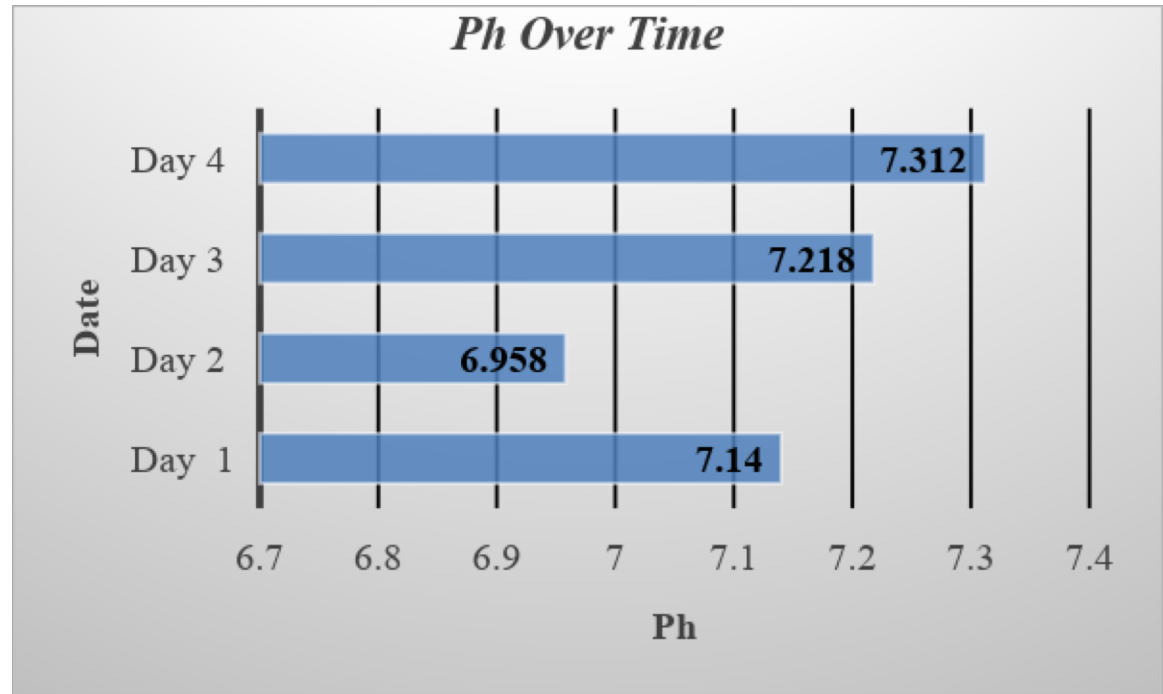
- Moisture levels will decrease over time





Soil Ph

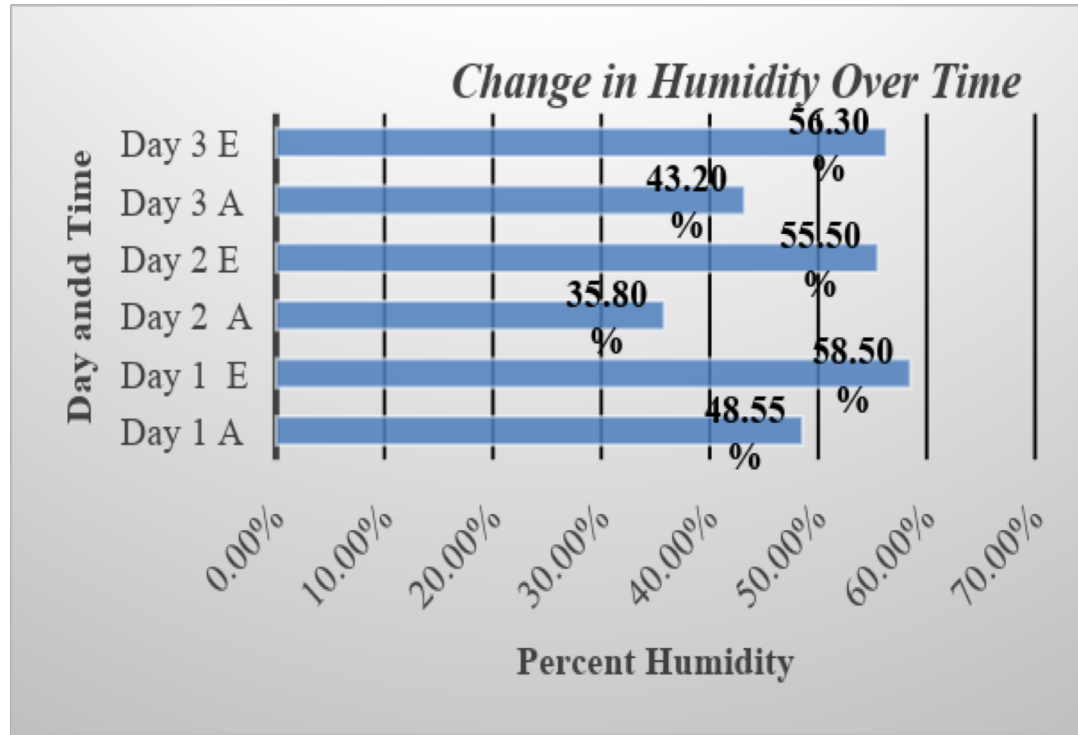
- Soil Ph is responsible for soil nutrient availability for plants





Humidity

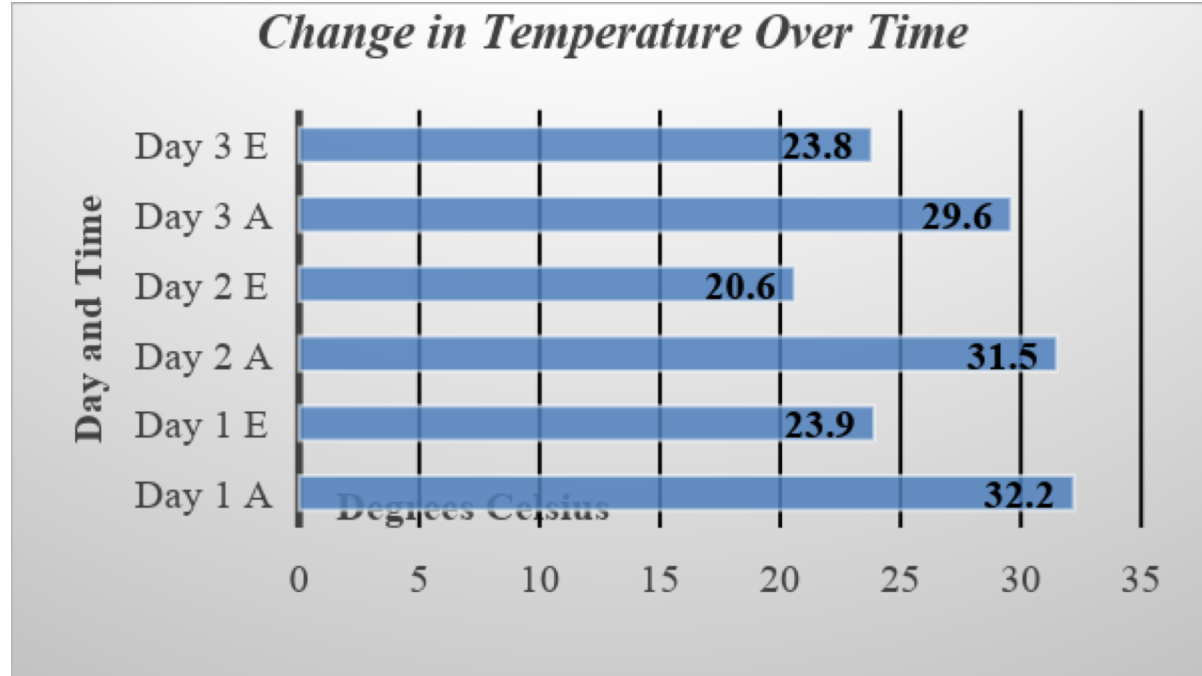
- Humidity plays a role in plant respiration.





Temperature

- Temperature affects crop development and maturation





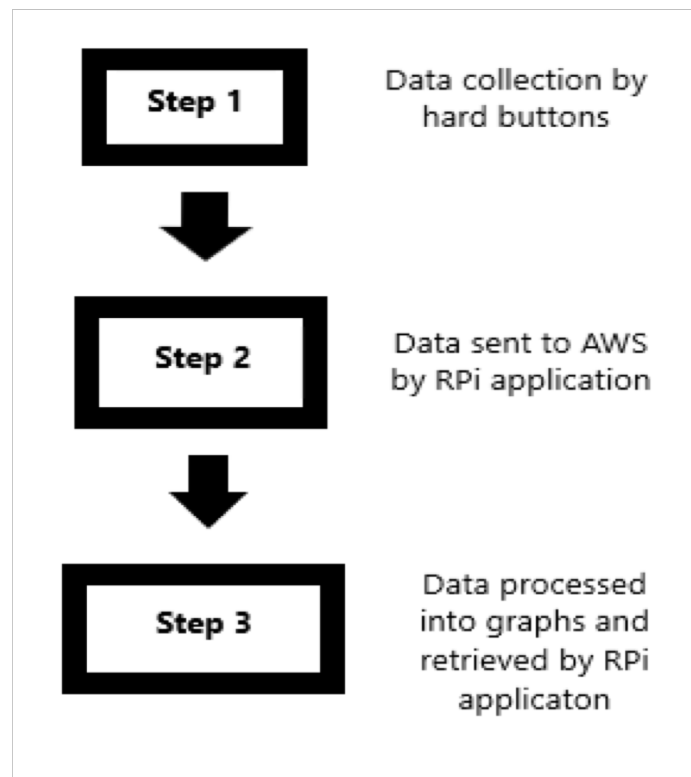
Maintenance

- Basic cleaning of Ph and moisture sensors
- Proper storage



Information Processing

- Same pathway for both use cases





Conclusion and Future Work

- Specialization of devices
- More sophisticated data processing
- Addition of GPS for mapping capabilities