Expert in your “Field”

A Presentation by Anushri Kumar, Bilal El-Habibi, Christine Vandevenoorde, Devin Bisconer and Taskin Khan
Meet Our Farmers
The Agricultural Sector

Agriculture is the world’s largest provider of jobs, employing 40% of the global workforce.
Rainfed agriculture is the predominant agricultural production system around the world, and its current productivity is, on average, little more than 1/2 the potential under optimal agricultural management.

That means, over 1.3 billion people like Ramu and Drew are being half as productive as they can be, all because of poor irrigation management.
Water-Energy Nexus

CA: Water use accounts for 20% of electricity use, or 7.2 TWh.

Equivalent to 300 million tons of coal!
Make Smart Irrigation Smarter

- Account for Resource Scarcity
- Capitalize on the nuance of Plant Yield
- Inform difficult Business Decisions

All while being MORE

- Affordable
- Accessible
- Renewable-Friendly
Multi-Objective Optimization

1. Economic: \[ J_1 = \sum_{K=0}^{N} (C_{\text{grid}} \times P_{\text{grid}}(k) + C_w \times P_{\text{pump}}(k)) \]

2. Yield moisture deviation: \[ J_2 = \sum_{K=0}^{N} [m(k) - m_{\text{des}}]^2 \]

3. Hybrid: \[ J_3 = (1 - \gamma) \times J_1 + \gamma \times J_2 \quad 0 \leq \gamma \leq 1 \]

Where \( \gamma \) is a tuning factor, for the user to weight the importance of economic cost vs plant health.
Cyber-Physical Layer

- Matlab
  Optimization.m

- Database
- Python
  SendAndListen.py
- Arduino
  SendData.ino
  - Soil Moisture Sensor
  - Humidity Sensor
  - Depth Gauge
- HTML
  JS
- Twilio
Text Controlled Pump - Screenshots

Sent from your Twilio trial account - Thanks for the message. Configure your number's SMS URL to change this message. Reply HELP for help. Reply STOP to unsubscribe. Msg&Data rates may apply.

Today 10:41 PM

Sent from your Twilio trial account - Sent from your Twilio trial account - Pump ON!

trial account - Pump ON!

Sent from your Twilio trial account - Thanks for the message. Configure your number's SMS URL to change this message. Reply HELP for help. Reply STOP to unsubscribe. Msg&Data rates may apply.

Sent from your Twilio trial account - Sent from your Twilio trial account - Pump OFF!
So How Does Texting Work?

**Twilio** allows software developers to send and receive text messages using its web service API.

We paired Twilio with the Linux and WiFi capabilities of the Arduino Yun
More Visualizations

Irrigation Schedule

- Monday Pump is on Night
- Morning
- Evening
- Early after noon
- Night

Moisture Level

Battery Level

73 Wh
256 m^3
Summary:
Affordable, renewable irrigation, optimized for farmers all over the world.

Questions?