Smart Drip Irrigation System

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Introduction

Problem: Approximately 35% of Nicaraguans live in poverty. Agriculture serves as the main source of employment for the rural population, and is also one of the country's biggest exports. However, agriculture, without proper technology, is arduous and time consuming. Further, farmers have limited resources, and these need to be expended sparingly

Need: A smart irrigation system that can provide relief to Nicaraguan farmers while irrigating efficiently

Design Considerations

Solar Panels

- **Charge Controller:** SDIS must be able to communicate battery levels and control rate of current into the battery

LCD Screen

- **Selection Menu:** Allows user to select from three time intervals of irrigation
- **Status of System:** Status of system is displayed on LCD screen and allows for manual triggering by user

Capacitive Sensors

- **Corrosion:** Sensors must be coated with protection to avoid corrosion and diminishing the utility of the project.

Plot

- **Plot size:** System must be able to irrigate 9 [m] x 16 [m] plot of land.

Design Limitations

- Designed to hold maximum of 6 sensors
- Limitation of one type of crop per plot
- No data from previous teams to improve on
- Depends on Sun as only source of energy
- No way to control water pressure
- No way to ensure requested 160 L/hr water flow rate

Purpose

A low cost, smart irrigation system is able for irrigate different types of crops. The SDID will provide technological and economical relief to Nicaraguan farmers. The SDIS will also allows for easy, intuitive interactions with the custom UI, while also being robust enough to operate in the harsh Nicaraguan climate.

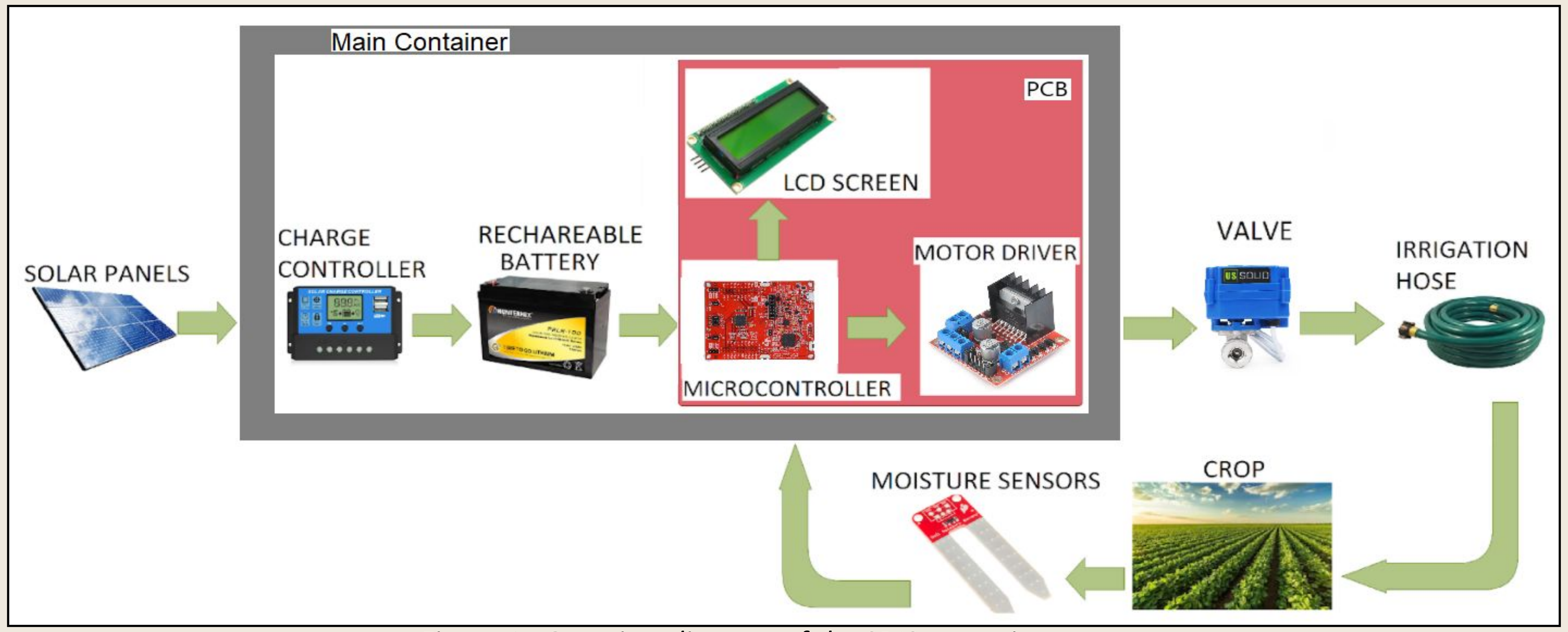

Figure 1: Overview diagram of the SDIS operation

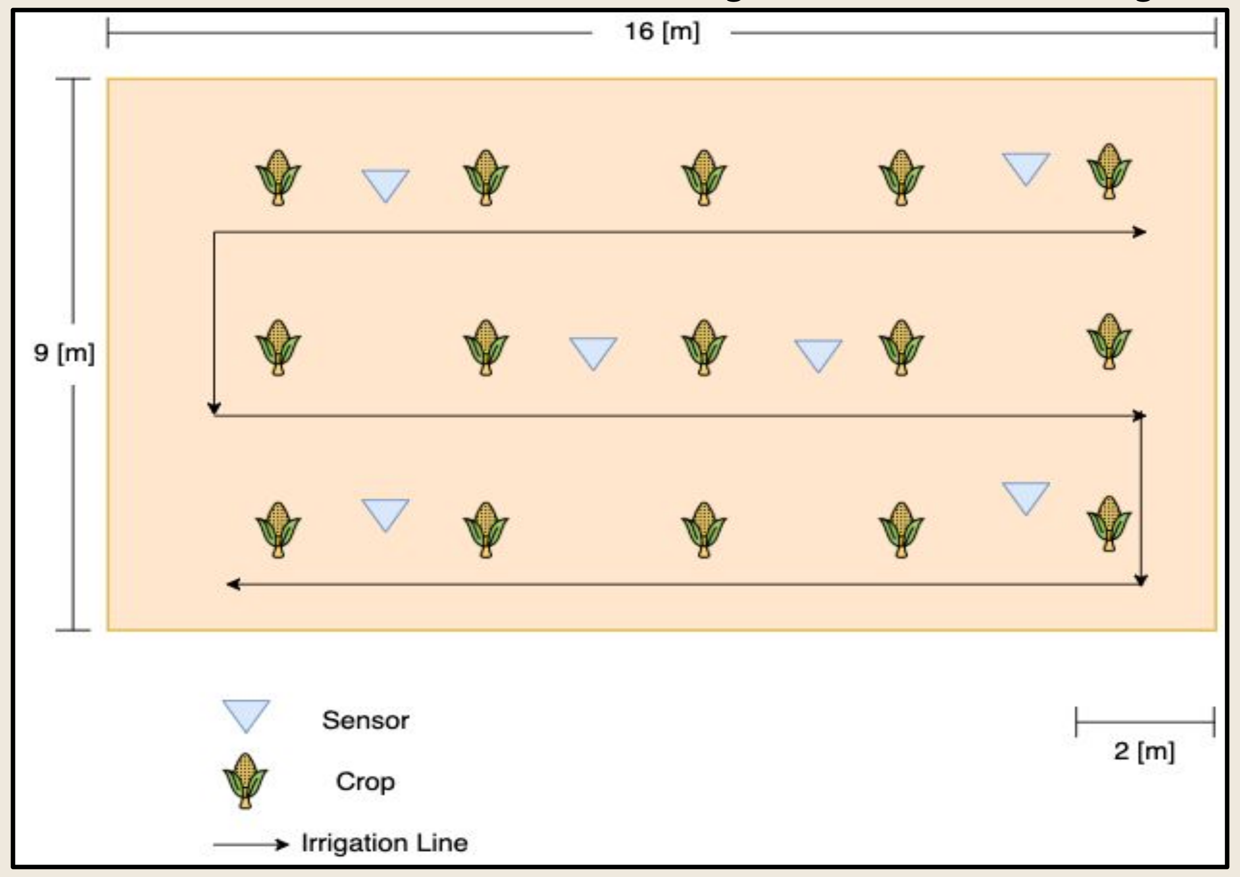

Figure 2: Overview diagram of sensor and hose placement

Previous Group	Our Group
Single Crop Design	Polycrop Design
One Moisture Sensor	Six Moisture Sensors
Loose Wiring	Printed Circuit Board
Used LEDs to Communicate	Using LCD Screen to Communicate
Three Solar Panels	Four Solar Panels
IP65 Container	IP67 Container

Figure 3: Design Improvements from previous team.

Conclusions

Impact: Our team created a cheap, polycrop SDIS that is ready for use in Nicaragua. It is a major improvement over the previous team, with better hardware, software, and design.

Future work:

- SDIS designed for use in other countries
- SDIS with high-accuracy sensors
- Clock system to regulate irrigation
- A SDIS that can work in a plot containing multiple crops
- Cable management outside the box

Specifications

- Battery: Lead-Acid, 12 [V] DC, 7 [Ah]
- Solar Panels: 20 [V] in series, 4 total panels
- Microcontroller: MSP430FR2476 TI Launchpad
- Container: IP67 waterproof and dustproof
- Ball Valve: 3-5 [s] operating tIme
- Irrigation Modes – 3 (Low, Medium, High)
- Sensors: 3.3 - 5 [V] output
- 3D Prints: PLA plastic

Features

- Polycrop Functionality
- Intuitive, Customizable UI
- Custom PCB for Wire Management
- IP67 Waterproof and Dustproof Container
- 4 Solar Panels for Upgraded Power
- LCD for Easy Communication with SDIS

Figure 4: Inside the SDIS, with the battery, shield, charge controller, LCD, and interactive components displayed

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