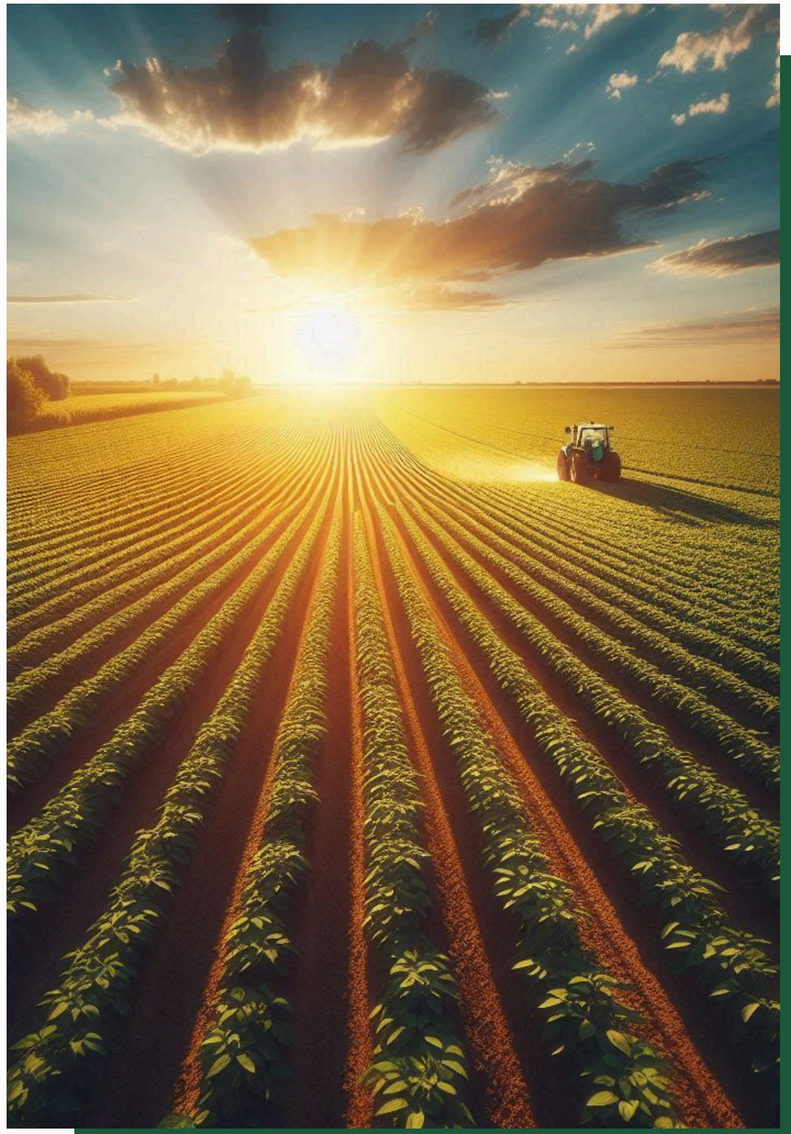
SECA - Sensor Ecosystem
for Controlling Agriculture

Challenge ID 16

PITCH DECK PRESENTATION

https://web.tecnico.ulisboa.pt/ist1103681/

Content



Problem Definition

Controlling the environment and growth level of agricultural products is carried out periodically and inefficiently.

Additionally, diverse plantations require a diverse list of checkmarks for each crop, different levels of light exposure, soil humidity, etc.

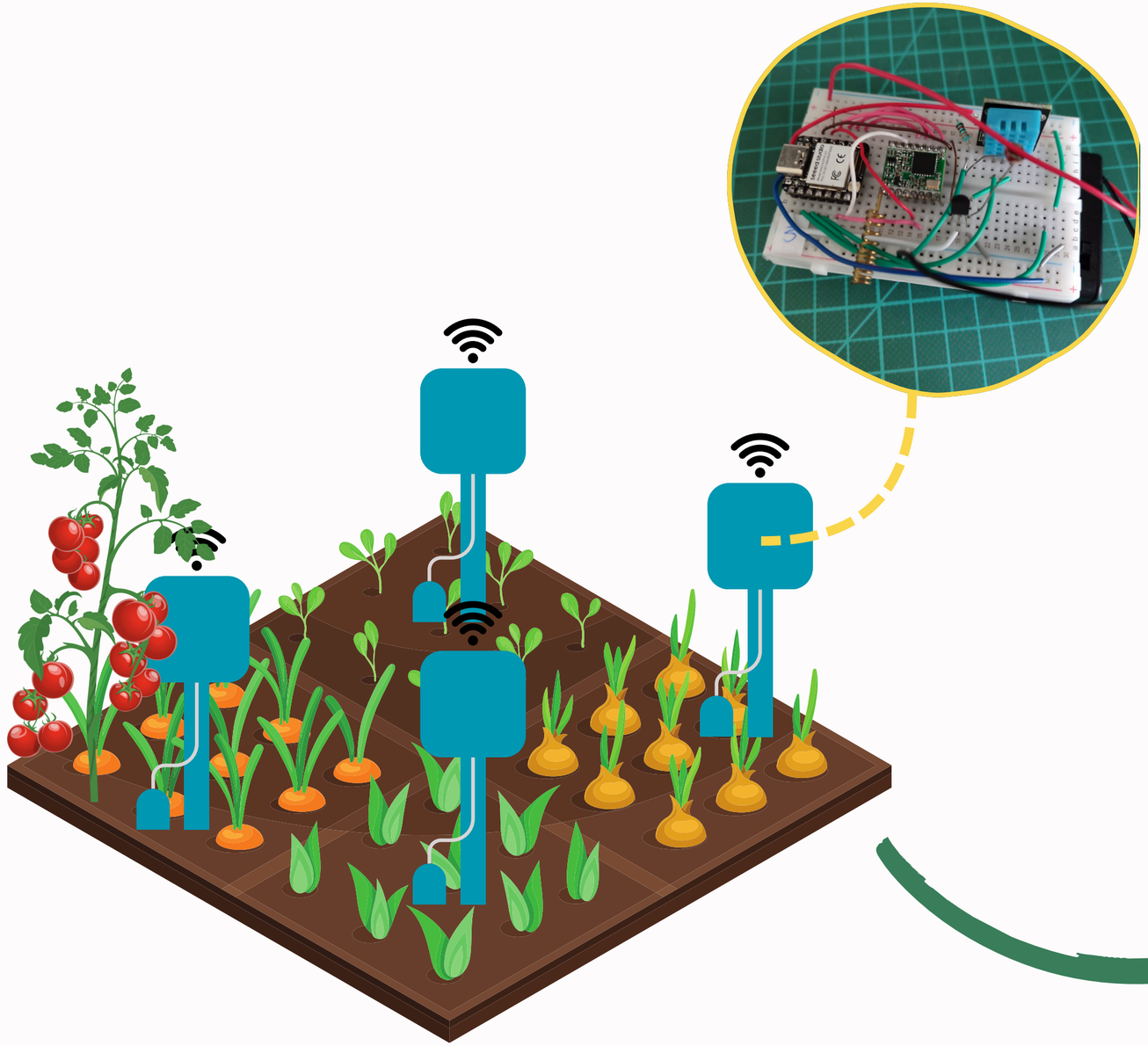
This all leads to late and less productive harvests due to problems identified too late in environments ranging from urban to rural agriculture.

The existing methods to monitor plantations cannot account for a diverse agricultural environment or are specifically designed for industrial production.

Solution

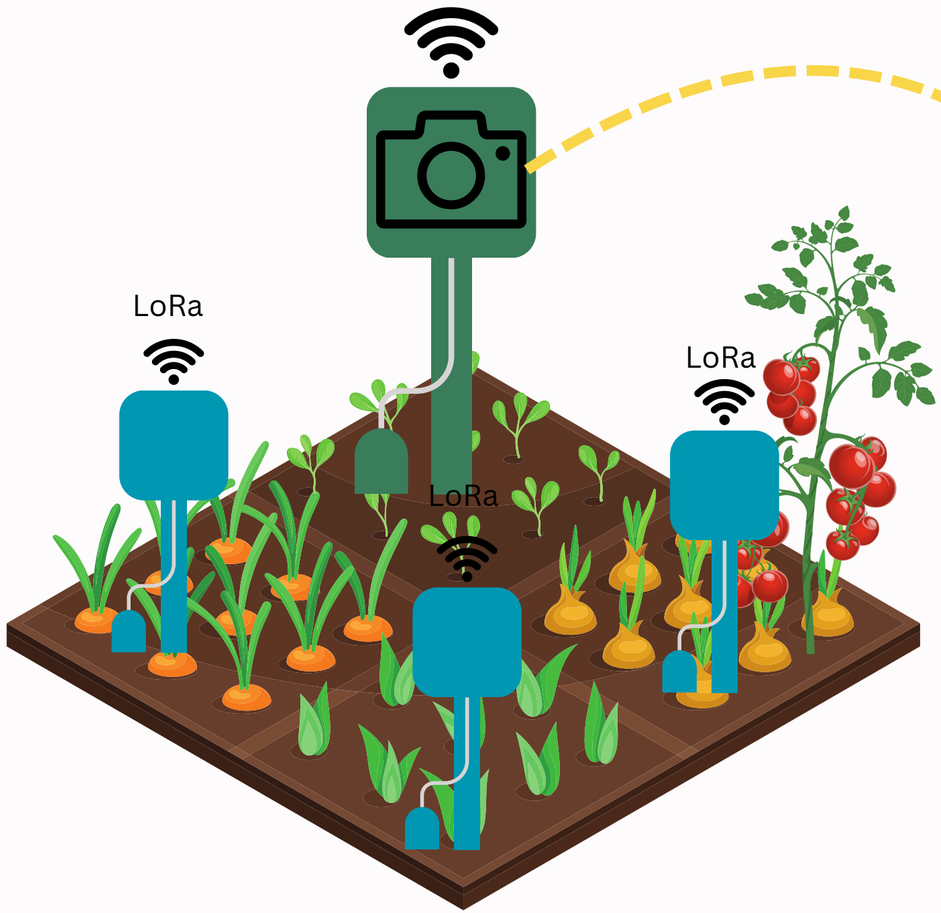
The solution would be a grid of wireless sensors that would stick to the soil, be waterproof, battery powered, each with a unique set of sensors and presets to measure the environmental conditions, such as:

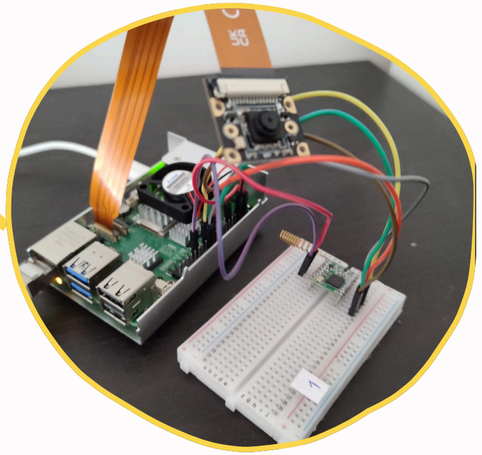
- Air Temperature
- Soil and Air Humidity
- Luminosity



Solution

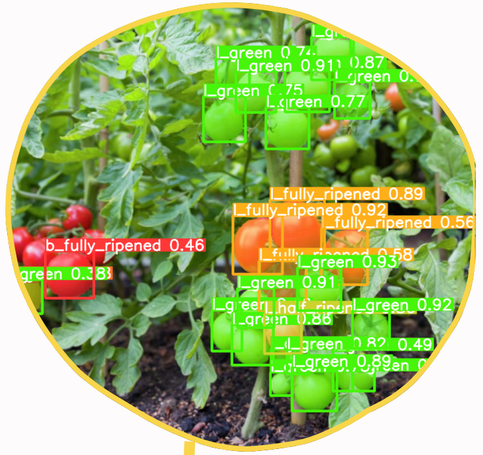
They would all be connected to a central processing node, which would be the main controller and would also daily analyse ripening stages and possible diseases through image recognition.

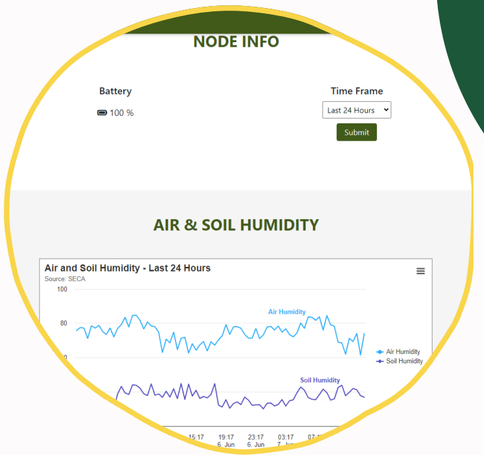


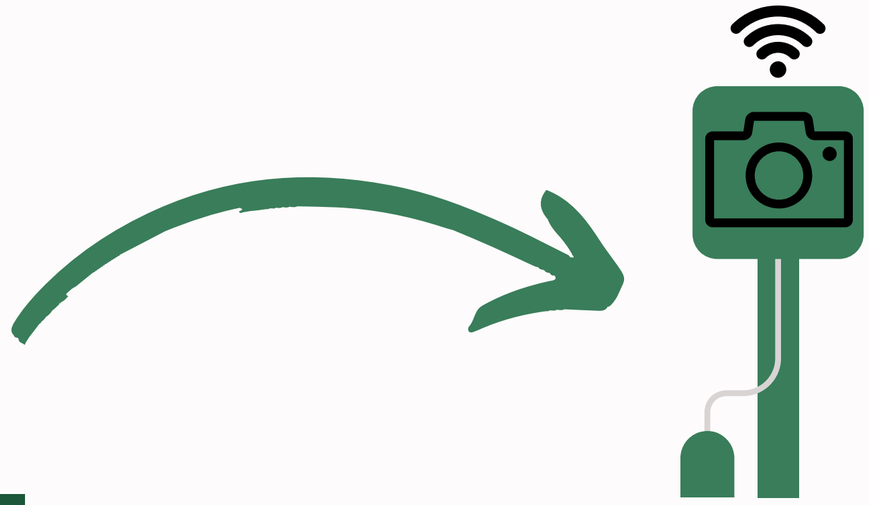


Solution

The entire system would work like a hive, with all the data being monitored on an hourly basis, processed, and shown to the user so that he could decide on how to act through a web app.







Solution Objectives

Objective 01
Efficient Monitoring
Improve continuous crop condition surveillance.

Objective 02
Speedy Response
Quick action on agricultural diseases and issues.

Objective 03
Profit Increase
Enhance financial returns from farming.

Objective 04
Waste Reduction
Cut down on agricultural process waste.

Target Clients

People with urban plantations, either on private balconies or terraces would be helped monitoring micro productions in between every-day tasks.

Farmers with small-sized plantations would more easily manage their crops

Medium and large-sized producers could have their workload lifted at a lower cost and with higher customizability.

MAIN COMPETITOR

Pycno

This is the competitor with the product most similar to what we propose to develop, also having a node structure. Despite this, it also belongs to a higher price range

Products Comparison

	SECA	*Pycno*
Node structure	✅	✅
GSM	✅	✅
LoRa	✅	✅
Solar powered	Upgradable	✅
Air temperature and humidity	✅	✅
Solar radiation	✅	✅
Soil temperature and humidity	✅	✅
Deep soil humidity	Upgradable	✅
Camera	✅	❌
Data dashboard	✅	✅
Price	≈ $120 + 2x$40 (with 2 auxiliary nodes)	$1999

Results

01

We succesfuly developed the nodes, combining the Raspberry Pi (in the central node) and ESP32 (in auxiliary ones) with the sensor architecture and the energy designed solutions. The nodes can **measure** the chosen parameters and **communicate** them with the central one, who sends the data to the server.

02

We implemented a server data base and a web app, combining frontend and backend, so that we could **store** the measured data, **present it** to the user in an intuitive way, and **notify** him in case of extreme measured conditions.

03

We created our own computer vision model with existing datasets, so that we could **determine** the ripening stage of tomatoes and **detect** diseases through its leafs.The taken images are analysed and the output image is displayed on the web app home page.

Future Plans

Our goal is to evolve the system to autonomously provide solutions and execute decisions.
This statement conveys the aspiration to develop a system capable of independent action and problem-solving in agricultural management.

4th Objective
Sensor Deployment
Enhance systems to autonomously execute critical agricultural decisions.

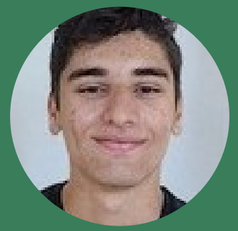
3rd Objective
Automated Correction Models
Create automated systems for problem-solving based on data.

2nd Objective
Data Analysis
Perform analysis on the collected data for insights.

1st Objective
Sensor Integration
Install sensors in fields to gather crop data.

Our Team

We are all Electrical and Computer Engineering Bachelor's (LEEC) students.



Filipe Piçarra

- Hardware Acquisition
- Server
- Webapp Backend
- Hardware Prototyping
- Video

Francisco Apolinário

- Website
- Meetings with Partners
- Webapp Frontend
- Poster
- Pitch Deck Presentation

Guilherme Barros

- Energy Management
- Pitch Deck Presentation

Hugo Dezerto

- Hardware Acquisition
- Internodal Communication
- Poster

Matilde Sardinha

- Webapp Frontend
- 3D Modeling
- Video

Nuno Abreu

- Computer Vision Model
- Video

Advisor: Prof. Marcelino Santos

Monitor: Francisco Simplício

SECA - Sensor Ecosystem
for Controlling Agriculture

THANK YOU

For More Information:

seca.agriculture@gmail.com

https://web.tecnico.ulisboa.pt/ist1103681/

Instituto Superior Técnico, Lisbon, Portugal