AGRI-Bird

Mawa Hijji , Liza Yousef, Giselle Kandiel & Alaa Aldybous

Mentor:Dr. Naila Marir

The Seed Of An Idea

Our journey didn't begin in a lab, but in the heart of agricultural innovation: Meshkat Farm.

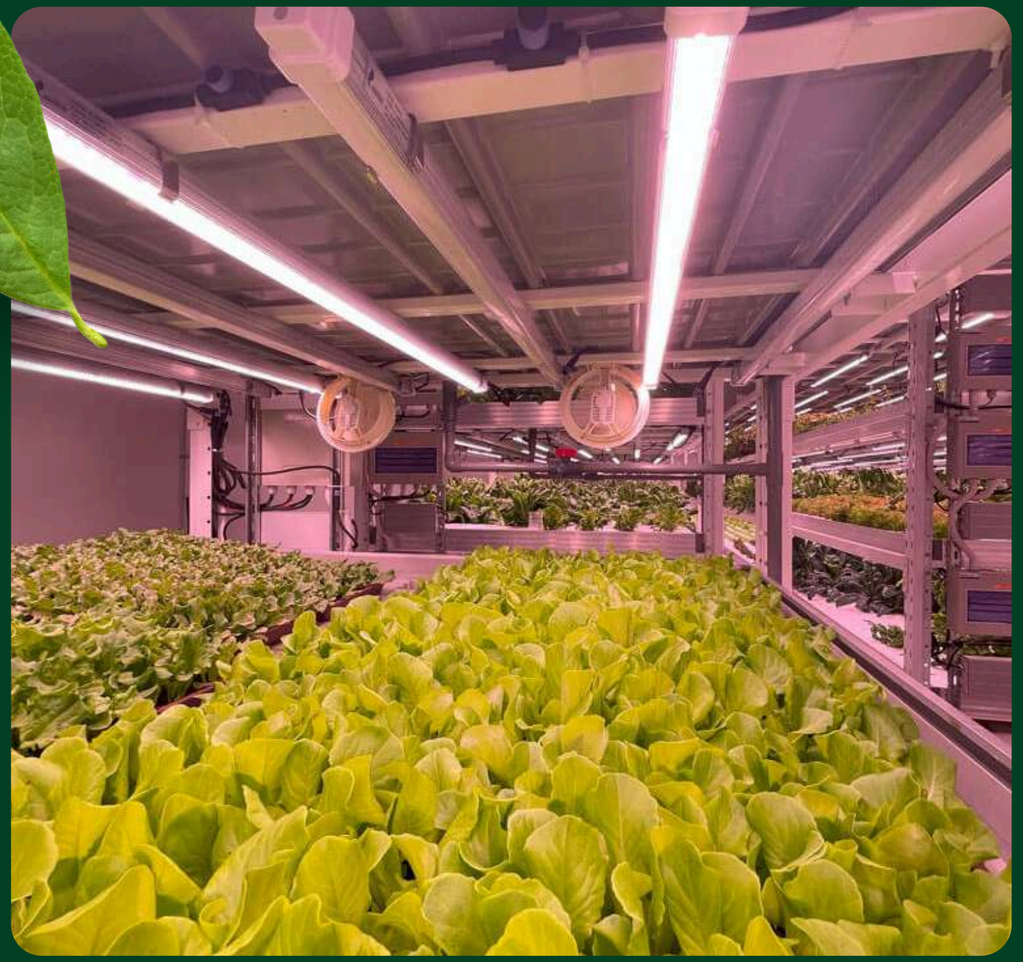
A pioneering facility located near Al Jumum, northeast of Jeddah, Mishkat is more than just a farm—it's a living laboratory. Here, tradition meets technology, and research is nurtured as carefully as the crops.

We were invited to walk these technologically advanced corridors not just as observers, but as problem solvers. The mission was simple: find a challenge, and build a solution.

Mishkat Farm

In a farm of this scale and diversity, a unique challenge emerged. While the farm grows a variety of produce like tomatoes and other leafy greens, we decided to focus our initial efforts on lettuce. How could we keep a watchful eye on every single plant in these vast rows?

The farm's greatest strength, its size, was also its greatest vulnerability.



Pinpointing the Problem

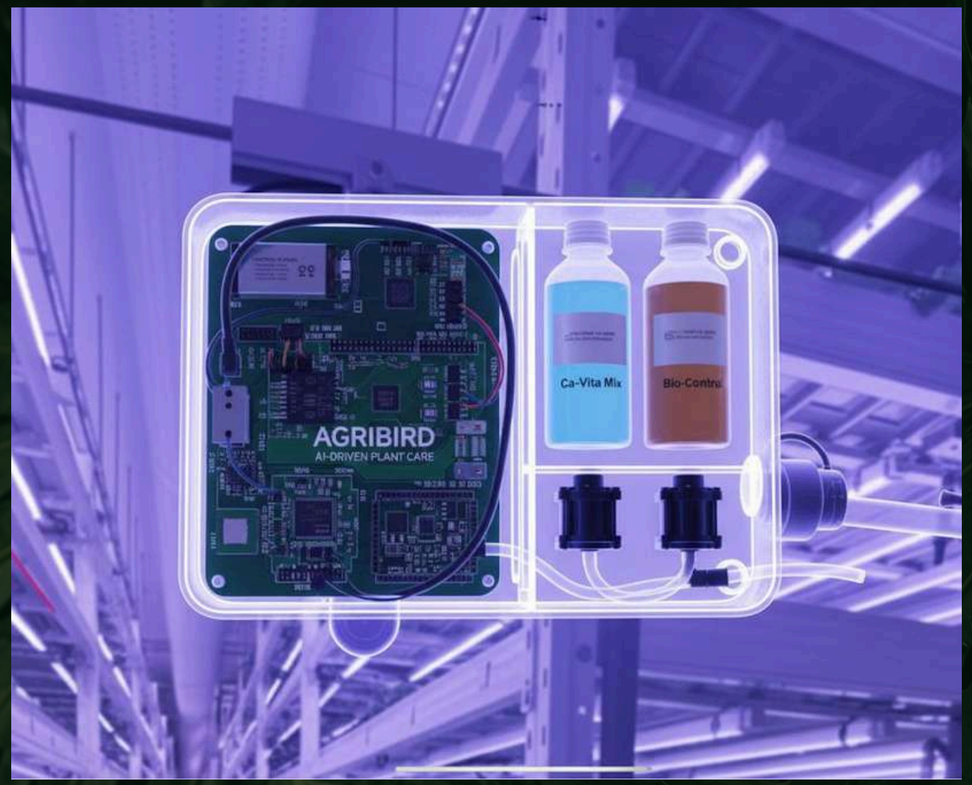
Early signs of disease or nutrient deficiency are subtle and can spread rapidly if missed.

Manual monitoring is time-consuming, labor-intensive, and prone to human error.

The question became clear: **How can we give farmers a superhuman ability to see, diagnose, and treat every plant, instantly?**

Our Solution: The AGRIBird!

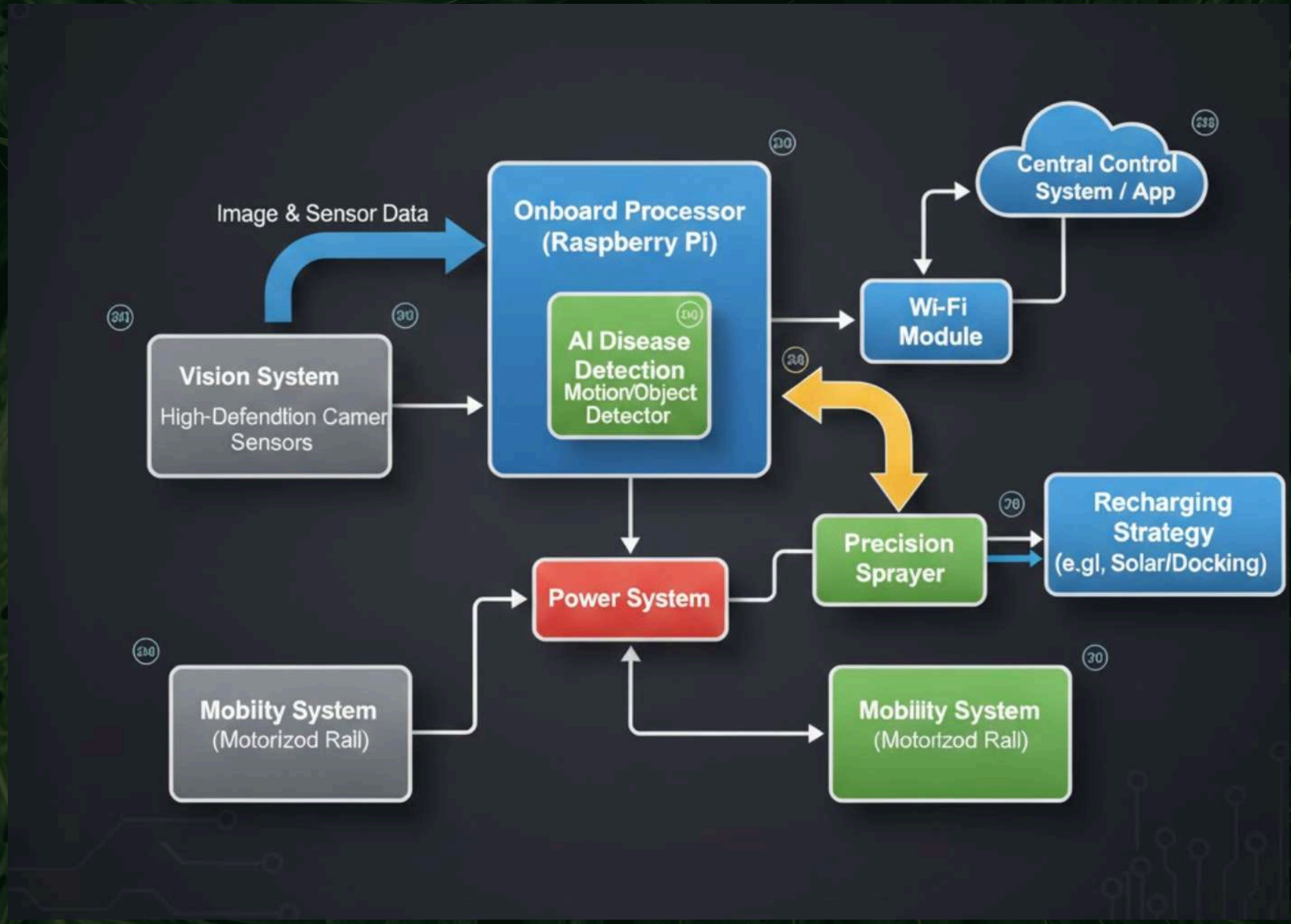
Introducing the AGRIbird!



An autonomous guardian for indoor farms, the AGRIbird is designed to be the eyes, mind, and helping hand for farmers.

- Autonomous Patrol
- Intelligent Vision
- Targeted Treatment

Inside the Machine



Inside the Machine

- Mobility System: Motorized rail for precise movement across farm shelves.
- Vision System: HD camera and multi-spectral sensors for early plant stress and disease detection.
- Onboard Processor: Raspberry Pi running AI for real-time analysis, including disease and object detection.
- Precision Sprayer: Electronically controlled nozzle for targeted treatment application.
- Power & Connectivity: Reliable power system, Wi-Fi for central control, and a recharging strategy for autonomy.

AI Integration: The Brains of the Bird

- Model: We selected MobileNetV3, an efficient computer vision model, optimized for real-time performance on a Raspberry Pi.
- Dataset: Trained on a diverse, publicly available Kaggle dataset of healthy and diseased lettuce images.
- Training: Fine-tuned MobileNetV3 over 10 epochs to recognize plant health conditions.
- Deployment: Converted the model to the .onnx format for high-performance, real-time analysis on the AGRIbird's processor.

Performace Metrics & Results

- Validation Accuracy: During the training phase, reached a validation accuracy of 97.66%.

- Final Test Result: On a final, unseen set of test images, the model achieved an accuracy of 98.29%.

This result proves the model is highly effective at accurately diagnosing the health of the lettuce from the images it captures

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Downloading: "https://download.pytorch.org/models/mobilenet_v3_small-047dcff4.pth" to /Users/alaa/.cache/torch
hub/checkpoints/mobilenet_v3_small-047dcff4.pth
100%|| 9.83M/9.83M [00:00<00:00, 42.1MB/s]
Model classifier updated for our task.
Training on device: cpu
Starting training for 10 epochs...
Epoch 1/10.. Train loss: 0.334.. Validation loss: 0.198.. Validation Accuracy: 95.11%
Epoch 2/10.. Train loss: 0.120.. Validation loss: 0.118.. Validation Accuracy: 97.02%
Epoch 3/10.. Train loss: 0.114.. Validation loss: 0.100.. Validation Accuracy: 97.45%
Epoch 4/10.. Train loss: 0.083.. Validation loss: 0.095.. Validation Accuracy: 97.23%
Epoch 5/10.. Train loss: 0.071.. Validation loss: 0.094.. Validation Accuracy: 96.81%
Epoch 6/10.. Train loss: 0.082.. Validation loss: 0.091.. Validation Accuracy: 97.02%
Epoch 7/10.. Train loss: 0.079.. Validation loss: 0.096.. Validation Accuracy: 97.02%
Epoch 8/10.. Train loss: 0.070.. Validation loss: 0.093.. Validation Accuracy: 97.23%
Epoch 9/10.. Train loss: 0.060.. Validation loss: 0.085.. Validation Accuracy: 97.02%
Epoch 10/10.. Train loss: 0.063.. Validation loss: 0.081.. Validation Accuracy: 97.66%
Finished Training!
Model saved to lettuce_detector.pth
(base) alaa@Alaas-MacBook-Air AI Project:GCC %
```

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⊗ 0 ⚠ 0  Live Share
hts_only=True` for any use case where you don't have full control
Please open an issue on GitHub for any issues related to this exp
  model.load_state_dict(torch.load('lettuce_detector.pth', map_lo
cpu')))
Trained model weights loaded successfully.
Evaluating on device: cpu

--- Final Test Result ---
Accuracy on the test set: 98.29%
(base) alaa@Alaas-MacBook-Air AI Project:GCC %
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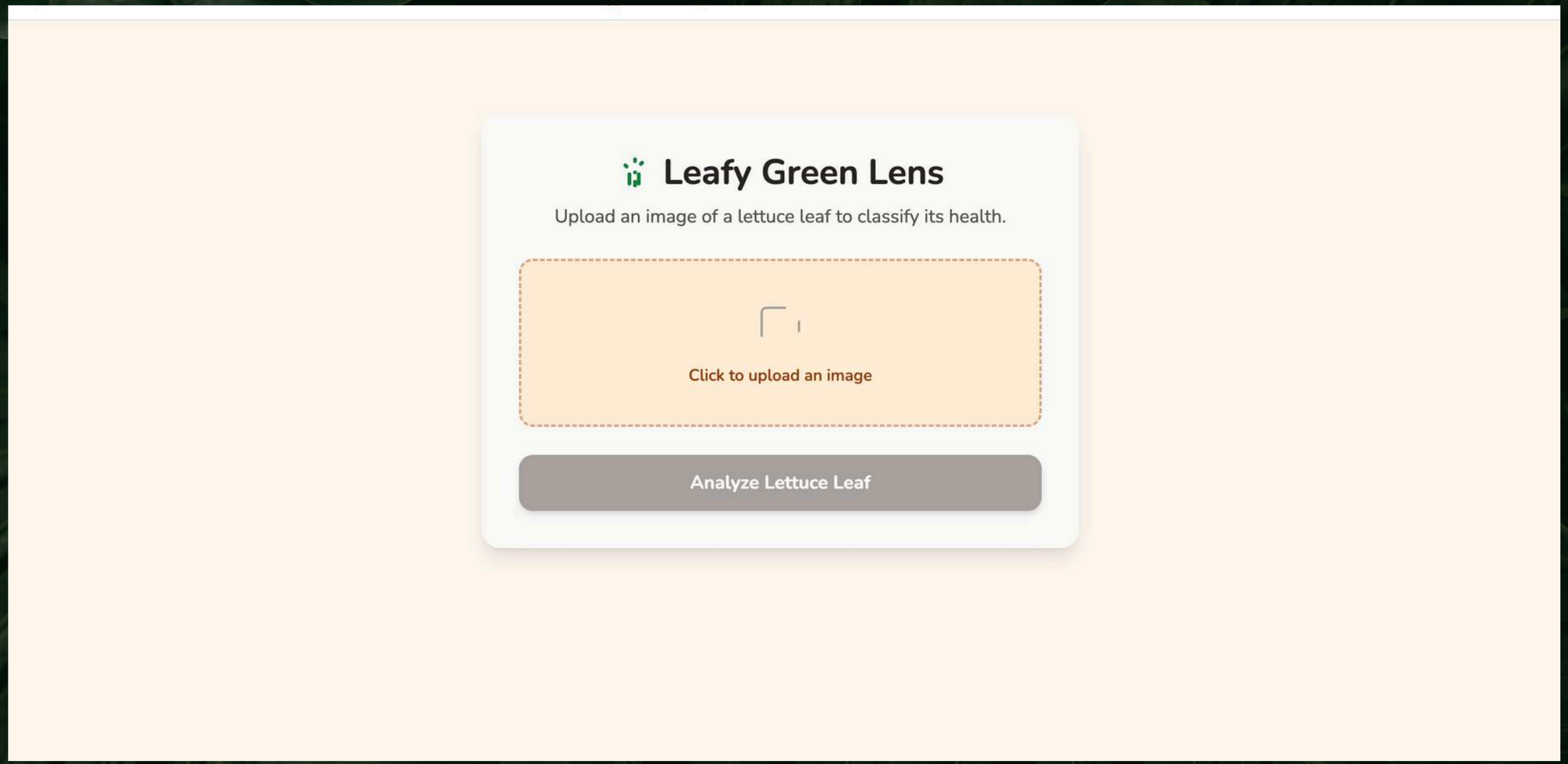
Website Deployment



Website Deployment

Leafy Green Lens

Upload an image of a lettuce leaf to classify its health.

Click to upload an image

Analyze Lettuce Leaf

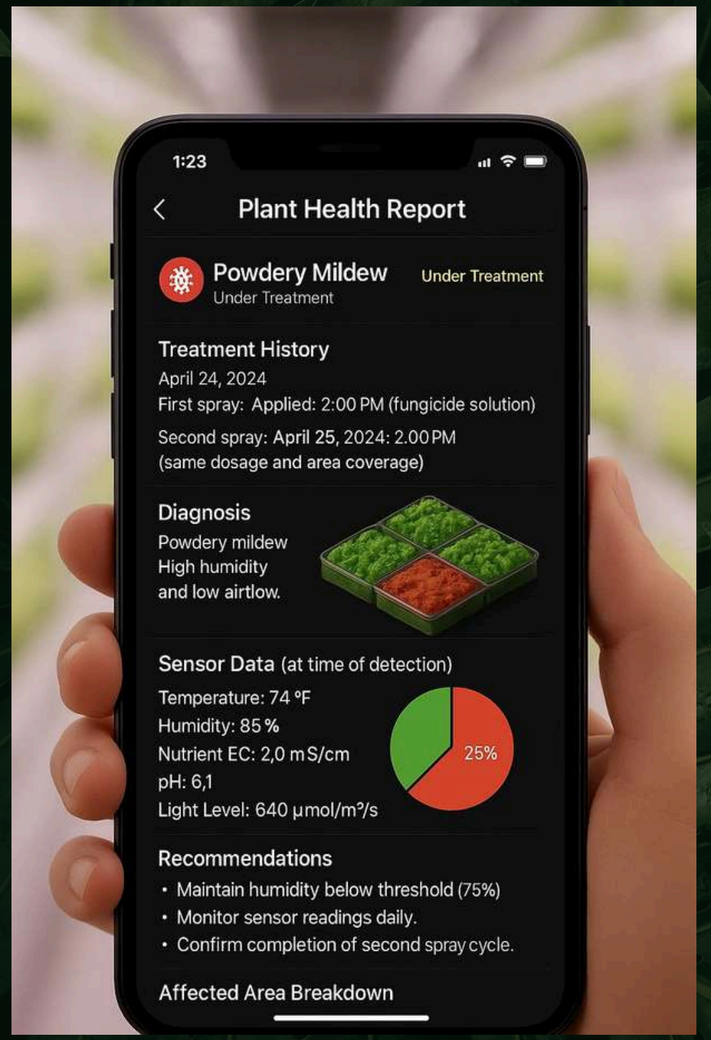
Analysis Result

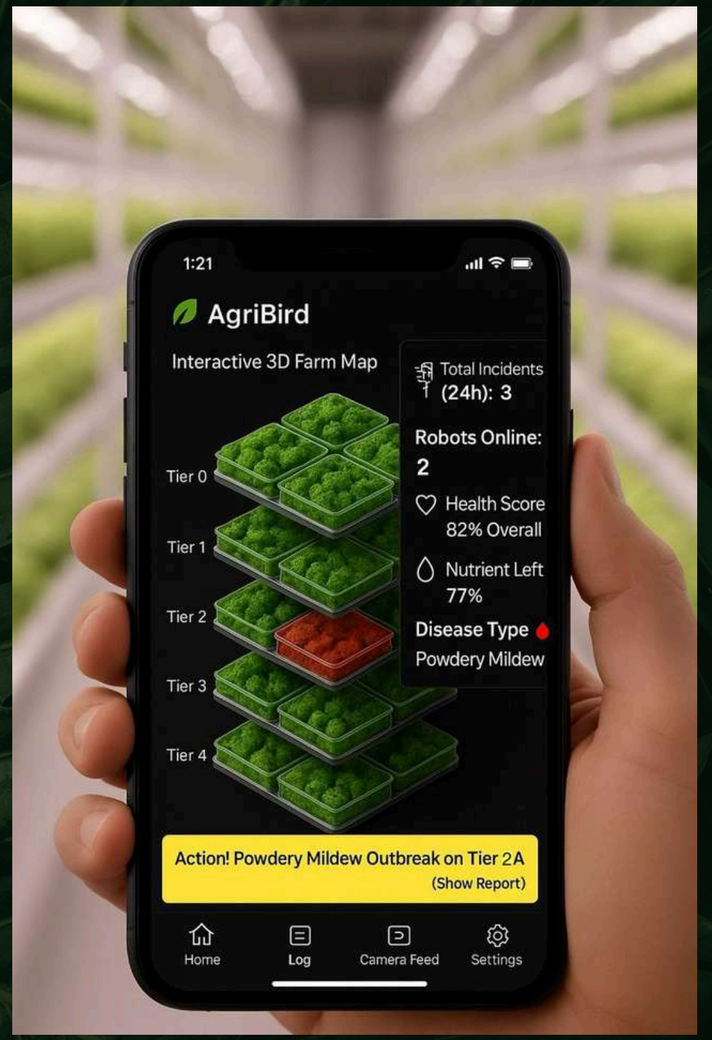
Status: Diseased

Details: Viral

The App Interface: Command & Control

- Interactive 3D Map
- Real-Time Dashboard
- Instant Outbreak Alerts
- Detailed Health Report





The App Interface: Command & Control

Reality & Future Trends

Our vision includes expanding its AI capabilities to recognize a wider range of crops, such as leafy greens, herbs, and tomatoes and increasing versatility and automating essential crop monitoring and early treatment to reduce resource waste and boost crop health and yield. Achieving this future requires rigorous testing, and strategic partnerships. To ensure continuous, efficient operation, the AGRIbird will integrates sustainable power autonomy through automated docking and potential solar charging, minimizing human intervention and maximizing energy efficiency.