WeedTrackr

Precision weed management system

Here’s what’s broken

Annually, weeds cause **$33 billion** in US crop yield losses.

Control measures add **$6 billion**.

70 million pounds of herbicides are lost to imprecise application and overuse each year.

Most herbicides are applied as “blanket” treatments.

Equal amounts are applied to ***the entire field.***

Precision equipment exists...

but it's *expensive* and built for annual row crops.

In vineyards & orchards mowing is common for controlling weeds between rows.

However, weeds along rows are another challenge.

How we fix that 👇

WeedTrackr is a low-cost AI weed monitoring system designed for planning sprays in orchards and vineyards.

WeedTrackr automates weed scouting and herbicide application planning, *saving $$$, and mitigating environmental impacts*

Our use case

Precision Ag tools for vineyards & orchards are an emerging market.

Intensive upkeep (like regular mowing) present opportunities for automated passive weed scouting.

How it works

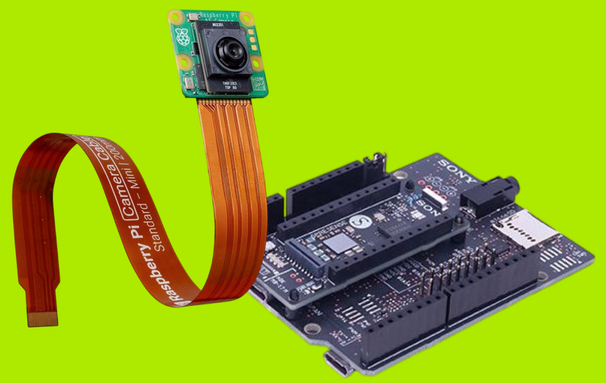
Step 1: Mount WeedTrackr onto your mower or tractor

Step 2: Activate the image collection system by powering on WeedTrackr

Step 3: That's it! Continue with planned activates. WeedTrackr will work while you do!

How it works

Detect

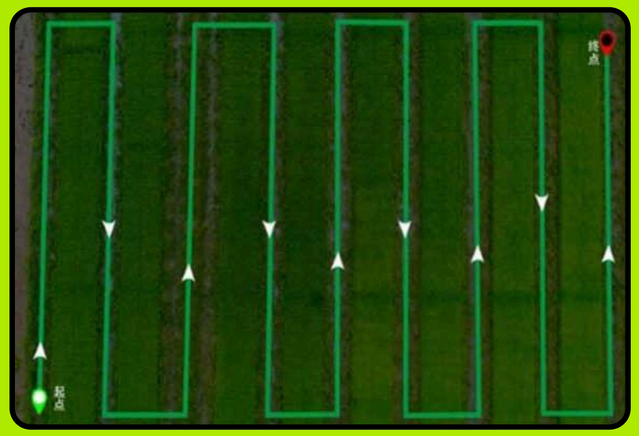


Raspberry Pi AI-Camera + Spresense GPS

Classify

Image-data trained ML model

Plan



Intelligent route planning

Datasets

AgML

iNatAg-mini

roboflow

soil analysis
Object Detection

Broadleaf

500+ images

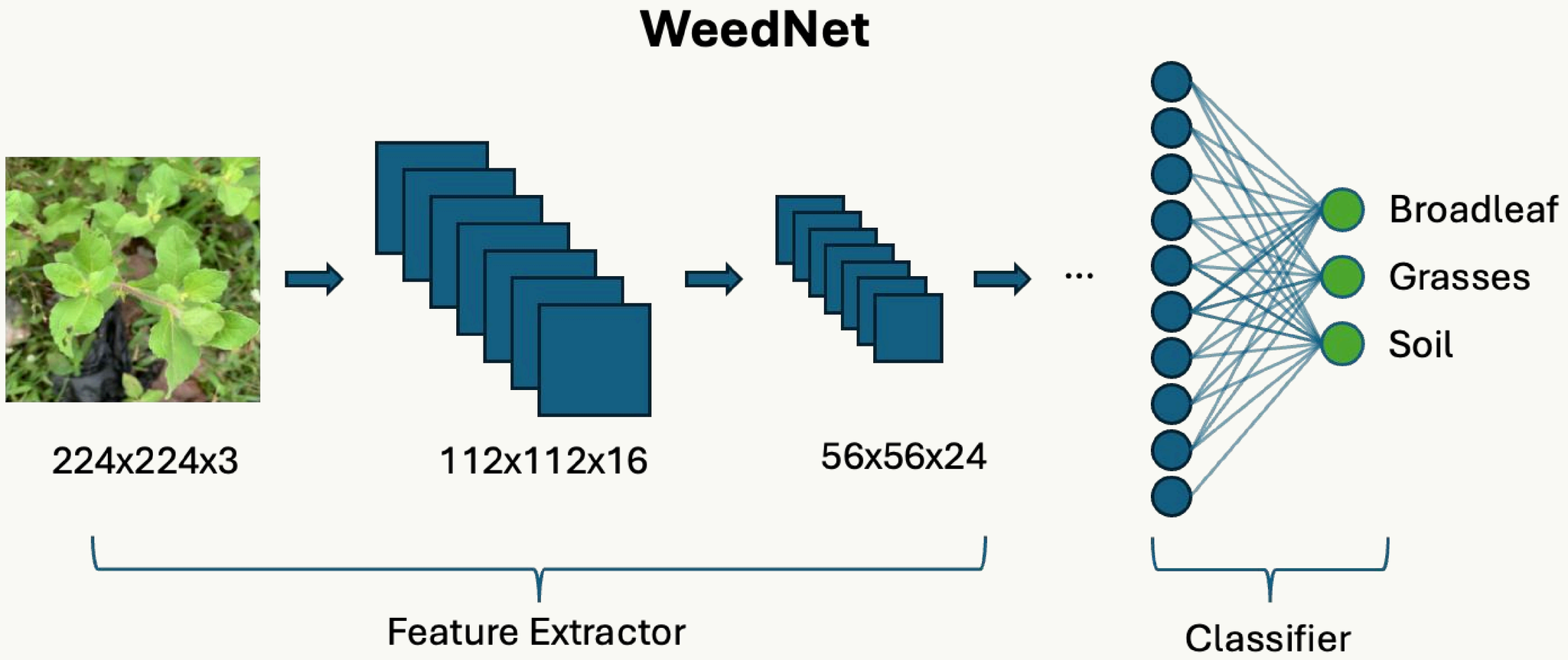
Grass

500+ images

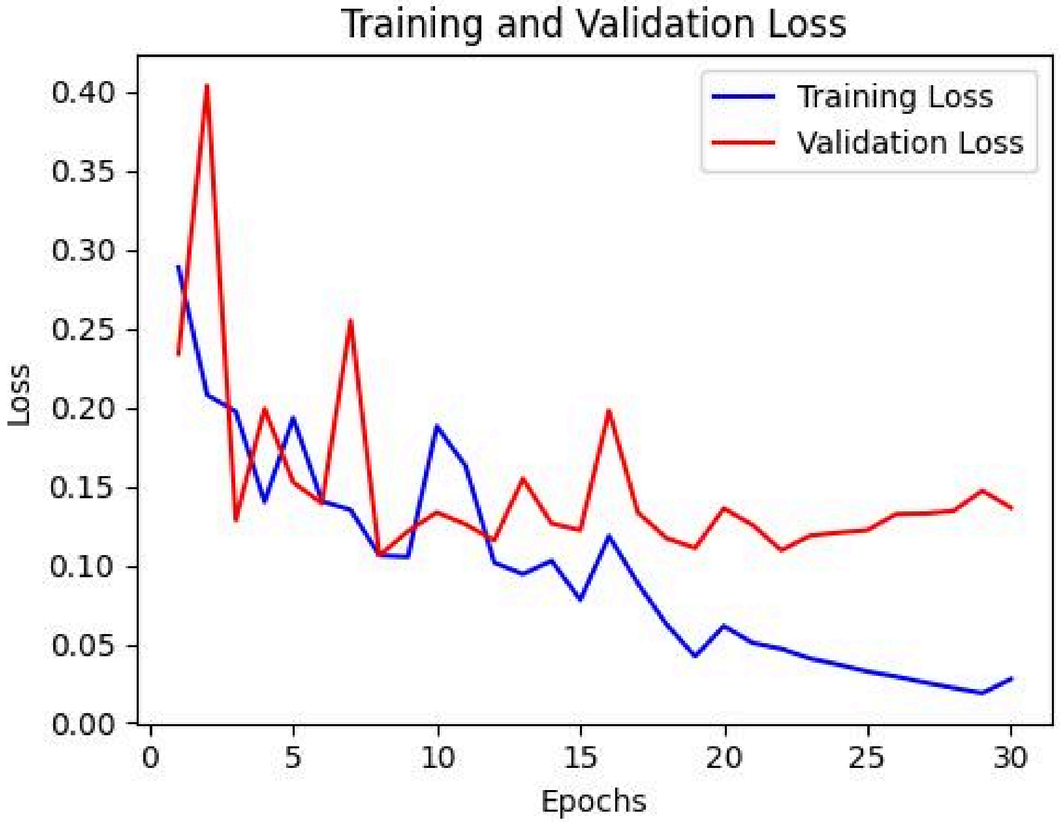
Soil / Background

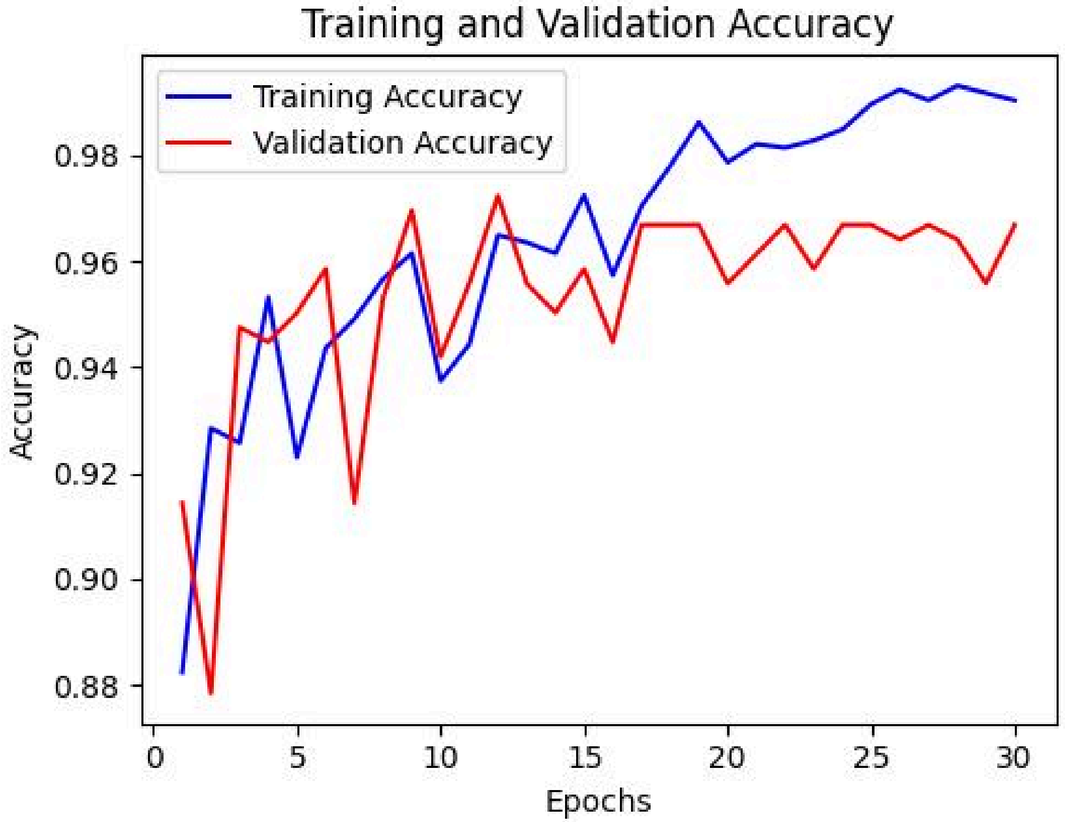
1000+ images

Model


WeedNet
224x224x3
112x112x16
56x56x24
...
Broadleaf
Grasses
Soil
Feature Extractor
Classifier

Model


Training and Validation Loss
Training Loss
Validation Loss
Loss
Epochs
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
0
5
10
15
20
25
30


Training and Validation Accuracy
Training Accuracy
Validation Accuracy
Accuracy
Epochs
0.88
0.90
0.92
0.94
0.96
0.98
0
5
10
15
20
25
30

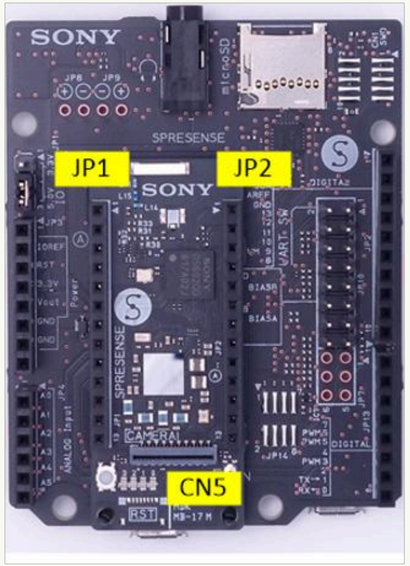
Hardware configurations

Sony IMX 500 AI Camera

GPS Signal

/dev/serial0
RX

TX

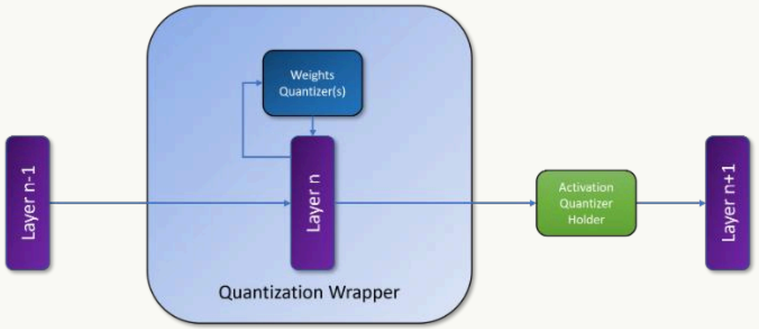


Raspberry Pi Zero 2 W

Sony Spresense Main Board

Deep learning model conversion for IMX500

Model Training



Quantize model using mct_quantize

Convert model using imxconv-pt

```
$ imxconv-pt -I model.onnx
-o output
```

Load model to IMX500 AI Camera

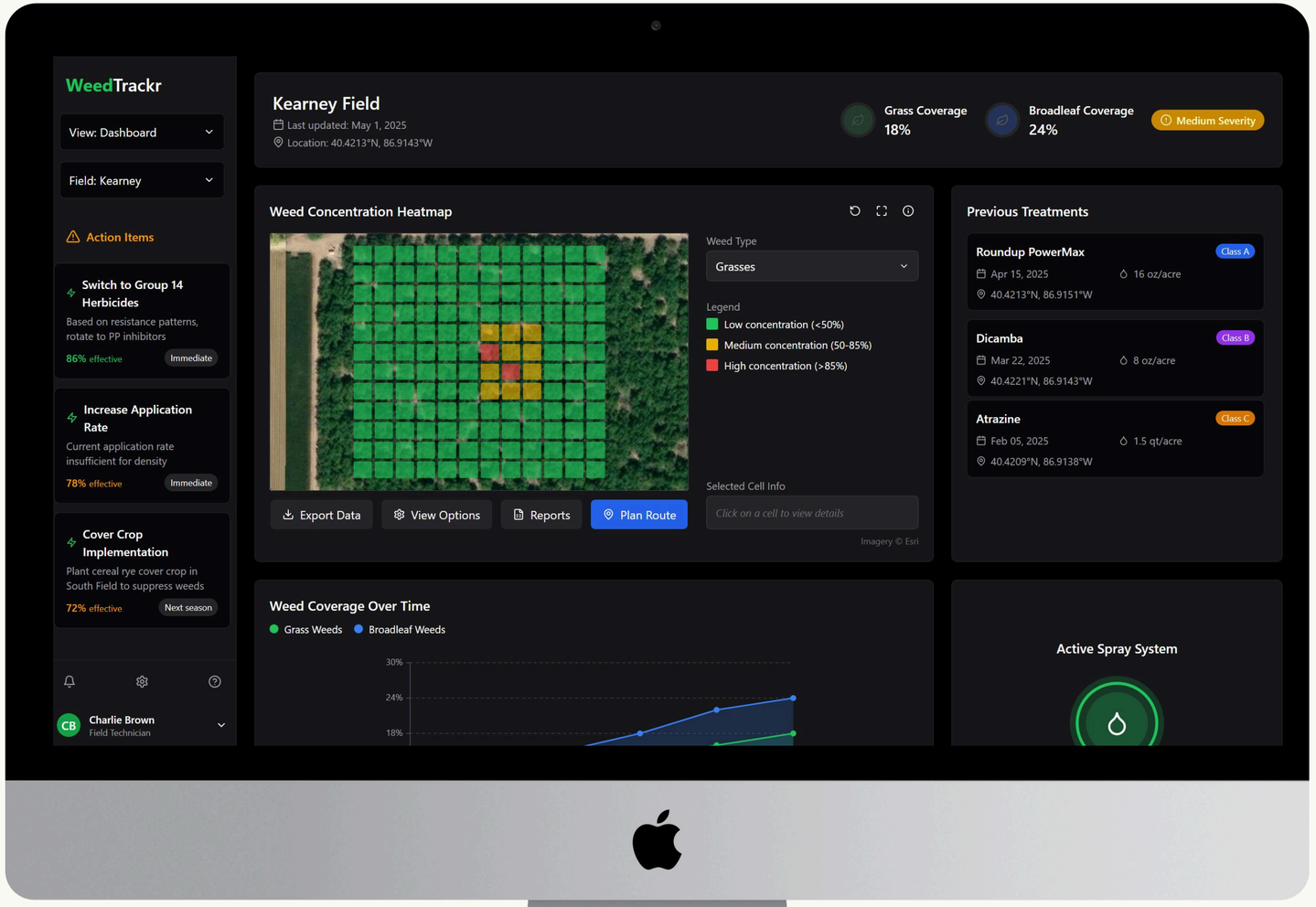
```
imx500 = IMX500(args.model)
```

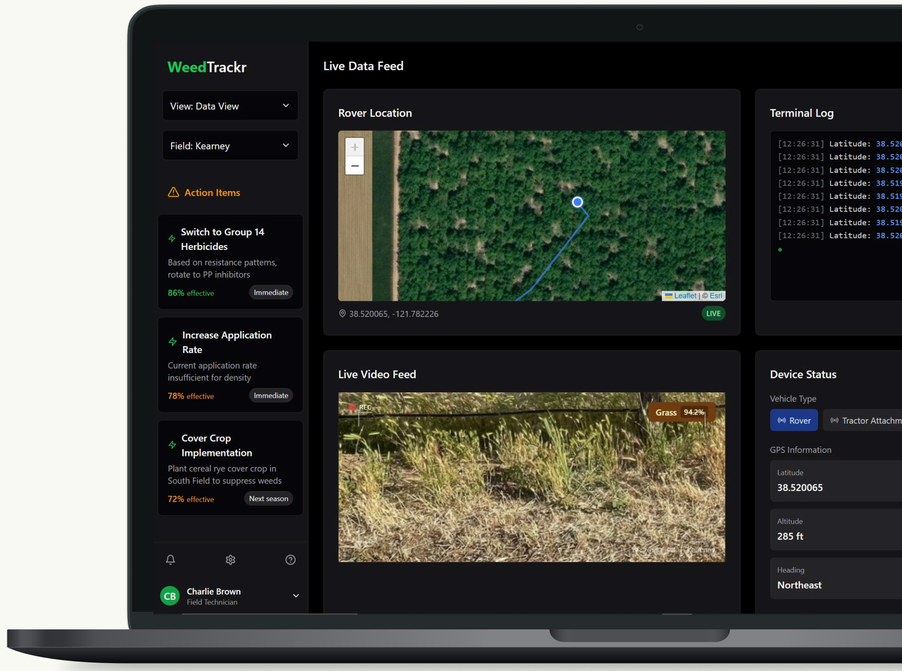
Compile rpk model for IMX500 AI Camera

```
$ imx500-package -i packerOut.zip -o .
```

Let’s see the WeedTrackr in action

Dashboard


WeedTrackr
View: Dashboard
Field: Kearney
Action Items
Switch to Group 14 Herbicides
Based on resistance patterns, rotate to PP inhibitors
86% effective
Immediate
Increase Application Rate
Current application rate insufficient for density
78% effective
Immediate
Cover Crop Implementation
Plant cereal rye cover crop in South Field to suppress weeds
72% effective
Next season
Charlie Brown
Field Technician
Kearney Field
Last updated: May 1, 2025
Location: 40.4213°N, 86.9143°W
Grass Coverage
18%
Broadleaf Coverage
24%
Medium Severity
Weed Concentration Heatmap
Weed Type
Grasses
Legend
Low concentration (<50%)
Medium concentration (50-85%)
High concentration (>85%)
Selected Cell Info
Click on a cell to view details
Export Data
View Options
Reports
Plan Route
Imagery © Esri
Previous Treatments
Roundup PowerMax
Class A
Apr 15, 2025
16 oz/acre
40.4213°N, 86.9151°W
Dicamba
Class B
Mar 22, 2025
8 oz/acre
40.4221°N, 86.9143°W
Atrazine
Class C
Feb 05, 2025
1.5 qt/acre
40.4209°N, 86.9138°W
Weed Coverage Over Time
Grass Weeds
Broadleaf Weeds
30%
24%
18%
Active Spray System


WeedTrackr
View: Data View
Field: Kearney
Action Items
Switch to Group 14 Herbicides
Based on resistance patterns, rotate to PP inhibitors
86% effective
Immediate
Increase Application Rate
Current application rate insufficient for density
78% effective
Immediate
Cover Crop Implementation
Plant cereal rye cover crop in South Field to suppress weeds
72% effective
Next season
Charlie Brown
Field Technician
Live Data Feed
Rover Location
38.520065, -121.782226
LIVE
Terminal Log
Live Video Feed
Grass 94.2%
Device Status
Vehicle Type
Rover
GPS Information
Latitude
38.520065
Altitude
285 ft
Heading
Northeast

So why now? 🤔

1. **Weeds are here to stay**
   And it's time we manage them more efficiently.
2. ***Regulations are tightening***
   Governments are cracking down on overuse and runoff.
3. **Input costs are *climbing***
   Chemicals, labor, and fuel are more expensive than ever.
4. **The tech is ready**
   AI and robotics are finally accessible and scalable.

Here’s the impact

Cut herbicide costs 90%

Only spray where it's needed. No more blanket treatments.

Boost crop yields

Fewer weeds + better plant performance.

Reduce manual labor

Automate weed scouting.

Protect land health

Minimize chemical buildup & preserve long-term biodiversity.

Keep food cleaner

Reduce health issues from herbicide over-usage.

Stay compliant

Meet evolving environmental standards & sustainability goals.

WeedTrackr

Weed vigilance and precision management

🧑‍🌾 Built by Heesup Yun, Jonathan Berlingeri, Ethan Truong, and Nathan Chiu

🌍 2025 AIFS × Sony AI AgTech Challenge