Open Innovation in AgTech:
The OpenWeedLocator Story

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Weed Control

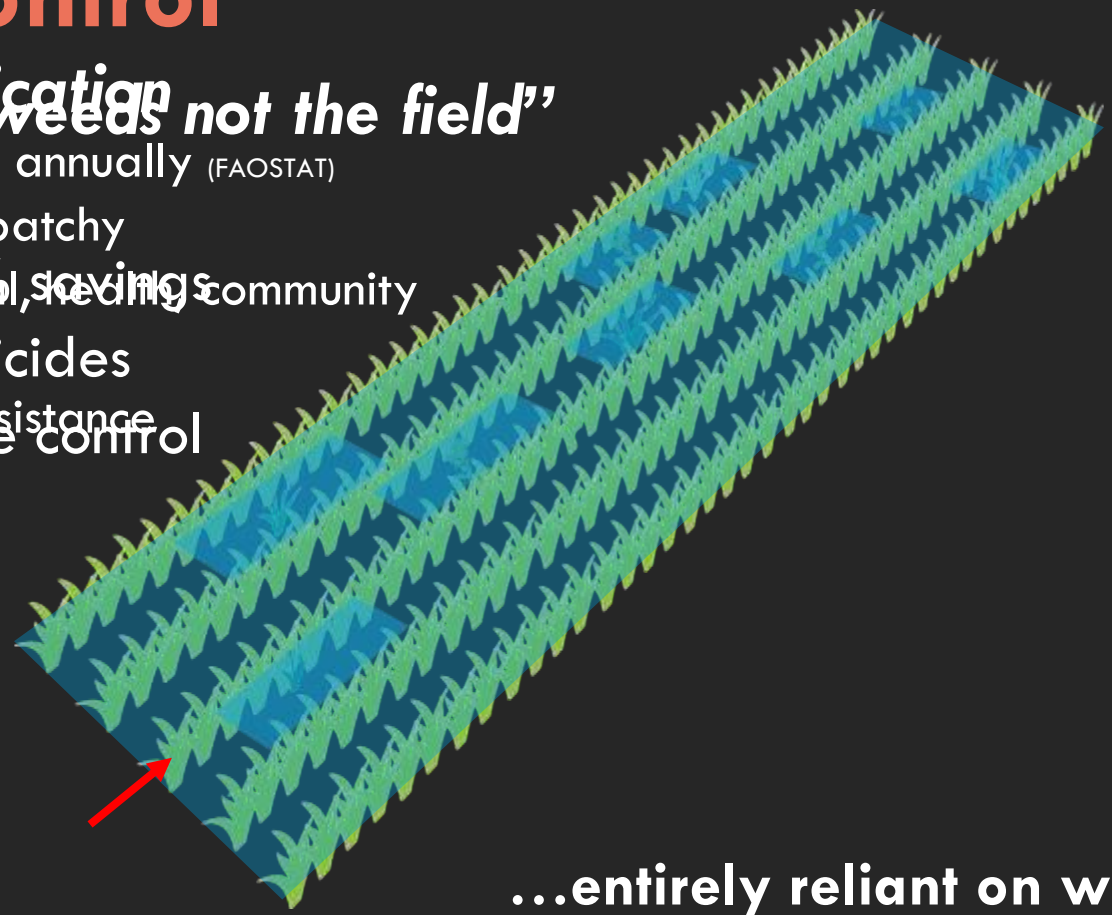
Blanket application

1. Approx. 3Mt annually (FAOSTAT)
2. Weeds are patchy
3. Environmental, healthy, community risks
4. Herbicide resistance

"Treat the weeds not the field"

Benefits

1. Up to 90% savings
2. New herbicides
3. Alternative control



…entirely reliant on weed detection

Weed Recognition

How do algorithms learn?

Input image (data)

121	48	78	126	52	82	130	54	86	134	60
130	55	84	135	58	87	138	61	92	143	66
139	63	91	145	69	92	149	72	92	149	72
145	70	95	151	76	96	154	78	96	154	78
150	78	99	155	82	99	157	83	98	156	82
152	84	102	155	87	100	155	87	98	153	85

Weed Recognition

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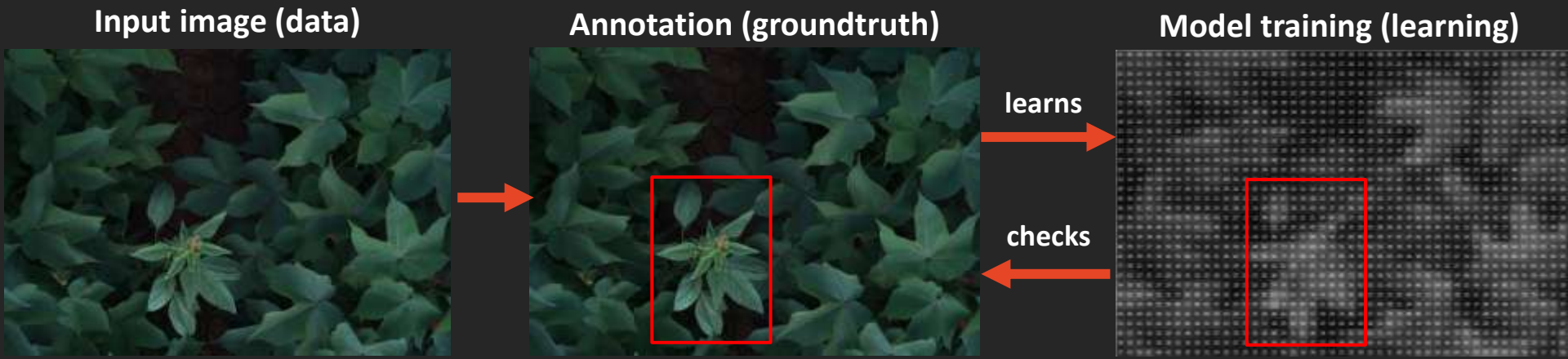
Input image (data)

Weed Recognition

How do algorithms learn?



> 1000s of images needed

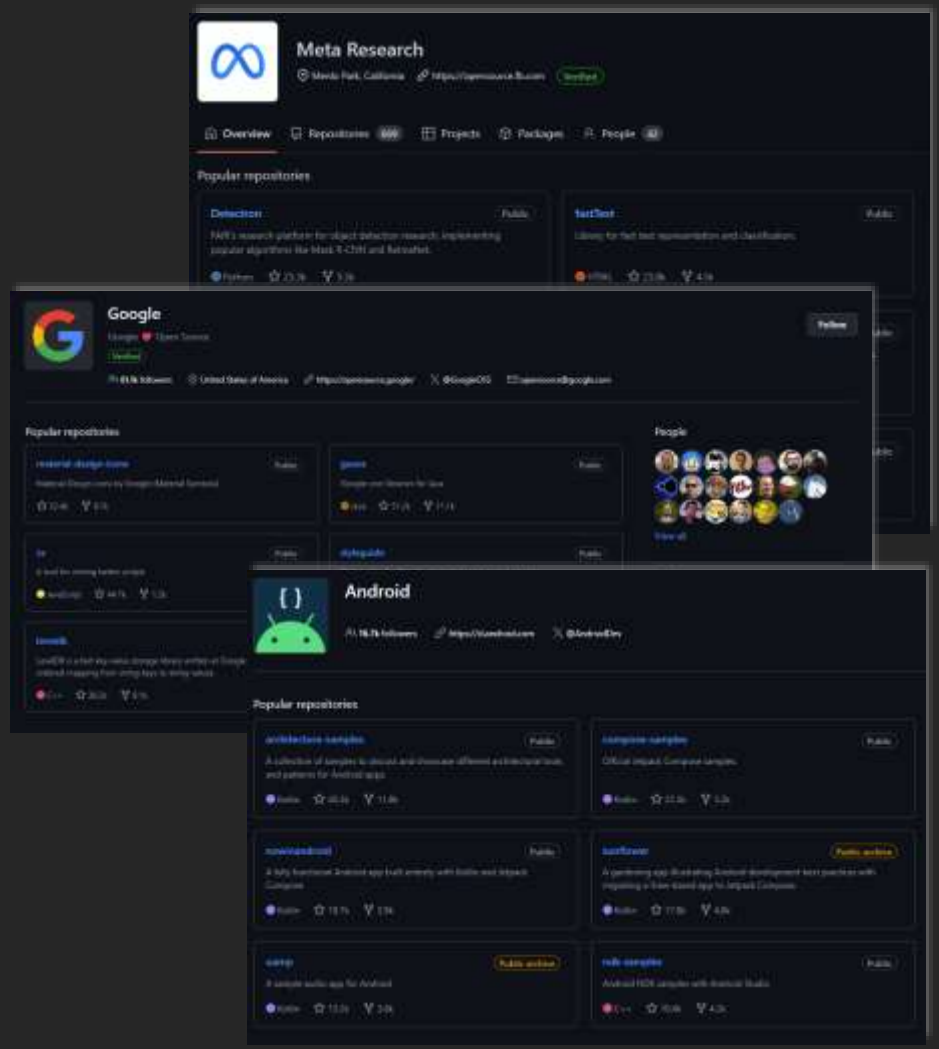
> Dependent on open-source architectures

Open-source Tech

Sharing the tech ‘recipe’

- Collaboration
- Error checking
- Niche use cases
- Lower the barrier to innovation
- User-driven development

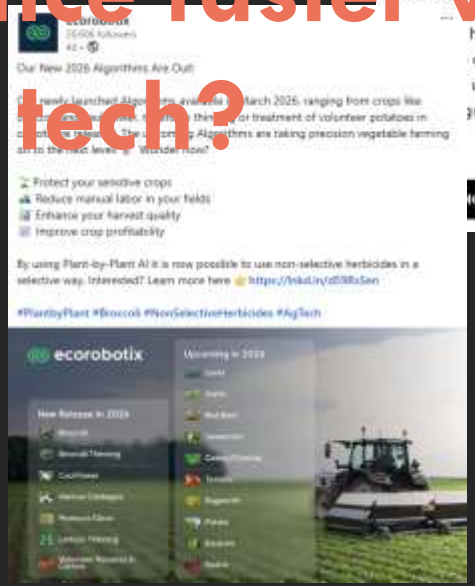
Enables open development and use – encourage collaboration



Can agriculture advance faster with open-source tech?

- Give farmers back the tools for innovation
- Allow better fit with all niches
- Stand on the shoulders of others
- Reduce risk in adoption
- Faster movement

Can agriculture advance faster with open-source tech?

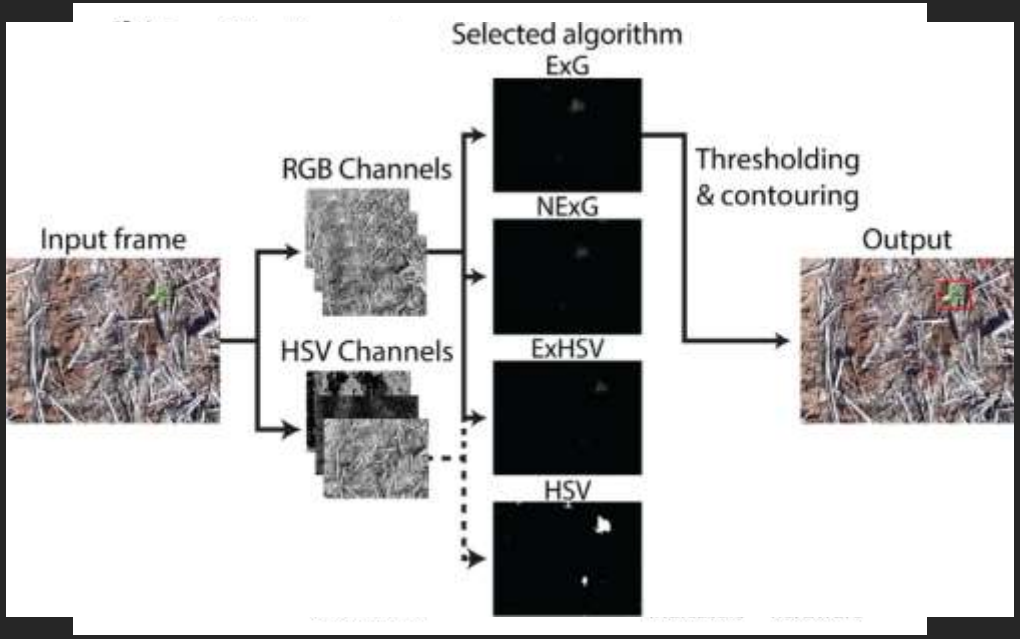


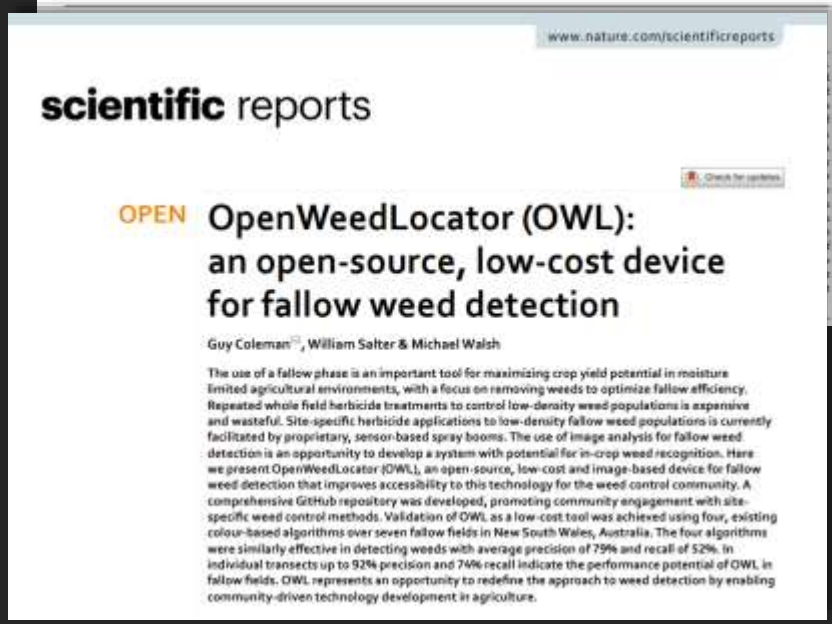
The original open-source ag tools

Lake King Bush Engineer Tractor Museum

OpenWeedLocator

- Educational, low-cost practical tool
- DIY detection, innovation platform
- Open-source software/hardware





Coleman et al. (2022, 2023)

OWL: Community

- Farmer-led innovation
- AUS, CAN, DK, UK, US, FRA, MEX…

Open-source Image Data

GRDC

GROUNDCOVER

GRDC News | Agronomy | Grower stories | Weeds, pests and diseases | Crops | Innovation | Farm business

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SPROUT S

management

1.42 TB (909958 Files)

SPROUT Spotlight: Real Farms, R

Out in the paddock, where dust, h
That's exactly the point of the SPI

An early participant of the SPROUT
OpenWeedLocator (OWL), developed by **Guy Coleman**,
an ag researcher with a DIY mindset. OWL isn't just
another commercial tool, it's an open-source camera
platform that anyone can build and adapt, aimed at
helping farmers detect weeds more accurately and, one
day, control them with greater precision.

From Python Code to the Paddock

Terry Antonio, a grower from Salmon Gums in WA with his autonomous boom sprayer.
Photo: Evan Collis

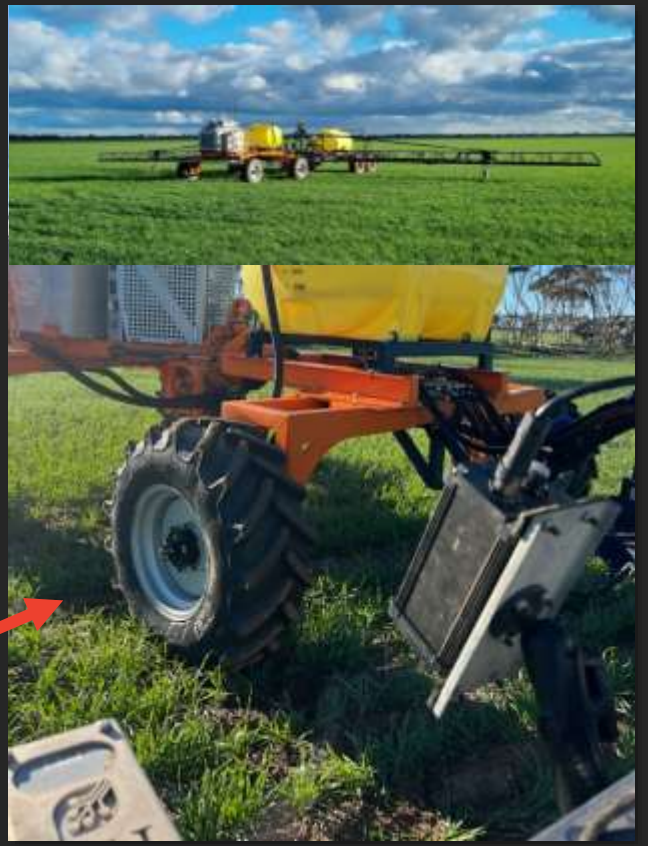
Collecting image data: at scale

Targeted:

- ATV
- Victoria, Australia
- Taastrup, Denmark

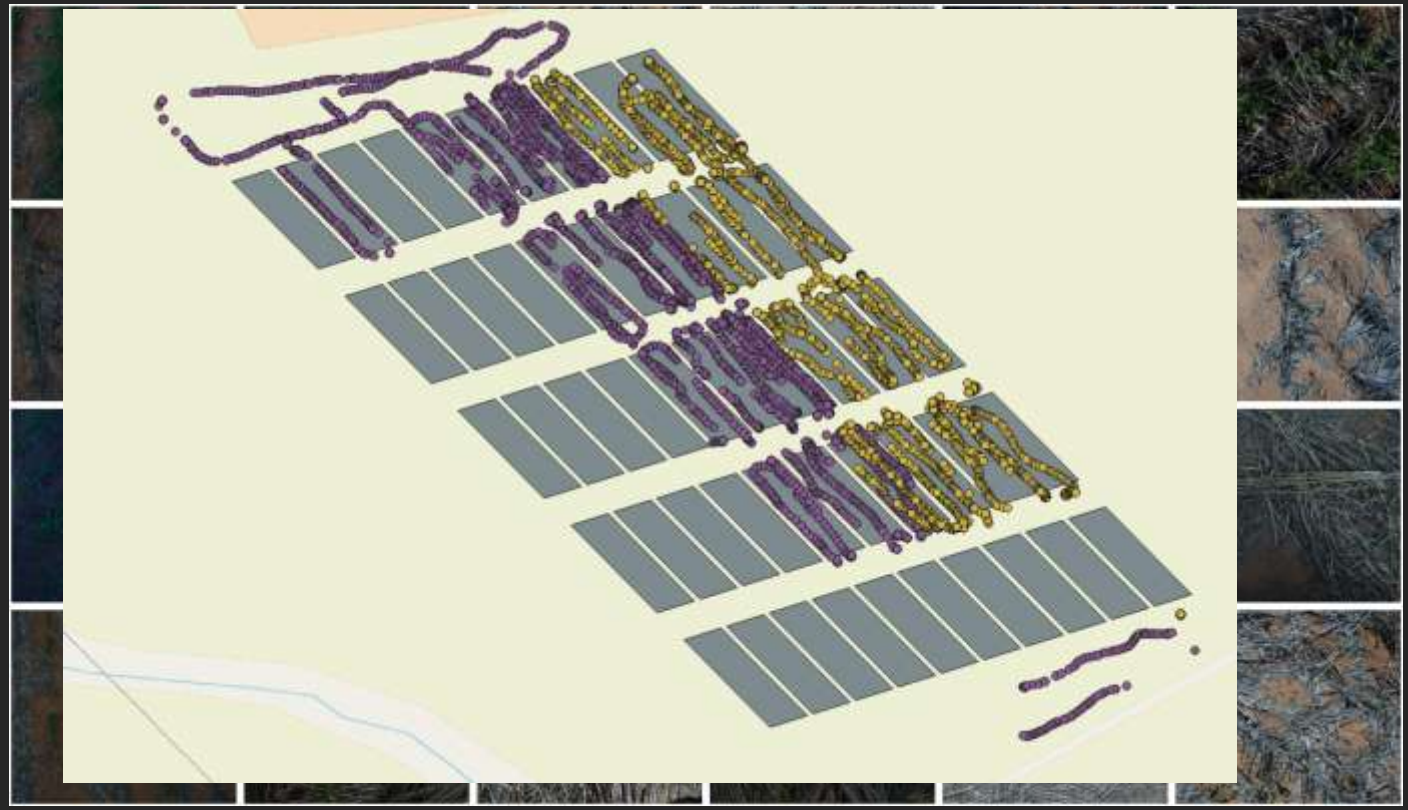
Autonomous

- SwarmFarm Robot
- Salmon Gums, WA
- During spray ops



Results: ATV

- 329.156 images
  - ~30.000 in DK
- ~3.8ha in 19 fields
- **Crops**
  - Wheat
  - Barley
  - Fallow
  - Lentils
  - Chickpea
- **Annotated**
  - FallowML
  - 3.163 img | 7.106 instances
  - 24 species



Results: FallowML

Image Size: 840 x 627 |
BS: 16 | **Epochs:** 100

YOLO11 **RF-DETR**

mAP@0.5:0.95

YOLO11: 0.51 | **RF-DETR:** 0.62

Results

- 416.895 images
  - Approx. 400k discarded
- Crops:
  - Wheat
  - Pasture
  - Fallow
- Challenges
  - Humidity
  - Dust
  - Lighting
  - Stationary collection

Take home messages

- Open-source: you don't need to wait for a company.
- Give back the tools for innovation.
- Allow better fit with all niches.
- You can build your own system tomorrow.
- Reduce risk in adoption
- Faster innovation

Questions

Open-source images
weed-ai.sydney.edu.au

DIY weed detector
Openweedlocator.org

OpenSourceAg Newsletter
openagtech.beehiiv.com

Contact
guycoleman@plen.ku.dk

Kieran Shepherd
University of Sydney, Research Farm 2021

Smarter Weeding: Killing Weeds, Not Biodiversity

THE PROBLEM: The Cost of "Clean" Fields

"Precision Eradication" Creates "Silent Fields"

The goal of 100% weed-free fields **destroys food and shelter** for beneficial insects.

A Flawed Binary View: Crop vs. Weed

This oversimplification ignores the valuable ecosystem services that many non-competitive weeds provide.

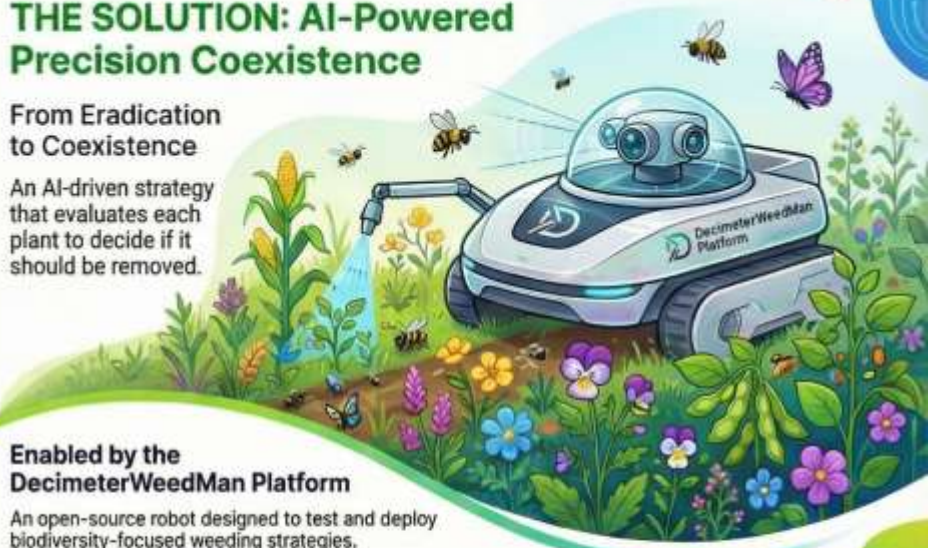
Chasing the Last Weed is Unprofitable

Eliminating the final 2% of weeds often costs more in resources than the potential yield gain.

THE SOLUTION: AI-Powered Precision Coexistence

From Eradication to Coexistence

An AI-driven strategy that evaluates each plant to decide if it should be removed.



Enabled by the DecimeterWeedMan Platform

An open-source robot designed to test and deploy biodiversity-focused weeding strategies.

The Smarter Algorithm: To Spray or Not to Spray?

The system identifies weed species in real-time and applies a nuanced control strategy.

CONTROL STRATEGY	SPECIES EXAMPLE	RATIONALE
SPRAY	Creeping Thistle (CIRAR)	Highly competitive with crops and must be removed.
PRESERVE	Field Pansy (VIOAR)	Provides ecosystem services without harming crop yield.
CHECK SIZE	Common Fumitory (FUMOF)	Not a threat at small sizes; only spray if larger than 40 cm².

NotebookLM