

University of California's Role in Advancing Ag Technology

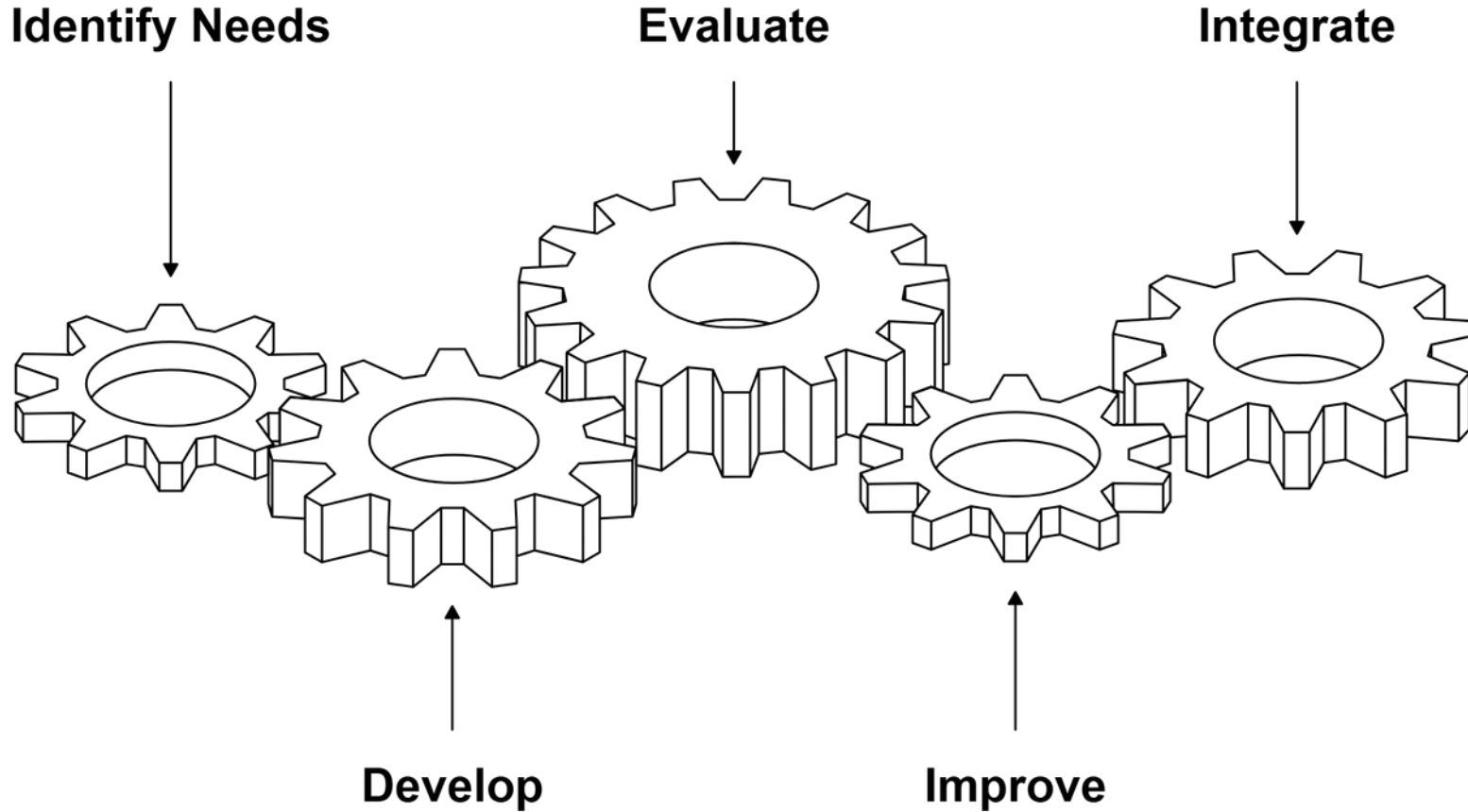
Paramveer Singh and Mark Bolda



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Agriculture and Natural Resources

■ Cooperative Extension

UCCE's Role in Advancing Ag Technology



Problem–Solution Alignment

THE PROBLEM: SOLUTION FIRST *“Looking for a Problem”*



THE COST OF MISALIGNMENT



**Pain for
Investors**



**Pain for
Producers**



**Pain for
Companies**

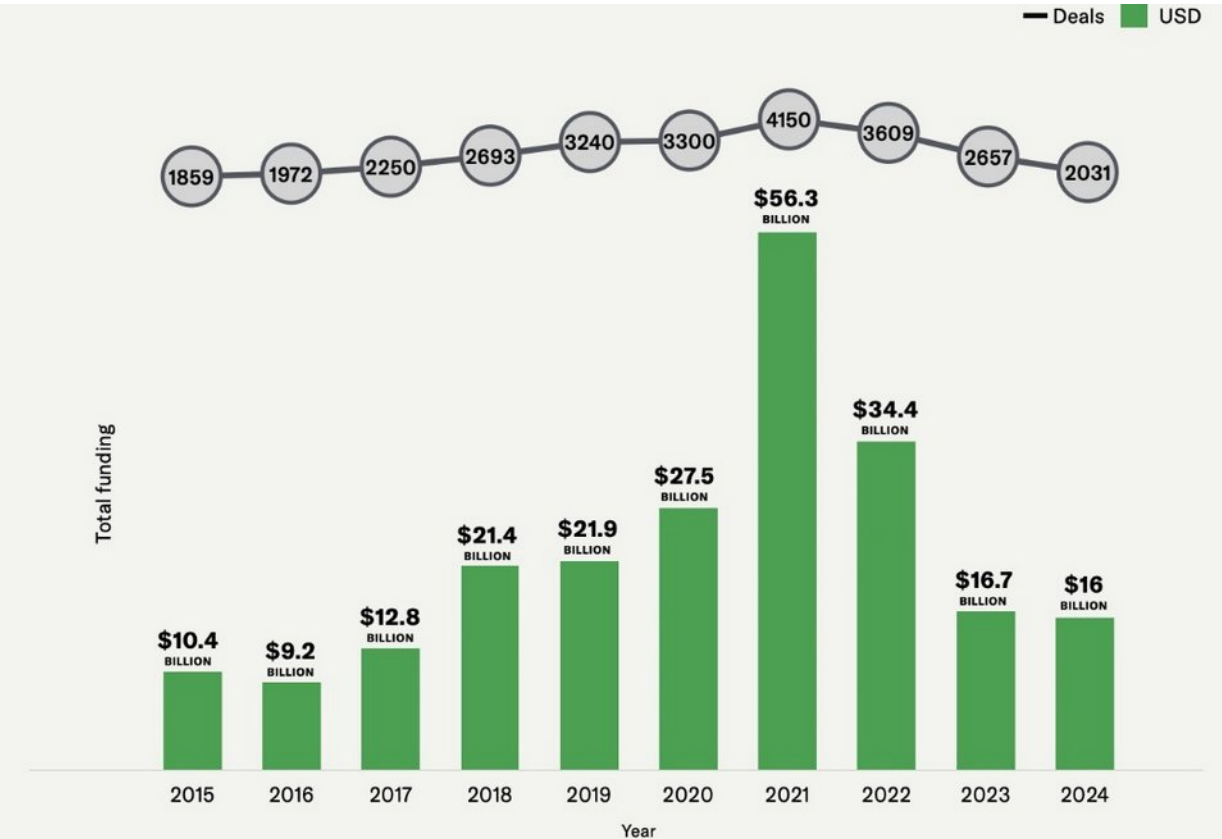
Problem–Solution Alignment



Monarch Tractor shuts down: What went wrong with the \$500M Electric tractor startup

Farm Progress America: Silicon Valley's ambitious electric tractor venture has collapsed, leaving dealers and farmers with broken promises and unusable machines.

Plenty, an autopsy: It promised the moon, but plants don't run on pitch decks, say experts



Source: AgFunder Global AgriFoodTech Investment Report 2025

Problem–Solution Alignment

- Our approach starts with needs assessment.
- We engage growers, advisors, and end users through surveys, meetings, field trials, and demos.
- Grower feedback helps us prioritize the most urgent and practical problems.
- This alignment reduces adoption barriers, investor risk, and implementation challenges.
- To date, we have engaged with more than 20 startups and service companies to share grower-centered insights.



**Needs
Assessment**



Prioritization



Benefits



Partnerships

The goal is to support programs, and technologies that solve real problems and fit existing farming systems.

Evaluation-Improvement-Integration

1. AI-Automation-Powered Next Gen Farm Equipment

UCCE Role : Field demos, efficacy assessment,
grower feedback loop

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2. Drone Spraying: Aerial Innovation

UCCE research on optimal spray height, speed,
volume.

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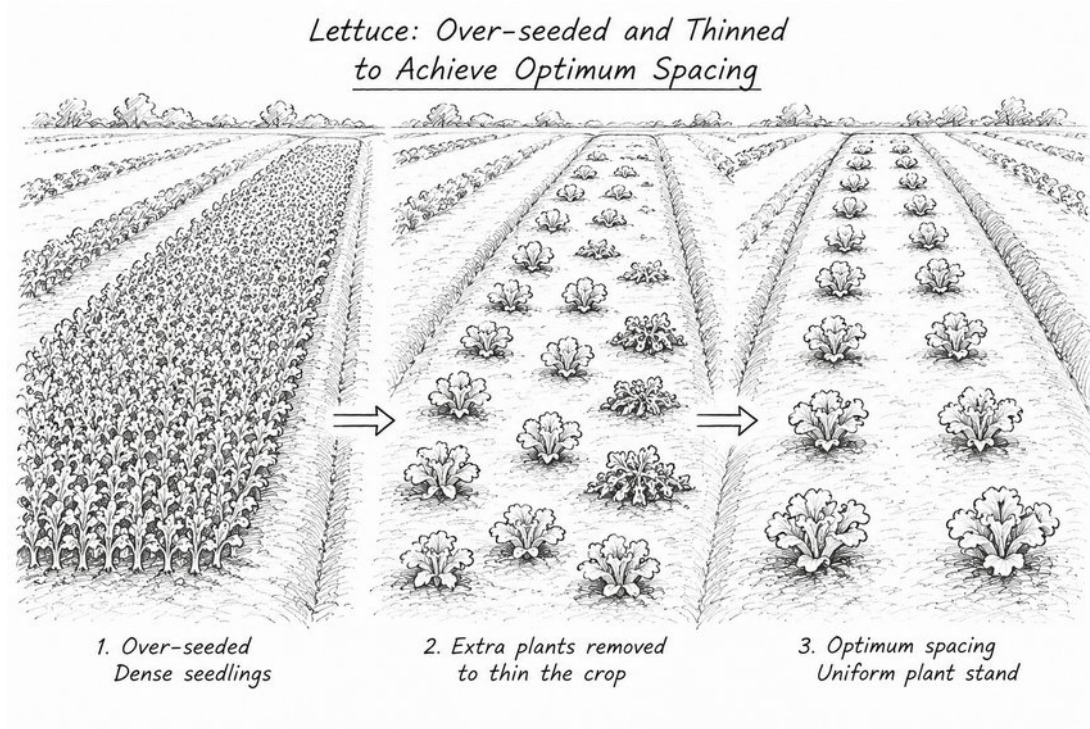
2. Drone Spraying: Aerial Innovation

UCCE research on optimal spray height, speed,
volume.

3. Improving resource use efficiency and reducing environmental costs of Agriculture

Biologicals: The Next Frontier in Crop Protection and
Nutrition

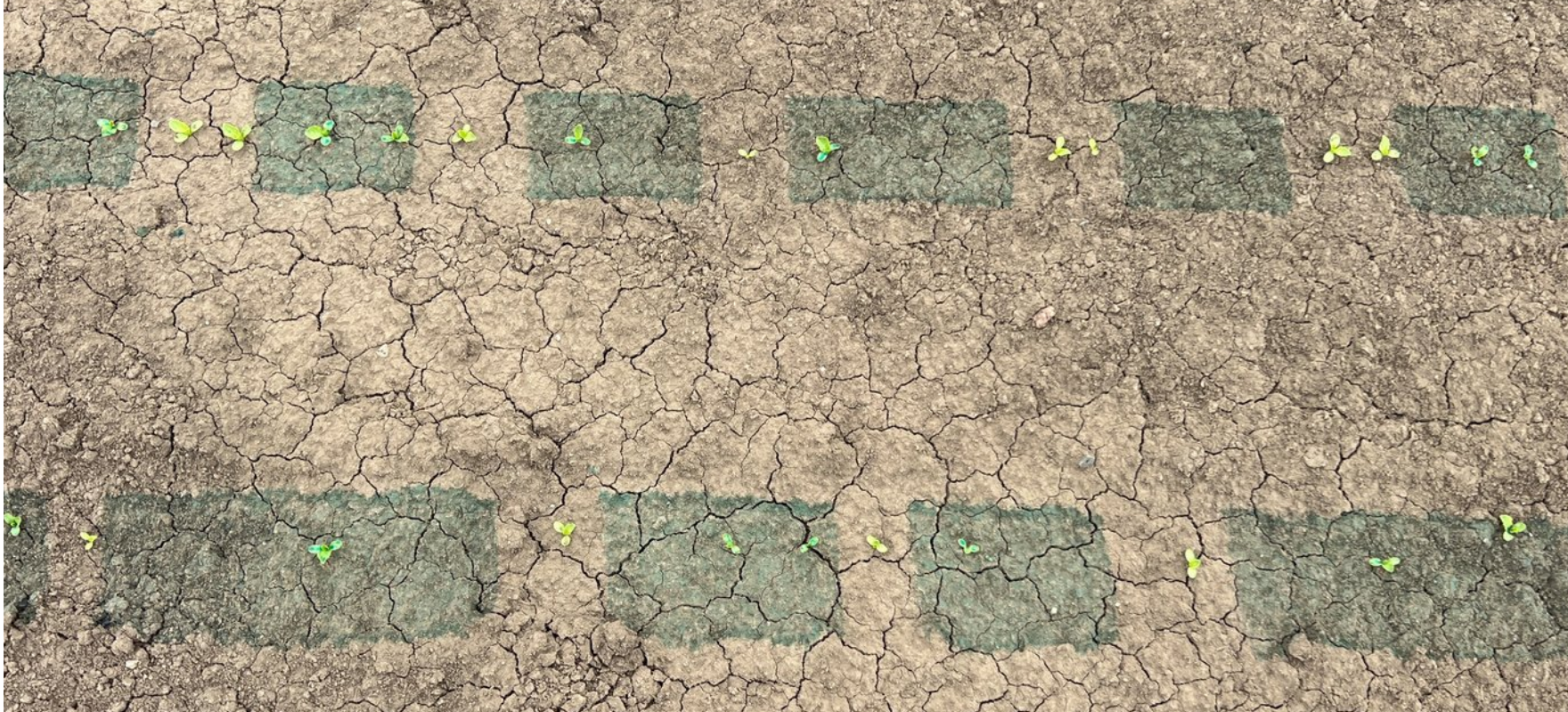
Carbon Robotics Laser Thinning Evaluation Trial 2026



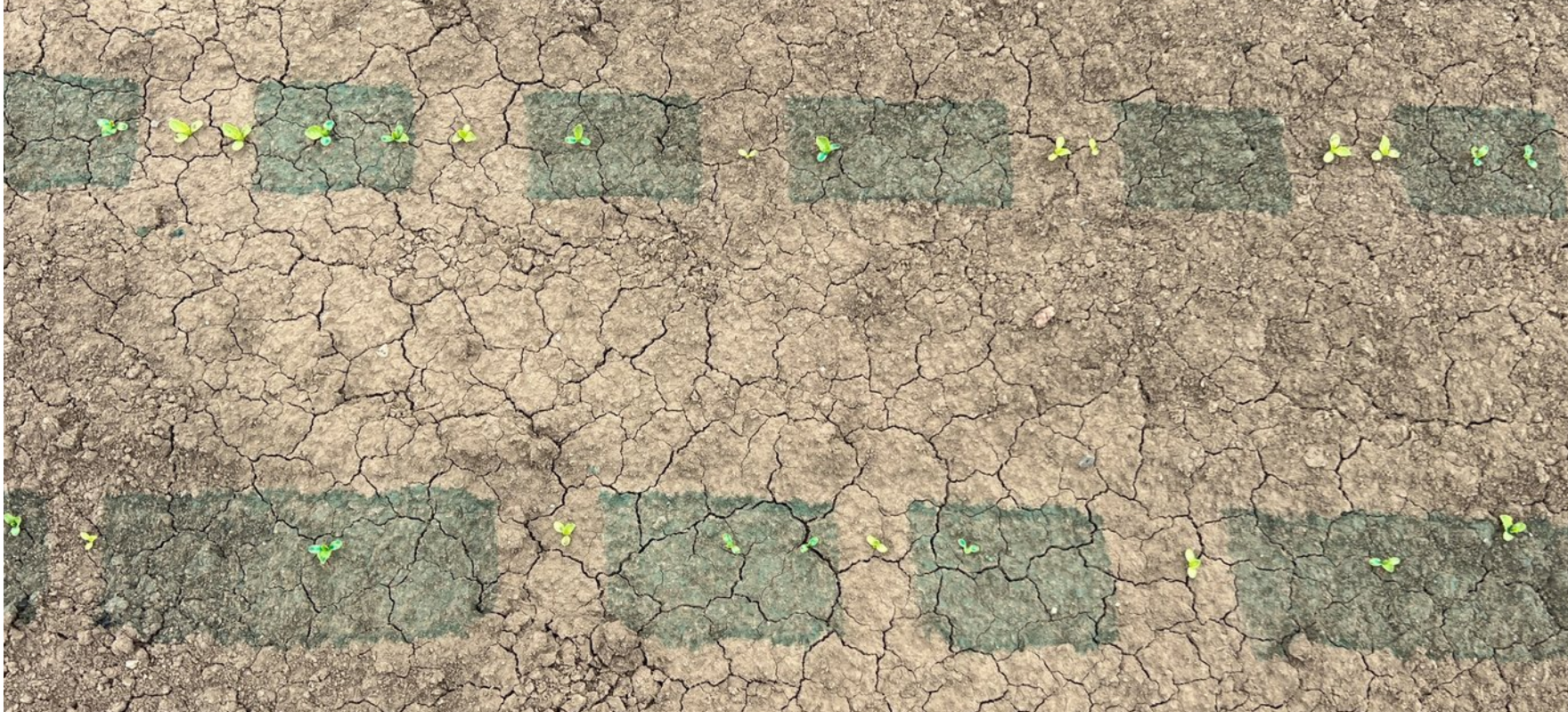
Carbon Robotics Laser Thinning Evaluation Trial 2026



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Carbon Robotics Laser Thinning Evaluation Trial 2026



Number of doubles left after treatment application per acre

Treatment	Field A	Field B
Carbon	1013 ± 1337	240 ± 221
Vision Robotics	7383 ± 1670	4040 ± 1119

Time taken to remove the doubles left after treatment application per acre

Treatment	Field A	Field B
Carbon	1 hr 47 m	1 hr 42 m
Vision Robotics	4 hr 30 m	2 hr 56 m



Drone Technology

Expanding use cases: Spray application

Spray Drones in Salinas Valley Lettuce: Landscape, Gaps & Goals



- Health & Safety
- Labor Constraints
- Environmental & Terrain

Crop Duster Crashes into Lettuce Field

No one was hurt when the helicopter went down while doing doing aerial agricultural spraying Wednesday morning.

Helicopter spraying pesticides crashes near Gonzales

Pilot walked away with no injuries

Spray Drones in Salinas Valley Lettuce: Landscape, Gaps & Goals

- **Who's operating now:** local stand-alone providers, chemical companies, and growers.
- **Field feedback:** some pilots expressed they are “**shooting from the hips**”
- **Guidance gap:** limited standards for spray application methods and the tech itself
- **Program goal:**
 - Identify the most effective **technical & operational strategies** for drone-based chemical application.
 - Develop **tailored solutions** for local specialty-crop production

Objectives

Objective 1: To evaluate commercial unmanned aerial application systems (UAAS) for spray deposition and uniformity under different operational parameters.

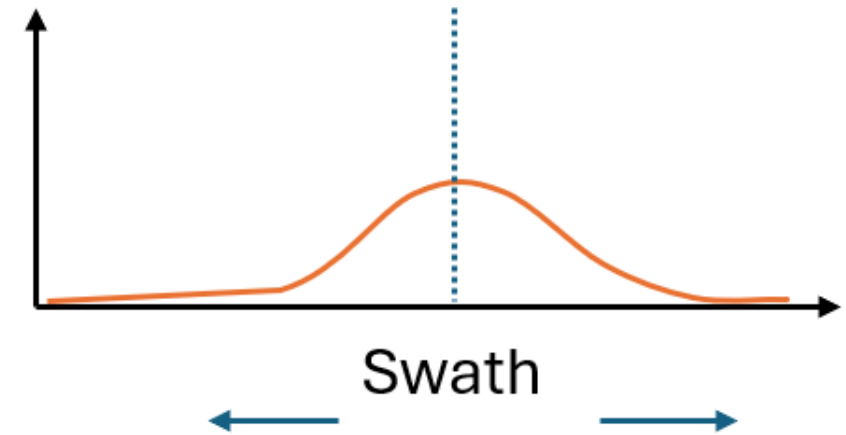
Objective 2: To evaluate and compare the spray deposition and penetration in different regions of the lettuce canopy using different drone technologies.



Methods



Observations

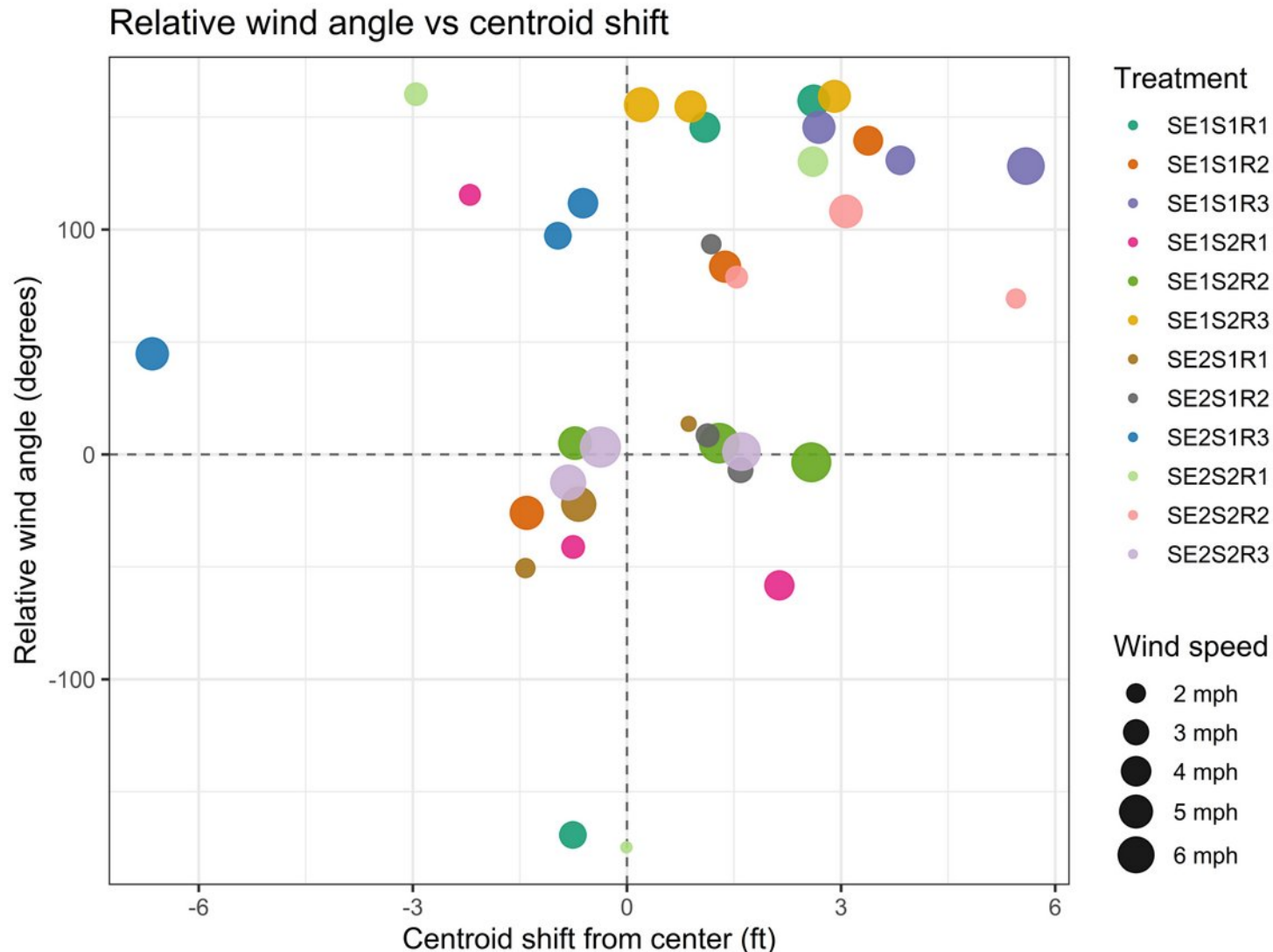


Coverage fraction: percentage of the card surface that got covered by spray droplets.

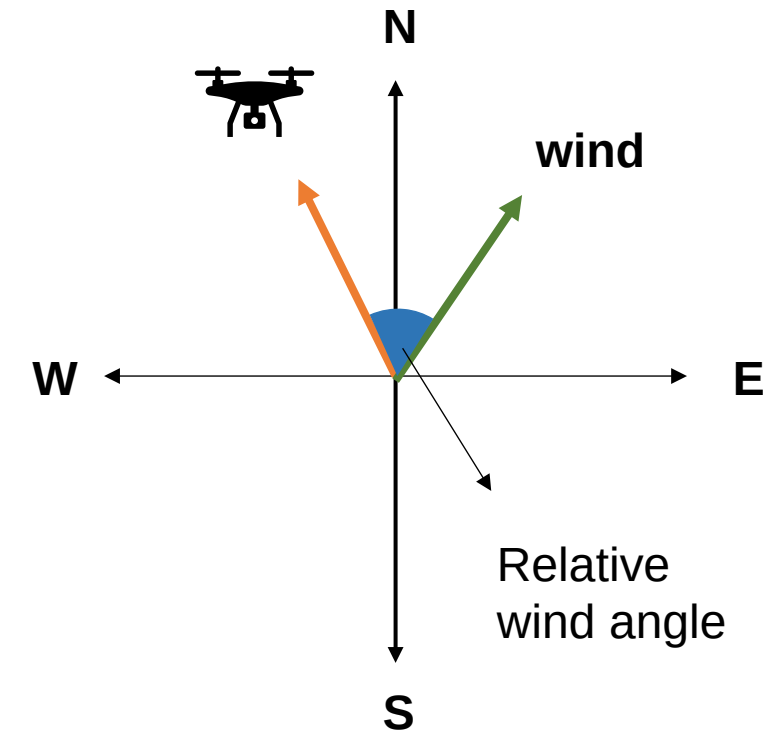
Effective swath width: usable spray width that can be repeated pass after pass with overlap while still giving reasonably uniform coverage.

Centroid: average center of where the spray was deposited across the swath, showing whether the pattern shifted left or right from the intended centerline

Even at lower speeds, wind direction moved the center of the drone spray pass



If I stand on the drone's path and look forward, how far to the left or right is the wind drift direction



Biologicals

The Next Frontier in Crop Protection and Nutrition

Sorting the Science from the Noise: UCCE's Biologicals Evaluation Initiative

PESTICIDES

California cracks down on neonicotinoid pesticides

Proposed regulations aim to protect pollinator health

Farm fertilizers contaminate thousands of wells in the Salinas Valley

Pesticide resistance building among spotted-wing drosophila

The insect is a problem for growers of cherries, caneberries and strawberries.

05/16/2025 | Announcement

DPR Proposes Regulations to Update Its Groundwater Protection List, Identifying the Pesticides with Potential to Pollute Groundwater



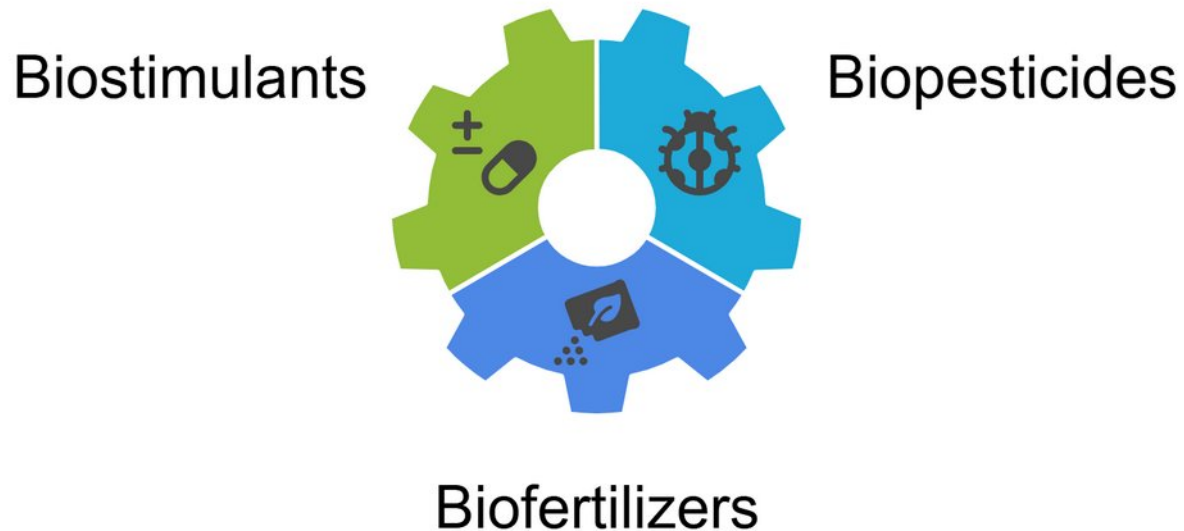
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Sorting the Science from the Noise: UCCE's Biologicals Evaluation Initiative

The push to find solutions to reduce the use of synthetic inputs has led to a movement towards biologicals.

The biological market more than **1,200** companies identified that produce at least one biological product.



Salinas Valley Biological Product Evaluation Trials



**UCCE
Advisors**



CSU MB



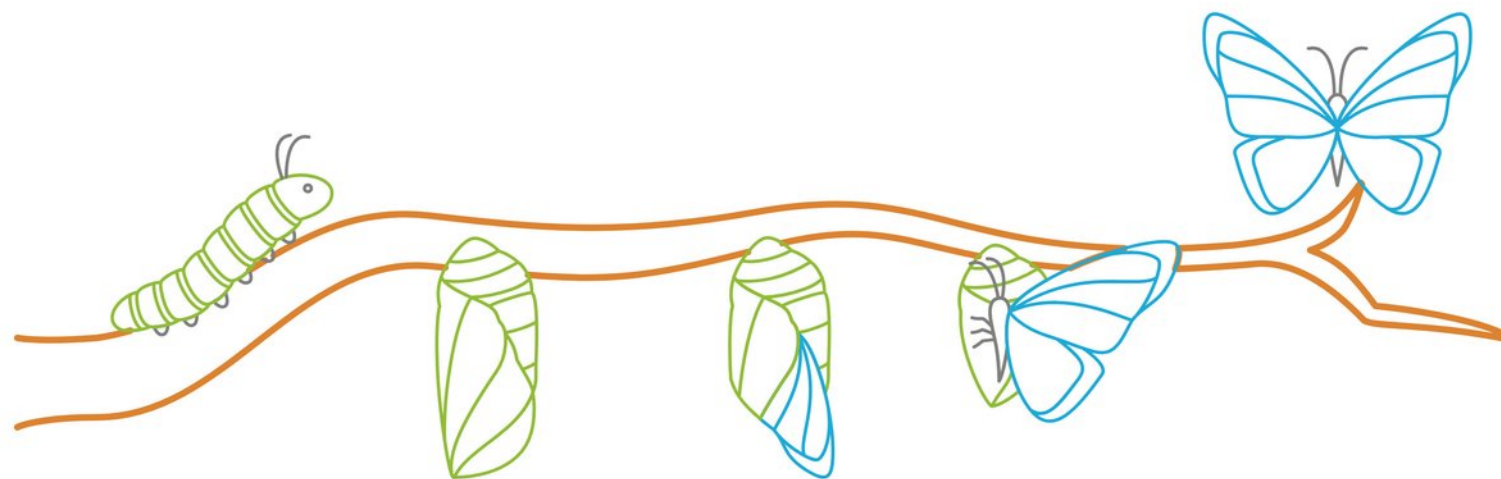
Growers



Industry



**Commodity
Boards**



**Untested
Products**

Unknown
efficacy and
benefits

Field Trials

Test efficacy and
verify claims

**Economic
Analysis**

Determine cost-
effectiveness for
growers

**Integration
Planning**

Incorporate into
grower
operations

**Verified
Products**

Effective and
beneficial
solutions

Salinas Valley Biological Product Evaluation Trials



**UCCE
Advisors**

2025: Tested 8 products

2026: Testing of 9 products underway



CSU MB



Growers



Industry



**Commodity
Boards**



Decision Support Tools

Empower growers with easy to use applications

A library of decision support tools

Smart Weeder & Thinner ROI Calculator

☒ Include depreciation (annual ownership cost) ⓘ

Expected machine life (years) ⓘ

7

Summary Results

Annual Savings
\$18,357

ROI (%)
15.3

Payback Period (Years)
6.5

Overall Chemical Reduction (%)
80.0



Decision Support Build for the Field.

CropManage is a free online decision-support tool for irrigation and nutrient management. It uses weather, soil, and crop data to deliver precise irrigation and nitrogen fertilizer recommendations.



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Extending the knowledge

Taking the findings to the end-users

Extension and outreach

Demonstration Field Days



Educational workshops

Artificial Intelligence (AI) for Sustainable Agriculture Workshop

November 6, 2024 By Paramveer Singh, Michael D Cahn

Pest Management & Plant Health Agriculture

When: December 3rd, 2024

Posts at UCANR Salinas Valley Blog

California Agriculture Takes Flight: A Guide to Drone Spray Pilot Certification

May 29, 2025 By Paramveer Singh

Article

2025 Biological Product Evaluation Trial in Romaine Lettuce: What Did We Learn?

February 25, 2026 By Paramveer Singh

FCC Covered List Update: Two Temporary Exceptions for Drone Supply in 2026

January 12, 2026

By Paramveer Singh

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