

CropManage: Online irrigation and nutrient management tool



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Salinas River at Chualar Bridge (January 2017)



Nitrogen Use Reporting

TIER 2/TIER 3 FARMS WITH HIGH NITRATE LOADING RISK

TOTAL NITROGEN APPLIED REPORT - RANCH/RISK UNIT & FIELD/BLOCK

Page 1 of 3 - September 26, 2016 Version

EMAIL FORM AS AN ATTACHMENT: Attach completed and saved form to an email and send to AgNOI@waterboards.ca.gov

Reporting Period: 09/01/2015 to 08/31/2016

Any changes to the reporting period must be approved or form will not be accepted.

CONDITIONAL WAIVER OF WASTE DISCHARGE REQUIREMENTS FOR DISCHARGES FROM IRRIGATED LANDS - REGIONAL BOARD ORDER R3-2012-0011

Annually by October 1st, Tier 2 and Tier 3 dischargers with High Nitrate Loading Risk must report total nitrogen applied and present in the soil.

[Click below to clear the corresponding section of the form.](#)

[Hover over the cells/boxes with your mouse for more information on what is required. Refer to instructions for further detail.](#)

Section I Section II Section III Section IV All

SECTION I: GENERAL RANCH INFORMATION <small>(Space for more parcels and multiple counties available on page 2)</small>												
AW#:	<input type="text"/>	Ranch Global ID:	<input type="text"/>	Ranch/Risk Unit or Field/Block Name:	<input type="text"/>	Physical Ranch Acres Reporting:	<input type="text"/>	Fallow Acres:	<input type="text"/>	<small>(If fallow entire report period)</small>		
County:	<input type="text"/>	APN(s):	<input type="text"/>	<input type="text"/>	<input type="text"/>	Sum of Total Crop Acres:	<input type="text" value="0.0"/>	<small>(Auto-calculates from Section IV)</small>				
<small>If ranch is a greenhouse, nursery, or hydroponic, select from the dropdown:</small>												
SECTION II: NITROGEN APPLIED WITH IRRIGATION WATER <small>(Include all uses, e.g. leaching; and all sources, e.g. CSIP or PVWMA delivered water)</small>						SECTION III: NITROGEN APPLIED WITH COMPOST & AMENDMENTS						
Section II-A: PVWMA/CSIP water use		Section II-B: PVWMA/CSIP water		Section II-C: Well/city water (or other non-PVWMA/CSIP source)		Section II-D: Nitrogen applied		Section II-E: Volume check				
Was PVWMA/CSIP water used during the reporting period?				Average Nitrate Concentration in Well/City Water (mg/L)		Estimated Total Volume of Well/City Water Applied to Entire Reporting Acres During Reporting Period (gallons)		Nitrogen Applied with Irrigation Water (lbs/ranch-ac)		Physical Acres Receiving Compost & Amendments		
<input type="text"/>				<input type="text"/>		<input type="text"/>		<input type="text"/>		<input type="text"/>		
				<input type="checkbox"/> as Nitrate (NO3) <input type="checkbox"/> as Nitrogen (NO3-N or N)		This field can be erased before submittal. Do not include volume of PVWMA/CSIP water applied. To convert from acre-feet or acre-inches to gallons, use the Excel tool 'convert_to_gallons'		This field auto-calculates. After completing Sections I-IV, check the estimated average acre-feet of water applied to each crop-acre grown		Applications of nitrogen from compost and amendments (not fertilizers) made to improve soil properties, and/or as a source of nitrogen to ALL crops grown during the reporting period may be reported here. Alternatively, the nitrogen may be distributed accordingly between the crops and reported in Section IV. Do not report this information in both sections.		
<small>-Section II-D will auto-calculate based on Sections II-B, II-C, and ranch acreage.</small>				<small>To calculate the weighted average concentration if more than one sample from one or more sources of irrigation water was used, use the Excel tool 'weighted_avg_conc'</small>		<small>Excel tool 'convert_to_gallons'</small>						
SECTION IV: NITROGEN APPLIED WITH FERTILIZERS & OTHER MATERIALS AND NITROGEN PRESENT IN SOIL <small>(The Excel tool 'N_from_fertilizers' assists with calculations in this section)</small>												
	Specific Crop(s) Grown and Harvested During Reporting Period <small>(Select from List on Page 3)</small>	Total Crop Acres	Nitrogen Present in Soil <small>(lbs/ac)</small>	Nitrogen Applied in Fertilizers and Other Materials <small>(lbs/crop-ac)</small>	O/C	Additional Information	Specific Crop(s) Grown and Harvested During Reporting Period <small>(Select from List on Page 3)</small>	Total Crop Acres	Nitrogen Present in Soil <small>(lbs/ac)</small>	Nitrogen Applied in Fertilizers and Other Materials <small>(lbs/crop-ac)</small>	O/C	Additional Information
1.	<input type="text"/>					<input type="text"/>	11.					
2.							12.					
3.							13.					
4.	<input type="text"/>						14.					
5.							15.					
6.							16.					
7.							17.					
8.							18.					

Tools for making water and nitrogen fertilizer decisions at the field level

- Soil nitrate quick test
- Weather-based irrigation scheduling



On-farm challenges in implementing tools for managing water and fertilizer:

- ✓ **Multiple fields to manage and track**
- ✓ **Other decisions and activities to coordinate**
- ✓ **Calculations involved for N and water management decisions are time consuming**
- ✓ **Collected data needs to be available to the decision maker(s) and decisions need to be communicated to field staff**



CropManage: online irrigation and N management decision support tool

<https://cropmanage.ucanr.edu>

CropManage Bondesen ▼ Español ➔ Log out

Welcome to CropManage

Ranch List

Ranch	Active Plantings	Total Plantings	
Bondenson	0	17	▼
Bondesen	0	39	▼
Callaghan Ranch	0	82	▼
DaRosa	0	1	▼

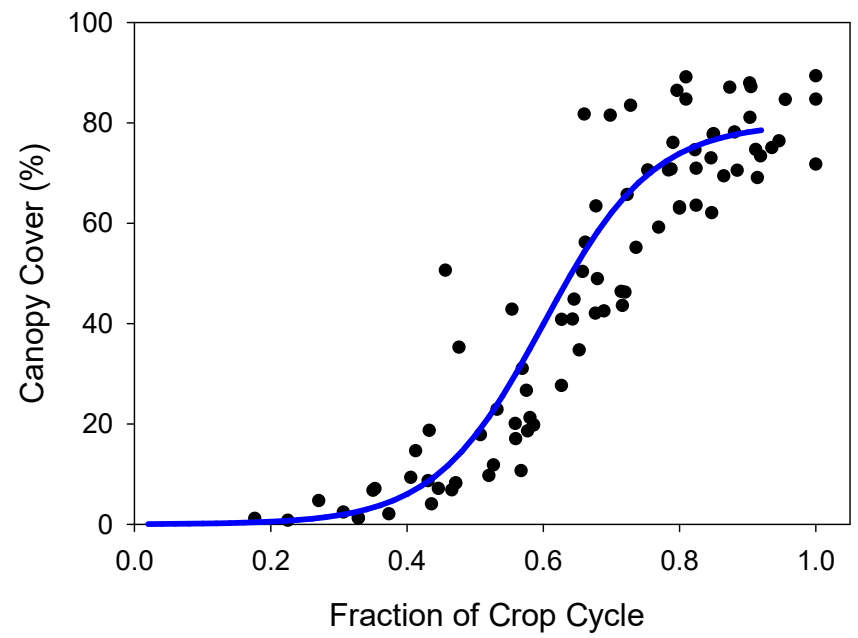
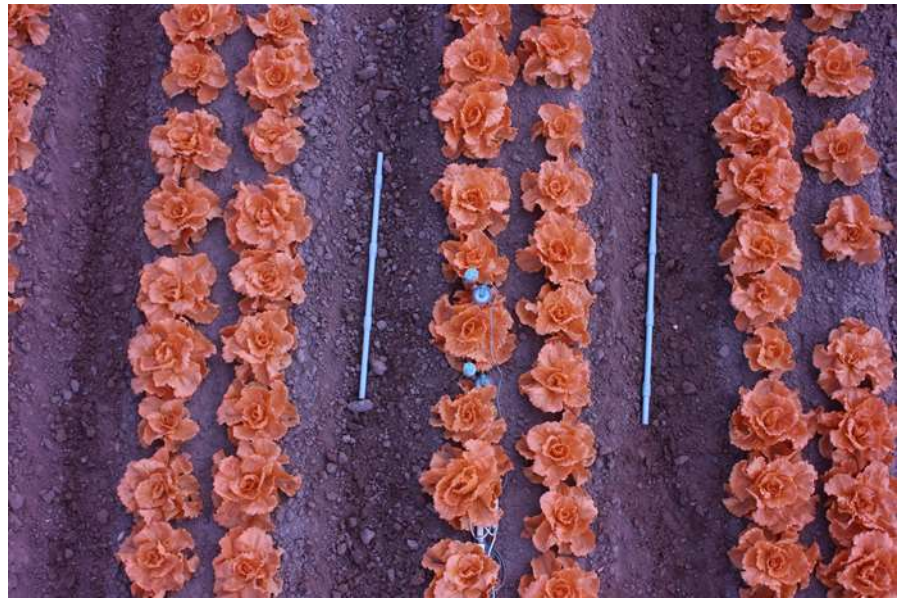
Weather-based irrigation scheduling



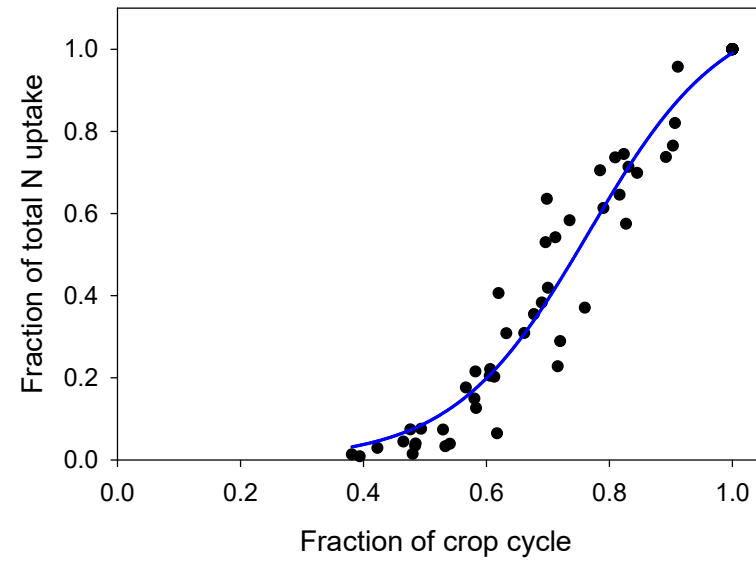
Converting Reference ET to
Crop ET:

$$ET_{\text{crop}} = ET_{\text{ref}} \times K_{\text{crop}}$$

K_c can vary from 0.1 to 1.2



Crop N uptake models



Crops currently supported

Vegetables:

Romaine (40 and 80-inch wide beds)

Iceberg (40 and 80-inch wide beds)

Leaf lettuce (80-inch wide beds)

Broccoli (summer and winter plantings)

Cauliflower (summer and winter plantings)

Cabbage (red and green)

Celery

Spinach (baby, teen, bunch)

Baby lettuce (red, green)

Mizuna

Cilantro

Berries

Strawberry (UC and proprietary varieties)

CropManage 2.0 released Nov 1, 2015



Microsoft .NET Framework

- Improved user-interface
- Faster speed
- Flexibility to support different types of commodities
- Web application protocol interface (API)



Scheduling and irrigation

Edit Irrigation Event



New Watering

Watering Date

Irrigation Method

- Germination Sprinkler
- Sprinkler
- Drip
- Rainfall

Create

Close

Watering Date

05/23/2016



Irrigation Method

- Germination Sprinkler
- Sprinkler
- Drip
- Rainfall

Recommended Water

0.27 in, 1.80 hours

Water Applied

0.00

in.

0.00

hours.

Manager Amount Recommendation

0.00

in.

0.00

hours.

CIMIS Precipitation

0.00 in

Rainfall Applied

0.00

in.

Save

Save and Close

Close

Delete



Irrigation Summary Table

	Date	Irrigation Method	Irrigation Interval (days)	Recommended Maximum Irrigation Interval (days)	Recommended Water - in.	Applied Water - in.	Rainfall (inches)
	8/6/2016	Sprinkler	N/A	N/A	N/A	1.8 in	0.0
	8/8/2016	Sprinkler	2	0.9 days	0.4 in	1.1 in	0.0
	8/10/2016	Sprinkler	2	1.1 days	0.3 in	1.0 in	0.0
	8/15/2016	Sprinkler	5	2.2 days	0.4 in	0.8 in	0.0
	8/26/2016	Sprinkler	11	4.7 days	0.6 in	1.1 in	0.0
	9/3/2016	Drip	8	3.2 days	0.7 in	0.9 in	0.0
	9/8/2016	Drip	5	3.3 days	0.5 in	0.6 in	0.0
	9/12/2016	Drip	4	3.4 days	0.4 in	0.6 in	0.0
TOTALS					11.02 inches	16.06 inches	1.14 inches

Transparency on how recommendations are made



Irrigation Recommendation Summary ×

Average ETo ⓘ	0.17 inches/day
Average Crop Coefficient ⓘ	0.40
Distribution Uniformity ⓘ	85.00 %
Days Since Last Irrigation ⓘ	5 days
Leaching Requirement ⓘ	0.00 % / 100
Total Precipitation ⓘ	0.00 inches

Base Amount	=	$\frac{\text{Average ETo} * \text{Average Crop Coefficient} * \text{Days Since Last Irrigation} * 100}{\text{Distribution Uniformity}}$
0.40 inches	=	$\frac{0.17 \text{ inches/day} * 0.40 * 5 \text{ days} * 100}{85.00 \%}$

Recommended Irrigation Amount	=	Base Amount / (1 - Leaching Requirement) - Total Precipitation
0.40 inches	=	0.40 inches / (1 - 0.00) - 0.00 inches

Date: 9/8/2016

Recommended Irrigation Amount: 0.40 inches

Identify when and who made entries

Irrigation Events

Current View: Irrigation ▾

Add... ⊕

	Date ↓	Irrigation Method ☐	Irrigation Interval (days) ☐	Recommended Maximum Irrigation Interval (days)	Recommended Water - in. ⇄	Applied Water - in. ⇄	Rainfal
 	9/7/2016	Drip	4	 3.5 days	 0.9 in	0.7 in	
 	9/12/2016	Drip	5	 4.2 days	 0.9 in	0.8 in	
 	9/18/2016	Drip	6	 4.2 days	 1.1 in	0.7 in	
 	9/19/2016	Drip	1	 3.8 days	 0.2 in	0.5 in	
 	Michael Cahn 9/26/2016 - 1:46 PM		4	 4.3 days	 0.7 in	0.9 in	
 	9/27/2016	Drip	4	 3.7 days	 0.9 in	1.3 in	
 	10/3/2016	Drip	6	 4.4 days	 1.1 in	0.6 in	
 	10/12/2016	Drip	9	 4.7 days	 1.5 in	1.0 in	

TOTALS

14.50 inches

17.08 inches

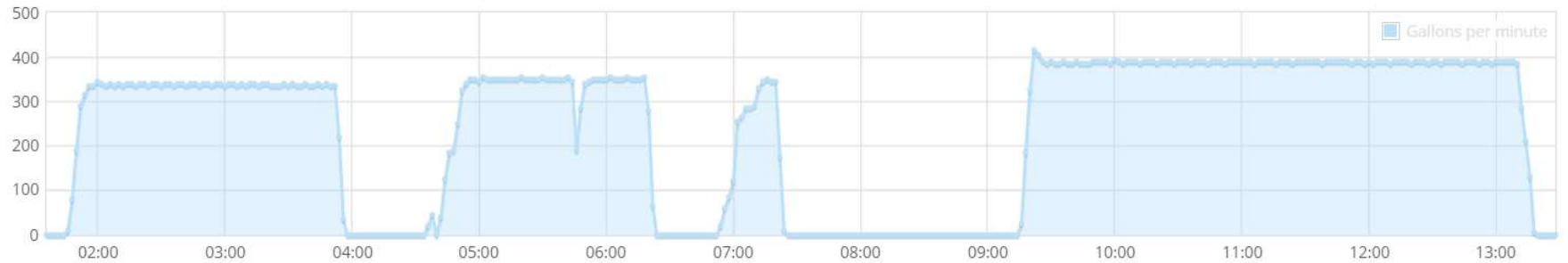
« 1 2 3 »

CropManage supports flowmeter data

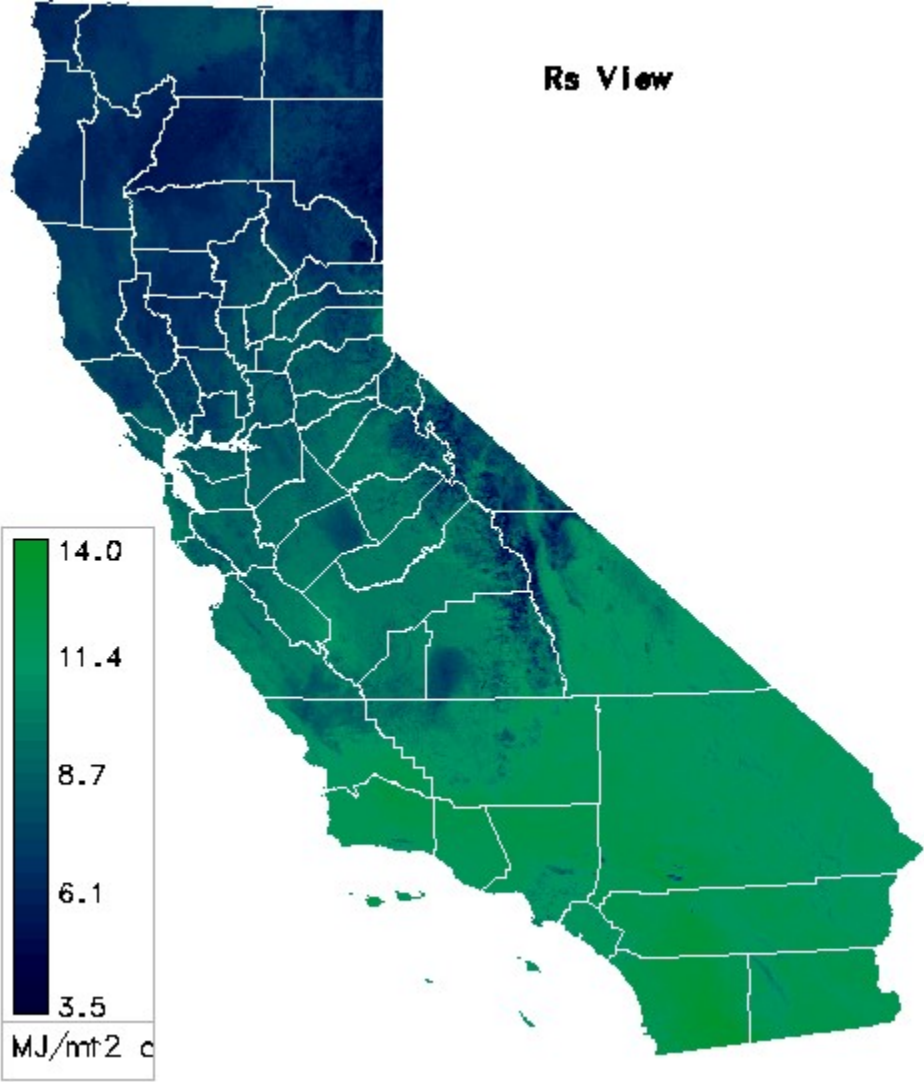


Flowmeters can help reveal irrigation problems

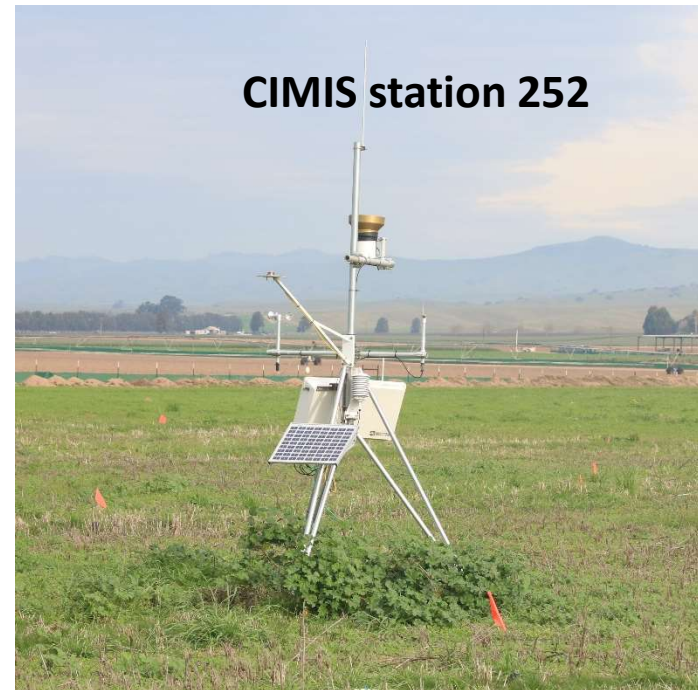
- ✓ Volume applied
- ✓ Application rate
- ✓ Pressure management
- ✓ interrupted flow



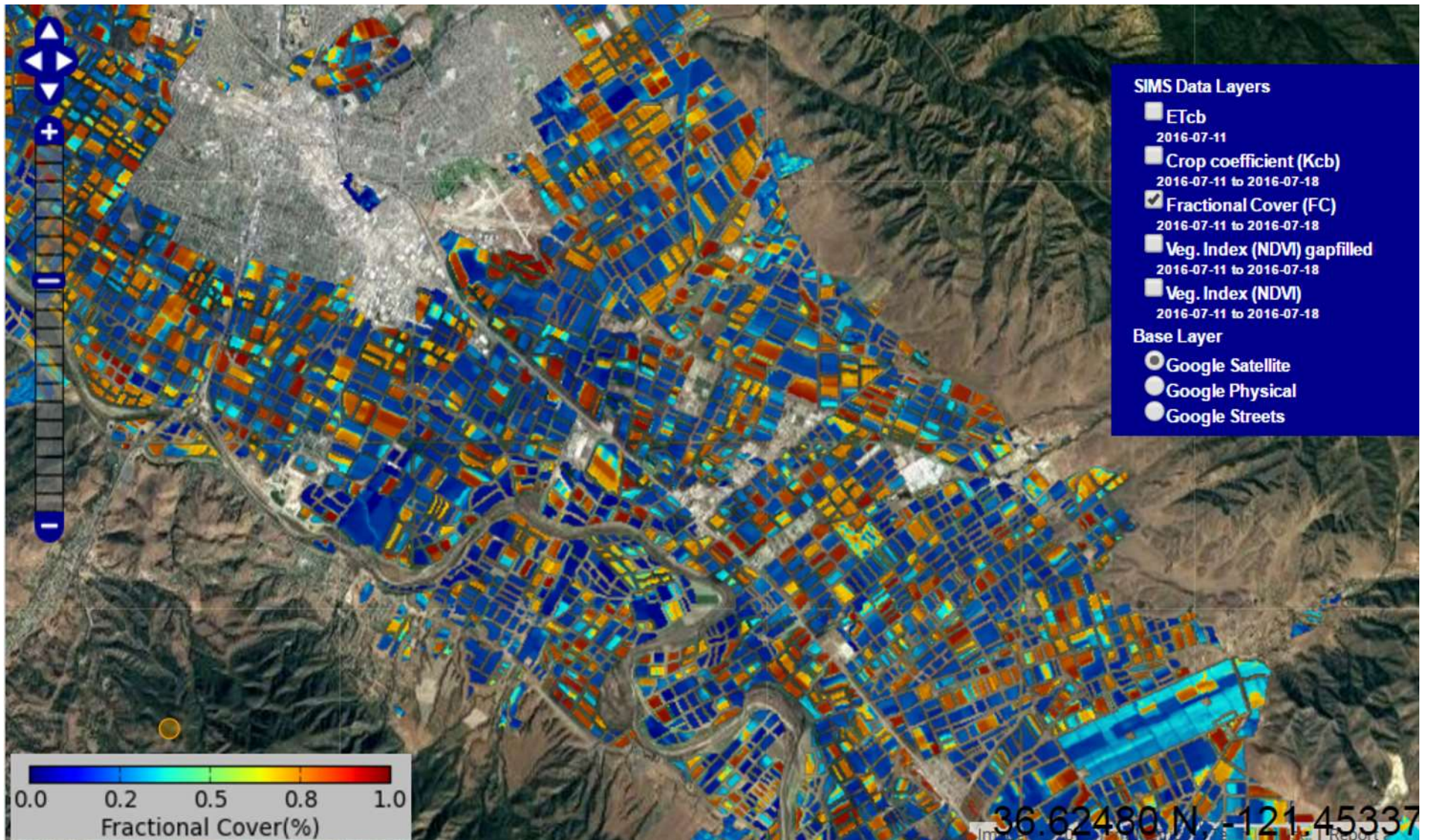
Spatial CIMIS ETo Reporting



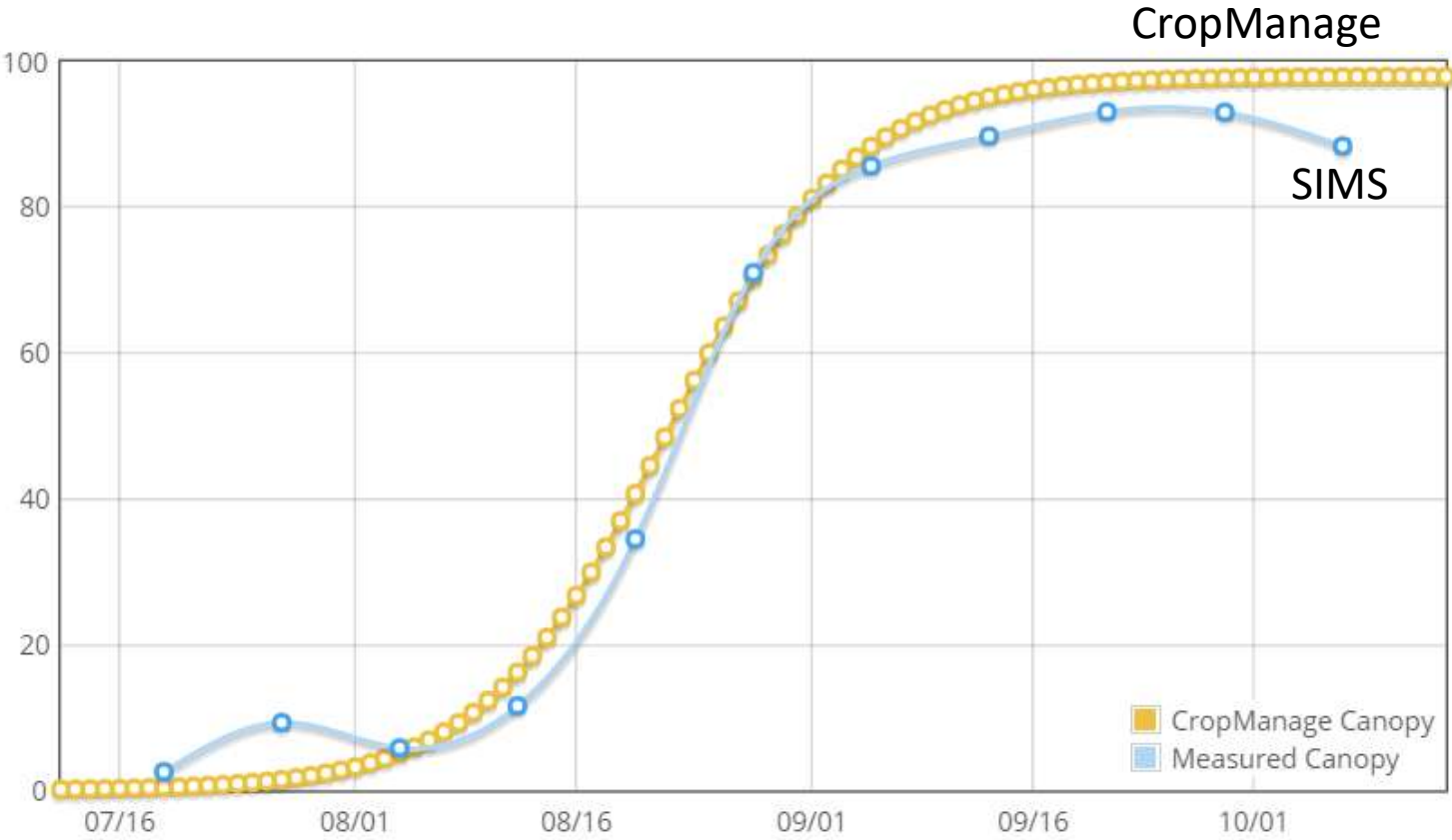
New Soledad CIMIS Station



CropManage interfaces with Satellite Irrigation Management Support (SIMS)



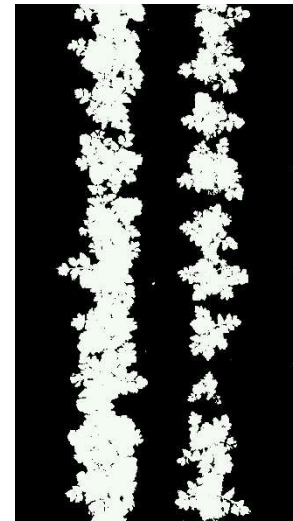
Comparison of CropManage and SIMS estimates of canopy cover (broccoli)



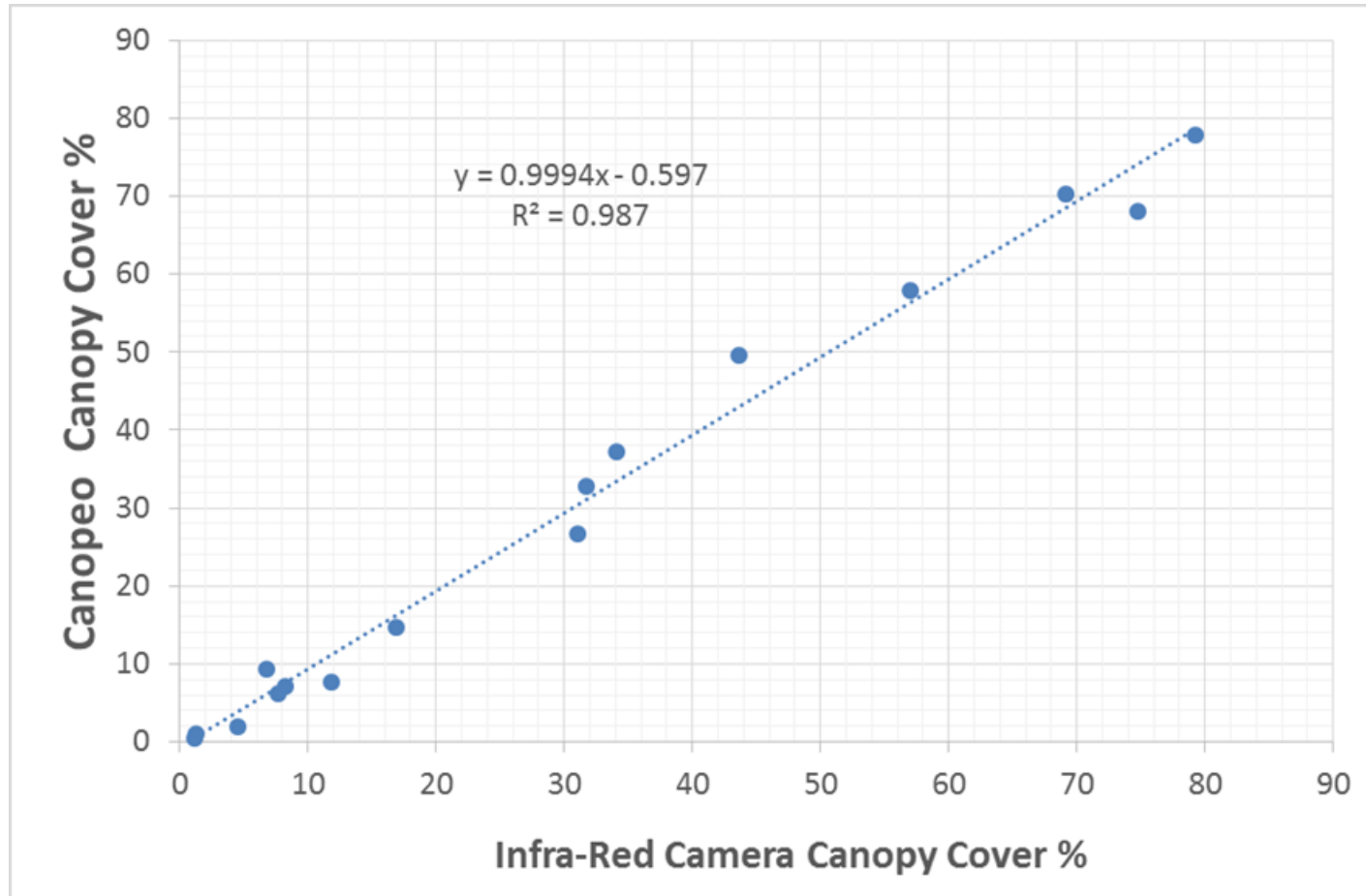
Field Evaluation of Canopy Cover



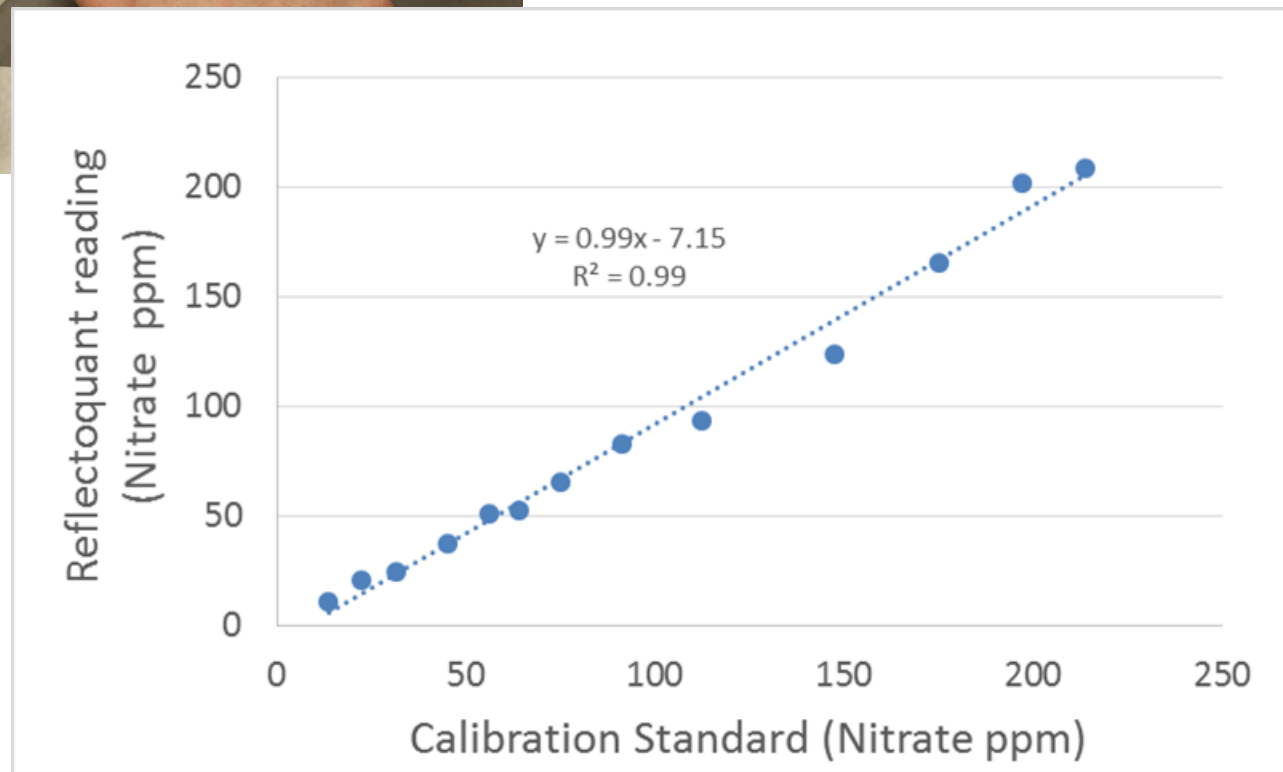
Oklahoma State University
Dept. of Plant and Soil Science



Canopeo was accurate for vegetable crops



Reflectoquant Test Strip Reader



CropManage 3.0

More intuitive user interface under development

breyta™

- Simplify user interface
- Easy to read on smart phones and tablet computers
- Intuitive to navigate
- Simple for field staff to use (irrigators, foremen)
- Better designed for communicating between decision makers and field staff

Main menu

The screenshot displays the CropManage application interface. On the left is a sidebar with navigation options: My Ranches, Administration, Profile, Logout, and Help. The top header shows the user's name, Dominic Stathos, and the language, English. The main content area is divided into three tabs: MY RANCHES, FAVORITE RANCHES, and PUBLIC RANCHES, with a '+ CREATE A RANCH' button. The MY RANCHES tab is active, showing a grid of ranch cards. Each card displays the ranch name, the user's name, a star icon, and the number of active plantings.

Ranch Name	User	Active Plantings
Bordenson	Michael Cahn	0
Bryon's Test	Bryon Noel	1
Callaghan Ranch	Michael Cahn	0
Callens	Andre Biscaro	2
Cheese Ranch	Bryon Noel	0
Selva	Michael Cahn	3
UCCE ranch	Michael Cahn	20
UCCE ranch	Michael Cahn	20

Plantings menu

MENU

 Dominic Stathos English ▼

Bondenson

ACTIVE PLANTINGS
FAVORITES PLANTINGS
ALL PLANTINGS
+ ADD A PLANTING

Search Active Plantings

Filter Plantings

Planting A <small>Lot 1</small>	Planting B <small>Lot 2</small>
Cauliflower-transplanted, 1 row, 40-inch bed, winter 1 Mar 2016 → 3 May 2016	Cauliflower-transplanted, 1 row, 40-inch bed, winter 1 Mar 2016 → 3 May 2016
Events Add: Upcoming Past	Events Add: Upcoming Past
18 Oct 2016 (Today) Recommendations	18 Oct 2016 (Today) Recommendations
Germination Sprinkler 0.42 in.	Germination Sprinkler 0.42 in.
UAN28 4.7 gal/acre	UAN28 4.7 gal/acre
Quick Nitrate Strip 1 ft	Quick Nitrate Strip 1 ft
19 Oct 2016 (Tomorrow) Recommendations	19 Oct 2016 (Tomorrow) Recommendations
Germination Sprinkler 0.11 in.	Germination Sprinkler 0.11 in.
UAN28 None	UAN28 None
UAN28 4.7 gal/acre	UAN28 4.7 gal/acre
Quick Nitrate Strip 1 ft	Quick Nitrate Strip 1 ft
19 Oct 2016 (Tomorrow) Recommendations	19 Oct 2016 (Tomorrow) Recommendations
Germination Sprinkler 0.11 in.	Germination Sprinkler 0.11 in.
UAN28 None	UAN28 None
View all events by:	View all events by:

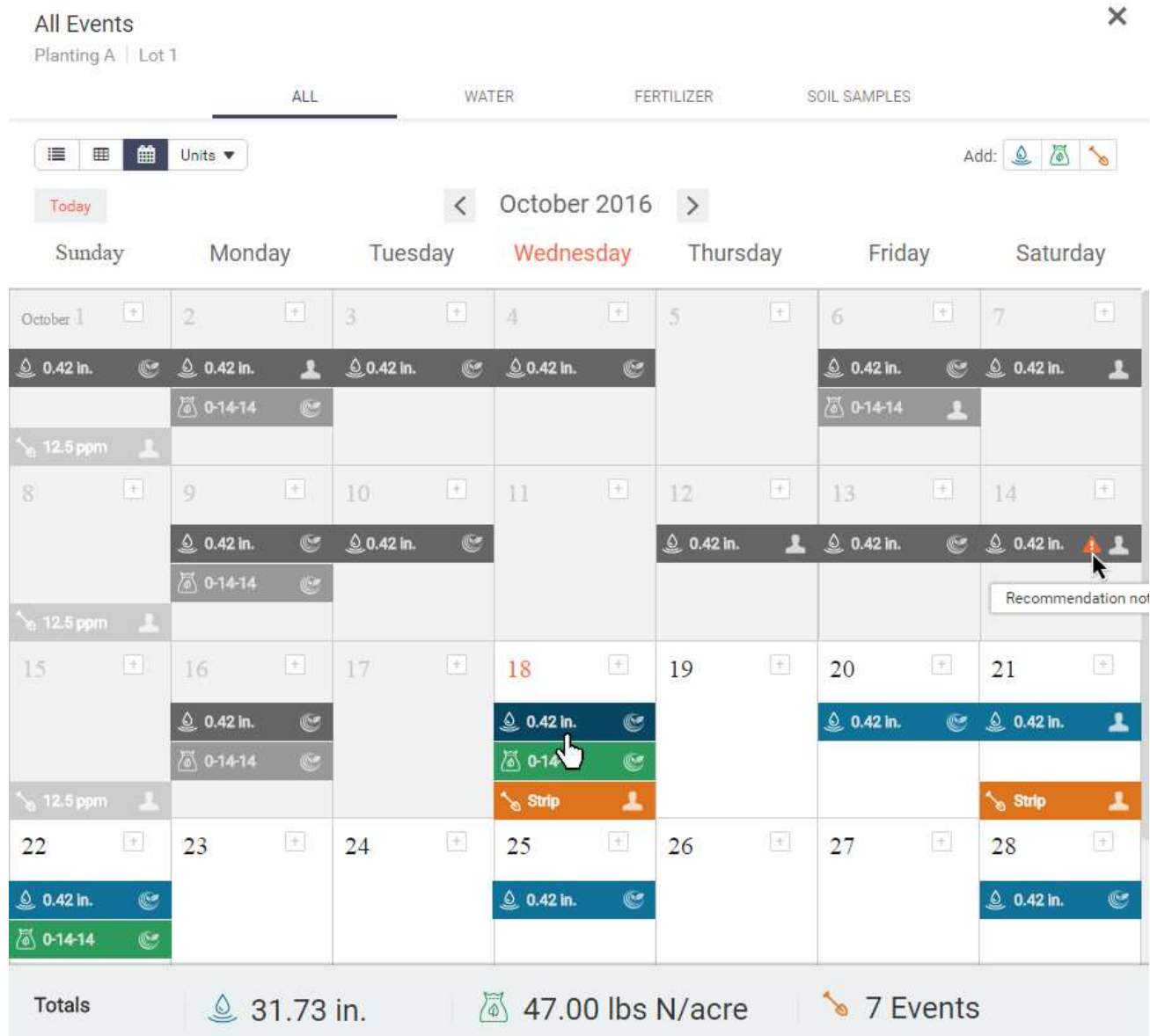
Planting C <small>Lot 2</small>	Planting D <small>Lot 3</small>
Cauliflower-transplanted, 1 row, 40-inch bed, winter 1 Mar 2016 → 3 May 2016	Cauliflower-transplanted, 1 row, 40-inch bed, winter 1 Mar 2016 → 3 May 2016

Communication and Record Keeping of Fertilizer Applications

The screenshot displays a mobile application interface for record keeping of fertilizer applications. The background features a green leafy plant. The interface is organized into several sections:

- Planting A**: The main title for the record, repeated across multiple overlapping panels.
- Event Description**: "Cauliflower-transplanted, 1 row, 40-inch bed, winter".
- Timeline**: "1 Mar 2016 → 3 May 2016".
- Events List**: A list of events with the following details:
 - 18 Oct 2016 (Today)**: Applied. Fertilizer: UAN28. Rate: 50.0 lbs N/acre. A hand cursor is pointing at this entry.
 - 17 Oct 2016 (Yesterday)**: Applied. Fertilizer: Germination Sprinkler. Rate: 2.12 in.
 - 14 Oct 2016**: Applied. Fertilizer: Germination Sprinkler. Rate: 1.43 in.
- Bottom Navigation**: "View all events by:" followed by icons for list, calendar, and another view.

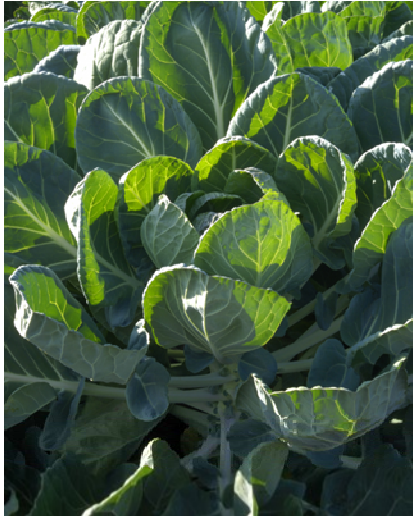
Various options to view summaries of field activities



Factoring in irrigation water nitrogen



Additional Crops in Development





Summary

- **Web-based decision support tools are an efficient way to extend research based recommendations to growers**
- **CropManage is designed to help growers customize water and nitrogen management for specific field conditions**
- **Opportunities exist for improving CM capabilities and to expand to additional commodities**

Upcoming Workshops and Trainings

- **CropManage Hands-on Training, UCCE Santa Cruz, Watsonville, March 29**
- **CropManage Hands-on Training, UCCE Monterey, Salinas, April 13**



Opportunities for on-farm demonstrations and trainings:

- **Nitrogen and water management demonstration trials**
- **Irrigation and fertigation for staff (English and Spanish)**
- **CropManage trainings for staff (English/Spanish)**

Acknowledgements:

- **UCCE Advisors/Specialists**
- **UC ANR programming staff**
- **CDFA-Fertilizer Research Education Program**
- **CDFA-Specialty Crop Research Grant Program**
- **CA Dept of Water Resources**
- **UC Division of Agriculture and Natural Resources**
- **Growers and Shippers**



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