



California Almond Stewardship Platform

Irrigation Calculator

How-To Guide

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Introduction

The purpose of this document is to outline the core functions of the Irrigation Calculator on the California Almond Stewardship Platform online platform.

Calculate your orchard's irrigation demand based on CIMIS station Evapotranspiration (ET) and soil moisture holding capacity with the Irrigation Calculator. Using the Irrigation Calculator to schedule irrigation involves one-time set up, making a plan, and refining the plan. Data is automatically updated from CIMIS.

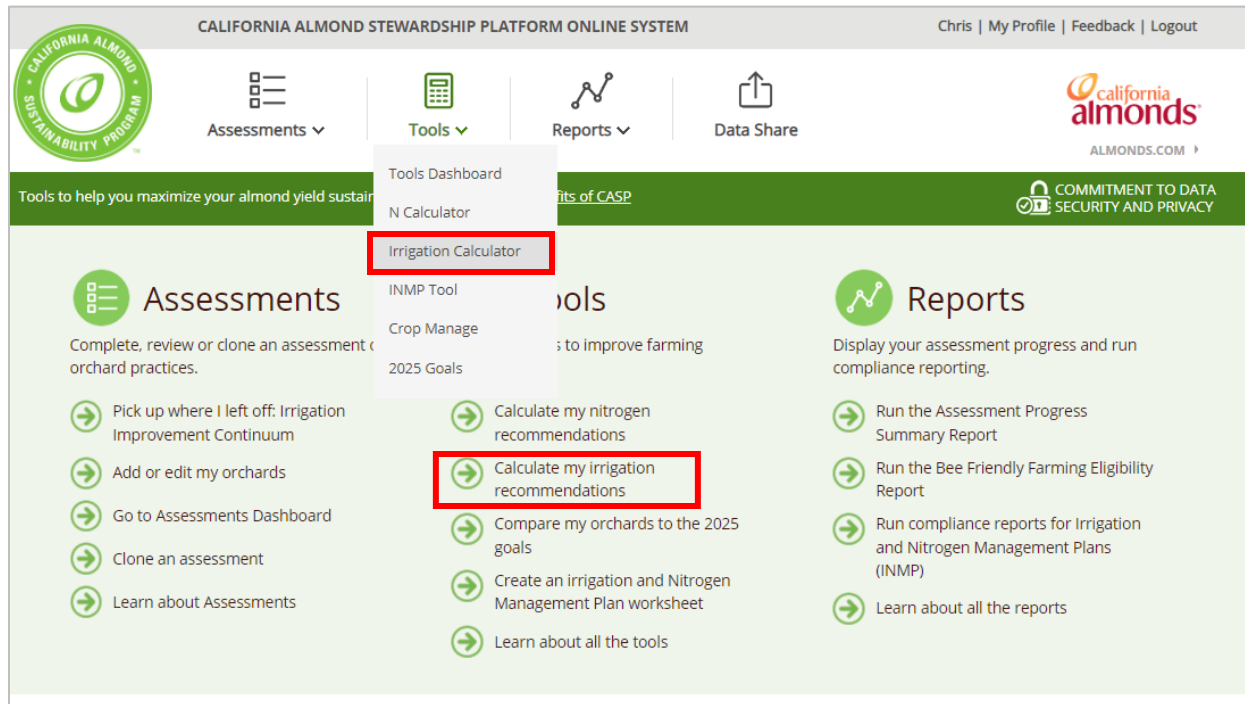
Key Points about the CASP Irrigation Calculator

- Local conditions and variations impact irrigation (e.g., microclimates, soil variation, irrigation system parameters and field history). Many factors should be considered when irrigating. The CASP Irrigation Calculator cannot account for all local conditions, use your best judgment.
- This calculator is based on CIMIS ETo data and models by UC farm advisors for mature almond orchards without salinity, infiltration, or other special considerations.
- Kc values are from UC ANR Publication 8515 <http://anrcatalog.ucanr.edu/pdf/8515.pdf>
- More information about irrigation management can be found in the [Almond Irrigation Improvement Continuum](#).

Add Irrigation Schedule

To add an Irrigation Schedule, proceed with the following:

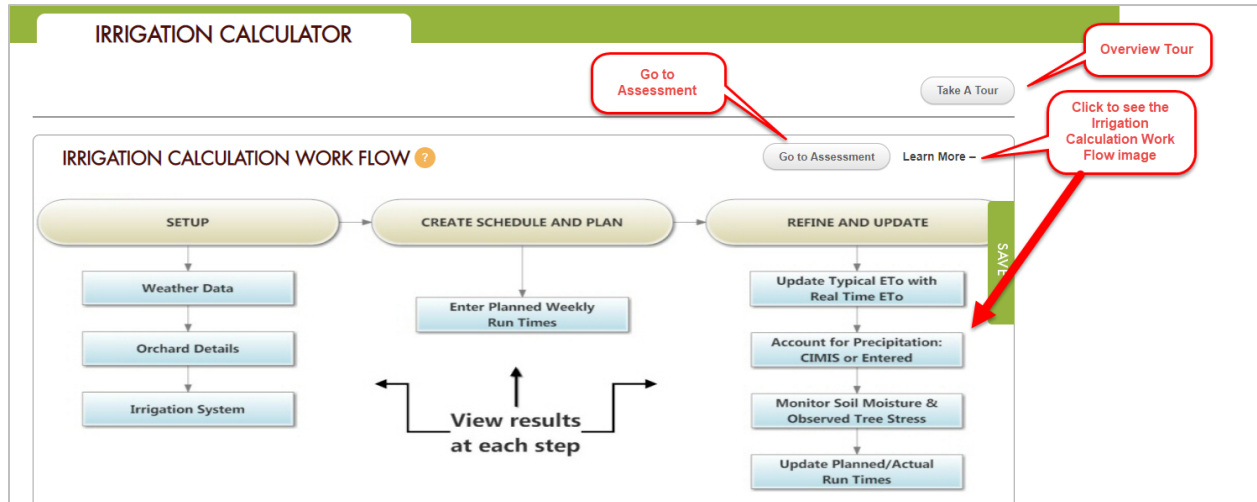
- Click any of these buttons to get to the Irrigation Calculator page:
 - [Irrigation Calculator](#) under Tools in the top menu
 - [Calculate my irrigation recommendations](#) on the Tools panel



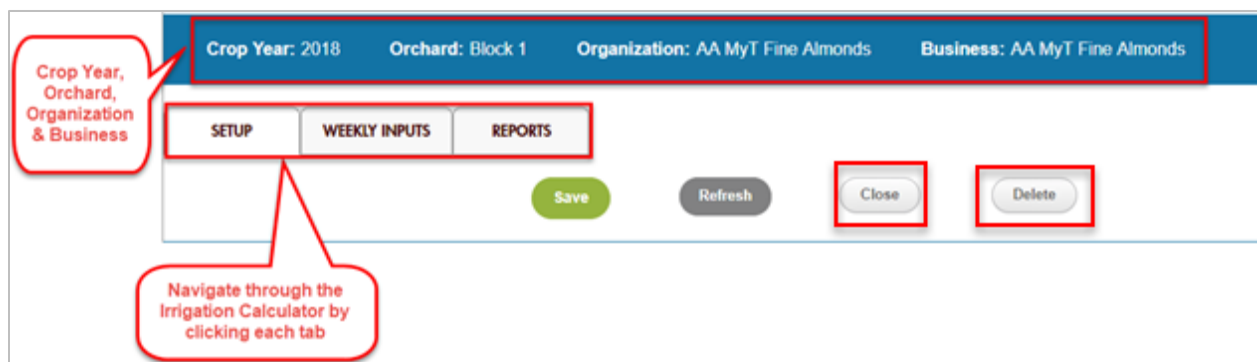
- Click **Add Irrigation Schedule**.

- **Crop Year**: This is defaulted to the current year.
 - Click **Select Crop Year** to create a schedule for a previous crop year.
 - Click **Select Orchard** to return to orchard selection.
- **Organization**: **Optional** Click the drop-down menu to choose Organization if not pre-selected.
- **Enterprise**: **Optional** Click the drop-down menu and choose the Enterprise if not pre-selected.
- **Orchard**: Click the drop-down and choose the Orchard.
- Click **Create Schedule** when you are finished.

- The system will create a new Irrigation Schedule for the selected Orchard and year.
- Click **Take a Tour** button at the top of the Irrigation Schedule to get more information about the Irrigation Calculator.
- Click **Go To Assessment** button to go to the assessment associated with this Irrigation Schedule.
- Click **Learn More** to see the Irrigation Calculator Work Flow image.



- The Irrigation Calculator overview includes **Crop Year**, **Orchard**, **Organization**, and **Business information**.
- Navigate through the Irrigation Calculator by clicking on each tab:
 - **Setup**
 - **Weekly Inputs**
 - **Reports**
- Click **Close** to go back to the Irrigation Schedule Summary or **Delete** to delete this Irrigation Schedule.
- Using the Irrigation Calculator to schedule irrigation involves one-time set up, making a plan, and refining the plan.



Setup

- The Setup tab has four sections:
 - **Weather**: Select a CIMIS station for precipitation and map your latitude and longitude to enable spatial CIMIS for ETo.
 - **Basic Orchard**: Enter the year planted, orchard spacing, maturity status and midday canopy coverage.
 - **Advanced Orchard**: Enter effective rooting depth, soil texture by depth, irrigation system subsurface wetted volume and available soil moisture (ASM) alert. The advanced settings are used to determine the amount of water held by the soil.
 - **Irrigation System**: Enter your pressurized irrigation system parameters; type (drip, micro sprinklers or rotator sprinklers), the typical run time, and system configuration, flow rate, and distribution uniformity.
- Use the tool tips (question mark icons) to see more information in context.
- Review the [Almond Irrigation Improvement Continuum](#) for additional guidance.
- Click the green **Save** button when you are finished entering data. Saving may take some time depending on your internet connection because weather data is being retrieved.
 - **UNSAVED CHANGES ARE LOST.**

SETUP

WEEKLY INPUTS

REPORTS

Save

Refresh

Close

Delete

SETUP ?

WEATHER SETUP

Use Station associated with Zip:
☐

* Orchard ZIP code: ?
 Confirm

* CIMIS Station: ?

* Map location for Spatial CIMIS ?
When evapotranspiration (ETo) data is not available, the historic average is used.

Map

Satellite



SAVE

* Latitude: ?

* Longitude: ?

* denotes required for calculations

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BASIC ORCHARD SETUP

Year Orchard Planted: ?

Acres: ?

* Row Spacing: ?

(feet)

* Tree Spacing: ?

(feet)

Mature Orchard ?

☐

* Orchard Canopy Cover at Midday: ?

%

* denotes required for calculations

SAVE

ADVANCED ORCHARD SETUP

Responses to items below are optional and do not change Run Hrs to Meet Etc. Available Soil Moisture (ASM) columns.

Effective Rooting Depth (feet): ?

Soil Texture by Depth: ?

Add

Delete

	Start Depth (feet)	End Depth (feet)	Soil Texture
☐	Surface	3	Fine - Loams, silt loams, sandy clays, silty clays, clays (2.4)

Soil Notes: ?

Irrigation System Subsurface Wetted Volume: ?

%

Available Soil Moisture (ASM) Depletion Alert (%): ?

%

SAVE

IRRIGATION SETUP

Week to start accumulating ETc: ?
 Week #8: 2/24/2019 - 3/2/2019

Number of Sets: ?
 1

Typical Run Time (hours): ?
 18

* System Type: ?
 Micro-sprinkler

Irrigation System Notes: ?

* Emitters / Microsprinklers per Tree: ?
 1

* Average Gallons per Hour (GPH) Rate per Emitter / Microsprinkler: ?
 10.6 gph

* Distribution Uniformity: ?
 89 %

* denotes required for calculations

SAVE

Weekly Inputs

- Use the Weekly Inputs tab to plan or enter actual weekly run times based on CIMIS Evapotranspiration (ETo) and Crop Evapotranspiration (ETc) data.
 - Week:** Pick a month to refocus week-grid.
 - Enter or update weekly values for the **Run Time**, **Soil Moisture**, **Rainfall**, **Observed Tree Status**.
- Click **Refresh** or **Save** to update all calculations. Depending on the internet connection, it may take some time to update the weather information from CIMIS.

SETUP **WEEKLY INPUTS** REPORTS

Save Refresh Close Delete

Click Refresh to update all calculations

Pick a month to refocus week grid

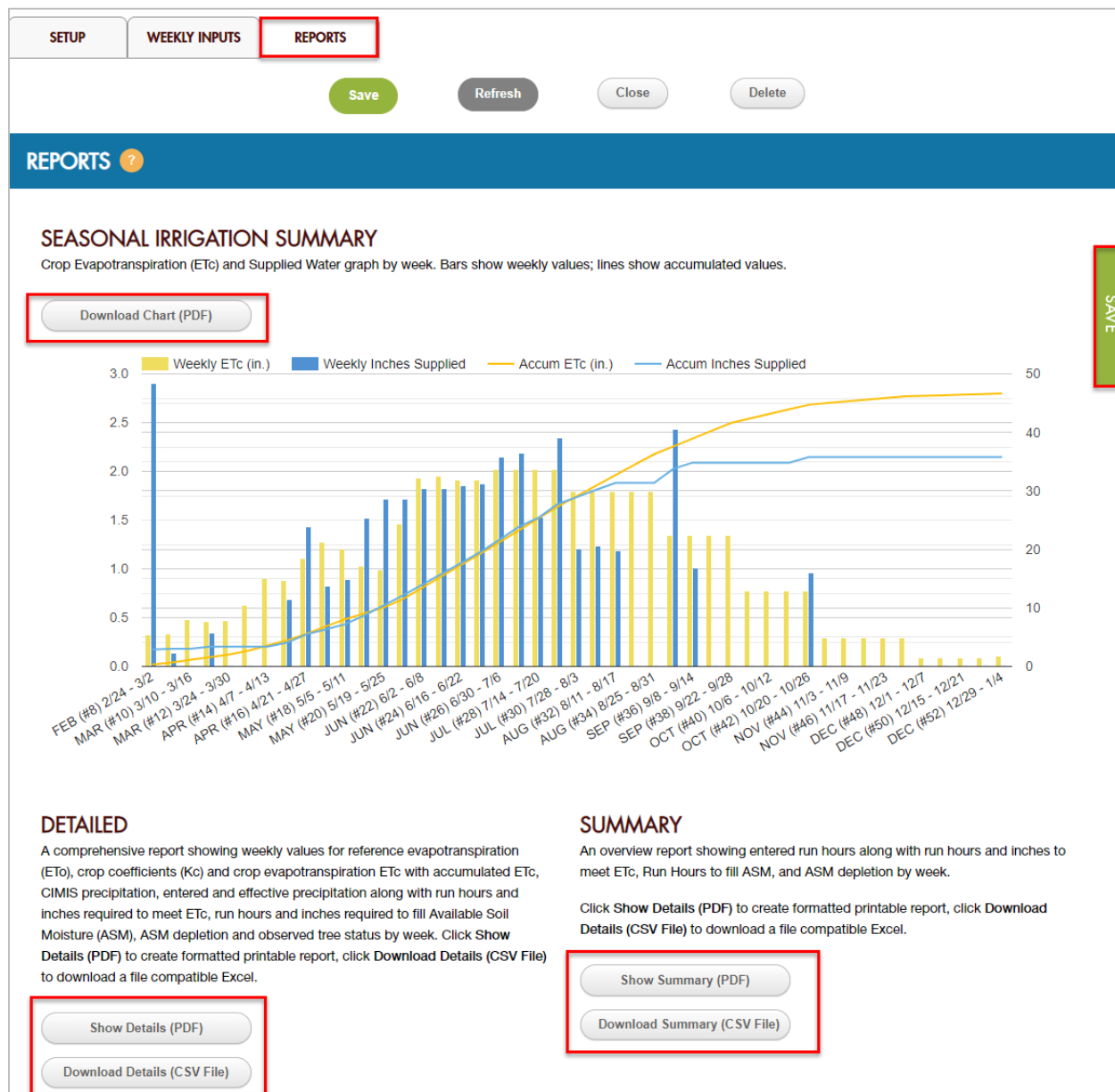
Week	Run time (hours)	Run to Meet Etc		Run to Fill ASM		Calculated % ASM Depleted	Measured Soil Moisture	Measured Rainfall (Inches)	Observed Tree Status
		Hours	Inches	Hours	Inches				
All Weeks									
JAN (#1) 1/6 - 1/12		2.3	0.10	2.3	0.10	4%		* 0.37	
JAN (#2) 1/13 - 1/19		2.4	0.11	0.0	-0.30	0%		* 1.14	
JAN (#3) 1/20 - 1/26		2.8	0.13	0.0	-0.87	0%		* 0.14	
JAN (#4) 1/27 - 2/2		3.2	0.14	0.0	-0.19	0%		* 0.92	
FEB (#5) 2/3 - 2/9	10.75	3.0	0.14	0.0	-3.35	0%		3 * 0.84	
FEB (#6) 2/10 - 2/16	28.75	3.7	0.17	0.0	-1.77	0%		* 1.30	

SAVE

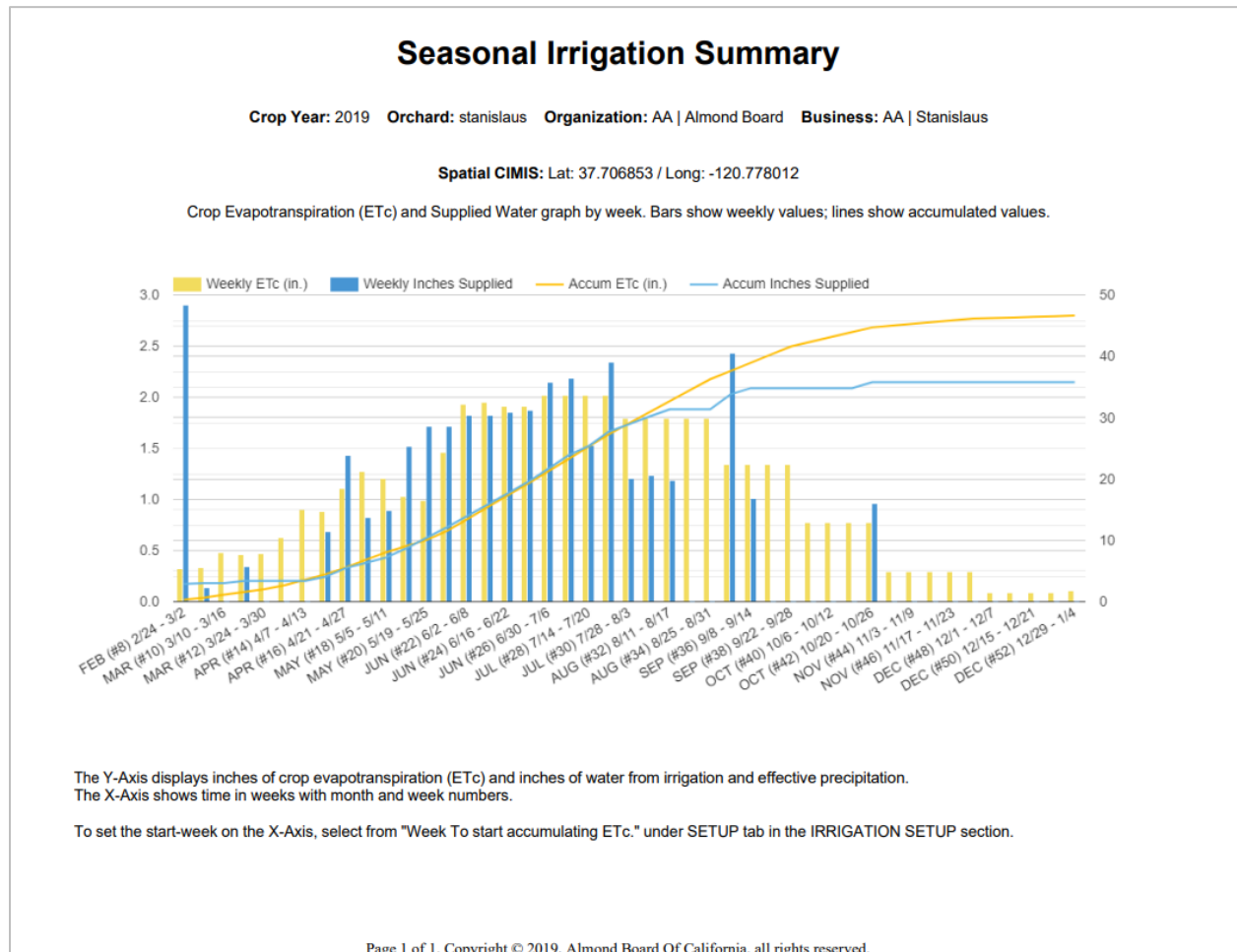
This recommendation is not intended to be used as the sole source of information for making irrigation decisions. Local environmental conditions can have a profound effect on irrigation demands. The Almond Board of California, the University of California, and the California State University are not responsible for the accuracy of this model.

Reports

- Use the Reports tab to download one of three irrigation reports:
 - Seasonal Irrigation Summary**: Shows a graph of applied water and crop evapotranspiration (ETc) and can be downloaded as PDF.
 - Irrigation Calculator Detailed & Summary Reports**: Shows details for each week and can be downloaded as PDF or as a CSV (Excel compatible) file.



Below is an example of the Seasonal Irrigation Summary (PDF chart):



Below is an example of the Irrigation Calculator Detailed Report (PDF):

Irrigation Schedule Details		Orchard/Org/Business: stanislaus Schedule Year: 2019	
Schedule Details		Weather Data Setup Details	
Year	2019	Orchard ZIP Code	95361
Organization	AA Almond Board	**CIMIS Station	Oakdale
	Board	CIMIS Station ID	194
Enterprise	AA Stanislaus	CIMIS Station Location (Lat,Long)	37.727194,-120.850860
Orchard	stanislaus	Reference CIMIS Zone	Zone 12
Orchard Details		**Spatial CIMIS (Lat, Long)	37.706853,-120.778012
Year Planted	2014	Irrigation System Setup Details	
Orchard Status	Immature	Week to Start Accumulating ETc	2/24 - 3/2
**Orchard Canopy Cover at Midday	80%	Typical Run Time	18 hours
Krt Factor	100%	Irrigation System Notes	
Acres	45	**System Type	Micro-sprinkler
**Row / Tree Spacing	21 x 16 feet	**Emitters/Microsprinklers per Tree	1 emitters/tree
Trees per Acre	129.6	**Average Gallons per Hour (GPH) Rate per Emitter/Microsprinkler	10.6 gallons/hour
**Soil Texture	0 - 3 feet: Fine - Loams, silt loams, sandy clays, silty clays, clays (2.4)	**Subsurface Wetted Volume	80%
Soil Notes		**Distribution Uniformity (DU)	89%
**Effective Rooting Depth	3 feet	Emitters per Acre	129.6 emitters
Available Soil Moisture for Orchard	3.6 inches	Inches per Hour Unadjusted for DU	0.051 inches/hr
Available Soil Moisture in Wetted Area	2.88 inches	Inches per Hour (Effective)	0.045 inches/hr
Available Soil Moisture (ASM) Depletion Alert (%)	50%		

** Denotes item required for calculations, if blank please review and insert.

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Irrigation Schedule Details										Orchard/Org/Business: stanislaus Schedule Year: 2019						
Week	Typical ETo (in.)	This Yr ETo (in.)	Kc	ETc (in.)	Accum ETo (in.)	CIMIS Precip (in.)	Entered Precip (in.)	Effective Precip (in.)	Run Hrs to Meet ETo	Entered Run Hrs	Inches Supplied	Run Hrs to Fill ASM	Inches to Fill ASM	Calc % ASM Depleted	Entered % ASM Depleted	Obs Tree Stress
12/29 - 1/4	0.28		0.4	0.11	46.63				2.5			66.5	2.99	100		
1/6 - 1/12	0.28	0.26	0.4	0.1		0.37			2.3			2.3	0.1	4		
1/13 - 1/19	0.28	0.27	0.4	0.11		1.14		0.51	2.4		0.51		-0.3	0		
1/20 - 1/26	0.28	0.32	0.4	0.13		0.14	1	1	2.8		1		-0.87	0		
1/27 - 2/2	0.49	0.35	0.41	0.14		0.92		0.34	3.2		0.34		-0.19	0		
2/3 - 2/9	0.49	0.33	0.41	0.14		0.84	3	3	3	10.75	3.54		-3.35	0		
2/10 - 2/16	0.49	0.41	0.41	0.17		1.3		0.64	3.7	28.75	2.09		-1.77	0		
2/17 - 2/23	0.49	0.48	0.41	0.2		0.06			4.4			4.4	0.2	7		
2/24 - 3/2	0.77	0.52	0.62	0.32	0.32	1	2.5	2.5	7.2	8	2.9		-2.34	0		
3/3 - 3/9	0.77	0.53	0.62	0.33	0.65	0.67		0.14	7.3		0.14	4.3	0.19	7		
3/10 - 3/16	0.77	0.78	0.62	0.48	1.13	0.05			10.7			15	0.68	23		
3/17 - 3/23	0.77	0.74	0.62	0.46	1.59	0.92		0.34	10.2		0.34	17.8	0.8	28		
3/24 - 3/30	0.77	0.76	0.62	0.47	2.06	0.08			10.5			28.2	1.27	44		
3/31 - 4/6	1.19	0.79	0.8	0.63	2.69	0.32			14			42.3	1.9	66		
4/7 - 4/13	1.19	1.13	0.8	0.9	3.59				20.1			62.3	2.81	97		
4/14 - 4/20	1.19	1.1	0.8	0.88	4.47	0.14	0.69	0.69	19.5		0.69	66.5	3	100		
4/21 - 4/27	1.19	1.39	0.8	1.11	5.58				24.7	28.25	1.43	60.4	2.72	94		
4/28 - 5/4	1.54	1.35	0.94	1.27	6.85				28.2	16.25	0.82	72.3	3.26	100		
5/5 - 5/11	1.54	1.29	0.94	1.21	8.06				26.9	17.5	0.89	73.4	3.3	100		
5/12 - 5/18	1.54	1.1	0.94	1.03	9.09	1.29		0.63	23	17.5	1.52	55.4	2.49	87		
5/19 - 5/25	1.54	1.05	0.94	0.99	10.08	0.47			21.9	34	1.72	43.3	1.95	68		
5/26 - 6/1	1.82	1.39	1.05	1.46	11.54	0.36			32.4	34	1.72	41.7	1.88	65		
6/2 - 6/8	1.82	1.84	1.05	1.93	13.47				42.9	36	1.82	48.6	2.19	76		
6/9 - 6/15	1.82	1.86	1.05	1.95	15.42				43.4	36	1.82	56	2.52	88		
6/16 - 6/22	1.82		1.05	1.91	17.33				42.4	36.5	1.85	62	2.79	97		
6/23 - 6/29	1.82		1.05	1.91	19.24				42.4	37	1.87	67.4	3.03	100		

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Schedule Details Header	Description
Typical ETo (in.)	ETo based on historical average for CIMIS region
This Yr ETo (in.)	ETo based on CIMIS station or spatial CIMIS
Kc	The co-factor for mature almonds that adjusts ETo almonds ETc
ETc (in.)	The expected or calculated losses to ETc based on ETo, Kc, and Krt (the factor that adjusts for canopy coverage)
Accum ETc (in.)	Accumulated ETc based on the value for the weeks since the user entered value "Week to start accumulating ET"
CIMIS Precip (in.)	Precipitation for the week at the selected CIMIS station
Entered Precip (in.)	Override of CIMIS precipitation data
Effective Precip (in.)	CIMIS precipitation is adjusted downward by the following formula: <i>When (CIMIS Precip) > 0.5 then (CIMIS Precip -0.5)*0.80 otherwise 0</i> Entered precipitation is not adjusted.
Run Hrs to Meet ETc	Calculation based on ETo and Kc, for the week, orchard canopy factor (Krt) and the irrigation system hourly supply rate adjusted for Distribution Uniformity (DU)
Entered Run Hrs	Entered Run Hours
Inches Supplied	Effective precipitation plus raw irrigation supply (unadjusted for Distribution Uniformity.
Run Hrs to Fill ASM	Run hours to fill Available Soil Moisture (ASM), Calculation based ASM from the previous week, irrigation applied, effective rainfall and losses to ETc for the week.
Inches to Fill ASM	Inches to fill Available Soil Moisture (ASM). Calculation based ASM from the previous week, irrigation applied, effective rainfall and losses to ETc for the week.
Calc % ASM Depleted:	Calculated percent ASM Depleted= $ASM_{[week's\ end]} / ASM_{[Total]}$ ASM _[week's end] accounts for run hours, previous week's ASM, precipitation and ETc.
Entered % ASM Depleted:	User entered override of the calculated depleted ASM
Obs Tree Stress	User entered observed tree moisture stress: select from Minimal, Mild, Moderate, or Severe

Below is an example of the Irrigation Calculator Summary Report (PDF):

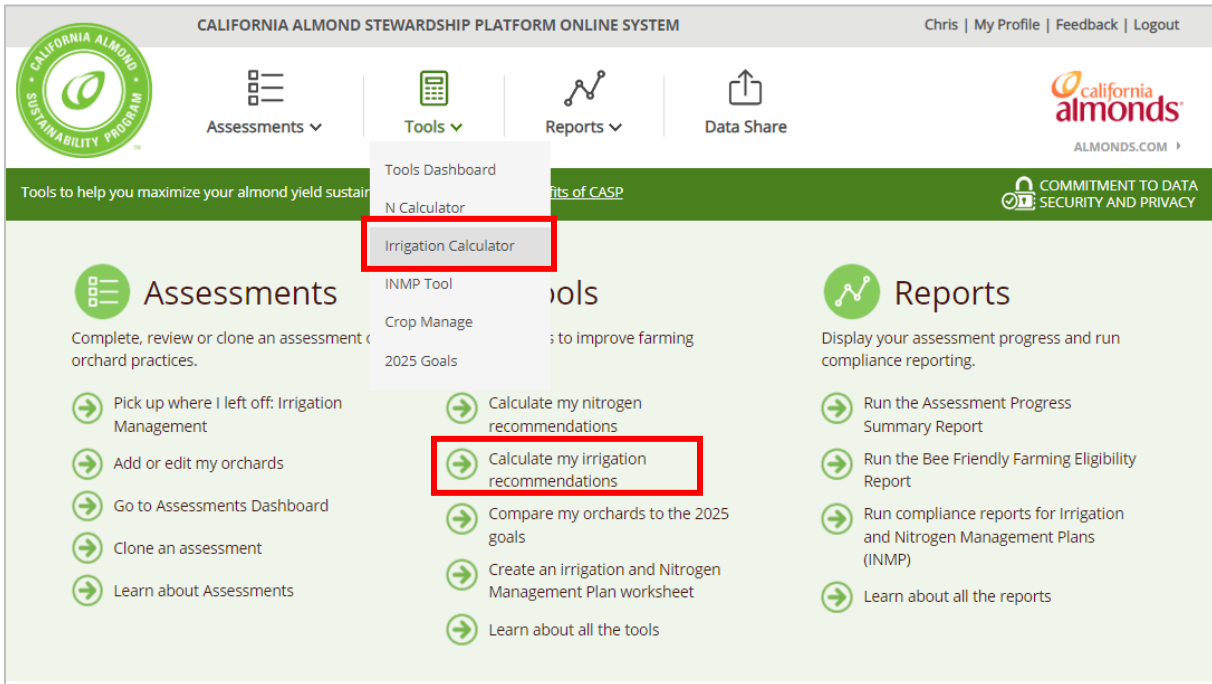
Irrigation Schedule		Calculations					
Criteria							
Year	2019						
Organization	AA Almond Board						
Enterprise	AA Stanislaus						
Orchard	stanislaus						
Weather Setup							
Orchard ZIP Code	95361						
CIMIS Station	Oakdale						
Latitude	37.706853						
Longitude	-120.778012						
Orchard Setup							
Year Orchard Planted	2014						
Acres	45						
Row / Tree Spacing	21 x 16 feet						
Soil Texture	0 - 3 feet: Fine - Loams, silt loams, sandy clays, silty clays, clays (2.4)						
Soil Notes							
Effective Rooting Depth (feet)	3						
Orchard Maturity	Immature						
Orchard Canopy Cover at midday (%)	80						
Available Soil Moisture (ASM) Depletion Alert (%)	50						
Irrigation Setup							
Week to Start Accumulating ETc	2/24 - 3/2						
Number of Sets	1						
Typical Run Time Hours	18						
Irrigation System Notes							
System Type	Micro-sprinkler						
Emitters/Microsprinklers per Tree	1						
Average Gallons per Hour (GPH) Rate per Emitter/Microsprinkler	10.6						
Subsurface Wetted Volume (%)	80						
Distribution Uniformity (%)	89						
		Week	Entered Run Hours	Run Hrs to Meet ETc	Run Hrs to Fill ASM	Calc % ASM Depleted	Entered % ASM Depleted
		12/29 - 1/4		2.5	66.5	100%	
		1/6 - 1/12		2.3	2.3	4%	
		1/13 - 1/19		2.4		0%	
		1/20 - 1/26		2.8		0%	
		1/27 - 2/2		3.2		0%	
		2/3 - 2/9	10.75	3		0%	
		2/10 - 2/16	28.75	3.7		0%	
		2/17 - 2/23		4.4	4.4	7%	
		2/24 - 3/2	8	7.2		0%	
		3/3 - 3/9		7.3	4.3	7%	
		3/10 - 3/16		10.7	15	23%	
		3/17 - 3/23		10.2	17.8	28%	
		3/24 - 3/30		10.5	28.2	44%	
		3/31 - 4/6		14	42.3	66%	
		4/7 - 4/13		20.1	62.3	97%	
		4/14 - 4/20		19.5	66.5	100%	
		4/21 - 4/27	28.25	24.7	60.4	94%	
		4/28 - 5/4	16.25	28.2	72.3	100%	
		5/5 - 5/11	17.5	26.9	73.4	100%	
		5/12 - 5/18	17.5	23	55.4	87%	
		5/19 - 5/25	34	21.9	43.3	68%	
		5/26 - 6/1	34	32.4	41.7	65%	
		6/2 - 6/8	36	42.9	48.6	76%	
		6/9 - 6/15	36	43.4	56	88%	
		6/16 - 6/22	36.5	42.4	62	97%	
		6/23 - 6/29	37	42.4	67.4	100%	
		6/30 - 7/6	42.5	44.9	66.3	100%	
		7/7 - 7/13	43.25	44.9	65.6	100%	
		7/14 - 7/20	30.3	44.9	78.5	100%	
		7/21 - 7/27	46.3	44.9	62.5	98%	
		7/28 - 8/3	24	39.7	78.2	100%	
		8/4 - 8/10	24.5	39.7	79.2	100%	
		8/11 - 8/17	23.5	39.7	80.2	100%	
		8/18 - 8/24		39.7	103.7	100%	
		8/25 - 8/31		39.7	103.7	100%	
		9/1 - 9/7	48	29.7	45.6	71%	
		9/8 - 9/14	20	29.7	55.3	86%	
		9/15 - 9/21		29.7	85	100%	
		9/22 - 9/28		29.7	93.6	100%	
		9/29 - 10/5		17.2	81.1	100%	
		10/6 - 10/12		17.2	81.1	100%	
		10/13 - 10/19		17.2	81.1	100%	
		10/20 - 10/26	19	17.2	62.1	97%	
		10/27 - 11/2		6.4	68.6	100%	
		11/3 - 11/9		6.4	70.4	100%	
		11/10 - 11/16		6.4	70.4	100%	
		11/17 - 11/23		6.4	70.4	100%	
		11/24 - 11/30		6.4	70.4	100%	
		12/1 - 12/7		2	66	100%	
		12/8 - 12/14		2	66	100%	
		12/15 - 12/21		2	66	100%	
		12/22 - 12/28		2	66	100%	

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Edit/View Irrigation Schedule

Click any of these buttons to get to the Irrigation Calculator page:

- **Irrigation Calculator** under Tools in the top menu
- **Calculate my irrigation recommendations** on the Tools panel



- **Filter Your List:** Check this box to narrow down your search results by:
 - Year
 - Organization
 - Enterprise
 - Orchard

The screenshot shows the 'Irrigation Calculator' page. The 'Irrigation Schedule Summary' section is highlighted with a red box. It contains a 'Filter your list' checkbox which is checked. Below the checkbox are four dropdown menus: 'Year' (set to '<All Years>'), 'Organization' (set to '<All Organizations>'), 'Enterprise' (set to '<All Enterprises>'), and 'Orchard' (set to '<All Orchards>'). At the bottom of the section is a green button labeled 'Add Irrigation Schedule'.

- Each Irrigation Schedule entry will show:
 - Crop Year
 - Organization
 - Enterprise
 - Orchard
 - Options
 - Open: Open the Irrigation Schedule for that Orchard
 - Clone: Clone the Irrigation Schedule for another Orchard or another year.
 - PDF: Download Irrigation Summary Report as a PDF

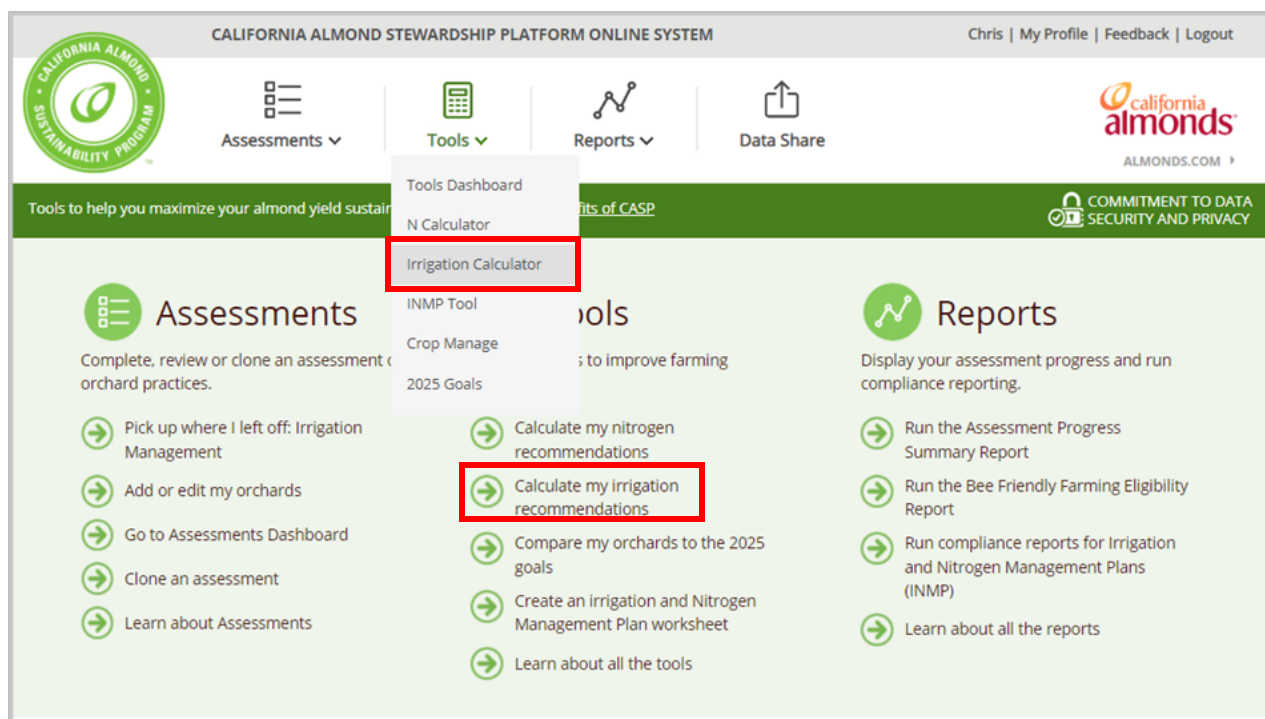
Crop Year	Organization	Enterprise	Orchard			
2018	AA MyT Fine Almonds	AA MyT Fine Almonds	Block 1	Open	Clone	PDF
2018	AA MyT Fine Almonds	AA MyT Fine Almonds	Block 2	Open	Clone	PDF
2018	AA MyT Fine Almonds	AA MyT Fine Almonds	Block 3	Open	Clone	PDF

- Click **Open** to edit an Irrigation Schedule.
- Proceed with the steps under [Setup](#) section of this document to edit the appropriate fields.

Clone Irrigation Schedule

To clone an Irrigation Schedule from one year to another year or from one orchard to another orchard, proceed with the following:

- Click any of these buttons to get to the Irrigation Calculator page:
 - **Irrigation Calculator** under Tools in the top menu
 - **Calculate my irrigation recommendations** on the Tools panel.



Filter Your List: Check this box to narrow down your search results by:

- Year
- Organization
- Enterprise
- Orchard

The screenshot shows the 'Irrigation Calculator' form. The 'Irrigation Schedule Summary' section is highlighted with a red box. It contains a 'Filter your list' checkbox which is checked. Below this are four dropdown menus labeled 'Year:', 'Organization:', 'Enterprise:', and 'Orchard:', each with a default selection of '<All [Category]>'. At the bottom of the highlighted section is a green button labeled 'Add Irrigation Schedule'.

- Find the Irrigation Schedule of the Orchard you want to clone.
- Click Clone.

Crop Year	Organization	Enterprise	Orchard			
2018	AA MyT Fine Almonds	AA MyT Fine Almonds	Block 1	Open	Clone	PDF
2018	AA MyT Fine Almonds	AA MyT Fine Almonds	Block 2	Open	Clone	PDF

- Details for the Source are on the left. Details for the Target are on the right.
- In the Target section, click the dropdowns and choose where you want this information cloned over to:
 - Crop Year
 - Organization (Pre-populated if only one)
 - Enterprise (Pre-populated if only one)
 - Orchard
- Click Clone

Irrigation Calculator

Source

Crop Year: 2022

Organization: Acme Farming

Enterprise: Acme Farming

Orchard: Block 1

Target

Crop Year: 2022

Organization: Acme Farming

Enterprise: Acme Farming

Orchard: Block 1

Clone

- Click OK to create this schedule
 - Click Cancel to abort.

Are you sure you want to create a new schedule from the source schedule?

Click OK to create this schedule.

Click Cancel to abort.

OK

Cancel

- Your Irrigation Schedule has now been copied.
- The copied schedule will automatically open. You must clone one at a time and save each newly created Irrigation Schedule.