Irrigation and Fertilization for Young Almonds

Cameron Zuber
Orchard Crops Farm Advisor
2025

Adapted from presentations of Luke Milliron, Mallika Nocco, Phoebe Gordon, Mae Culumber, Moneim Mohamed, Kamyar Aram, David Doll, and Kenneth Shackel

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Irrigating

Source L. Milliron

Irrigating

- Determine amount
- Irrigate that amount
- Check amount right
- Repeat

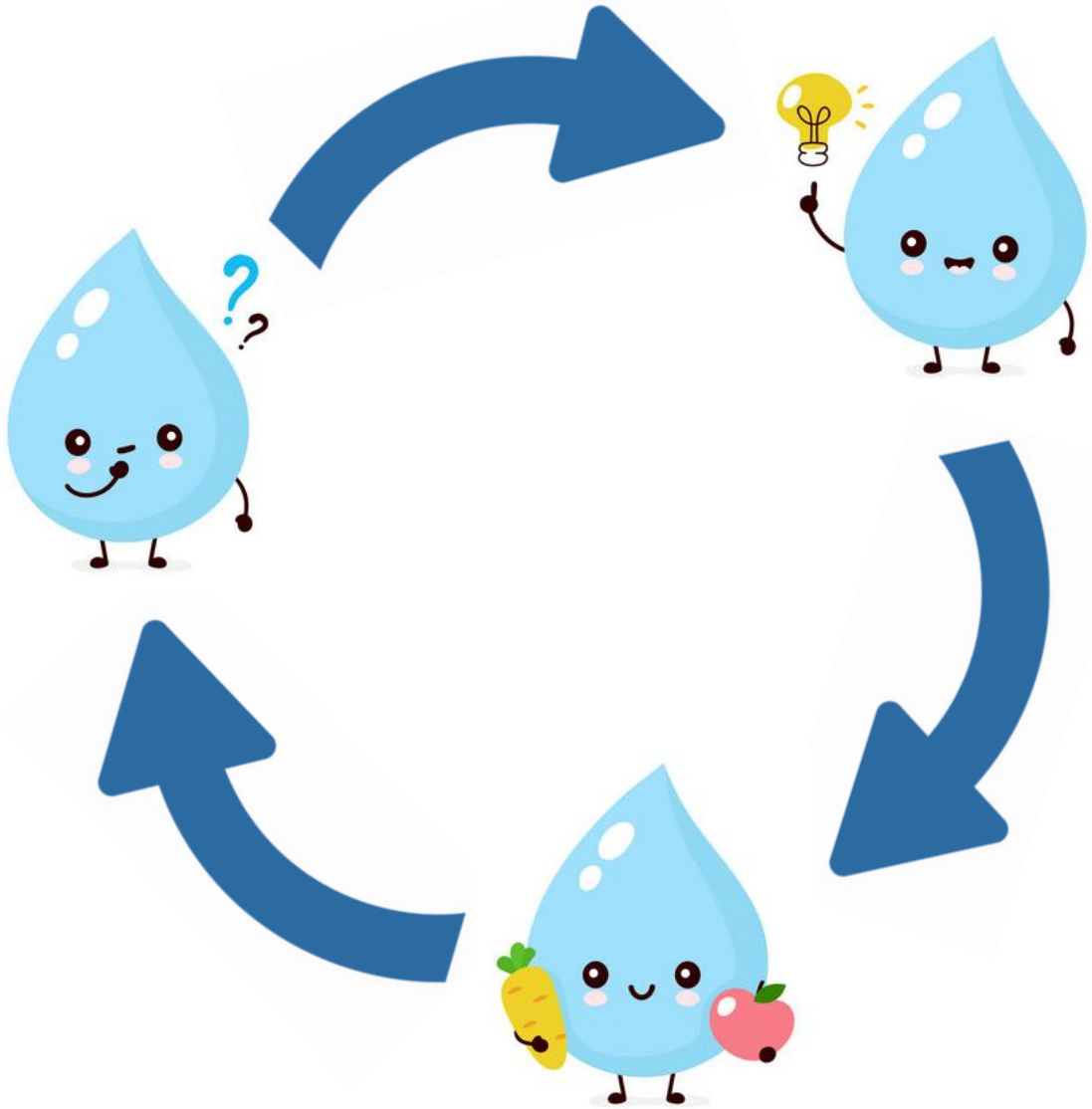

Image source VectorStock

Determine Amount

How much water your ***field*** is using

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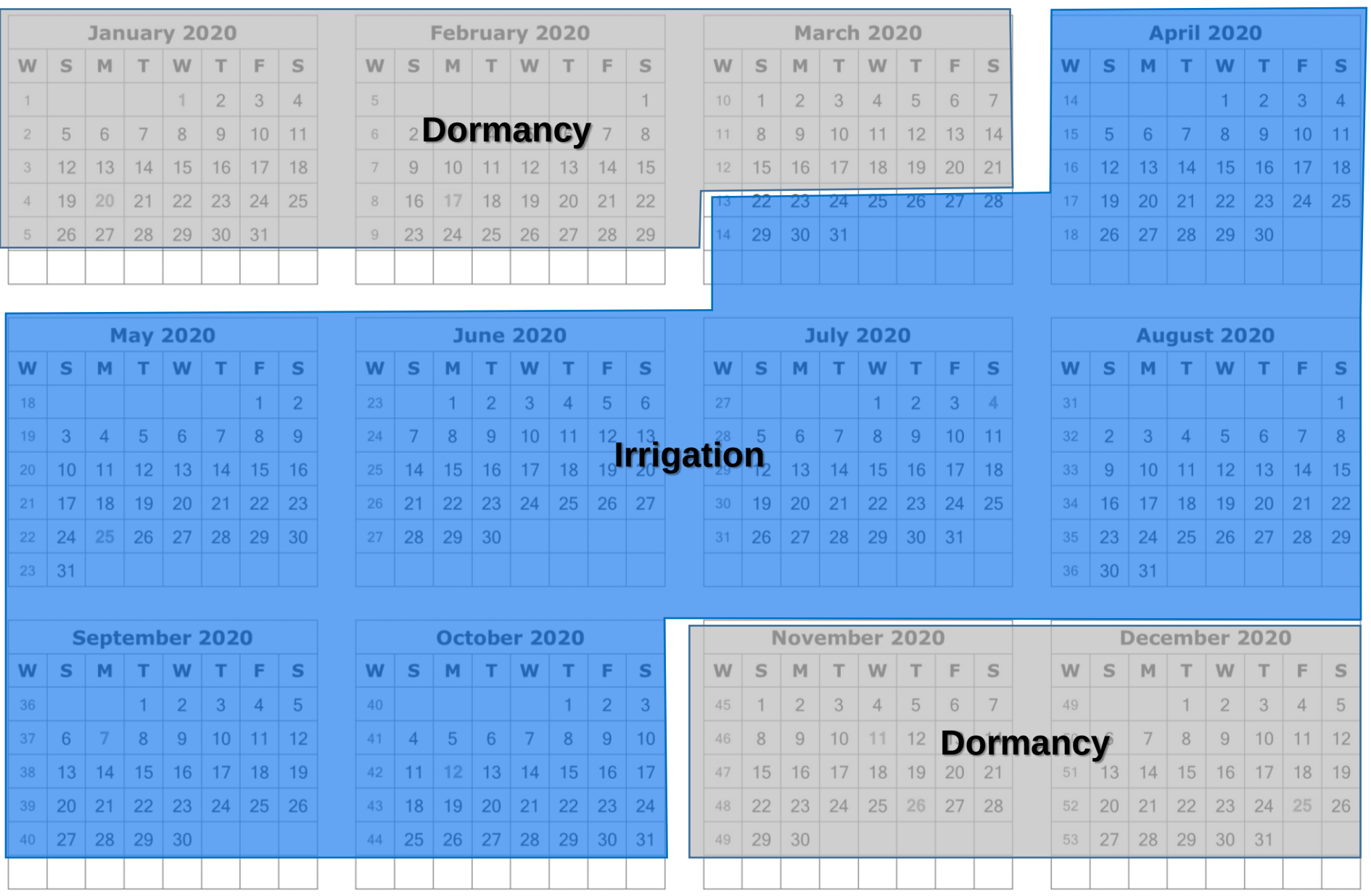
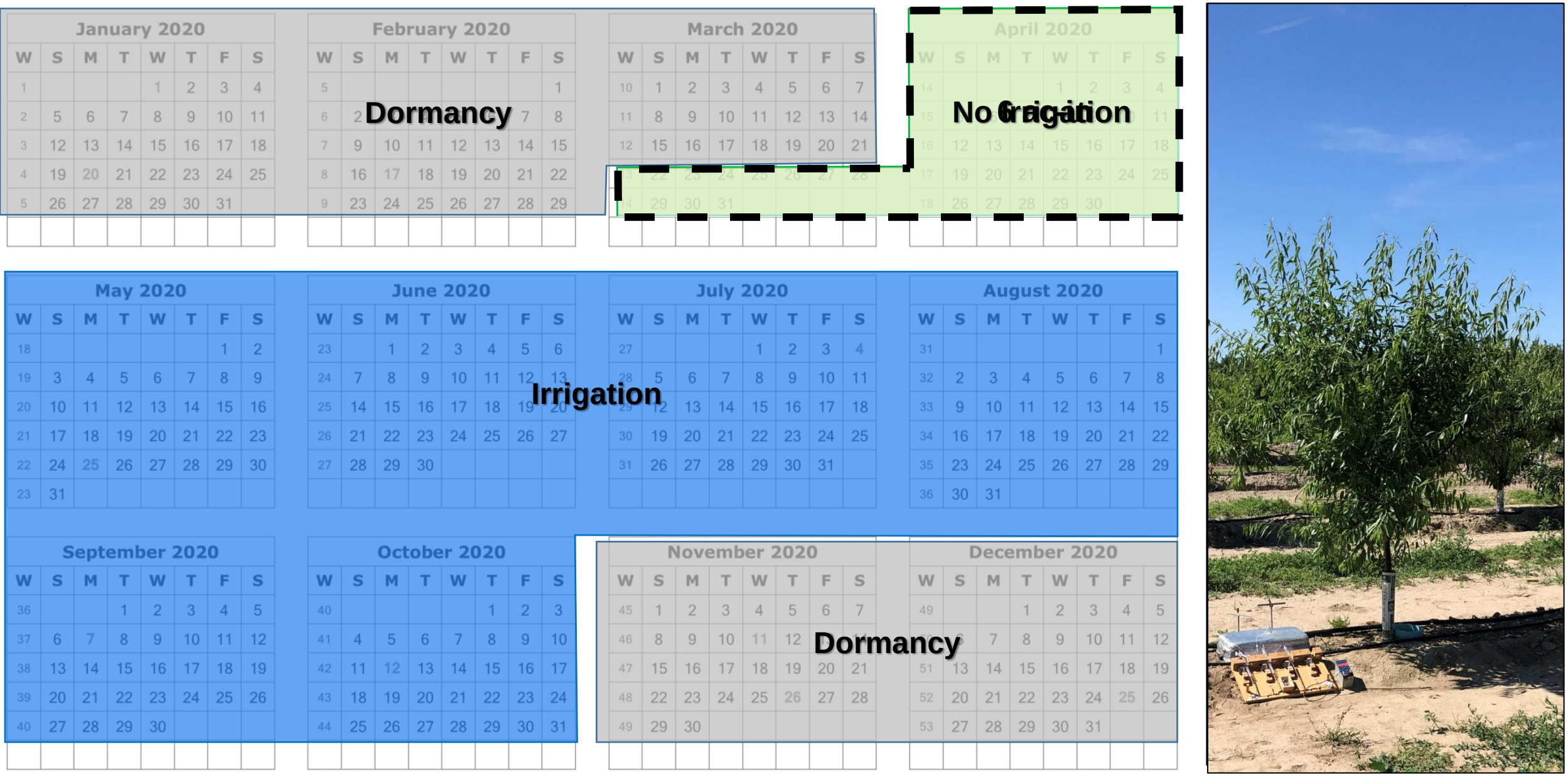
Determine Amount

Source NASA

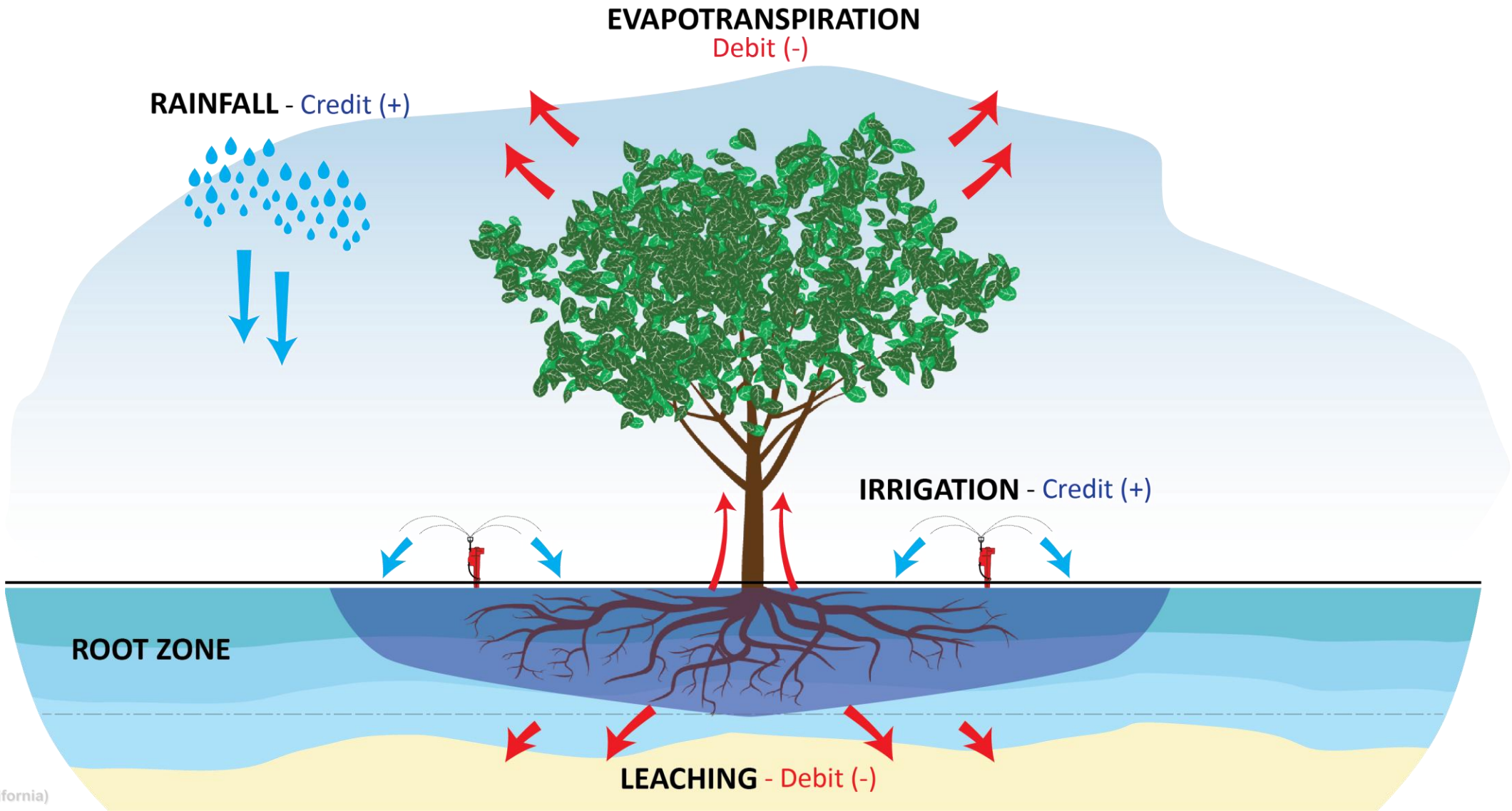
Determine ~~Amount~~ When To Start



Determine ~~Amount~~ When To Start



Determine ~~Amount~~ When To Start



Source Tom Devol
(Almond Board of California)

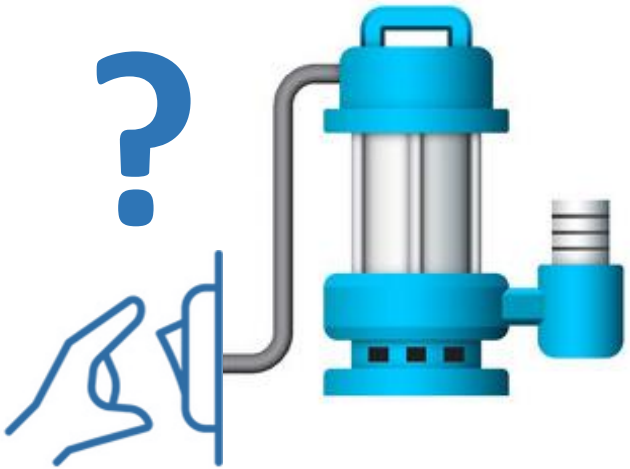
Determine ~~Amount~~ When To Start

- Soil moisture
- Plant water stress

Determine Amount

Water droplet and rainbow source VectorStock

Determine Amount



=

Tree image source PMS Instruments
Vector image source VectorStock

Determine Amount

$$Hours\ run\ irrigation = \frac{Gallons\ per\ tree}{Emitter\ output\ per\ tree}$$

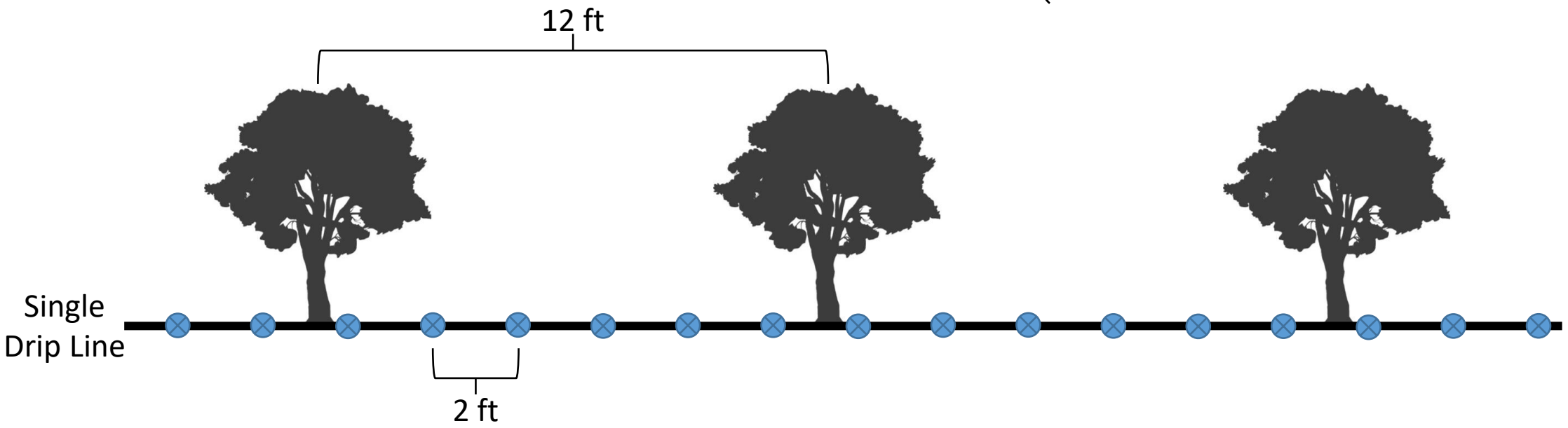
Microsprinkler

Inline Drip

Inline drip image source Barney Butter

Determine Amount

$$Emitter\ output\ per\ tree = (One\ emitter's\ output)\left(\frac{Tree\ spacing}{Space\ between\ each\ emitter}\right)$$

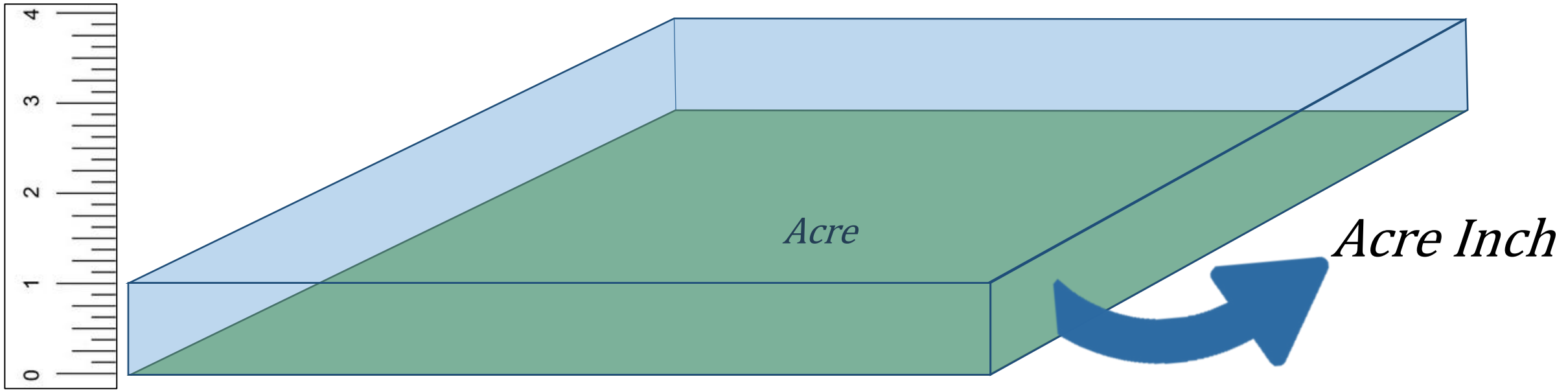


$$6\ gallons/hour = (\ 1\ gallon/hour\ )\left(\frac{12\ feet}{2\ feet}\right)$$

Determine Amount

$$Hours\ run\ irrigation = \frac{Gallons\ per\ tree}{Emitter\ output\ per\ tree}$$

$$Gallons\ per\ tree = \underset{(inch)}{ET_o} \times K_c \times \underset{(feet)}{Row\ Spacing} \times \underset{(feet)}{Tree\ Spacing} \times 0.623$$



Determine Amount

$$Hours\ run\ irrigation = \frac{Gallons\ per\ tree}{Emitter\ output\ per\ tree}$$

$$Gallons\ per\ tree = \underset{(inch)}{ET_o} \times K_c \times Row\ \underset{(feet)}{Spacing} \times Tree\ \underset{(feet)}{Spacing} \times 0.623$$

Determine Amount

San Joaquin and Stanislaus counties: https://cestanislaus.ucanr.edu/news_102/Weekly_Crop_Water_Use_Report/
Merced, Madera, Fresno counties: https://ucanr.edu/sites/Nut_Crops/Weekly_ET_Reports/
Kern County: https://cekern.ucanr.edu/news_80/Kern_ET_Update/

WEEKLY SOIL MOISTURE LOSS IN INCHES
(Estimated Crop Evapotranspiration or ET_c)
04/12/24 through 04/18/24

Crops (Leafout Date)	#148 Merced			#39 Parlier			#258 Lemon Cove		
	4/12 - 4/18 Water Use	Accum'd Seasonal Water Use	4/19 - 4/25 Estimated ETc	4/12 - 4/18 Water Use	Accum'd Seasonal Water Use	4/19 - 4/25 Estimated ETc	4/12 - 4/18 Water Use	Accum'd Seasonal Water Use	4/19 - 4/25 Estimated ETc
Almonds (3/1) *	0.90	4.30	1.07	0.87	4.44	1.08	0.89	4.24	1.11
Pistachio (TBD) * **	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Citrus (2/1)	0.81	5.93	0.91	0.81	6.18	0.92	0.79	5.94	0.95
Raisin Grapes (3/11) (11 ft. row spacing)	0.16	0.47	0.24	0.16	0.48	0.24	0.16	0.45	0.24
Winegrapes (3/11) (10 ft. spacing on California Sprawl Trellis)	0.24	0.78	0.30	0.21	0.78	0.31	0.23	0.76	0.31
Walnuts (TBD)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stone Fruit (3/11)	0.46	1.48	0.49	0.43	1.52	0.50	0.45	1.49	0.53
Past 7 days precipitation (inches)		0.00			0.81			0.55	
Accumulated precipitation (inches) (1/1/2023)		14.98			8.64			9.06	

Crops (Leafout Date)	#124 Panoche			#2 Five Points			#15 Stratford		
	4/12 - 4/18 Water Use	Accum'd Seasonal Water Use	4/19 - 4/25 Estimated ETc	4/12 - 4/18 Water Use	Accum'd Seasonal Water Use	4/19 - 4/25 Estimated ETc	4/12 - 4/18 Water Use	Accum'd Seasonal Water Use	4/19 - 4/25 Estimated ETc
Almonds (3/1) *	0.81	4.01	1.21	0.81	4.05	1.27	0.85	3.96	1.26
Pistachio (TBD) * **	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Citrus (2/1)	0.75	6.11	1.04	0.78	6.31	1.08	0.81	6.18	1.07
Raisin Grapes (3/11) (11 ft. row spacing)	0.14	0.47	0.25	0.14	0.47	0.26	0.15	0.48	0.26
Winegrapes (3/11) (10 ft. spacing on California Sprawl Trellis)	0.20	0.80	0.32	0.21	0.78	0.34	0.21	0.78	0.34
Walnuts (TBD)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stone Fruit (3/11)	0.41	1.54	0.59	0.43	1.46	0.61	0.45	1.42	0.61
Past 7 days precipitation (inches)		0.60			0.40			0.99	
Accumulated precipitation (inches) (1/1/2023)		6.41			6.69			5.29	

Determine Amount

$$Hours\ run\ irrigation = \frac{Gallons\ per\ tree}{Emitter\ output\ per\ tree}$$

$$Gallons\ per\ tree = \underset{(inch)}{ET_o} \times K_c \times \underset{(feet)}{Row\ Spacing} \times \underset{(feet)}{Tree\ Spacing} \times 0.623$$

Irrigation Considerations

Irrigation Considerations

True or False

"Young almonds use the same exact amount of water as older almonds"

Irrigation Considerations

$$Gallons\ per\ tree = (ET_c \times K_c) \times Row\ Spacing \times Tree\ Spacing \times 0.623$$

(ET_c: inch; K_c: %; Row Spacing: feet; Tree Spacing: feet)

Almond tree age (years)	% of ET_c of mature almond trees
1	40
2	55
3	75
4	90

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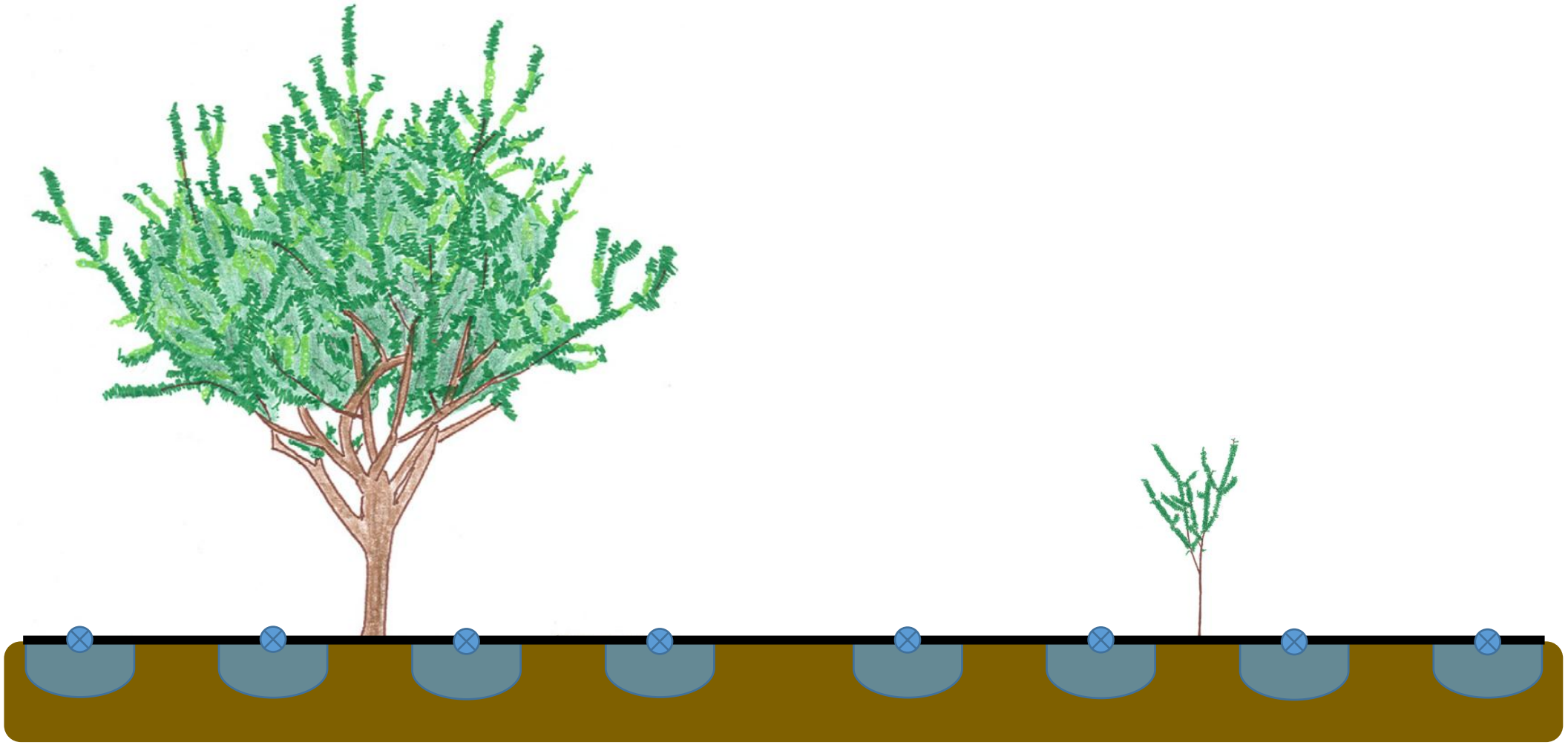
Right graph adapted from Drechsler et al., 2022

Irrigation Considerations

True or False

"The perfect emitter placement for older almond trees is the same as young almond trees"

Irrigation Considerations



Tree image source FREP

Irrigation Considerations

Others have or will cover

- Soil water holding capacity
- DU or CU

Irrigate That Amount

Irrigate That Amount

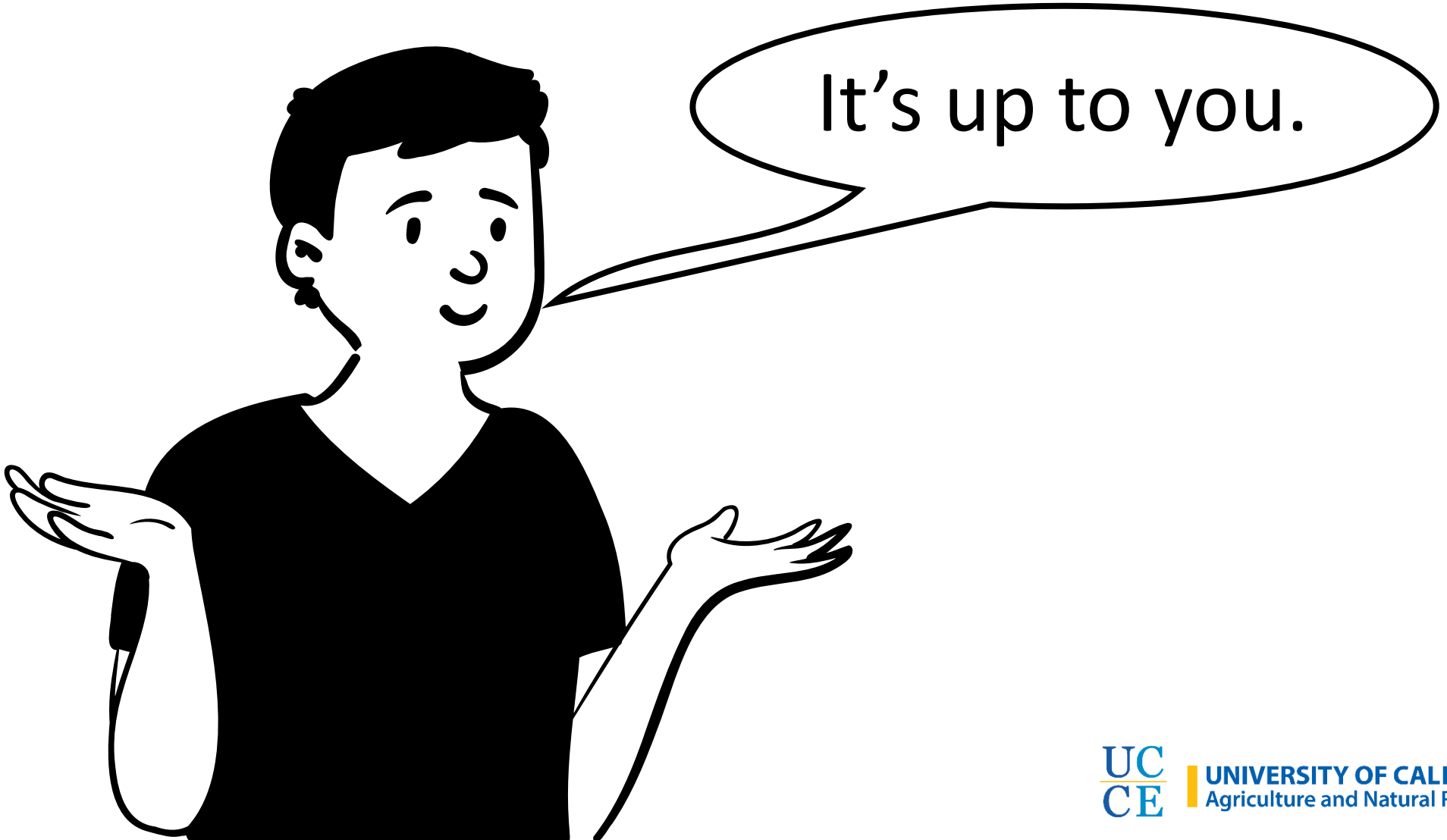
Check That It Was Right

Check That It Was Right

Why?

Haven’t I done enough…..

Check That It Was Right



Check That It Was Right

$$Gallons\ per\ tree = \underset{(inch)}{ET_o} \times K_c \times \underset{(feet)}{Row\ Spacing} \times \underset{(feet)}{Tree\ Spacing} \times 0.623$$

CIMIS
CALIFORNIA IRRIGATION MANAGEMENT INFORMATION SYSTEM
CALIFORNIA DEPARTMENT OF WATER RESOURCES

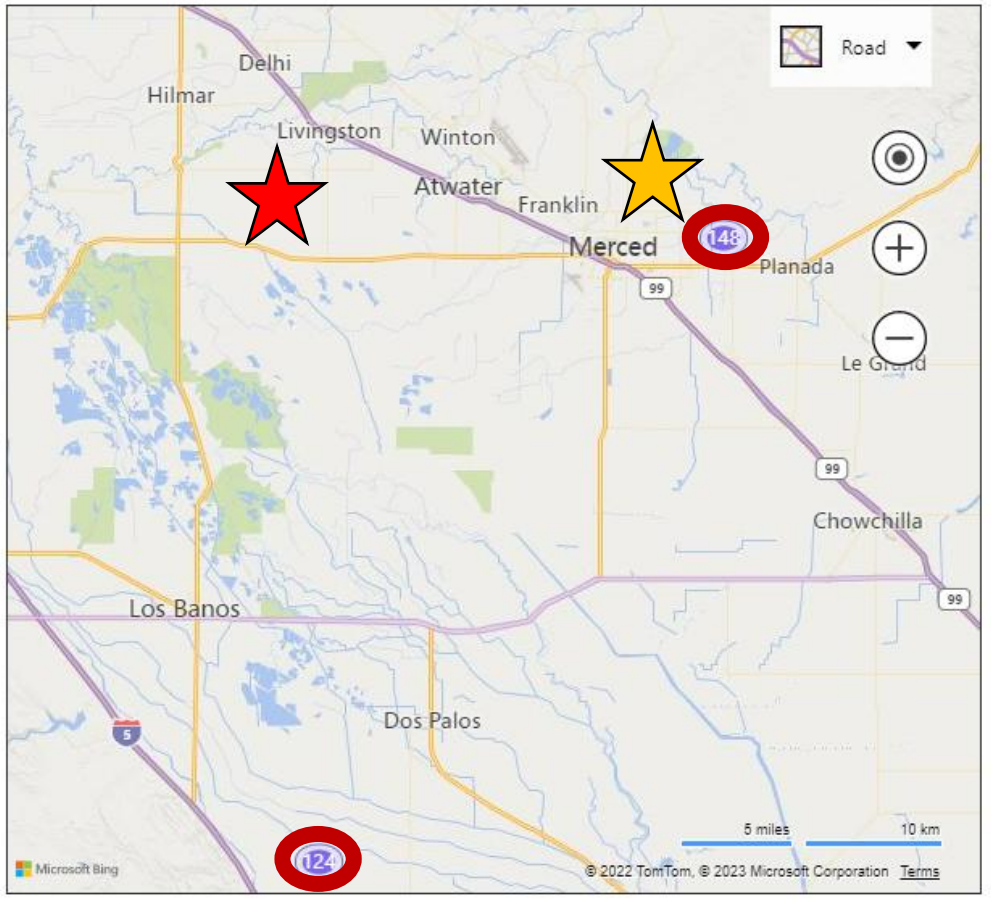


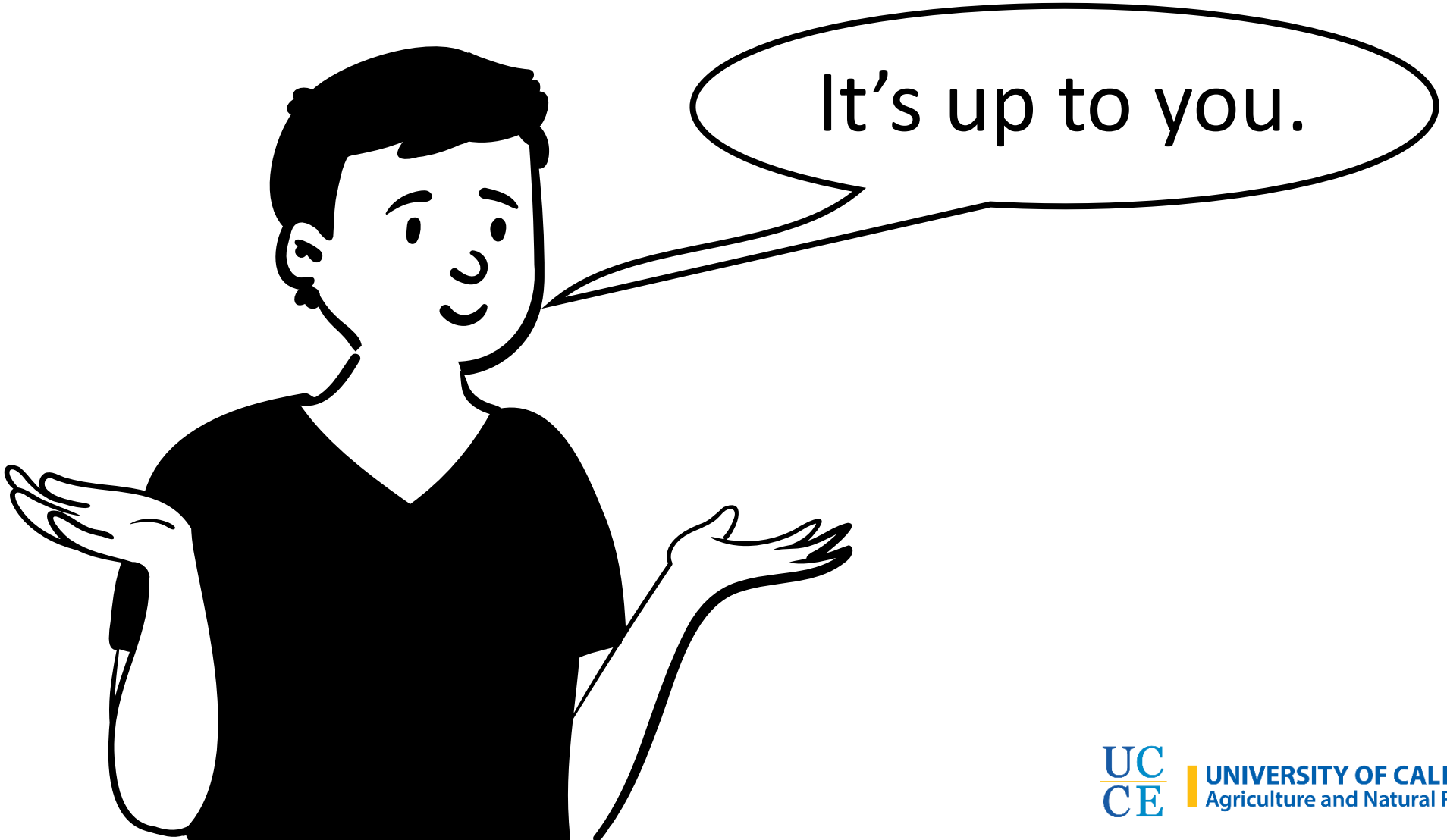
Image source CIMIS

Check That It Was Right

$$Gallons\ per\ tree = \underset{(inch)}{ET_o} \times K_c \times \underset{(feet)}{Row\ Spacing} \times \underset{(feet)}{Tree\ Spacing} \times 0.623$$

	Almond Production Manual (1996)	Sanden (2007)	Goldhamer (2012)
March	0.54	0.59	0.20
April	0.63	0.78	0.67
May	0.76	0.92	0.95
June	0.85	1.01	1.09
July	0.94	1.08	1.15
August	0.94	1.08	1.17
September	0.93	1.02	1.12
October	0.82	0.89	0.85
November	0.70	0.69	

Check That It Was Right



Check That It Was Right

"Don't pick the perfect tool,
pick the perfect tool <u>for you</u>."

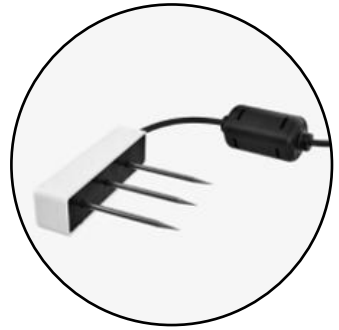
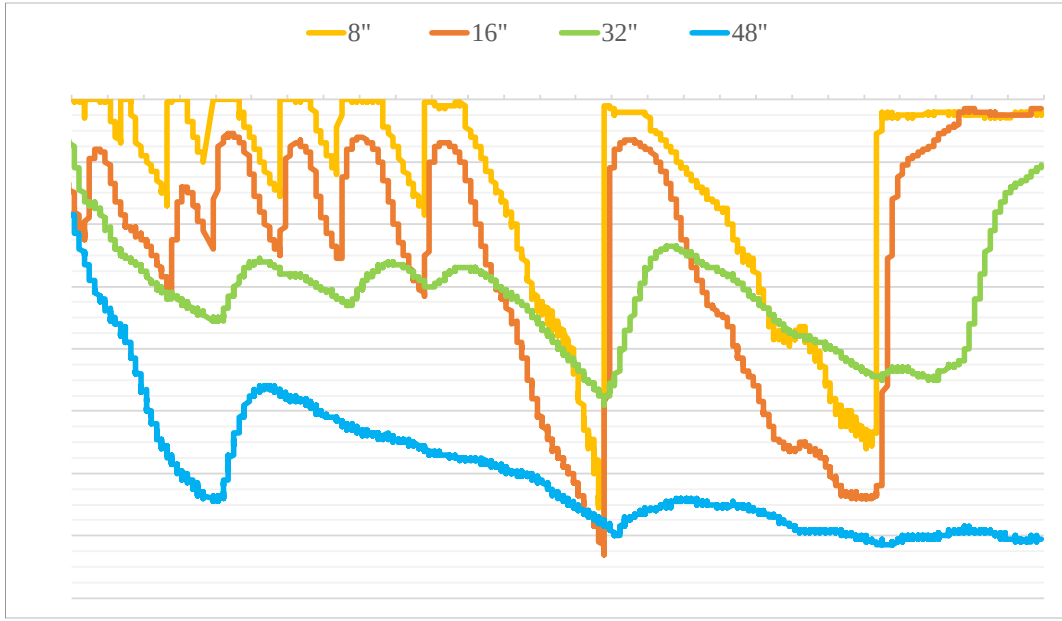
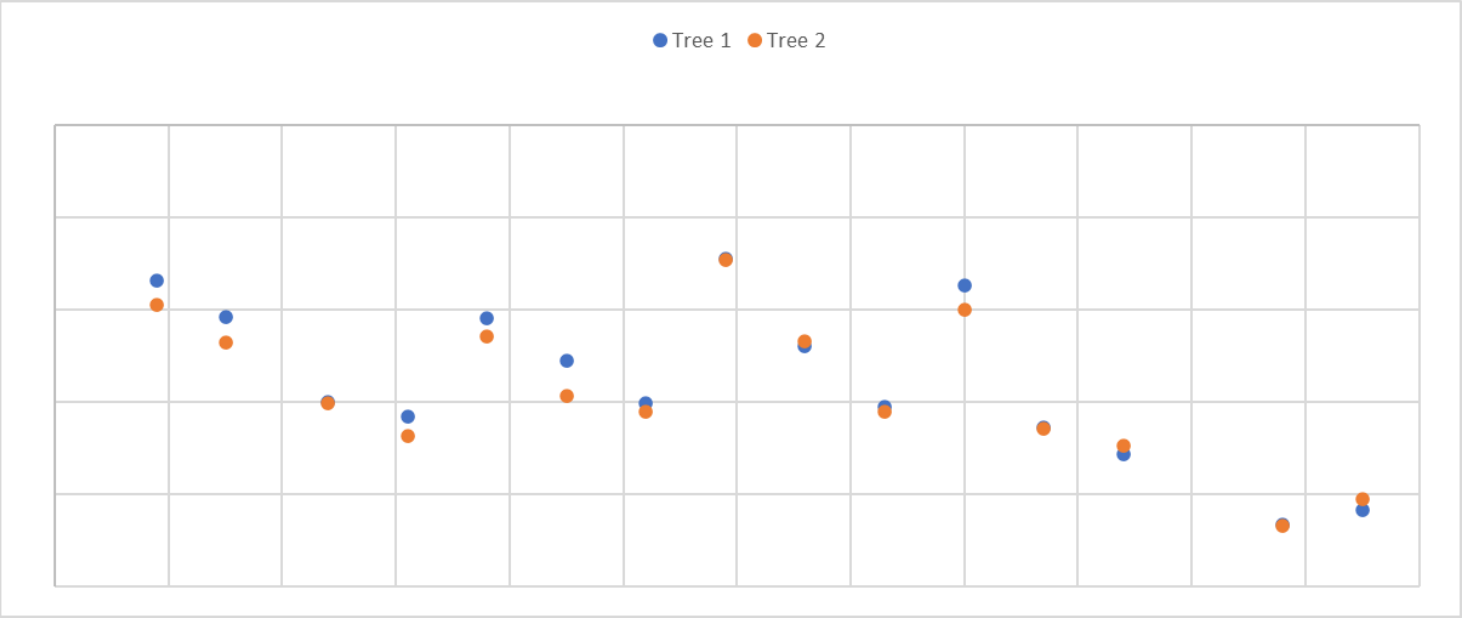


Image sources Phytech, Implexx Sense, PMS Instrument Co, Saturas LTD, FloraPulse, Netafim, Meter Group, and USDA

Check That It Was Right



Soil tension

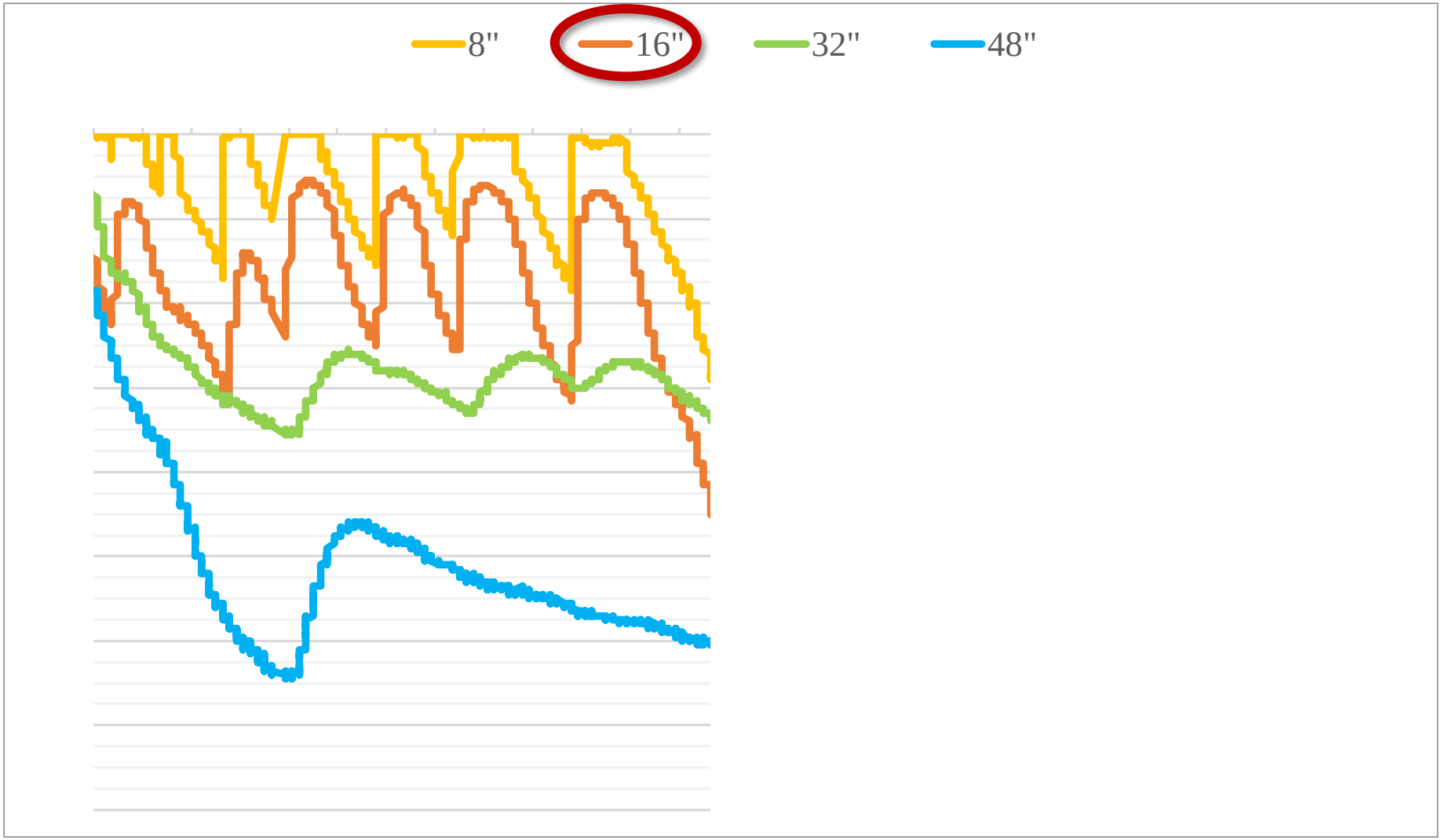


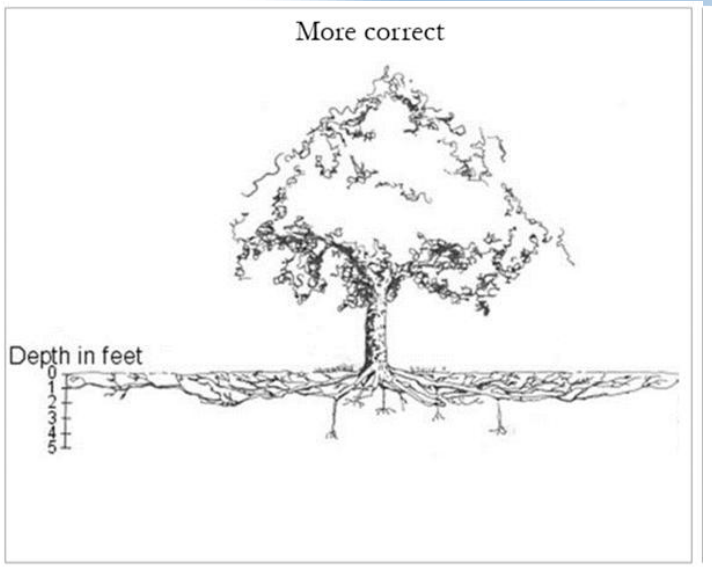
Plant water stress

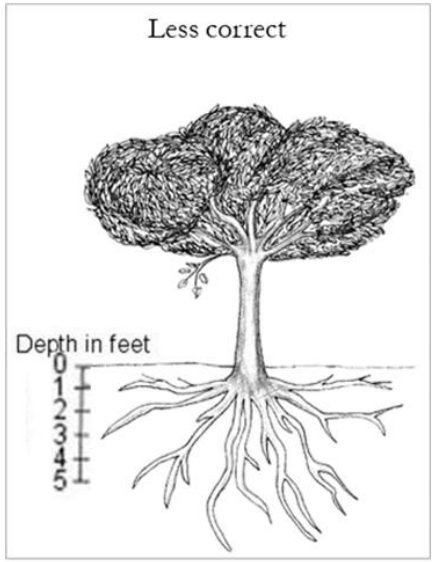
Left Image source Kamyar Aram

Check That It Was Right

Check That It Was Right







Original image sources Kamyar Aram, University of Minnesota Extension, and Janice Austin

Check That It Was Right

Original image sources Kamyar Aram,

In Summary for Irrigation

In Summary

- Determine amount
- Irrigate that amount
- Check amount right
- Repeat

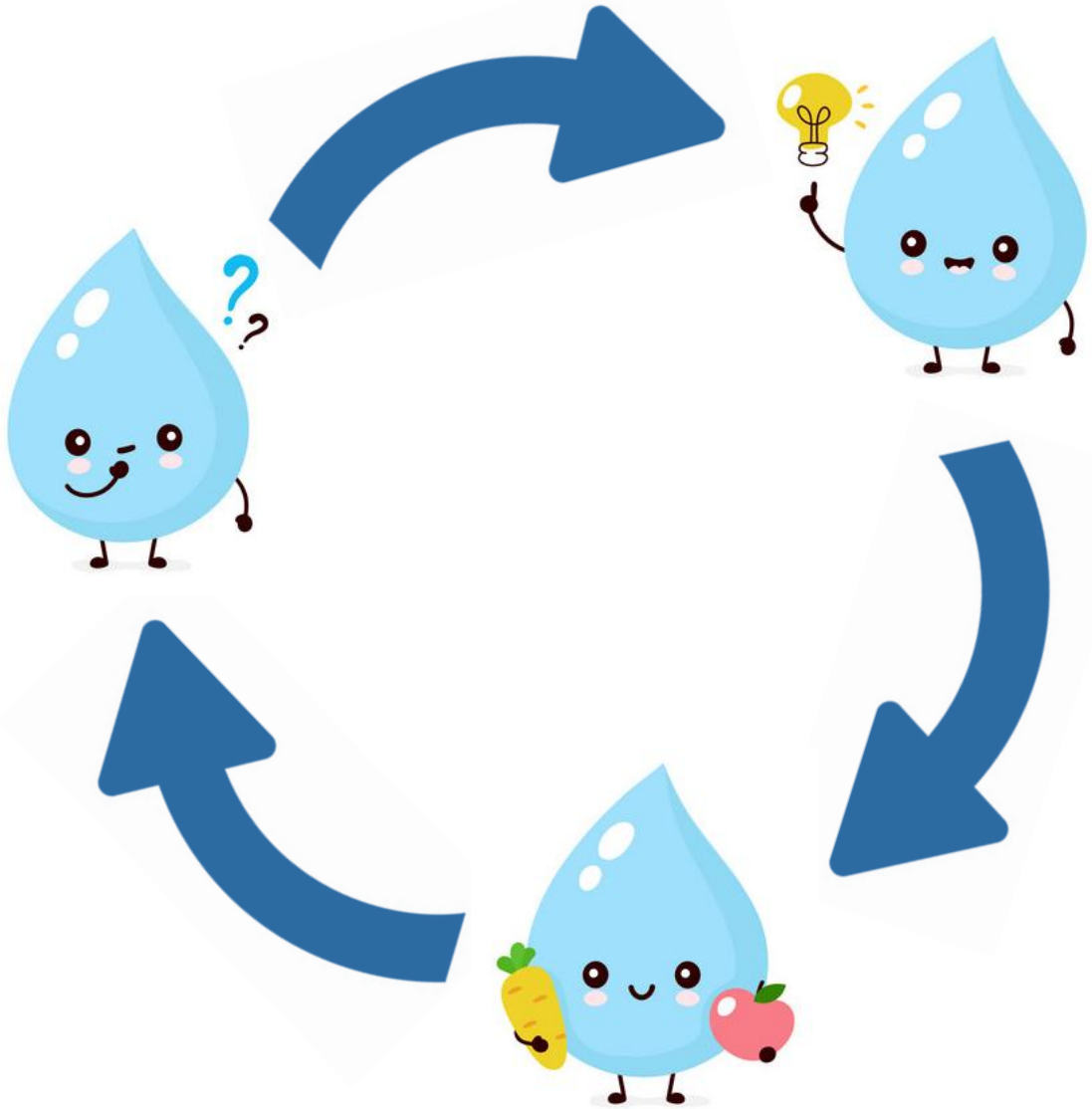


Image source VectorStock

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Fertilization

Fertilization

- What type
- How much
- How often

Type of Fertilizer

Nitrogen is nitrogen

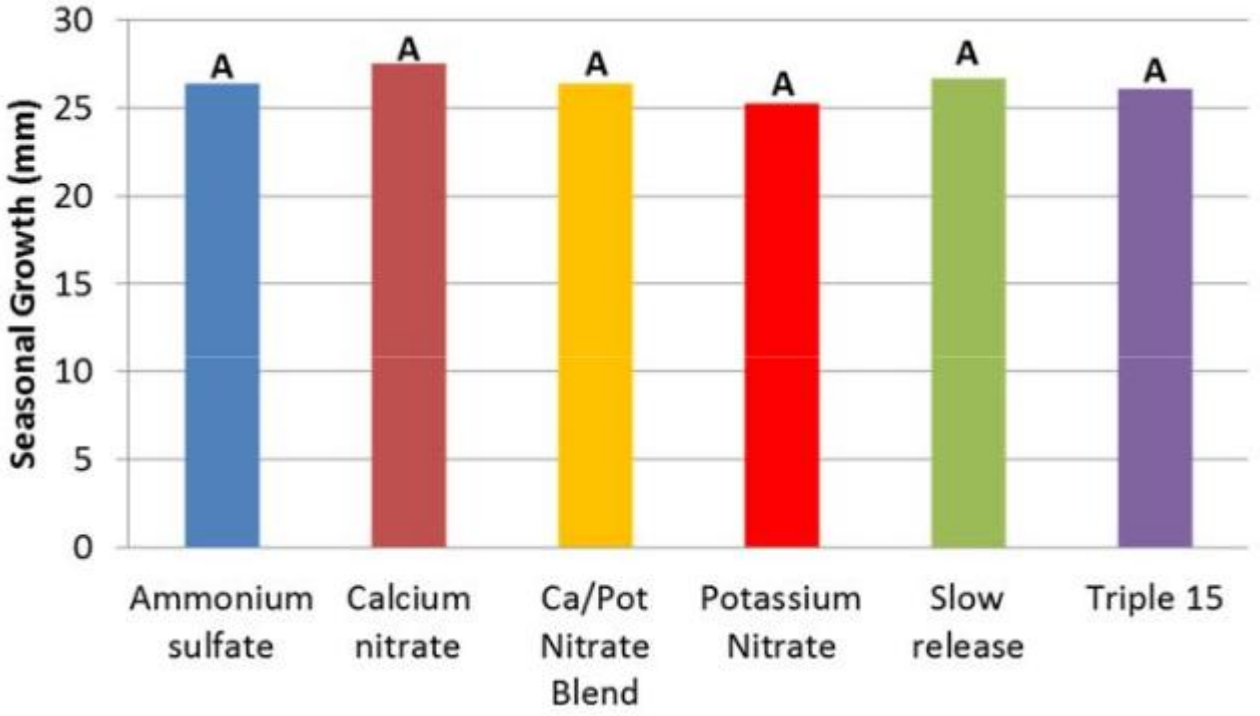

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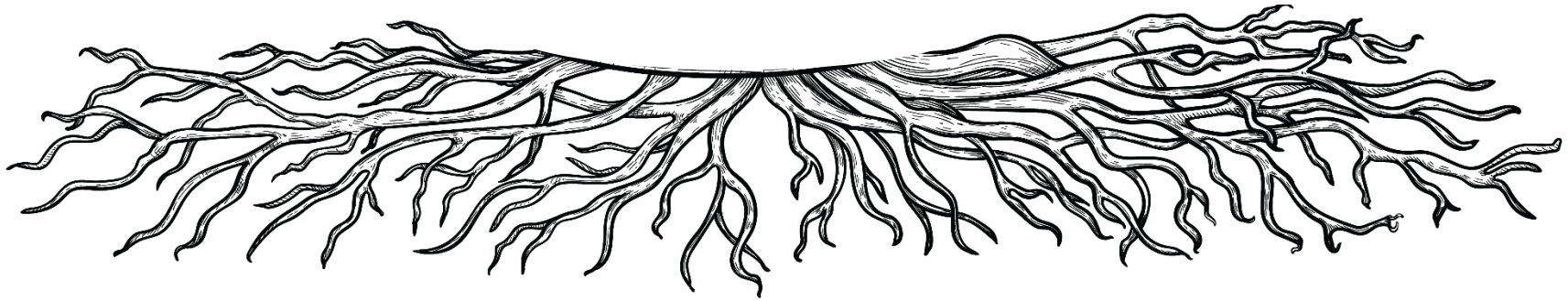
Image source UC ANR Young Orchard Handbook

Type of Fertilizer

- Availability
- Leaching
- pH



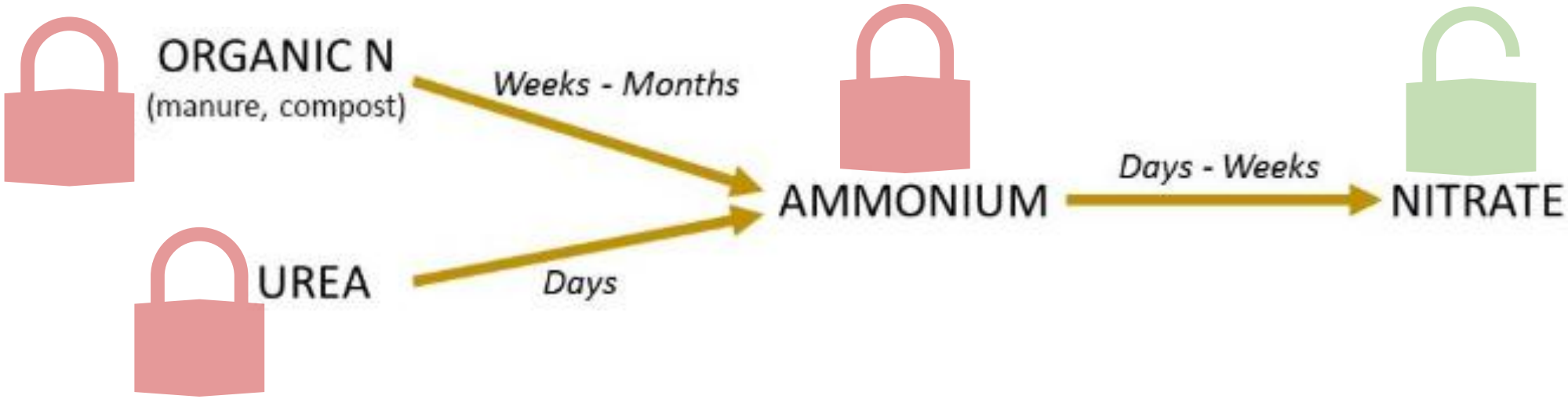


Image source UC ANR Young Orchard Handbook

Type of Fertilizer

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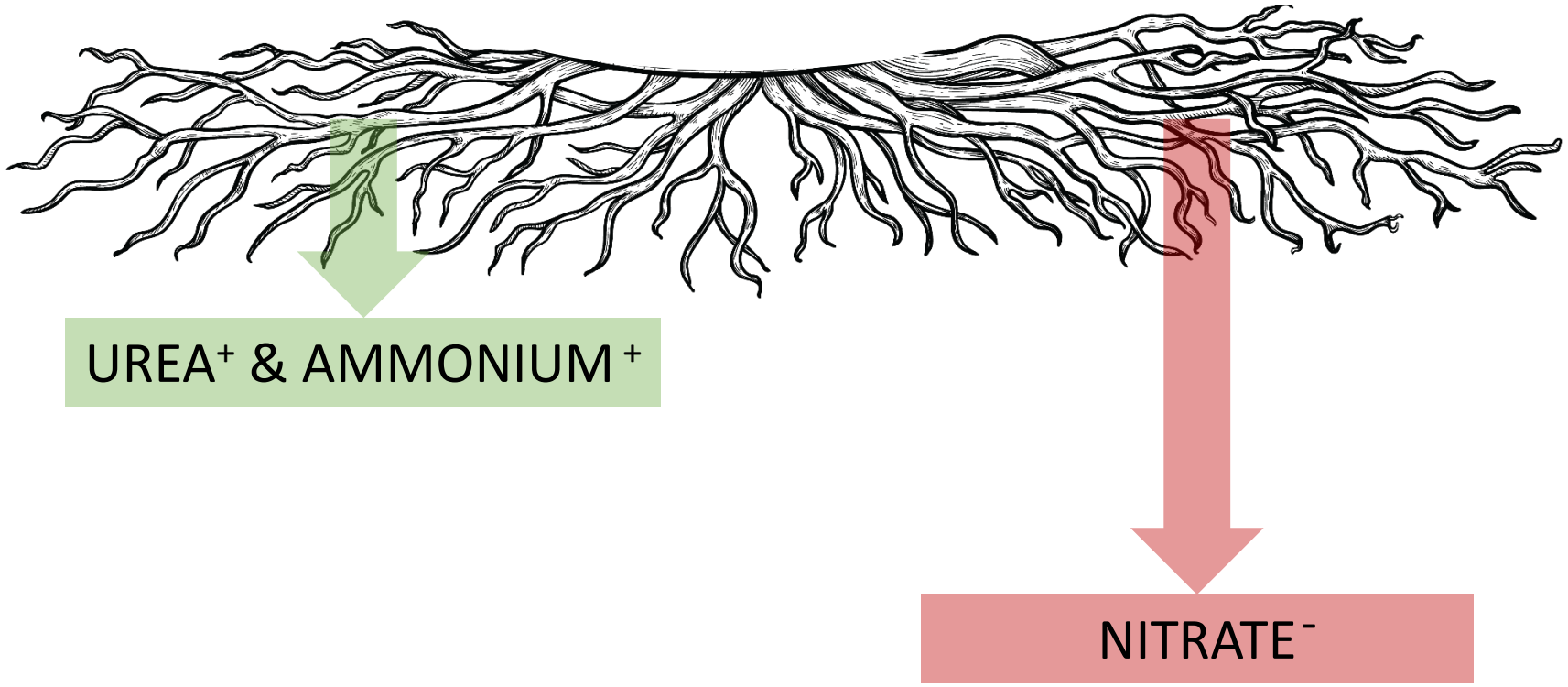

Type of Fertilizer

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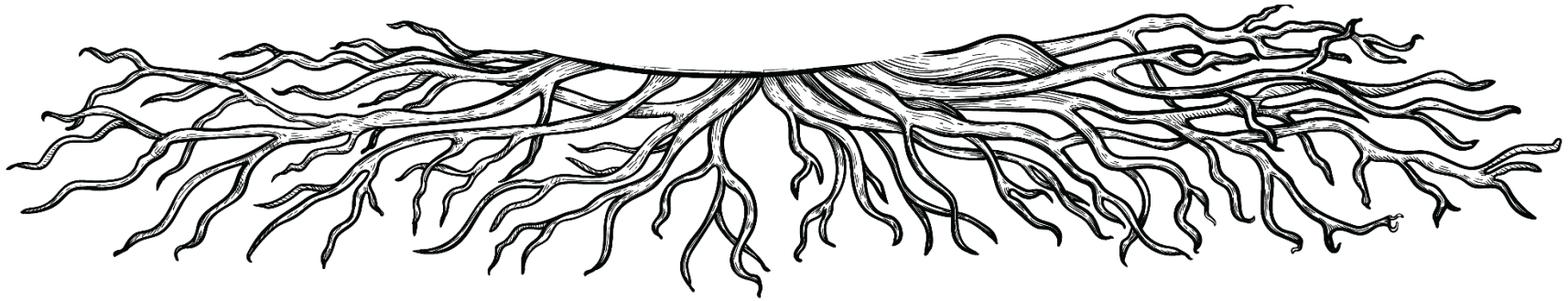


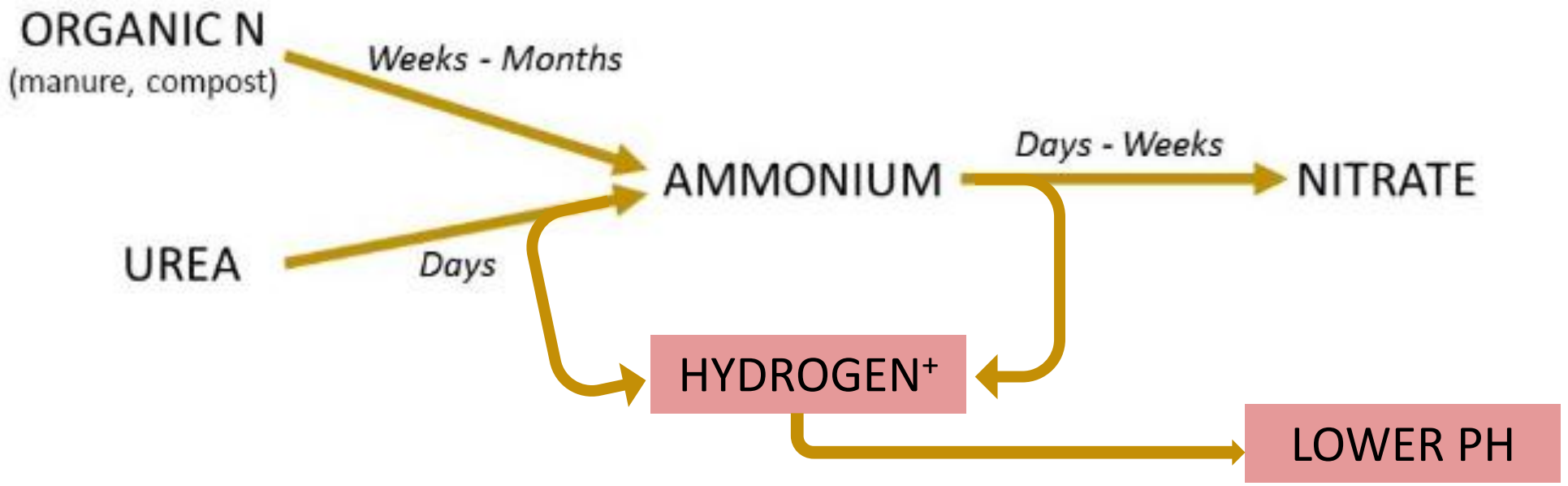
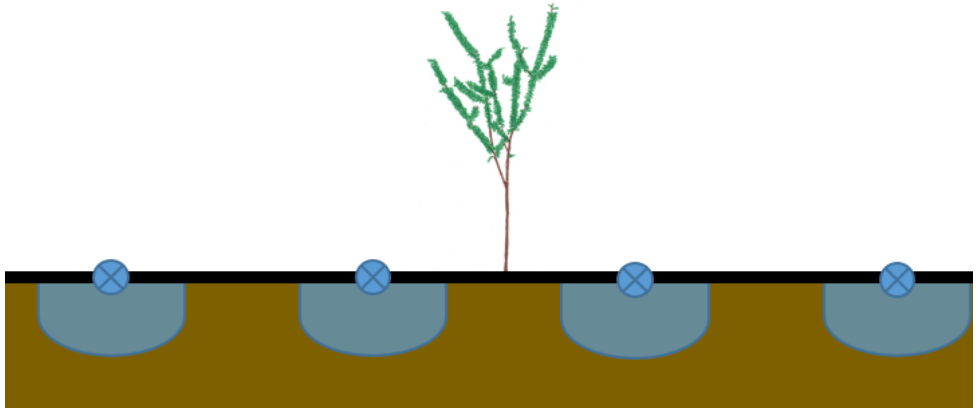


Image source UC ANR Young Orchard Handbook

Type of Fertilizer

Nitrogen is nitrogen



How Much To Apply

How Much

Year	Nitrogen per acre (lbs)	
	Baseline	Additional
1	30	0
2	55	0*
3	65	68 per 1000 kernel lbs
4	55	68 per 1000 kernel lbs

*Some Year 2 almond orchard can have substanital yield. If so, follow Year 3 and 4 recommendations

$$\frac{N\ lbs}{acre\ inch\ water} = NO^3\text{-}N\ ppm \times 0.23$$

Sources Young Orchard Handbook and Nitrogen Best Management Practices

How Often

How Often

No more than <u>one oz</u> of nitrogen per tree for any single application on <u>first year</u> trees

How Often

No more than <u>two oz</u> of nitrogen per tree for any single application on <u>second year</u> trees

How Often

Lanky

Burned

Image source VectorStock

Technical assistance and trainings

If interested, please contact:

- Moneim Mohamed – UCCE Stanislaus, San Joaquin and Merced Counties: amohamed@ucanr.edu
- Mae Culumber – UCCE Fresno County: cmculumber@ucanr.edu
- Cameron Zuber – UCCE Merced and Madera Counties: cazuber@ucanr.edu
- Tobias Oker – UCCE Kern County: teoker@ucanr.edu
- Giulia Marino – UC Davis: giumarino@ucanr.edu

Cameron Zuber

Email: cazuber@ucanr.edu

Cell: (209) 201-2352

Office: (209) 385-7403

Most deciduous crops in Merced County.
Just walnuts in Madera County

Web Resource

TREE FRUIT NUTS VINEYARDS IPM
SOILS AND IRRIGATION NUTRITION GALLERY VIDEOS

UC CE San Joaquin Valley Trees and Vines

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OTHER RESOURCES

www.sjvtandv.com

Mar 1, 2023

Madera/Merced Pistachio Day is April 13

Feb 22, 2023

Madera County almond day is March 23

Feb 15, 2023

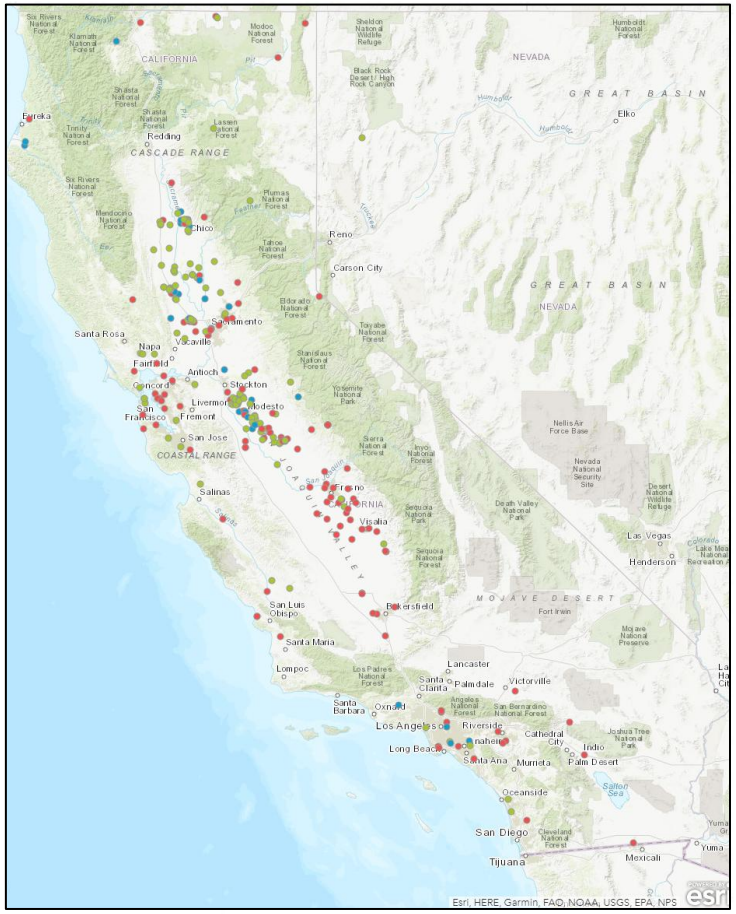
Almond Variety Trial field notes

Feb 8, 2023

How Late is Too Late for NOW Winter Sanitation?

How Do You Say Almond?

Take the survey and put your pronunciation on the map!



Map as of 2023

MAP LEGEND

- With the L (ALL-mund)
- Without the L (AH-mund)
- Both, it depends on the company I'm with

Visit the website at

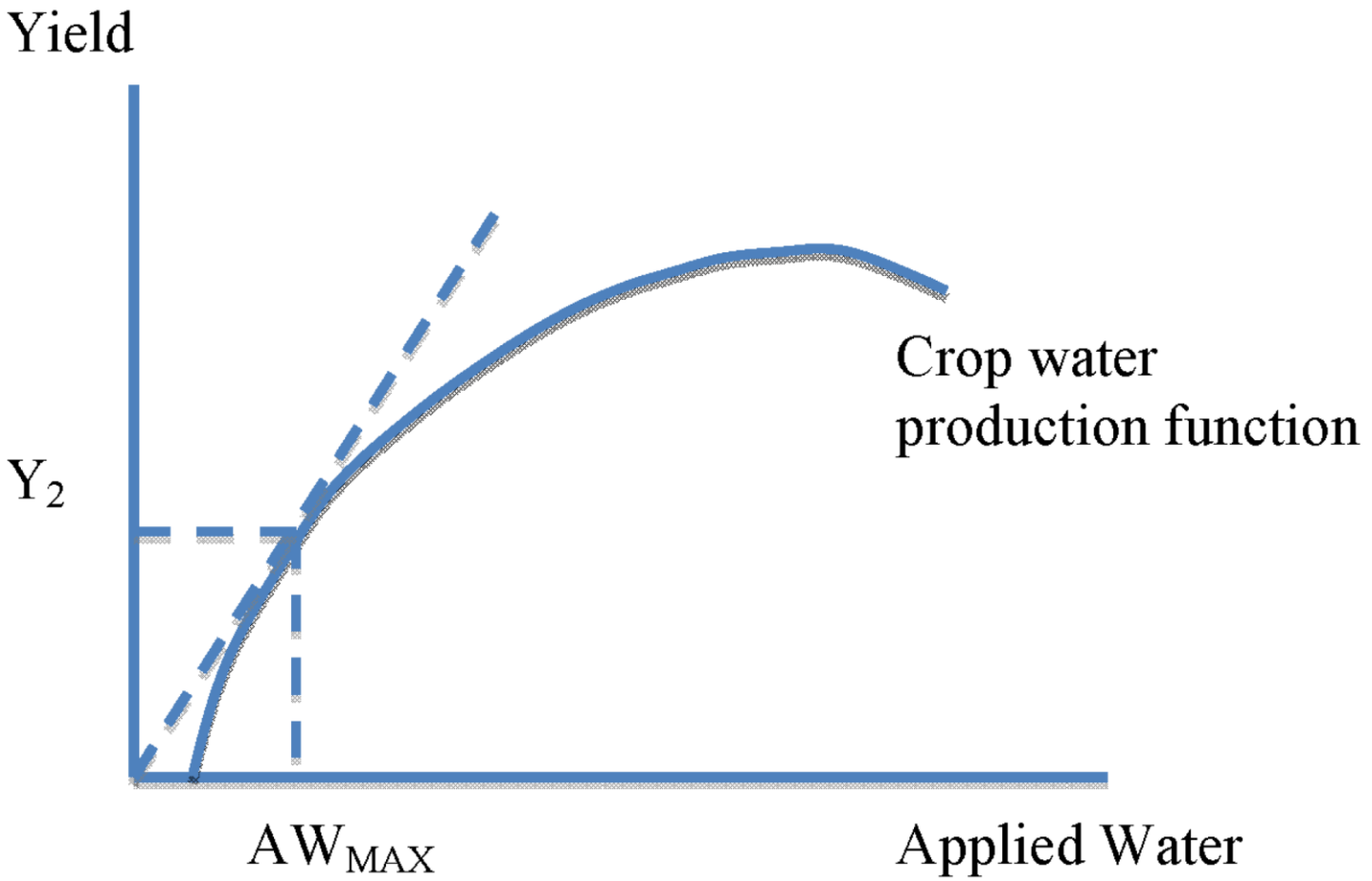
www.ucanr.edu/sayalmond

to learn more about this project and to see how people around California say the word almond

While at the website take the survey yourself and add your pronunciation to the map

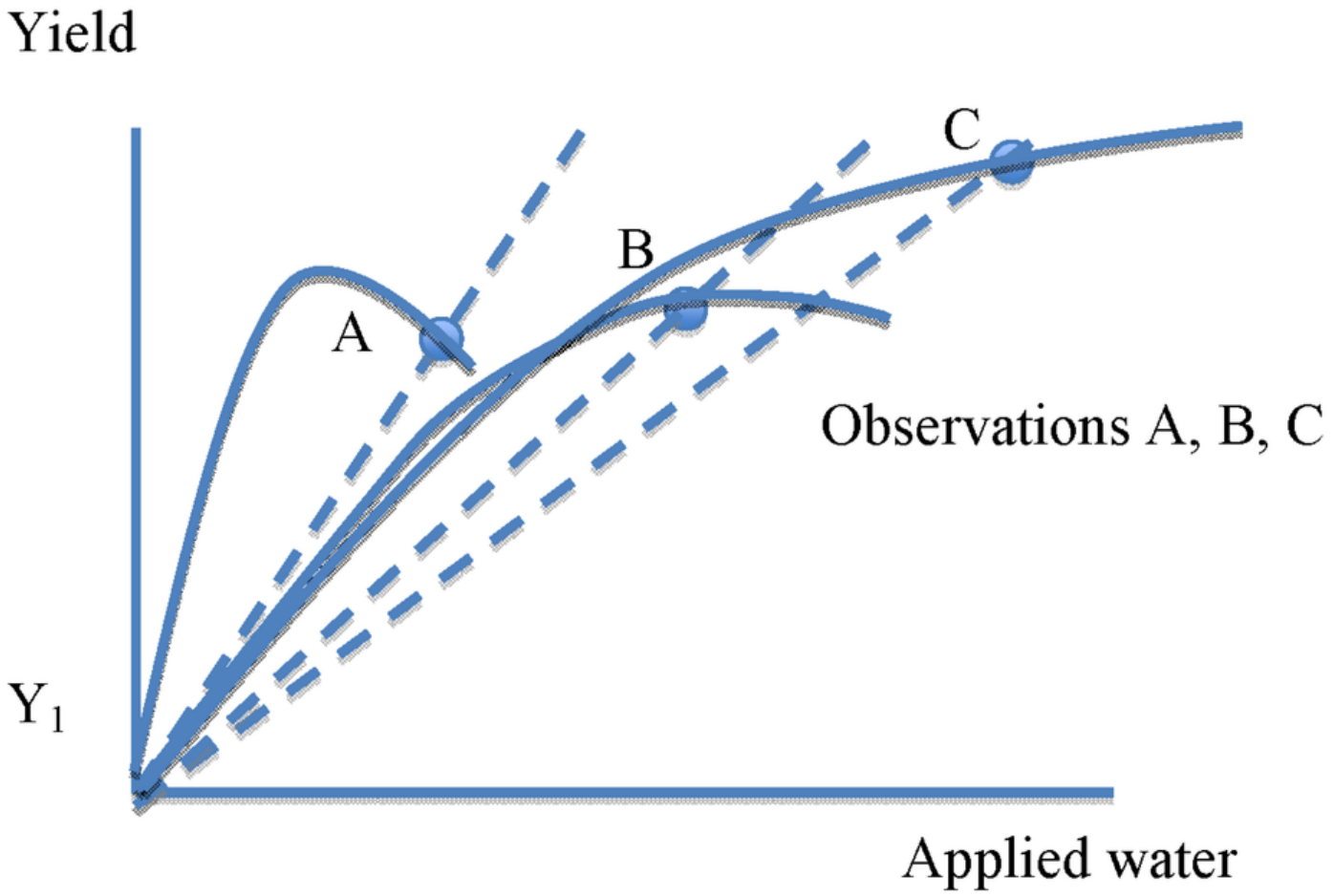
SCAN ME

Other information



Wilchens, 2014; Goldhamer and Fereres, 2016

Other information



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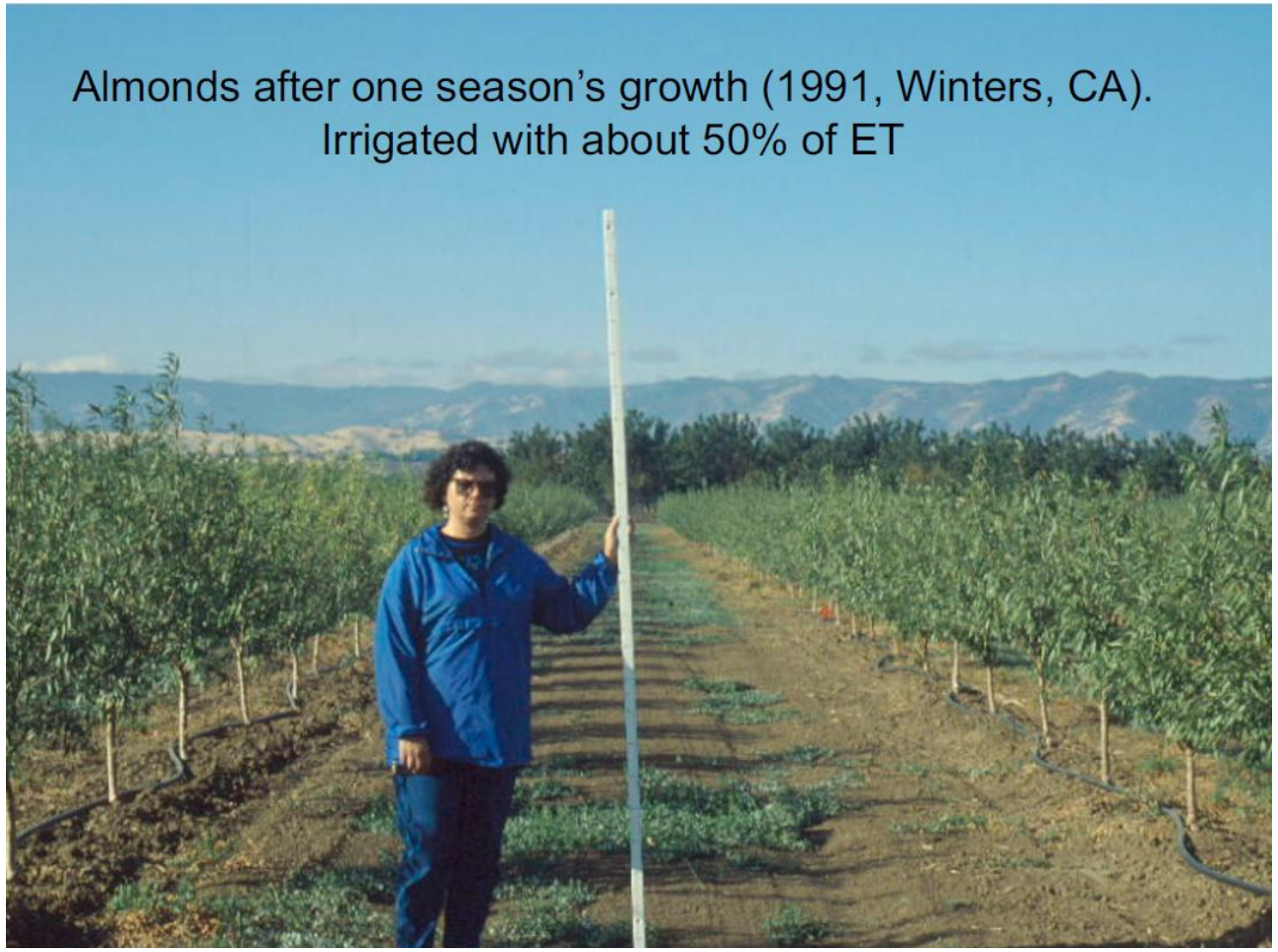


Source Unknown

Other information

Source Unknown

Other information

Source Unknown

Irrigation Considerations

True or False

"All soil types can hold the same amount of water"

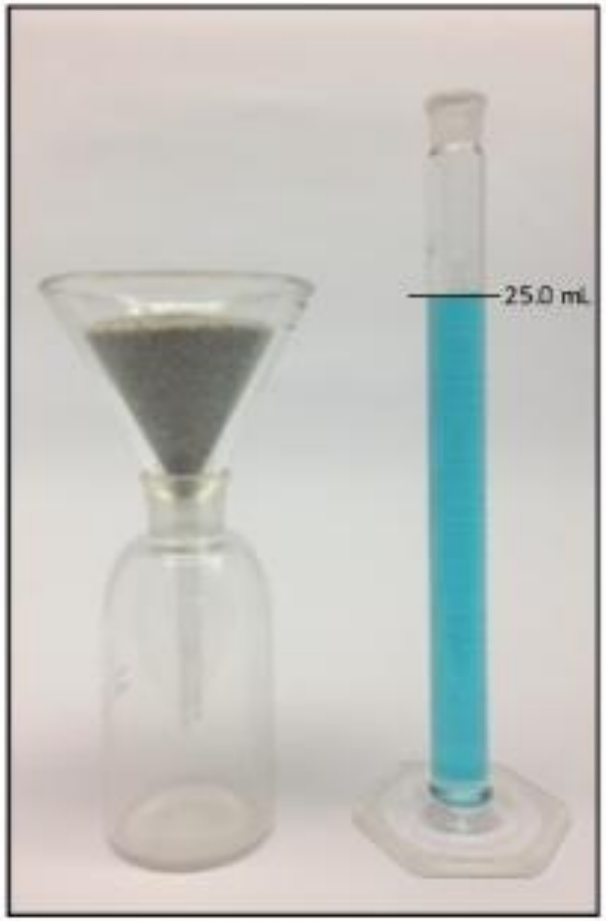
Irrigation Considerations

Soil Water Holding Capacity

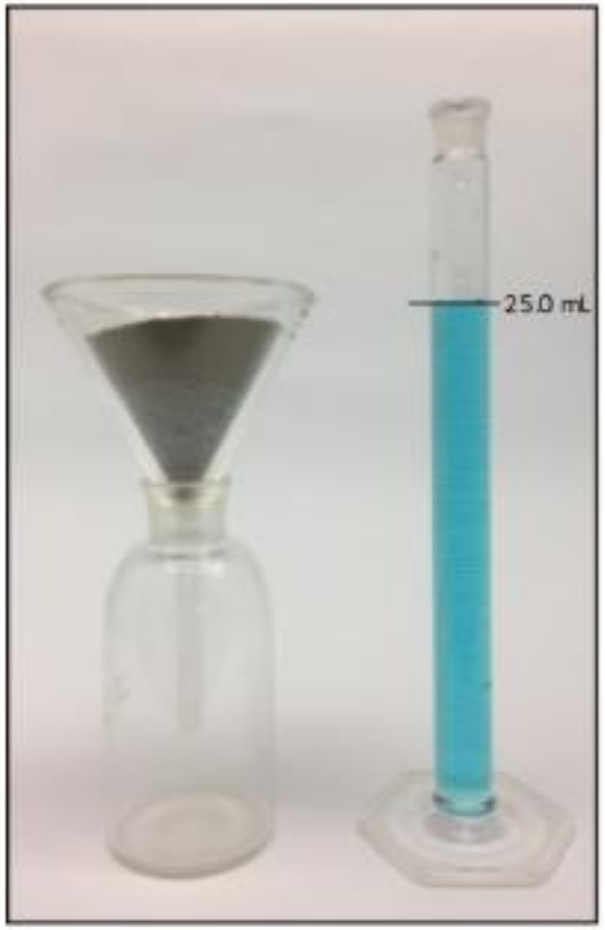
Textural class	*Water holding capacity, inches/foot of soil*
Coarse sand	0.25 - 0.75
Fine sand	0.75 - 1.00
Loamy sand	1.10 - 1.20
Sandy loam	1.25 - 1.40
Fine sandy loam	1.50 - 2.00
Silt loam	2.00 - 2.50
Silty clay loam	1.80 - 2.00
Silty clay	1.50- 1.70
Clay	1.20 - 1.50

Irrigate That Amount

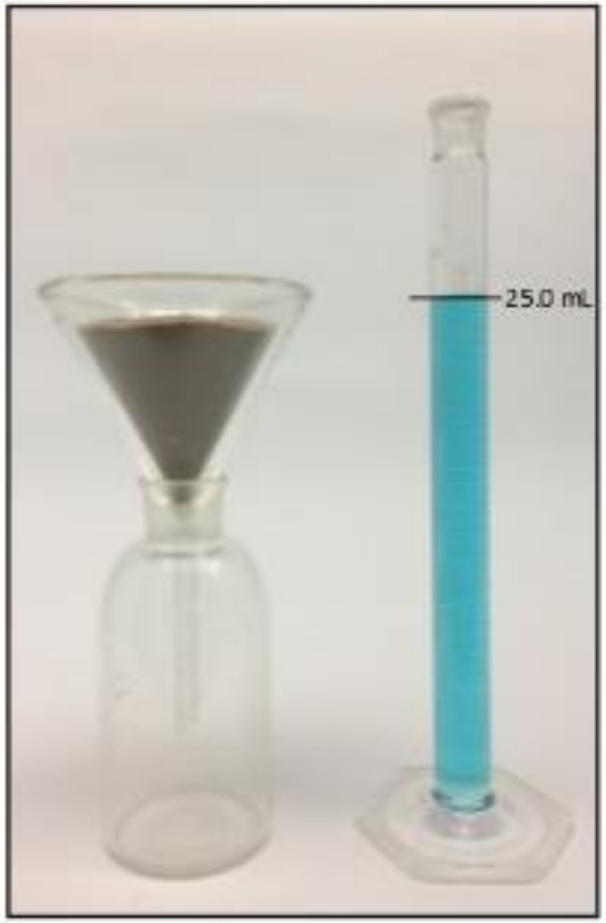
Sand



Mixture

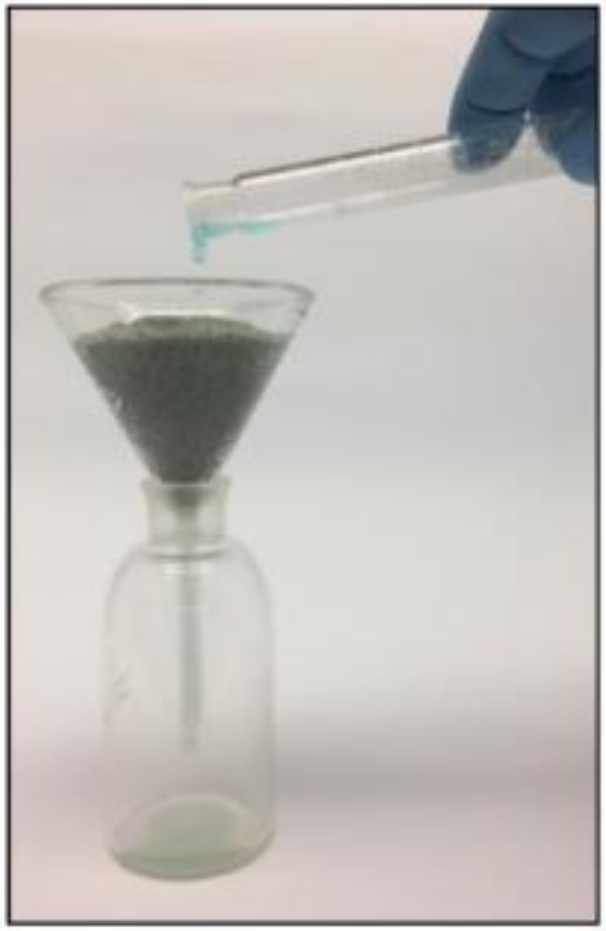


Clay loam

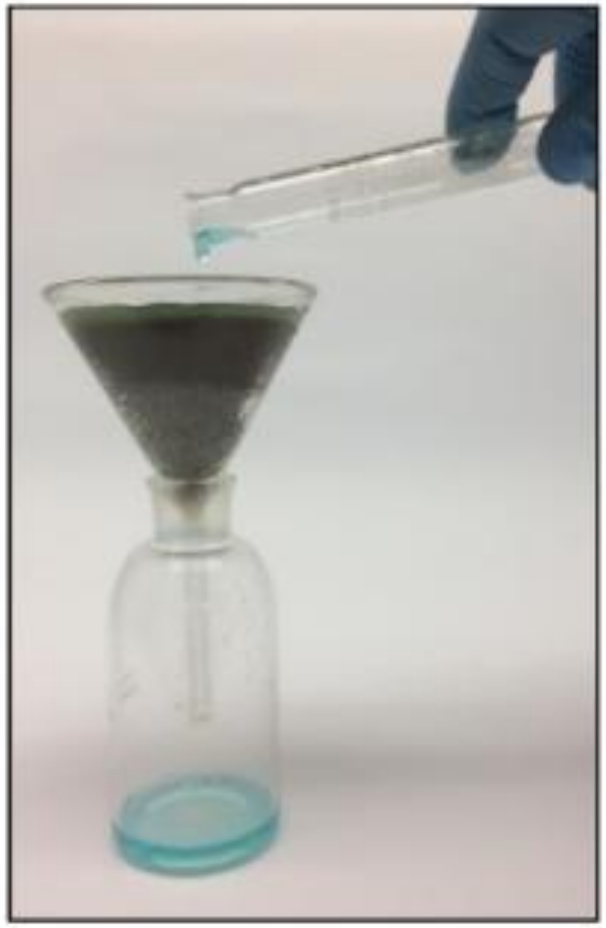


Irrigate That Amount

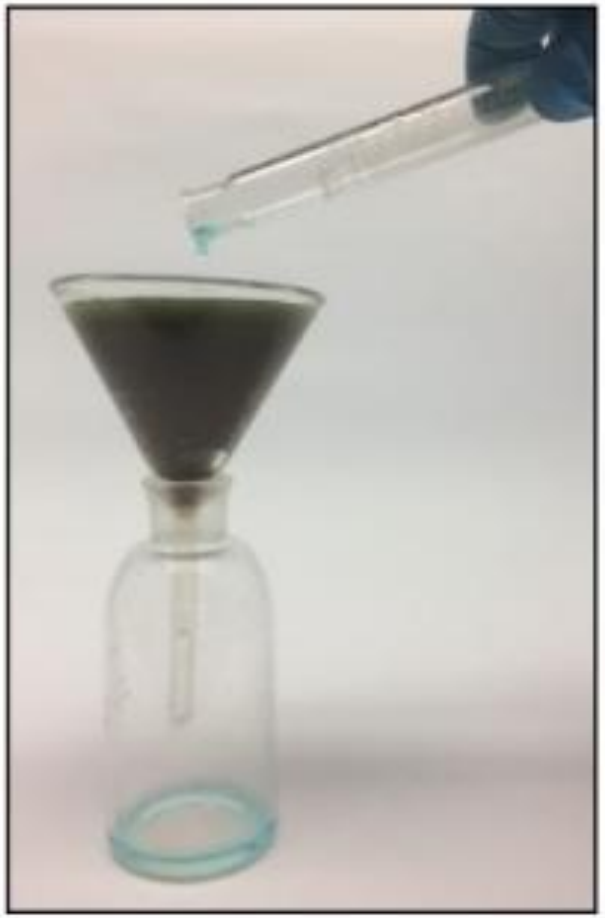
Sand



Mixture

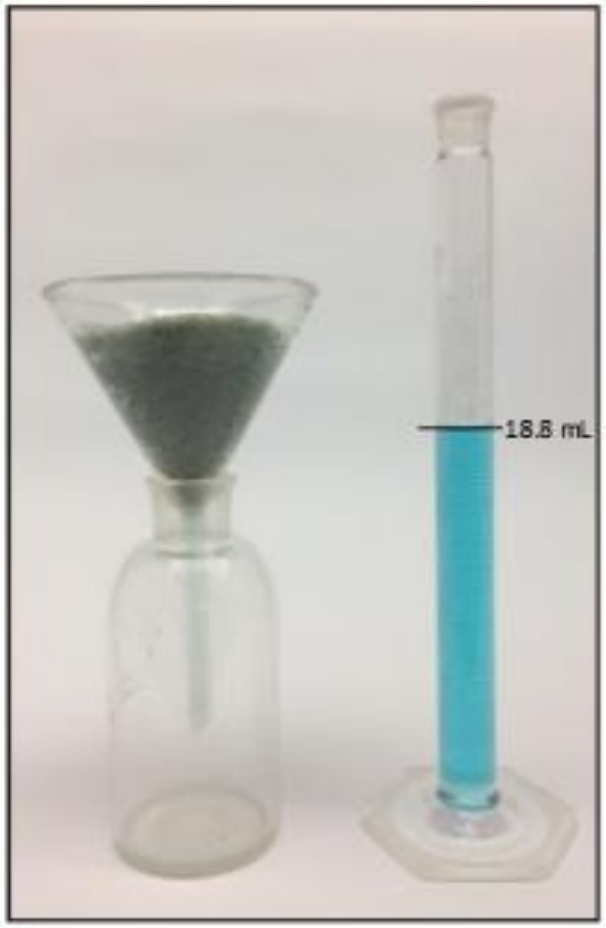


Clay loam



Irrigate That Amount

Sand



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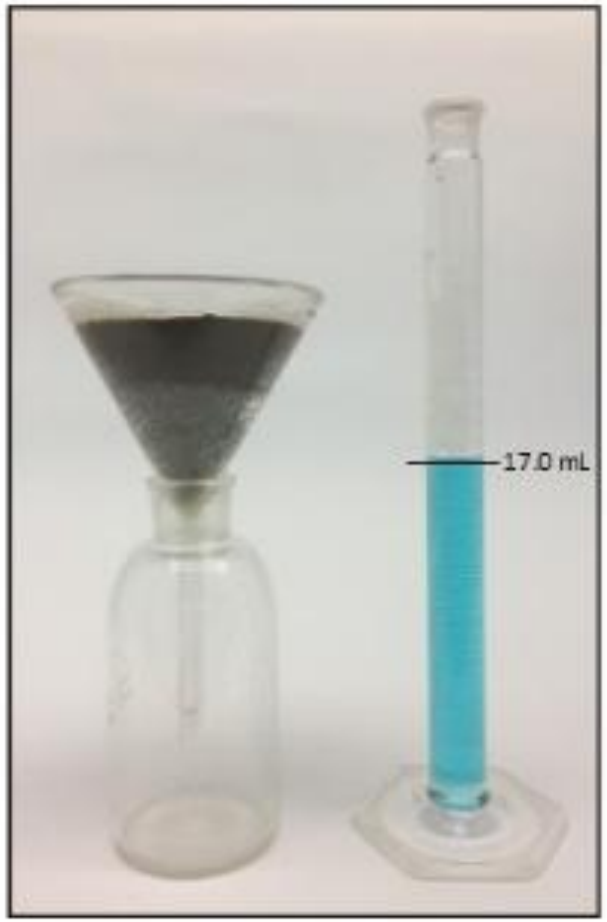
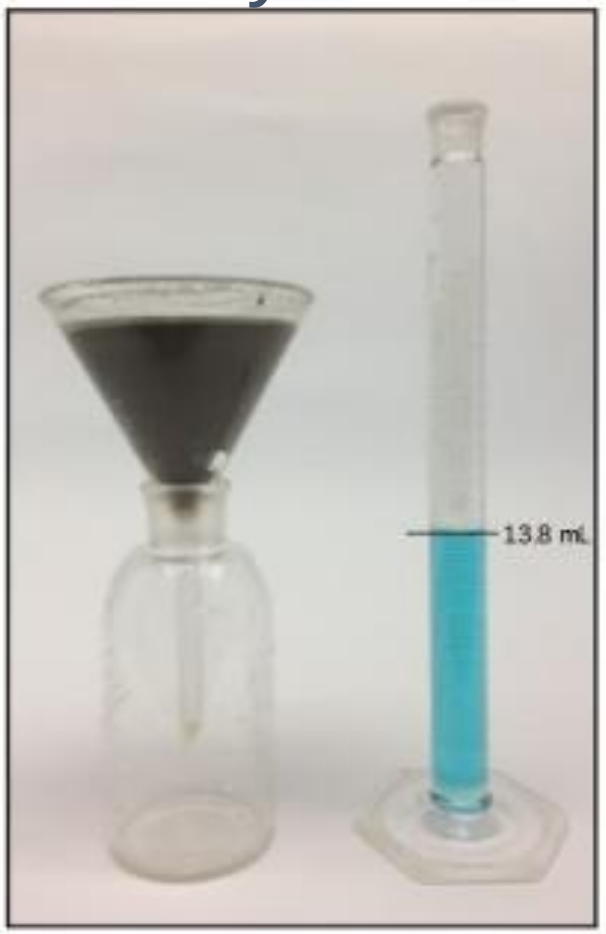


Clay loam



Determine Amount

$$ET_o$$

Google

almond crop coefficient California

Google Search I'm Feeling Lucky

Image source CIMIS

Irrigation Considerations

True or False

"Every single emitter in your field outputs the same exact amount of water"

Irrigation Considerations

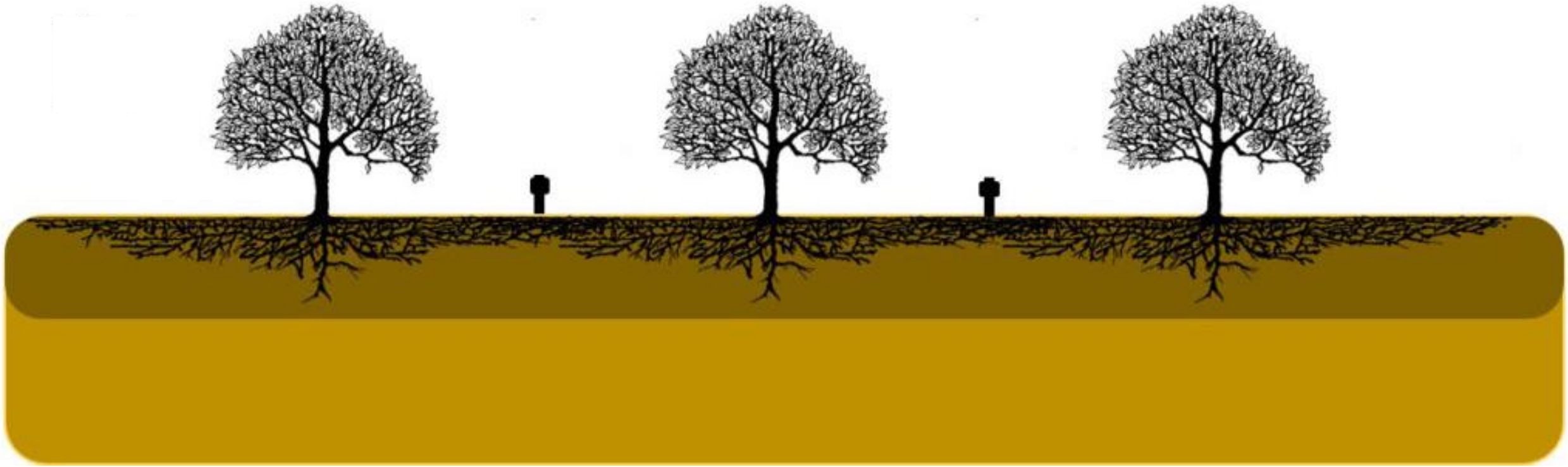


Image source West Coast Nut and D. Lightle, 2019

Irrigation Considerations

Distribution Uniformity

Image source West Coast Nut and D. Lightle, 2019

Irrigation Considerations

System	Distribution Uniformity Fraction
Drip	0.85-0.90
Micro-sprinkler	0.80-0.90
Sprinkler	0.70-0.90

Source Conservation Irrigation Lab

Irrigation Considerations

Image source Conservation Irrigation Lab

IRRIGATION EVALUATIONS

STANISLAUS MERCED MADERA COUNTIES

APRIL THROUGH NOVEMBER

Have an Irrigation Specialist evaluate your existing irrigation system for FREE!

THEY WILL:

- CONDUCT AN IN-FIELD SYSTEM AND SITE EVALUATION
- IDENTIFY ANY SYSTEM INEFFICIENCIES
- DEVELOP FULL CONSERVATION PLAN

TO SCHEDULE AN EVALUATION PLEASE CONTACT:

KEVIN REYES
programs@maderachowchillarcd.org
559-755-5148

EAST STANISLAUS RESOURCE CONSERVATION DISTRICT

california almonds
Almond Board of California

EAST MERCED RESOURCE CONSERVATION DISTRICT

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MADERA/CHOWCHILLA RESOURCE CONSERVATION DISTRICT