

Assessing regional irrigation usage for grapevines

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Why the interest?

- Can aid regional water management
 - Entering new era in California with SGMA
 - Groundwater use needs to be managed
- Aid to farmers
 - Can evaluate own practices by comparing to others
 - Starting point for how much to irrigate

Scale of measurements

- Large region, many different operations
 - To provide baseline information to industry
 - Data for agency use
- Within an operation
 - To track their own practices
 - Are directives carried out properly?
- By some external entity
 - Independent overseer, consultant

Can we just ask growers?

- May not know themselves
- Difference between records and reality
- Automated measurements provide more data

Estimating from flow meters

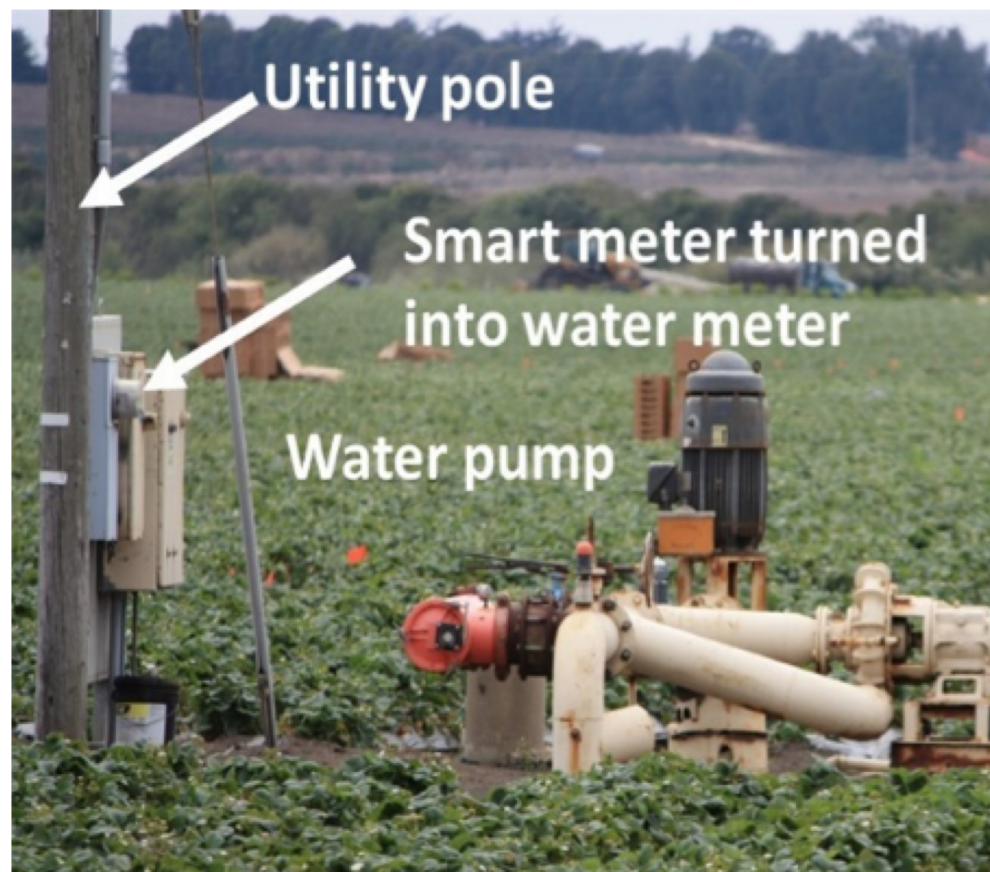
- Costly if not already installed
- All pumping may not be irrigation use
- Data not specific to a block



Netafim

Estimating from electricity use

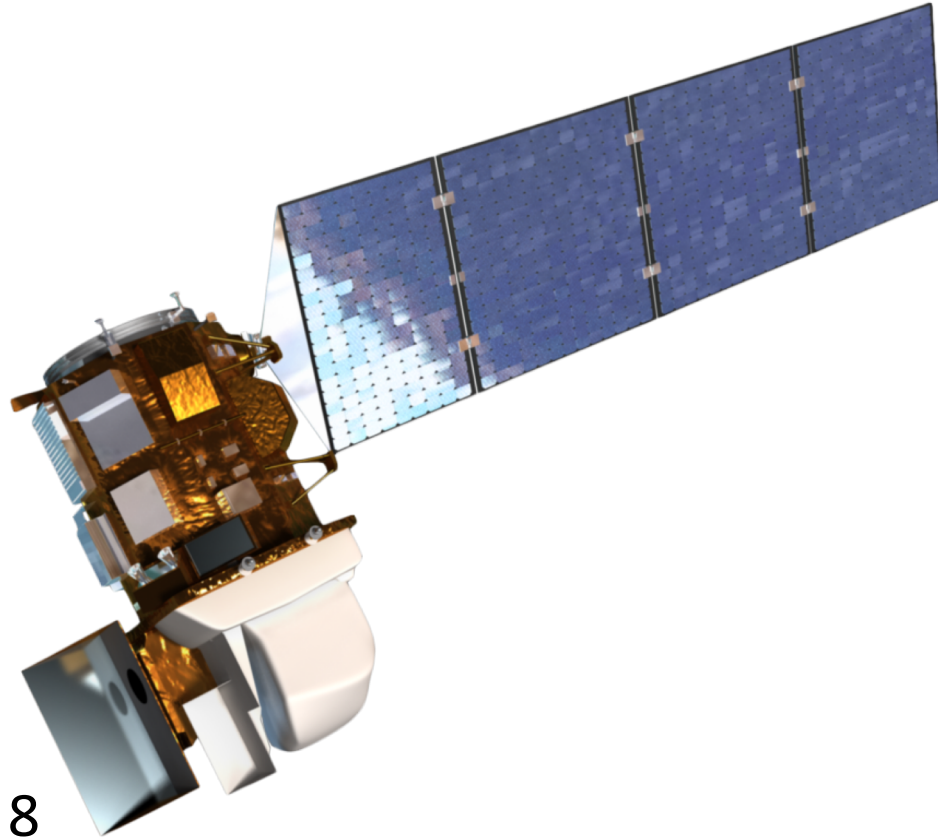
- Only electric pumps
- Values from pump test
 - kWh/ac-ft
- Uses other than irrigation?



Powwow Energy

Estimating from remote sensing data

- Estimated evapotranspiration



Landsat 8

Maps (Mark)

May 9 - May 16 2019

- Landsat 7
- Landsat 8
- Sentinel 2
- Clouds
- NDVI
- Kc

Satellite

My Fields 11

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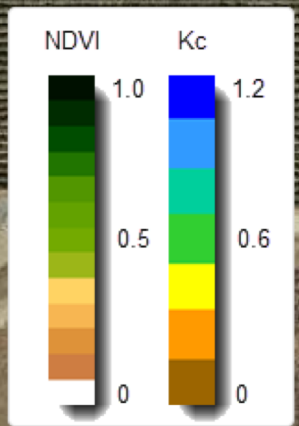
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IrrisAT

Google

Sign out from Google

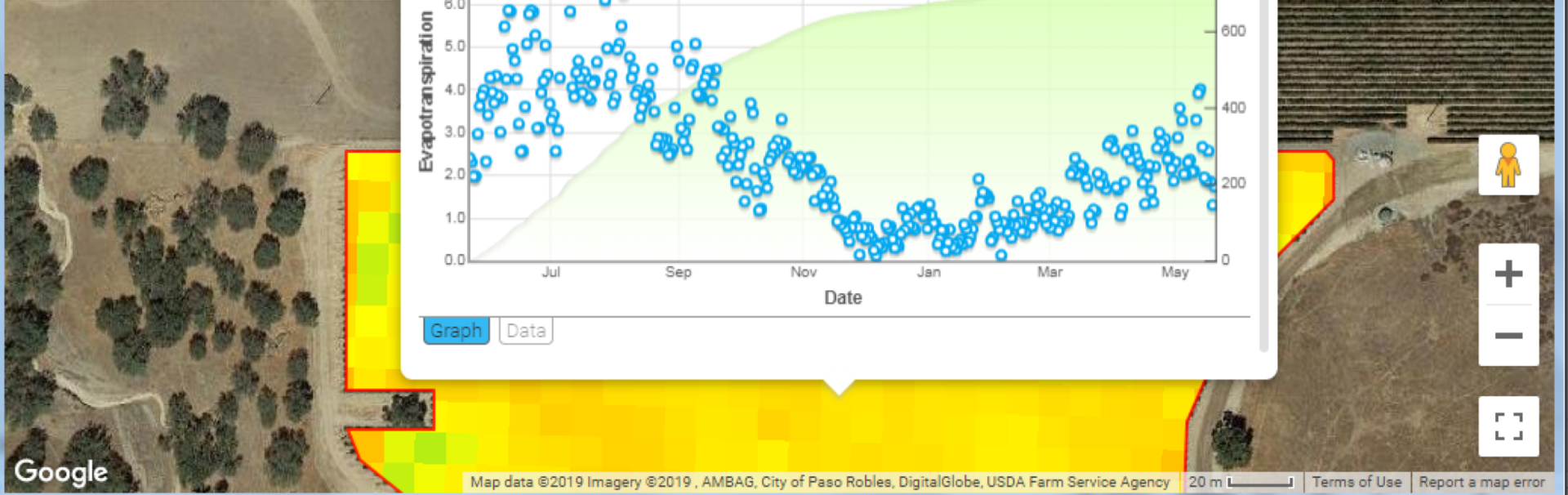
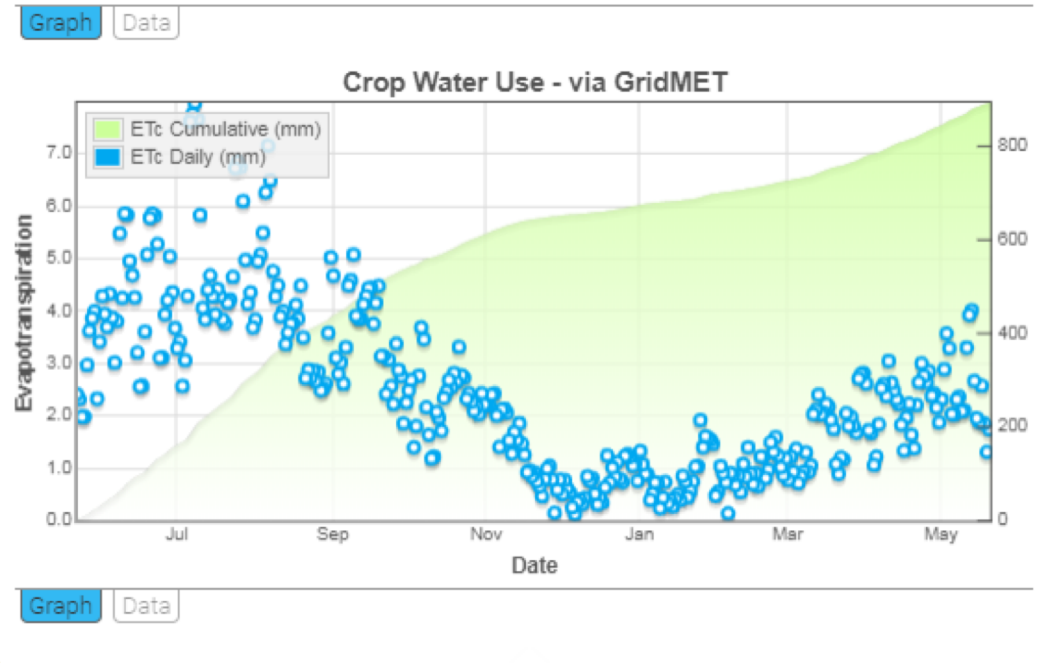
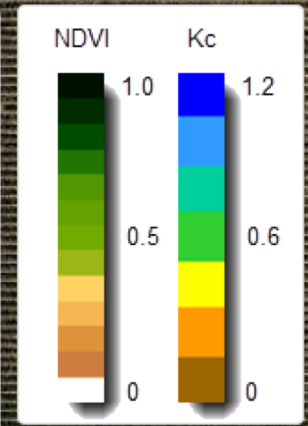
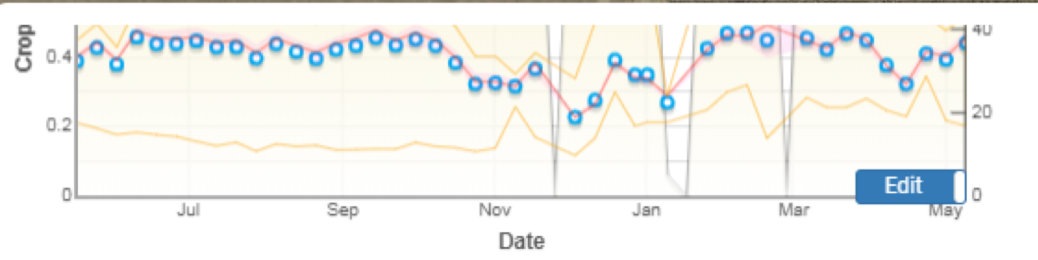
Maps (Mark)

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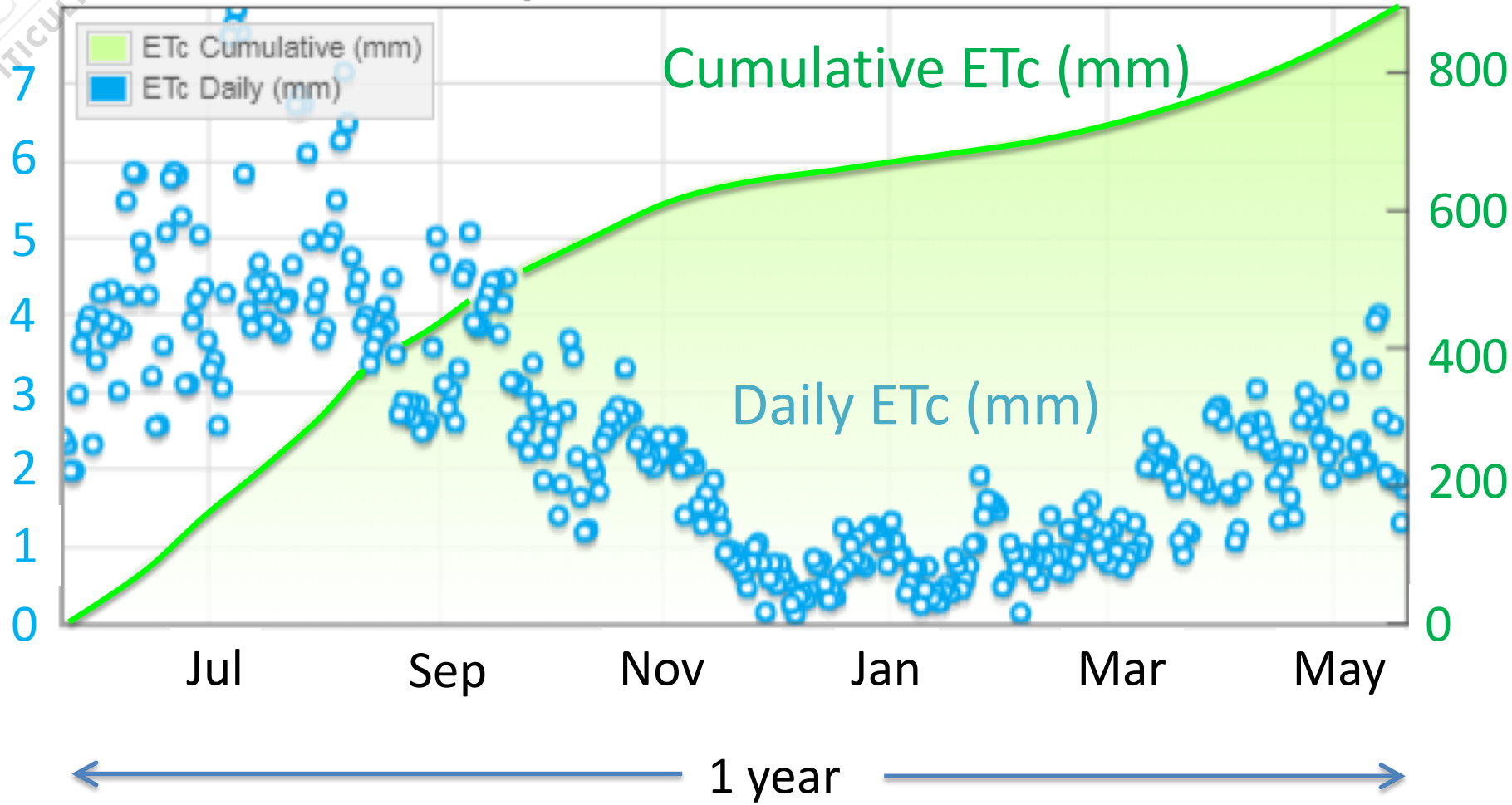
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Google

IrriSAT chart output

Crop Water Use - via GridMET



IrrisAT

Realisation



Our Partners



Estimating from pressure switches

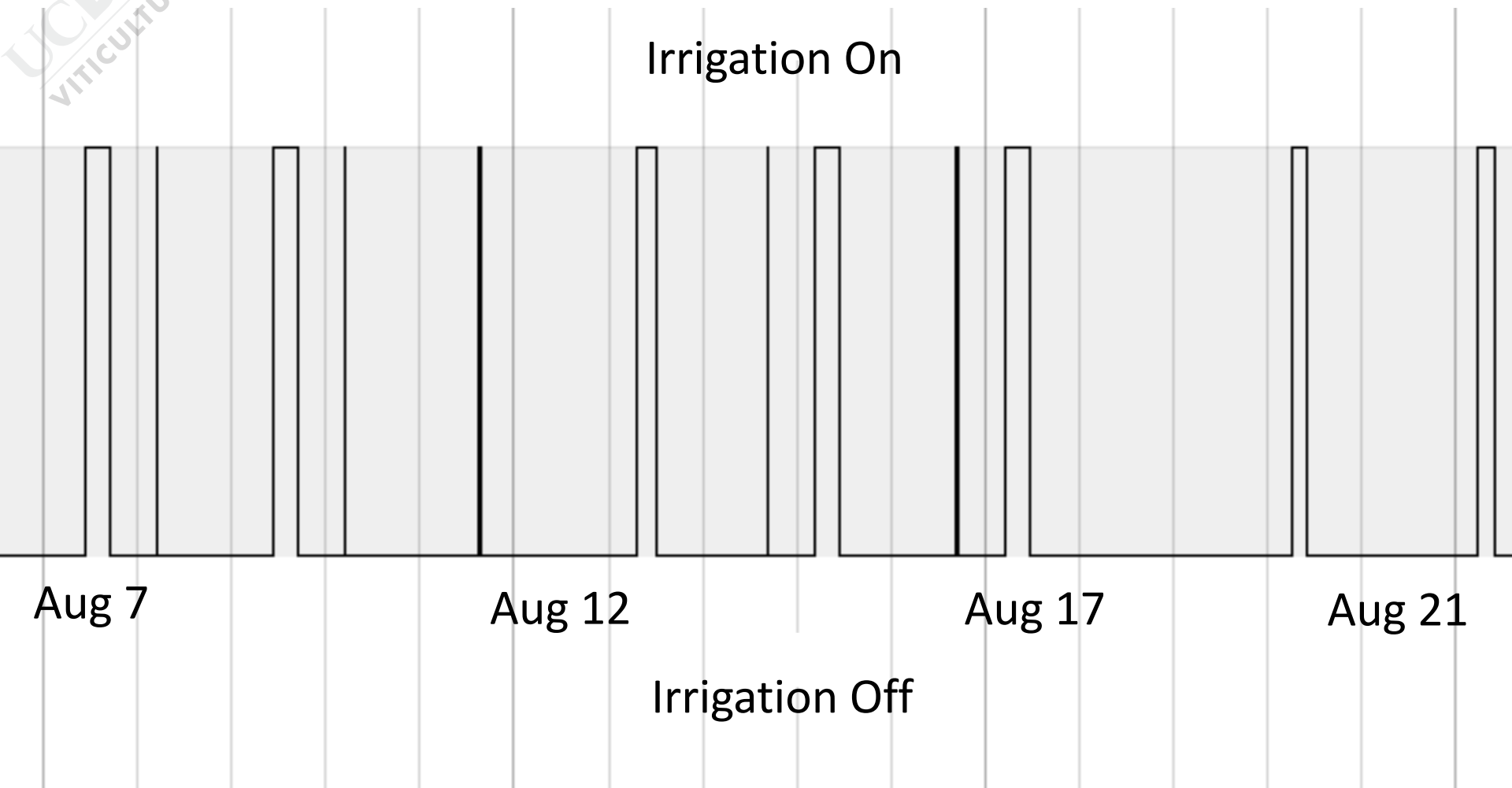
- Cheap, reliable, minimal disturbance
- Assumption: actual flow rate is the design rate
 - i.e. the ½ gph emitters are providing ½ gph
- Not a bad assumption for a properly operated and maintained system
- Many automated devices now incorporate
 - Soil moisture loggers, weather stations, Tule, etc.

Pressure switches



4 psi activation pressure

Example pressure switch data



Example pressure switch data

Time, GMT-08:00	Irrigation
08/07/12 03:17:37 AM	0.00
08/07/12 10:36:40 AM	1.00
08/07/12 10:36:41 AM	0.00
08/07/12 10:36:47 AM	1.00
08/07/12 10:36:49 AM	0.00
08/07/12 10:36:50 AM	1.00
08/07/12 04:53:37 PM	0.00
08/08/12 04:37:41 AM	1.00
08/08/12 04:45:54 AM	0.00
08/09/12 10:48:12 AM	1.00
08/09/12 05:02:46 PM	0.00
08/10/12 04:46:27 AM	1.00
08/10/12 04:58:25 AM	0.00

1 second run time

6+ hours run time

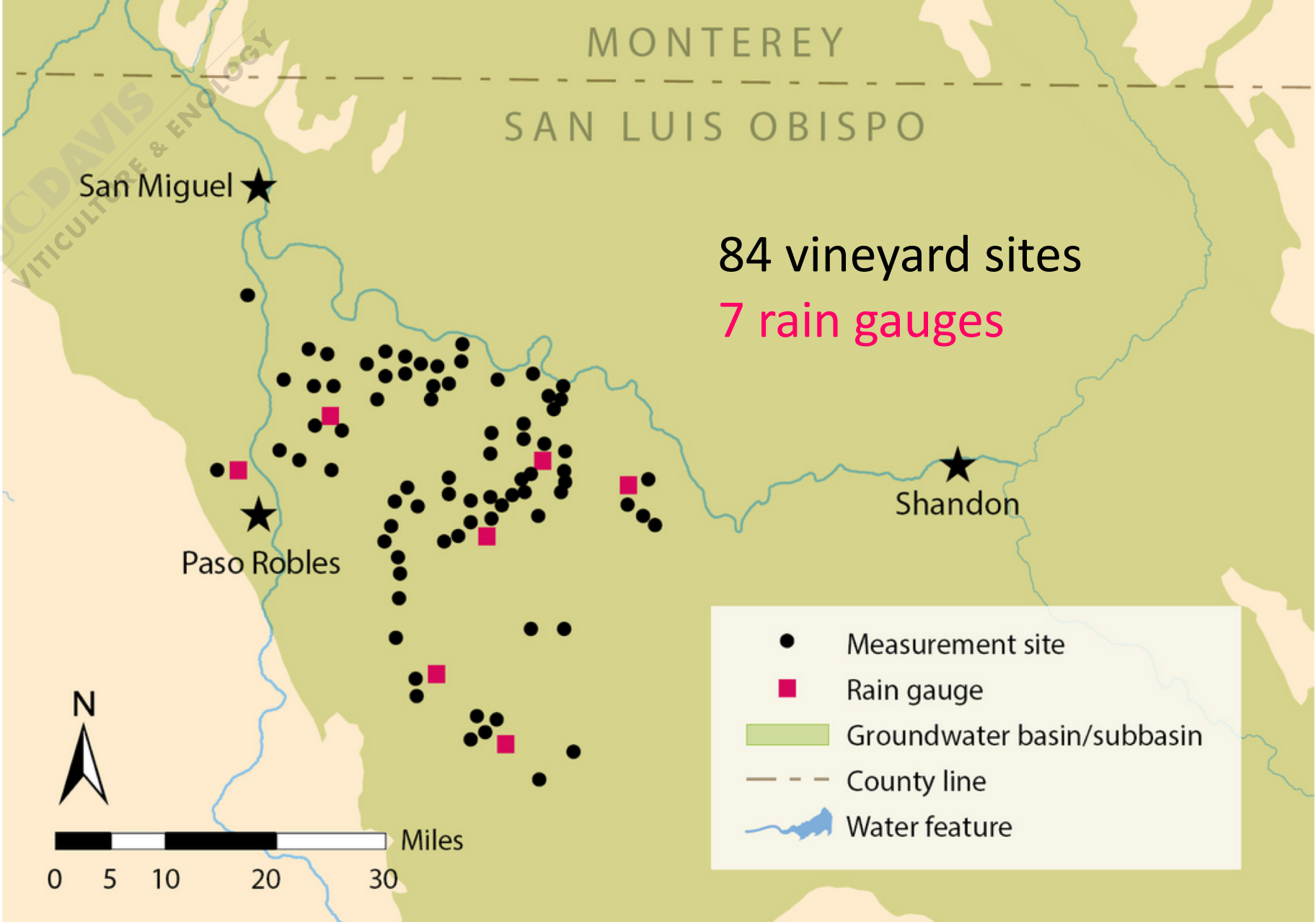
Using a Hobo “State”
data logger

Data anonymity

- Why the concern?
- How to address
- Limits incorporating other data later
 - Example: can't compare to IrriSAT afterward

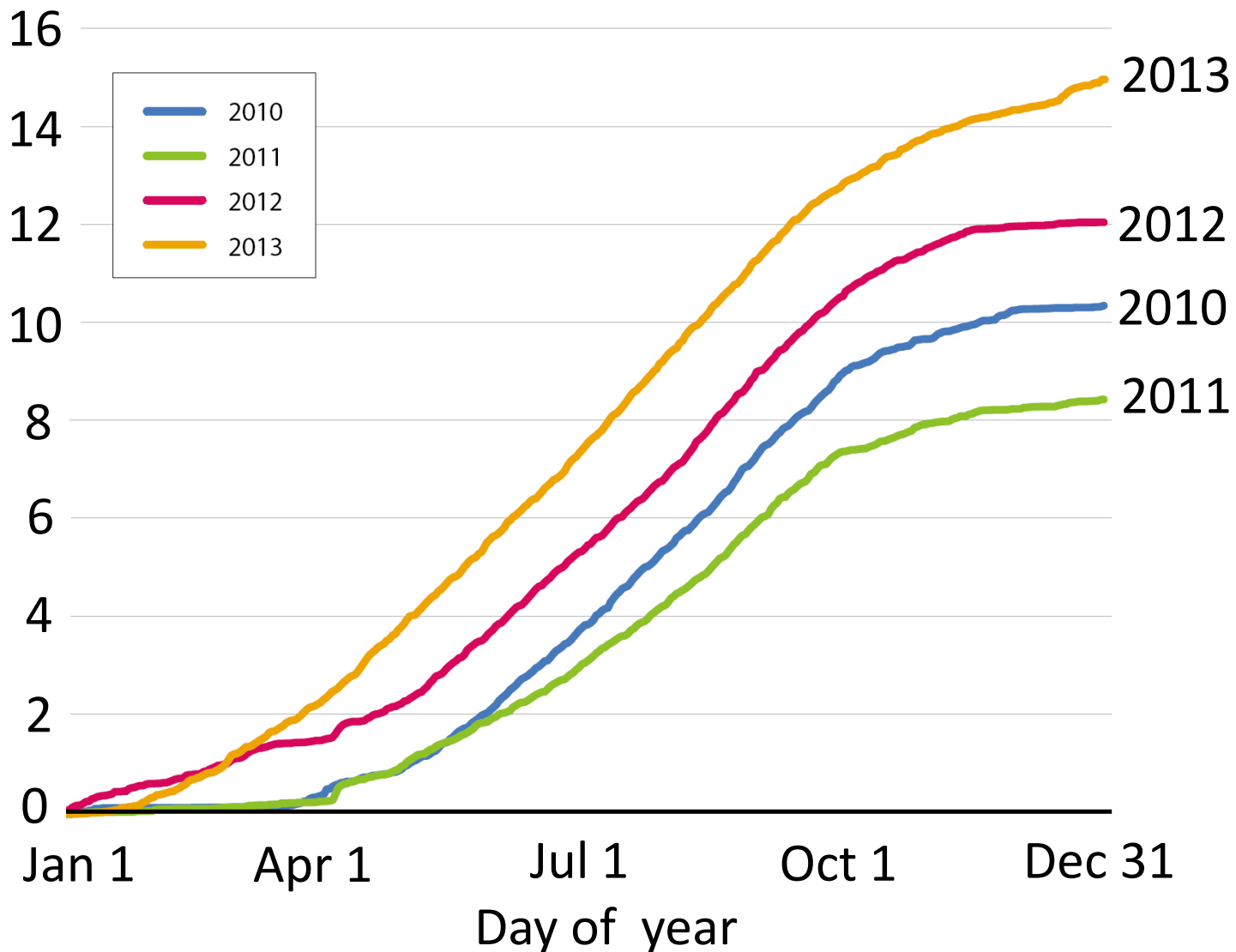
Paso Robles study, 2010-2013

- “Paso Robles vineyard irrigation study provides benchmark data to assist future area groundwater management”
- <http://calag.ucanr.edu/archive/?article=ca.2018a0003>



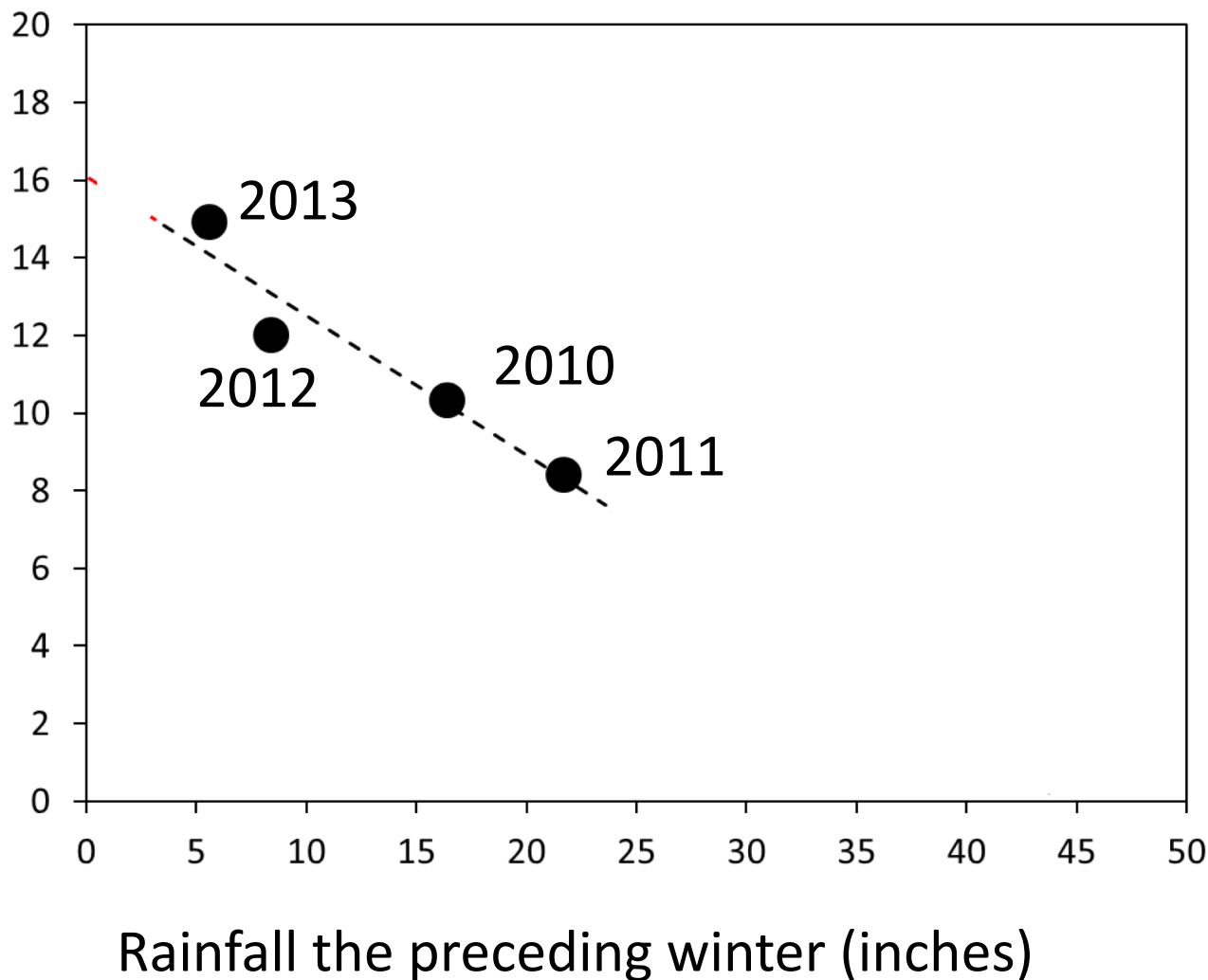
Cumulative irrigation

Cumulative applied irrigation (inches)



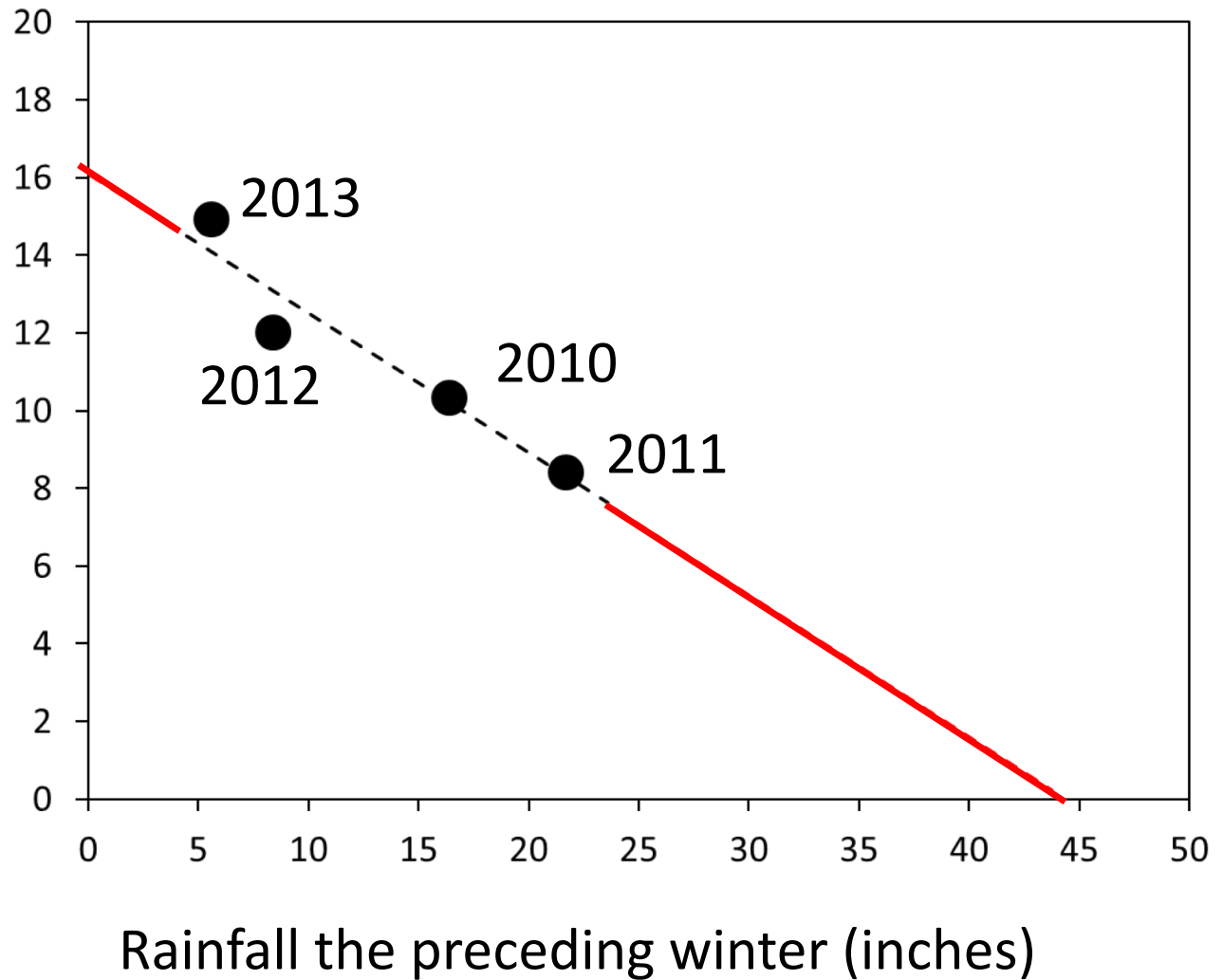
Annual irrigation vs. preceding winter rainfall

Average annual applied irrigation (inches)



Annual irrigation vs. preceding winter rainfall

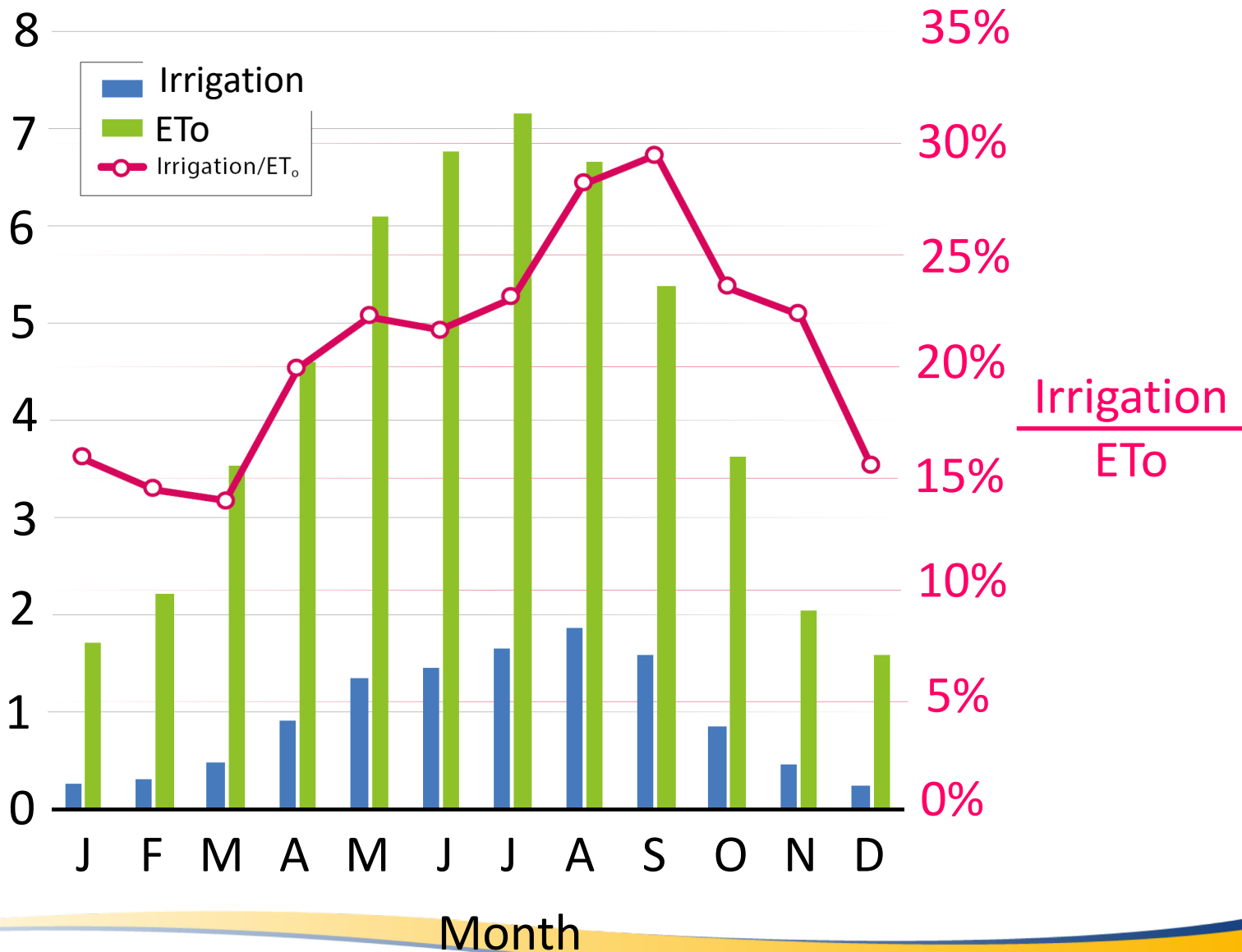
Average annual applied irrigation (inches)



“Recipe” from the Paso Robles study

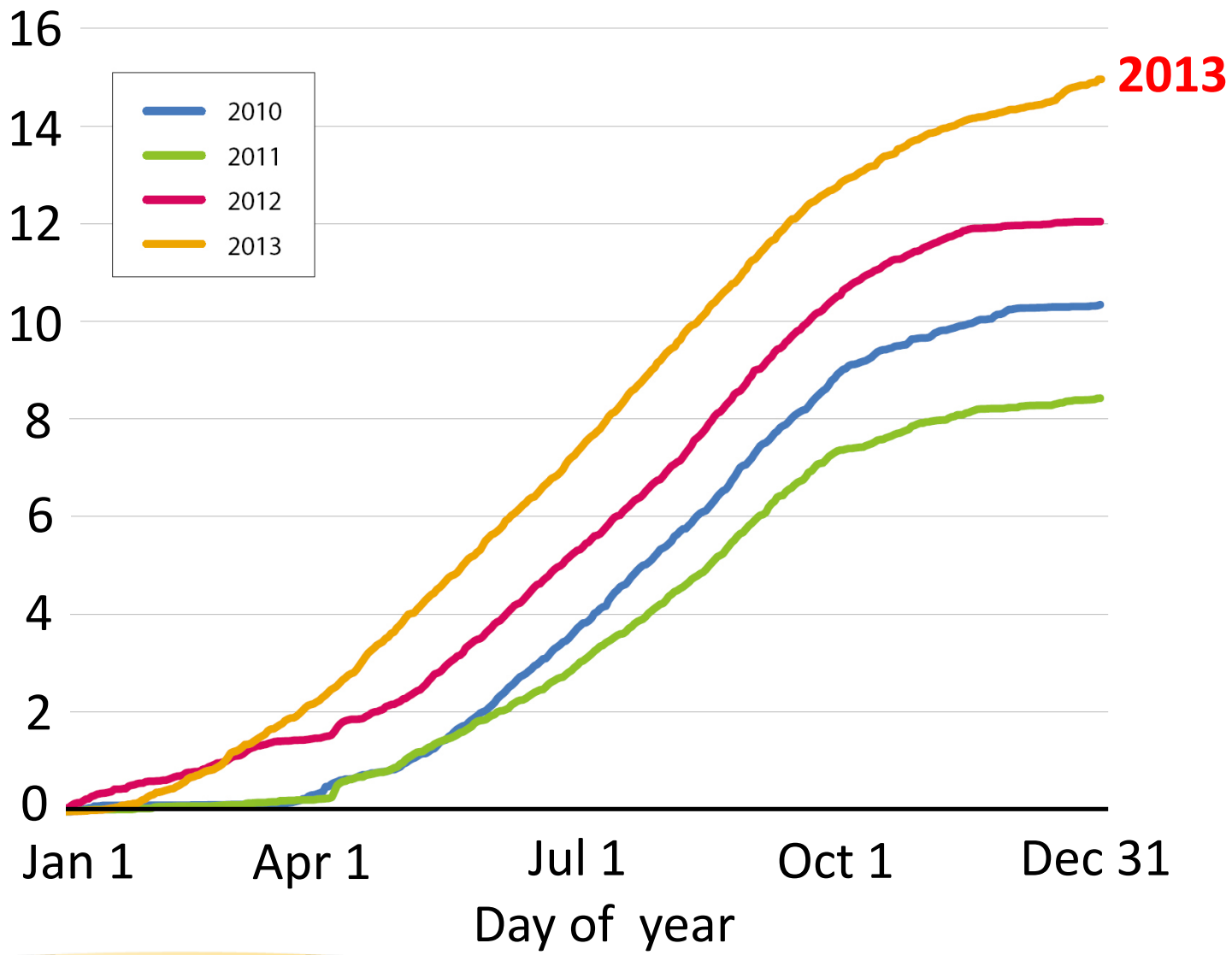
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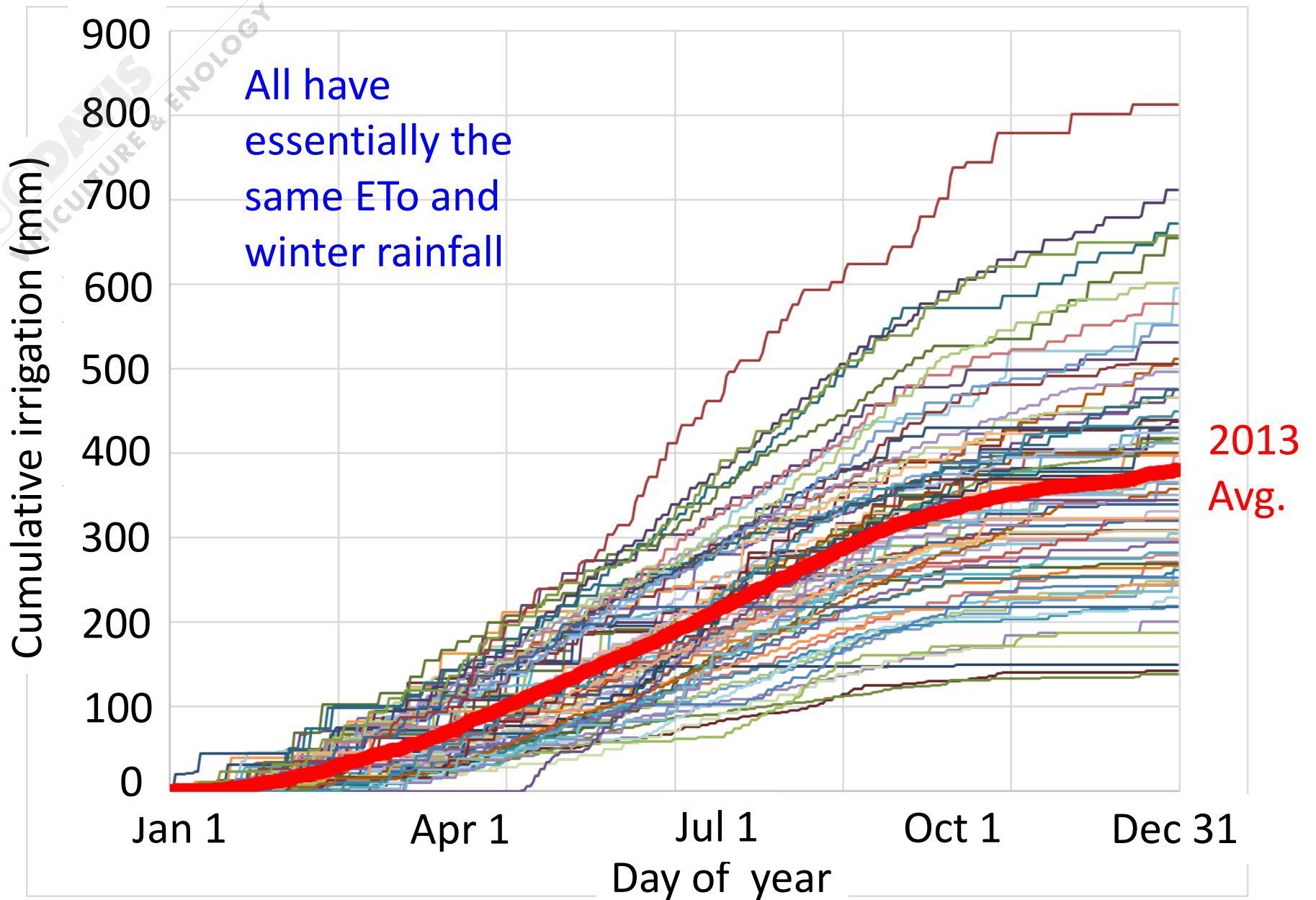
Applied irrigation and ETo (inches/month)

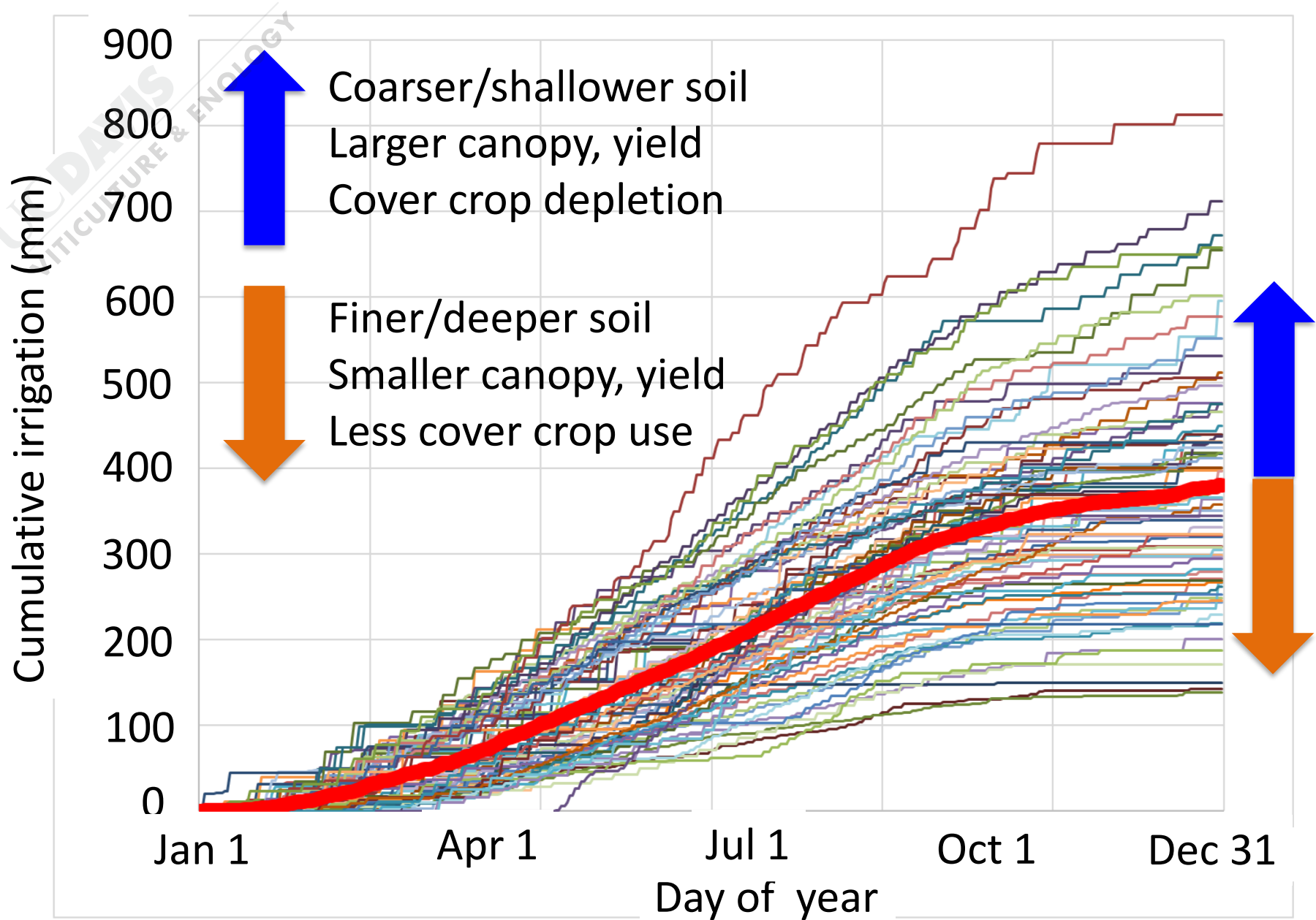


Cumulative irrigation

Cumulative applied irrigation (inches)







Same soil, same ETo, very different irrigation needs



Adding value to measured data

- Other measurements can add value:
 - Soil water holding capacity
 - Soil moisture levels
 - Estimated Kc values
 - Crop yields
 - Irrigation water quality, soil salinity
- But the above add time, cost to effort

Planned studies

- More areas of San Luis Obispo County
- Areas of Sonoma County

- Update method; intend long-term operation without being accessed

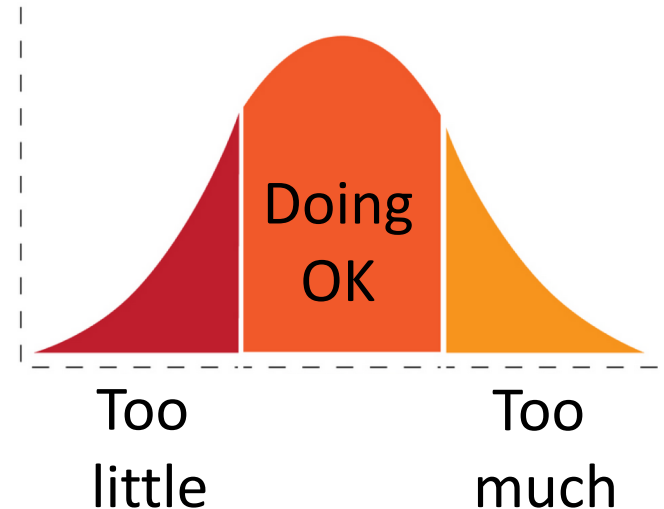
A real-time tool for management?

- Can real-time measurements of regional irrigation applications be turned into a useful tool for farmers?
- Future groundwater management agencies may collect for their needs
- Able to provide additional benefit to growers?

Value for irrigation management

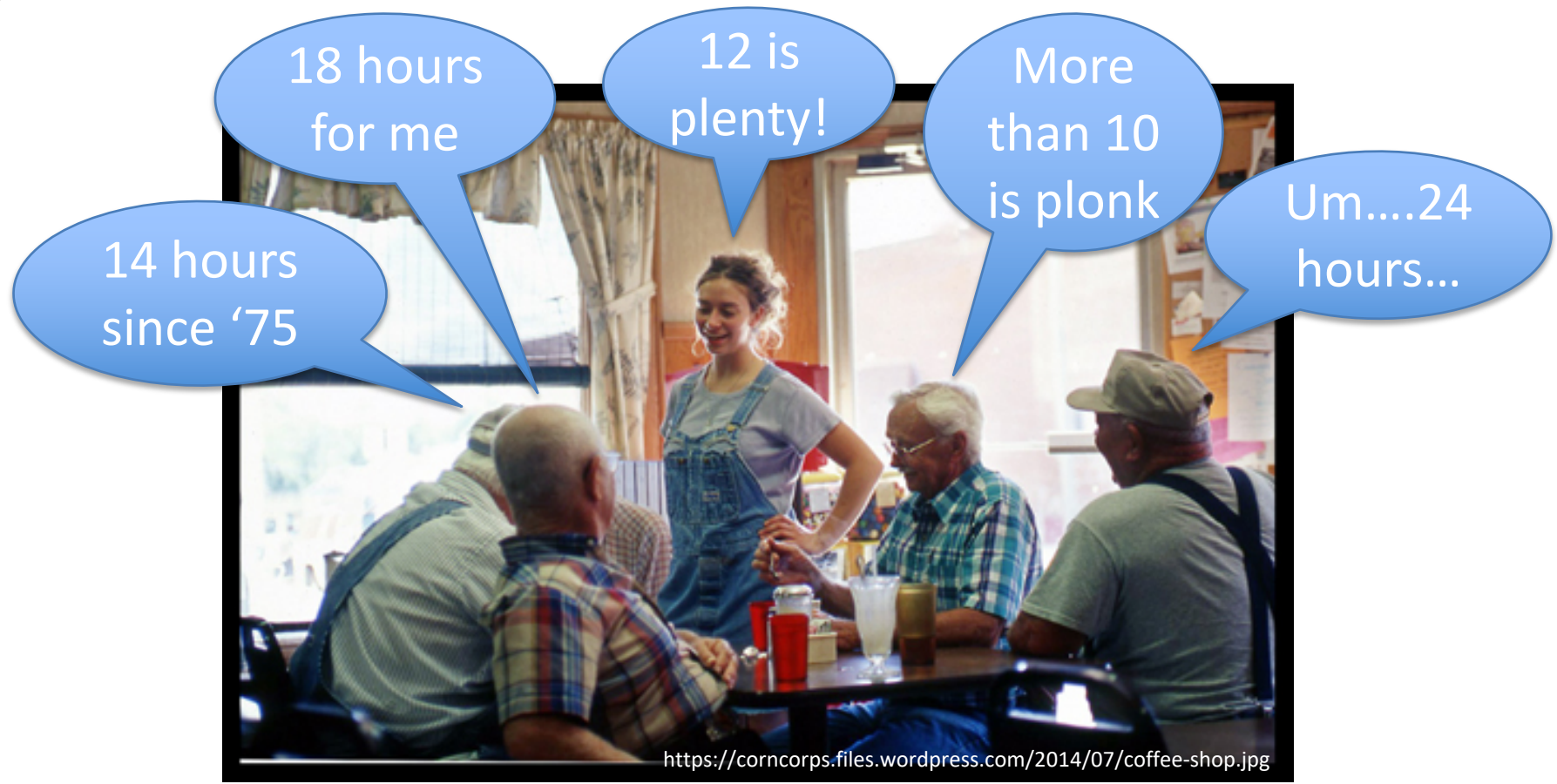
- Wisdom of the crowds
 - Our collective knowledge often exceeds that of most individuals

- Being able to see what is being done on average in real time will help inform the outliers



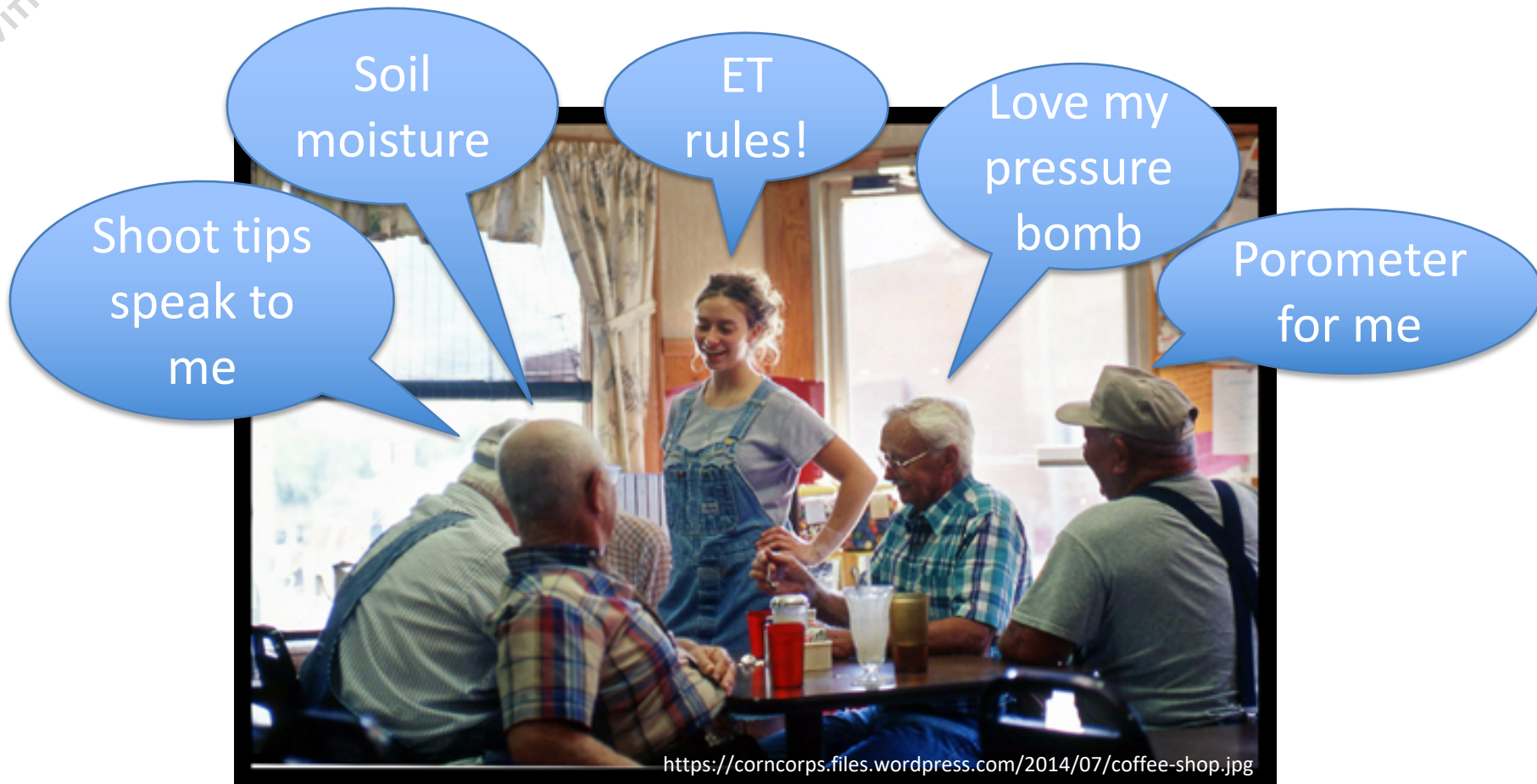
Where we are coming from

How many hours per week to irrigate?



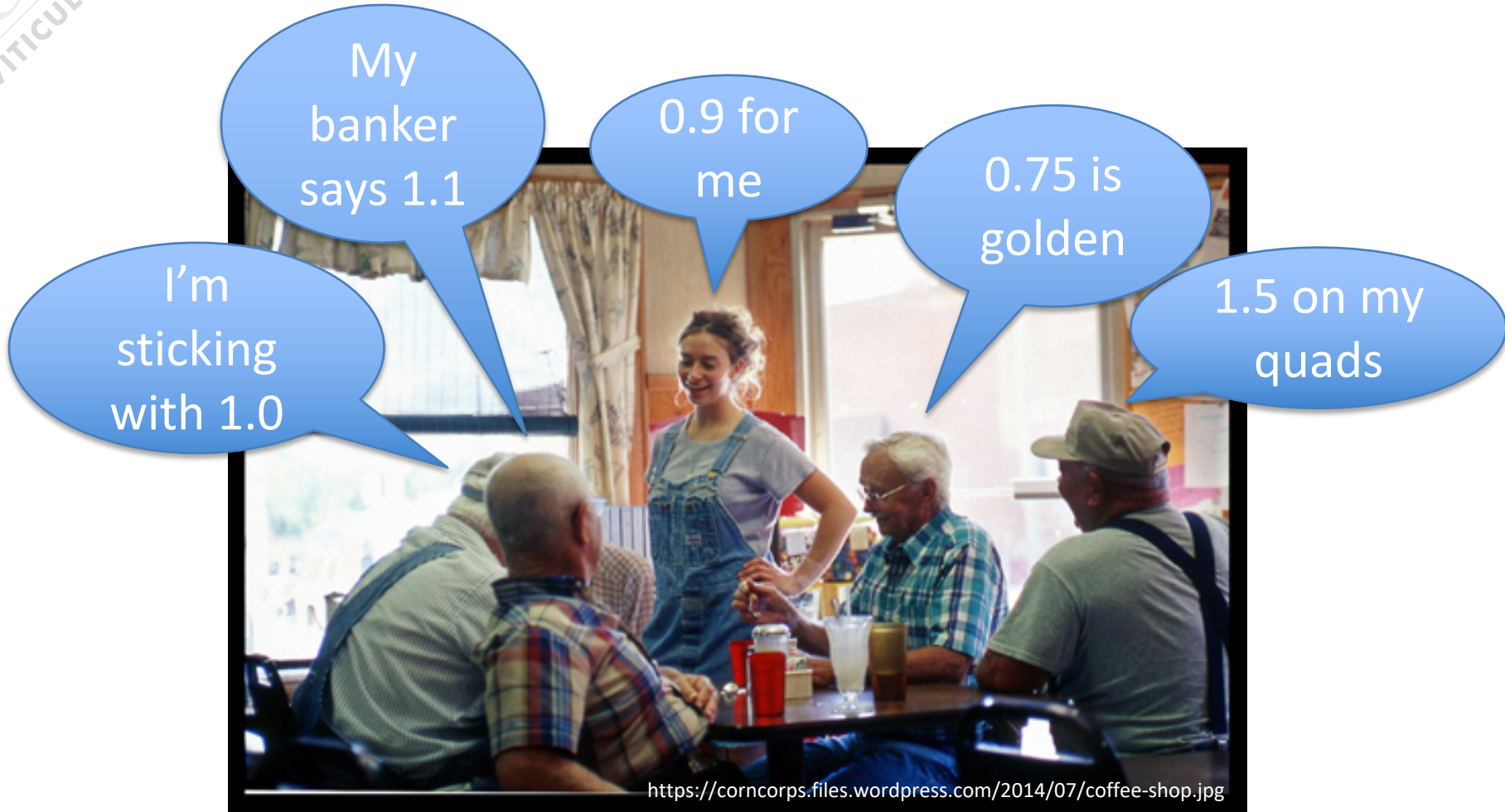
Conversation evolving

What method to use to manage irrigation?



Indexing on mass data?

What proportion of regional average to use



How much to irrigate this week?



Visual observations
Past experience
Input from others
Educated guessing
Some measurements

How much to irrigate this week?

Weed control
Disease control
Canopy
management
Fertilizing
Harvest
Etc.

Visual
observations
Past experience
Input from others
Educated guessing
Some
measurements

Running the
business
Employees
Paying bills
Etc.