How to use ET to schedule irrigations?

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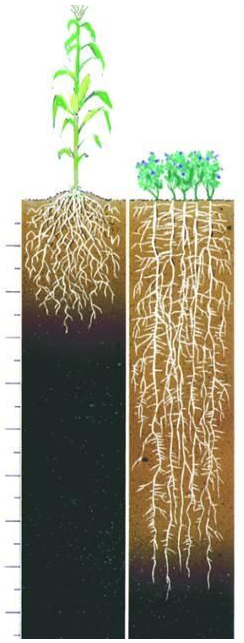
Proper irrigation management of alfalfa- easy or difficult?



Easy because:

- Deep rooted perennial- more available water
- Relatively drought tolerant
- Feasible deficit irrigation under every irrigation practice

Difficult because:

- Starting date not well defined
- Variable Kc over the season and the cutting cycle
- Difficulty in ET-based irrigation scheduling when it takes multiple days to irrigate entire field (6-20 days cannot be irrigated)

Which information do we need for an effective irrigation scheduling?

- Crop water demand (Actual **ET** or $ET = K_c \times ET_o$)
- Soil characteristics and moisture at the effective root zone

ET_o from CIMIS
Proper K_c value

Table 1. Available water capacity for different soils

Soil type	Avail. Water (in/ft)	Ave. Allow. Depl. (in/ft)	Ave. Allow. Depl. 4 ft. zone (in/ft)
Sandy loam	1.25-1.40	0.66	2.65
Silt loam	2.00-2.50	1.13	4.50
Silty clay loam	1.80-2.00	0.95	3.80
Clay	1.20-1.50	0.68	2.70

Soil moisture sensors as useful tool may answer critical questions:

- How is water status of the soil during the dormant season?
- When is the right time of first irrigation?
- Is the soil profile full after first irrigation event? How about after each irrigation event?
- What is length of irrigation time required to replenish water to a desired rooting depth?
- Should irrigation practice need to change?

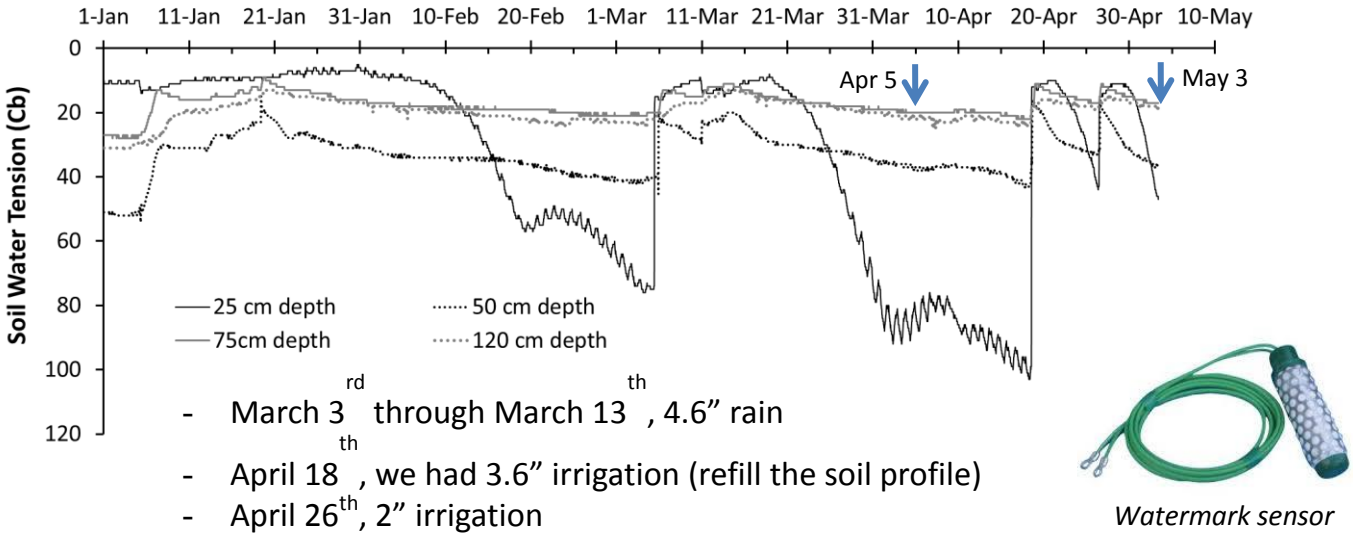


Figure 1- Early season 2016 soil moisture data (alfalfa field under sprinkler, Davis)

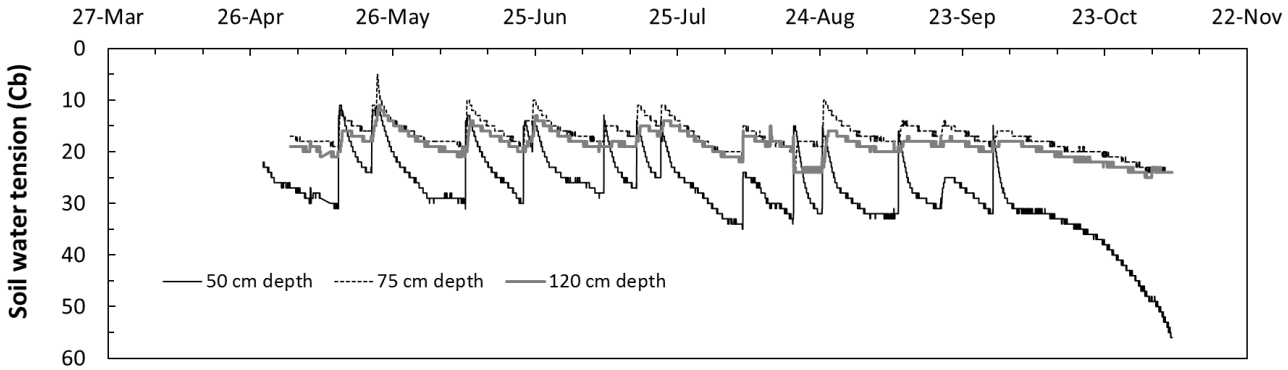


Figure 2- Soil moisture data over the season 2015 (alfalfa field under sprinkler, Davis)

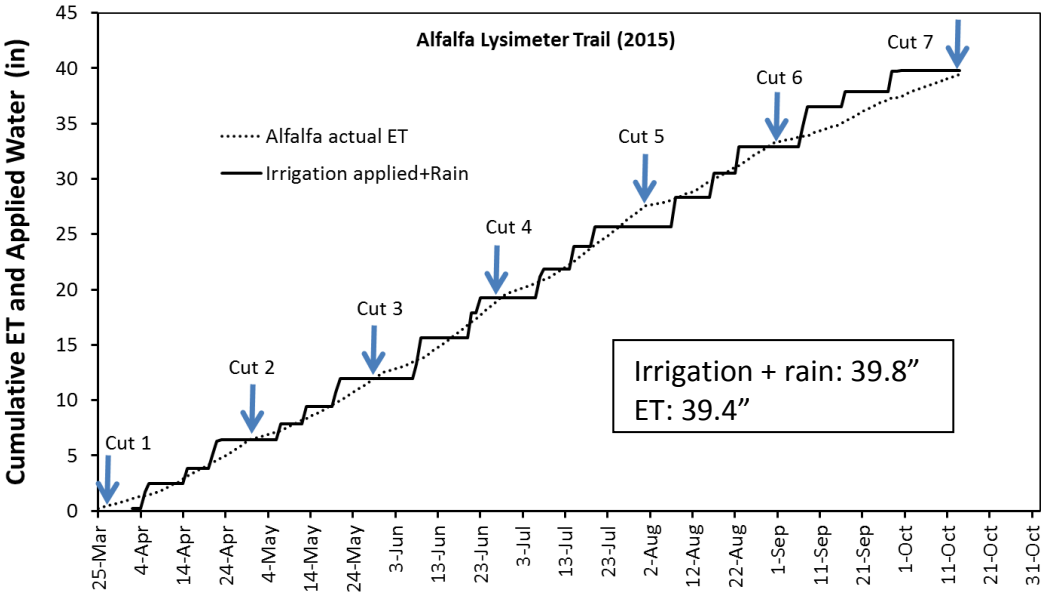


Figure 3. Cumulative ET and applied water at alfalfa field under sprinkler (Davis, season 2015)

0.8” effective rainfall ……. 39.0” net irrigation applied
Net irrigation applied= 1,059,240 gallons per acre= 3.3 acre-foot/acre

<u>Units of evapotranspiration (ET) & applied water</u>

Volume of water

One acre-inch = 27,160 gallons

One acre-foot = 325,900 gallons

Depth of water (inch, feet, cm, mm)

Standardized water use (independent of field size)

One inch of water = 1 acre-inch per acre = 27,160 gallons per acre

Table 2. Recommended maximum soil moisture tension allowable for different soil types

Soil type	Soil moisture tension (centibar)
Sandy or loamy sand	40-50
Sandy loam	50-70
Loam	60-90
Clay loam or clay	90-120

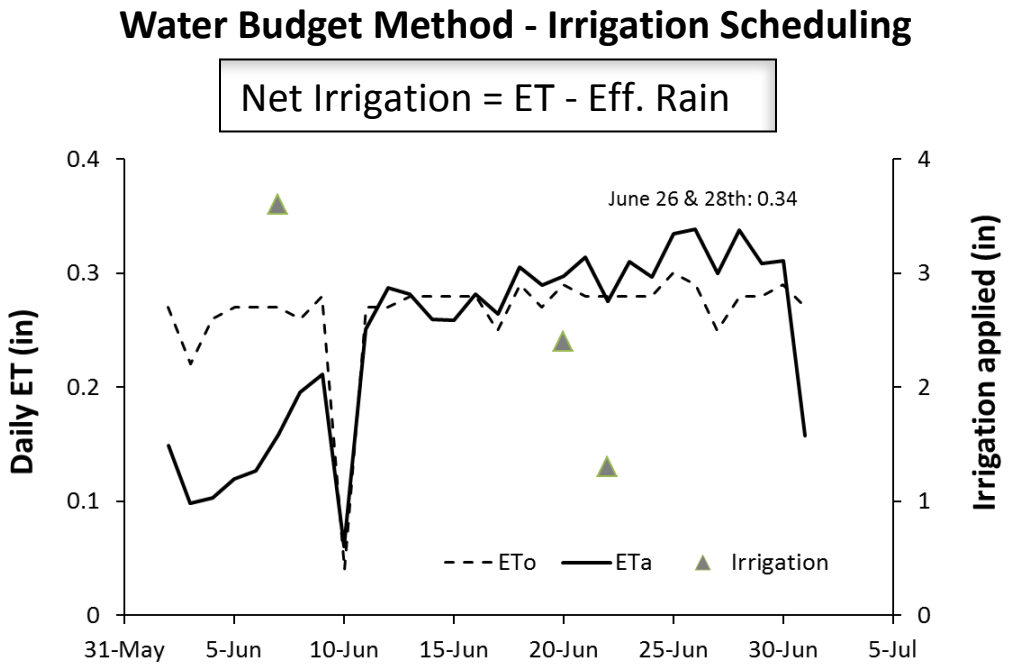


Figure 4. Daily ET and applied irrigation over cutting cycle # 4
(Alfalfa field under sprinkler- Davis 2015)

Table 3. Water budget components over cutting cycle # 4 (Davis, 2015)

Period	ET (in)	Eff. Rain (in)	Irrigation (in)	Water budget (in)
Cum. from first irrigation till June 1st	12.1	0.8	11.9	+0.6
Jun 2 to Jun 7	0.6	0	…	0.0
Jun 8th	…	…	3.6	+3.6
Jun 8 to Jun 19	2.9	0	…	+0.7
Jun 20th	…	…	2.4	+3.1
Jun 20 to Jun 21	0.6	0	…	+2.5
Jun 22th	…	…	1.4	+3.9
Jun 22 to Jun 30	3.0	0	…	+0.9
The day cutting #4	19.2	0.8	19.3	+0.9

What we need to do for a proper irrigation management:

1. Refill the soil profile early season
2. Track daily ET crop using CIMIS daily ET_o and right K_c

   Measuring actual ET crop is the best option.
3. Maintain soil moisture at acceptable levels through harvest **&** monitor it to schedule irrigations/or verify ET-based scheduling
4. Involve system irrigation efficiency (Gross Irrigation= Net Irrigation/Irrigation Efficiency)
5. Know more about irrigation practice