Subsurface Drip Irrigation (SDI), Deficit Irrigation Strategies, and Improved Varieties to Enhance Alfalfa Water-Use Efficiency during Drought

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Objectives: Optimize mgt. under SDI
Var X Irrig. Deficits in controlled studies
Advance Breeding Objectives

Drip irrigated alfalfa field, California

NAAIC-Madison, WI

AGGIES NEW MEXICO STATE

UCDAVIS UNIVERSITY OF CALIFORNIA

Breeding for Forage Productivity in Deficit-Irrigated Alfalfa

Germplasm:

- Multiple advanced UC, NMSU, & Industry varieties evaluated
- 28 \NMSU entries - DNA Marker Assisted Selection for high or low biomass marker alleles.

Environments (Locations and Irrigation Treatments):

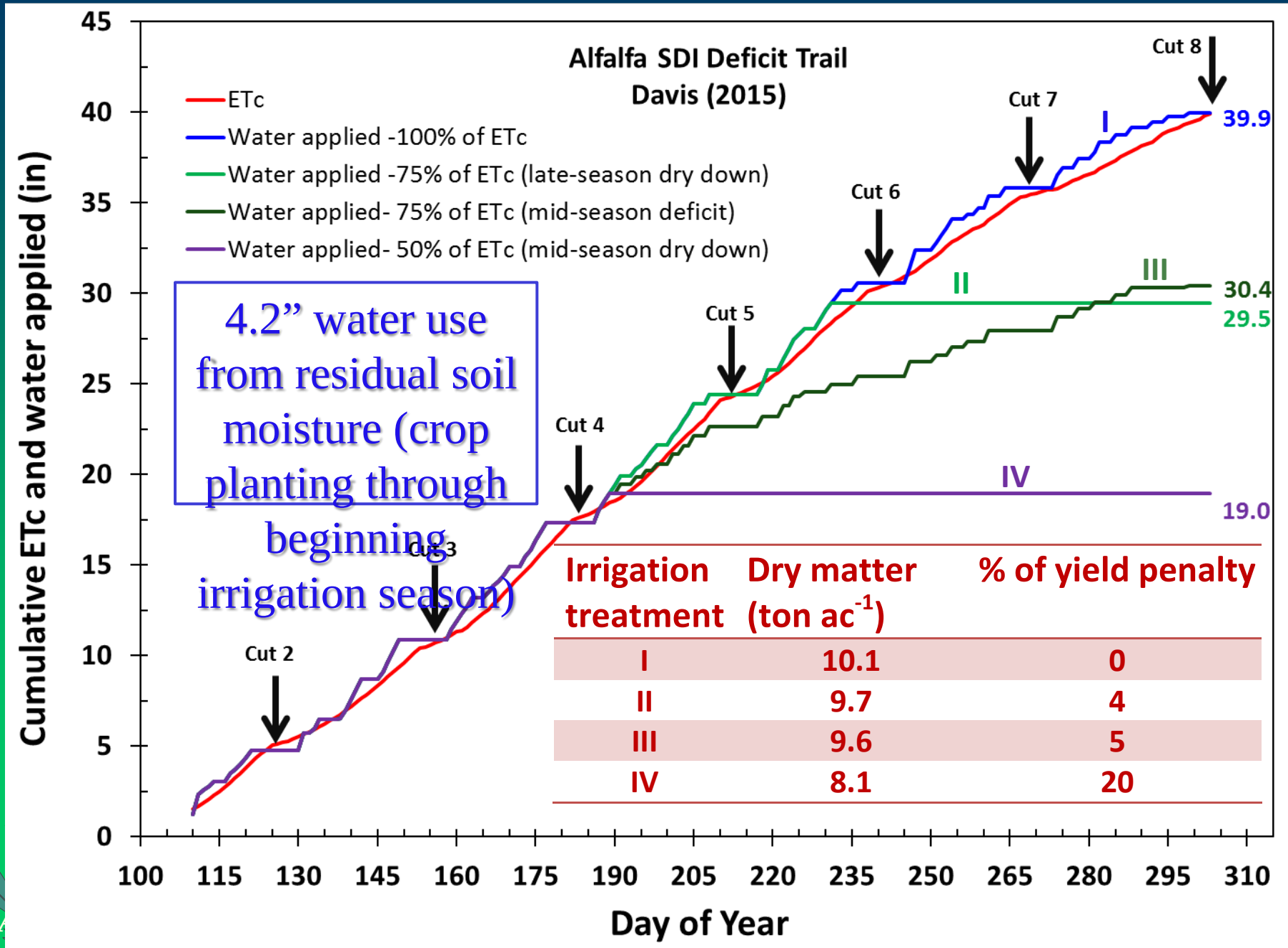
- Davis, CA and El Centro, CA: Control and 3 levels of deficit subsurface drip irrigation management at each site.
- Las Cruces, NM: Control and two levels of deficit flood irrigation

Evaluation of yield stability and productivity over 3-4 years:

- All entries in common over all irrigation treatments at each site, and multiple entries in common over all locations.
- Evaluate genotype x irrigation treatment interactions and yield rankings within and across locations/years - yield stability.

Germplasm Enhancement: Cooperators will select most vigorous plants from their populations at all sites at conclusion of study.

[Controlled Deficit Irrigation in SDI]



Irrigation treatment	Dry matter (ton ac^{-1})	% of yield penalty
I	10.1	0
II	9.7	4
III	9.6	5
IV	8.1	20

Year 1 Results:

Variety	FD	Full (T/A)	Rank (50%)	Reduction (50%)
AFX149092	9	12.0	5	29.6%
CUF101	9	11.3	3	23.3%
NM14GTAF	8	11.1	4	22.7%
NM14ALWLHQ	7	10.6	6	20.4%
AFX148091	8	10.5	7	19.8%
SW 10	10	10.4	1	13.0%
NM14BM1008251	7	10.3	10	21.8%
S8421S	8	10.2	2	14.7%
NM14MLLS2	6	9.9	11	18.9%
NM14MALHS3	6	9.6	12	17.9%
NuMex Bill Melto	7	9.5	9	12.2%
NM14BMHS1	6	9.3	8	10.1%
Artisia Sunrise	7	9.3	13	18.8%
HybriForce 2600	6	8.8	14	18.2%
R510Hg812dt	5	8.1	15	20.2%

Summary

- On-Farm Visits: SDI Improved yields 3 tons/a in long-seasoned environments (9-15 t/a), Improved WUE, Improved stand longevity, less weeds, Labor in grower's fields. Rodent Management, cost are major impediments.
- Partial-season deficits appear to be highly feasible, due to seasonal yield patterns, deep roots. Long-term effects need further investigation. Water benefits, ability to deal with droughts.
- Sustained effort required to solve SDI problems:
  - *Rodent management, scheduling/spacing, Water quality*
- Variety issue – stand persistence is key


SDI
CHECK FLOOD