Irrigation Management Options

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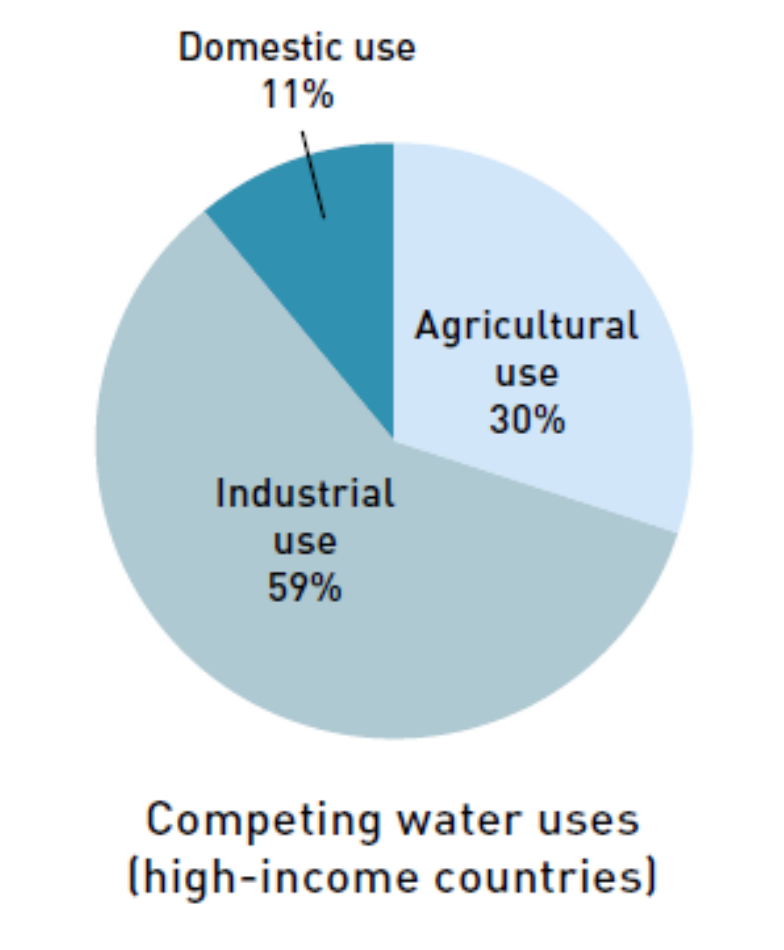
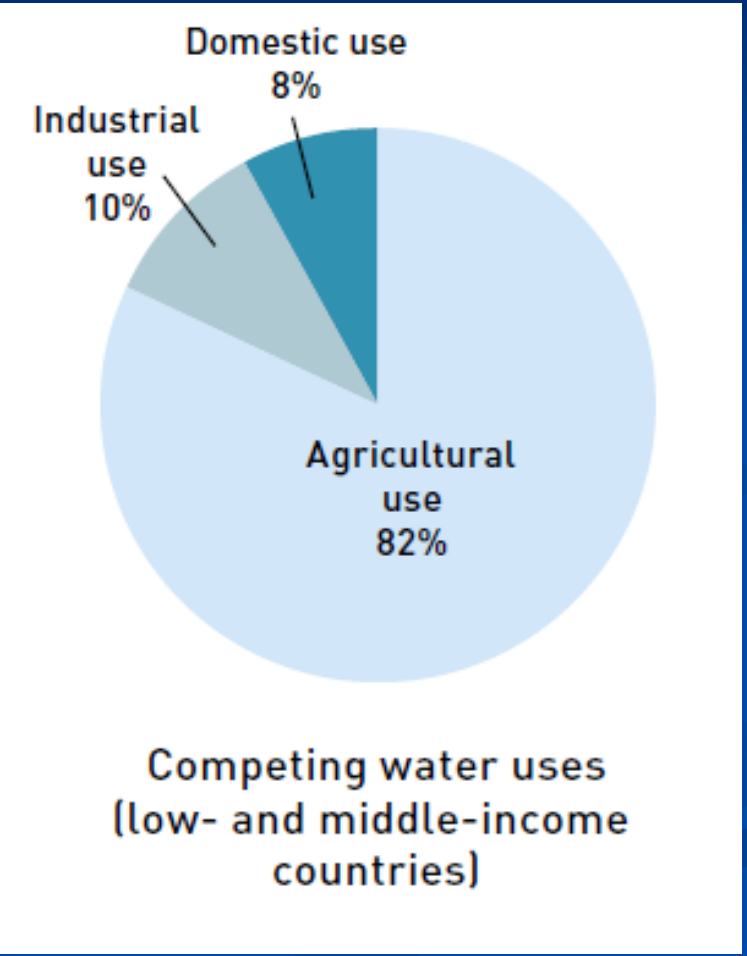
Global Water Use





United Nations

Water Demand of Different Products

Product	Unit	Equivalent water in cubic metres
Bovine, cattle	head	4,000
Sheeps and goats	head	500
Meat bovine fresh	kilogram	15
Meat sheep fresh	kilogram	10
Meat poultry fresh	kilogram	6
Cereals	kilogram	1.5
Citrus fruit	kilogram	1
Palm oil	kilogram	2
Pulses, roots and tubers	kilogram	1

United Nations

Today's Presentation

- Wisconsin Irrigation Management
- Integrated solutions toward water management

Irrigation Management

- Water balance method
  - http://wisp.cals.wisc.edu/
  - Crop water use
  - Precipitation and irrigation
- Soil water holding capacity
  - Soil texture
  - Rooting depth
- Soil moisture is reservoir
  - Allowable depletion level

Allowable Depletion Level

	Crop Effective Rooting Depth			
	Potato	Snap Bean/Pea	Soybean Sw Corn	Corn, alfalfa
	12"	24”	30"	36"
Soil type	AD (inches)			
Plainfield loamy sand	0.7	1.1	1.4	1.6
Billet sandy loam	0.9	1.7	2.1	2.4
Plano silt loam	1.2	2.4	3	3.4
Antigo silt loam	1.3	1.8	2.3	2.4

Soybean Water Use

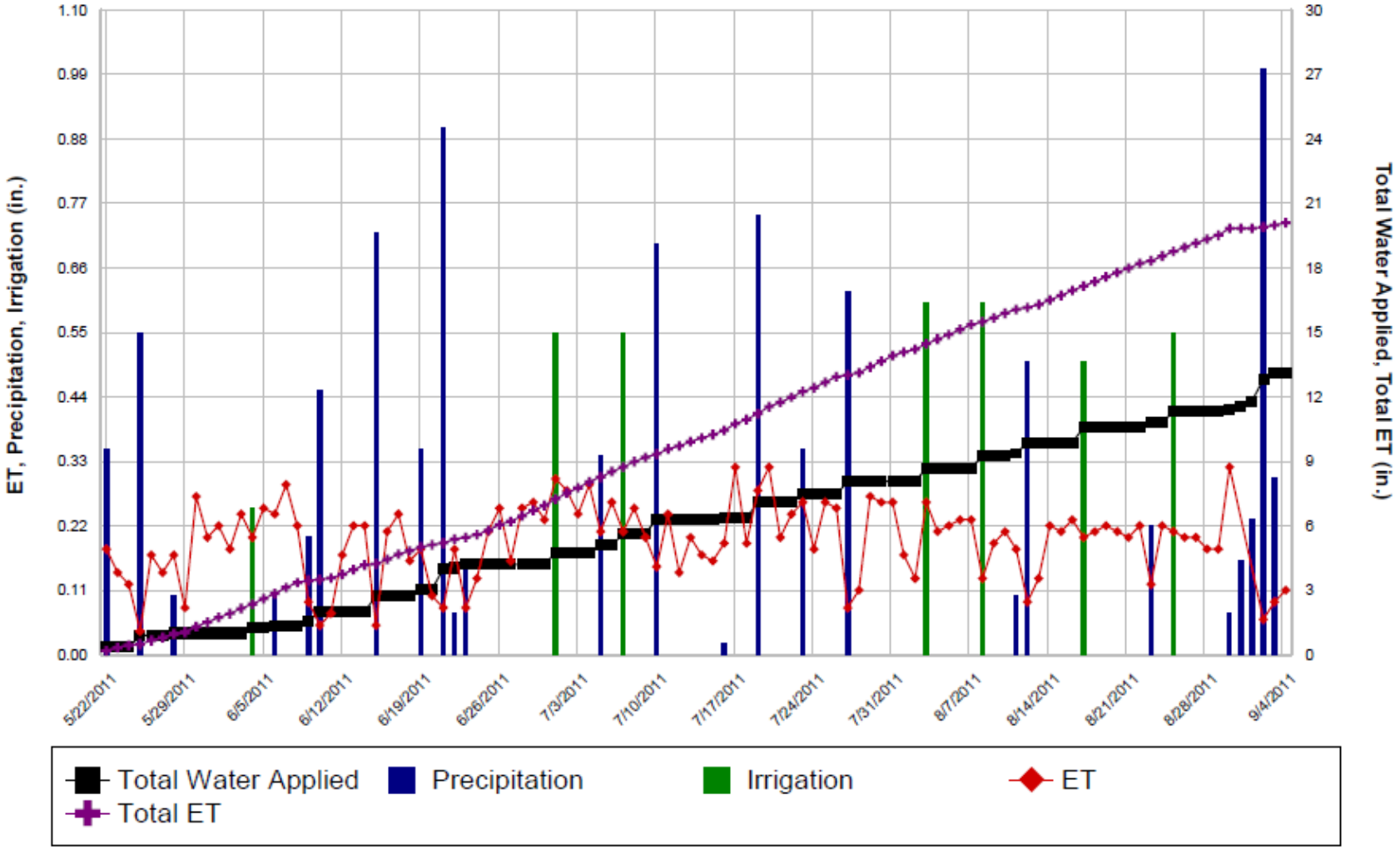
Coloma Farms Inc.

Water Use Details (by location)

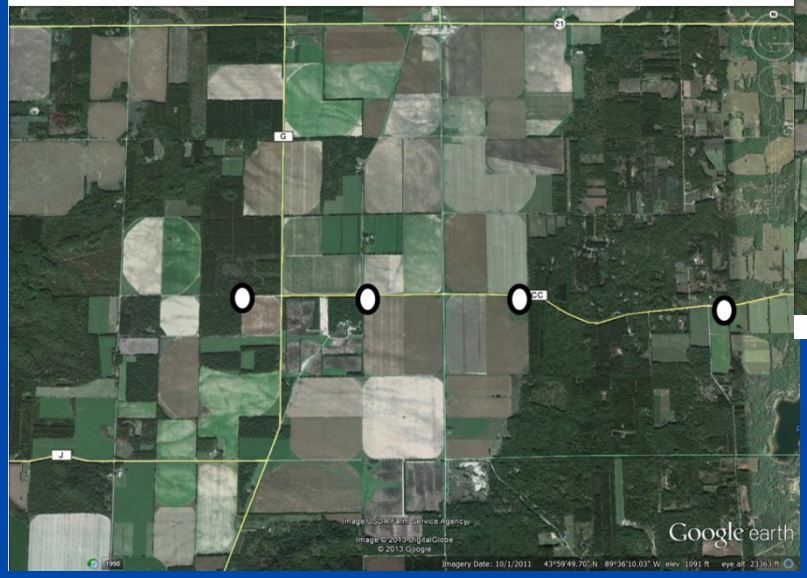
5/22/2011 through 9/4/2011

Coloma / Morrison North

UW Hancock Weather Station - Middle



Groundwater Monitoring



Managing Water Resources

- Achieve economic, social, and environmental goals
- Technological Innovation
  - Irrigation efficiency
- Crop Management
  - Deferred or deficit irrigation
- Land Management
  - Landscape scale water management

Technological Innovation

Valmont

Valley Variable Rate Irrigation (VRI)

Water Use By Crop

Values				
Row Labels	Average of Rain	Average of Irrigation	Average of ET	Average of Adjusted ET
Alfalfa	11.30	3.20	14.90	14.90
Corn	12.41	4.69	15.51	13.46
Mix	13.09	4.46	15.30	13.52
New Land	12.52	4.50	15.48	12.72
Peas	8.60	4.57	13.39	11.46
Potato	16.42	6.78	14.82	11.60
Soybean	12.04	4.41	15.00	13.48
Sweet Corn	11.19	4.33	13.43	11.13
Grand Total	**14.06**	**5.57**	**14.84**	**12.87**

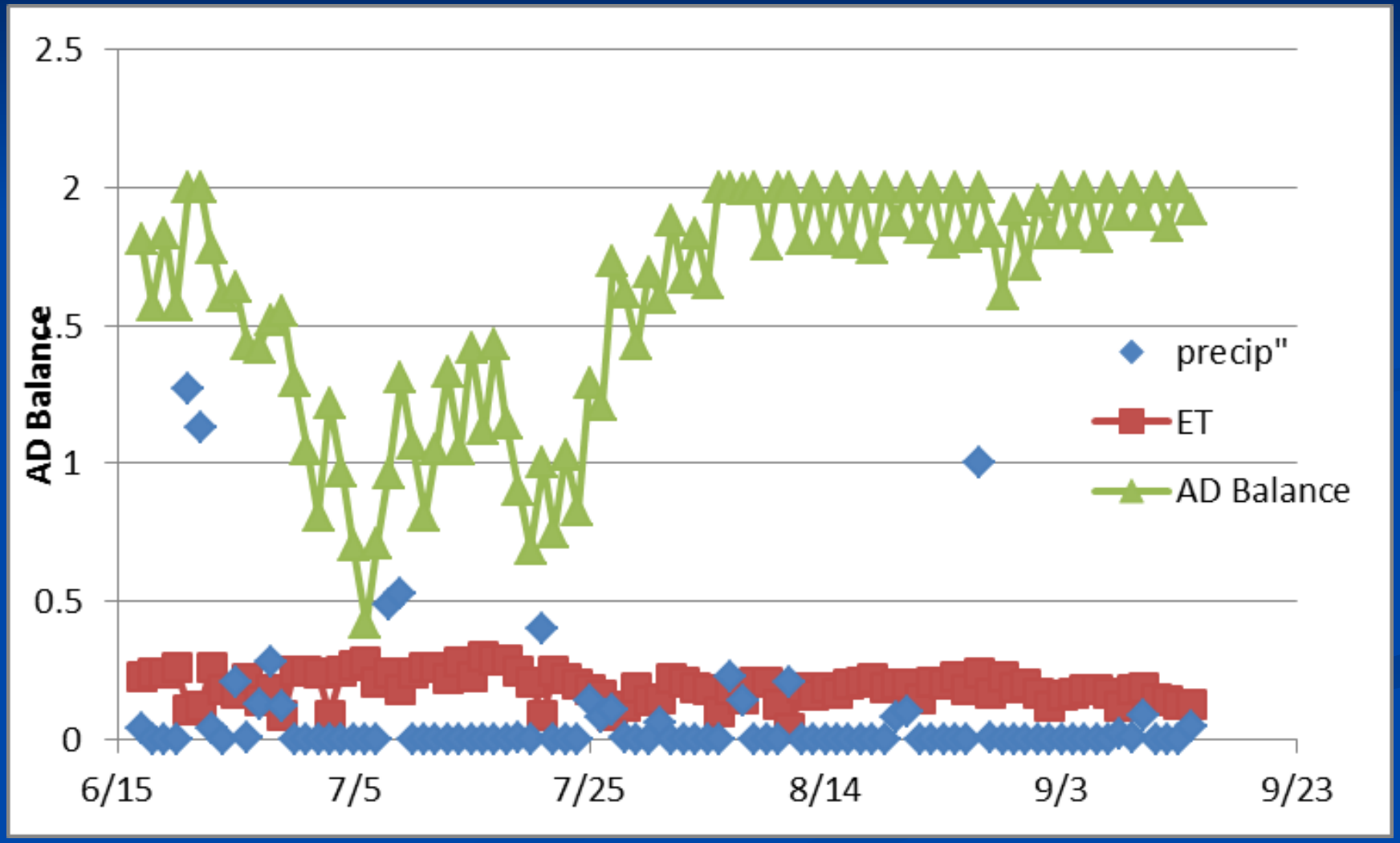
Deferred Irrigation

- Relying on soil moisture to maximize use of precipitation
  - Implement during less sensitive stages of growth

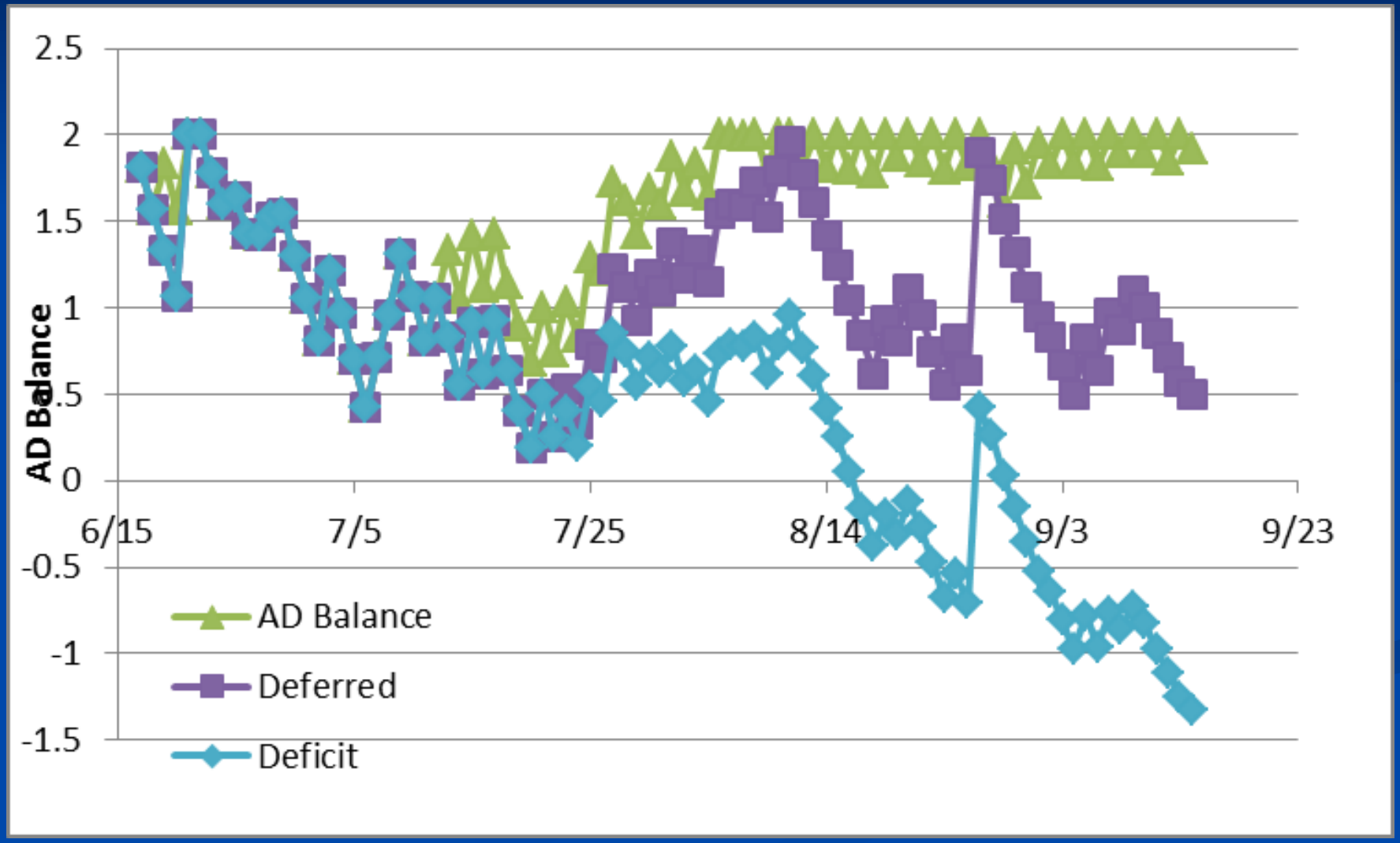
Deficit Irrigation

- Irrigate at less than ET
  - Adjusted ET > irrigation + precipitation - excess

AD Balance


2.5
2
1.5
1
0.5
0
AD Balance
6/15
7/5
7/25
8/14
9/3
9/23
precip"
ET
AD Balance

Irrigation Treatments



Deferred Irrigation

- Relying on soil moisture to maximize use of precipitation
  - Implement during less sensitive stages of growth
- Soybean example
  - 77 bu at full irrigation
  - 76 bu at deferred irrigation
- 2.5" less irrigation
  - 67,855 gallons/acre
  - 1.03 million gallons/pivot

Deficit Irrigation

- Irrigate at less than ET
  - Adjusted ET > irrigation + precipitation - excess
- Soybeans
  - 13 bu/a yield reduction
- Snap Beans
  - 2.5-3.2 ton/a yield reduction
- Sweet Corn
  - No yield response
  - Was this deficit irrigation

Soybean Yield Response

Variety	Yield Difference
AG1931	11.6
AG2431	10.7
CH2105	15.8
P92Y11	18.1
P92Y32	9.9
P92Y51	16.5

Field Corn Irrigation

- ET 18.5”
- Deferred Irrigation
  - Conserve 1.5” of irrigation
  - 40,713 gallons/acre
  - 6.2 million gallons/pivot
- Irrigate at less than ET
  - Adjusted ET > irrigation + precipitation - excess
- Field corn
  - 9 bu/a yield reduction

Field Corn Response

		Yield		
Brand	Hybrid	water opt	Full	Defecit
NuTech/G2 Genetics	5Z-200	X	199	213
DuPont Pioneer	P9690HR	X	213	217
NuTech	5N-9802		198	213
DuPont Pioneer	P9917AMX		215	228
NuTech/G2 Genetics	5X-698	X	201	200
NK Brand5N-9802	N45P-3011A	X	214	217
Unity Seeds	3190-3000GT	X	220	221
NuTech/G2 Genetics	5H-707		224	236
NuTech/G2 Genetics	5F-008	X	231	242
NuTech/G2 Genetics	5Z-709	X	243	255
Hughes	2987GT3	X	229	233
Power Plus	2V56AMX	X	221	238
LSD			22	32
All hybrids corn borer, liberty link, roundup ready				

Lauer, Kohn, Diallo 2013

Sweet Corn Response

Treatment Variety & Irrigation	Total yield ton/acre	ears/acre	Lb/ear
DM 21-84	9.63	25832.3	0.75
SV 1365	9.83	22700.6	0.87
SV 1514 SK	12.90	26781.3	0.97
GSS 1453	9.53	23383.9	0.82
GSS 1477	10.47	25860.8	0.82
Protege	9.45	24873.8	0.76
Rocker	8.65	21485.8	0.81
GH 4927	9.25	26316.3	0.70
Overland	9.35	22520.2	0.83
Overland + SO	9.60	24171.5	0.80
LSD (P=0.05)	1.25	NS	0.06

Sweet Corn Response

Treatment		Total yield		
Variety & Irrigation		ton/acre	ears/acre	Lb/ear
	Normal Irrigation	9.54	23653.4	0.81
	Deficit Irrigation	10.19	25131.9	0.82
	LSD (P=0.05)	NS	1326.0	NS

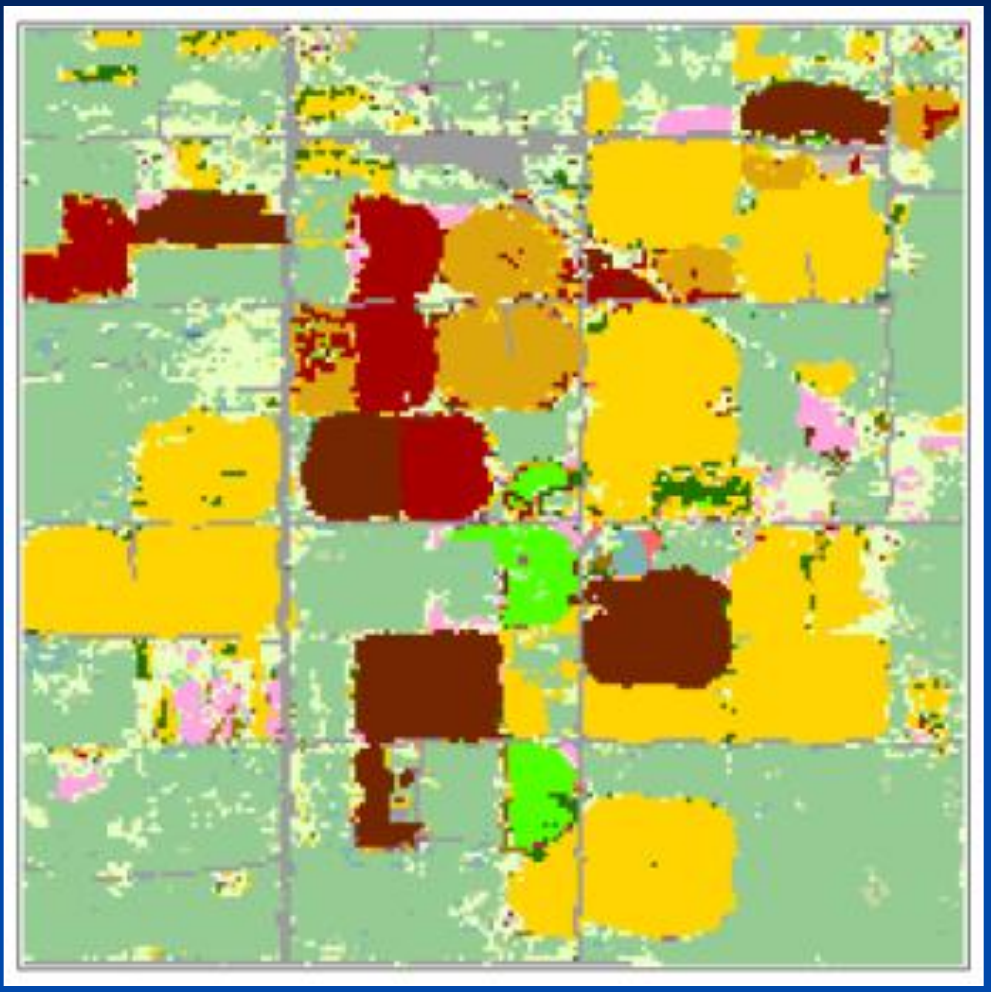
Sweet Corn Hybrid Response

Hybrid		Total yield (ton/acre)		
		Deferred		Deficit
DM 21-84		9.23		10.0
SV 1365		9.87		9.8
SV 1514 SK		13.47		12.3
GSS 1453		9.00		10.1
GSS 1477		9.93		11.0
Protege		8.83		10.1
Rocker		8.13		9.2
GH 4927		8.67		9.8
Overland		9.00		9.7
	LSD	NS		NS

Green Bean

Treatment		Total yield	Size 4 & 5
Variety & Irrigation		(ton/acre)	%
DMC 04-88	Normal Irrigation	8.05	77.3
DMC 04-88	Deficit Irrigation	5.45	80.2
DMC 04-95	Normal Irrigation	8.18	84.2
DMC 04-95	Deficit Irrigation	6.42	80.6
Huntington	Normal Irrigation	7.41	71.9
Huntington	Deficit Irrigation	5.70	83.0
Caprice	Normal Irrigation	4.52	65.2
Caprice	Deficit Irrigation	4.05	70.6
Masai	Normal Irrigation	3.60	0.0
Masai	Deficit Irrigation	4.13	0.0
BA 0999	Normal Irrigation	5.95	91.4
BA 0999	Deficit Irrigation	4.49	92.0
BA 1001	Normal Irrigation	6.97	76.5
BA 1001	Deficit Irrigation	6.02	75.3
SV 1098 GV	Normal Irrigation	5.95	87.2
SV 1098 GV	Deficit Irrigation	4.84	86.1
	LSD (P=0.05)	1.21	5.0

Land Management



- Landscape is variable
- Manage land to optimize water use
- Identify where water withdrawals have acceptable impacts

Summary

- Design system to meet capacity
- Understand soils and relationship to crop water use
- Design farm within the landscape
  - maximize value
  - benefit the community
  - minimize impacts

Thanks

- Funding support
  - MWFPA
  - WPVGA
  - Wisconsin Soybean Marketing Board
  - Wisconsin Specialty Crop Block Grant Program
  - USDA NRCS Conservation Innovation Gratn