

Flickner Innovation Farm

2019 – 2022 IWM Summary

Water Use Water Duty

Monitoring Irrigation System Operations for EVEN Application

Improving Rainfall Efficiency

Water Use Summary

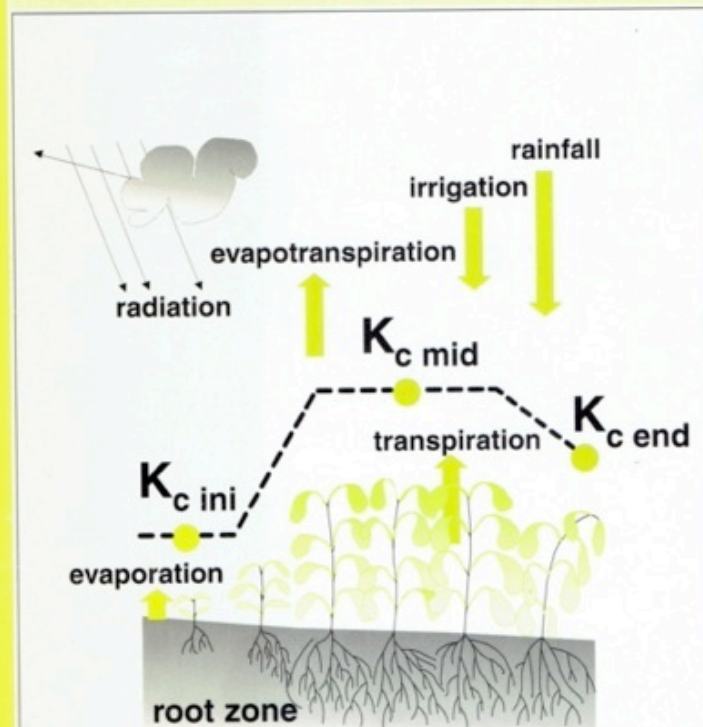
- 2019 Big Pivot Corn 6.3" 8 Irrigations Water Duty 30
- 2020 Big Pivot East ½ Corn 8.0" Water Duty 25
- 2020 South SDI Corn 5.7" Water Duty 35
- 2021 Big Pivot Soy 4.5"
- 2021 South SDI Soy 5.0"
- 2021 Gringo SDI Corn 7.3" Water Duty 29.4
- 2021 Little Pivot Corn 11.2" Water Duty 17
- 2021 Rattlesnake NRCS CIG TNC Project 19 Corn fields
- 11 to 21" Yields 170-280 B/a Water Duty 10-20

Crop evapotranspiration

Guidelines for computing
crop water requirements

FAO
IRRIGATION
AND DRAINAGE
PAPER

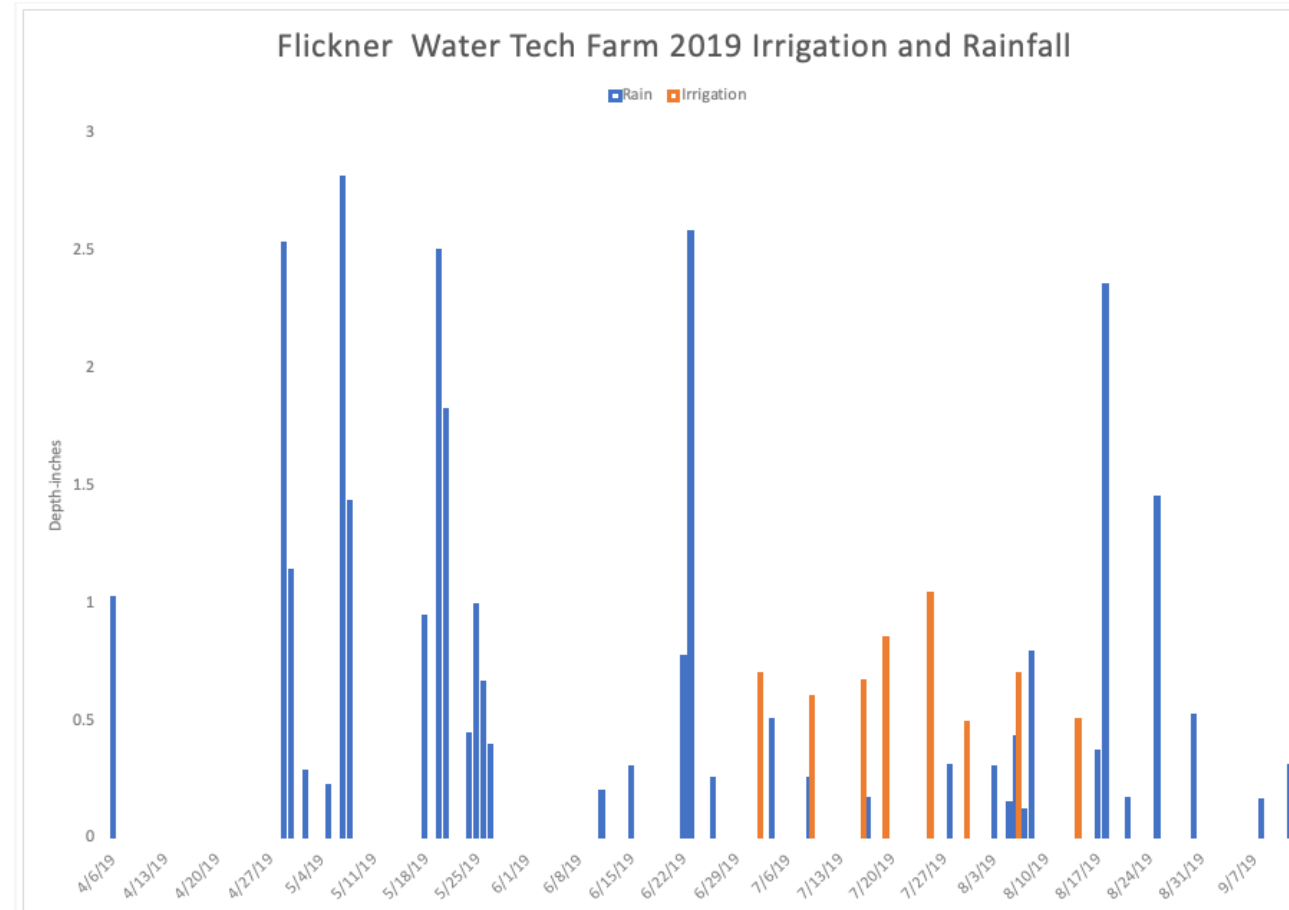
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Food
and
Agriculture
Organization
of
the
United
Nations



Irrigation + Rain 2019 Corn Big Pivot



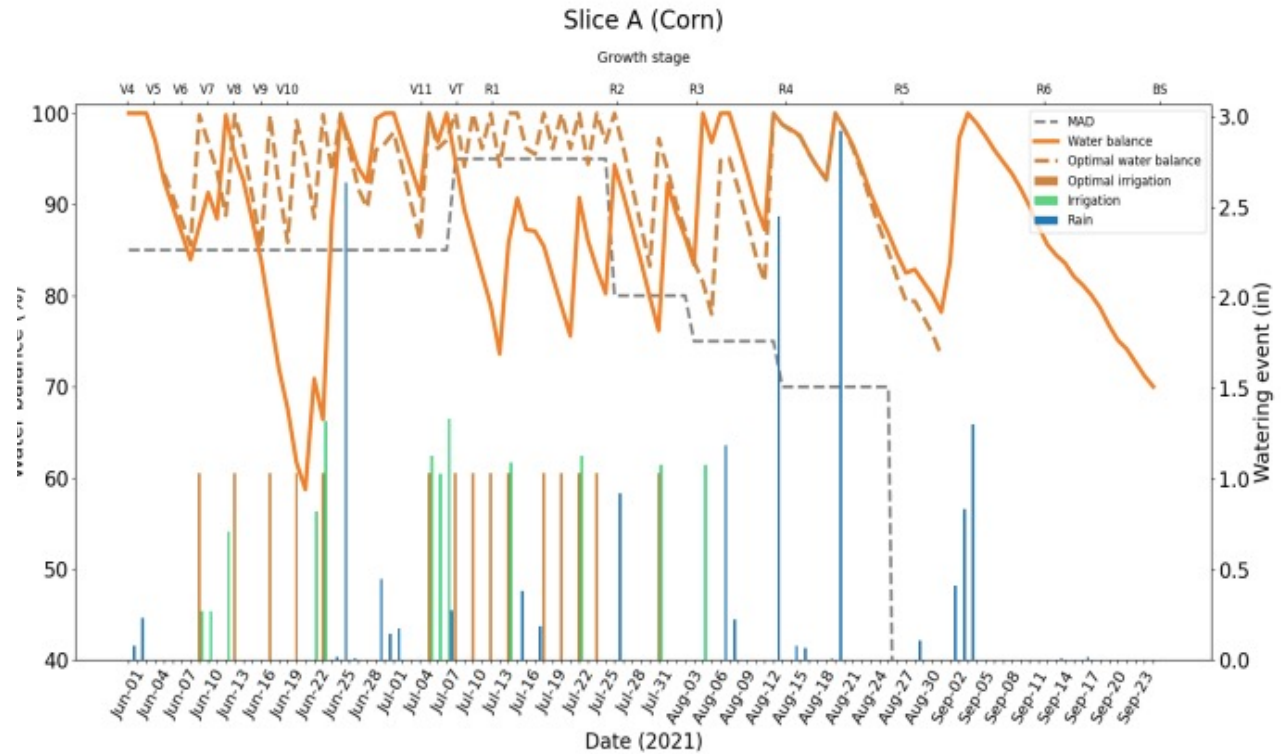
Little Pivot 2021 Corn

Slice A (Corn) - Watering Events



Date	Irrigation (in)	Optimal irrigation (in)	Rain (in)
2021-06-01	0	0	0.078
2021-06-02	0	0	0.235
2021-06-09	0.27	1.034	0
2021-06-10	0.27	0	0
2021-06-12	0.71	0	0
2021-06-13	0	1.034	0
2021-06-17	0	1.034	0
2021-06-20	0	1.034	0
2021-06-22	0.82	0	0
2021-06-23	1.32	1.034	0
2021-06-24	0	0	0.02
2021-06-25	0	0	2.637
2021-06-26	0	0	0.01
2021-06-29	0	0	0.451
2021-06-30	0	0	0.147
2021-07-01	0	0	0.176
2021-07-05	1.13	1.034	0
2021-07-06	1.03	0	0
2021-07-07	1.33	0	0.275
2021-07-08	0	1.034	0
2021-07-10	0	1.034	0
2021-07-12	0	1.034	0
2021-07-14	1.09	1.034	0
2021-07-15	0	0	0.382
2021-07-17	0	0	0.186
2021-07-18	0	1.034	0
2021-07-20	0	1.034	0
2021-07-22	1.13	1.034	0
2021-07-24	0	1.034	0
2021-07-26	0	0	0.922
2021-07-31	1.08	1.034	0
2021-08-05	1.08	0	0
2021-08-07	0	0	1.186
2021-08-08	0	0	0.225
2021-08-13	0	0	2.451
2021-08-15	0	0	0.078
2021-08-16	0	0	0.069
2021-08-19	0	0	0.01
2021-08-20	0	0	2.922
2021-08-29	0	0	0.108
2021-09-02	0	0	0.412
2021-09-03	0	0	0.833
2021-09-04	0	0	1.304
2021-09-14	0	0	0.01
2021-09-17	0	0	0.02
Total	11.26	15.51	15.147

Slice A (Corn) – Water Balance:

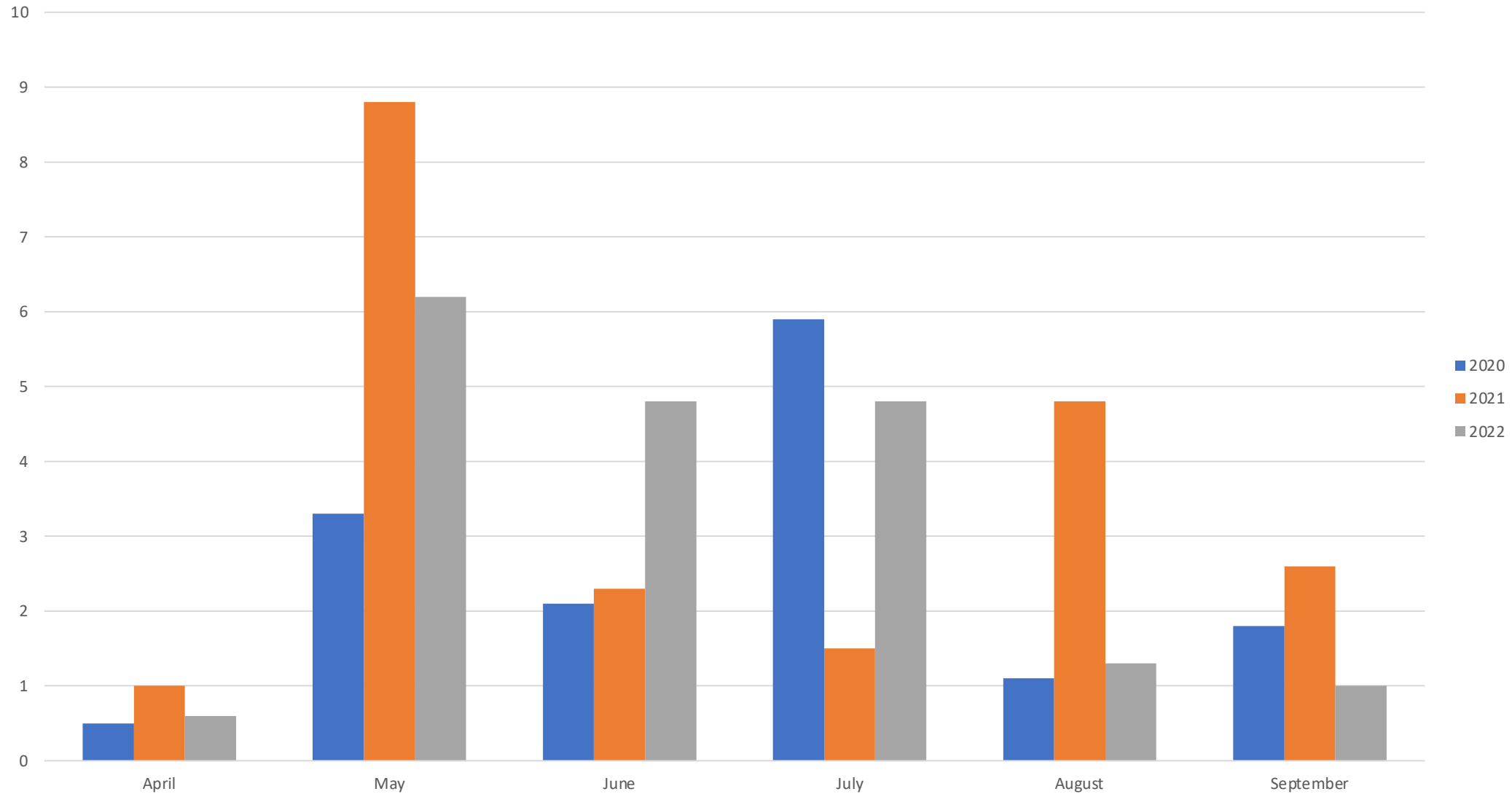


Operations/Monitoring To Maintain Uniform Irrigation Depths

- Pressure is key Must have above Min Required Everywhere in field
- Know the Design gpm and psi at top of pivot
- Measure and Monitor
- For Pivots AgSense, FieldNet or FieldWise End Tower GPS and PSI
- For SDI Fewer Options Need more PSI sensors, 1 for each zone

Rainfall Summary April 1-Sept 30 (2019-2022)

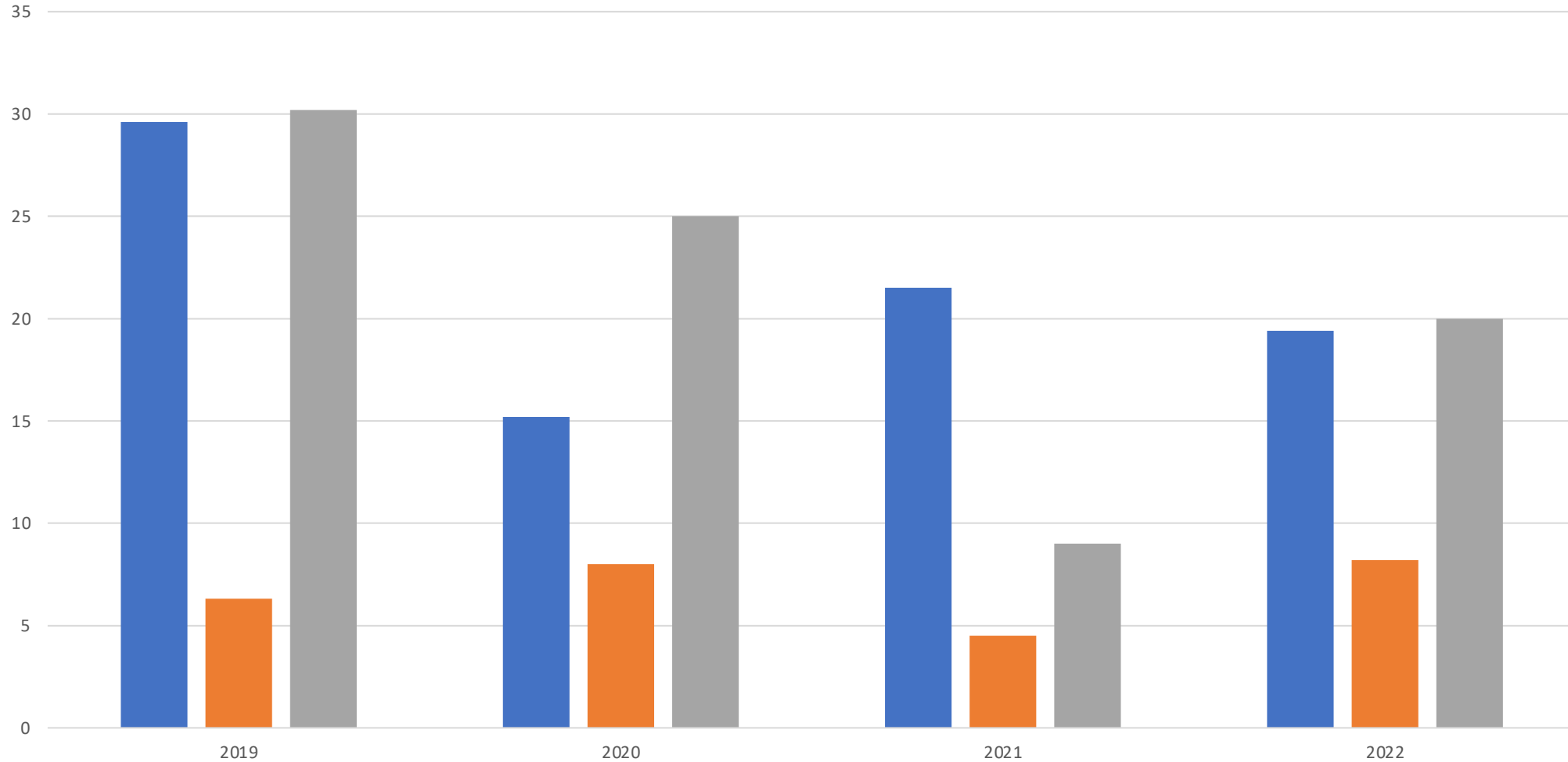
Flickner 2020-2022 Rain-inches



Big Pivot Water Use Summary 2019-2022

Flickner Water Use 2019-2022

Rain Irrigation Water Duty

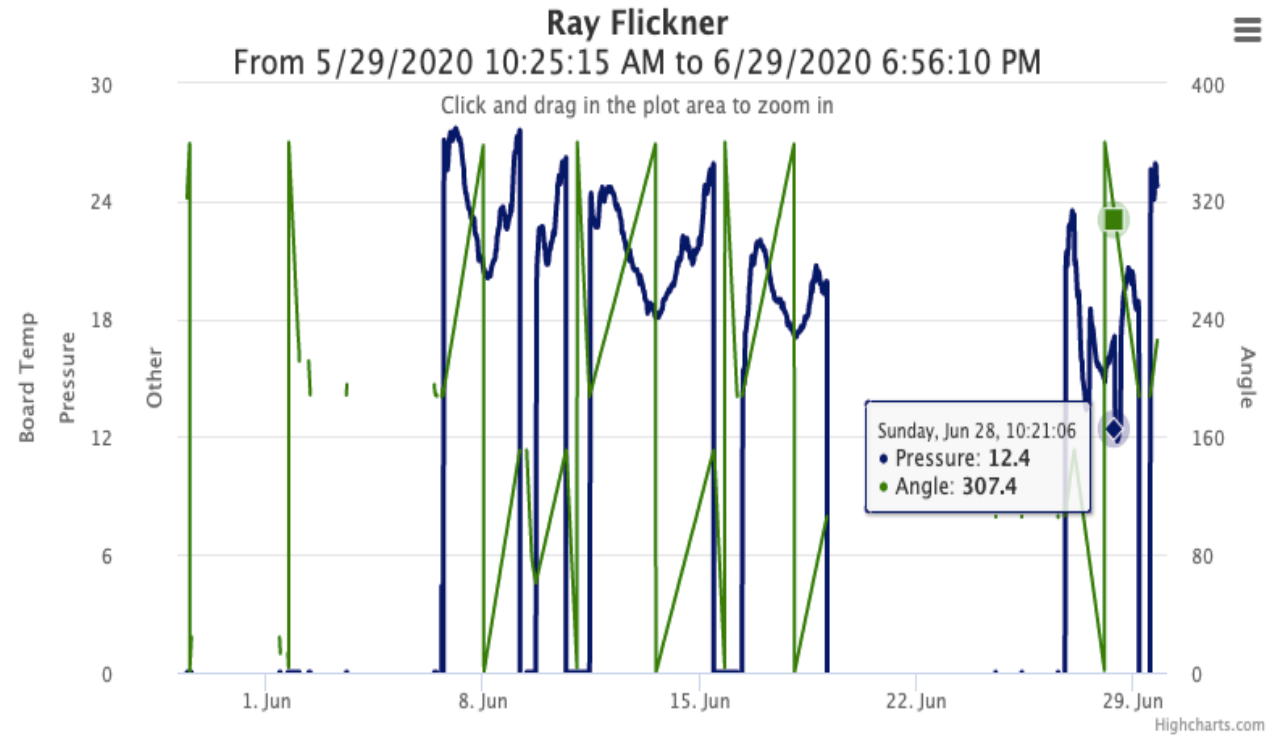


Big Pivot Mobile Drip							
		Rain	Irrigation	Water Duty			
Corn/Soy	2019	29.6	6.3	30.2			
Corn	2020	15.2	8	25			
Soy	2021	21.5	4.5	9			
Corn	2022	19.4	8.2	20	Rain 9" before June12		
					10" June 12-Sept 30		
SW SDI Gringo							
Corn	2021	21.5	7.3	29.4			
SE SDI	2020	15.2	5.7	35	No Irrigation in July !!		
	2022	19.4	10.3	16.3			
Rattlesnake NRCS CIG Project							
	2021	15	11-21	10-20			
	2022	9	12-24	5-12	6.8" before June 7 !!		
					3" June 7 to Sept 30		

Big Pivot MDI since 2019

- 2019 450 gpm 30 psi XI-Wobs MDI 30 hp Electric VFD
- Static Water Level 58.5 PWL 98 480 gpm 27 psi
- Well log 1993 SWL 50 ft. Well screen 61-71, 91-131 Depth 131
- Pump efficiency critical. Impellers adjusted twice to increase psi
- Well sustainable Q not much over 480
- Pump when adjusted well with VFD at 60 Hz provides adequate psi
- MDI leaks quite obvious on AgSense. Leads to low pressure OP

Ag Sense Big Pivot 2020



Battery Pressure Angle Signal Strength

1 day 2 days 1 week 1 month

From 05/29/2 To 06/29/2

CMD

Chart

Config

Field Info

Forms

Readings

CMD History

Reports

Unit History

Ray Flickner

From 5/13/2022 4:58:39 PM to 10/17/2022 3:11:02 PM



Click and drag in the plot area to zoom in



Highcharts.com

- Battery
- Pressure
- Angle
- Signal Strength

1 day 2 days 1 week 1 month

1 day
 2 days
 1 week
 1 month

From

To

05/01/2022



mm/dd/yyyy



Go

Back

Forward

Current

18682

Raymond Flickner - SW20-21s-2w - Light Soil
Corn RF4

2020 (Planted 04/26)

41°F
Humidity: 54%
Wind: 9 mph ESE

Growing° Units: --
Root Depth: 48"
Last Moisture Detected:
8" 09/01/2020



Last Reported

Summary

Moisture

EC

Temp°

Weather

CT

Template



Show: Growth Stages Irrigations Root Growth Projected Summary

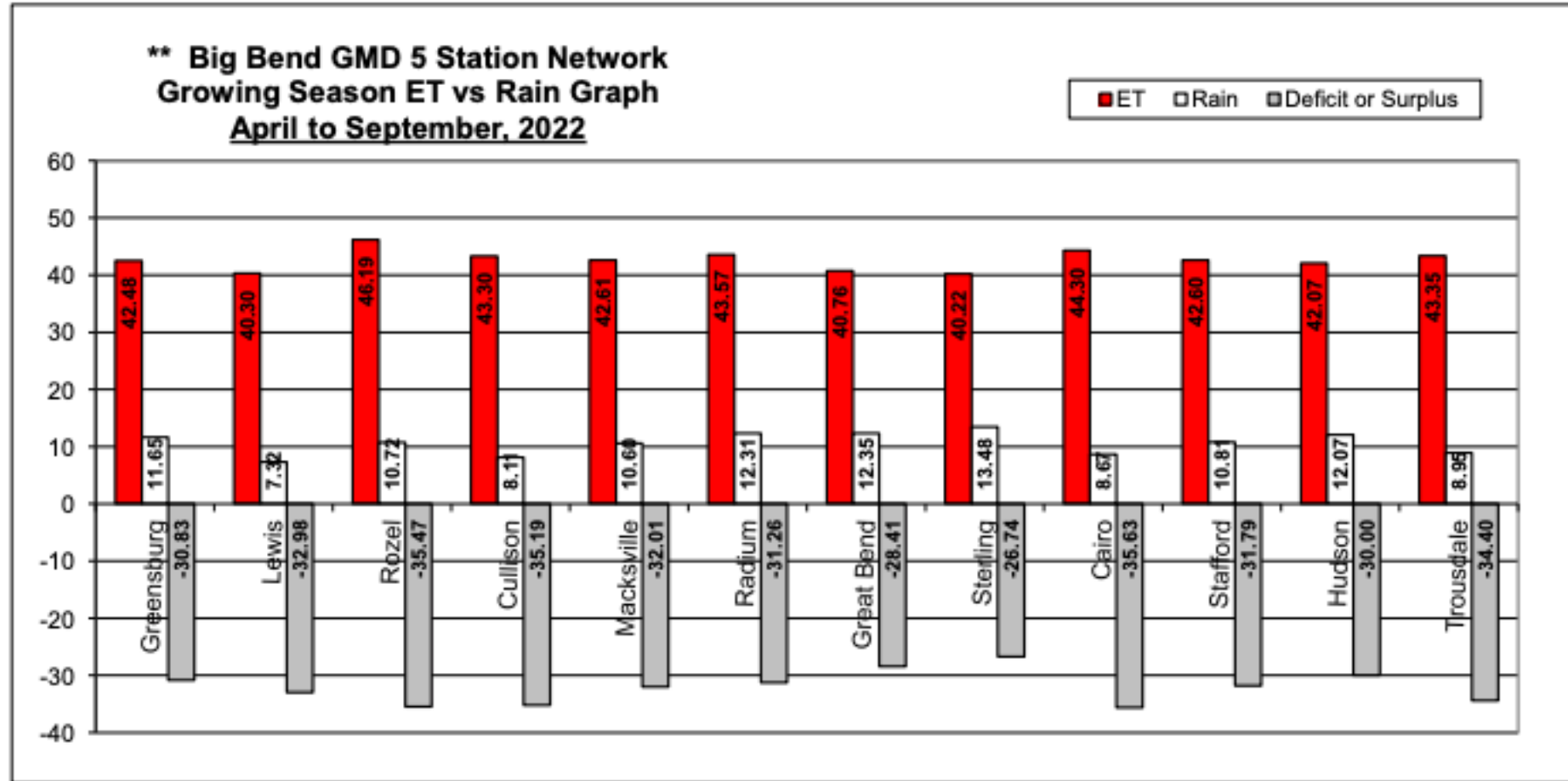
SDI South and Gringo Fields

- Common Problem is too much psi differential Supply to Flush Manifolds. We had 7-8 psi 2020 South SDI. Large 1.125" diameter gets compacted easier increasing friction loss on long runs
- And Zone differential operations. Not following Design settings at PRV Pilot valves leads to uneven zone applications.
- Gringo had pilot valve settings too high. And Disc Filter partial plugging. More psi loss
- Readjusted PRV settings mid summer back to design. Zone flows variable 370-400+ gpm. Design is 330-340 gpm

ET too different or not correct

- ET₀ grass reference, k_{c0}
- E_{tp} alfalfa reference, k_{cp}
- Each has associated k_c , crop coefficients. Generally at peak use 1.2
 $k_{c0} = k_{cp}$
- Mesonet Flickner 2020 4-23 to 9-30 ET₀=30.35, E_{tp}=40.13 32% more
 - 2021 4-1 to 9-30 ET₀=32.3, E_{tp}=43.1 33% higher

GMD 5 ET0 only 12 stations Big Bend Aquifer



Mesonet Data Policy

[English](#)
[Metric](#)
[Table](#)
[Graph](#)
[CSV](#)
[SHEF](#)
[Weather Parameters](#)

St John 1NW

2021-04-01 — 2021-09-30

	Air Temperature		Relative Humidity	Precip	Wind Speed		2" Soil Temperature		4" Soil Temperature		Solar Radiation	ETo	
	Max °F	Min °F	Avg %	Total inches	Avg mph	Max mph	Max °F	Min °F	Max °F	Min °F	Total ly	Grass inches	Alfalfa inches
04-01	60.4	26.1	46.3	0	10.1	25.3	51.6	42.7	51.0	44.5	496.7	0.16	0.24

09-27	92.9	60.9	42.1	0	7.0	23.2	74.8	67.0	72.2	66.1	458.2	0.26	0.38
09-28	90.6	63.3	49.1	0	8.4	21.9	75.1	69.0	72.8	68.7	440.3	0.25	0.38
09-29	85.3	64.6	63.9	0.06	9.7	24.2	74.2	70.0	72.3	69.6	307.9	0.20	0.29
09-30	70.1	57.5	84.9	1.05	7.2	30.2	72.1	67.9	71.3	67.6	278.3	0.10	0.14
summary	83.1	58.3	64.2	15.62	7.7	55.9	76.4	67.5	73.8	67.6	512.4	41.68	57.10