

Importance of Proper Irrigation Scheduling in Cotton Production

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2023 Georgia Cotton Commission
Annual Meeting
January 25, 2023

Background

- Irrigation scheduling is determining how much and when to apply irrigation to a crop to maximize water use efficiency without reducing crop yield or on farm profitability.
- Cotton is a difficult crop to adequately determine an appropriate irrigation scheduling strategy for.
 - Many studies have shown positive effects on cotton growth and biomass development but negative effects on final yield when “excessive” irrigation is applied.
 - Cotton is a crop that responds positively to well-timed periods of stress during the production season.

Background

- Producers have many options available to them for the purpose of scheduling irrigation in crop production.
- The methods range from free, to inexpensive, to a perceived expensive cost.
 - Additionally, each scheduling method comes with an associated time required to make decisions from these methods.

Irrigation Scheduling Method	Entire US (%)	AL (%)	FL (%)	GA (%)	SC (%)	MS (%)
Visible Stress	78	86	83	87	89	86
Feel of Soil	40	42	36	27	22	41
Soil Moisture Sensor	12	8	16	11	12	27
Scheduling Service	8	1	5	4	3	4
Weather Report	7	1	5	8	1	4
Calendar Schedule	20	10	15	15	11	15
When Neighbor Irrigates	6	1	2	3	2	6

Irrigation Information

- Where do farmer's get their info from??

Irrigation Scheduling Method	Entire US (%)	AL (%)	FL (%)	GA (%)	SC (%)	MS (%)
University Extension	48	45	82	79	63	58
Private Consultant	58	34	66	36	51	66
Irrigation Equipment Dealer	41	66	47	39	35	48
Irrigation District	14	11	8	13	3	8

Barriers to Improvements in Water Conservation

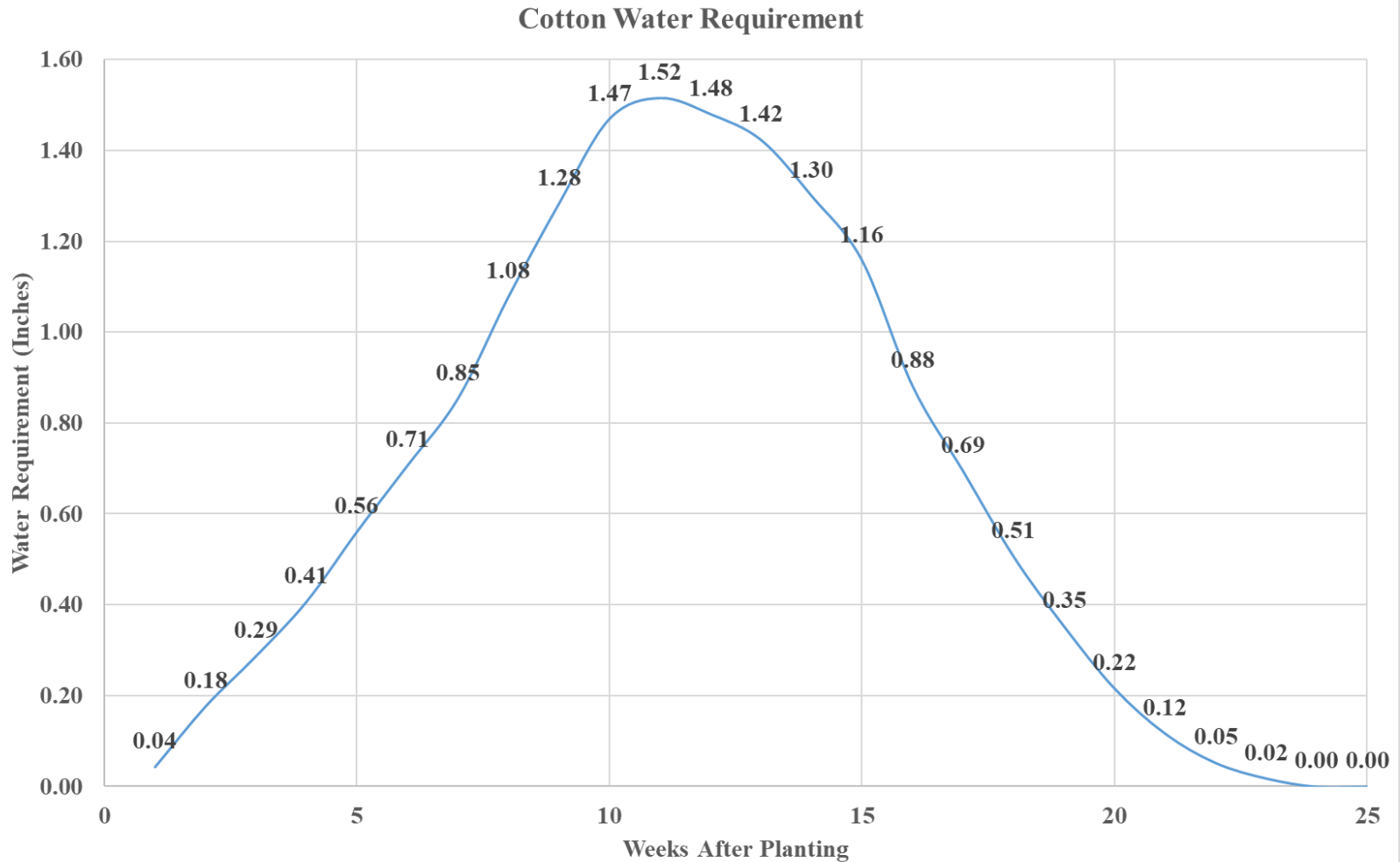
1. Investing in improvements is not a priority (34%)
2. Cannot afford improvements (32.2%)
3. Improvements won't reduce costs enough to cover new costs (22.4%)
4. Risk of reduced yield (17.4%)
5. Uncertainty about future water availability (11.7%)
6. Improvements will increase management time or cost (10.3%)
7. Won't be farming long enough to justify improvements (7.7%)
8. Landlord will not share in cost (7.7%)
9. Physical Field/Crop Limits Improvements (3.5%)

Cost of Pumping Irrigation

- Average Irrigation cost ~ \$13.50/ac-in applied:
 - ~\$7/ac-in for electric
 - ~\$20/ac-in for diesel
- So for 500 acres of irrigated land @ 10 inches of irrigation:
 - \$67,500

• <https://agecon.uga.edu/extension/budgets.html>

Water Requirements: Cotton



Water Requirements: Cotton

Growth Stage	DAP	Weeks after Planting	Inches/Week	Inches/Day
Emergence	1 - 7	1	0.04	0.01
Emergence to First Square	8 - 14	2	0.18	0.03
	15 - 21	3	0.29	0.04
	22 - 28	4	0.41	0.06
	29 - 35	5	0.56	0.08
First Square to First Flower	36 - 42	6	0.71	0.10
	43 - 49	7	0.85	0.12
	50 - 56	8	1.08	0.15
First Flower to First Open Boll	57 - 63	9	1.28	0.18
	64 - 70	10	1.47	0.21
	71 - 77	11	1.52	0.22
	78 - 84	12	1.48	0.21
	85 - 91	13	1.42	0.20
	92 - 98	14	1.30	0.19
First open boll to >60% Open Bolls	106 - 112	16	0.88	0.13
	113 - 119	17	0.69	0.10
	120 - 126	18	0.51	0.07
	127 - 133	19	0.35	0.05
Harvest	141 - 147	21	0.12	0.02
	148 - 154	22	0.05	0.01
	155 - 161	23	0.02	0.00
	162 - 168	24	0.00	0.00
	169 - 175	25	0.00	0.00

Peak Water Use

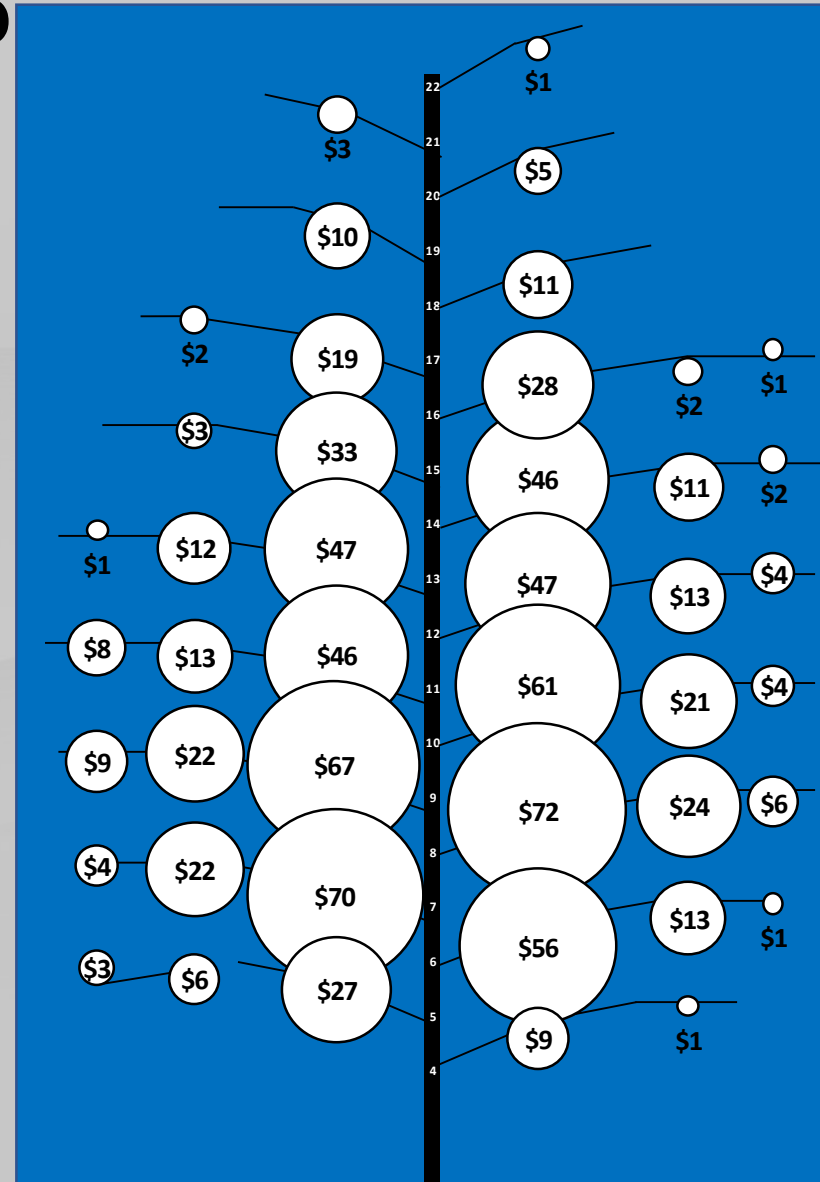
Water Use Declines

Irrigation Termination is Strongly Advised

Fruiting Position Value

Georgia 2019 (3 location average)

Fruiting Location	Value
1 st Positions	72%
2 nd Positions	18%
3 rd Positions	5%
Vegetative	5%
Nodes ≤ 10	60%
Nodes 11-15	31%
Nodes ≥ 16	9%

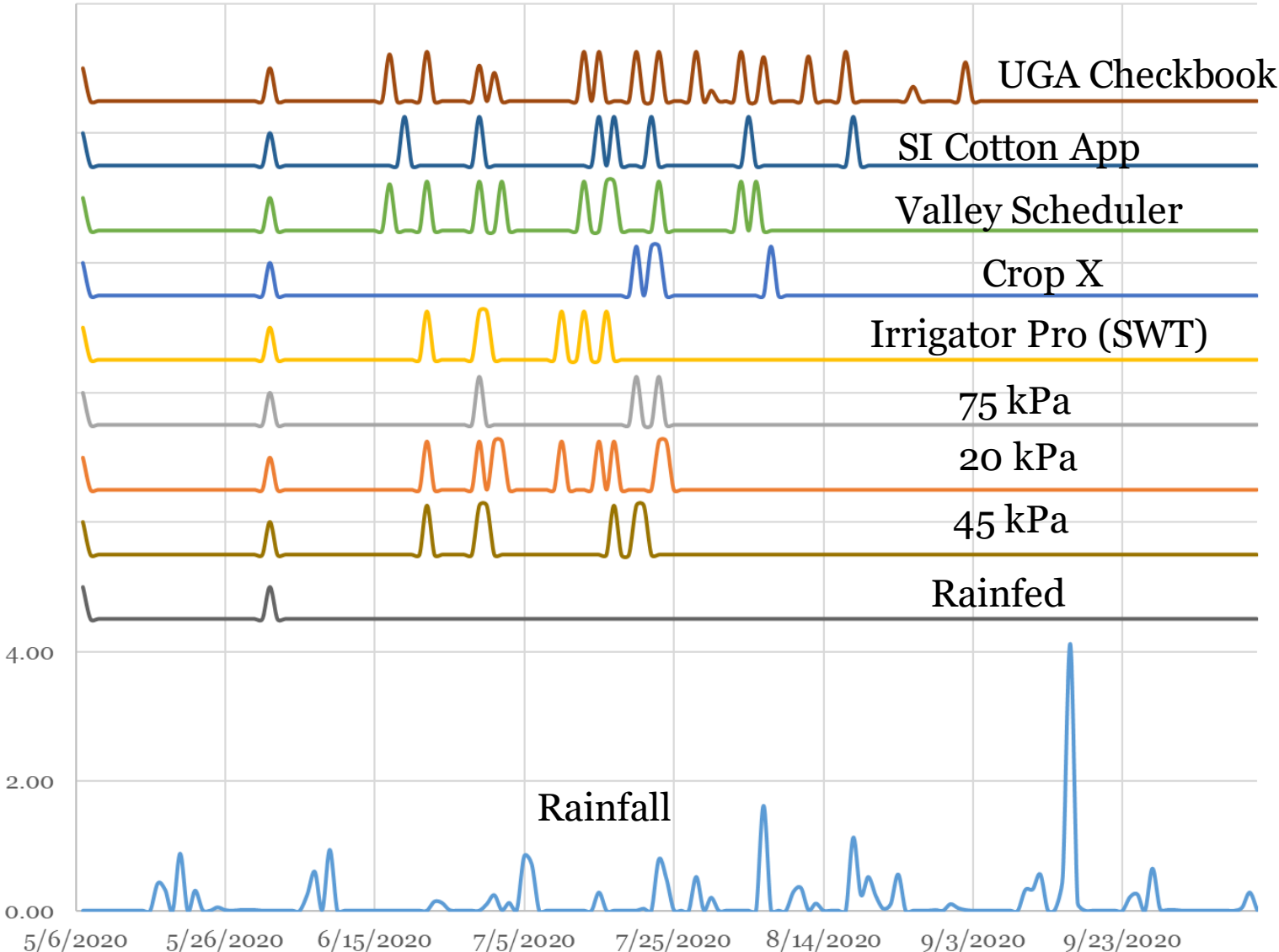


2020 Results

Treatment	Irrigation (in)	Total Water (in)	Lint Yield (lb/ac)	IWUE (lb/in)	Profit for \$7/ac-in @ \$0.79 Cotton	Profit for \$12/ac-in @ \$0.79 Cotton
Rainfed	1.0	22.4	795	N/A	621	616
45 kPa	5.5	26.9	1304	237	992	964
20 kPa	7.75	29.1	1293	167	967	928
75 kPa	3.25	24.6	1129	347	869	853
Irrigator Pro	5.5	26.9	1245	226	945	918
CropX	4.0	25.4	1113	278	851	831
Valley Scheduler	8.5	29.9	1240	147	920	878
SI Cotton App	6.25	27.6	1270	203	960	928
Checkbook	11.0	32.4	1196	109	868	813



2020 Results

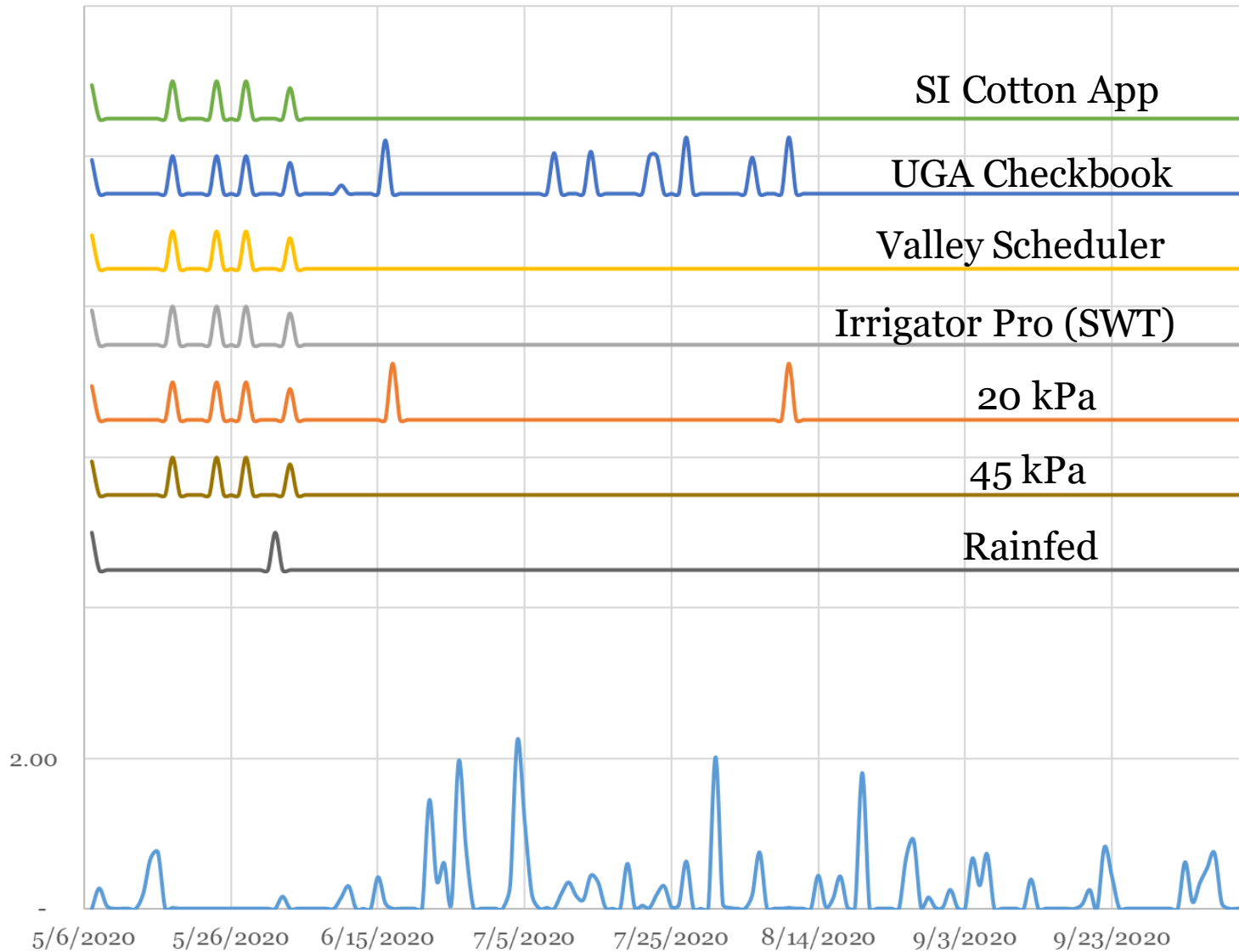


2021 Results

Treatment	Irrigation (in)	Total Water (in)	Lint Yield (lb/ac)	IWUE (lb/in)	Profit for \$7/ac-in @ \$1.00 Cotton	Profit for \$12/ac-in @ \$1.00 Cotton
Rainfed	1.0	30.66	1119	N/A	1112	1107
45 kPa	2.36	32.1	1191	505	1175	1162
20 kPa	3.86	33.6	1197	310	1170	1151
Irrigator Pro	2.36	32.1	1175	498	1159	1147
Valley Scheduler	2.36	32.1	1148	486	1131	1120
SI Cotton App	2.36	32.1	1164	493	1148	1136
Checkbook	7.26	37.0	1177	162	1126	1090

Planted: May 7, 2021
 Picked: October 20, 2021
 2021 Rainfall = 29.66 in

2021 Results



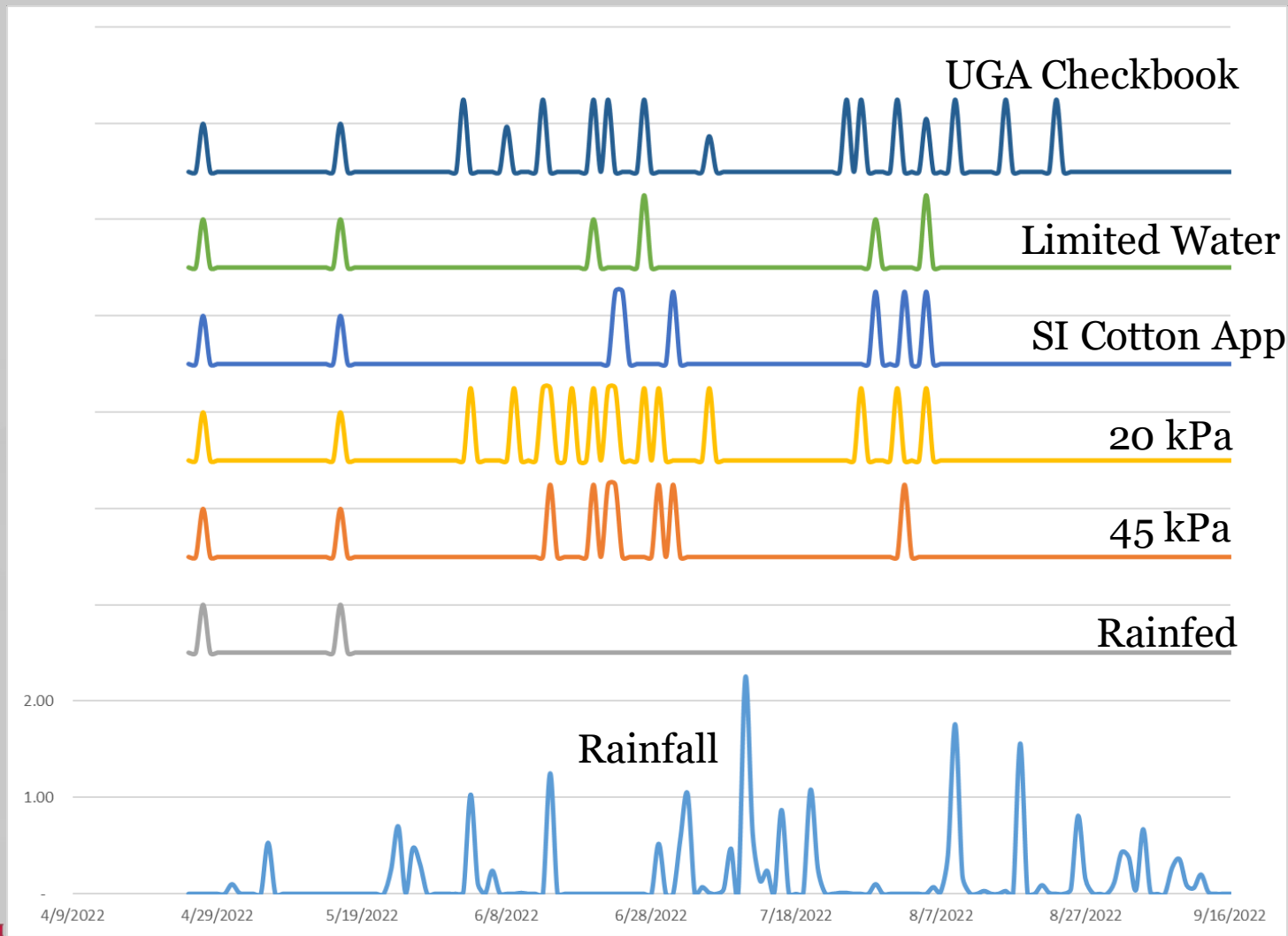
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2022 Results

Treatment	Irrigation (in)	Total Water (in)	Lint Yield (lb/ac)	IWUE (lb/in)	Boll Rot Rating (% of rotted bolls)	Profit for \$7/ac-in @ \$0.90 Cotton	Profit for \$20/ac-in @ \$0.90 Cotton
Rainfed	1.0	22.3	1431	N/A	13	1281	1268
45 kPa	6.25	27.6	1256	201	18	1086	1005
20 kPa	11.5	32.8	1099	95	23	908	759
SI Cotton App	5.5	26.8	1200	218	24	1042	970
Limited Water	3.5	24.8	1265	361	19	1114	1069
Checkbook	10.6	31.9	1219	115	18	1022	884

Planted: April 25, 2022
Picked: October 24, 2022
2022 Rainfall = 21.31 in

2022 Irrigation Timing Results



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QUESTIONS?

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