

Drought and Irrigation Best Practices

**U. S. DROUGHT MONITOR WORKSHOP: FORECASTING,
MONITORING AND RESPONDING TO
DROUGHT IN THE SOUTHEAST**

Feb 4-5, Columbia, SC

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Strategies to adapt to drought

- Land management strategies
- Crop Management strategies
- Irrigation management strategies
- Business management strategies



Land management strategies

- Conservation Tillage
- Fallowing land with standing stubble



Crop Management Strategies

- Reducing plant population and using skip-row configurations
- Selecting appropriate crops and crop varieties
- Using crop rotation
- Using opportunity cropping
- Adjusting cropping strategy according to amount and source of water supply





Business Management Strategies

- Trading land and water
- Developing a long-term plan
- Diversifying sources of income
- Minding the budget



Irrigation Management Strategies

- Improving irrigation scheduling
 - Using available tools to make irrigation decisions
 - properly timing supplemental irrigation,
 - eliminating pre-irrigation,
 - adjusting irrigation according to crop and crop variety
- Improving efficiency of surface irrigation systems
- Investing in more efficient irrigation systems
- Reducing water losses in farm storages

Capture more rain and reduce evaporation

- Crop rotation
- Reduced traffic
- Manure application
- Conservation tillage
- Land leveling/terracing
- Crop residue management
- Cover crop

Table 3. Land Use on Farms with Irrigation: 2018

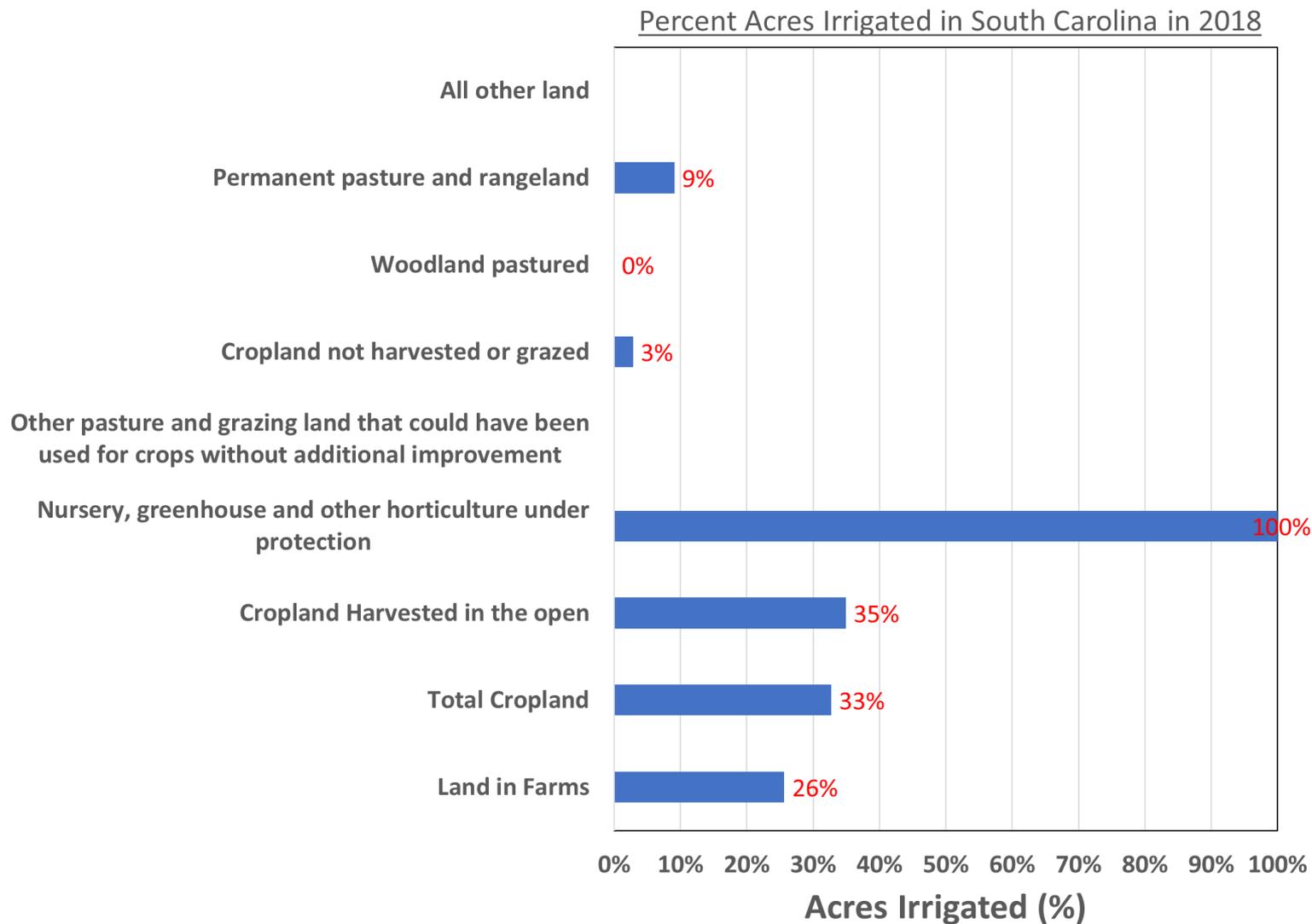


Table 1. Irrigated Farms in the Censuses of Agriculture: 2017 and Earlier Censuses

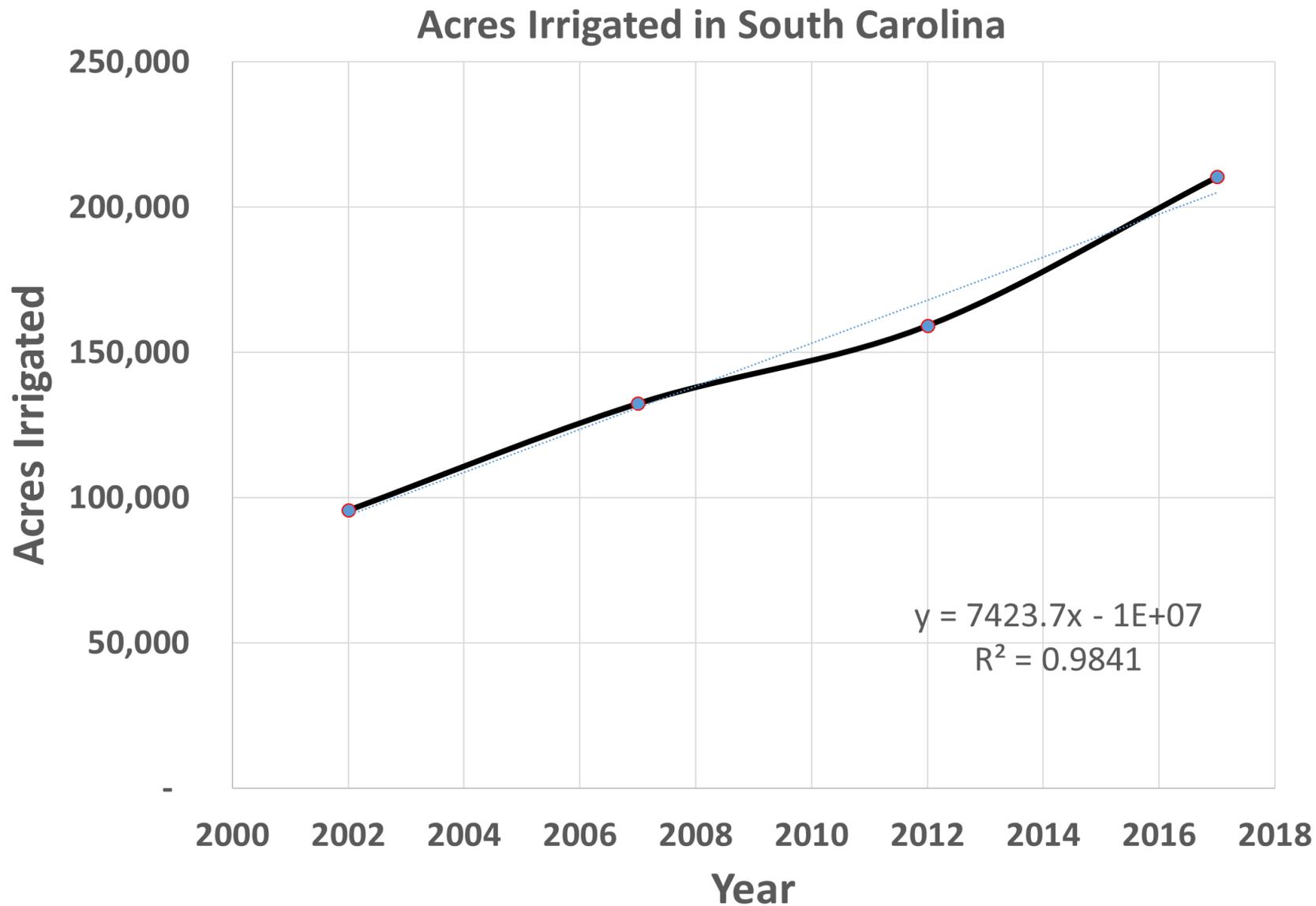


Table 13. Energy Expense for All Well Pumps and Other Irrigation Pumps by Type of Energy Used: 2018

Total Energy Expense For Pumping						
Farms	Pumps Powered	Acres in the open by water source		Square feet under protection by water source		Expenses
		Water from wells	Surface water	Water from wells	Surface water	
1,347	3,909	220,332	42,235	4,459,916	1,253,000	\$10,540,000

Average Energy Expenses:

= \$2,696/pump
= \$7,825/farm
= \$40/acre

Table 16. Expenditures for Irrigation Equipment, Facilities, Computer Technology, and Land Improvement: 2018

Purchase of new or replacement equipment or machinery during survey year								
Farms	Acres irrigated affected by expenditure	Expenditures (dollars)	Average per farm (dollars)	Farms with expenditures of -				
				\$1 to \$999	\$1000 to \$9,999	\$10,000 to \$29,999	\$30,000 to \$74,999	\$75,000 or more
427	12,848 ac	\$5,166,000	\$12,098	113	235	40	21	18

CLEMSON COOPERATIVE EXTENSION

Last revised: 03/07/2019

CORN FOR GRAIN - IRRIGATED - CONSERVATION TILLAGE

ESTIMATED COSTS AND RETURNS PER ACRE
200 BUSHEL YIELD, 80 ACRE CENTER PIVOT - 6" OF WATER

	UNIT	QUANTITY	PRICE OR COST/UNIT	TOTAL PER ACRE	YOUR FARM
1. GROSS RECEIPTS					
CORN	BU.	200.00	\$4.25	\$850.00	
TOTAL RECEIPTS:				\$850.00	\$0.00
2. VARIABLE COSTS					
SEED	THOU.	32.00	\$3.48	\$111.36	
FERTILIZER					
NITROGEN	LBS	210.00	\$0.52	\$109.20	
PHOSPHATE	LBS	80.00	\$0.60	\$48.00	
POTASH	LBS	60.00	\$0.33	\$19.80	
LIME (PRORATED)	TON	0.50	\$52.00	\$26.00	
HERBICIDES	ACRE	1.00	\$31.02	\$31.02	
FUNGICIDES	ACRE	1.00	\$36.84	\$36.84	
INSECTICIDES	ACRE	1.00	\$20.65	\$20.65	
IRRIG., MACH & LABOR	ACRE	6.00	\$8.00	\$48.00	
DRYING (3 POINTS)	BU.	211.66	\$0.25	\$52.92	
HAULING	BU.	200.00	\$0.35	\$70.00	
CROP INSURANCE	ACRE	1.00	\$15.00	\$15.00	
TRACTOR/MACHINERY	ACRE	1.00	\$55.40	\$55.40	
LABOR	HRS	2.77	\$11.25	\$31.16	
CROP SCOUTING	ACRE	1.00	\$3.25	\$3.25	
INTEREST ON OP. CAP.	DOL.	\$337.68	7.0%	\$23.64	
TOTAL VARIABLE COSTS:				\$702.24	\$0.00
3. INCOME ABOVE VARIABLE COSTS:				\$147.76	\$0.00
4. FIXED COSTS					
TRACTOR/MACHINERY	ACRE	1.00	\$74.79	\$74.79	
IRRIGATION	ACRE	1.00	\$125.00	\$125.00	
TOTAL FIXED COSTS:				\$199.79	\$0.00
5. OTHER COSTS					
LAND RENT	ACRE	1.00	\$60.00	\$60.00	
GENERAL OVERHEAD	DOL.	\$702.24	5.0%	\$35.11	
TOTAL OTHER COSTS:				\$95.11	\$0.00
6. TOTAL COSTS:				\$997.14	\$0.00
7. NET RETURNS TO RISK AND MANAGEMENT:				-\$147.14	\$0.00
BREAK-EVEN YIELD					
		BREAK-EVEN PRICE			
VARIABLE COSTS	159	BU.	VARIABLE COSTS		\$3.51
TOTAL COSTS	241	BU.	TOTAL COSTS		\$4.99

Irrigation cost:

Variable cost = \$ 48/ac

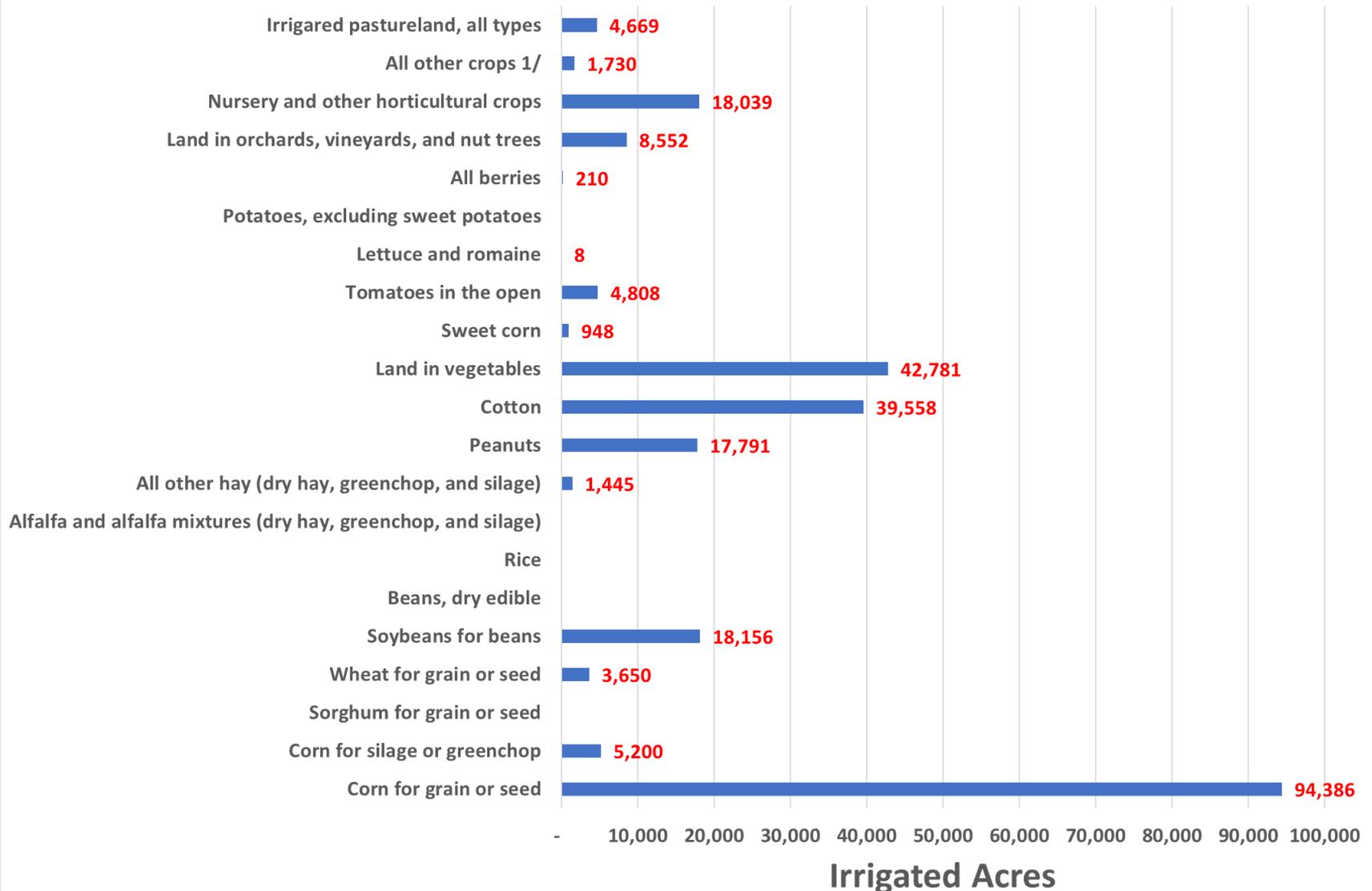
Fixed cost = \$125/ac

Total = \$173/ac

% of Total = 17.3%

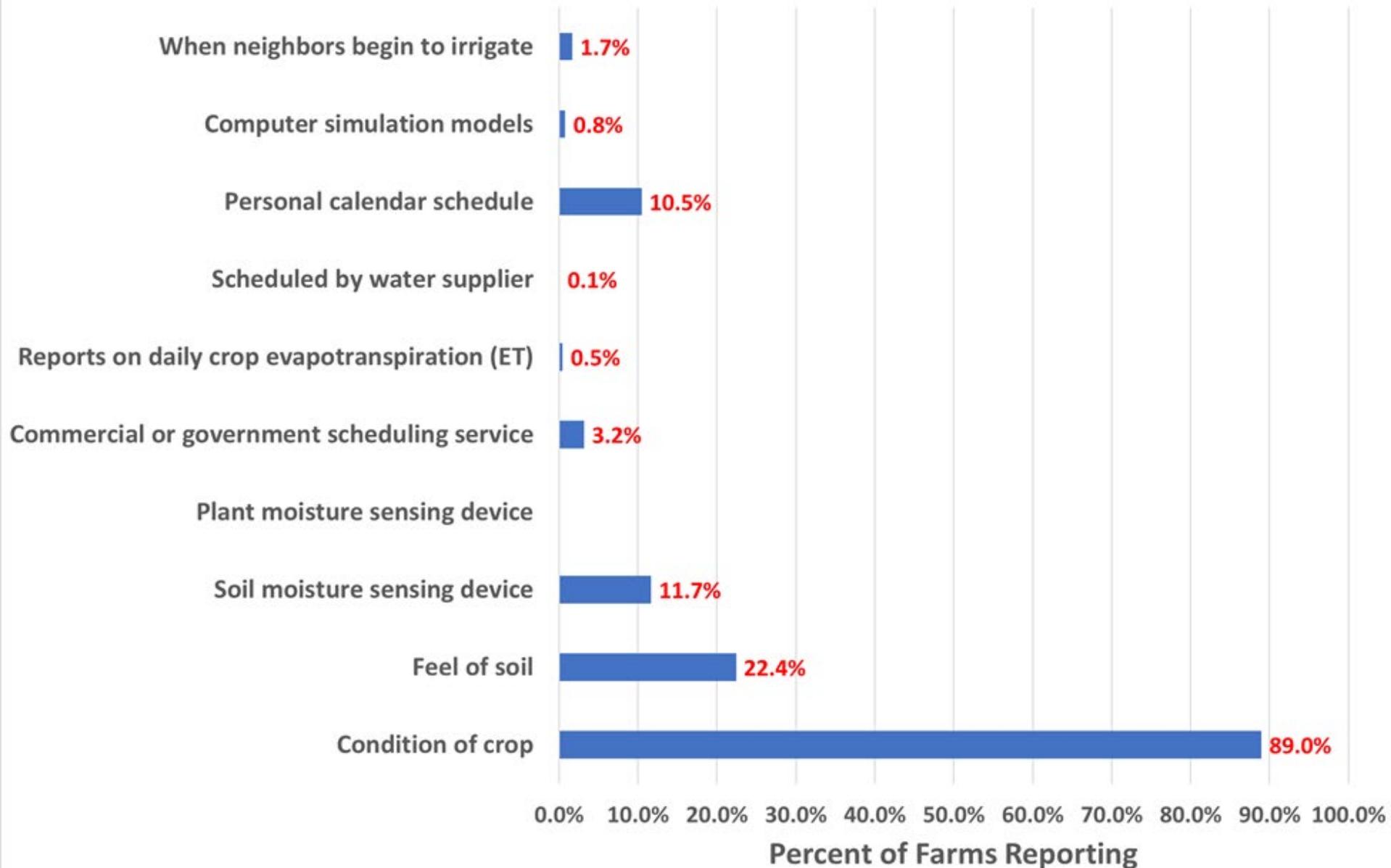
Table 35. Crops Harvested in the Open from Irrigated Farms and Irrigated Pastureland: 2018

Irrigated Acres by Crop Type in South Carolina in 2018

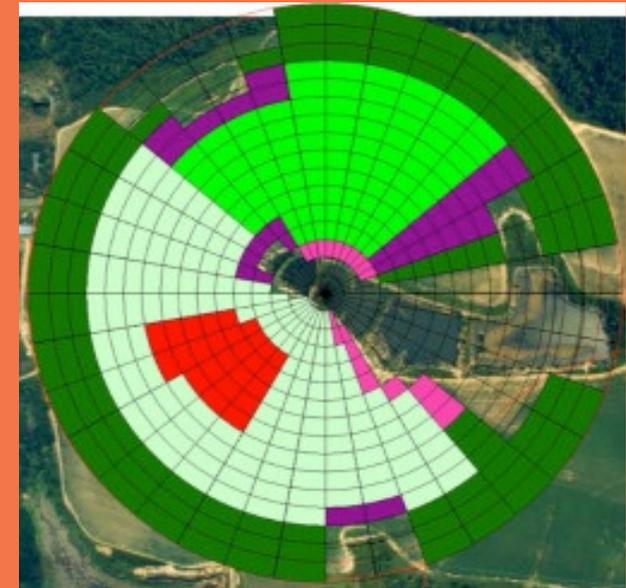
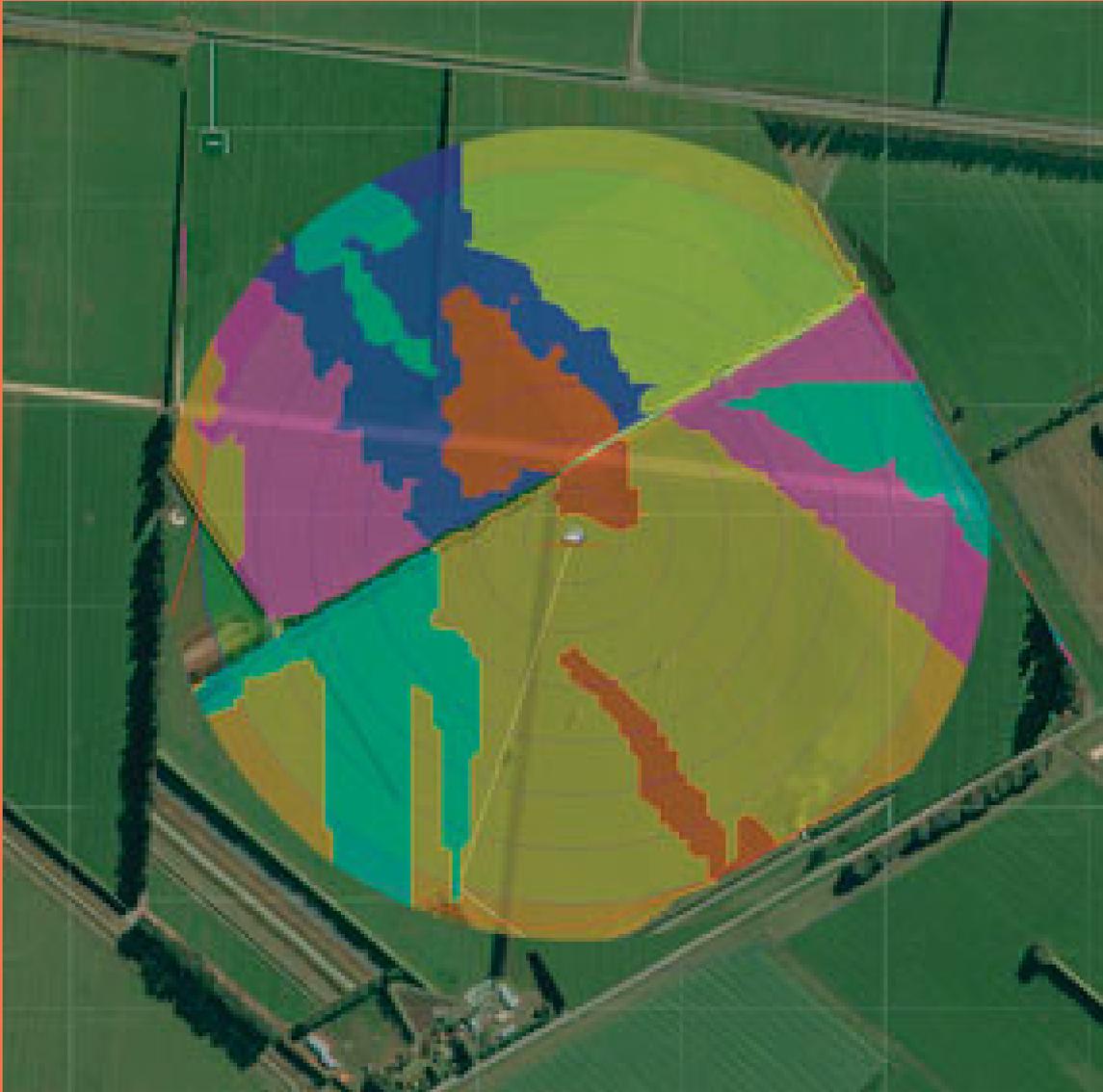


Methods Used in Deciding When to Irrigate in SC - 2018

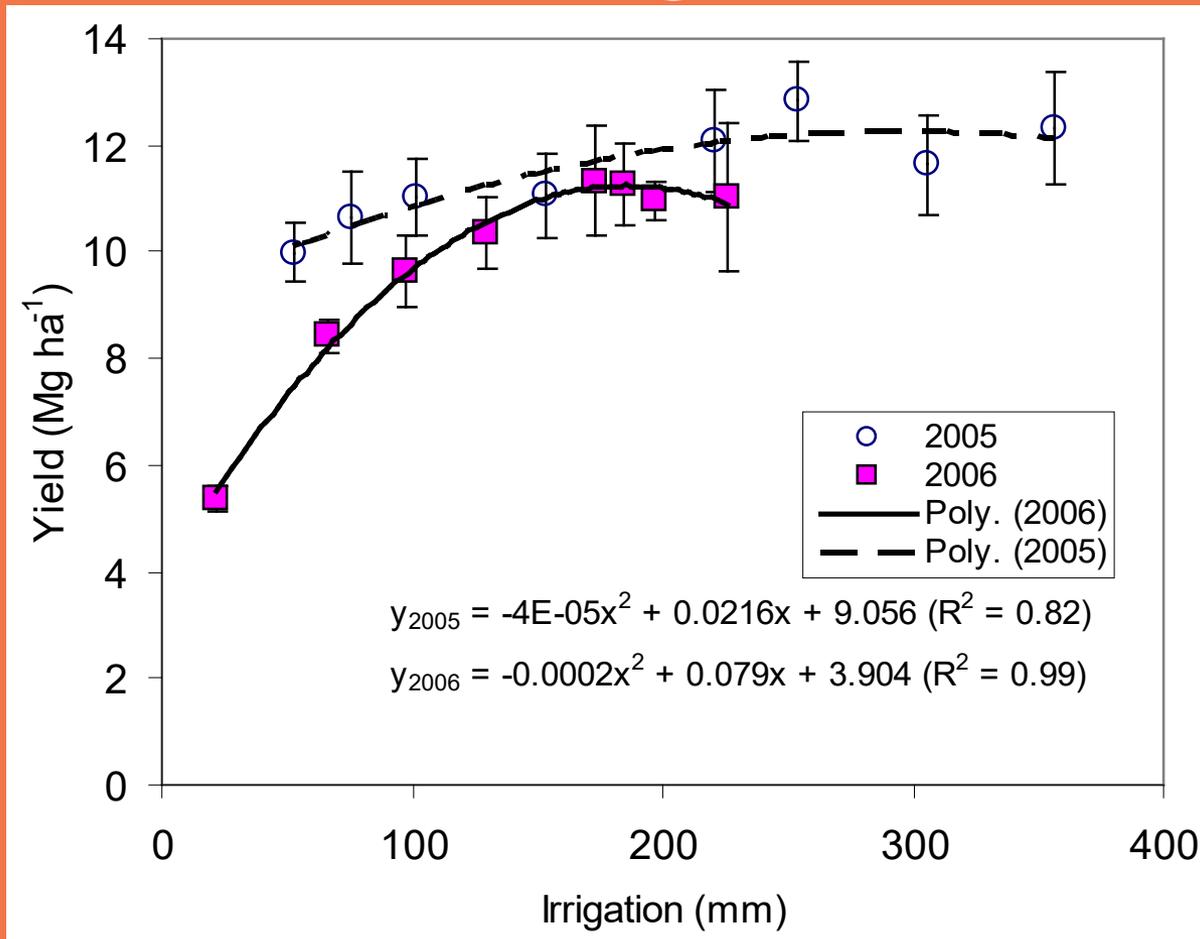
(Total farms reporting = 1,489)



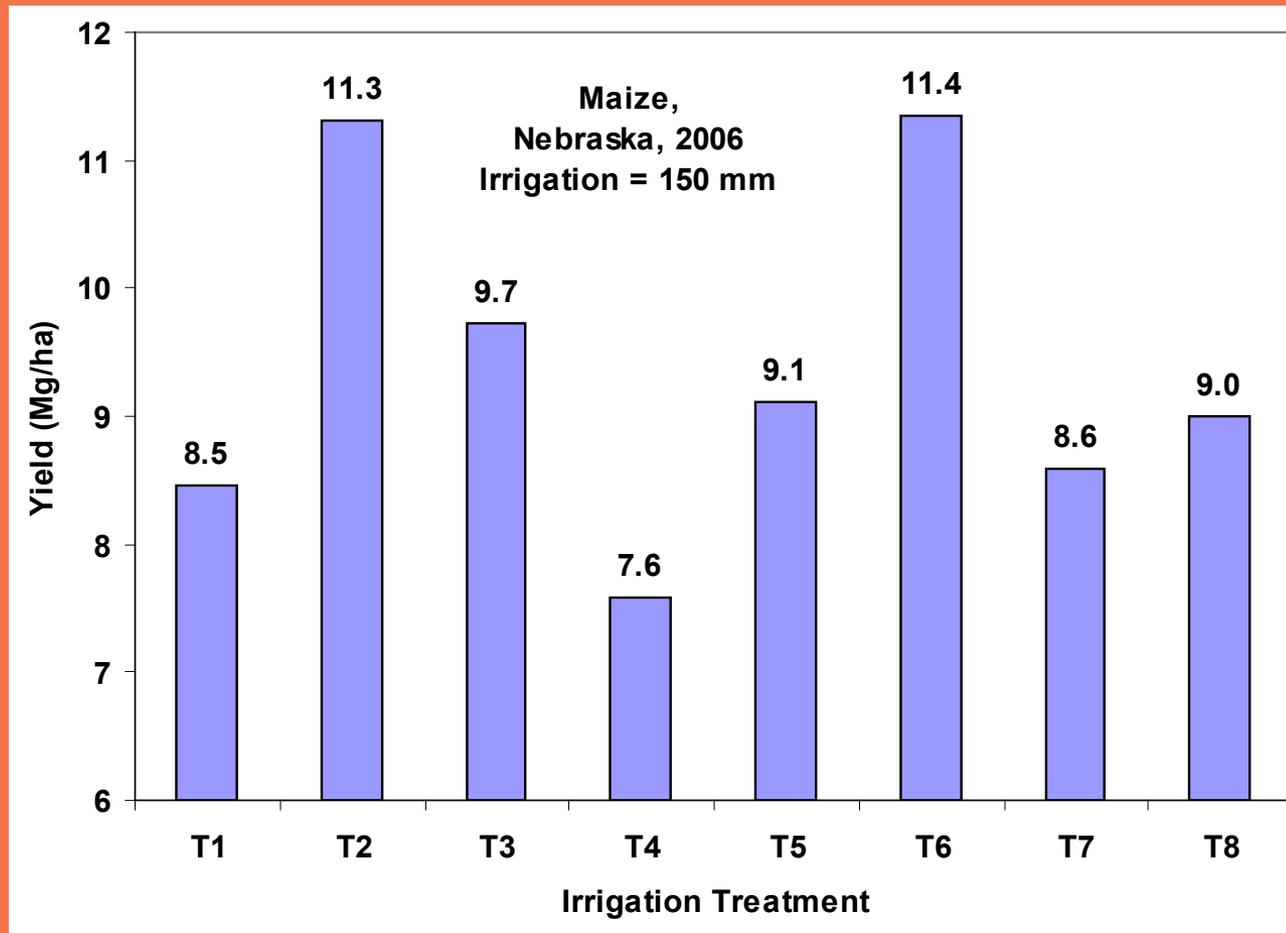
Variable Rate Irrigation



Response to Irrigation Amount



Effect of irrigation timing on yield



Irrigation Scheduling Methods



----- Sense the environment
(Soil water balance)



----- Sense the plant

----- Sense the soil



On-Farm Weather Station



WU WU Weather-ITM (Local Forecast) | [Maps & Radar](#) | [Severe Weather](#) | [News & Blogs](#) | [Photos & Video](#) | [Activities](#) | [More](#)

Edisto REC KSCBLACK8 (About this PWS)

Forecast for Blackville, SC > 33.965 -81.329 > 32ft

PWS Data | **PWS Widgets** | **WeatherStation**

PWS revised 657 times since March 1, 2015

Radar | **Webcam** | [Compare](#)

[View WunderMap](#)

Current Conditions

station reported 6 seconds ago

76.5 °F

Feels Like 76.5 °F

6.7 mph
Wind from SE
Gusts 9.8 mph

Dew Point: 63 °F | UV: 4.0
Humidity: 64% | Solar: 571 w/m²
Precip Rate: 0 in/hr | Soil Moisture: --
Precip Accum: in | Soil Temp: --
Pressure: 30.23 in | Leaf Wetness: --

7:41 AM | 7:22 PM

☁️ Waning Gibbous | 71% Illuminated

Weather History for Blackville, SC [KSCBLACK8]

[Previous](#) | [Daily Mode](#) | [March](#) | [11](#) | [2015](#) | [View](#)

Summary
Mar 11, 2015

	High	Low	Average		High	Low	Average
Temperature	76.3 °F	61.2 °F	66.8 °F	Wind Speed	6.2 mph	--	2.6 mph
Dew Point	65.1 °F	60.6 °F	62.7 °F	Wind Gust	9.8 mph	--	--
Humidity	98%	64%	92%	Wind Direction	--	--	South
Precipitation	0 in	--	--	Pressure	30.26 in	30.19 in	--

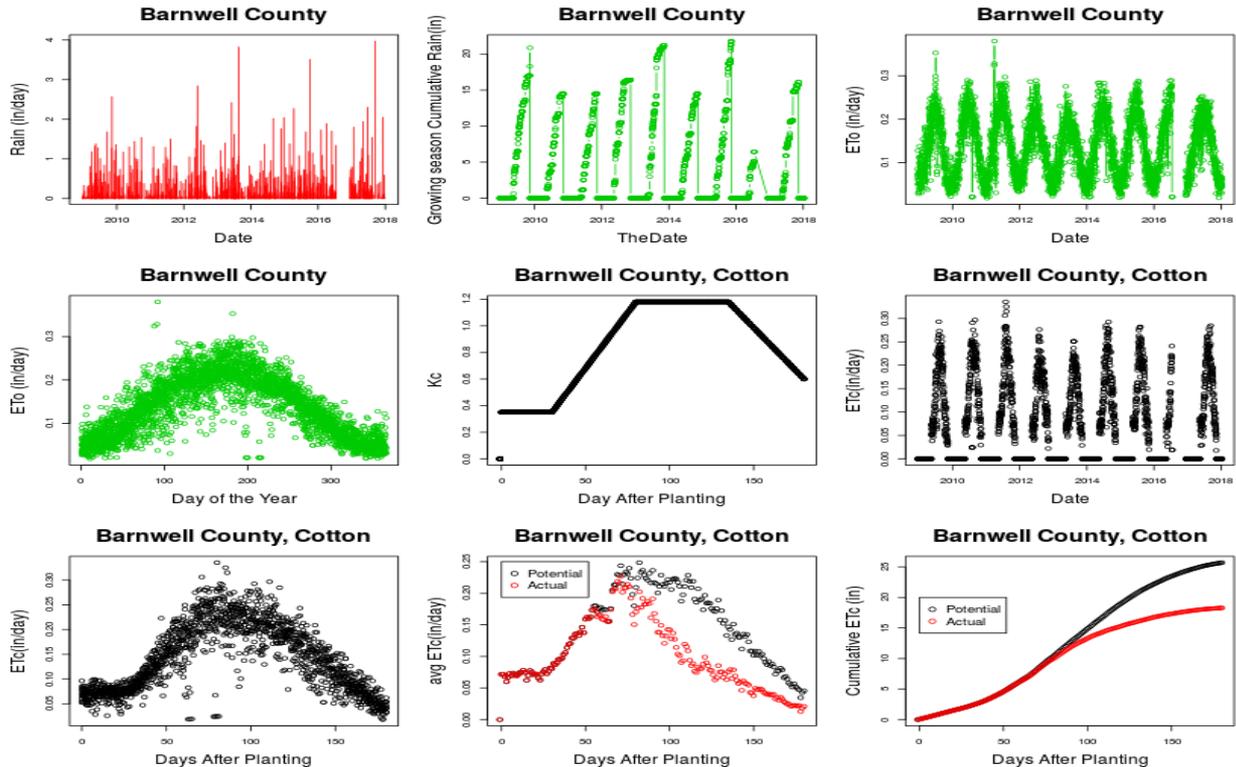
<https://etcman.shinyapps.io/CropWaterUse/>



South Carolina Crop Water Requirement Calculator

Developed by Dr. Jose O. Payero (Clemson University, jpayero@clermson.edu), 2017.
This application allows users to determine crop water requirements for different crops in South Carolina.
The system uses weather data to estimate crop water use.

Crop ET, Rainfal, Irrigation Required



CLEMSON UNIVERSITY

Change Inputs:

Select County: Barnwell

Select Crop: Cotton

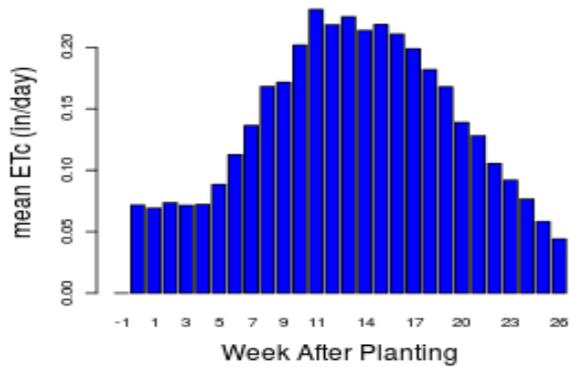
Select Soil: Sandy Loam

Select Planting Month: May

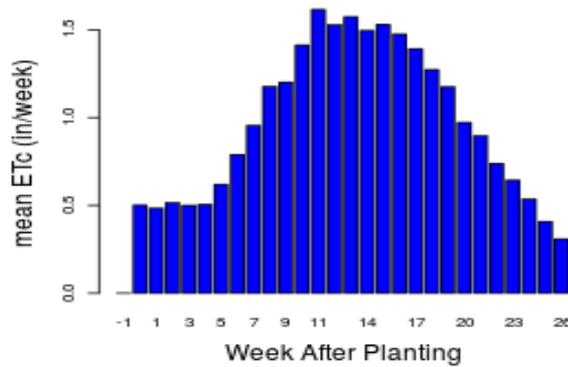
Select Planting Day: 15

Select Irrigation Efficiency (%): 90

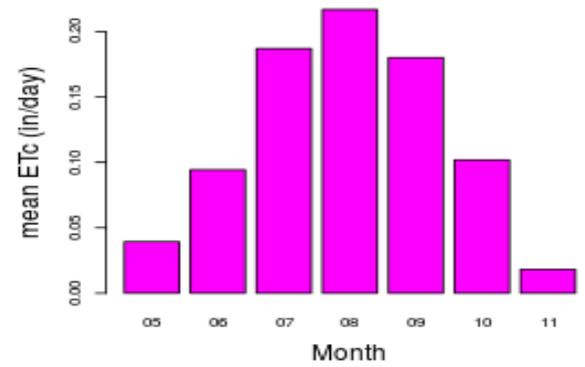
Mean ETc/day



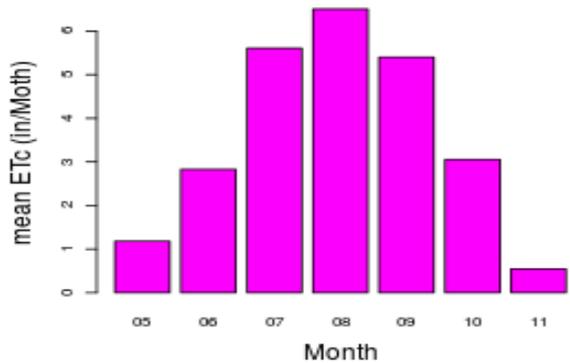
Mean ETc/Week



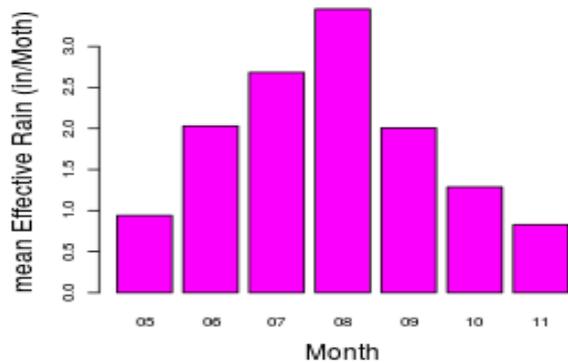
Mean daily ETc



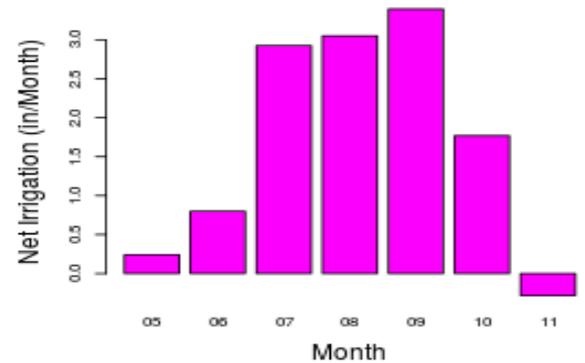
Mean Monthly ETc



Monthly Effective Rain



Monthly Net Irrigation



Irrigation Scheduling

<https://etcman.shinyapps.io/IrrigSchedCRONOS/>



South Carolina Irrigation Scheduling Tool

Developed by Dr. Jose O. Payero (Clemson University, jpayero@clemson.edu), 2017.

This application allows users to perform irrigation scheduling for different crops in South Carolina.

The system uses weather data from the CRONOS database to estimate irrigation requirements.

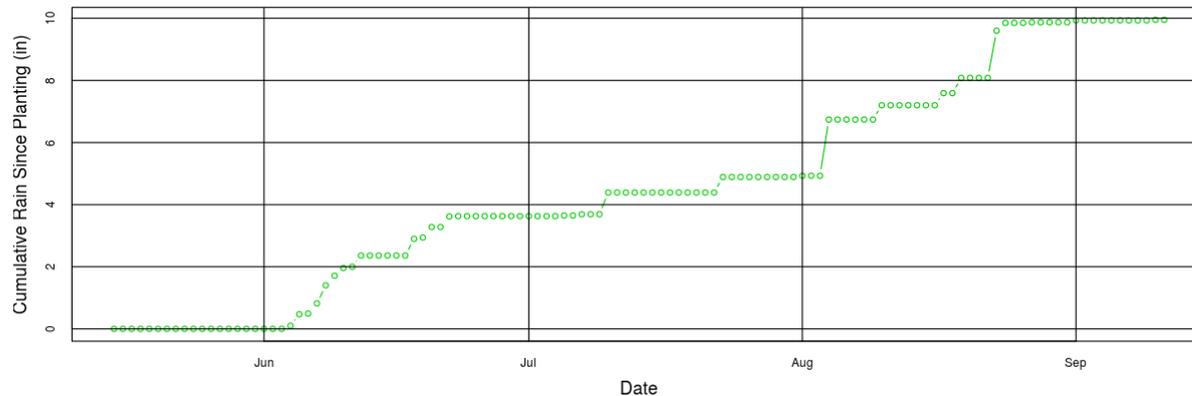
Please allow some time for weather data to load.

Please, press 'Bookmark' if you want to save your inputs for later use.

Bookmark...

Crop ET, Rainfal, Irrigation Required

Cumulative Rain Since Planting, Barnwell County, Cotton 2019



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R Studio

Change Inputs:

Select County in SC

Barnwell

Select Crop

Peanuts

Cotton

Corn

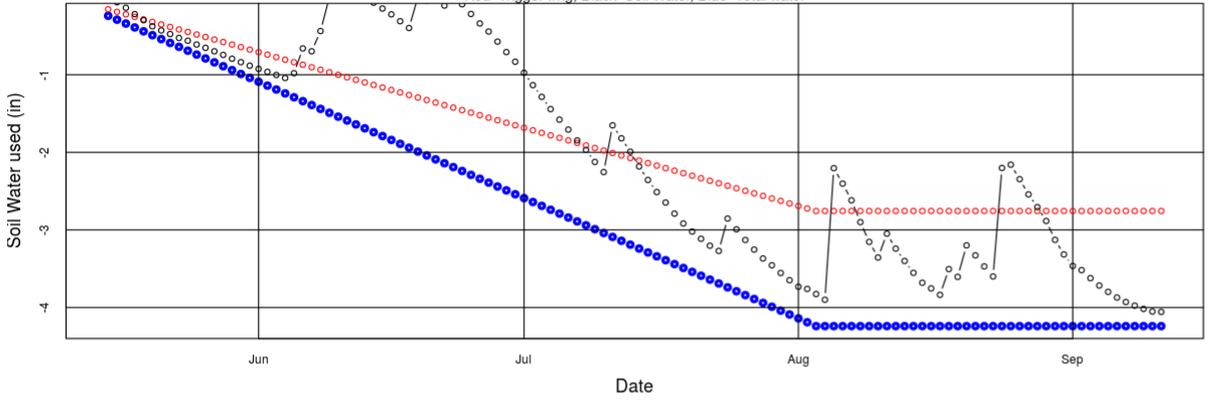
Soybean

Peanuts

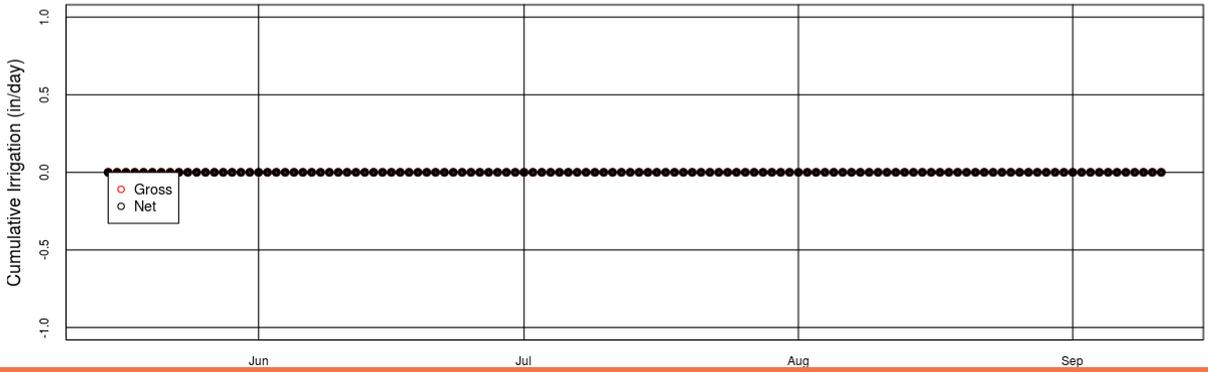
Sorghum

Soil Water Balance, Cotton 2019, Barnwell County

Red=Trigger Irrig, Black=Soil Water, Blue=Total water

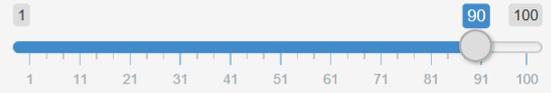


Cumulative Irrigation, Barnwell County, Cotton 2019



2019-05-15

Select Irrigation Efficiency (%)



Date for Irrigation 1

2019-05-15

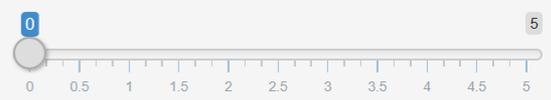
Amount for Irrigation 1 (in)



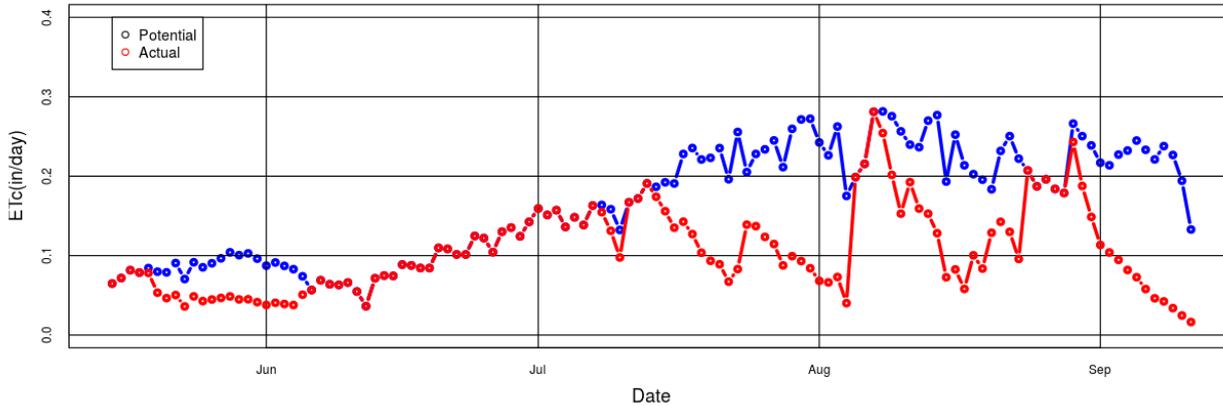
Date for Irrigation 2

2019-05-15

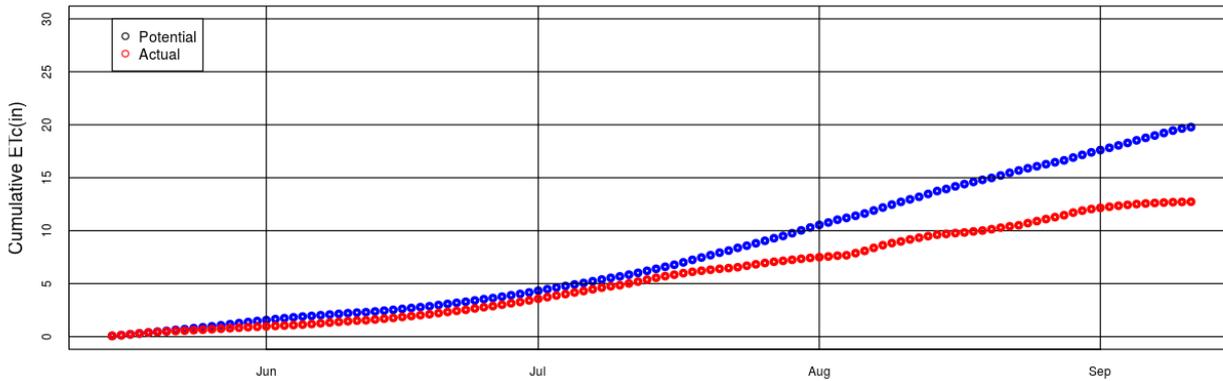
Amount for Irrigation 2 (in)



Crop Evapotranspiration, Barnwell County, Cotton 2019



Cumulative Crop Evapotranspiration, Barnwell County, Cotton 2019



2019-05-15

Amount for Irrigation 3 (in)



Date for Irrigation 4

2019-05-15

Amount for Irrigation 4 (in)



Date for Irrigation 5

2019-05-15

Amount for Irrigation 5 (in)



Soil moisture monitoring

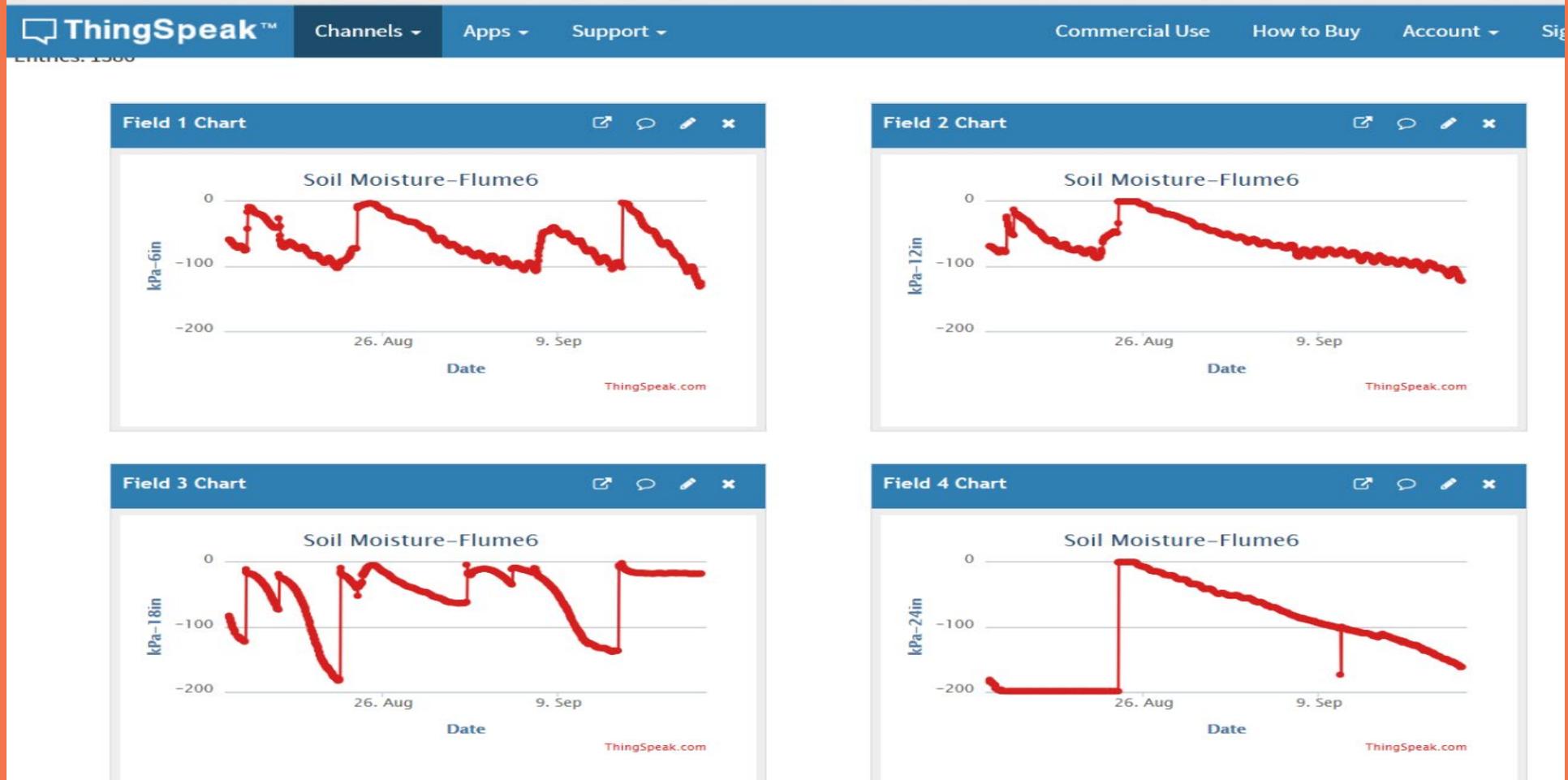
Watermark Sensor



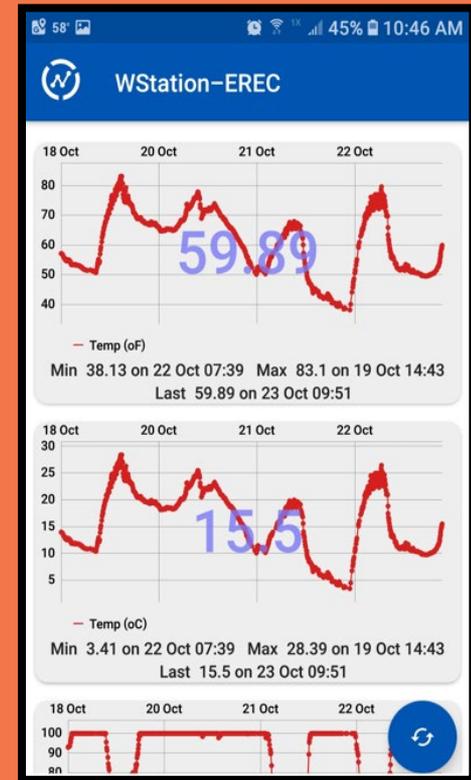
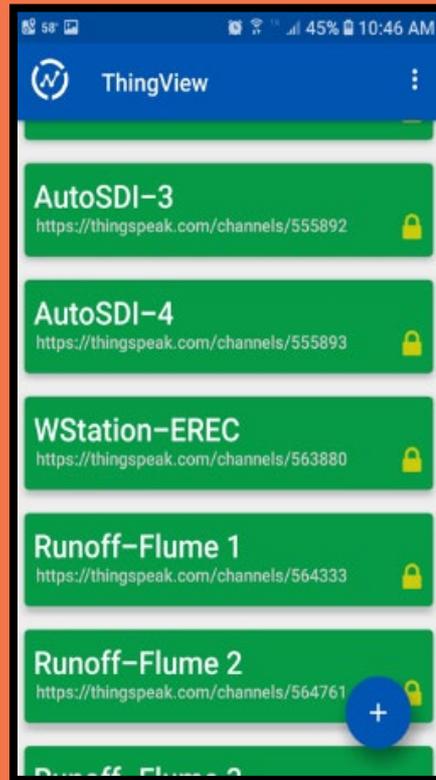
Radio (LoRa)



Send data to the Internet



Mobile App (*ThingView*)



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