

Optimizing Irrigation Scheduling With Limited Water Using the iCrop Decision Support Tool

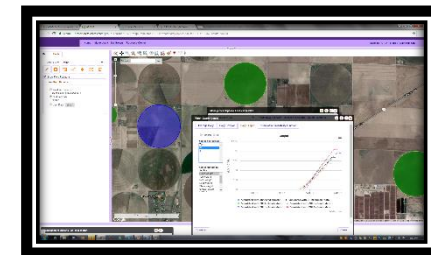
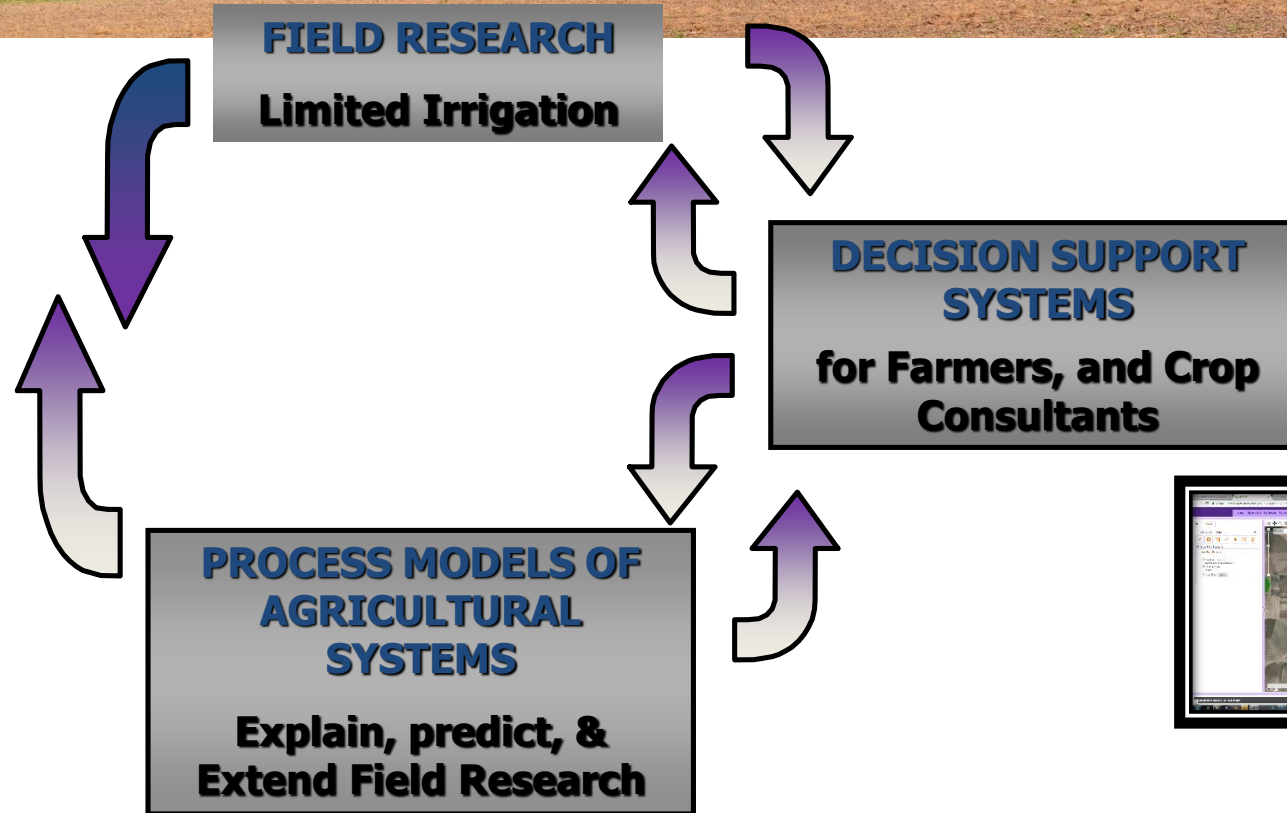
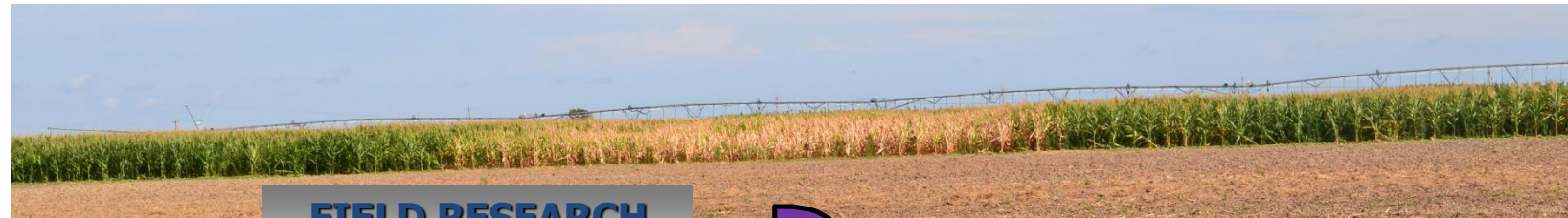
Isaya Kisekka

Assistant Professor

Departments of LAWR and BAE

iCrop: Integrated Crop Water and Nitrogen Management

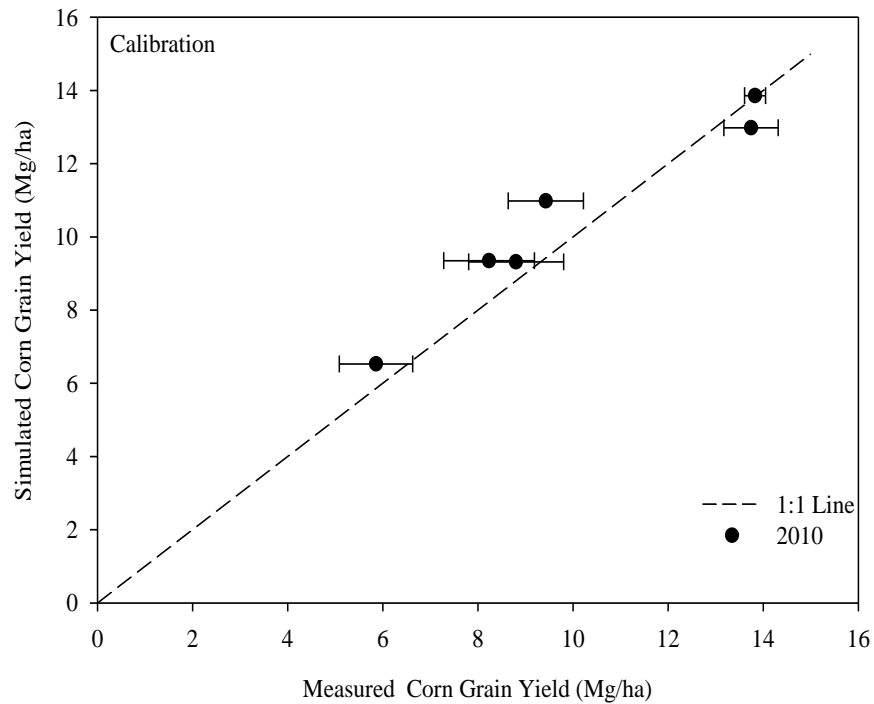
From Experiments to Models to Decision Support



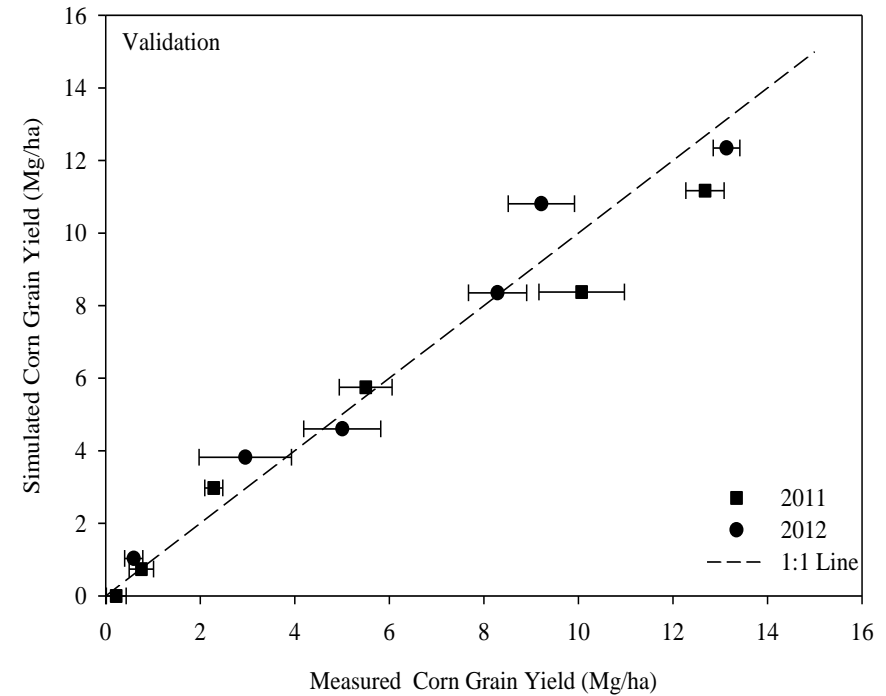
iCrop

DSSAT-CSM CERES-Maize

Calibration



Validation

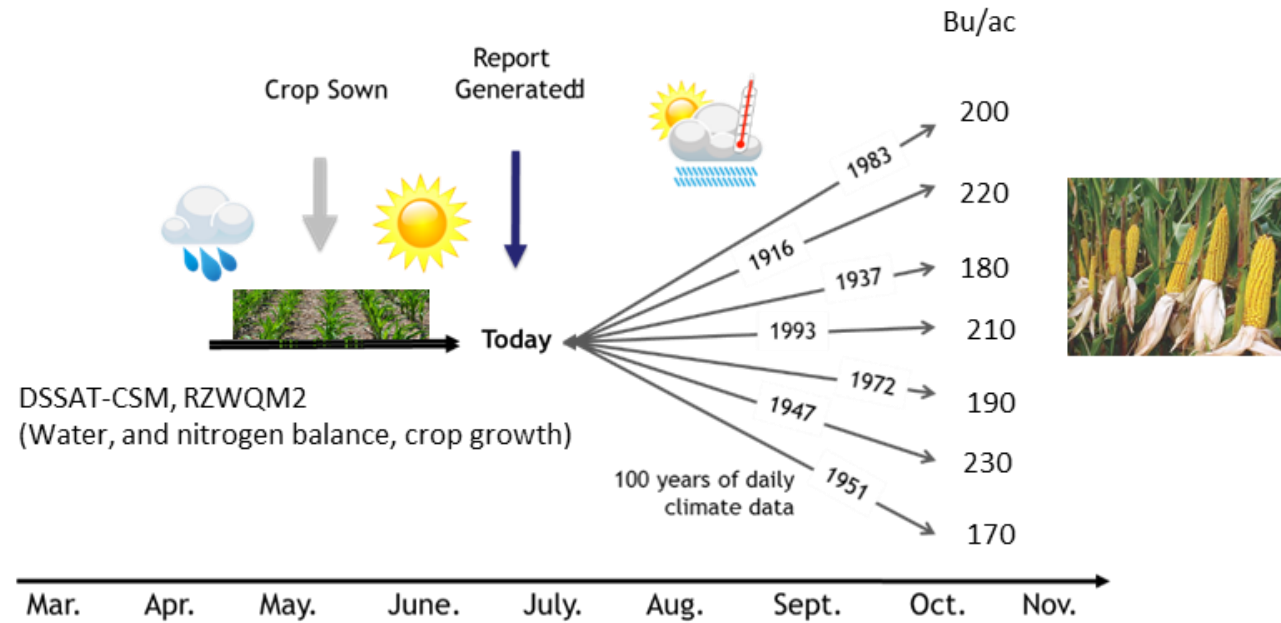


Kisekka et al. 2016

iCrop

- Integrated **C**rop water management model-driven decision support tool.
- Useful for optimizing **strategic** (preseason) and **tactical** (in season) management decisions.
- Examples of potential applications:
 1. Land-water allocation
 2. Hybrid selection and seeding rate
 3. When to initiate irrigation
 4. When to terminate irrigation
 5. Effect of splitting nitrogen applications
 6. etc.

iCrop Conceptual framework



Modified from Yield Prophet: <http://www.yieldprophet.com.au/YP/HowItWorks.aspx>

Map

Fields

Select Field: TestK1



Show Field Polygons

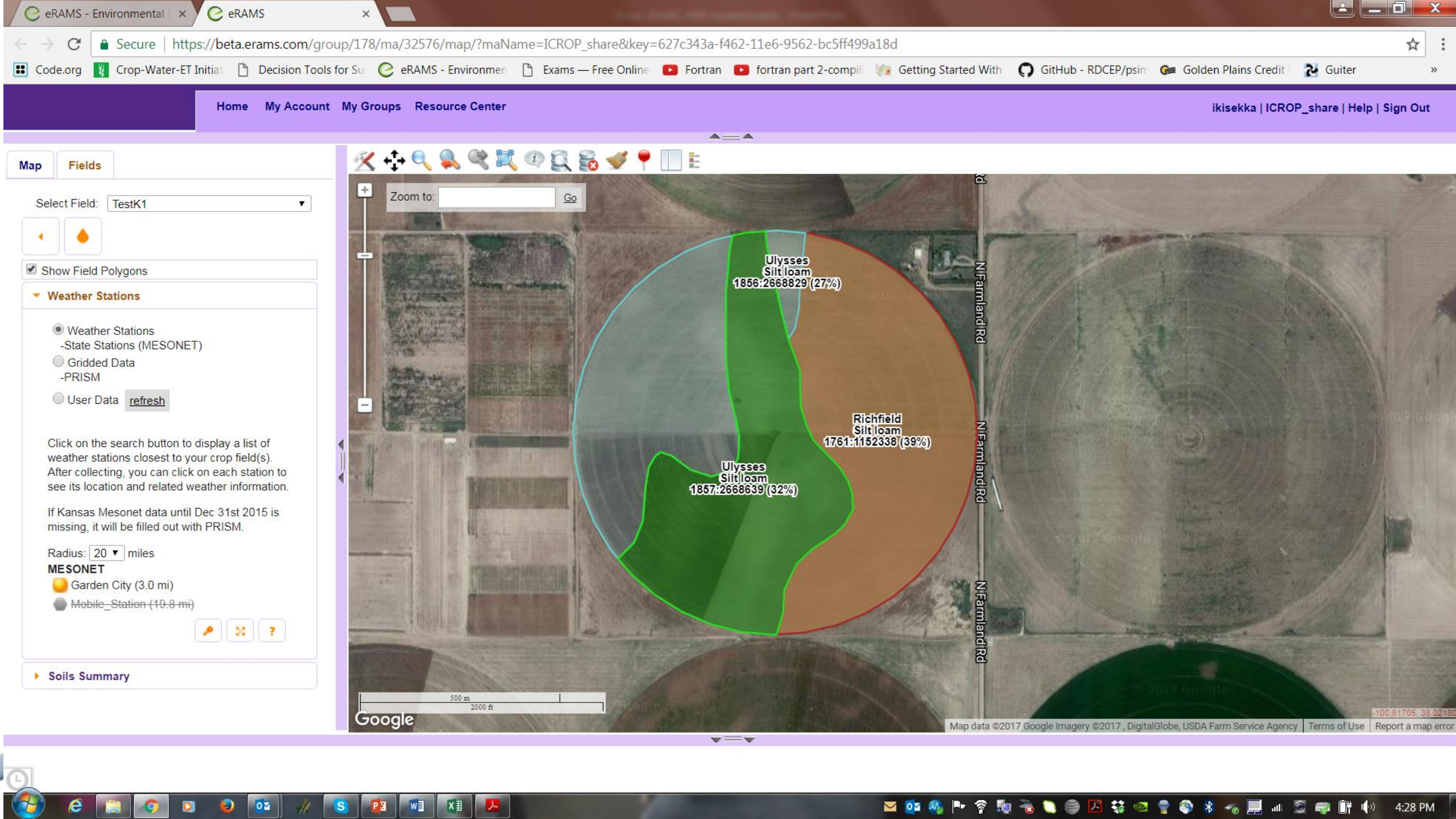
Weather Stations

- ☐ Weather Stations
 - State Stations (MESONET or CIMIS)
- ☒ Gridded Data
 - PRISM
- ☐ User Data [refresh](#)








Zoom to: Go





Map Fields

Select Field: TestK1

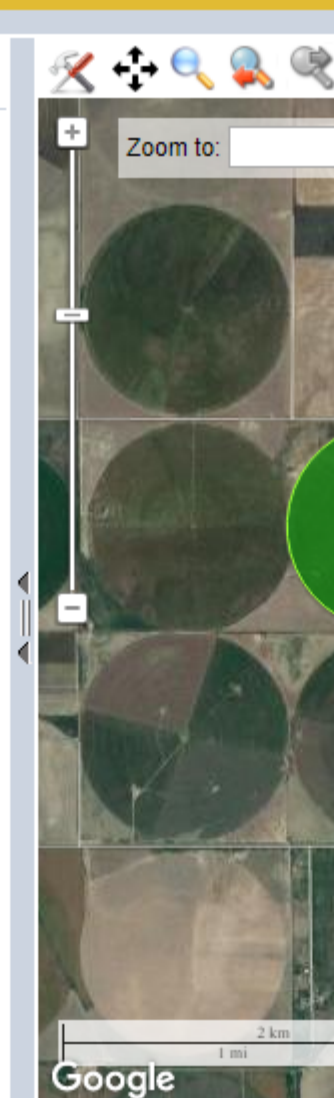
☒ Show Field Polygons

Weather Stations

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☒ Gridded Data
-PRISM

☐ User Data [refresh](#)



Management Options For Field TestK1

Select Scenario: Irrigation_Termination2 [Create New Scenario](#) [Duplicate Scenario](#) [Delete Scenario](#)

Select Cropping System for Field [Save](#) [Import](#) <Choose>

Year #	Date	Operation	Par 1	Par 2	Par 3	
1	02/01/2017	Nutrient	Ammonium nitrate	200	1	+ X
1	04/20/2017	Tillage	Tandem disk			+ X
1	05/10/2017	Planting	Maize	25000	2750-2800 GDD	+ X
1	06/11/2017	Irrigation	Sprinkler	1	<Choose>	+ X
1	06/19/2017	Irrigation	Sprinkler	1	Customized Cultivar	+ X
1	06/29/2017	Irrigation	Sprinkler	1	2500-2600 GDD	+ X
					2600-2650 GDD	+ X
					2650-2700 GDD	+ X
					2700-2750 GDD	+ X
					2750-2800 GDD	
					PIO 3489	

[Advanced Options](#) [Save](#) [Done](#)

https://erams.com/icrop/

eRAMS - Environmental

eRAMS

(anonymous)

Secure | https://beta.erams.com/group/178/ma/32576/map/?maName=ICROP_share&key=627c343a-f462-11e6-9562-bc5ff499a18d

Crop

map

TEST

Select Field: TestK1

Show Field Polygons

Weather Stations

Weather Stations

-State Stations (MESONET)

Gridded Data

-PRISM

User Data

refresh

Click on the search button to find weather stations closest to your location. After collecting, you can click on the station to see its location and information.

If any data is missing, you can use PRISM or monthly data.

Radius: 30 miles

MESONET

Garden City (2.0 mi)

Haskell (27.6 mi)

Lakin (24.4 mi)

Mobile_Station (11.1 mi)

Advanced Options

HomeMy AccountMy GroupsResource Center

Soil Analysis

Initial Conditions

Irrigation Management

Soil Management

Initial conditions measurement date02/02/20

Previous crop code

Faba beanGreen beanPearl milletMaize

Additional Parameters

Bottom depth (ft)	Water, cm ³ cm ⁻³ × 100 volume percent	Ammonium, KCl, g elemental N Mg ⁻¹ soil	Nitrate, KCl, g elemental N Mg ⁻¹ soil	Add/ remove row
5	30	0.1	0.1	+ -
15	30	0.1	0.1	+ -
30	30	0.1	0.1	+ -
60	28	0.1	0.1	+ -
100	28	0.1	0.1	+ -
200	28	0.1	0.1	+ -

Save

Close

Advanced Options

Submit

Done

https://erams.com/icrop/

eRAMS - Environmental

eRAMS

Secure

https://beta.erams.com/group/178/ma/32576/map/?maName=ICROP_share&key=627c343a-f462-11e6-9562-bc5ff499a18d

Map

Fields

Select Field: TestK1

Show Field Polygons

Weather Stations

Weather Stations

-State Stations (MESONET or CIMIS)

Gridded Data

-PRISM

User Data

refresh

Management Options For Field TestK1

Select Scenario: test for jae

Create New Scenario

Duplicate Scenario

Delete Scenario

Select Cropping System for Field

Save

Import

<Choose>

Year #	Date	Operation	Par 1	Par 2	Par 3	
1	02/03/2017	Nutrient	Urea	200	1	+×
1	04/20/2017	Tillage	Tandem disk			+×
1	05/02/2017	Planting	Maize		2750-2800 GDD	+×
1	07/13/2017	Irrigation	Sprinkler			+×
1	07/21/2017	Irrigation	Sprinkler			+×
1	07/31/2017	Irrigation	Sprinkler	1		+×

Running DSSAT

Advanced Options

Submit

Done

ikisekka | ICROP_share | Help



▼ Weather Stations

● User Data [refresh](#)

If any data is missing, it will be filled out using PRISM or monthly average of data.

MESONET

Mobile Station (18.7 mi)

Management Event

Select scenarios:

Irrigation_Termination2

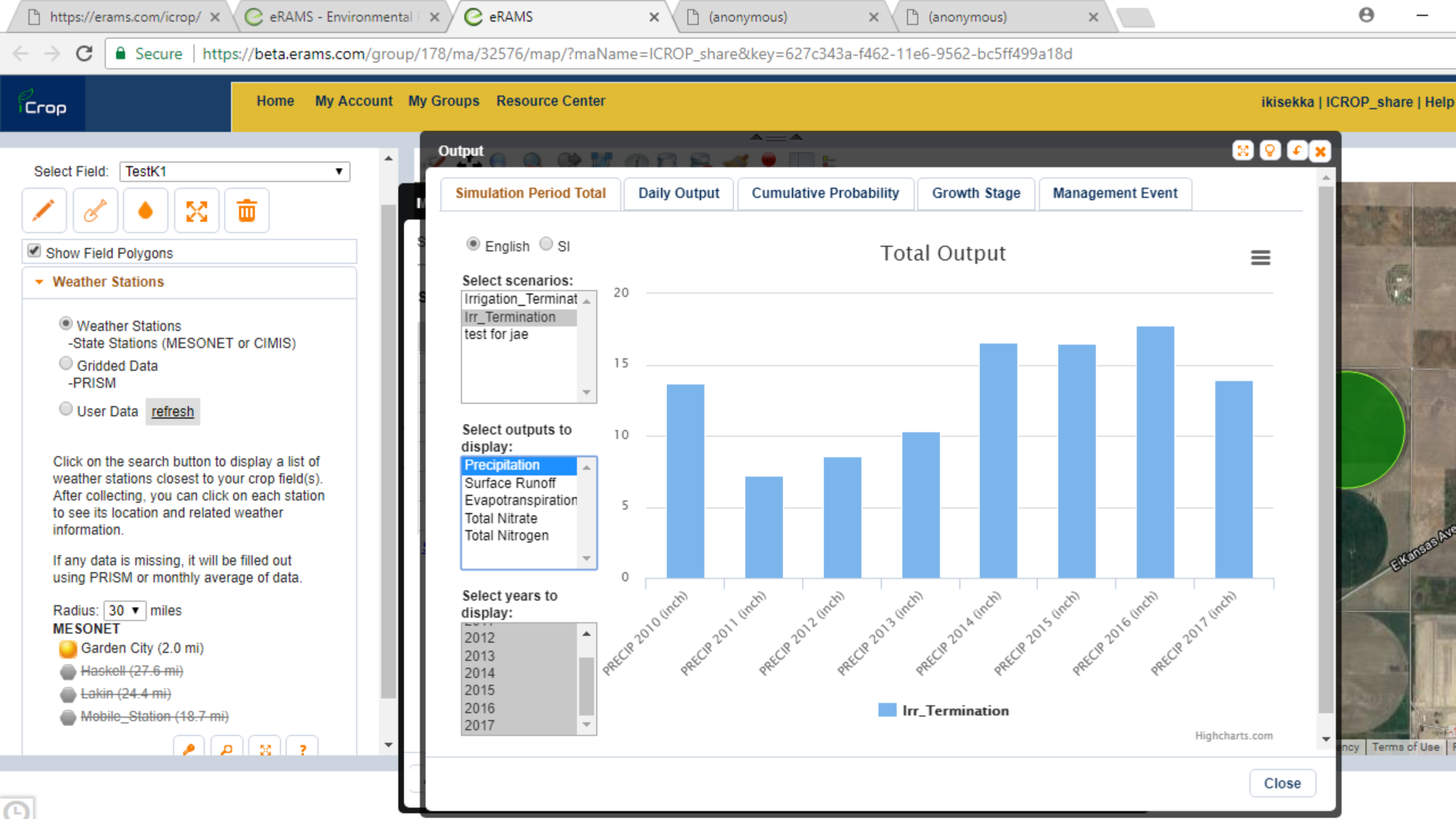
Select outputs to display:

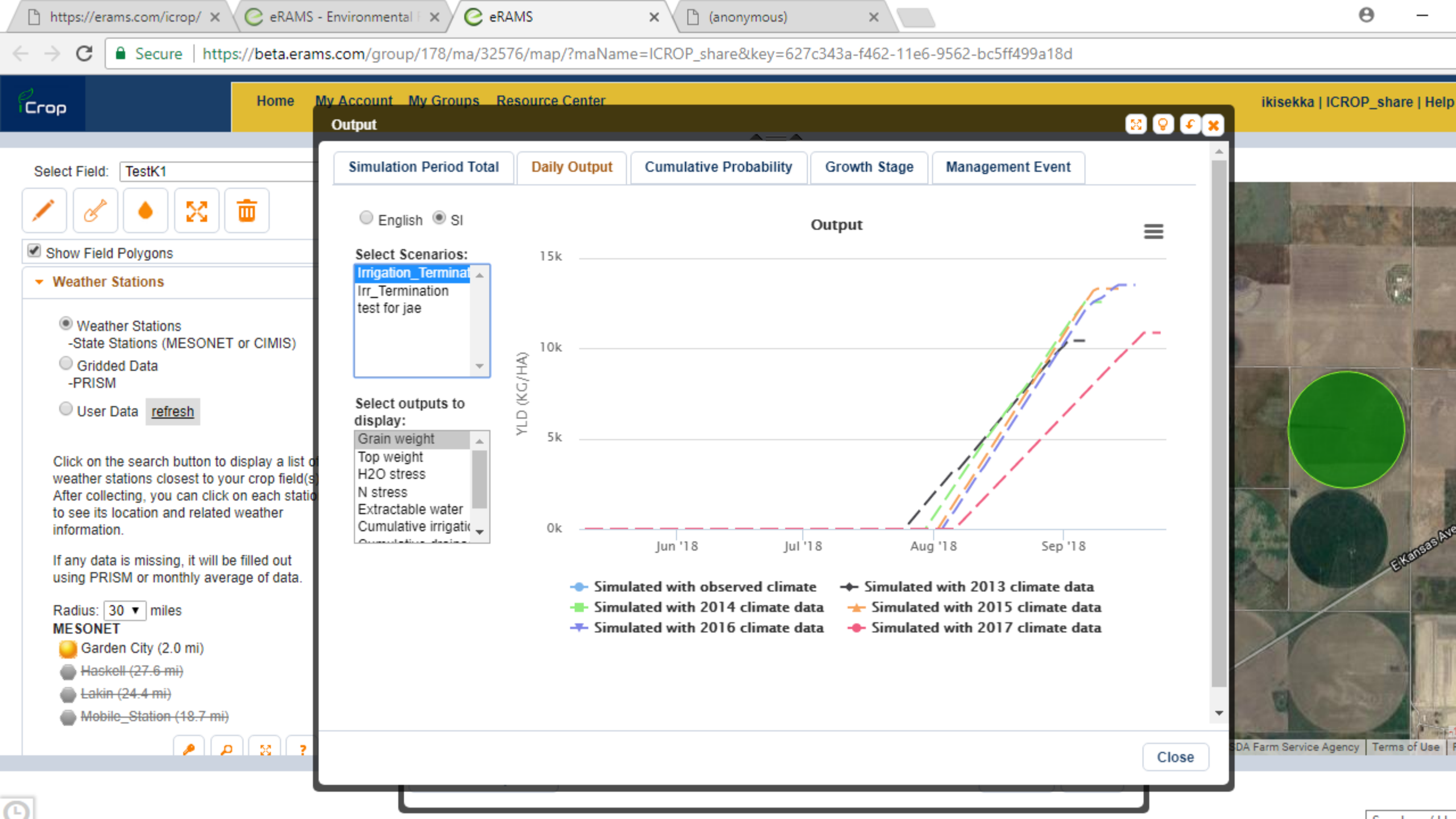
Precipitation
Surface Runoff
Evapotranspiration
Total Nitrate
Total Nitrogen

Select years to display:

2010
2011
2012
2013
2014
2015
2016

Done





Select Field: TestK1



Show Field Polygons

Weather Stations

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-PRISM
- ☐ User Data [refresh](#)

Click on the search button to display a list of weather stations closest to your crop field(s). After collecting, you can click on each station to see its location and related weather information.

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Radius: 30 miles

MESONET

- Garden City (2.0 mi)
- Haskell (27.6 mi)
- Lakin (24.4 mi)
- Mobile_Station (18.7 mi)

Output

Simulation Period Total

Daily Output

Cumulative Probability

Growth Stage

Management Event

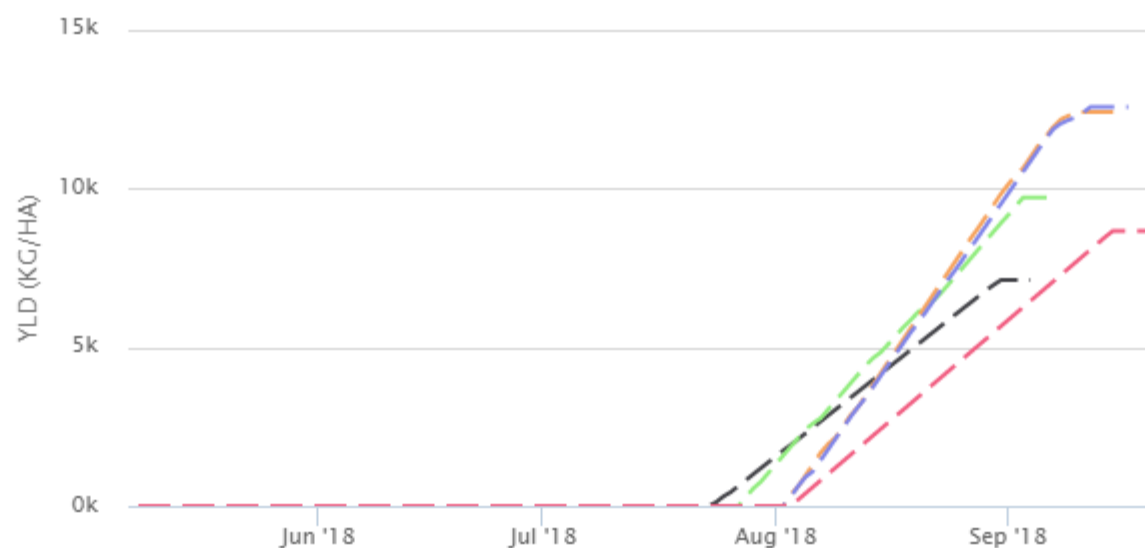
☐ English ☒ SI

Select Scenarios:

Irrigation_Terminat
Irr_Termination
test for jae

Select outputs to display:

Grain weight
Top weight
H2O stress
N stress
Extractable water
Cumulative irrigati
Cumulative stress



- Simulated with observed climate
- Simulated with 2013 climate data
- Simulated with 2014 climate data
- Simulated with 2015 climate data
- Simulated with 2016 climate data
- Simulated with 2017 climate data

Close

Select Field: TestK1



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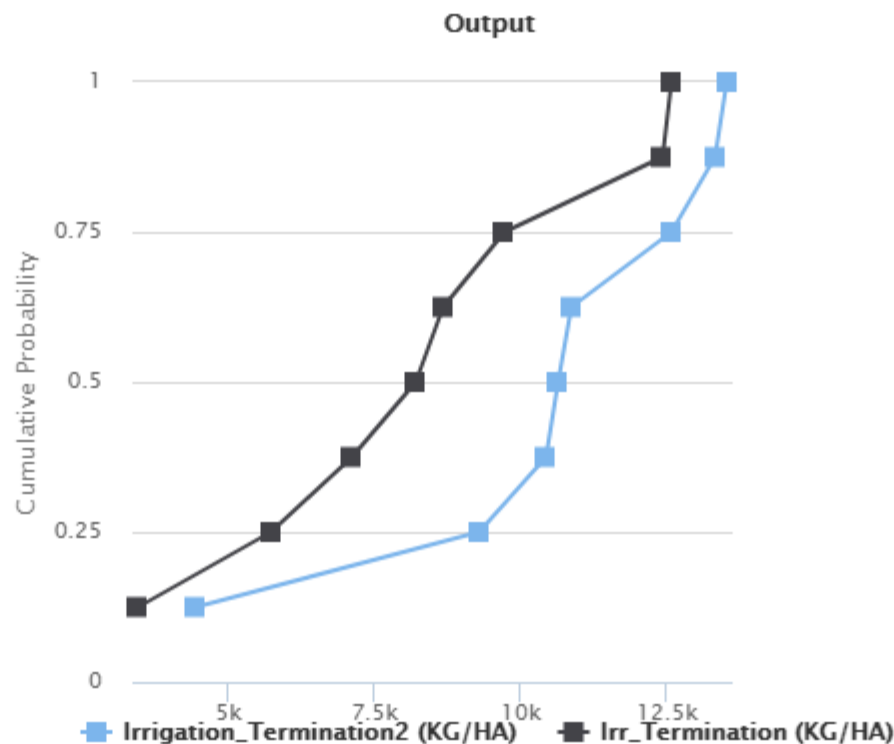
☐ English ☐ SI

Select Scenarios:

Irrigation_Terminat
Irr_Termination
test for jae

Select outputs to display:

CPF of Yield
CPF of Top Weight
CPF of Water Proc



Highcharts.com

Close

https://erams.com/icrop/

eRAMS - Environmental

eRAMS

(anonymous)

Secure | https://beta.erams.com/group/178/ma/32576/map/?maName=ICROP_share&key=627c343a-f462-11e6-9562-bc5ff499a18d

Crop

HomeMy AccountMy GroupsResource Center

ikisekka | ICROP_share | Help

Select Field: TestK1

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Growth Stage

Management Event

Select Scenarios:

Irrigation_Termination

Irr_Termination test for jae

Select outputs to display:

Management Event

Climate year:2010

Emergence

Floral Initiation

75% Silking

Phys. Maturity

MAY 23, 2018

JUN 15, 2018

JUL 22, 2018

SEP 10, 2018

Climate year:2011

Close

SDA Farm Service Agency

Terms of Use

Select Field: TestK1



Show Field Polygons

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☐ English ☐ SI

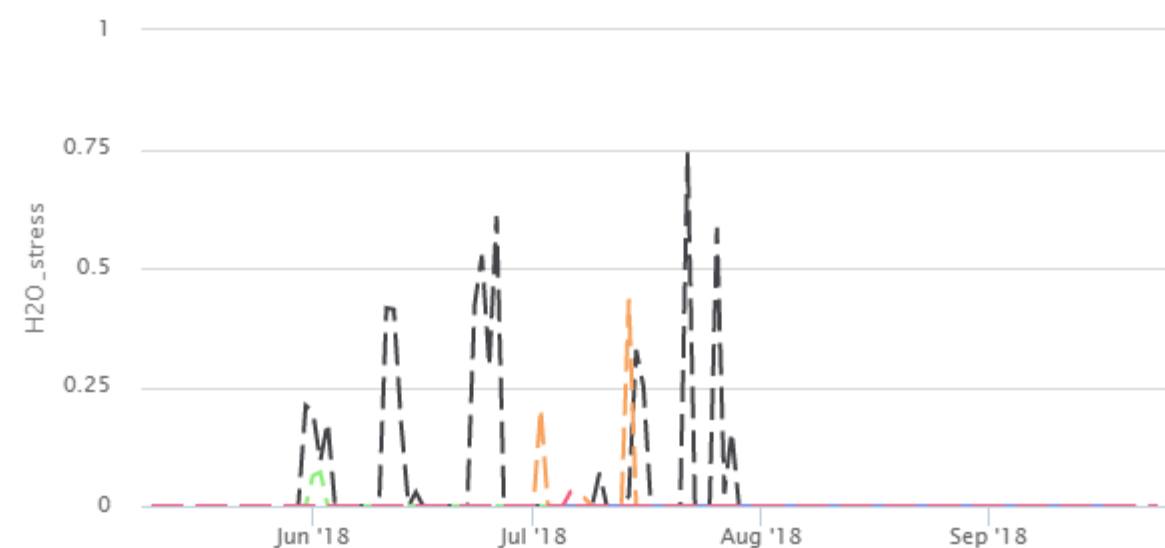
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- Top weight
- H2O stress**
- N stress
- Extractable water
- Cumulative irrigati
- Cumulative desig

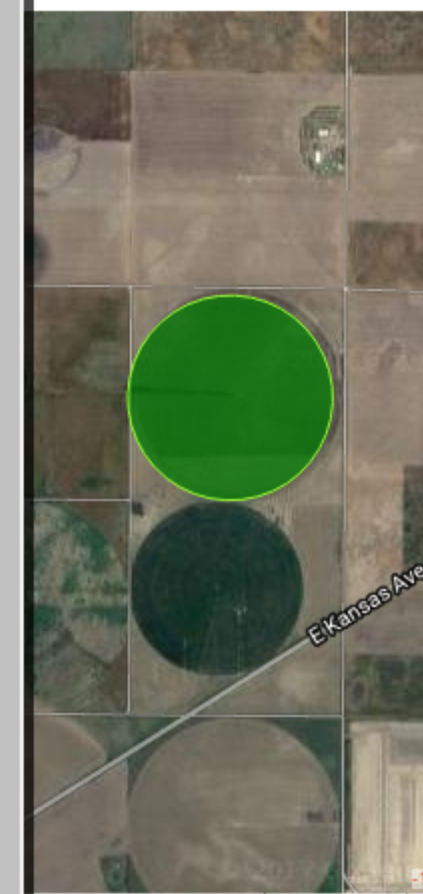
Output



- Simulated with observed climate
- Simulated with 2013 climate data
- Simulated with 2014 climate data
- Simulated with 2015 climate data
- Simulated with 2016 climate data
- Simulated with 2017 climate data

(1 is maximum stress, 0 is no stress)

Close



Select Field: TestK1



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☐ English ☐ SI

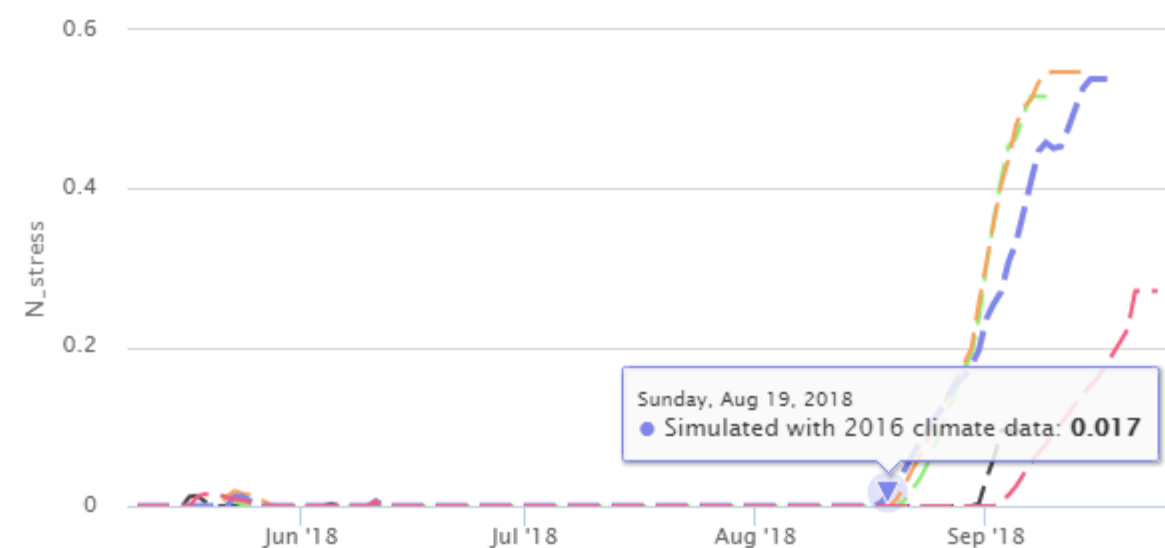
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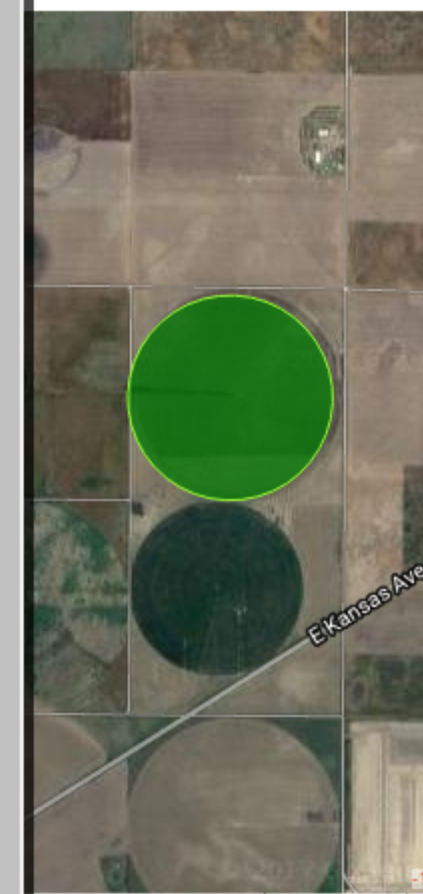
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Simulation Period Total

Daily Output

Cumulative Probability

Growth Stage

Management Event

☒ English ☐ SI

Select Scenarios:

Irrigation_Terminat
Irr_Termination
test for jae

Select outputs to display:

top weight
H2O stress
N stress
Extractable water
Cumulative irrigati
Cumulative draina
Cumulative evapot

Output



- Simulated with observed climate ◆ Simulated with 2013 climate data
- Simulated with 2014 climate data ▲ Simulated with 2015 climate data
- ✖ Simulated with 2016 climate data ● Simulated with 2017 climate data

Close



Select Field: TestK1



☒ Show Field Polygons

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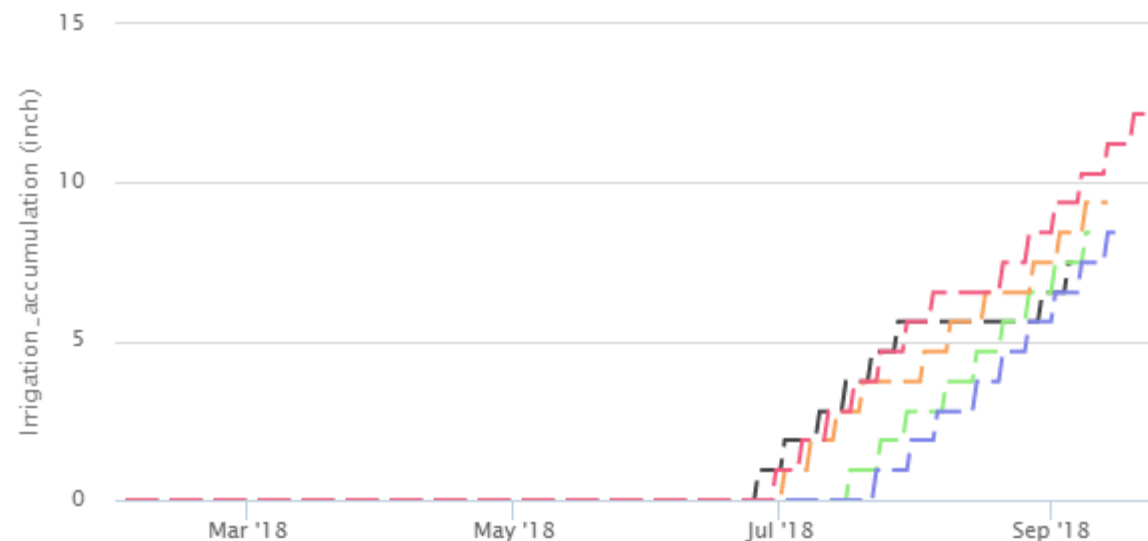
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test for jae

Select outputs to display:

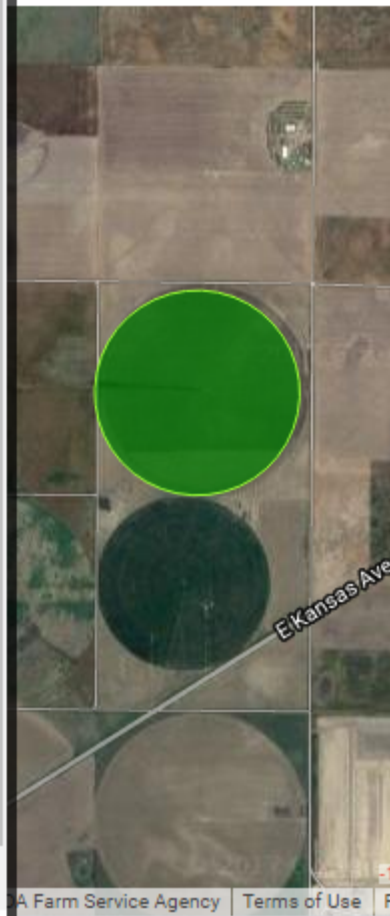
top weight
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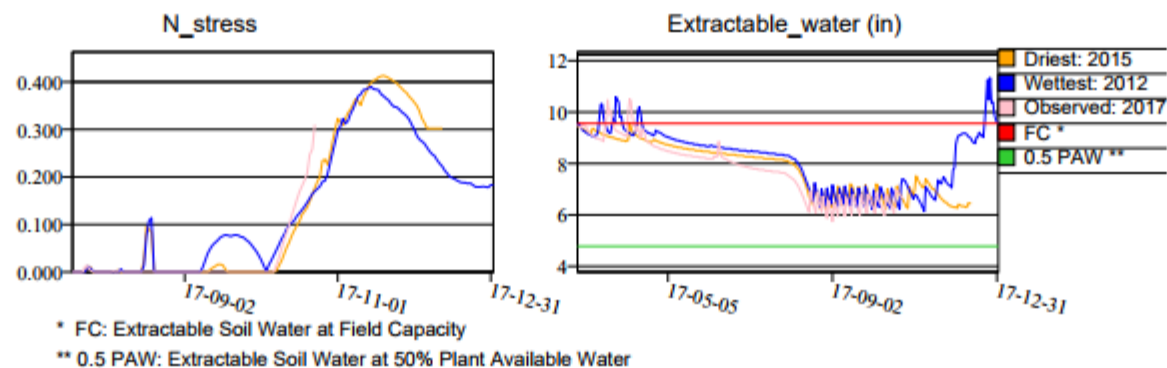
Output



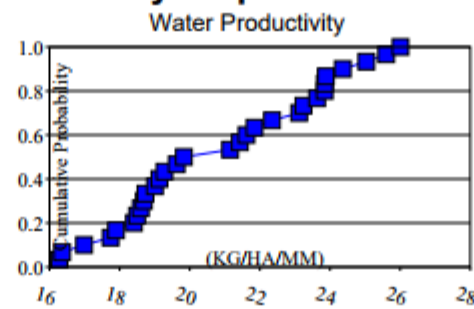
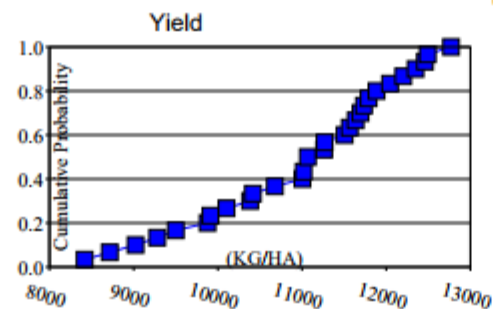
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- Simulated with 2017 climate data

Close





Cumulative probability output



Research Field

WEATHER DATA

64°F

Wind: 31.09 mph

Humidity: 17%

Pressure: 1,026 hPa

FORECAST

Tue	Wed	Thu	Fri	Sat
58°	71°	65°	40°	55°
38°	37°	45°	33°	28°
0"	0"	0"	0.0"	0"

CROP INFORMATION

Crop: Corn

Growth Stage: R6 - maturity

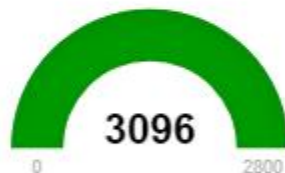
Planting Date: 05/08/2017

Current ET: 0.03

Avg 4 Day ET: 0.03

Estimated GDUs to Maturity: 2800

GDUs



PIVOT

Power: ON

October 23, 2017

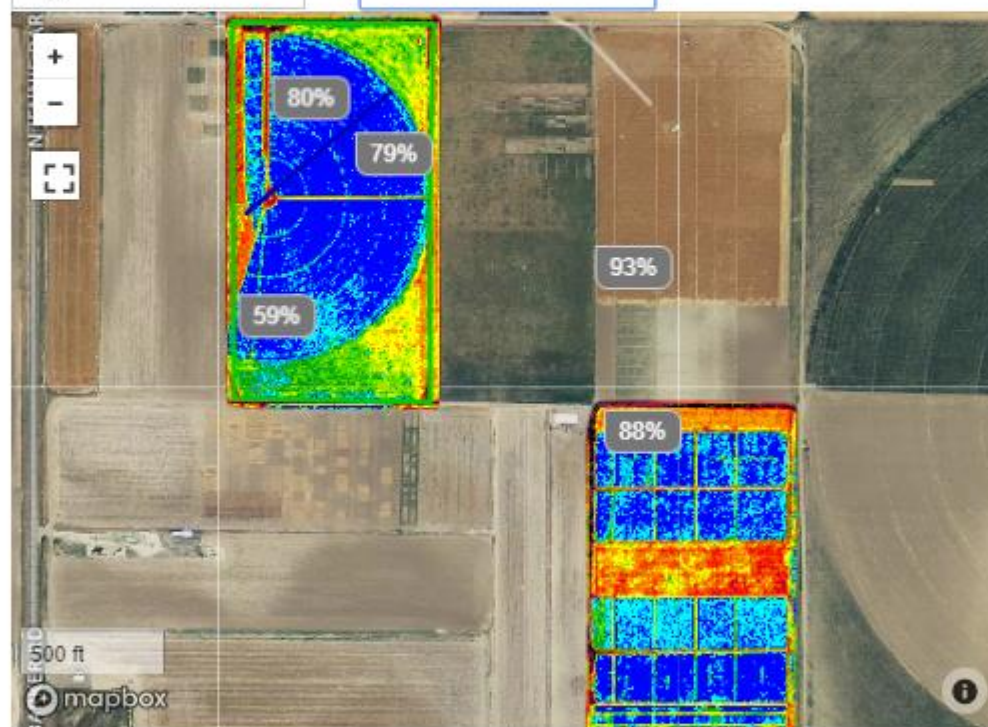
Pressure: 0.0PSI

Direction of travel: FWD

Angle: 50

Vigor

8/2/2017



Pivot History

A. 53428 3RD TOWER DRAGONLINE300

Oct 10 2017 4:40PM

Soil Temp: 68°F

Soil: Silt Loam

59%

B. 53405 3RD TOWER NOZZLES 300

Oct 12 2017 3:26AM

Soil Temp: 61°F

Soil: Silt Loam

53%

C. 53403 2ND TOWER DRAGONLINE300

Oct 11 2017 7:05AM

Soil Temp: 67°F

Soil: Silt Loam

64%

D. 53867 2ND TOWER NOZZLES 300

Oct 10 2017 5:04PM

Soil Temp: 64°F

Soil: Silt Loam

71%



Thank you!