AgTech Pilot Project

Funded by CETF

California State University, Fresno

CETF
CALIFORNIA EMERGING TECHNOLOGY FUND

"Demonstrate the Value of Broadband for Agriculture."

3 Goals

#1 - Help develop a comprehensive approach in utilizing broadband for agriculture.

#2 - Increase the availability of broadband infrastructure in Ag industry

#3 - Introduce AgTech capabilities to Fresno County farmers/growers.

21st Century Broadband

On Farm Wireless Sensor Network AgTech Pilot Project

Overview of pilot project goal

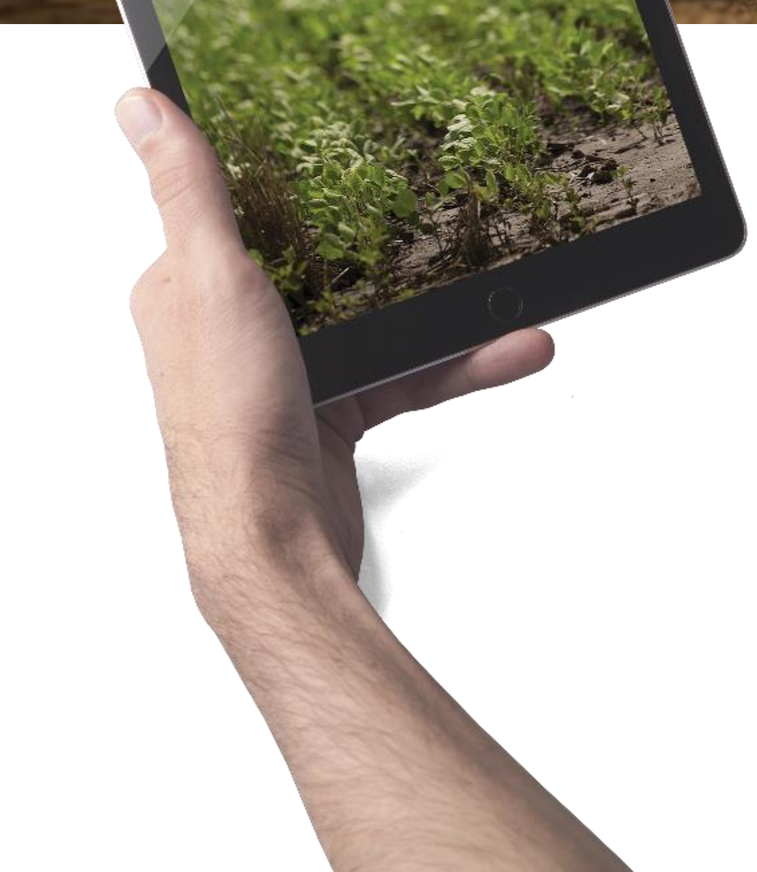
The Primary goal of the ***"21st Century Broadband: On Farm Wireless Sensor Network AgTech Pilot Project"*** was to reduce water usage and increase crop yield by improving automated irrigation systems currently in place through an on farm wireless sensor network.

Crops: *Grapes, Almonds, Tomatoes*

AgTech Pilot Project, implemented various conceptual design elements and activities that supported 3 land owners growing 3 different crops geographically dispersed in rural Fresno County. Rios Farms (Grapes), Logoluso Farms (Almonds), and Sano Farms (Tomatoes)

AgTech Pilot Project

Implementation



Implementation of Pilot Project in rural Fresno County

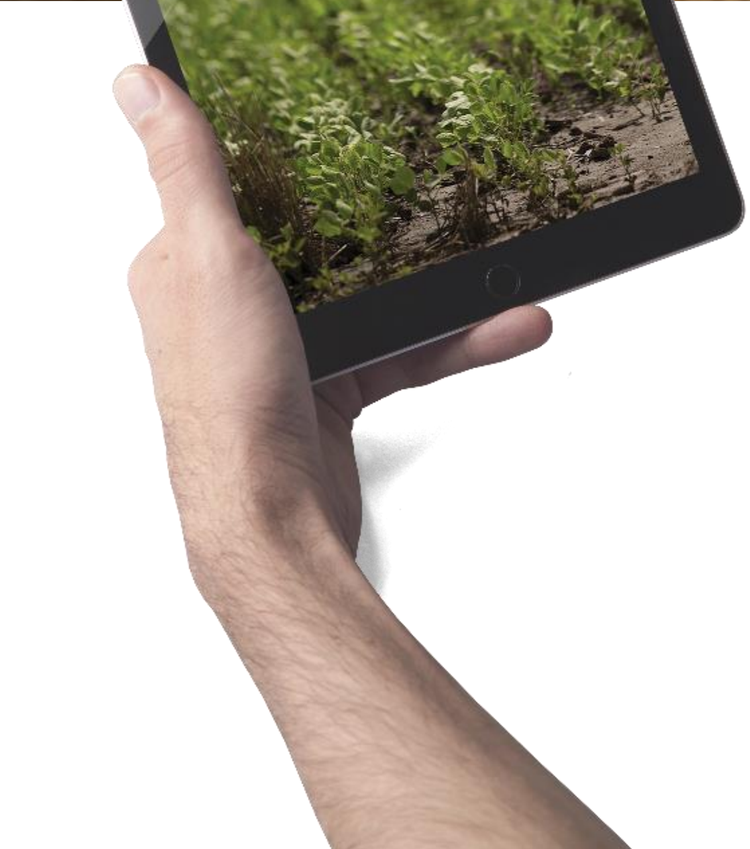
PHASE 1 - Dedicated to project planning, identifying equipment necessary for purchase and potential broadband infrastructure refinement.

PHASE 2 - training sessions and technical assistance were provided during the second phase of the project. WiseConn led the trainings in automated irrigation systems, data/control dashboards, wireless telemetry systems and other crop water status sensor trainings.

PHASE 3 –All data collected from March 2017 to November 2017 was analyzed as part of the project evaluation and overall data reporting.

AgTech Pilot Project

Implementation



Implementation of Pilot Project in rural Fresno County

PHASE 4 - an evaluation of the AgTech pilot project was conducted by the Office of Community and Economic Development (OCED) at Fresno State and input from the Water, Energy and Technology (WET) Center to determine the overall outcomes and success of the project.

Advisory Board – An advisory board of industry experts was created and provided advice and support throughout the AgTech Pilot Project

AgTech Pilot Project

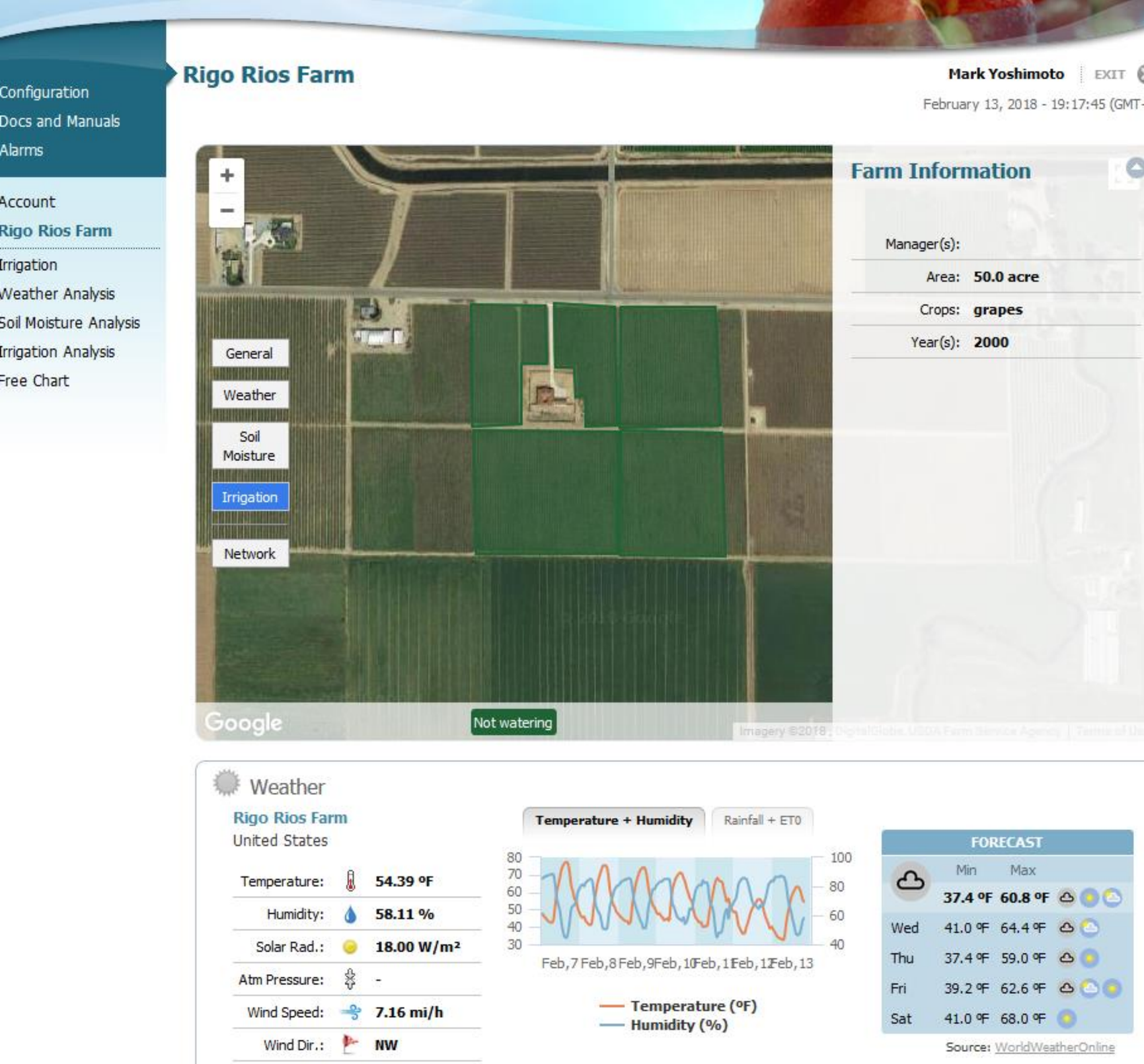
Equipment

- *Real-time water sensors and data models that measure specific water flow within a field and help make real-time recommendations, considering all factors affecting growth development and harvest were deployed in identified parcels in 3 farms. All equipment was connected via wireless broadband.*
- Allow farmers to precisely target their time, limited water and expensive nutrient resources to improve overall yield and quality.
- WiseConn provided the necessary technical assistance and training to install water flow meters, which measured absolute water release to determine which portions of the crops required water and which did not as indicated by ground sensors.
- Data collection was managed using a specially designed application on a Smart Phone/iPad and broadband connection.
- Test and control parcels were utilized for data analysis. Equipment was strategically placed in certain parcels on each farm, but not in others, allowing data comparison on crop production, yields, water usage, and cost.

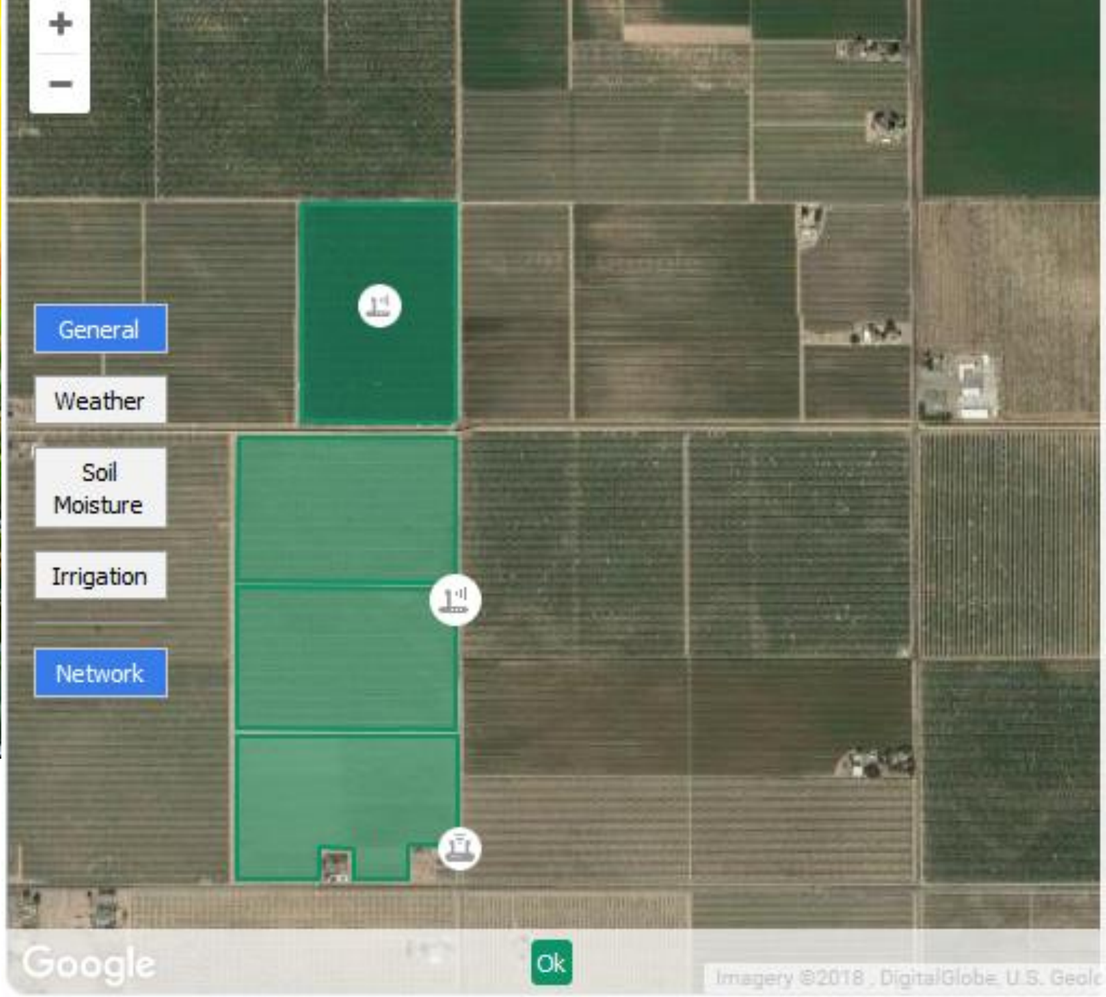
DropControl
by WiseConn

How It Works

DropControl consists of a wireless network for monitoring and control, and a Web application. The network is made of nodes, which are connected to sensors and actuators for monitoring weather conditions, soil moisture, irrigation historic data, and to actuate the irrigation system. The nodes communicate with each other to send the information to the central Gateway, which connects the network with a web server.



As a result of having access to broadband in the Farm, all 3 farmers can monitor and schedule irrigation times (from anywhere) to reduce water usage and energy costs. It also provides real time soil moisture analysis.



North Filter Node

3 sensors

5 actuators

Node OK

Battery level: 100%

RF signal level: -

Expansions:

TE AREINS - FW: AREINS V.2.0.4
TE AREINS - FW: AREINS V.2.0.4
TE LATCH4X - FW: EXP-LATCH-4X V.1.0.3
TE S3X420 - FW: S3X420 V.2.0.3

Sensors:

North Filter Inlet - Pressure
North Filter Flowmeter - Flow
North Filter Outlet - Pressure

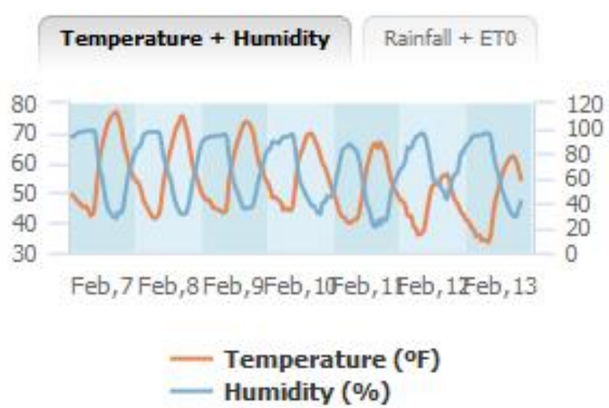
Last data: 02-13-2018 19:40

As a result of having access to broadband in the Farm, all 3 farmers can monitor and schedule irrigation times (from anywhere) to reduce water usage and energy costs. It also provides real time soil moisture analysis.

Weather

Home Ranch Farm
United States

Temperature:	54.50 ºF
Humidity:	41.00 %
Solar Rad.:	0.00 W/m²
Atm Pressure:	-
Wind Speed:	4.03 mi/h
Wind Dir.:	NW
Daily Rainfall:	0.0000 in



FORECAST

	Min	Max
	33.8 ºF	60.8 ºF
Wed	37.4 ºF	66.2 ºF
Thu	33.8 ºF	60.8 ºF
Fri	37.4 ºF	64.4 ºF
Sat	42.8 ºF	68.0 ºF

Source: WorldWeatherOnline

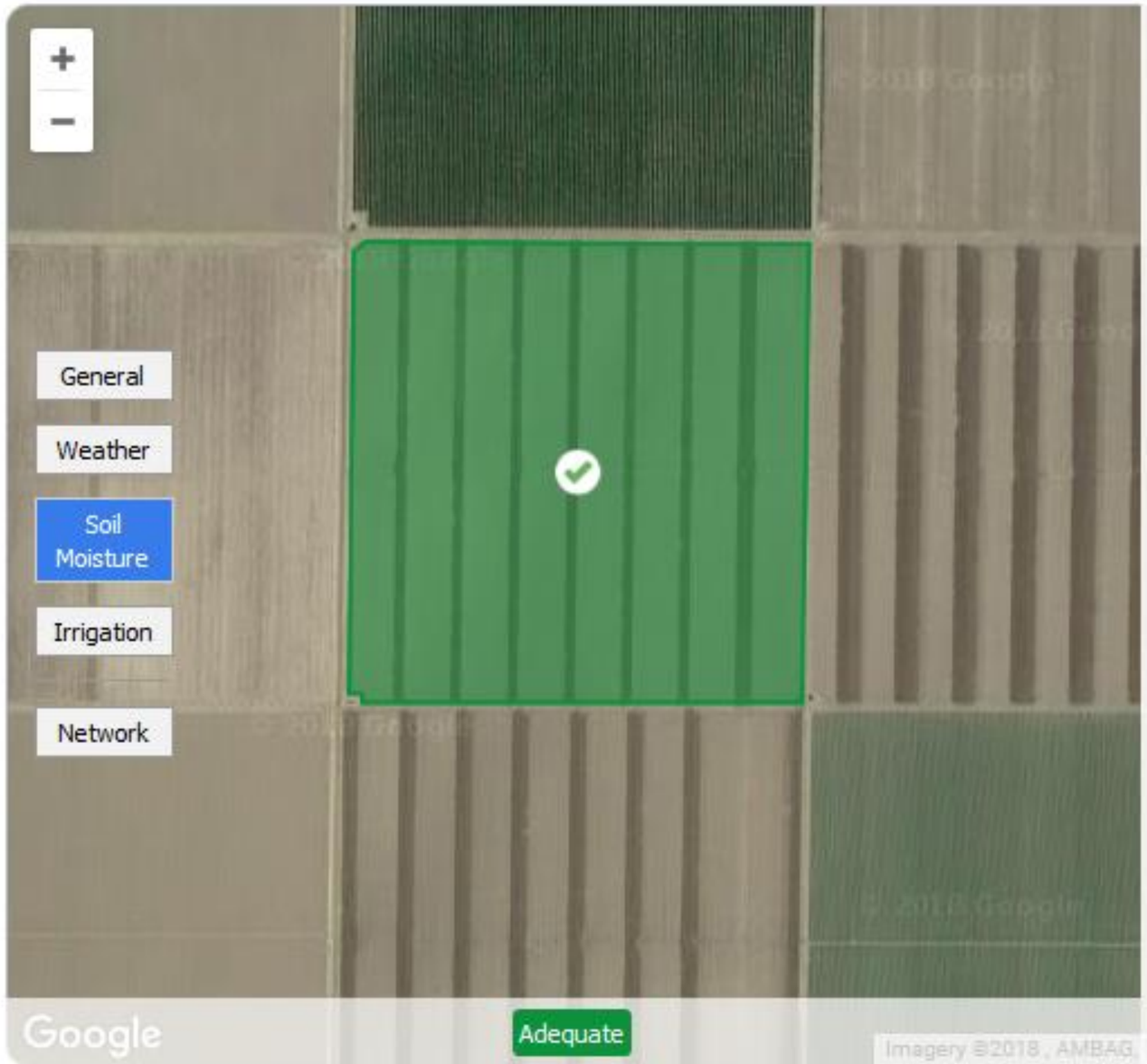
- Configuration
- Docs and Manuals
- Alarms

- Account
- Field 4 Farm
- Irrigation
- Weather Analysis
- Soil Moisture Analysis
- Irrigation Analysis
- Free Chart

Field 4 Farm

Mark Yoshimoto | EXIT

February 13, 2018 - 18:49:10 (GMT-8)



Farm Information

Manager(s):	**Jesse Sanchez**
Area:	**148.0 acre**
Crops:	**tomatoes**
Year(s):	**1**

Tomatoes

Zone	Irrigation [in]	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
All	Schd: 0.0000 Real: 0.0000 Diff: 0.0000																								
Heavy Soils	Schd: 0.0000 Real: 0.0000 Diff: 0.0000																								
Light Soils	Schd: 0.5488 Real: 0.0000 Diff: 0.5488																								
Medium Soils	Schd: 0.5516 Real: 0.0000 Diff: 0.5516																								
N2 AVA	Schd: 0.0000 Real: 0.0000 Diff: 0.0000																								
N2 MF	Schd: 0.0000 Real: 0.0000 Diff: 0.0000																								
N2 TC	Schd: 0.0000 Real: 0.0000																								

Irrigation Irrigation Program Fertigation Manual Irrigation Proposed by API Confirmed

Monitoring

Component Name	Type	Status	Alarms	Flow (gal/m)

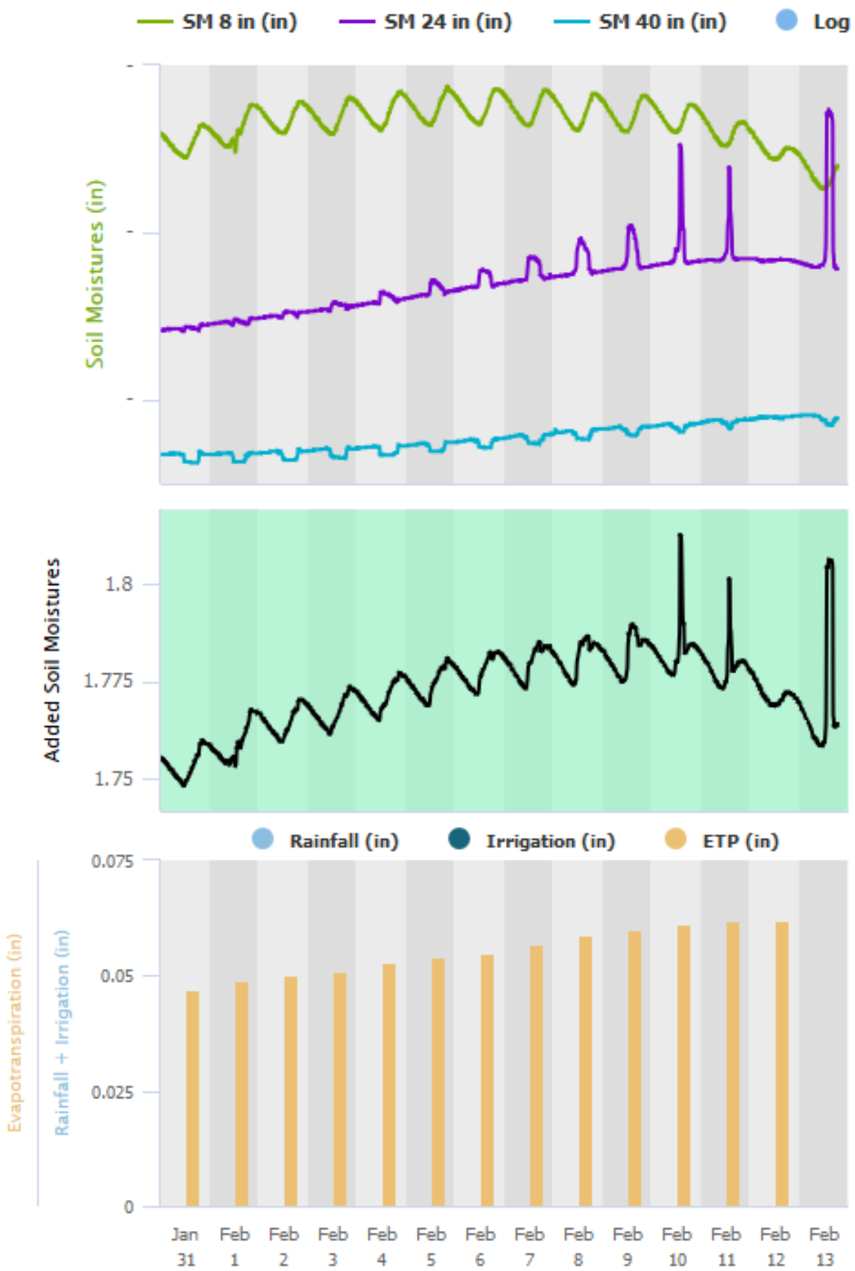
Time Selector

*Start Date: 01-31-2018 *End Date: 02-13-2018 View

Previous | 1D | 1W | 2W | 1M | 3M | 6M | Next

Soil Moisture Chart

Save Image



Settings

☑ SM 8 in
FC: 1.00 AW: 0.50

☑ SM 24 in
FC: 1.00 AW: 0.50

☐ SM 40 in
FC: 1.00 AW: 0.50

Stack | Normalize | Show Line

Maximum
Critical Point 1
Critical Point 2
Critical Point 3
Critical Point 4
Minimum

View Historic | Save

Data Summary

Avg SM 8 in:	**0.906 in**
Avg SM 24 in:	**0.866 in**
Avg SM 40 in:	**0.926 in**
Accum Irrigation:	**0.0000 in**
Irrigation Time:	**0h 0m**
Accum Rainfall:	**0.0000 in**
Rainfall + Irrigation:	**0.0000 in**
Accumulated ETC:	**0.7200 in**
Kc Real:	-

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Data Results

Grapes

-reduced Water usage by 18% to 20%
-reduced Energy usage by 15%
-reduced Labor usage by 12%
-Increased Crop Yield by 18%
-reduced costs (still analyzing total costs savings)

Almonds

-reduced Water usage by 10% to 12%
-reduced Energy usage by 10%
-reduced Labor usage by 15%
-Increased Crop Yield by 12%
-reduced costs (still analyzing total costs savings)

Tomatoes

-reduced Water usage by 17% to 19%
-reduced Energy usage by 13%
-reduced Labor usage by 15%
-Increased Crop Yield by 14%
-(still analyzing total costs savings)

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Advantages

Advantages of Broadband and wireless sensor technology

-Field nodes simultaneously monitor and control performance as well as control components like valves and pumps.

-Real time and historical data analysis of sensor technology helps growers make profitable decisions for irrigation.

-IOT (internet of things) that connects to the cloud from Ethernet, 3g, 4g, LTE, soon LoRa and narrowband

-Provide a Birdseye view of your operation, showing real time crop events.

-Saves water, by scheduled irrigation and VRI (variable rate irrigation).

-Saves energy, by reduction of irrigation time and running off peak.

-Saves labor, by automation of irrigation sets.

- Increases and maintains yields with lower cultural costs.

-Access, Anytime, Anywhere via an App (IOS and Android)

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THANK YOU