

## DOCKETED

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**Emerging Technology for Agriculture - Actual In-field Evapotranspiration**

*Additional submitted attachment is included below.*



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Subject: Emerging Technology for Agriculture - Actual In-field Evapotranspiration

**What emerging technologies should be considered that provide direct on-site energy, water and greenhouse gas savings for each of the identified sectors?**

Some growers may over-irrigate because they don't know exactly how much water their crops are using and are more concerned about crop stress. Tule sensors measure actual crop water use and monitor water stress in an agriculture field (up to 10 acres). Measuring Actual Evapotranspiration (ET) with Tule allows growers to dial in their irrigation amounts based on actual crop needs, therefore reducing water use (and associated pumping costs and energy use) while optimizing production. Tule provides growers with irrigation recommendations on how much to irrigate and when.

We've provided more information about Tule below for your reference.



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## Emerging Technology for Agriculture - Actual In-field Evapotranspiration: A Tool to Help Growers Manage Water at Field Scale



Evapotranspiration (ET) is the process of evaporation from plant and soil surfaces and from within plant tissues (i.e., water movement through stomata). In short, ET tells us the amount of water that is lost from a field.

The Tule Actual ET sensor is an innovation out of UC Davis based on the Surface Renewal method to measure how much water vapor the wind is carrying away from the field (up to 10 acres). The technology was validated against lysimetry and eddy covariance, so we know it works -- and it works at a fraction of the cost.

Tule ET sensors are the only commercial device that can measure the Actual ET from your field with accuracy, ease and affordability. This is not CIMIS or calculated based on reference ET.

### Why Measure Actual ET?

- Know the plant water stress level
- Know when to irrigate
- Know how much to irrigate
- Know how the plants are responding to your irrigation decisions



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## How it Works:

The Tule Actual ET sensor is a hardware device installed in the field, above the plant canopy.

The sensors measure ET and irrigation activity 24/7.

The device communicates to our server using a cellular connection, enabling you to monitor your fields without visiting each block.

The Tule web dashboard reports

- the plant water stress level
- the amount of water used by the field
- the irrigation application amount
- a forecast of atmospheric demand for the coming week

Growers get a recommendation for when to irrigate and the amount of water to apply based on their production goal and crop water stress.

## Key Advantages:

### **Real-time, 24/7 remote monitoring**

**Field Scale** - Tule tells you about the field -- not just one point in the soil or just one plant. One sensor covers between a 1 and 10 acre area.

**Integrates the Soil-Plant-Atmosphere Continuum with one device** - If the soil is not supplying enough water, the Actual ET decreases. If the plants close their stomata, the Actual ET decreases. If the air temperature cools, the Actual ET decreases. Tule uses these changes in Actual ET to inform our irrigation recommendations of when to water and how much.

### **Monitor plant water stress level (Plant Response Index, PRI)**

A decrease in the PRI means an increase in the water stress level, and correlates with other measures of plant water stress, like leaf water potential. Knowing the plant water stress levels can help ensure the health of your field and that you are meeting your production goals for quality and/or quantity.



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**Provides actionable irrigation recommendation for the week ahead**

Collecting data is great, but you don't want to know only what happened in the past week, you want to know what to do in the week ahead. Tule uses actual ET from the previous week combined with forecasted atmospheric demand for the coming week to provide actionable irrigation recommendations based on your production goals.