

# Agronomic Crop Irrigation

## Evapotranspiration:

Knowing the daily evapotranspiration rate can help you determine the best time to irrigate agronomic crops. Watering only when plants need water reduces irrigation costs, conserves Oklahoma water resources, and helps you grow healthier plants. Evapotranspiration is an estimate of the water that evaporates from the soil surface ("evapo" in evapotranspiration) and the water a plant loses through transpiration ("transpiration" in evapotranspiration).



The evapotranspiration products available on the Oklahoma AgWeather web site (<http://agweather.mesonet.org>) are weather-based tools that estimate daily water loss from a plant canopy. Using weather data from the closest Oklahoma Mesonet tower, unique evapotranspiration rates are calculated for a wide variety of agronomic crops. These include alfalfa, corn, cotton, warm-season grass hay (bermudagrass), cool-season grass hay (tall fescue or rye grass), peanut, sorghum, soybean, and wheat. Reference evapotranspiration rates are calculated that represent a well-watered short crop canopy, similar to cut grass, or a well-watered tall crop canopy, similar to alfalfa. These reference evapotranspiration rates are located in the Atmosphere section, under WEATHER on the Oklahoma AgWeather web site.

AgWeather evapotranspiration charts provide daily evapotranspiration rates and accumulated evapotranspiration rates back to the planting of the crop or the beginning of the growing season. Included in the evapotranspiration chart is the daily rainfall and accumulated rainfall. This provides a season-long perspective of plant water needs and the amount of rain that has fallen to meet those needs. Rainfall amounts reported are those collected at the nearest Oklahoma Mesonet tower and may not reflect rainfall received at your location. While a variation in rainfall amount might change when you water, it does not affect the accuracy of the evapotranspiration rates.

## AgWeather Evapotranspiration Chart:

To use the evapotranspiration rates to irrigate you need to think backwards. The evapotranspiration chart (see image below) shows the evapotranspiration rate in inches of water for each day in the **red colored column**. The most current date is at the top of the chart, descending through past dates as you scroll down the table. The chart shows the Mesonet station code, Date, Number of Days (descending), daily Evapotranspiration, Accumulated Evapotranspiration, daily Rainfall amount (**blue colored column**), Accumulated Rainfall, and Water Balance.

Station	Date	Number of Days	Evapotranspiration (inch)	Accumulated Evapotranspiration (inch)	Rainfall (inch)	Accumulated Rainfall (inch)	Water Balance (inch)
GOOD	2004-10-12	1	0.11	0.11	0.00	0.00	-0.11
GOOD	2004-10-11	2	0.03	0.15	0.25	0.25	0.10
GOOD	2004-10-10	3	0.07	0.22	0.00	0.25	0.03
GOOD	2004-10-09	4	0.13	0.34	0.00	0.25	-0.09
GOOD	2004-10-08	5	0.18	0.52	0.00	0.25	-0.27
GOOD	2004-10-07	6	0.14	0.66	0.00	0.25	-0.41
GOOD	2004-10-06	7	0.13	0.79	0.02	0.27	-0.52
GOOD	2004-10-05	8	0.04	0.83	0.05	0.32	-0.51
GOOD	2004-10-04	9	0.11	0.94	0.06	0.38	-0.56

The Water Balance column values come from subtracting the Accumulated Evapotranspiration from the Accumulated Rainfall. All evapotranspiration and rainfall amounts are in inches of water lost or gained.

The Water Balance column numbers are negative (**red**) when the water lost through evapotranspiration exceeds

the amount of rainfall. When the water gained in accumulated rainfall is higher than that lost from accumulated evapotranspiration, the Water Balance column numbers are positive (**blue**). It is time to water when the negative value reaches the amount of water you want to provide your plants. See page 2 for specific crop irrigation guidelines.

## Using Evapotranspiration on OK AgWeather (<http://agweather.mesonet.org>):

Agronomic crops should be irrigated when the target irrigation amount or 50% of the available water in the root area is lost to evapotranspiration. The charts on pages 2-4 list the amount of available water for different soil types to the depth indicated and the 50% Accumulated Evapotranspiration value for soil type and rooting depth. When the Accumulated Evapotranspiration reaches 50% of the value for the depth corresponding to the rooting depth of the crop, it is time to irrigate. Young plants should be irrigated sooner, because their root system is shallower than full-sized plants. Irrigate sooner when using low volume water sources, to keep up with crop water needs during times of peak water use.

### Alfalfa:

- Click on CROPS, then select Alfalfa, then Evapotranspiration.
- Select the nearest Mesonet Site location.
- Select the Alfalfa Cut Status.
- When alfalfa cut status is "After First Cutting," enter the last cutting date.
- Click on Get Alfalfa Data.
- Determine a target irrigation amount or use 50% of available water capacity as an irrigation amount. The effective rooting depth of alfalfa can vary from 3 feet to 10 feet. The first table below lists the total available water of different soils to the depth indicated. The second table shows the Accumulated Evapotranspiration value when 50% of the available water has been lost.
- Go down the Water Balance column until it shows a negative value equal to the target irrigation amount or a 50% depletion of available water in the crop root zone and note the date. If your last irrigation occurred on or before this date, then it is time to irrigate again.

#### Total Available Water:

Root depth	Sandy loam	Silt loam	Silty clay
3 feet	4.3 inches	6.5 inches	4.7 inches
5 feet	7.2 inches	10.8 inches	7.8 inches
7 feet	10.1 inches	15.1 inches	10.9 inches

#### Accumulated ET when 50% of Available Water Lost:

Root depth	Sandy loam	Silt loam	Silty clay
3 feet	-2.15 inches	-3.25 inches	-2.35 inches
5 feet	-3.6 inches	-5.4 inches	-3.9 inches
7 feet	-5.05 inches	-7.55 inches	-5.45 inches

### Grass Hay (bermudagrass or cool-season):

- Click on CROPS, then select Grass Hay, then Evapotranspiration.
- Select the nearest Mesonet Site location.
- Select the Grass Hay Type.
- Select the Grass Hay Cut Status.
- When grass hay cut status is "After First Cutting," enter the last cutting date.
- Click on Get Grass Hay Data.

- Determine a target irrigation amount or use 50% of available water capacity as an irrigation amount. The effective rooting depth of grasses can vary from 1.5 feet to 5 feet. The first table below lists the total available water of different soils to the depth indicated. The second table shows the Accumulated Evapotranspiration value when 50% of the available water has been lost.
- Go down the Water Balance column until it shows a negative value equal to the target irrigation amount or a 50% depletion of available water in the crop root zone and note the date. If your last irrigation occurred on or before this date, then it is time to irrigate again.

#### Total Available Water:

Root depth	Sandy loam	Silt loam	Silty clay
1.5 feet	2.2 inches	3.2 inches	2.3 inches
3 feet	4.3 inches	6.5 inches	4.7 inches
5 feet	7.2 inches	10.8 inches	7.8 inches

#### Accumulated ET when 50% of Available Water Lost:

Root depth	Sandy loam	Silt loam	Silty clay
1.5 feet	-1.1 inches	-1.6 inches	-1.15 inches
3 feet	-2.15 inches	-3.25 inches	-2.35 inches
5 feet	-3.6 inches	-5.4 inches	-3.9 inches

### Corn:

- Click on CROPS, then Corn, next Evapotranspiration.
- Select the nearest Mesonet Site location.
- Enter the Relative Maturity Days for the corn variety planted.
- Enter the Planting Date.
- Click on Get Corn Data.
- Determine a target irrigation amount or use 50% of available water capacity as an irrigation amount. The effective rooting depth of corn can vary from 3 feet to 6.6 feet. The first table on page 3 lists the total available water of different soils to the depth indicated. The second table shows the Accumulated Evapotranspiration value when 50% of the available water has been lost.
- Go down the Water Balance column until it shows a negative value equal to the target irrigation amount or a 50% depletion of available water in the crop root zone and note the date. If your last irrigation occurred on or before this date, then it is time to irrigate again.

**Total Available Water:**

Root depth	Sandy loam	Silt loam	Silty clay
3 feet	4.3 inches	6.5 inches	4.7 inches
4.5 feet	6.5 inches	9.7 inches	7.0 inches
6 feet	8.6 inches	13.0 inches	9.4 inches

**Accumulated ET when 50% of Available Water Lost:**

Root depth	Sandy loam	Silt loam	Silty clay
3 feet	-2.15 inches	-3.25 inches	-2.35 inches
4.5 feet	-3.25 inches	-4.85 inches	-3.5 inches
6 feet	-4.3 inches	-6.5 inches	-4.7 inches

**Cotton:**

- Click on CROPS, then select Cotton, then Evapotranspiration.
- Select the nearest Mesonet Site location.
- Enter the Relative Maturity Days for the cotton variety planted.
- Enter the Planting Date.
- Click on Get Cotton Data.
- Determine a target irrigation amount or use 50% of available water capacity as an irrigation amount. The effective rooting depth of cotton can vary from 3 feet to 6.5 feet. The first table below lists the total available water of different soils to the depth indicated. The second table shows the Accumulated Evapotranspiration value when 50% of the available water has been lost.
- Go down the Water Balance column until it shows a negative value equal to the target irrigation amount or a 50% depletion of available water in the crop root zone and note the date. If your last irrigation occurred on or before this date, then it is time to irrigate again.

**Total Available Water:**

Root depth	Sandy loam	Silt loam	Silty clay
3 feet	4.3 inches	6.5 inches	4.7 inches
4.5 feet	6.5 inches	9.7 inches	7.0 inches
6 feet	8.6 inches	13.0 inches	9.4 inches

**Accumulated ET when 50% of Available Water Lost:**

Root depth	Sandy loam	Silt loam	Silty clay
3 feet	-2.15 inches	-3.25 inches	-2.35 inches
4.5 feet	-3.25 inches	-4.85 inches	-3.5 inches
6 feet	-4.3 inches	-6.5 inches	-4.7 inches

**Peanut:**

- Click on CROPS, then select Peanut, then Evapotranspiration.
- Select the nearest Mesonet Site location.
- Select the Peanut Type.
- Enter the Relative Maturity Days for the variety planted to refine the model output or use the default value.
- Enter the Planting Date.
- Click on Get Peanut Data.
- Determine a target irrigation amount or use 50% of available water capacity as an irrigation amount. The effective rooting depth of peanut can vary from 1.5 feet to 3.5 feet. The first table below lists the total available water of different soils to the depth indicated. The second table shows the Accumulated Evapotranspiration value when 50% of the available water has been lost.
- Go down the Water Balance column until it shows a negative value equal to the target irrigation amount or a 50% depletion of available water in the crop root zone and note the date. If your last irrigation occurred on or before this date, then it is time to irrigate again.

**Total Available Water:**

Root depth	Sandy loam	Silt loam	Silty clay
1.5 feet	2.2 inches	3.2 inches	2.3 inches
2.5 feet	3.6 inches	5.4 inches	3.9 inches
3.5 feet	5.0 inches	7.6 inches	5.5 inches

**Accumulated ET when 50% of Available Water Lost:**

Root depth	Sandy loam	Silt loam	Silty clay
1.5 feet	-1.1 inches	-1.6 inches	-1.15 inches
2.5 feet	-1.8 inches	-2.7 inches	-1.95 inches
3.5 feet	-2.5 inches	-3.8 inches	-2.75 inches

**Sorghum:**

- Click on CROPS, then Sorghum, next Evapotranspiration.
- Select the nearest Mesonet Site location.
- Enter the Relative Maturity Days for the sorghum variety planted.
- Enter the Planting Date.
- Click on Get Sorghum Data.
- Determine a target irrigation amount or use 50% of available water capacity as an irrigation amount. The effective rooting depth of sorghum can vary from 3 feet to 6.6 feet. The first table on page 4 lists the total available water of different soils to the depth indicated. The second table shows the Accumulated Evapotranspiration value when 50% of the available water has been lost.

- Go down the Water Balance column until it shows a negative value equal to the target irrigation amount or a 50% depletion of available water in the crop root zone and note the date. If your last irrigation occurred on or before this date, then it is time to irrigate again.

**Total Available Water:**

Root depth	Sandy loam	Silt loam	Silty clay
3 feet	4.3 inches	6.5 inches	4.7 inches
4.5 feet	6.5 inches	9.7 inches	7.0 inches
6 feet	8.6 inches	13.0 inches	9.4 inches

**Accumulated ET when 50% of Available Water Lost:**

Root depth	Sandy loam	Silt loam	Silty clay
3 feet	-2.15 inches	-3.25 inches	-2.35 inches
4.5 feet	-3.25 inches	-4.85 inches	-3.5 inches
6 feet	-4.3 inches	-6.5 inches	-4.7 inches

**Soybean:**

- Click on CROPS, then select Soybean, then Evapotranspiration.
- Select the nearest Mesonet Site location.
- Select the Soybean Maturity Group.
- Enter the Relative Maturity Days for the variety planted to refine the model output or use the default value.
- Enter the Planting Date.
- Click on Get Soybean Data.
- Determine a target irrigation amount or use 50% of available water capacity as an irrigation amount. The effective rooting depth of soybean can vary from 2.5 feet to 5 feet. The first table below lists the total available water of different soils to the depth indicated. The second table shows the Accumulated Evapotranspiration value when 50% of the available water has been lost.
- Go down the Water Balance column until it shows a negative value equal to the target irrigation amount or a 50% depletion of available water in the crop root zone and note the date. If your last irrigation occurred on or before this date, then it is time to irrigate again.

**Total Available Water:**

Root depth	Sandy loam	Silt loam	Silty clay
2.5 feet	3.6 inches	5.4 inches	3.9 inches
3.5 feet	5.0 inches	7.6 inches	5.5 inches
4.5 feet	6.5 inches	9.7 inches	7.0 inches

**Accumulated ET when 50% of Available Water Lost:**

Root depth	Sandy loam	Silt loam	Silty clay
2.5 feet	-1.8 inches	-2.7 inches	-1.95 inches
3.5 feet	-2.5 inches	-3.8 inches	-2.75 inches
4.5 feet	-3.25 inches	-4.85 inches	-3.5 inches

**Wheat:**

- Click on CROPS, then Wheat, next Evapotranspiration.
- Select the nearest Mesonet Site location.
- Go down the Water Balance column until it shows a negative value equal to a 50% depletion of available water in the crop root zone and note the date. If your last irrigation occurred on or before this date, then it is time to irrigate again. • Enter the Planting Date.
- Click on Get Wheat Data.
- Determine a target irrigation amount or use 50% of available water capacity as an irrigation amount. The effective rooting depth of wheat can vary from 3 feet to 6.6 feet. The first table below lists the total available water of different soils to the depth indicated. The second table shows the Accumulated Evapotranspiration value when 50% of the available water has been lost.
- Go down the Water Balance column until it shows a negative value equal to the target irrigation amount or a 50% depletion of available water in the crop root zone and note the date. If your last irrigation occurred on or before this date, then it is time to irrigate again.

**Total Available Water:**

Root depth	Sandy loam	Silt loam	Silty clay
3 feet	4.3 inches	6.5 inches	4.7 inches
4.5 feet	6.5 inches	9.7 inches	7.0 inches
6 feet	8.6 inches	13.0 inches	9.4 inches

**Accumulated ET when 50% of Available Water Lost:**

Root depth	Sandy loam	Silt loam	Silty clay
3 feet	-2.15 inches	-3.25 inches	-2.35 inches
4.5 feet	-3.25 inches	-4.85 inches	-3.5 inches
6 feet	-4.3 inches	-6.5 inches	-4.7 inches

