

JUNE 2018



IRRIGATION MANAGEMENT IN SWEET CORN

KEY IRRIGATION TIPS

- Pay more attention when the crop canopy is rapidly growing, and corn ear size is determined. Crop water use at this time can be increasing by more than 400%, making irrigation management tricky. Even a small delay in irrigation can decrease yield substantially
- Use evapotranspiration forecasts to manage irrigation when a run of windy, hot weather spikes crop-water use
- Most irrigation systems will be running at capacity to keep up with crop water requirements once the canopy closes. As a result, there is little opportunity to catch up on irrigation if the system has a down time, or during a run of high reference crop evapotranspiration (ET_0)
- Soil moisture reserves are important in helping the crop get through peak water use, typically when the crop is setting and filling the corn cobs. Make sure soil moisture levels are not run down heading into January
- Don't delay restarting irrigation after in-crop rainfall

IRRIGATION AND SWEET CORN

Sweet corn has a high water requirement. The most sensitive growth stages (3–5) are also when crop water usage is at its highest, increasing by more than 400% over a few weeks. This rapid increase in crop water use can catch growers out and reduce yield and quality.

This factsheet provides a refresher on irrigation scheduling and outlines how new tools can help manage irrigation, especially when crop water use is changing rapidly. The factsheet uses as an example sweet corn crop grown in Cowra, NSW during 2017–18 to highlight crop development and evapotranspiration combined to change irrigation requirements (figure 1)

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Evapotranspiration - reference (ET_o) and under actual crop conditions (ET_c)

Reference evapotranspiration observations (ET_o) are readily available from Bureau of Meteorology or from apps such as The Yield and IrriSAT. Useful 7-day forecasts of ET_o are also provided by IrriSAT and The Yield.

ET_o provides you with a measure of the water demand from the air. It combines sunshine (length and strength), wind, humidity and

temperature to estimate the amount of water which would be lost from a well-watered crop.

To get an estimate of your crop water requirement ET_o must be adjusted based on the development of your crop. These crop factors can be obtained from satellite (e.g. IrriSAT) or from look-up tables. In the example below, we obtained these crop factors from IrriSAT, which automatically uses satellite images to measure the development of the crop and estimated crop factors.

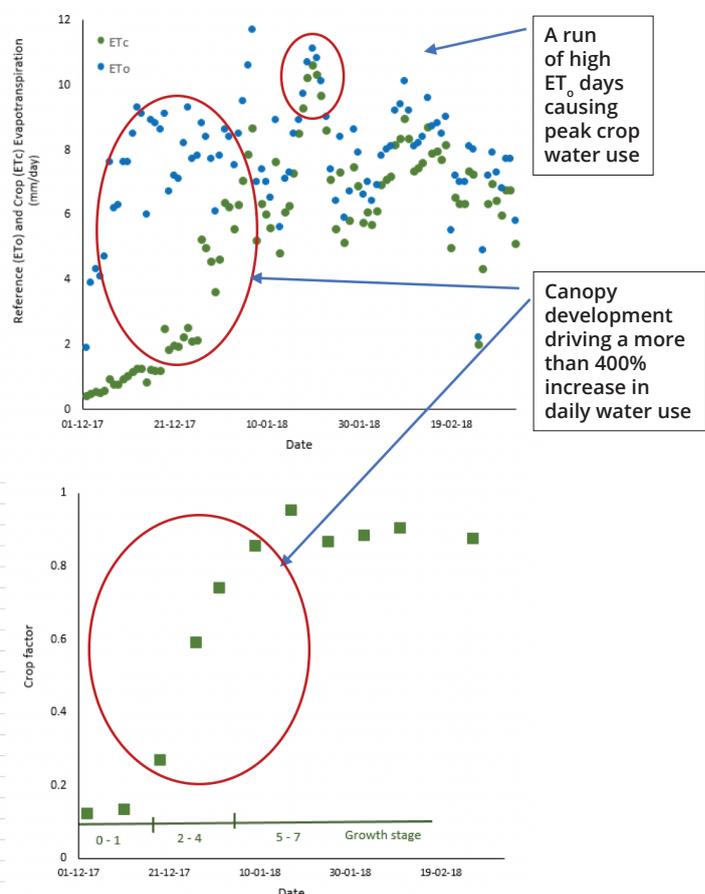
CASE STUDY

Sweet corn grown in Cowra (2017-18 summer) under a centre pivot is used to highlight how growth, ET_o and crop water use change over the season and what this means for irrigation management (figure 1). Information was obtained from IrriSAT, with weekly satellite imagery automatically providing canopy development (crop factor).

The rapid development in canopy covered over three weeks of increases in crop water use – from 1.4 to 7.6mm/day. If irrigation is not increased during this period then either soil moisture reserves would run down, or the crop would suffer water stress and therefore yield reductions.

A run of high ET_o days causes peak crop water demand with five days above 9mm/day. Not many irrigation systems have the capacity to deliver this much water, and soil moisture reserves are important for minimising crop water stress and yield reductions. Using 7-day ET_o forecasts would help prepare for such events.

Figure 1. Change in crop development and evapotranspiration rate in sweet corn over growing season at Cowra, NSW (2017-18).



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CROP DEVELOPMENT, WATER USE AND KEY IRRIGATION DECISIONS

Centre pivot and lateral move irrigators are commonly used to irrigate sweet corn. The system capacity of the irrigation system (i.e. the maximum application rate in mm/day) is commonly close to or under peak water requirements for sweet corn.

Once canopy closure has occurred, most systems will be running flat out to keep up with crop water requirements. Any system down time, or a run of high ET_o will have the potential to water stress the crop. Soil moisture reserves are very important during these periods.

Irrigation managers should pay attention to the following three periods when rapidly changing crop growth or when high crop water requirements coincide with sensitive crop stages.

Getting irrigation wrong will reduce yields.

The three key irrigation periods are:

1. When rapid crop growth combines with increasing ET_o

One of the most important irrigation periods is when the crop canopy is rapidly growing (figure 2, stages 3–5) and corn ear size is determined. Crop water use is increasing rapidly during this period, by over 400%, making irrigation management tricky. A small delay in the timing of your irrigation can significantly reduce yield.

At Cowra the rapid growth in the canopy results in the crop factor increasing from 0.3 to 1.0 in less than four weeks at a time when ET_o is also increasing (figure 1). Crop water use increases from 1.4 to 7.6 mm/day during this sensitive growth

period. Careful attention should be paid to adjusting irrigation to the more-than-400% increase in crop water use if good yields are to be realised.

Failure to keep up with crop water requirements will draw down soil moisture reserves. This may cause problems when peak crop water use occurs.

2. A run of high ET_o days

Once canopy closure has occurred (Stages 4–5) crop water use is directly linked to changes in ET_o . During this period, spikes in crop water use due to a run of windy hot weather when the crop is setting and filling the corn cobs, can impact on yield. This is most likely during January. In 2018 at Cowra ET_c has a run of five days above 9mm/day. This will push up against the capacity of most irrigation systems to deliver that amount of water. Ensuring the soil is near field capacity, especially in the subsoil, going into these periods will provide some insurance against water stress during this period.

3. Restarting irrigation after in-crop rainfall

In-crop rainfall provides welcome relief to the constant pressure of irrigating to meet crop water requirements. A common mistake is to leave restarting irrigation for too long after rainfall. This will deplete soil moisture, which increases the risk of water stress during peak crop water use.

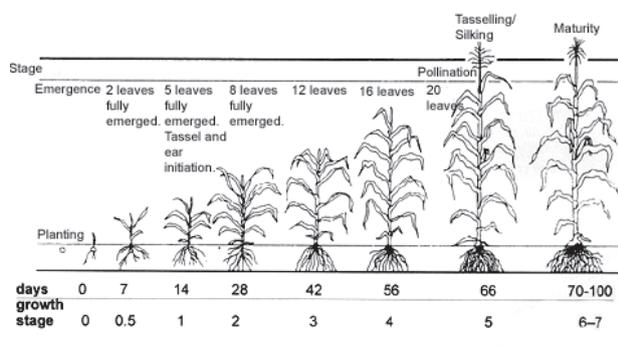


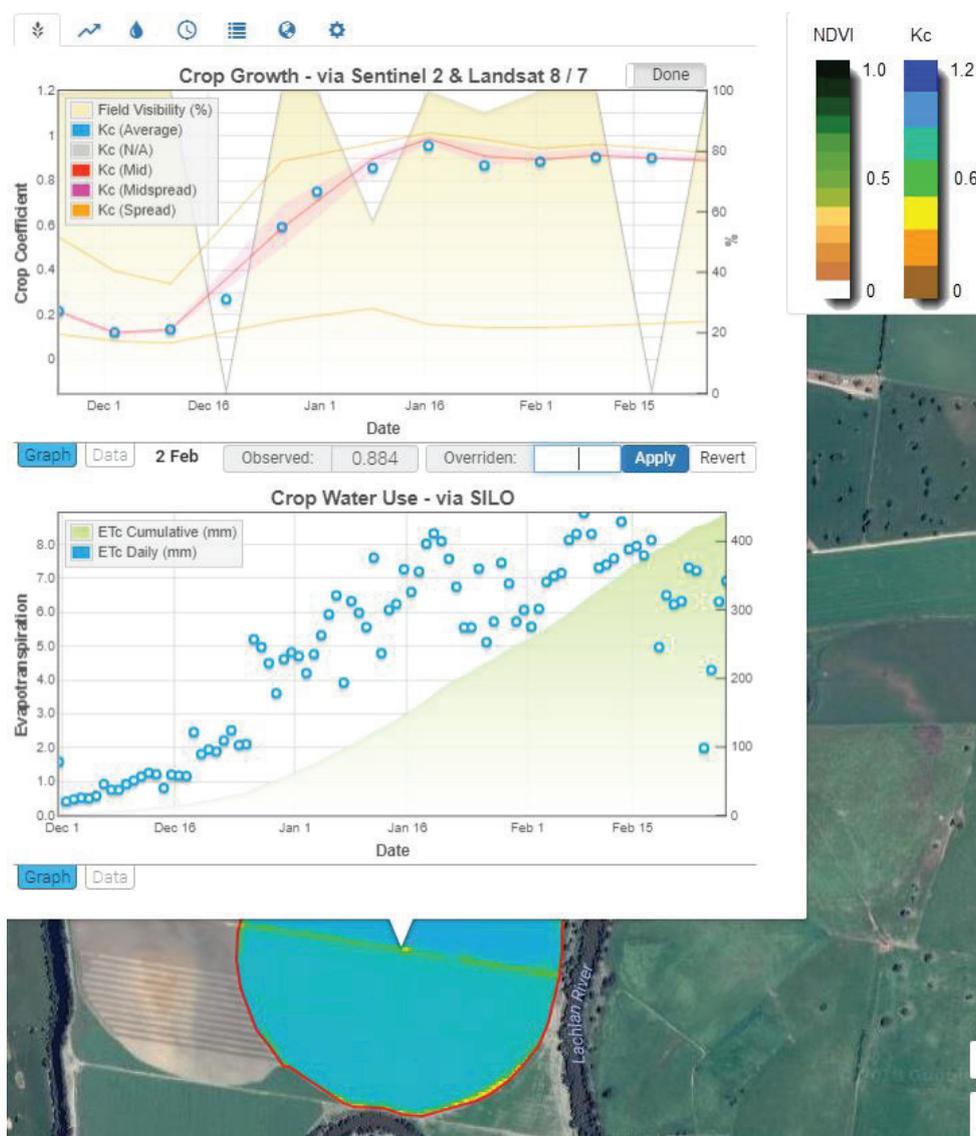
Figure 2. Growth stage of sweet corn.

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TOOLS TO HELP WITH IRRIGATION DECISIONS

Most irrigation decisions will derive from the grower's experience. There is a range of tools which can help growers make key irrigation decisions outlined above and deliver optimum yield and quality.

Technological development has seen crop evapotranspiration methods such as IrriSAT leapfrog other soil moisture monitoring methods.



Tools such as IrriSAT can provide reference evapotranspiration observations (ET_o) as well as useful 7-day forecasts of ET_o

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CROP DEVELOPMENT

Knowing how the crop is developing is important in keeping up with crop water requirements. In the example above, crop development drives most of the increase in crop water use. If you don't account for this when timing your irrigation there is a problem of getting behind with your irrigation. Walking your crop will give you information on its development. Linking this to crop water requirement is important when the crop is developing rapidly, as the example above demonstrates.

IrrisAT provides free access to weekly satellite images and automatically calculates the crop factor and crop water use. This tool is very useful when crop growth is rapid and crop water use is increasing. This crop-based irrigation support tool is ideal for sweet corn.

WEATHER

Reference evapotranspiration observations (ET_0) are readily available from Bureau of meteorology or from apps such as The Yield and IrrisAT.

Useful seven-day forecasts of ET_0 are also provided by IrrisAT and The Yield. Remember to take into account crop development to get ET_c otherwise you are not getting the whole picture.

SOIL MOISTURE

There are many soil-moisture monitoring systems available – from the spade to the various sensors. The big advance in technology has been in the communications with soil moisture monitoring systems sending information back to smartphone apps and/or computers.

The best use of soil moisture monitoring is to ensure that the soil is not drying out prior to peak crop water use. Also, soil moisture information can be useful when adjusting irrigation following in-crop rainfall.



There are a range of remote soil-moisture monitoring systems available which provide an accurate, timely and convenient means of monitoring soil moisture

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