Soil & Irrigation Fact Sheet

The Potato Crop

Crop Water Use

A potato crop will consume at least 400 mm (16") of water from planting to maturity. The actual water requirement depends on variety, crop vigour, and weather. The highest rate of water use occurs during the flowering and tuber bulking stages, which tends to coincide with the heat of the summer.

The BC Agriculture Water Calculator estimates a peak evapotranspiration (ET) of 4.3 to 4.7 mm/day in the lower Fraser Valley. Peak ET is derived from the maximum ET calculated over a 10-day period from 2001 through 2010. As the climate changes, peak evapotranspiration is likely to increase. When the potato crop is at full canopy and temperatures exceed 30°C, daily water demand can exceed 7.0 mm/day.

Daily crop ET (ET_{CROP}) can be calculated from weather information. BC's Farmwest network provides ET values from a network of weather stations located across agricultural production areas. Alternatively, many farmers opt to install their own on-farm weather station to get site-specific information, including ET.

DATE RANGE Jul 25 - Jul 31, 2022	TOTAL	DAILY AVERAGE
Evapotranspiration (mm):	36	5.1
Effective Precipitation (mm):	0	0
Moisture Deficit (mm):	36	5.1

Figure 2: Evapotranspiration report from Farmwest

Whether from Farmwest or an on-farm weather station, ET is reported as a "Reference ET" (ET_{REF}), which is the theoretical water demand from a well-watered short grass surface. Most crops, including potatoes, require an adjustment called a crop coefficient (K_C) which varies depending on the stage of the crop. For potatoes, the value ranges from 0.3 to 0.5 at planting, from 0.93 to 1.15 at row closure, and 0.7 as the crop approaches maturity. To determine the ET_{CROP}, the ET_{REF} simply gets multiplied by the K_C such that.

$$ET_{CROP} = ET_{REF} \times K_C$$

For example, at planting, if the ET_{REF} was 3.0 mm and K_C was 0.5, then the ET_{CROP} is 1.5 mm (3.0 mm x 0.5). K_C values for potatoes based on growth stage are shown in Figure 3.

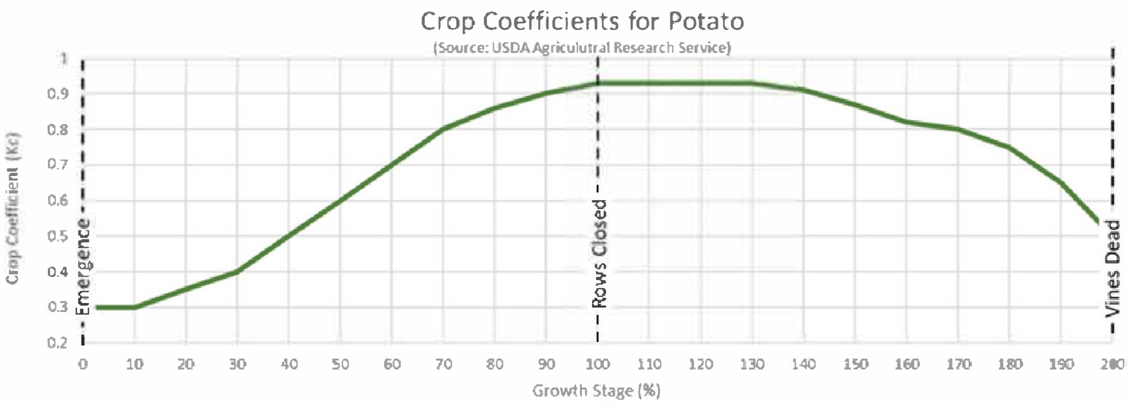

Figure 3: Crop Coefficients (K_C) values for potatoes

Root Zone

Potato roots are relatively shallow, reaching an effective depth of roughly 60 cm (24"). Therefore, when calculating plant available water, any moisture below that depth is considered unavailable. Approximately 70% of the water is extracted from the upper 30 cm.

Calculating the Water Balance

A simple method to determine the irrigation requirements of a crop is to keep track of the water balance. Also referred to as the checkbook method, this strategy is analogous to a financial balance sheet where each credit and debit are recorded and used to calculate the final balance. In the case of a crop, the credits are effective rainfall and irrigation while the debits are ET_{CROP} and runoff.

Over several days, the difference between ET_{CROP} and the rainfall and irrigation will show a surplus or a deficit. A deficit represents the approximate irrigation requirement to replenish the root zone. If the balance shows a surplus, the soil water content has increased over that period. If the amount of water added exceeds the water holding capacity of the soil, then the soil is likely to be at or above field capacity. When this occurs, no additional water should be credited as the excess water likely ran off the field or drained beyond the root zone.

An ideal time to start the balance sheet is just after a significant rain or irrigation when the root zone is at field capacity (FC). Since it takes some time for the soil to drain to FC, this deficit may remain at zero for a few days. The time to reach field capacity will depend on the soil texture and its internal drainage.

Whether using the simple checkbook method or more sophisticated software, it is always important to periodically check the soil and the crop to ensure that the water calculations remain on track. Checking the root zone by manually digging a hole or with a soil auger are excellent strategies to inspect irrigation performance. Alternatively, automated soil moisture sensors provide a continuous time series of measurements and a great deal of insight into soil water status.

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