Water for Profit

WHEN AND FOR HOW LONG SHOULD I IRRIGATE?

WATERFORPROFIT

Row crop micro-irrigation systems (drip) without overlap of water from emitters along the row

Calculating when to irrigate

You need to know:

- How much water is available in the soil? This requires an understanding of soil texture, decision on the maximum level of water stress to be applied to the crop and a measure of the crop rooting depth.
- How much water should the crop be using? This requires an understanding of type of crop, stage of crop growth and a measure of climatic conditions including evaporation.

Step 1: Calculate the readily available water (RAW) in the crop root zone.

Soil type (texture):		
Crop stress willing to be applied:		kPa
Crop rooting depth		
Early		m
Mid		m
Late		m

Table 1: Effect of soil texture on readily available water content

Soil Texture	Readily Available Water (mm_{water} per m_{soil}) between field capacity and;				
Crop Stress Level	-20 kPa	-40 kPa	-60 kPa	-100 kPa	-200 kPa
Sandy	30	35	35	40	45
Loamy Sand	45	50	55	60	65
Sandy Loam	45	60	65	70	85
Loam	45	65	75	85	105
Sandy Clay Loam	40	60	70	80	100
Clay Loam	30	55	65	80	105
Light Clay	27	46	57	70	90
Medium Clay	24	43	55	65	83
Heavy Clay	21	40	53	60	81

To calculate the RAW in the crop root zone

= RAW (in mm/m) x 3.14 x radius x radius (in m) x crop rooting depth (in m)

Early: mm/m x 3.14 x m x m x m = L/emitter

Mid: mm/m x 3.14 x m x m x m = L/emitter

Late: mm/m x 3.14 x m x m x m = L/emitter.

To calculate the RAW available per unit length of lateral

= RAW (L/emitter) ÷ emitter spacing (in m)

Early: L/emitter ÷ m = L/m of row

Mid: L/emitter ÷ m = L/m of row

Late: L/emitter ÷ m = L/m of row.

Step 2: Calculate the expected crop water requirement.

Crop water requirement (mm/day) = crop coefficient x evaporation (mm/day)

- Select the appropriate crop coefficient for your crop from the monthly crop coefficients (Kc) factsheet. Remember that your growing season may differ to the growing seasons shown in this table.
- For each month of the crop growing season, select the appropriate daily evapotranspiration rates (mm/day) and add them to the following table.
- Crop coefficient x evapotranspiration (mm/day) = crop water requirement (mm/day).

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily evapotranspiration (mm/day)												
Crop coefficient (Kc)												
Crop water requirement (mm/day)												

- Convert the crop water requirement (expressed in mm/day) to a volumetric measure.

1 mm of water applied = 1 L/m2

100 mm of water applied = 1 ML/ha

To convert the crop water requirement to an appropriate volumetric measure

= crop water requirement (mm/day) x crop canopy width (m)

Early: mm/day x m = L/day/m of row

Mid: mm/day x m = L/day/m of row

Late: mm/day x m = L/day/m of row.

Step 3: Use the data from steps 1 and 2 to work out the expected period between irrigations for each month

Readily available water (in soil) ÷ crop water requirement = irrigation interval

Early: L/m of row ÷ L/day/m of row = days

Mid: L/m of row ÷ L/day/m of row = days

Late: L/m of row ÷ L/day/m of row = days.

Calculating how long to irrigate

You need to know:

- Readily available water content of the area/volume wetted by the irrigation system
- Water application rate or discharge from the irrigation emitter/sprinkler.

Step 1: Calculate the readily available water (RAW) in the crop root zone.

Use the same steps as for Step 1 in the section calculating when to irrigate on the previous page.

Step 2: Measure the discharge from your irrigation application nozzle/emitter.

Discharge per emitter (L/hr) = volume in container (in Litres) ÷ time to fill container (in minutes) x 60 mins/hr

L ÷ mins x 60 mins/hr

Discharge rate = L/emitter/hr.

To calculate the discharge per metre of tape:

Discharge rate (L/m/hr) = discharge rate (L/emitter/hr) ÷ emitter spacing (m)

= L/emitter/hr ÷ m

= L/hr/m of row

Step 3: Use the data from steps 1 and 2 to calculate how long to irrigate.

To calculate the period of irrigation

= readily available water (L/m of row) ÷ discharge (L/hr/m of row)

Early: L/m of row ÷ L/hr/m of row = hrs

Mid: L/m of row ÷ L/hr/m of row = hrs

Late: L/m of row ÷ L/hr/m of row = hrs.

For more details contact the Growcom members access line on 07 3620 3844.

A Growcom project conducted in collaboration with the Queensland Department of Agriculture, Fisheries and Forestry and the National Centre for Engineering in Agriculture with funding provided by the Queensland Government's Rural Water Use Efficiency Initiative.

Queensland Government

NCEA

growcom