Water for Profit

WHEN AND FOR HOW LONG SHOULD I IRRIGATE?

WATERFORPROFIT

Tree/vine micro-irrigation systems without overlap of water from emitters along the row

Calculating when to irrigate

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 and understanding of type of crop, stage of crop growth, 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	
Month one:	m
Month two:	m
Month three:	m
Month four:	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 root depth (in m)

Month one: mm/m x 3.14 x   m x   m x   m = L/emitter

Month two: mm/m x 3.14 x   m x   m x   m = L/emitter

Month three: mm/m x 3.14 x   m x   m x   m = L/emitter

Month four: mm/m x 3.14 x   m x   m x   m = L/emitter

To calculate the RAW available for each tree/vine

= RAW (L/emitter) x number of emitters per plant

Month one: L/emitter x   emitters/plant   =   L/plant

Month two: L/emitter x   emitters/plant   =   L/plant

Month three: L/emitter x   emitters/plant   =   L/plant

Month four: L/emitter x   emitters/plant   =   L/plant

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 canopy area (m2/plant)

Month one: mm/day   x   m ^{2}/plant   =   L/plant/day

Month two: mm/day   x   m ^{2}/plant   =   L/plant/day

Month three: mm/day   x   m ^{2}/plant   =   L/plant/day

Month four: mm/day   x   m ^{2}/plant   =   L/plant/day

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

To calculate the period between irrigations

= RAW (L/plant)   ÷   crop water requirement (L/plant/day)

Month one: L/plant ÷   L/plant/day   =   days

Month two: L/plant ÷   L/plant/day   =   days

Month three: L/plant ÷   L/plant/day   =   days

Month four: L/plant ÷   L/plant/day   =   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 above.

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 total discharge per plant:

Discharge rate (L/emitter/hr)   x   number of emitters per plant

= L/emitter/hr   x   emitter/plant

= L/plant/hr

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/plant) ÷ discharge (L/plant/hr)

Month one: L/plant ÷   L/plant/hr   =   hrs

Month two: L/plant ÷   L/plant/hr   =   hrs

Month three: L/plant ÷   L/plant/hr   =   hrs

Month four: L/plant ÷   L/plant/hr   =   hrs

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