

Water for Profit



WATERFORPROFIT

When and for how long should I irrigate?

Travelling boom irrigation systems: Calculating when to irrigate

Need to know:

- How much water is available in the soil? (requires 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? (requires type of crop, stage of crop growth, measure of climatic conditions including evaporation)

Step 1: you need to calculate the readily available water (RAW) in the crop root zone.

Soil Type (texture):	Crop rooting depth:	
	Month 1:	m
Crop stress willing to be applied: kPa	Month 2:	m
	Month 3:	m
	Month 4:	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

$$\text{RAW (in mm/m)} \times \text{crop rooting depth (in m)}$$

Month 1:	mm/m	x	m	=	mm of water
Month 2:	mm/m	x	m	=	mm of water
Month 3:	mm/m	x	m	=	mm of water
Month 4:	mm/m	x	m	=	mm of water

When and for how long should I irrigate? Continued

Step 2: calculate the expected crop water use.

Crop water use (mm/day) = crop factor x evaporation (mm/day)

- Select the appropriate crop factor for your crop and growth stage from the following table.

Table 2. Crop factors for selected horticultural crops

Crop	Crop factors (K _c)		
	Early season	Mid season	Late season
Apples	0.45	0.95	0.7
Apricots/peaches	0.5	0.9	0.65
Asparagus	0.5	0.95	0.3
Avocado	0.6	0.85	0.75
Bananas – 1 st year	0.5	1.1	1.0
Beans (green)	0.5	1.05	0.9
Broccoli	0.7	1.05	0.95
Carrots		1.05	0.95
Cauliflower		1.05	0.95
Citrus	0.7	0.65	0.7
Grapes - table	0.3	0.85	0.45
Grapes - wine	0.3	0.70	0.45
Lettuce		1.00	0.95
Potato		1.15	0.75
Pumpkin		1.00	0.8
Squash, zucchini		0.95	0.75
Tomato		1.15	0.8
Watermelon	0.4	1.00	0.75

Crop factors vary with the stage of crop growth. For most tree crops, early season irrigation refers

to the period prior to flowering, mid-season refers to the flowering period and late season

refers to the fruit filling period.

- For each month during the crop growing period in your area, enter the appropriate daily evaporation rates (mm/day) in the following table.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily evaporation (mm/day)												

- For each month and crop growth stage, multiply the crop factor (K_c) by the daily evaporation rate to calculate the expected daily water use.

Crop factor	x	Evaporation (mm/day)	=	Crop water use (mm/day)
Month 1:	x	mm/day	=	mm/day
Month 2:	x	mm/day	=	mm/day
Month 3:	x	mm/day	=	mm/day
Month 4:	x	mm/day	=	mm/day

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 use	=	irrigation interval
Month 1:	mm ÷	mm/day	=	days
Month 2:	mm ÷	mm/day	=	days
Month 3:	mm ÷	mm/day	=	days
Month 4:	mm ÷	mm/day	=	days

When and for how long should I irrigate? Continued

Calculating how long to irrigate

Need to know:

- readily available water content of the area/volume wetted by the irrigation system
- water application rate or discharge from the travelling irrigator

Step 1: you need to 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.

Discharge from one nozzle (L/hr) =

$$\text{volume in container (in litres)} \div \text{time to fill container (in minutes)} \times 60 \text{ mins/hr}$$

$$\text{L} \div \text{mins} \times 60 \text{ mins/hr}$$

Discharge from one nozzle = L/hr

To calculate the total discharge rate for the boom

$$\text{Total discharge (L/hr)} = \text{discharge from one nozzle} \times \text{number of nozzles on boom}$$

$$= \text{L/hr} \times$$

$$= \text{L/hr}$$

If you want to calculate the above application rate in mm/hr

$$\text{Discharge (mm/hr)} = \text{discharge (L/hr)} \div \text{distance travelled in 1 hour} \div \text{wetted width}$$

$$= \text{L/hr} \div \text{m} \div \text{m}$$

$$= \text{mm/hr}$$

Step 3: use the data from steps 1 and 2 to calculate required speed of the traveller.

To calculate the speed of travel required to apply the RAW

For travelling boom systems:

$$\text{Speed (m/hr)} = \text{total discharge rate (L/hr)} \div \text{wetted width (m)} \div \text{RAW (mm)}$$

Month 1: L/hr ÷ m ÷ mm = m/hr

Month 2: L/hr ÷ m ÷ mm = m/hr

Month 3: L/hr ÷ m ÷ mm = m/hr

Month 4: L/hr ÷ m ÷ mm = m/hr

For more details contact the Growcom members access line on 1800 654 222

Disclaimer: This information is provided as a reference tool only. Seek professional advice for irrigation specifics.



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