Water for Profit

CONVERTING READILY AVAILABLE WATER TO HOURS OF IRRIGATION – DRIP SYSTEMS

WATERFORPROFIT

Introduction

Where the irrigation water and plant roots are evenly distributed over the whole planting area, water storage and plant water use are commonly measured in mm. However, where drip irrigation is used, the irrigation water and roots are only distributed over a small area of the field.

In these cases, it is often easier to use litres to describe both the water use and water storage in the plant root zone. This also has the advantage of enabling the simple calculation of irrigation time as the discharge from drip systems is also commonly reported in litres/hour.

1 mm depth of water = 1 L applied to 1 m^2

Calculating the volume to be applied by micro-irrigation

The volume of root zone wet by micro-irrigation will depend on the size and shape of the wetting pattern. However, where the drip patterns overlap, it can be assumed that a wetted strip or "sausage" shaped wetted pattern is produced.

In this case, the volume of water to be applied can be estimated from the readily available water content of the soil, the width and length of the wetted strip and the depth of the active root zone.

Volume to be applied (L) = RAW (mm/m) x bed width (m) x bed length (m) x active rooting depth (m).

Example for a whole lateral: For a lateral length of 200 m, bed width of 1 m, RAW of 45 mm/m and an active rooting depth of 0.3 m, the volume that should be applied = 45 x 200 x 1 x 0.3 = 2700 L/lateral.

Example for a unit length of lateral: As the discharge from most drip irrigation systems is reported in L/m/hr, it is useful to calculate the volume of water to be applied per metre of drip line. The same equation as above is used but in this case the bed length is set at one metre. Hence, using the example above, the volume to be applied to each m of the bed length would be

= 45 x 1 x 1 x 0.3 = 13.5 L/m.

Where the wetting patterns do not overlap

Where the wetting patterns do not overlap, it is necessary to calculate the wetted volume assuming a cylinder, hemisphere or cone shaped wetting pattern. For example, if the root zone wet by a dripper on a sandy soil (RAW = 35 mm/m) is approximated by a cylinder 0.2 m in radius and 0.5 m deep, then the volume to be applied by each emitter will be:

= RAW x ÷ πr^2 x depth = 35 x 3.14 x 0.22 x 0.5 = 2.2 L/emitter.

Measuring the discharge from emitters

Even though the manufacturer normally specifies the output of the drippers it is best to check the actual discharge as your system may be operating at a different pressure or affected by blockages and wear. Discharge can be checked by digging a hole under the emitter and using a container to measure the volume emitted over a known period. The discharge per m length of tape can be calculated by:

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

For example, where the emitters are discharging at 2 L/hr and are spaced at 0.4 m intervals, 2 ÷ 0.4 = 5 L/m/hr.

Calculating the hours of irrigation

The irrigation time can be determined from the volume to be applied and the discharge rate of the drippers. Hence:

Irrigation time (hours) = volume to be applied (L) ÷ emitter discharge (L/hour)

Example 1: if the volume to be applied is 13.5 L/m of bed and the emitter discharge rate is 5 L/m/hr then the irrigation time will be = 13.5 ÷ 5 = 2.7 hours (or two hours and 40 mins).

Example 2: if the volume to be applied is 2.2 L/emitter and the emitter discharge rate is 2 L/hour then the irrigation time = 2.2 ÷ 2 = 1.1 hours (or one hour and six minutes).

For more details contact Growcom on 07 3620 3844.

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