



# readily available water (RAW)

SERIES 1: IRRIGATION FARM RESOURCES

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## How much water is readily available to plants?

Not all water held in the soil is readily available to plants. Some water is bound so tightly to soil particles it cannot be used by plants. For irrigators it is useful to know how much water is readily available for plant use.

### ► What is RAW?

Readily available water (RAW) is the water that a plant can easily extract from the soil.

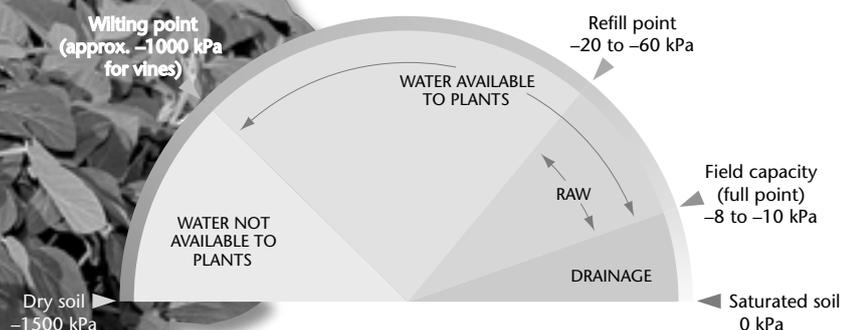
RAW is the soil moisture held between field capacity and a nominated refill point for unrestricted growth. In this range of soil moisture, plants are neither waterlogged or water-stressed.

Plant roots will continue to take water from the soil after the refill point is reached, but this water is not as readily available and the crop finds it difficult to extract. If the soil dries to the permanent wilting point, the plant can no longer remove any water from it: some water may still be present but is completely unavailable.

The drier the soil, as shown by high tensiometer values, the more water needs to be added to bring the soil back to field capacity. These values are presented in table 5 as millimetres of moisture available per centimetre of soil depth. The figures in kPa across the top of this table correspond to the figures that you would find on a tensiometer gauge.

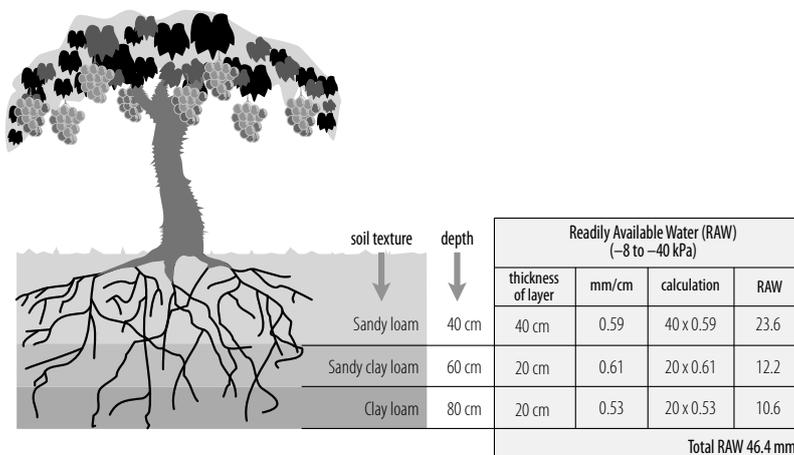
So, for a sand (S) at a tensiometer reading of  $-40$  kPa, you would need to supply  $0.36$  mm of water for each centimetre depth of soil to bring the soil to field capacity. At  $-1500$  kPa (much drier – beyond the values on a tensiometer gauge) you would need to supply  $0.62$  mm of water for each centimetre depth of soil to reach field capacity.

**Soil water content.** Depending on the type of crop, RAW for horticultural crops is usually the amount of water held between field capacity ( $-8$  to  $-10$  kPa) and  $-20$  to  $-60$  kPa. The most common refill value for perennial horticulture in the Mallee is  $-40$  kPa.



## ► Calculating RAW

To calculate rootzone RAW, multiply the **thickness** of each soil layer (in centimetres) by the RAW of that layer (table 1). Then add the values for each soil layer in the rootzone to get the total rootzone RAW.



This means that, in this case, when irrigating you should apply approximately 45 mm in order to refill the rootzone once your tensiometers have reached -40 kPa. Further sampling or soil moisture monitoring will refine this figure.

Table 1. Readily available water (mm/cm) stored between -8 and -1500 kPa

Texture grade	Soil water deficit (mm/cm)				
	-8 to -20 (kPa)	-8 to -40 (kPa)	-8 to -60 (kPa)	-8 to -200 (kPa)	-8 to -1500 (kPa)
sand (S)	0.33	0.36	0.38	0.40	0.62
loamy sand (LS)	0.45	0.52	0.55	0.58	0.87
clayey sand (CS)*	–	0.55	0.60	0.64	1.00
sandy loam (SL)	0.46	0.59	0.65	0.70	1.15
light sandy clay loam (LSCL)	0.45	0.65	0.74	1.03	1.37
loam (L)	–	0.69	0.84	1.00	2.43
sandy clay loam (SCL)	0.39	0.61	0.71	1.01	1.44
clay loam (CL)	0.30	0.53	0.65	0.73	1.48
clays (SC, LC, LMC, MC)	0.27	0.46	0.57	0.66	1.49
heavy clay (HC)**	–	0.25	0.41	0.49	1.20

\* Interpolated value \*\* Samples from Kununurra, WA

Source: K. G. Wetherby, soil survey and land use specialist. This table is the result of detailed field and laboratory studies on 360 samples from the Murray Mallee and Barossa Valley in South Australia.

## ► Further reading

NSW Agriculture 2002 *Irrigation for Horticulture in the Mallee* available from NSW Department of Primary Industries Bookshop on 02 6391 3994.

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