

Soil water holding capacity

Soil water is made up of plant available and plant unavailable water. *Plant available water* is the water in the soil profile between the *full point* and *permanent wilting point* (when the plant can no longer be revived by irrigation or rainfall). Within plant available water is *readily available water* (RAW). This is the water the crop can easily access. When the RAW has been used up the soil is regarded as being at the *refill point*.

Irrigation scheduling aims to replace the RAW. But before scheduling decisions can be made the amount of RAW in the root zone needs to be known.

To determine the RAW you need to know:

- The effective rooting depth – how much of the soil profile are roots accessing?
- The soil texture – soil texture influences the soil's water holding capacity.
- The soil tension where crops begin to stress – for sugarcane this is about -100 kPa.

Effective rooting depth

The best way to determine the effective rooting depth is to dig a hole in the crop row and measure how far down the majority of the roots go.

Table 1: Typical RAW for a range of soil types, sugarcane experiences stress at -100 kPa.

Readily available water (mm water per m soil) between field capacity and different stress levels					
Soil texture	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

Soil texture

Many soil tests now report soil texture. If the test doesn't have soil texture then it can be determined by hand texturing (see chart).

If there are different soil layers within the effective rooting zone the soil texture for each layer needs to be determined.

Calculating RAW

Once the rooting depth and soil texture are known the RAW in the root zone can be calculated by multiplying the depth of the root zone (m) by the typical RAW (mm/m) at a given soil tension (Table 1).

For example: Rooting depth is 40 cm; soil texture is a sandy loam; soil tension for irrigation is -100 kPa. From Table 1 the RAW (mm/m of soil) at -100 kPa is 70 mm. RAW in the root zone is then 70 mm × 0.4 m = 28 mm.

Using RAW for scheduling

When the RAW is known, crop water use numbers (see Crop Water Use Information Sheet IS13023) can be used to calculate when the crop will again require irrigation. If the RAW is 28 mm and the crop is using 14 mm per week; it will need to be irrigated in two weeks time.

Determining soil texture by hand texturing

