

Making a soil moisture probe

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Agriculture NSW Water Unit

A simple way of judging the depth of soil wetting after irrigation or rain is to use a soil moisture probe or push probe. The soil moisture probe may be used in irrigated or rainfed systems to determine the depth of wet soil. This is because soils loose strength when wet so the probe easily penetrates the wetted profile but finds resistance to penetration when it reaches dry soil. Dry soil retains its structural integrity and will resist the push probes passage. Using this information and the depth to which the probe can be pushed into the soil will provide you with information about strength of resistance of soil and if the soil is wet, the lack of resistance, and to what depth the soil has a lack of resistance or is wet. Measuring the depth of wetted soil provides useful information about how plant roots can access soluble nutrients within the soil profile. The root zone is determined by the plants grown.

Figure 1 Using a soil moisture probe to check a wheat crop



To determine the depth of water penetration during or shortly after irrigation, simply push the probe into the wetted soil. The depth of wet soil can be read off the probe by adding up the number of marks covered with soil and multiplying by 10 to determine the depth in centimetres. Additional marks right around the probe at 500 mm and 1000mm will assist reading the depth of probe penetration.

The probe works very well during irrigation when the water has penetrated 0.2–1 m and the soil is still fairly dry at depth. It is not sensitive when the soil is already quite wet throughout the profile, because there is very little difference in resistance.

Information about how deep soil is wet may be used to determine if the root zone of the crop or pasture is wet or not. In rainfed systems, the wetness of the soil profile can determine if a crop or pasture:

- can be planted;
- the amount of pasture likely to be grown from a rainfall event; or,
- if grain fill is likely to occur from stored soil moisture,
- if major events like flowering will occur in a particular pasture species.

These are all important production questions worthy of consideration.

Making a soil moisture probe

The probe can be made from 10–12 mm diameter stainless steel round bar, about 1.65 metres long, forming a T-handle at one end and a sharpened tip at the other. Mark 10-cm intervals along the length of the probe.

Make the handle of 26 mm outside diameter pipe cut 30 cm long so that it fits into both hands.

Make the base of the tip piece slightly wider than the rod by:

- building up some stainless steel weld and then sharpening the tip;
- hard facing welded thicker than the rod and ending in a point; or,
- by welding a sharpened stainless steel bolt to the end of the rod.

The bulbous tip means the diameter of the hole in the soil is slightly larger than the diameter of the rod. This reduces friction on the side of the rod, so that the only resistance when pushing through the soil is at the tip of the rod. Stainless steel should be used to prevent rust increasing the resistance to soil penetration.

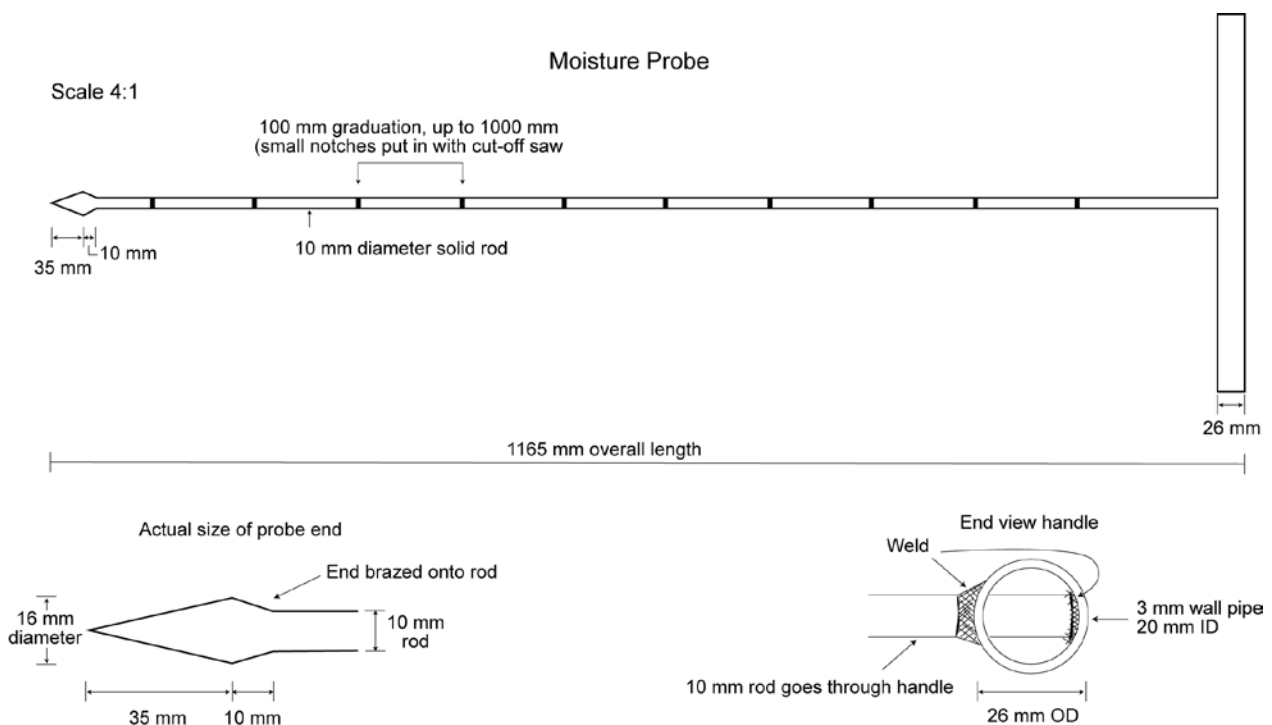


Figure 2 Stainless steel probe tip



Using the soil moisture probe

Push the probe into the soil and assess the depth of the soil's resistance. Recording the position in the field and the depth of resistance will provide useful data of soil moisture in the profile and at a number of points in and across the field.

Measure the penetrated depth by reading the marks on the probe. If you repeat this procedure systematically across the paddock, you will get a good idea of water penetration across the area. In an irrigation setting, a probe can also be useful to measure sideways spread into the beds when you are looking at furrow irrigation.

The soil texture will have an impact on the operation of a soil moisture probe. The probe does not work well in fine-textured or dense subsoils. Knowing your soil texture is valuable information in determining water holding capacity of your soil. The fact sheet on determining soil texture will assist in determining your soil texture and can be found at http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0005/164615/soil-texture.pdf

When using the probe to determine when to stop irrigating, remember that after irrigation the wetting front will continue to move downward for several days. Manage drainage below the root zone by timing the application of irrigation water to cease before the wetting front has penetrated the full depth of dry soil in the root zone. This will maintain fertilizer nutrients within the root zone and within reach of the plant. If using a saline water supply then you may need to flush the wetting front to just below the root zone to prevent salt damage to crops.

Acknowledgments

Edward Joshua Development Officer Irrigation (Broadacre) Central NSW

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