

# Soil Moisture Monitoring in Onions

On the north west coast of Tasmania onions are grown extensively on krasnozem soils. These soils are medium to heavy in clay and are well drained. The topography is undulating and the predominant irrigation system are travelling boom guns.

Many growers are now using a neutron probe for irrigation scheduling. Monitoring the soil water status on a regular basis has identified soil structural problems, causing low crop water use and consequently a poor yield. The following is an example of poor water infiltration following an irrigation which is very typical of a large number of sites monitored on the north west coast, in the 1989/90 onion season.

## Monitoring Depth of Water Extraction

It is important for farmers to know the depth of water extraction of onions for irrigation scheduling. On these well drained soils farmers must be careful not to over irrigate and cause water to drain below the root zone.

The root extraction pattern for onions is shown in Figure 1. Following an irrigation of 26mm on the 27/12 the soil profile reading is shown for the 29/12 with water being added to 60cm. Between the 29/12 and 2/1 the onions used water at 20, 30, 40cm at 2.7mm/day. From the 2/1 to the 4/1 the onions continue to use water at 20, 30, and 40cm at 2.2mm/day. Between the 4/1 and the 9/1 the onions daily water use declined to 1.1mm/day indicating the onset of water stress occurred on the 4/1. This has forced the onions to use water at deeper depths including 20, 30, 40, 50, 60 and 80cm (Figure 1). The most important root zone being 0-50cm.

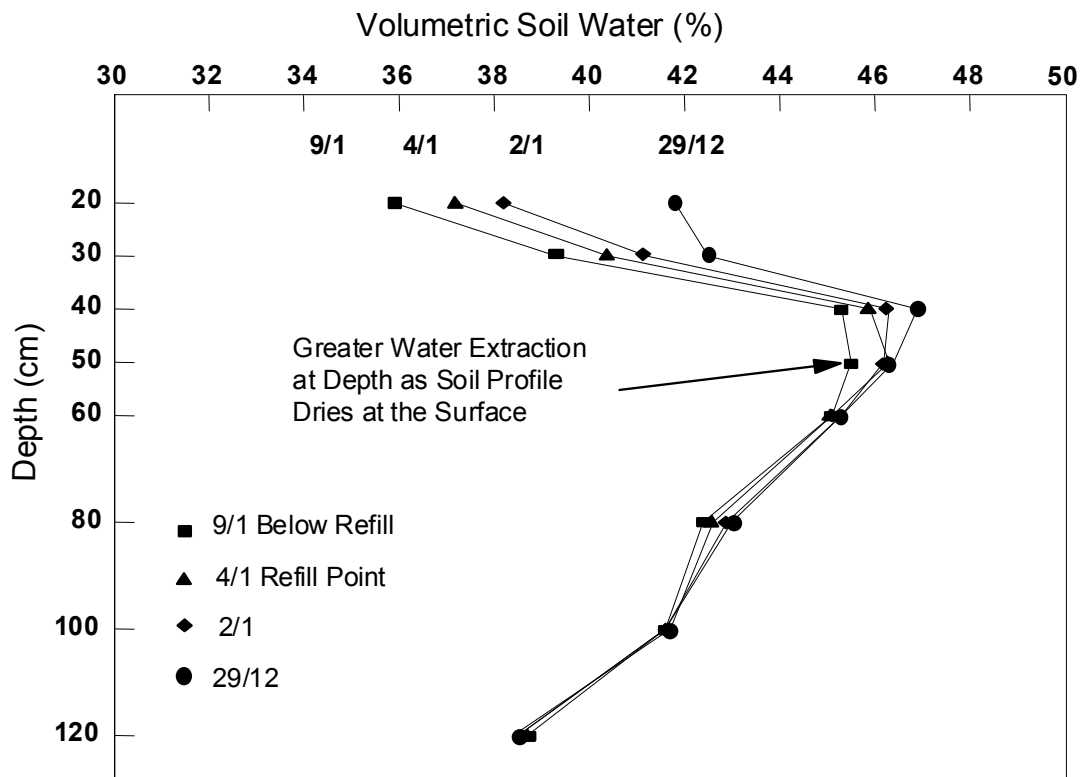


Figure 1. Water extraction by onions

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## Monitoring Depth of Irrigation Water Infiltration

The crop was then irrigated on the 10/1 with 15mm of water applied. The neutron probe reading on the 10/1 after the irrigation shows the profile is wetter at 20cm and slightly wetter at 30cm representing a total increase of 9mm in the profile (Figure 2).

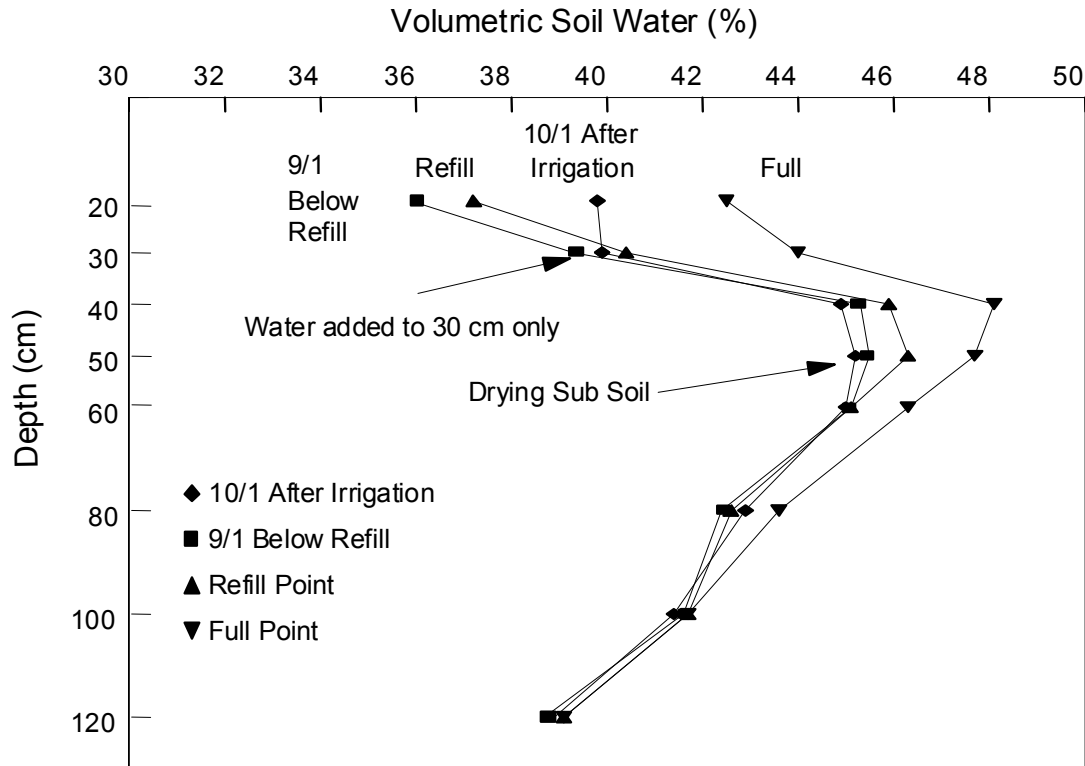


Figure 2. Poor water infiltration following an irrigation in onions

On the surface, to the farmer, the irrigation looked like it had done a good job. However the 40 and 50 cm readings show that this part of the root zone is still below the refill point and the profile at 60 and 80 cm is right on the refill point after the irrigation on 10/1. This means that when the profile at 20 and 30 cm dries out the crop will rapidly run out of water as the reserves in the rest of the profile are already depleted, catching the farmer by surprise and the crop will be subjected to another period of water stress.

Clearly much of the applied water had not entered the profile as there is no evidence of through drainage, a common problem on these soils. Analysis of the soil moisture readings at 20, 30 and 40cm readings for the whole season confirmed the poor water infiltration.

Figure 3 shows the VSW% for 20, 30 and 40cm for the whole season. The 20cm and 30cm readings show similar trends, wetting with irrigations and rain, and drying with crop water use and water extraction. At 40cm the VSW% has not increased despite irrigation and rainfall. The onions used water at 40cm between the 4/1 and 9/1 (Figure 1) and the VSW% at 40cm dropped below the refill point on the 4/1 until early February (Figure 3). There was no infiltration of irrigation water to 40cm during January to replace water extracted between 4/1 and 9/1. The VSW% at 40cm only increased at the end of the season due to excessive rainfall. There is a general

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downward trend for each of the 20, 30 and 40cm readings implying poor water infiltration for the whole season.

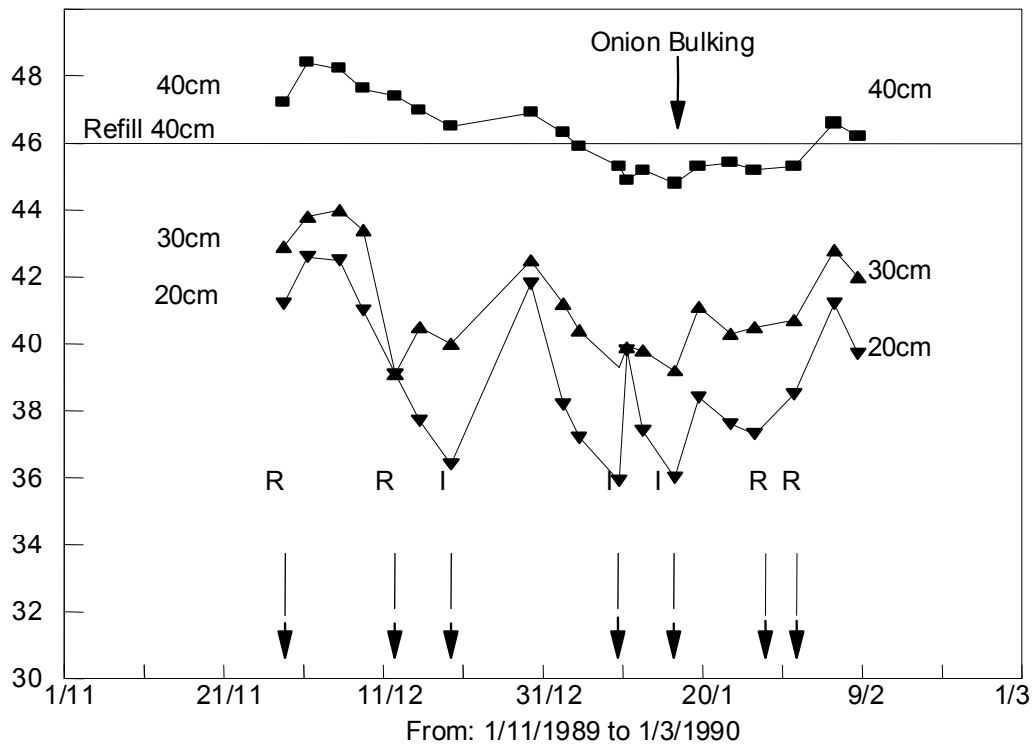


Figure 3. Poor water infiltration

## Summary

Monitoring the soil moisture status in onions has identified poor water infiltration of irrigation water. This has subjected the onions to periods of water stress indicated by the low daily water use as measured using the neutron probe. Figure 3 shows clearly that the 40cm reading was below the refill point during the critical stage of onion bulking resulting in a poor yield at the end of the season.

The large droplet size of water from the boom guns is breaking down the soil structure on the surface causing poor infiltration, runoff and erosion. In the following season growers must look carefully at their probe readings following irrigations to identify ineffective irrigations.

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