

Deep Drainage under Sprinkler Irrigation at Waikerie

A major inefficiency of irrigation farming is putting on too much water at each irrigation. Deep drainage occurs causing agronomic and environmental problems and higher pumping costs for farmers.

Alan Hillier is a farmer from the Waikerie district and grows citrus, stone-fruit and vines under sprinkler irrigation. Alan, a relative newcomer to the industry, suspected that the irrigation practices of the previous owner needed changing. For the 1991/92 season a neutron probe was used at three sites to evaluate these practices.

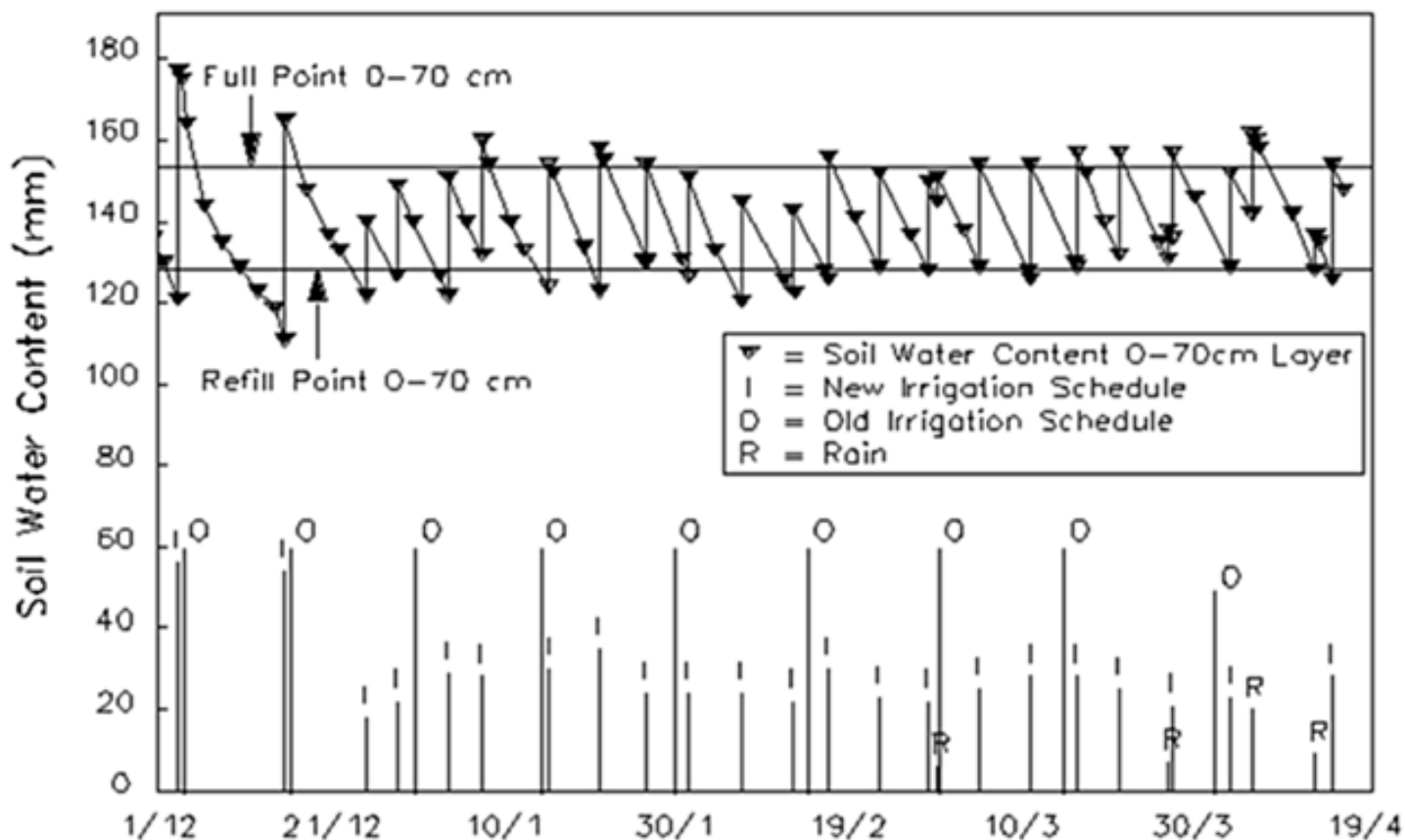


Figure 1. Deep Drainage of Irrigation Water

A series of readings at one of these sites with the neutron probe was started on 3/12 following an irrigation of 60 mm (Figure 1). The second reading on 4/12 shows that water had moved down the profile from 20 and 30cm into 40 and 50cm and that water was being lost from 60, 80 and 100cm – ie, deep drainage had occurred. On 6/12 a significant amount of water had moved out of the profile at all depths. On 8/12 deep drainage had slowed and by 10/12, with no change in water content at 80 and 100cm, it had ceased. The change in soil water between 8/12 and 10/12 was a typical extraction pattern and shows the root activity of the citrus trees. Comparing this extraction pattern to the pattern of the preceding days showed that 35 mm of the 60 mm of irrigation water applied was lost via deep drainage.

As a result changes were made to the irrigation schedule. A full point of 155mm and a refill point of 127mm were set for the 0-70cm root zone – a deficit of 27 mm (Figure 2). The aim was to irrigate when the soil water content fell to 127mm, but to only add an amount of irrigation water that would get the soil to the full point of 155mm. Most of the applied water would remain in the root zone, 0-70cm, keeping deep drainage to a minimum.

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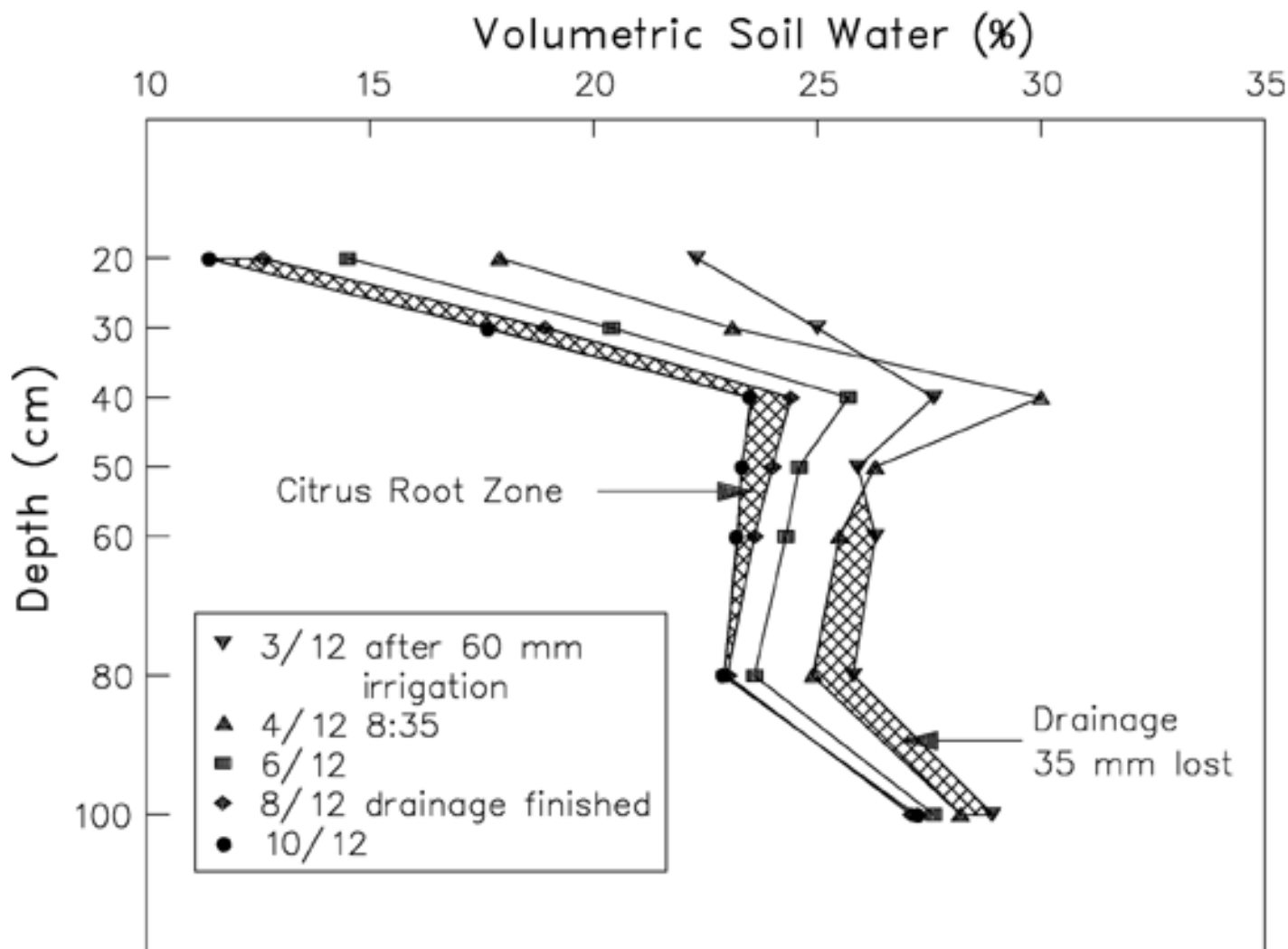


Figure 2. Soil Water Content of Valencia Oranges

The irrigation schedule for the season (I), the old irrigation pattern (O) and the 0-70cm soil water content for the season are illustrated in Figure 2. Irrigations of 25-35mm were applied as required during the season. This was more frequent than previous seasons, when 50-60 mm was applied at about 15 day intervals.

The soil water content was kept in a range from 120-160mm for the season. This was a little outside the intended range, but a vast improvement on the range of 110-180mm produced at the start of the season. As a consequence there was far less leaching of water and valuable nutrients from the profile. The supply of water was better matched with tree demand, resulting in more efficient use of water and better crop growth. This should result in yield improvements in forthcoming seasons.