Using a Wheat Rotation to Repair Soil Compaction

Soil compaction is a problem common to agriculture throughout the world. Australia is no exception and the heavy clay soils in North West NSW are particularly susceptible to compaction especially when they are wet. This application note is an example of the use of a rotation crop to improve the structure of a heavy cracking clay with a compaction problem on Telleraga Station west of Moree in North-West NSW.

Field 16 had grown cotton for three years and analysis of the neutron probe readings for the 1985/86 season showed that it had become compacted. In Figure 1 the full and refill points shown are for the 85/86 cotton season. When these soils are in good structural condition a cotton crop will extract water from a depth of 60 cm or more. However the neutron probe readings in this field show that the crop did not extract moisture from below 50cm indicating a compacted soil.

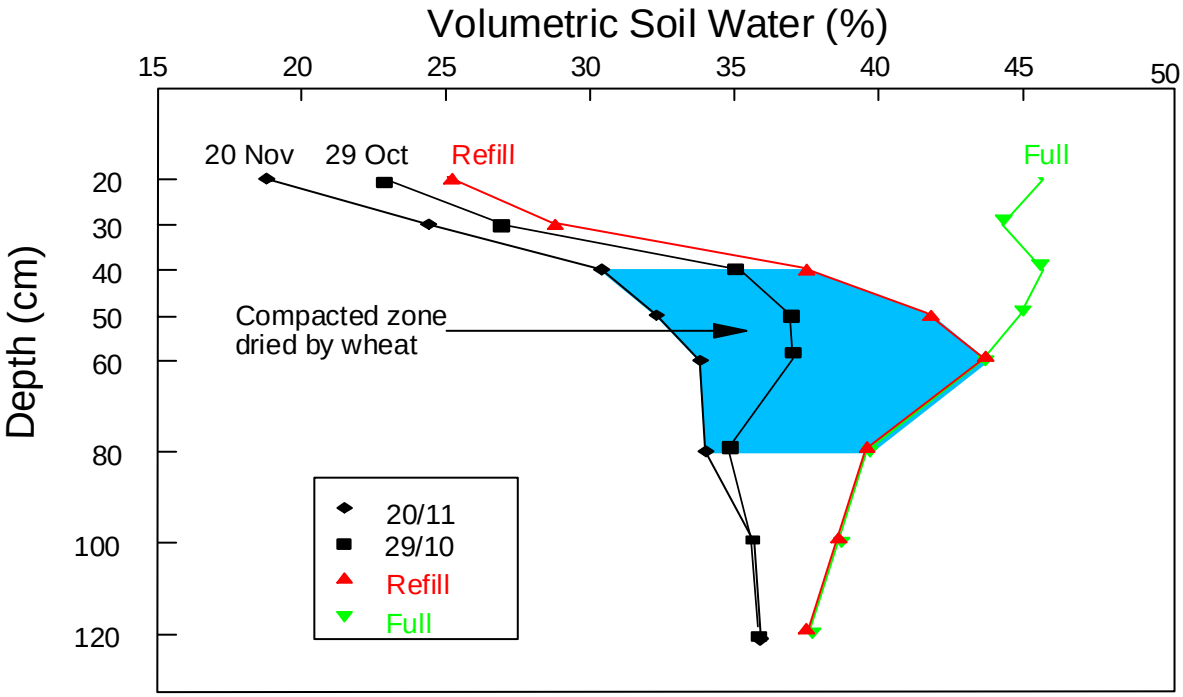

Figure 1. Cotton Refill Points Field 16 Telleraga Station 1985/6.

After the cotton crop was picked in April 1986 it was decided to rotate the field and wheat was planted in May 1986. The two readings on the 29 October and 20 November show how the wheat crop dried the soil profile especially in the compacted zone of the profile.The drying and cracking of the soil at 30, 40, 50 and 60cm, the shaded area in figure 1 are important to ameliorate soil structure as these depths are often compacted and are not readily ripped.

The result of this drying and cracking can be seen in figure 2. The full and refill points for the cotton crop grown in the following cotton season of 1987/88 show that the crop extracted water more readily at 40, 50 and 60cm as shown by the shaded area. This shaded area represents an additional 14mm of water available to the cotton crop following the rotation wheat crop.

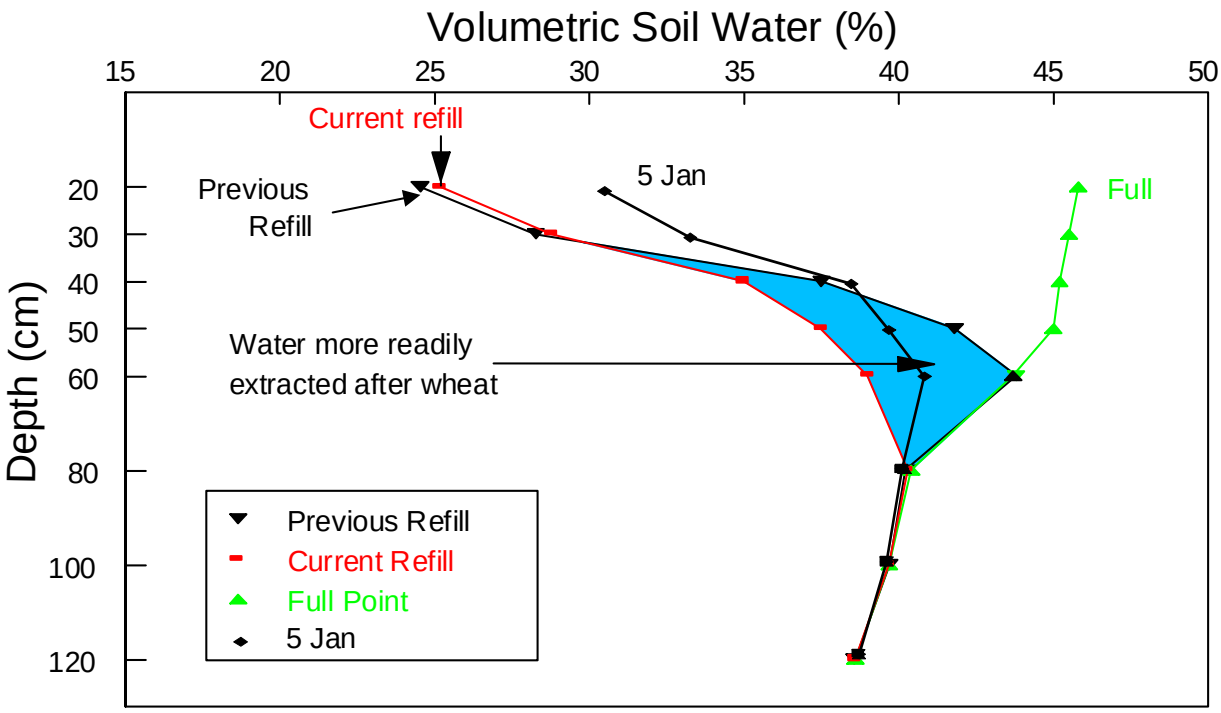

Figure 2. Cotton Refill Points Field 16 Telleraga Station 1987/8

The extra 14mm of available water meant that the refill point was lowered from 237mm to 223mm and this lengthened the time between irrigations by 2-4 days. One example of how this can benefit a crop is shown in Figure 3. On 18 January the profile was at 230mm when 52mm of rain fell. With the previous refill point the field would have been watered the previous day and the rain would have severely waterlogged the crop causing a yield loss. The lower refill point helped avoid this. Even if there is no rainfall an extra 2-4 days between irrigations would mean less irrigations in total during the season and so less waterlogging events and less potential for rainfall just after irrigation to cause severe waterlogging.

Soil compaction places the plant under stress as it is more difficult to extract water from the soil. The more readily available water from the improved structural conditions means better conditions for plant growth. The improved soil structural condition will increase crop daily water use and total crop water use. Yield is related to total crop water use so the field will have a higher yield potential after the wheat crop.

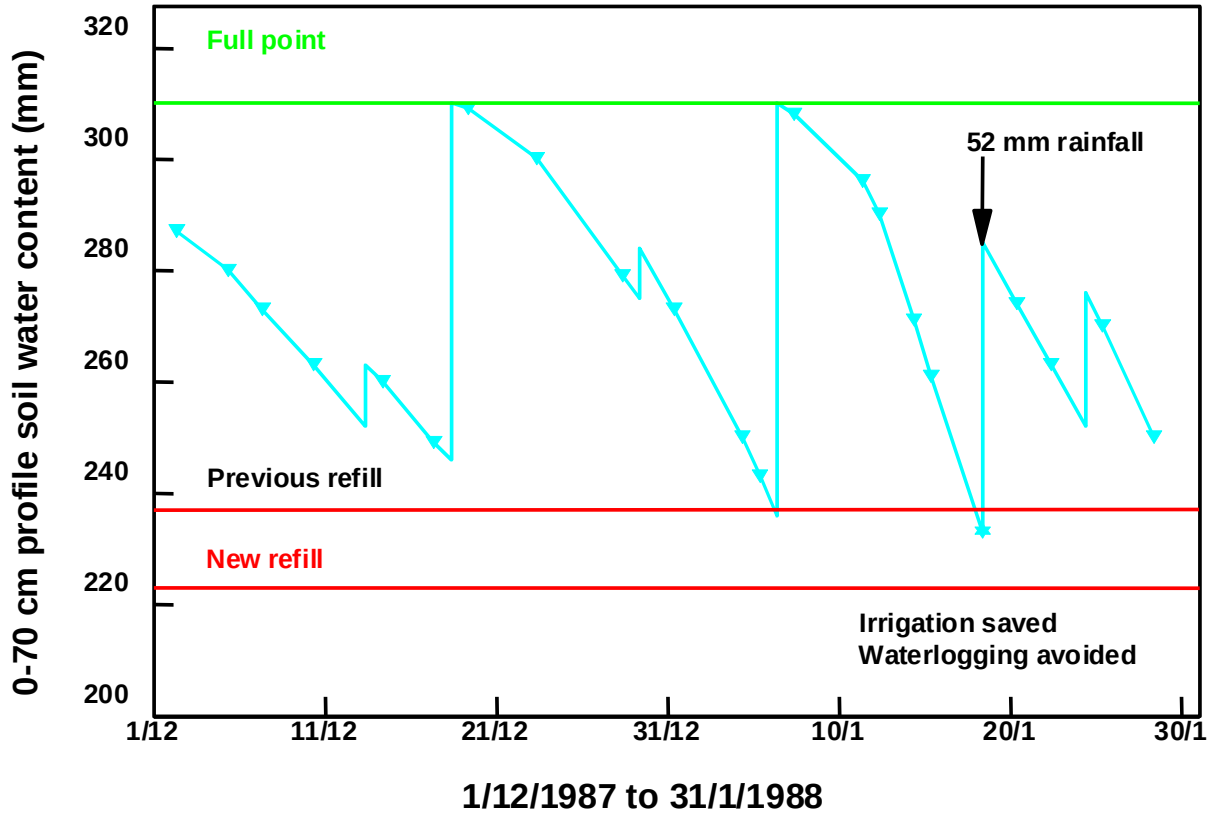

Figure 3. Cotton Soil Water Content Field 16 Telleraga Station 1987/8

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