Soil Compaction and the Deficit

Considerable soil structure degradation has occurred in many cotton fields during the past three seasons. This has been caused by picking and tillage operations during the wet winters of 1988, 1989 and 1990. Soil compaction as a result of these operations will have a significant impact on the irrigation schedule in the following year.

The following example demonstrates how a wet pick in the previous season influences the irrigation schedule. Growers need to be aware of this in the current irrigation season.

The Deficit

The deficit is how many mm of water the profile is below the full point. A deficit of 80-90 mm is typical for heavy clay soils around Moree which have good soil structure. It is most important to realise that the deficit will be different for every field and change from year to year depending on the history of wet picking and tillage operations in each individual field.

The Daily Water Use

Frequent neutron probe readings (2 - 3 times/week) enables the daily water use of the crop to be determined. The daily water use will decline, assuming constant weather conditions, when the refill point has been reached.

Table 1. Regular neutron probe readings showing probe daily water (probeDWU)

Date	-	-	2/1	5/1	9/1	11/1	12/1	13/1	14/1	14/1	16/1	18/1	20/1	22/1	24/1	25/1
Time	-	-	8:00	8:00	8:00	8:00	8:00	8:00	8:00	8:00	8:00	8:00	8:00	8:00	8:00	8:00
Depth	Full	Refill	Irri	Probe	Probe	Probe	Probe	Probe	Probe	Irri	Probe	Probe	Probe	Probe	Probe	Probe
20cm	46.6	26.5	-	42.9	40.7	37.0	35.4	34.4	33.3	49	45.8	42.8	40.6	37.4	34.9	34.7
30cm	45.0	33.0	-	44.3	43.0	40.6	39.0	38.3	37.3	(0)	45.0	44.1	42.9	40.6	39.0	37.3
40cm	48.5	40.5	-	48.5	47.9	45.8	45.3	44.3	43.7	-	48.1	48.0	46.9	45.3	43.9	45.5
50cm	47.0	42.3	-	46.9	46.7	46.0	45.8	45.3	44.9	-	46.4	46.1	45.7	45.2	44.3	43.6
60cm	45.5	43.0	-	45.2	45.5	45.1	45.3	44.9	44.7	-	44.8	44.8	44.4	44.3	44.4	43.8
80cm	41.8	42.0	-	41.7	41.8	42.3	41.6	41.8	41.7	-	41.7	41.8	41.7	41.6	41.4	41.7
100cm	41.7	41.0	-	42.0	41.9	42.0	41.7	41.8	42.0	-	41.8	41.5	41.9	41.7	41.9	41.8
120cm	40.5	37.6	-	40.5	40.4	40.4	40.5	40.6	40.4	-	40.1	40.2	40.2	40.5	40.4	39.9
0-70cm	325	247	-	315	308	293	287	281	276	325	321	312	304	291	281	279
25-70cm	209	180	-	208	206	200	198	195	193	-	207	205	202	198	194	192
0-130cm	573	488	-	563	556	542	534	530	524	-	568	559	551	539	528	526
Deficit	0	79	-	11	18	33	39	44	49	0	4	13	22	34	44	46
ProbeDWU	-	-	-	1.3	1.8	7.5	6.0	5.4	5.0	-	2.0	4.4	4.4	6.3	5.0	2.2
Est DWU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Effect of Compaction

The full and refill points shown in Figure 1 have been transferred from the previous seasons data in this field. Last year this field had a 79mm deficit which is typical of good fields in the area.

The rest of the neutron probe data in Figure 1 is for the following irrigation season. Following the 2nd crop irrigation on the 2/1 a low daily water use (1.3mm and 1.8mm) is evident on the 5/1 and 9/1 due to water logging and cool temperatures. On the 11/1 the water use was 7.5mm/day The daily water use then dropped to 5.0mm/day and it was decided to irrigate this crop again, based on crop symptoms and the reduced daily water use at a deficit of 49mm.

A similar pattern of water use was evident between the 3rd and 4th crop irrigations. Between the 14/1 and 16/1 a daily water use of 0.0mm/day was recorded due to water logging. This increased to 4.4mm/day as the crop recovered from the water logging to a peak of 6.3mm/day on the 22/1. By the 25/1 the daily water use had dropped to 2.2mm/day at a deficit of 47mm.

This is a similar deficit to the previous irrigation, indicating that the refill point had changed from a deficit of 79mm which it was in the previous season to a deficit of 47mm. The values (VSW%) for 25/1 should be used to replace the previous years refill point.

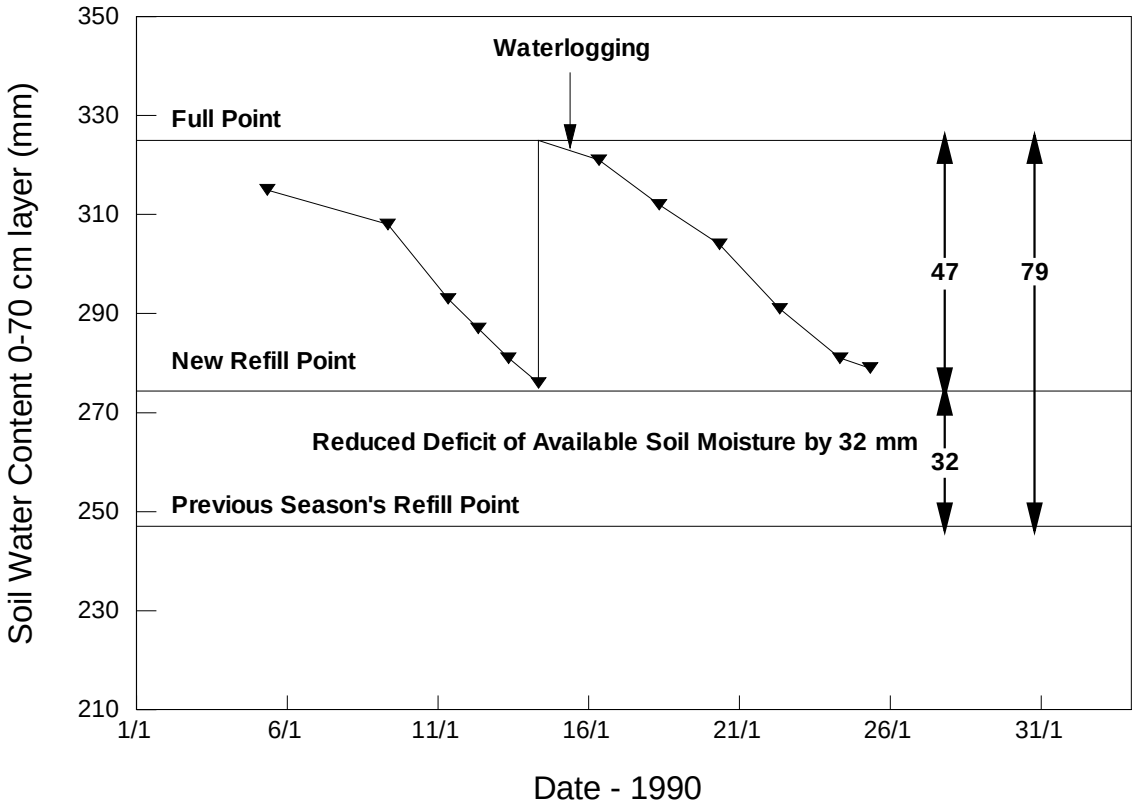

Figure 1. Reduced Deficit due to Soil Compaction.

Summary

Wet picking reduced the deficit by 32mm in one season due to soil compaction (Figure 2). Irrigators should be aware of an expected reduced deficit following wet harvesting and tillage operations in the previous season. Careful monitoring of the crops daily water use and root extraction patterns as well as crop observations will enable refill points to be set correctly.

ICT International Pty Ltd
PO Box 503, Armidale NSW 2350, Australia
Ph: [61] 2-6772-6770 Fax: [61] 2-6772-7616
sales@ictinternational.com.au
www.ictinternational.com.au