Irrigation Scheduling of Maize

This technote outlines the value of monitoring individual fields as field specific characteristics arise due to each fields' farming history. The dollar gains from recording soil moisture with a neutron probe and then analysing the data, using **the Probe** software, are highlighted by studying an irrigated maize crop grown at Forbes in NSW, Australia. The field is 40 Ha., flood irrigated, has a Sandy Clay Loam and was cropped in the 1996/97 season. Neutron probes are widely used in the district for irrigation scheduling and monitoring of the water tables.

With the high capital cost of irrigation systems, a crops overhead costs are increased. Farmers must more effectively manage their available resources to capitalise on their investment. If you look at irrigation as an insurance policy to safe guard your investment in land, labour, seed, fertiliser etc., then one must constantly review their position to get the best out of the insurance policy. So, just as the insurance broker reviews policies to helps the farmer get the most cost effective policy, irrigation scheduling helps the farmer to manage his crops water requirements to minimise water waste and maximise yield plus quality through timely irrigations.

Like many crops grown under irrigation, high yielding maize crops require soil moisture monitoring to schedule irrigations so water can be applied at the right time to eliminate any moisture stress that will adversely affect yield and dollar returns. Figure 1 shows the relationship between a maize plants dry weight and water requirement.

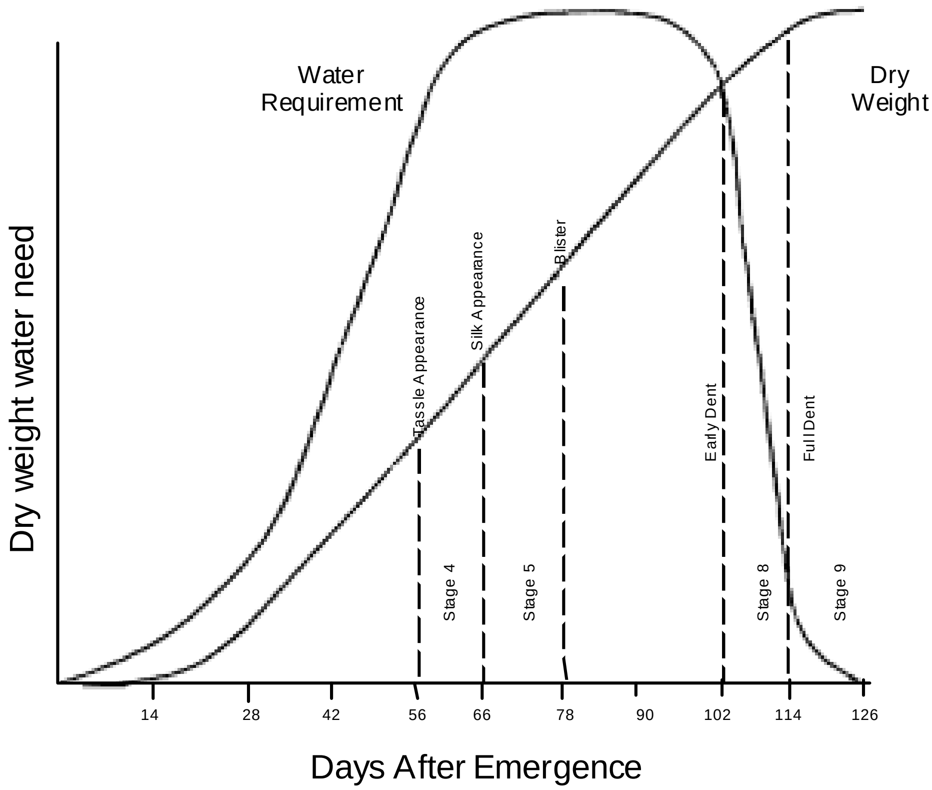


Figure 1. The relationship between a corn plant's dry weight and water requirement

During the critical flowering and pollination period, maize yields can be reduced by up to 8% per day of moisture stress. By the time you visually identify leaf margins beginning to roll, the damage is done. The final irrigation must be applied so the grain filling will continue unabated till maturity. Yield declines of 1% per day due to moisture stress are possible during the last ten to fourteen days of grain fill.

Many booklets on maize growing suggest the need to irrigate is every 14 days in hot dry weather when flood irrigating. The grower had planned to irrigate every ten days depending on rain, using a "rule of thumb" from previous years, plus had a consultant measure soil moisture using a Neutron Probe to compare the two methods.

The following points characterised the crops available soil moisture: (see Figures 2-6, pg 3).

- The fields full point was set after rain in October. (Figure 2.)
- Rain on 21/11 infiltrated the soil to a depth of 50cm, and all seemed O.K. (Figure 2.)
- Water infiltration problems start appearing after the first irrigation. Water infiltrated to 40cm, the available moisture added was 35 mm when the deficit was 54 mm.
- At the second irrigation, the above result got worse with only 24 mm infiltrating. (Figure 3).
- The third irrigation, however, filled the profile up by 38 mm and to 50cm, but still far below the initial full point.
- By the fourth irrigation, only 25 mm was added to the top 20cm which was then repeated on a regular basis till the last irrigation. (Figure 4).
- The last irrigation had similar infiltration to that of the first. (Figure 5).
- 13 irrigations all up were applied with a total of 10 megalitres per hectare used. (Figure 6).

By using a Neutron Probe to accurately quantifying the soil moisture and then analyse the data using **the Probe** software, the consultant was able to confidently advise the grower to irrigate earlier and more frequently due to the reduced infiltration. This ensured the crop didn't stress for moisture at critical stages of development. As the level of infiltration fluctuated throughout the crops life, the consultant was able to quantify the changes and advise on appropriate irrigation timings. The end result was there were 13 irrigations, however the grower saved the crop from stress during flowering. This alone avoided an estimated 30% yield loss. The crop yielded 13 t/Ha.

The irrigation efficiency was 33%. This was less than half the expected 75% due to the poor infiltration and frequent irrigating. The crop used a total of 510 mm of plant available moisture from a gross applied (irrigation and rainfall) of 1,238 mm.

However, the value of the increased production was equal to 4 t/Ha. x say $165/t, so the grower effectively increased his gross income by $660/Ha. This far outweighs the greater expenses incurred from the need to irrigate more frequently.

In summary, two hectares of the increased production paid for the consultant. The grower could have purchased a complete probe package and 21 Ha. of the increased production would have paid for the package in that year alone. Further, the importance of monitoring each field is highlighted with the infiltration problem being specific to this field only. A neutron probe and **the Probe** software allows farmers to better manage their crops through quantified information and thus insure themselves against poor yields and possible economic loss.

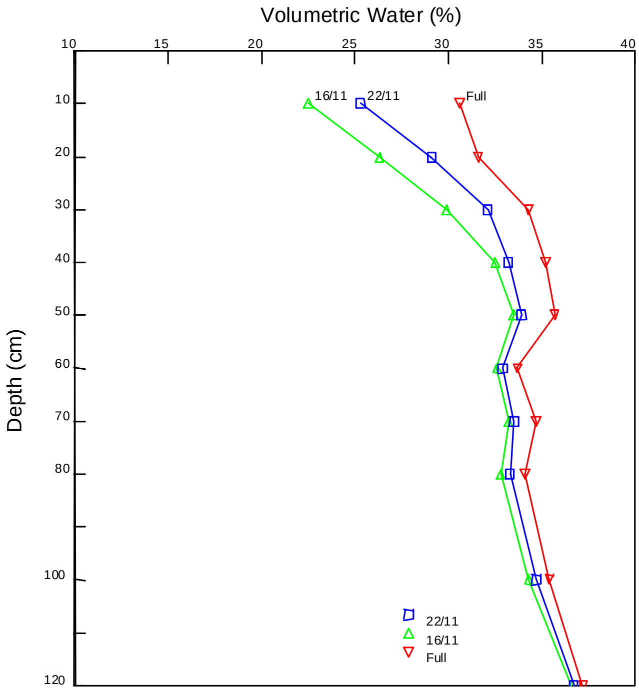


Figure 2. Rainfall Event mid-November

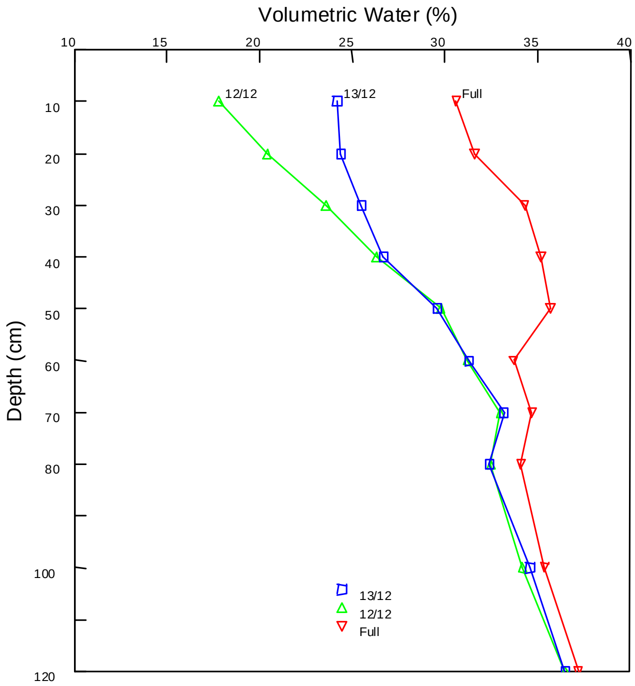


Figure 3. Reduced infiltration after 2nd irrigation

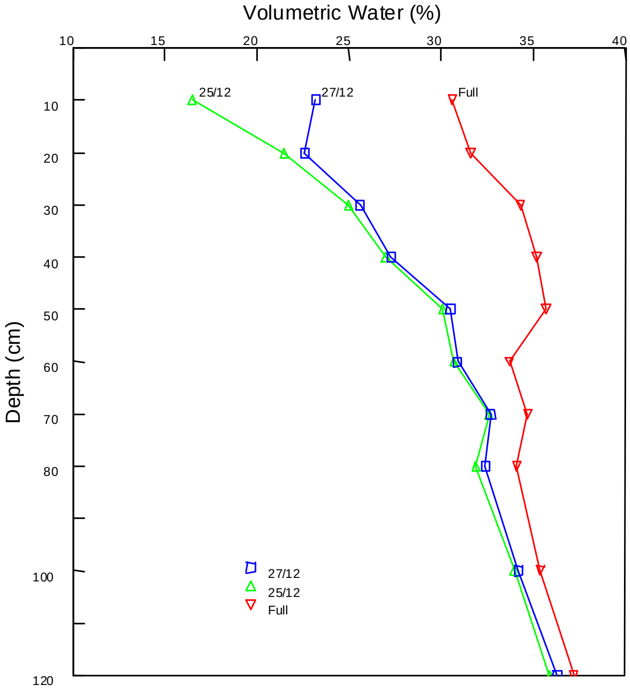


Figure 4. Further reduction in infiltration after fourth irrigation.

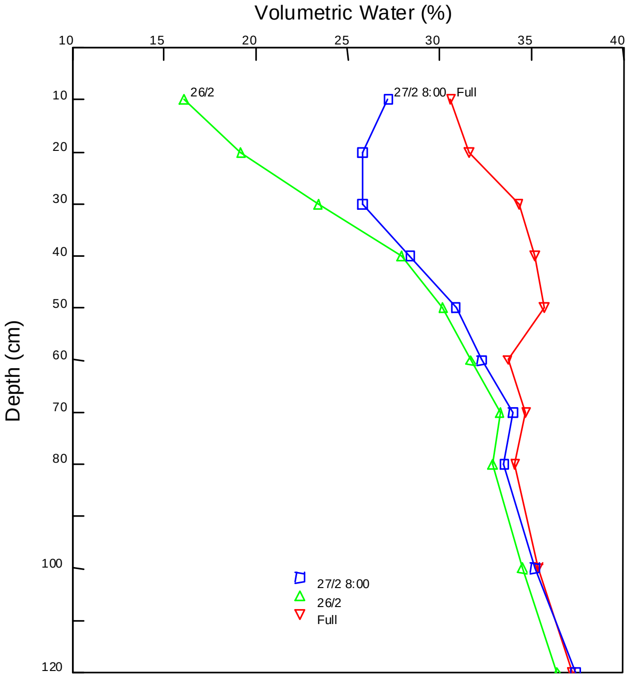
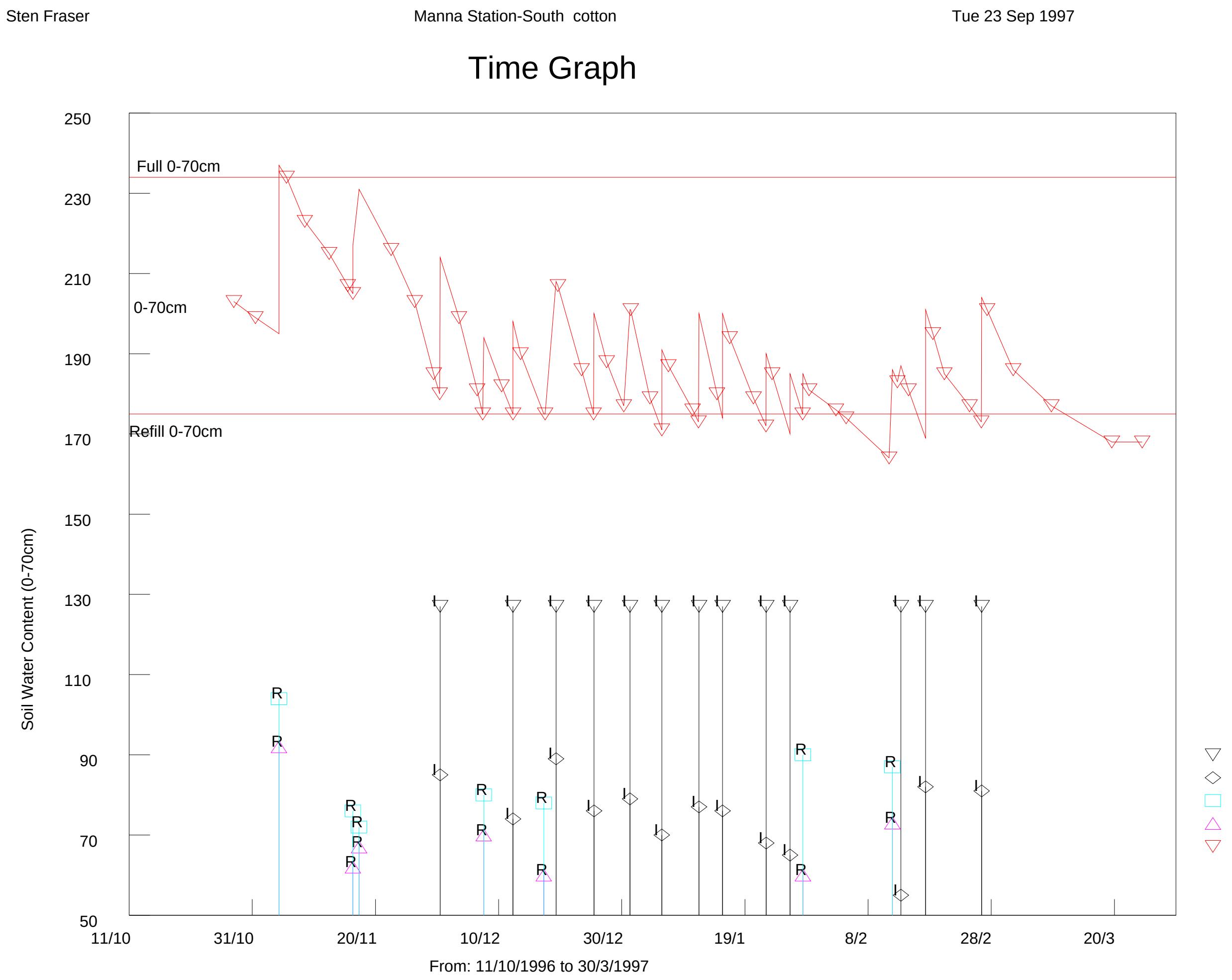


Figure 5. Infiltration after last irrigation



Depth	Full	Refill	Previous	Current	Days	PDWU	Date	EDWU	Date	Amount
0-70cm	234	175	168	168	4.9	-0.0	<fill	5.8	<fill	59 mm

Figure 6. Depth graph for 96/97 season

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