# Real Time Dynamic Monitoring of Soil Salinity Improves Management of Grass Irrigation at ICBA

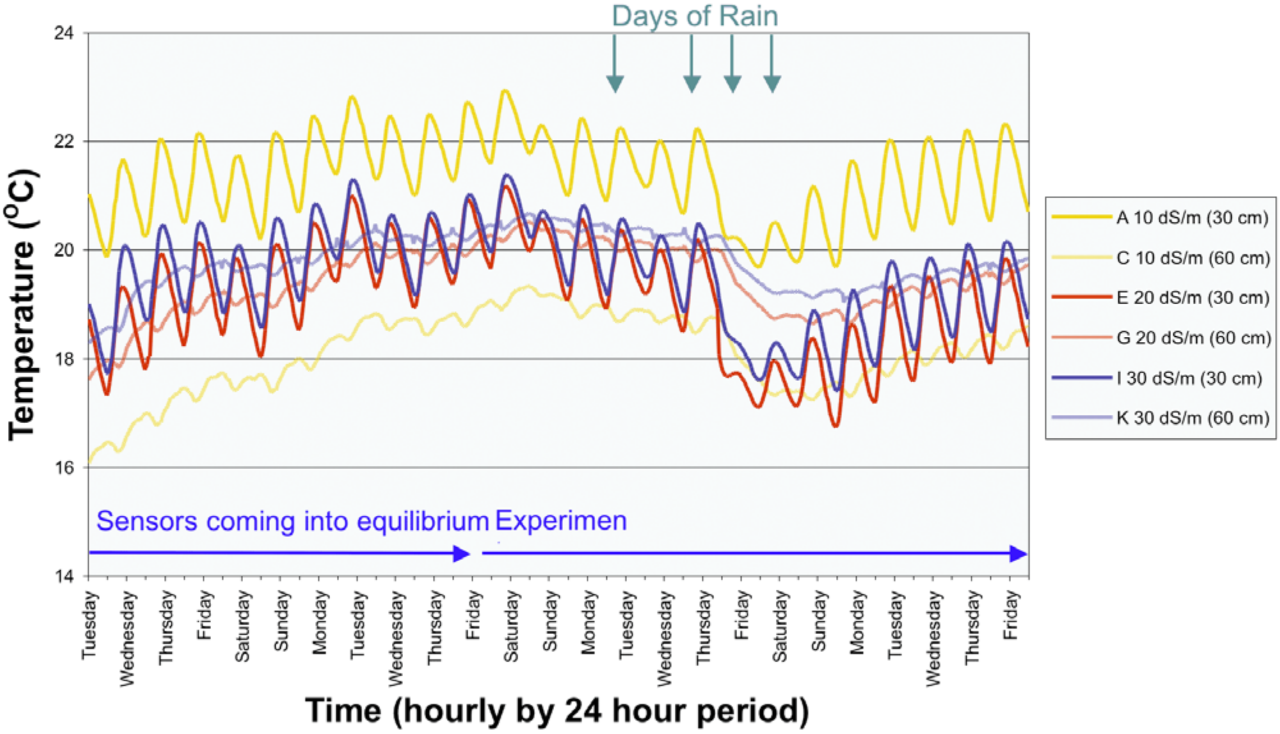
A greatly improved understanding of the dynamic behavior of salinity of soil solutions is now possible due to the recent installation of a Soil Salinity Monitoring Station at ICBA. Hourly data logging of soil salinity and temperature using soil salinity sensors connected to a “Smart Interface” enables direct and dynamic monitoring of soil salinity EC in units of dS/m corrected to 25°C. This system was installed, and training in operation and data interpretation was carried by Dr Peter Cull from ICT International; an Australian company which specializes in soil moisture, salinity and plant water use monitoring instrumentation.

Each salinity sensor is fitted with an external Smart Interface that includes an integrated microprocessor. This interface contains all the required information to allow autonomous operation of the sensor, including power requirements and logging interval. The Smart Interface resolution is 16 Bit offering highly precise and accurate recording of the salinity sensor.

A feature of this salinity monitoring field station is that is does not require any knowledge of electronics or computer programming. To operate the salinity station simply plug in a salinity sensor and the Smart Logger will then search the DataBus and automatically identify the number of salinity sensors connected and begin logging them at hourly intervals. For custom configuration of the Smart Logger or salinity sensors a simple menu system can be accessed through HyperTerminal that provides complete control over each individual sensor’s set-up. Instantaneous readings from sensors can be viewed on the logger’s display directly in the field without the need for a laptop. Data can also be accessed in the field by memory stick or remotely using a mobile phone modem. This data is then available for graphing and interpretation in Excel.

The monitoring is taking place in Field 10 which is being irrigated with 10, 20 and 30 dS/m salinity water. Salinity sensors have been buried at 30 cm and 60 cm. The dynamic changes of soil salinity within an irrigation cycle are showing the effect of the salinity of the irrigation water on the salt concentration in the rootzone of the grass and how this is constantly changing under irrigation. The installation at ICBA of the salinity monitoring system and resultant data is clearly outlined in “Installation of Soil Salinity Station” available on www.ictinternational.com.au/salinity.htm.

**Figure 1. Soil Temperature (*Distichlis spicata*)**



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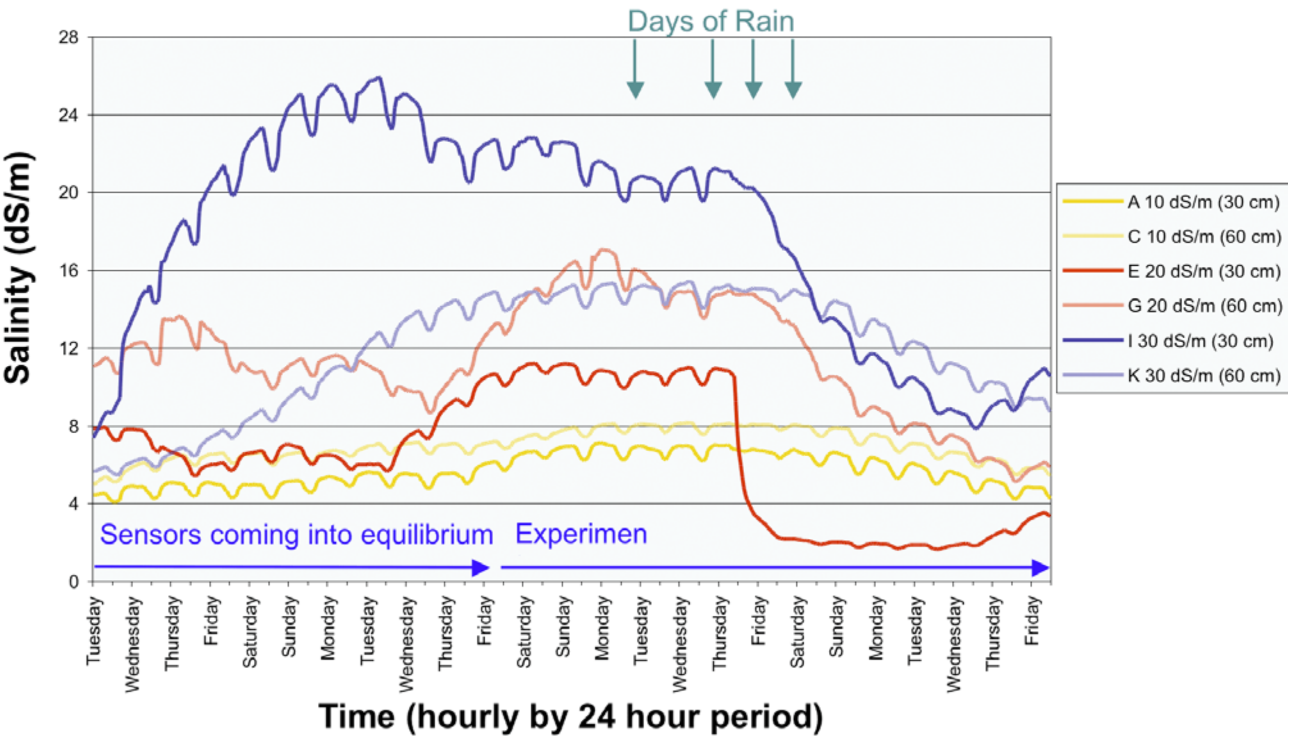
The soil temperature is recorded enabling the correction of the soil salinity EC to units of dS/m at 25°C. However the soil temperature readings can also be used to give assistance with interpretation of soil moisture movement as no soil moisture sensors were installed. This soil temperature data shows:

- Diurnal fluctuation in 30 cm temperature and a more stable temperature at 60 cm (Figure 1).
- After rainfall the soil temperature decreased at both the 30 cm and 60 cm depths (Figure 1). This indicates rainfall infiltration to 60 cm. This was associated with a fall in soil salinity after the rainfall at both 30 cm and 60 cm (Figure 2).

**Figure 2. Soil Salinity (*Distichlis spicata*)**




The soil salinity data in the Distichlis shows:

- After initial installation it takes about 10 days for the sensors to come to equilibrium with the soil solution. This is especially for the 30 dS/m treatment (Figure 2).
- Salinity levels for the 10 dS/m irrigation water treatment are stable and typically 6-8 dS/m with little change after rainfall (Figure 2).
- Salinity levels for the 20 dS/m irrigation water treatment are 10 dS/m at 30 cm and 14-16 dS/m at 60 cm under standard irrigation and management practice. Rainfall rapidly reduces the salinity level at 30 cm and 60 cm. At 60 cm the salinity level falls by 8-10 dS/m from 16 to 6 dS/m (Figure 2).
- Salinity levels for the 30 dS/m irrigation water treatment are above 20 dS/m at 30 cm and 14-16 dS/m at 60 cm under standard irrigation and management practice. These values are higher than for the other treatments reflecting the higher salinity of the applied irrigation water (Figure 2).
- The sensitivity of the sensors to changing soil salinity levels is illustrated by both the diurnal fluctuation of salinity levels and the rapid changes that were measured after rainfall. Diurnally the data is indicating a slight decline in soil salinity as the soil dries between 9:00 am and 4:00 pm, when irrigation water is again applied to the treatments (Figure 3).

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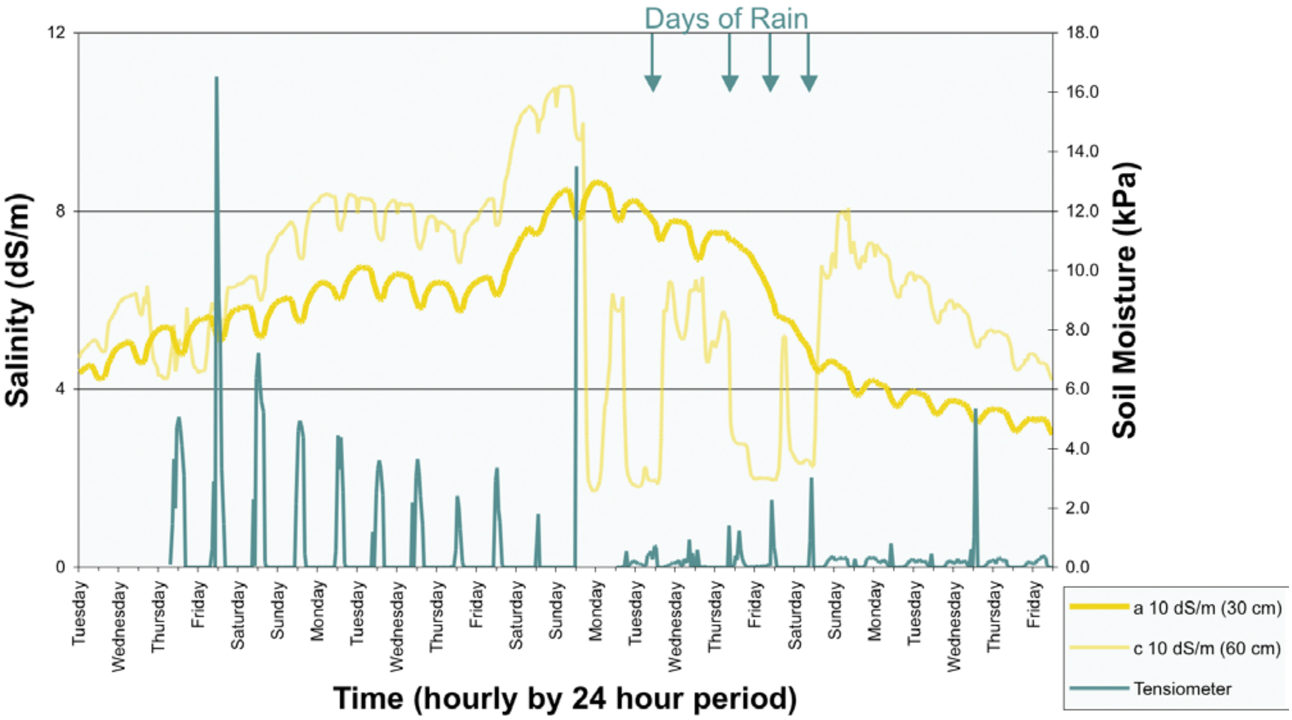
The soil moisture (tensiometer) was data logged in only one treatment 10 dS/m at 30 cm in Sporobolus (Figure 3).

- The soil tension levels are 0 kPa from 4:00 pm to 9:00 am each day indicating that the soil at 30 cm is at field capacity overnight. Each day the tensiometer first increases suction at the 9:00 am reading as the soil begins to dry from plant water use. The soil suction is driest at 1:00 pm each day and typically prior to the rainfall events 2-4 kPa at 1:00 pm. After this time the soil suction declines due to upward flux of water from depths below 30 cm at a rate sufficient to satisfy the demands of plant water use. This flux will impact the salinity levels within the profile and indicates the necessity to monitor closely soil water movement and soil salinity dynamics at the same time.

**Figure 3. Soil Salinity and Moisture (*Sporobolus virginicus*)**

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