The application of the electro-magnetic induction conductivity meter to detect latent salinity in alluvial soils

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Latent salinity in the alluvial soils of the Lockyer Valley is extensive. This salinity is due to the inherent salinity of some soils such as the Clarendon series (black earth) and saline water tables close to the soil surface (approximately 3.0 m) that occasionally rise to the root zone. Under normal climatic conditions these areas behave as prime agricultural land. However, in wet years the irrigated soils become saline. These alluvial soils have a sandy layer at approximately 1.5-2.0 m depth which improves their overall drainage. Consequently, the soils arc difficult to identify from general observations and require elaborate soil survey techniques which are expensive in time and resources. The electro-magnetic induction conductivity meter (EMIC) is a rapid non-destructive method to measure soil salinity. This instrument has been used for salinity survey on soils developed *in situ (1),* however, it has not been used on alluvial soils.

Methods

A grid survey (60m x 40m) was undertaken of several arable alluvial soils under irrigated sorghum. The soils varied from low salinity (EC < 4 ds/m) to moderate salinity (EC up to 1.2 dS m). At each point an EMIC reading using the EM 34-3 $^{(R)}$ determined the average salinity from 0-7.5 m depth. Similarly, root zone (0.0-0.3 m) salinity (using the 5: I water:soil method), and measurements of plant population, grain yield, seed size, and seed number per head measurements were taken. An adjacent saltpan was also included in the survey which had the root zone salinity sampled. The relationships between the EMIC reading and the other data were assessed with Pearson's correlation co-efficient. The data were then analysed by a least square method of linear and curvilinear regression to describe the relationships of the sampled data.

Results and discussion

The results showed that there was no relationship between the EMIC readings and the plant characteristics (mainly due to the salt tolerance of sorghum). There was a strong correlation between the EMIC reading and root zone salinity (r^2 = 0.69). However, the line of best fit of the relationship between root zone salinity and the EMIC reading is described by the logarithmic equation:-

Log_e EC = 0.0458 (? 0.0010)$_*$ EMIC (r^2 = 0.9938).

Interpretation of the data suggests that EMIC readings less than 120 ms m^{-1} may be considered to have a low salinity, readings of 144 + 20 ms m^{l} indicate moderate salinity and readings in excess of 200 mS/m indicate extreme salinity. The broad bands and gaps in the interpretation of the EMIC readings show the difficulties of their interpretation. The crude measurements showed that a reasonable prediction of the salinity hazard was possible. In practical terms, the results indicate that the EMIC provides a rapid reconnaissance survey technique to identify possible sites that need further investigation.

References

1. Kingston, G. 1985. Proc. Aust. Soc. of Sugar Cane Tech.. Bunciaberg, Aust.