



Better Prediction of Groundwater Recharge from Ricegrowing

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Background

Rice soil suitability assessment is needed to minimise the impact of recharge from ricegrowing on rising regional groundwater levels.

In Southern NSW, the EM-31 instrument is routinely used to assist in the identification of soil with acceptable texture to grow rice with minimal recharge. However, Beecher *et al.* (2000) reported that textural criteria for rice suitability assessment has limitations and proposed a new scheme for rice soil suitability assessment. EM-31 value of >150 (mS/m) or soil sodicity, an ESP > 6 in the 0-60cm depth or ESP > 12 in the 60-150 cm depth interval are the key parameters in the scheme.

We have therefore focused our research on two major areas:

- (1) Can we use in-field classes derived from EM31 maps of rice fields to effectively estimate spatial changes in sodicity across these rice fields.
- (2) Can we quantitatively assess soil sodicity levels successfully with in-field approaches.

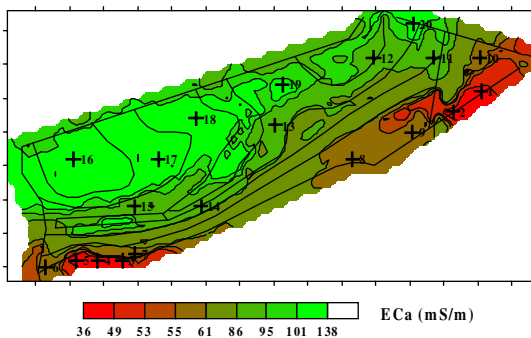


Figure 1. Percentile map of EM31 survey of the Red Brown Earth field with the sampling sites positions shown.

Methodology

Vertical EM31 values (EM31v) were measured across the six rice fields in the Murrumbidgee (MIA) and Murray (MV) irrigation areas using Geonics EM31 instrument. The distribution of EM31v values were contour mapped based on dGPS data using the mapping program SURFER. For each rice field, four or five EM31v classes were defined based on frequency distribution of EM31v values in each field. The mapped values of EM31v were used to randomly locate 5 sampling sites at approximately the mean EM31v value within each EM31v class (Figure 1).

Soil sodicity in the air dried clods (<1cm) and ground (<2mm) soil was measured by a number of methods including saturation extract sodium adsorption ratio (SARe), 1:5 soil water extract SAR_{1:5}, the Rengasamy jar test, Horiba cady meter and Hach field sodicity kit.

The ESPe data for the soil depth intervals analysed were used to calculate depth weighted average ESPe data for the 0-60 cm and 60-150 cm depth intervals.

Results and possible applications

(1) The results indicate that difference in soil sodicity levels occur between EM classes, with higher EM31v value sites having higher soil sodicity levels (Figure 2 and 3). There is an opportunity to classify the rice fields on the basis of differences in soil sodicity levels and this approach has a good potential for rapid field assessment of high recharge areas.

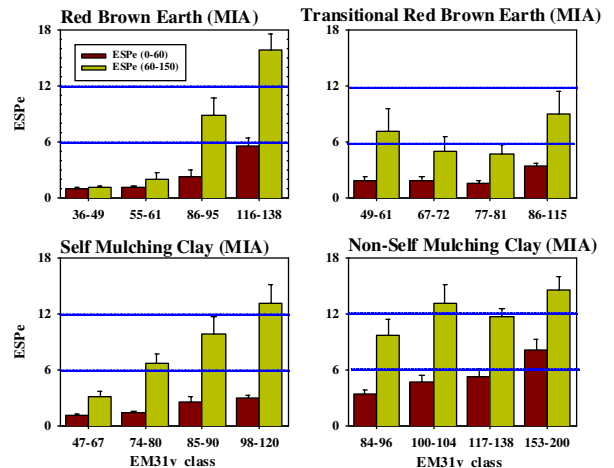


Figure 2. Depth weighted ESP across fields, low to moderate EM31v values.

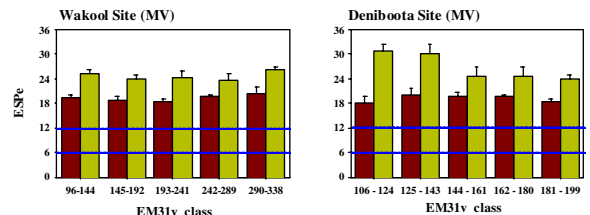


Figure 3. Depth weighted ESP across fields, moderate to high EM31v values.

(2) Results indicate that in-field sodicity assessment methods including Hach field sodicity kit (Rhoades *et al.* 1997) are not accurate enough to estimate soil sodicity. Calibration of the Hach field kit for Australian soil conditions did not improve its soil sodicity estimation (Figure 4).

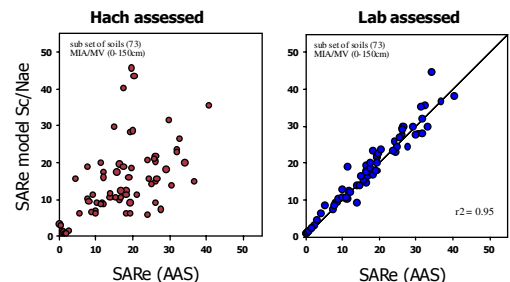


Figure 4. Calibration of Hach sodicity field kit for Australian soils.

Future work

- Further assessment of field sodicity using Queensland Industry approach, specific area/soil type, ESP prediction from 1:5 soil/solution parameters.
- Review if this approach can separate sites at low EM levels.
- Use soils held by Coleambally Irrigation as verification data set.

