POSTER SUMMARY

USEFULNESS OF SOIL APPARENT ELECTRICAL CONDUCTIVITY (ECa) AS AN INDICATOR OF SOIL PROPERTIES IN RESEARCH TRIALS

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Abstract

Soil variability has been shown to impact negatively on the outcomes of research trials at the South African Sugarcane Research Institute (SASRI). Due to cost and length of time required for intensive soil sampling, soil variability is normally not quantified before trials are established. Electromagnetic induction (EMI) is a technique that measures apparent electrical conductivity (ECa) of soils, which is influenced by many soil properties such as soil water, clay, electrical conductivity, total cations and organic matter content, and can thus be used to estimate these and other soil constituents. The aim of this research was to assess the accuracy of soil ECa in quantifying the variability in soil properties at field trial sites. EMI values of Field 163 on the SASRI Gingindlovu Research Station were obtained with an EM38-MK2 instrument linked to a GPS unit, with an accuracy of less than 0.3 m. The survey paths were 1.5 m apart on average and the data points were captured at one second intervals. Data from more than 3 000 points were collected from a 1.2 ha field. Soil samples were collected from 74 positions representing each plot, at 20-80 cm depths and analysed for clay, silt, sand and water content. The resultant ECa data were used to develop an ECa variability map. This poster reports on the accuracy of estimating these parameters from ECa data mostly for the topsoil. A Geographically Weighted Regression (GWR) was performed on the ECa and all laboratory determined soil data. The relationships between ECa and clay, silt, sand and soil water content (SWC) were significant at $p<0.05$ and with $r^2=0.71$, $r^2=0.67$, $r^2=0.59$ and $r^2=0.58$ respectively. The advantage of using GWR is that standard deviation and correlation maps could be produced. These maps indicate the degree of ECa correlation with each variable at each sampling point geographically. This study reinforces the case that EMI is a suitable technology, which can be used to detect soil variability which can be used in facilitating the randomisation of trials and interpretation of results.

Keywords: apparent electrical conductivity, GIS, plant breeding, field trials, research station, soil properties, clay, silt, sand, soil water content (SWC)