

Use of Proximal Sensing and GIS Technologies to Support the Management of a Salt Affected Paddy Growing Soil

Nirmal K.A.D.S., Vitharana U.W.A.* and Matthews N.¹

Department of Soil Science,
Faculty of Agriculture, University of Peradeniya, Peradeniya, Sri Lanka

Management salt affected soils rely on accurate maps showing spatial patterns of soil salinity. However, spatial characterization of salinity using conventional soil sampling and laboratory analysis techniques are laborious and cost prohibitive. This study attempted to use DUALEM-1S apparent electrical conductivity (ECa) proximal soil sensor and geographic information system (GIS) to map salt affected areas of a paddy tract (16 ha) located in the Nellikkadu in Sammanthurai. DUALEM-1S is an electromagnetic induction based proximal sensor which makes on-the-go measurements of both ECa of surface (ECa-PRP) and subsurface (ECa-HCP) soils, simultaneously. The sensor was pulled on paddy lands resulting 14272 measurements of ECa. Surface soil samples (0-30 cm) were collected at 25 locations identified based on spatial patterns of ECa and analyzed for EC of saturated soil paste extract (ECe), pH, and Sodium Adsorption Ratio (SAR). Layers of ECa obtained by inverting sensor measured ECa revealed distinct patches of salt affected soils in the study area. ECa-PRP showed a strong linear regression relationship with surface soil ECe ($R^2=0.9$). This relationship was used to construct salinity map (ECe map) of the study area by combining ordinary kriging and regression prediction approaches. Fuzzy *k*-means unsupervised classification of ECe map of the study area delineated two salinity management zones having high and low levels of soil salinity (HSMZ and LSMZ, respectively). Soil analysis showed that soils in HSMZ are saline sodic while soils in LSMZ are non-saline but with high Na content. High SAR in irrigation water could have contributed for the soil salinity development. Soil pore water samples analyzed for EC, pH, SAR and K^+ showed differences of these properties between the two management zones. This study revealed fusion of proximal sensing and GIS technologies has a large potential to support the site-specific management of soil salinity in paddy grown soils.

Keywords: Apparent electrical conductivity, Proximal soil sensing, Salinity mapping

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¹Postgraduate Institute of Agriculture, University of Peradeniya, Peradeniya, Sri Lanka

*uvithara@agri.pdn.ac.lk