Assessing Soil Salinity using the Relationship of Satellite Image Observation with Electrical Conductivity

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Soil salinity affects the vast areas of Thailand's farming land and the area of salt affected land is increasing rapidly. Soil salinity has been problems in Thailand which affect the loss of much of agriculture land. The problem of soil salinity in Thailand is prominent, especially in the Northeast region which is particularly a dry zone. Remote sensing technologies have recently being employed for mapping and monitoring the soil salinity. The objective of this study is to formulate a technique of utilizing remote sensing for assessing soil salinity. Five districts from the province of Nakhon Ratchasima were selected for this study from which 30 different soil samples were collected for laboratory analysis. The correlation of spectral reflectance with electrical conductivity was established by using the remote sensing data from Landsat 8 and laboratory EC. Analysis showed reflectance band B2, NDSI and salinity index S4 and S5 have high correlation with the observed EC. The multiple regression analysis was used to evaluate the relationship between EC and the spectral reflectance which then generated the 8 models by using SPSS 17.0. The result from the multiple regression analysis showed that the coefficient of determination R^2 for all models were approximately more than 70%. Using the regression equation from the model generated, the predicted EC value was computed for each of soil samples as well as for each pixel of Landsat 8 data. Subsequently the soil salinity map was generated by ranking the predicted EC as non-saline with EC value 0-2 ds/m, slightly saline with EC value 2-4 ds/m, moderately saline with EC value 4-8 ds/m and very saline with EC value 8-16 ds/m. The accuracy for the generated salinity map was compared with the soil series data. The accuracy assessments yield the overall accuracy of 70% between soil series with model 7 of Landsat 8.

Keyword: Remote sensing, Electrical Conductivity (EC), Salinity Index (SI), Normalized Difference Salinity Index (NDSI), Reflectance