

Remote Sensing and GIS techniques for predicting soil Organic Carbon and Nitrogen in Southern Iraq

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The present study aimed to develop remote sensing and GIS based methods to predict the spatial distribution of soil organic carbon and nitrogen (and its different forms) for soils in the region of Al-Kufa city, Al-Najaf province of southern Iraq. The study area was characterized by a hot desert climate (Koppen-Geiger BWh) dominated by Fluvents and Salids soils. 35 sites across the 27,664 ha study area, representing key variations in topography, crop types and soil types were selected for field sampling of surface horizons (0 - 25 cm depth) and laboratory analysis for the target soil attributes. 2015 LANDSAT OLI images of the study area, obtained from the USGS EROS Centre, were used to calculate a range of indices from the distributed spectral values for evaluation; including SAVI, EVI, MNLI and GDVI. Statistical correlations were applied between soil organic carbon forms and forms of nitrogen, and the range of indices, to determine the best-performing models for prediction. Predicted values were compared with the actual values obtained from laboratory analysis of the 35 sampled soils across the region. We found that SAVI was the best index for predicting soil organic carbon and nitrate N, while EVI was the best index for predicting soil ammonium. Integrated combination of SAVI and EVI gave accurate predictions of Total soil N. Soil organic carbon and forms of nitrogen varied closely with salinity levels and crop types. Strong correlations between total nitrogen and soil organic carbon indicated that organic matter was the key source of nitrogen in soils of the study area.