Using geostatistical analysis and spectral signature for identifying shale distribution and type in El-Salhia project, Ismaillia, Egypt

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The current work aimed at recognizing shale distribution and its type in El Salhia project where it represents a serious limiting factor that precludes the agricultural development in that project. Shale is a fine-grained sedimentary rock whose original constituents were clays or muds. It is characterized by thin laminae breaking with an irregular curving fracture, often splintery and usually parallel to the often-indistinguishable bedding plane. Shale formation is typically as a result of deposition in very slow moving water and are often found in lake and lagoonal deposits, in river deltas, on floodplains and offshore of beach sands. Two main landforms affecting shale distribution were recognized in the project i.e. 1-The Nile river terraces. 2-The deltaic stage of the river terraces. Geostatistical analysis was performed to identify shale spatial distribution. Spectral analyses and consequently clay minerals identification representing shale type was realized by matching the unknown spectra that extracted from the field radiometer to predefined (library) spectra providing score with respect to the library spectra. Two weighting methods i.e. Spectral Feature Fitting (SFF) and Binary Encoding (BE) have been used to identify mineral type producing score between 0 and 1. Montmorillonite and Kaolinite were identified scoring high values of 1.0 and 0.944 respectively while illite scored values of 0.833 using SFF weighting method. These three clay minerals (i.e. montmorillonite, kaolinite and illite) recorded scores of 0.883, 0.833 and 0.667 respectively using BE weighting method.