



Evolution, Physico-chemical and Mineralogical Properties of Saline and Sodic Loess Derived Soils of Northern Iran

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Abstract:

Golestan Province of Iran considered as a major agricultural region, contains a vast area of salt affected soils in the northern parts originated mainly due to the near surface water table and/or high evaporation. Knowledge of the soil properties can help improve and reclaim these soils. The main objectives of this investigation were to study soil formation and evolution, their classification, clay mineralogy, type and intensity of salinity and sodicity and to present general reclamation strategy. The study area is the Atrak river basin and a part of Gorgan river in Golestan Province with the area of about 790000 ha. 21 pedons were selected, described and sampled based on the satellite image interpretations. Physico-chemical, mineralogical and TEM studies were carried out on the samples and finally soils were classified. The results revealed that soils are neutral to alkaline. Electrical conductivity varies from 1 dSm⁻¹ in the eastern parts to 90dSm⁻¹ in the Caspian Sea lowlands of the western parts. ESP and SAR also follow the same trend as EC. Na⁺ and Cl⁻ are the dominant cation and anion, respectively. The dominant soil great groups in the eastern regions are Xerorthents. Towards west, soils gradually shift to Torriorthents, Haplosalids and finally to Aquisalids in the west where the ground water table is near soil surface. Soil formation was mainly affected by topography and depth to saline ground water. Most of the soils are in the salinization and alkalization stage of evolution and if leached with water, they have potential to become normal calcareous soils. XRD analyses showed that the soil are somehow similar in the type of clay minerals but different in the abundance

which is mainly due to drainage conditions. Chlorite, illite, smectite and kaolinite were detected on the X-ray diffractograms. Illite is found as the dominant clay mineral in all the soils. Smectite increases in the soils with poor drainage conditions mainly due to the soil solution rich in basic cations. Illite, chlorite and kaolinite were found in C horizons and are mainly of inherited origins. Palygorskite i.e. fibrous clay mineral was detected in minor abundance by TEM. Formation of this clay mineral in the studied soils is mainly due to its neoformation from soil solution rich in Mg. With regard to the reclamation of the soils, most of them contain low to moderated quantities of gypsum and leaching would help wash out Na. The major problem however, is the lack of enough water in this arid region and therefore watershed management through controlling Atrak seasonal flooding would be of prime importance.