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Characteristics of natural clay deposits in Saudi Arabia and their potential for water conservations

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Abstract: Clay minerals in soils are the key component controlling water storage and movement in irrigated arid lands. Previous studies proved that application of high quality clay minerals even in low quantities to coarse textured desert soils improved dramatically water conservation and water use efficiency. The main objective of this research was to identify and characterize clay deposits and their desired characteristics for water conservation. Forty seven representative clay deposit samples were collected from different regions in Saudi Arabia. Samples were subjected to physical, chemical and mineralogical characterization. Results indicated that most of the selected sites are rich in natural clay deposits, some were found at the surface while others were exposed in the slopes of the mountainous areas. Data showed relatively high variations in the clay deposit characteristics from the different regions particularly in clay contents, salinity, alkalinity and the dominant clay minerals. Smectite clay minerals dominated the clay fraction of deposits collected from Khulays, Jeddah, Al-Hassa, and Al-Kharj areas beside attapulgite, Kaolinite and other minerals. Dhruma and Rawdat clays are dominated mostly by Kaolinite, illite and smectites. Clay deposit characteristics range as follows: clay content (20-96%), saturation percentage (29-184 %), field capacity (14-140 %), wilting point (6-64 %), available water content (8-77 %), ECe dS/m (0.66-47.0), pH (6.82-8.36), $CaCO_3$ (1-52.9 %) and CEC cmole/kg (10.3-77.2). It appears that samples with high clay contents have high available water and field capacity. Soluble B was relatively high in some samples collected from Al-Kharj which indicated relatively high levels. Available Fe was very high in all samples while other nutrients (K, Mn, Zn and Cu) are high to moderate. Total heavy metals (Cd, Ni, Pb and Co) were low to moderate in

most of the studied samples and relatively high in few samples particularly that collected from the western region.