physical, chemical and mineralogical studies of some reclaimed soils in Egypt

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The aim of this work is to evaluate the pedological characterization of some reclaimed soils of Egypt.Twenty six soil profiles were selected to represent the reclaimed soils in 4 areas EL-Shabab , El-Salhiya , El-Nobariya and El-Tina Plain and were morphologically described and sampled for physical , chemical and mineralogical analysis . Soil classification , land capability and land suitability were also done .1-Physical and chemical properties .El-Shabab soilsEl-Shabab soils (6 profiles) are clay loam to sandy clay loam in surface , sandy loam to sand in subsurface ; 1.00% to 2.95% CaCO3 ; 0.10 to 0.41% gypsum , organic mater up to 0.85% .Particle density (PD) 2.63 to 2.75 g/cm3 ; bulk density (BD) 1.30 to 1.75 gm/cm3 ; Hydraulic conductivity (HC) 6.70 to 12.40 cm/hr . Field capacity (FC) : 7.11 to 20.90 % ; Wilting point (WP) 3.96 to 8.96% ; available water (AW) 2.11 to 15.75% . Total porosity (TP) 34.7 to 59.1 % . Frequency distribution of pores : quickly drainable pores (QDP) : 4.5 to 32.1 ; slowly drainable pores (SDP): 4.1 to 22.7 % , water holding pores (WHP) : 4.5 to 21.2 % and fine capillary pores (FCP) : 5.1 to 12.2 % . Other ranges are as follows :-7.1 to 7.9 pH , 0.43 to 2.20 dSrn-1 EC ; Soluble ions : Na’ > Ca4+>Mg++>K+ ; > SO4-- > HCO3-- ; Cation exchangeSummary and Conclusion -219-capacity 3.07 to 26.91 cmolck-’g ; exchangeable cationsCa4+>Mg.”->Na4 >K+ mostly ; and MgH->Ca++>Na+>K4 in somecases . El-Salhiya soils .El-Salhiya soils (6 profiles) are clay loam or sandy clay loam in surface , sandy loam in the deepest layers , 1.00 to 1.65 % CaCO3 ; 0.10 to 0.22 % gypsum , 0.10 to 0.68 % organicmater .(PD) 2.63 to 2.77 g/cm3 ; (BD) 1.53 to 1.73 gm/cm3 ; (HC) 6.80 to 15.20 cm/hr . (FC): 9.20 to 20.00 % ; (WP) 4.00 to 9.98% ; (AW) 2.62 to 15.19 % . (TP) 31.00 to 54.70 % . Frequency distribution of pores : (QDP) : 1.00 to 12.10 ; (SDP): 1.2 to 13.2 % , (WHP) : 2,5 to 24.9 % and (FCP): 6.5 to 13.80 %7.20 to 7.9 pH , 0.45 to 3.70 dSmi EC ; Soluble ions : Na+ >Ca++>Mg-H->K+ ; > SO4- > HCO3- ; Cation exchange capacity 3.71 to 29.55 cmolck-ig ; exchangeable cations Ca++> Nair = Mg++>K+ .El-Nobariya soils .El-Nobariya soils (7 profiles) are clay loam or sandy clay loam in surface , sandy loam or loamy sand in the deepest layers, 10.00 to 20.50 % CaCO3 ; gypsum up to 0.22 % , 0.10 to 0.85 % organic mater .(PD) 2.64 to 2.76 g/cm3 ; (BD) 1.50 to 1.76 gm/cm3 ; (HC) 6.90 to 15.30 cm/hr . (FC): 6.45 to 17.50 % ; (WP) 1.72 to -14.76% ; (AW) 1.35 to 15.76 % . (TP) 30.00 to 45.80 % .Frequency distribution of pores : (QDP) : 8.60 to 10.80 ; (SDP): 1.5 to 11.5 % , (WHP) : 6.2 to 21.00 % and (FCP): 3.2 to 12.5%.7.00 to 7.9 pH , 0.41 to 1.40 dSm-1 EC ; Soluble ions : Na+ >Ca++>Mg+-1->K+ ; CF > SO4-- > HCO3-- ; Cation exchange capacity 3.90 to 15.70 cmolck-ig ; exchangeable cations Ca++> Na+ >Mg++>K+ .El-Tina plainEl-Tina plain soils (7 profiles) are commonly clay , 1.90 to 8.10 % CaCO3 ; 1.16 to 12.20 % gypsum , organic mater up to 1.9 % .(PD) 2.57 to 2.89 g/cm3 ; (BD) 1.14 to 1.40 gm/cm3 ; (HC) 0.05 to 6.50 cm/hr . (FC): 7.78 to 36.40 % ; (WP) 5.01 to 21.47% ; (AW) 2.77 to 20.75 % . (TP) 32.70 to 66.10 % . Frequency distribution of pores : (QDP) : 3.90 to 14.40 ; (SDP): 4.8 to 11.4 % , (WHP) : 4.7 to 28.30 % and (FCP): 8.5 to 26.5%.7.70 to 8.3 pH , 3.45 to 174.00 dSm-1 EC: Soluble ions :Na+ >Ca++ and or Mg++>K+ ; Ci > SO4-- > ; Cationexchange capacity 6.51 to 57.42 cmolck-ig ; exchangeablecations Mg++> Ca++> Na+ >K+ .2-Rating of morphological properties was figured out using the relative horizon distinctness (RFID) and relative profile development (RPD) . Modifications of the morphological rating systems were provided . Data concerning CaCO3 , gypsum , salinity and pH have significant importance in the studied soils . Results indicate apparent discontinuity and stratification of profile

layers as shown by the variations in RHD and RPD values .3-Grain Size analysis .from the grain size parameters , it can be noticed that the water and / or water and wind actions are the main factors affecting to transportation and deposition of the studied soils .4-Soil mineralogy4.1 Mineralogy of the sand fractiona . Light mineralsData indicate that the light fraction is composed almost entirely of quartz which constitutes 91.91 — 97.97 % . Other associated minerals are orthoclase , plagioclase and microcline (feldspars) . Orthoclase and plagioclase are the main members of feldspars with less pronounced occurrence of microcline .b. Heavy minerals .The opaques are the dominant and constitute 47.40 to 63.60 % . The non-opaques are dominanted by pyroboles (pyroxenes + Amphiboles) and epidot . Tourmaline and rutileare in moderate amounts . Garnet , staurolite , kyanite and sillimanite are of less pronounced amounts .Uniformity and development of soil profiles shows that the soils are heterogeneous either due to their multi — origin or due to a subsequent variation along the course of sedimentation . Therefore , they are young from the pedological view point .4.2 Clay mineralogyIn most soils of El-Shabab , El-Salhiya and El-Tina Plain areas , mineralogical identification of clay of fourteen samples , (using x-ray diffraction) reveals the dominance of smectite (montmorillonite) followed by kaolinite with less pronounced occurrence of illite , chlorite and vermiculite minerals .Calcareous soils of El-Nobariya , particularly show that palygorskite mineral was the second predominant mineral after smectite . The identified accessory minerals are mainly quartz and feldspars .The mineralogical constitution of the clay fraction suggests the inheritance of clay minerals from the parent materials , except for palygorskite which may have been either inherited or geo-genetically formed under soil forming processes , stimulated by a presence of high contents of $CaCO_3$ and soluble salts .5- Soil classificationThe investigation soils are.1- EntisolsSummary and Conctirsion-223-Sub order : Orthents 10 profiles 2-AridisolsSub order : Calcids 7 profilesGypsids one profile3- VertisolsSub order : Aquerts one profileTorrerts 5 profilesSoil moisture and temperature regimes are different into nine families .6-Land evaluationAccording to the land capability index , the soils are placed between grade 2 and 5 as follows :1-Grade (2) : ”Good soils” , represented by 4 profiles2-Grade (3):” Fair soils” , represented by 19 profiles .3-Grade(5): ”very poor soils ” represented by 3 profiles According to the land suitability index , soils are located within the following suitability classes :S2 : moderately suitable with suitability index 50 - 75S3 : marginally suitable with suitability index 25 - 50 N : non suitable with suitability index < 25Suitability for various crops was also assessed . Soils were suitable for growing 22 different crops (11 different field crops ; 7 different vegetable crops and 4 different fruit crops)