Land evaluation of some soils in arab rebublic of egypt

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This work aims to evaluate some soils in Arab Republic of Egypt represented by El-Fayoum area. The studied area is bounded by longitudes 30° 20- and 31° 10- East and latitudes 29° 02- and 29° 34- North. It is characterized by the presence of seven geomorphic units. To get more soil information on such are, 21 soil profiles were selected to represent these prevalent seven physiographic units. Soil profiles were morphologically described and soil samples were physically and chemically analyzed. The taxa output were processed and sorted for ”Soil Taxonomy” and ”Land evaluation”. The main results could be briefly summarized as follows: (a) Physical soil properties:1-Soil texture falls under eight-soil texture classes ranged from clay to sand, with a dominance for clayey grade, which cover most of El-Fayoum area.2-Soil calcium carbonate content ranged from 0.81 to 39.83 %.3-Soil gypsum content ranged from 0.33 to 18.02.4-Soil organic matter was generally low and ranged from 0.15 to 1.92 %.5-Values of the soil bulk density ranged from 1.10 to 1.69 Mg/m3.6-Values of the soil particle density ranged from 2.52 to 2.70 Mg/m3.7-Values of the soil total porosity ranged from 35.38 % to 58.17 %.8-Values of the soil hydraulic conductivity ranged from 0.13 cm/h to 15.57 cm/h.9-Soil moisture content at field capacity ranged fro 12.85 to 48.70 %, while it ranged from 4.00 to 25.20 % t wilting point. These wide variations are more related with s it texture and the studied criteria of structure, which refle t on the available water contents (8.85 — 23.60 %). (b) Soil chemical properties:1-Soil pH ranged from 7.4 to 8.95.2-Soil salinity ranged from non-saline to extremely sali e, as the electrical conductivity (EC) values ranged widely fro 0.92 to 126.30 dS/m.3-Soil sodicity ranged from non-sodic to sodic, as exc angeable sodium percent (ESP) ranged from 3.18 % to 45.45 °4-Soluble cations in the studied soils followed the order of Na+ > Ca+4 and/or Mg++ > K+, but their arrangement in some soil layers followed the order of Ca’ or Mg’ > Na+ > K. However, soluble anions, in general, followed the or er of CF or SO4- > HCO3 while CO3 was not detected in th studied soil profiles.5-Cation exchange capacity (CEC) values ranged fro 2.58 to 50.72 cmole/kg soil. Exchangeable calcium or magne ium was the dominant cation in the studied soils followed by Na+, while K+ represented the least concentration. (c) Grain size analysis:Results obtained by using statistical size parameters showed that water or wind and their combined actions were themain factors affecting the media of both transportation and deposition of the soil material. The most probable mechanisms of soil materials transportation are suspension in different forms, suspension and rolling and rolling form. (d) Mineralogy of the sand fraction: 1-Light minerals:Quartz content predominated the light minerals and constituted more than 72.0 %, with less pronounced amounts of feldspars (orthoclase, plagioclase and microcline). Orthoclase and plagioclase were the principal members of feldspars, while microcline represented the least content. The presence of feldspars indicated that the studied soils are young from the pedological viewpoint. 2-Heavy minerals:Heavy minerals were, generally, dominated by opaques. Non-opaques were dominated by amphiboles, pyroxenes, epidote, garnet and zircon, meanwhile rutile, tourmalie, staurolite and biotite were detected in few amounts. 3-Uniformity of parent material:This criterion was assessed through statistical size parameters and heavy minerals. Distribution of the resistant mineral ratios and weathering values indicated that the studied soils are, generally, heterogeneous either due to their multi-origin or their multi-deposional regime along the course of sedimentation.(e)Soil classification:Soils were classified according to the Soil T onomy

system of the USDA (1975) and USDA (1999), u.mg the Taxonomy Key Manual (USDA, 2001). The studied so is could be classified into three orders, i.e., Aridisols, Enti ols and Vertisols. Also, the soils could be classified into subord rs, great groups, subgroups and families. (f)Land evaluation: 1- Land suitability for irrigated agriculture:Evaluation of the studied soils based on the sy terns of Sys and Verheye (1972) and Sys and Verheye (1978) showed that the representative 21 soil sites are considered as m derately suitable (S2, 9 soil sites), marginal suitable (S3, 9 so ’1 sites), currently not suitable (Ni, 3 soil sites). (g)Land suitability for certain crops: Current land suitability:Studied soils were evaluated for proposed cert cropsbased on the systems of Sys (1991) and Sys et al. (199). Their suitability classes were calculated for every specific c op. It is clear that most of these soils are moderately suitable (S2) or marginally suitable (S3) for most of the selected crops, without the major land improvements. Potential land suitability:Potential land suitability was evaluated based on xcuting specified major land improvements (drainage, sali ity and sodicity). Evaluation was done on the basis of supreme potential suitability and subsequent prior potential suitability. Tley weredone for the best land utilization alternatives giving a possible maximum output. The two productive levels were adapted for soils developed on the identified physiographic units as follows: (I) Supreme potential suitability for specific utilizations: a)Highly suitable (Si) adaptations:Soils of lacustrine depressed plain, for barley, cotton, maize, guava and olives.Soils of lacustrine terraced like, for barley, wheat and guava. Soils of alluvial terraces, for olives.Soils of alluvial fan basin (almost flat), for alfalfa, barley, wheat and sorghum. b)Moderately suitable (S2) adaptations:- Soils of alluvial plain (locally terraced), for alfalfa, barley, maize, wheat, cabbage, guava and olives.- Soils of reworked aeolian terraces over weathered limestone rock, for cabbage.- Soils of alluvial plain (almost flat), for alfalfa, barley, maize, sorghum, wheat, guava and olives. (II) Subsequent prior potential suitability for specific utilizations: a) Moderately suitable (S2) adaptations:Soils of lacustrine depressed plain, for alfalfa, rice, wheat, watermelon and banana.Soils of lacustrine terraced like, for alfalfa, cotton, maize, sorghum, rice, cabbage, watermelon and olives.- Soils of alluvial terraces, for alfalfa, barley, maize, wheat and sesame.- Soils of alluvial fan basin (almost flat), for cotton, maize, potato, cabbage, tomato, sesame, watermelon, banana, citrus, guava, mango and olives. b) Marginally suitable (S3) adaptations:Soils of alluvial plain (locally terraced), for cotton, potato, rice, tomato, sesame, cabbage and mango.Soils of reworked aeolian terraces over weathered 1 mestone rock, for alfalfa, barley, cotton, maize, wheat, •orghum, potato, sesame and watermelon.Soils of alluvial plain (almost flat), for cotton, ri , potato, sesame, cabbage and watermelon.