Soil Quality as Indicated by Physical and Chemical Properties in Some Tanta Areas, Nile Delta, Egypt Using Remote Sensing and GIS Techniques.

Maha A. M. Abdel-razek, Heba. S. Rashed, Mohamed. A. Abdel-salam and Mohamed H.H. Abbas
Department of Soil and Water, Faculty of Agricultural, Moshtohor, Benha Universty, Egypt.
Corresponding Author: maha.abdelrazek@fagr.bu.edu.eg

Abstract

The present study aimed at assessing the physical and chemical quality of the soils in Tanta area of El-Gharbia Governorate, Egypt. Its area is 33760 ha (located between longitudes 30°45′ and 31°20′ E and latitudes 30°35′ and 31°15′ N). The mapping units in the study area: overflow basin (OB), high river terrace (RT1), moderate river terrace (RT2), low river terrace (RT3). Nine soil profiles were selected to represent Tanta area soils in addition to ١٨ soil samples. Twelve physio-chemical parameters which used to assess soil quality were chosen to evaluate soil quality including; texture (T), drainage (D), effective depth (P), parent materials (M), rock fragment (R), slope gradient (S), hydraulic conductivity (H), water holding capacity (W), electrical conductivity (C), soil reaction (O), exchangeable sodium percentage (G) and calcium carbonate (N). Results showed that Tanta district could be classified into one class according to the physical quality measures (moderate), while results of chemical quality index revealed two classes (high and moderate). Over 44% of the soil of Tanta area is of moderate soil quality index while 55.51% is of low soil quality index according to both physical and chemical parameters. The low soil quality dominates the areas characterized by shallow depth, poor drainage and hydraulic conductivity. The results demonstrated that management of soil practices should be carefully associated with soil characteristics.

Keywords: Soil quality, Tanta district, Nile Delta, Remote sensing and GIS.

Introduction

Egypt is one of the most old countries worldwide. It is located geographically in the northeastern corner of Africa (between latitudes of 22° and 32° N and longitudes 25° and 37° E) **(Zahran and Willis, 2009; Negm et al., 2017 and Embabi, 2018).**The Nile Delta in Egypt, with its fringes, covers an area of 22,000 km^2. The Nile Delta was formed during flood seasons by Nile sediments during the Late Miocene as an apron in the North Delta embayment. Its sediments are coarse, derived from the elevated Tertiary rocks of the Eastern Desert. Sediments of the ancient Niles, called the Paleonile, Prenile, and Neonile, cover wide tracts along the eastern and western margins of the delta **(Said 1981)**. The oldest sedimentary rocks penetrated in the Nile Delta are the shallow marine Late Jurassic carbonates, which are overlain un conformably by the Early Cretaceous sediments that interbedded carbonate-clastic sequence un conformably underlies the earliest Tertiary sediments, which is un conformably overlain by the Late Eocene-Early Oligocene shale section **(Younes, 2015).** Central part of Nile Delta is classified by sedimentary non-consolidated deposits belonging to the quaternary area that is differentiated into four different deposits: young deltaic, Fluvio-marine, young Eolian, and old Eolian **(Abu-hashim, 2015)**. **El-Asmar and Hereher (2011) and Embabi (2018)** recorded that Nile Delta with its triangular shape is a nearly flat plain. Its surface slopes gently northwards, where the difference in elevation between its apex in the south and the Mediterranean coast is +18 m **(Sestini, 1992).** According to **Moustaf (2000)** Geology of the Nile Delta areas is largely divided into two geologic units; Nile River alluvium and undifferentiated basement rocks. The soils are sandy texture outside the cultivated areas in the Delta, whereas very high clay content exists in this Delta producing some infertile black-alkali soils as well as saline soils **(Negm, 2017).** The soils of alluvial and alluvio-marine deposits contain loam and clay to clay-loam. According to **Omran (2017)** most of the Nile Delta soils are recent alluvial soils and most soils are originated from the ancient Nile sediments, which are mostly derived from igneous and metamorphic rocks of the Abyssinian Plateau. The major landscape in El-Gharbia is the flood plain and these soils are originated from Nile sediments before High Dam construction. They are developed from sediments of Ethiopian plateau transported by Nile River and subsequently deposited in both the valley and Delta **(El-Baroudy, 2015).**

Land evaluation used to describe and quantify the sustainable productive capacity of land **(Mackay et al., 2018),** it is an integral part of land use planning, has been established as one of the preferred methods to support sustainable land use management. In essence, land evaluation aims to compare and match each potential land use with the properties of individual parcels of land, also called land units **(De la Rose (2005); Palm et al. (2007); Niekerk, (2010); Liniger et al. (2011) and Govers et al. (2013)**. Based on **Daneshvar (2017)** Land suitability evaluation mainly focuses on environmental attributes that refers to the spatial, ecological and social configurations of land use development in urban planning. Hence, a multi-criteria evaluation method is used in order to find out the sustainable balance to assess the suitability index of land units