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Soil Spatial Information and Production of Thematic Maps for the Northern Emirates, UAE

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Soil spatial data is an integral part of any effective agricultural research or advisory program. It provides information needed for planning and decision making processes. In many parts of the world, including the Northern Emirates of the United Arab Emirates, there is an ever increasing demand for digital soil and thematic maps of different scales. However, the existing data are either not available or not exhaustive and precise enough for use within a number of environmental applications. The reason for the lack of the spatial information is that conventional soil survey methods are relatively slow and very expensive. The present study highlights the generation of soil spatial information of the Northern Emirates and its use in the production of thematic maps through soil survey. The Soil Survey of the Northern Emirates was conducted between June 2010 and March 2012, and covered an area of about 400,000 ha. The objective was to prepare a soil map at 1:50,000 scale with associated data and information in a spatial and point database, the United Arab Emirates Soil Information System (UAESIS). Among other outputs, the survey information was used in an evaluation of the land for various uses to provide information that will help land use planning. The United States Department of Agriculture Soil Classification System (USDA Soil Taxonomy) has been used to classify the soils of the study area.

Several land evaluations of both agricultural and non-agricultural land uses have been undertaken for the 1:50,000 scale map data and are presented in this study. These evaluations serve as base information for future land use planning and land management decision making. Irrigated agriculture suitability was evaluated using concepts developed by the Food and Agriculture Organization of the United Nations. Each soil map unit was allocated one of five ratings ranging from S1 (highly suitable) to N2 (permanently unsuitable), and an irrigated agriculture suitability map was published. The results of the suitability evaluation indicated that the soils classified at the subgroup level of the USDA Soil Taxonomy as Haplocambids, Torripsamments, Torriorthents, and Haplocalcids with good deep drainage and low salinity are the preferred soils for irrigated agriculture. Other soils are generally considered unsuitable for irrigated agriculture due to high salinity (Aquisalids and Haplosalids), shallow depth to gypsum (Haplogypsids), extremely coarse textures (some skeletal soils and all fragmental soils), and soils associated with high dune fields.

Soil properties that impact land use were evaluated. These include salinity of the upper soil layer (0 – 50 cm); texture including rock fragments on the surface, shallow water tables (shallower than 200 cm from the soil surface); and shallow hardpans (or bedrock). Potential construction and other material resources that were evaluated are gypsum, gravel, calcium carbonate, and sand. Of these, gypsum is the least common. Land degradation was also assessed and mapped based on criteria developed and adopted to meet the conditions of the study area. Evaluation of salinity in the first 50 cm of the soil profile was based on electrical conductivity. The resulting salinity map indicates that most of the soil classified as non-saline and consists of predominantly sandy soils with little or no accumulation of salts within the upper 50 cm. The highest levels of salinity are found along the coasts in the sabkha where soils are moderately saline, strongly saline or very strongly saline. The study concludes that the soils of the Northern Emirates, and indeed the rest of the UAE, are among the most challenging in the world with regards to their efficient and sustainable use.

Keywords: Soil, spatial information, suitability, thematic, agriculture, Northern Emirates.