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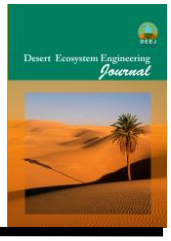

Investigating and Assessing Soil's Texture and Density in Different Land Uses Via Google Earth Engine System

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Extended Abstract

Introduction: Awareness of soil quality in agricultural lands and natural resources is essential to achieve maximum production and environmental sustainability. Although soil quality is not directly assessed, soil quality indicators are widely used today, including the physical indicators which are of great importance in measuring the soil quality, as they directly influence the plant growth and the soil's chemical and biological properties. Therefore, it is necessary to evaluate the quality of the soil and to take its changes into account when using the land for the intended uses before its exploitation. On the other hand, applying satellite imagery and GIS to extract the required information and map soil indicators to make optimal decisions has become an integral part of sustainable land management.

Considering the changes in the soil's physical, chemical, and biological properties and the human-induced land degradation, it could be argued that the quality of the soil varies in different land uses. Therefore, the soil's quality index can be measure in each unit through the land use map. In this regard, various studies have been conducted on land use-related soil index via remote sensing techniques, indicating that unscientific and uninformed changes in land use may have negative effects on the soil's desired physical and chemical properties. Thus, this study sought to investigate the status of the soil's texture and density in different land uses and assess its quantification using the Google Earth Engine system.

Material and Methods: The Rudan basin is one of the sub-basins of the Minab watershed, whose rainfall distribution does not follow a uniform pattern, with roughly 242 mm average annual precipitation, more than 77% of which occurs during the rainy season (Autumn and Winter). On the other hand, the annual minimum, average, and maximum temperature rates of the study area during the study period (1980-2020) are 18.1 °C, 25.7 °C, and 33.02 °C, respectively, and the area's average annual evaporation rate is 2858 mm. To conduct the study, the intended area was divided into five uses, including the moderate pastures, poor pastures, agricultural lands, garden lands, and canals. Then, a total of 218 samples were taken from all such land uses from the soil's zero to 10 cm surface, and some experiments were performed to determine the soli's texture, sand percentage, and density using hydrometric and paraffin black methods. Open Land map was also used in Google Earth Engine. To this end, first the location of the study area was identified in the Google Earth Engine system. The data used in this phase included the Landsat series images related to the study period (January 1, 1950 to January 1, 2018) with a resolution of 250 meters. The location of the captured points was then determined using GPS in the Arc GIS 10.3 software. Moreover, variance coefficient analysis, overall accuracy, and kappa coefficient were used to evaluate and validate the obtained results.

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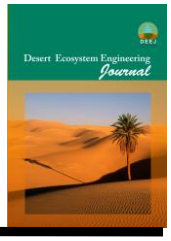

Results and Conclusion: According to the validation of the results obtained from the Google Earth Engine service, total accuracy was 95% and the kappa coefficient was 0.93. Furthermore, it was found that the amount of clay and silt decreased and the sand percentage increased with the change in land use over the large area of agricultural lands, which is consistent with the findings reported by Bewket and Stroosnijder (2003), Martinez et al. (2008), and Riahi et al., (2016) who found in their studies that the amount of clay and silt decreased and the sand percentage increased during the change of land use from forest to the agricultural and garden ones. Moreover, as suggested by Aghdami et al., 2019, Zare et al., 2011, and Wang et al., 2012, the soil's physical properties, especially its texture, is one of the most important determinants in the distribution of plant communities in different land uses.

Considering different land uses and agricultural activities in the study area and the fact that most of the area's residents earn their living via farming, and based on the strategic document of Hormozgan province, the area is considered an agricultural territory (Hormozgan Management and Planning Organization, 2019) that has already experienced a variety of land-use changes. On the other hand, any change in land use may lead to the loss of natural resources and agricultural biodiversity (Rawat and Kumar, 2015; Seyum et al., 2019).

Given the importance of agriculture in the region, any change in land use should be considered in the mid-term and long-term planning. Therefore, a detailed, up-to-date, inexpensive, and fast surveys are required to prepare development plans for various types of land uses, relying on the available data collected from the Google Earth satellite engine's online image processing system. In fact, Landsat satellite images are processed in a fraction of minutes, which are then analyzed for evaluation and planning. This system is a safe and cost-free way to process large volumes of satellite images from various sources, accelerating the processing very well and saving a lot of time.

Keywords: Soil Texture, Land Use, Google Earth Engine, Rudan Basin.