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Research Article

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GIS Usage in Determining the Change of Soil Properties

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Abstract It is very important to know the soil properties and its spatial changing in the selection of the irrigation method. In this study, it was tried to determine the spatial variation of soil characteristics such as Field Capacity, Wilting Point, Bulk density and Available Water Holding Capacity in irrigation field in Bursa Province. For this purpose, soil samples taken from 3 different layers from 83 control points determined by large soil groups and field observations were processed and mapped in ArcGIS program.

Keywords Solar cell, finite elements, Gaussian beam, wavelength, photocurrent, photovoltage, recombination velocity, diffusion length, shunt resistance, series résistance.

1. Introduction

Water has a critical prescription for agriculture and global food safety. In particular, the need for non-agricultural water, such as meeting urban, industrial and environmental needs, places irrigation activity at an important point in providing threatened food safety [1-2].

In order for an irrigation project to be successful, all elements such as soil characteristics, water resources, plant pattern, topography and water users' economic level and knowledge level affecting the project must be meticulously determined and calculated. However, for irrigation projects that serve large areas, collecting information and making calculations with this information is very difficult and time-consuming by conventional methods. In addition, it is quite difficult to analyze and share collected information with conventional methods [3].

In this study, it was tried to determine the change of soil characteristics in the irrigation areas of Solöz and Heceler neighborhoods in Orhangazi province of Bursa. The soil capacity (TK), fading point (SN), structure, Bulk density, Available Water Holding Capacity (AWHC) values were determined from soil samples taken from 83 points to represent the land. The measured soil values were transferred to the ArcGIS program and the point data were converted to continuous data format using spatial analysis module to generate relevant maps.

2. Materials and Methods

2.1. Material

The location of the study area is given in figure 1. The topographic structure of the study area is generally composed of plains. As the lands on the İznik lakeshore are formed by flat rubbing, the slope of the land is increasing as it moves to the south. The soil structure of the study area is composed of brown forest soils towards the southern parts of the Katirli Mountains. Towards the shores of Iznik, there are alluvial lands formed by Sölöz. There are also colluvial soils transported from the southern slopes in the middle of the study area [4].

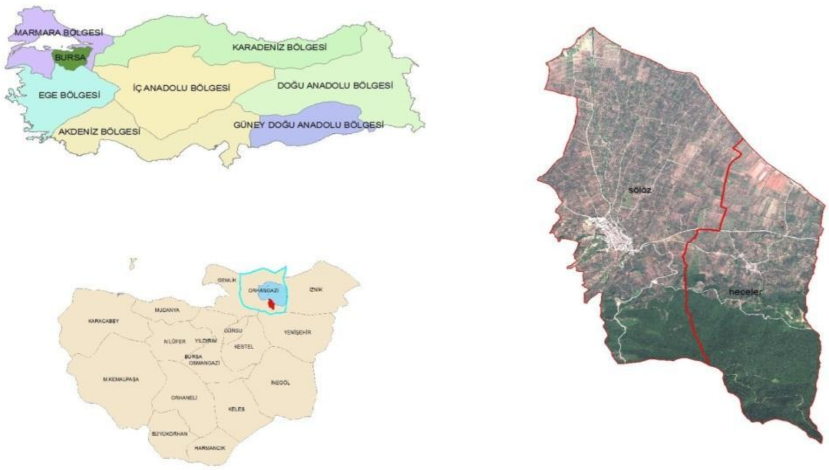

Figure 1: Location of the research area

2.2. Method

In order to determine the soil characteristics in the study area received help from the Great Soil Group Maps, local people, and other land studies and 83 soil analysis points were identified, representing the project area.

Disturbed and undisturbed soil samples were taken according to the basis determined by Benami and Diskin (1965) [5] from 0-30, 30-60 and 60-90 cm soil layers from GPS marked points. Bulk density was determined on the basis of Klute and Dirksen (1986) [6] of undisturbed soil samples. In addition, field capacity (TK), Wilting point (WP) values were determined using Disturbed soil samples according to the principles given in Klute and Dirksen (1986) [6]. Field capacity and wilting point were determined by measuring the amount of moisture the soil samples held at 1/3 and 15 atmospheres, respectively, using a pressured plate tool.

The values obtained from the analysis laboratory were processed using Excel and imported in the European 1950 datum by using "add x y data" feature of ArcGIS program. Continuous data are generated from point data by using IDW interpolation method [7].

3. Results and Discussion

The clay, silt and sandy soil changes obtained from the samples taken from the research area are given in Figures 2, 3 and 4 respectively.

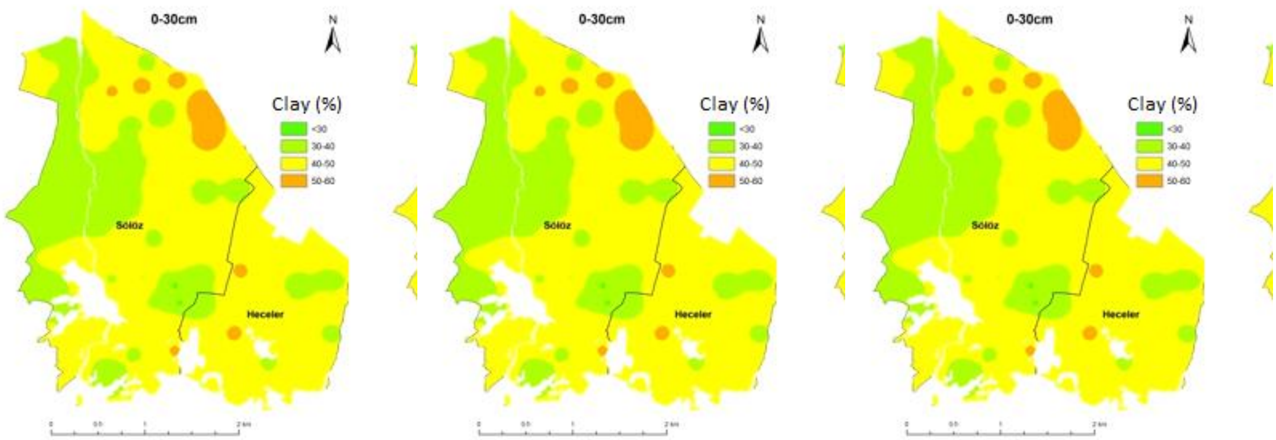

Figure 2: Clay percentage grids for 0-30, 30-60 and 60 -90 cm soil depths of the study area

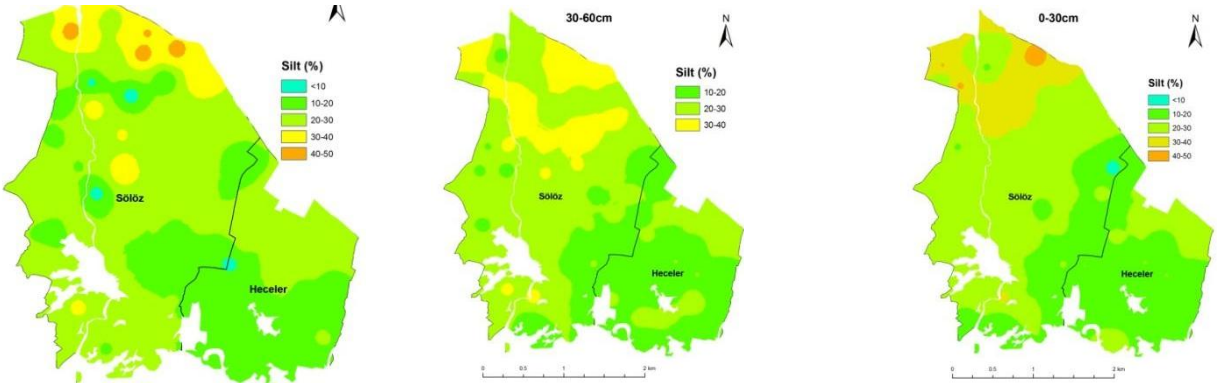

Figure 3: Silty soil grids for 0-30, 30-60 and 60-90 cm soil depths of the study area

As seen in Figure 2. clay mineral decreases to 30-40% in the eastern part of the Sölöz neighborhood and towards the west of the Sölöz district while at the 40-50% level in the majority of the Heceler area. In the southern part of the Sölöz Heceler neighborhood border, the amount of clay is seen to be 40-50%.

As can be seen from the thematic map in Figure 3. The amount of silt in the study area is in the southeast of Heceler and in the region of 10-20% along the eastern border of the Sölez neighborhood. silty soil increases to 20-30% in the north of the Heceler neighborhood and throughout the Sölöz neighborhood. At the northern end of the Sölez neighborhood, the silty soil amount is 30-40%.

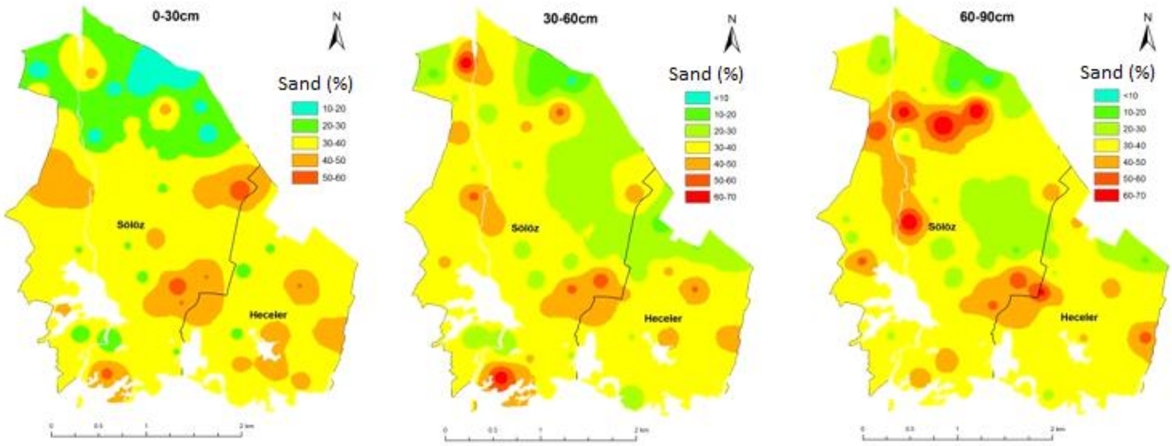

Figure 4: Sand grids for 0-30, 30-60 and 60 -90 cm soil depths of the study area

As seen in Figure 4. The amount of sand in the whole studying area is around 30-40%. At the northern end of the Sölöz neighborhood, a small amount of sand is between 20-30%. On the other hand, it was seen that sandy areas were increased up to 50% in different places of Sölöz and Heceler districts.

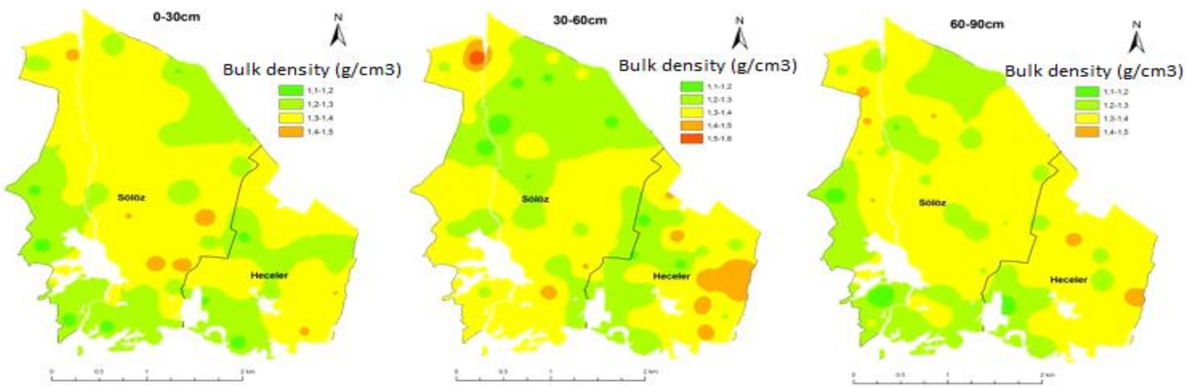

Figure 5: Bulk density percentage grids for 0-30, 30-60 and 60 -90 cm soil depths of the study area

As shown in Figure 5. it was determined that the Bulk density value in the study area was changed between 1.12-1.59 g / cm3.

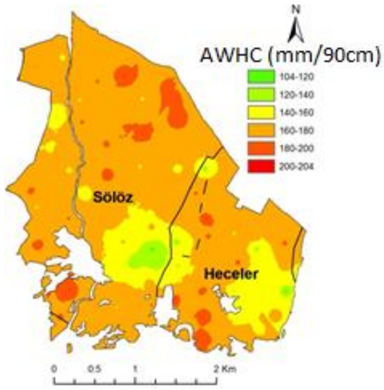

Figure 6: AWHC grids for 0-30, 30-60 and 60 -90 cm soil depths of the study area

The thematic map in Figure 6. shows the available water holding capacity values obtained from the analysis data. In the vast majority of the working area, the available water holding capacity varies from 104 to 204 mm 90 cm

4. Conclusion

In parallel with the developments in computer technology, GIS technology emerges as one of the most important factors in facilitating the work of users in many different sciences. Transferring the data of the study area in the spatial planning process to the GIS environment makes it very easy for project engineers and end users to make decisions

Acknowledgments

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