

Spatial Evaluation of Current Landuse, Elevation and Aspect Features of Nevşehir Province Lands (Türkiye) by GIS Mapping

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Abstract— This study was carried out in order to evaluate the current land uses, land elevation and aspect characteristics spatially by using 1/25.000 scaled digital soil maps in Nevşehir province. For this purpose, Arc GIS 10.3.1 program from Geography Information Systems (GIS) software was used and some land features were classified as spatial. As a result of the research, it was seen that dry agricultural areas dominate the area and it covers an area of 336,653.36 hectares (60.47%). It covers a part of 109180.06 hectares of meadow and pasture area. When the land elevation is examined, it is determined that the highest land level is 1985 m and the lowest land level is 860 m. When the land surface is examined in general, it is seen that flat and near-flat areas are few. When the directional conditions of the lands were examined, it was seen that the lands were generally in the north oriented group.

Index Terms— Current Landuse, Elevation, Aspect, GIS Mapping, Nevşehir Province, Türkiye

I. INTRODUCTION

For centuries, mankind has seen nature as an unlimited resource, polluted it and caused environmental problems. This process, which resulted in the danger of depletion of natural resources, necessitated the search for new solutions for humanity. The solution put forward in this framework is the understanding of sustainable development, which can be summarized as ensuring the transfer of natural resources to future generations without being completely consumed. Sustainable development is a concept that attaches importance to people in its essence and envisages the careful consumption of natural and cultural resources by taking into account the needs of future generations while making the necessary effort to meet the economic and social needs of the current population. In the face of the fact that natural resources are limited and can be exhausted, it is inevitable that the environment should be protected and that this situation should be continuous [1].

Planned and harmonious use of natural resources, especially soil materials, and planning and implementation of investments by taking into account the public interest and human priorities are important. First of all, soil resources should be protected. The effective and sustainable use of owned resources is an important issue in terms of ensuring economic development. Since the soil, which is the most basic capital of agriculture, which is one of the main sectors of the economy, cannot be reproduced unlike other production factors, its sustainable use is of special importance [2,3,4].

Soils are natural assets that develop with soil formation events under the influence of bedrock, climatic conditions, relief and living things. The development of soils is closely related to the development of living things on earth. In the last 5000 years of the history of the earth, the soils have begun to be affected by the various forms of management of the people, and this situation has caused the human factor to come into play in the development of the soil today [5,6,7].

Thanks to technological developments, the use of geographic information systems in many fields of study has increased. The use of GIS for sustainable agriculture has gained importance especially in mapping techniques and land use studies in agricultural areas [8,9].

In this study, current land uses, land elevation and aspect characteristics were analyzed spatially by using digital soil maps in Nevşehir province. It is thought that the results will make significant contributions to agricultural production activities in the region.

II. MATERIALS AND METHODS

This study was carried out within the borders of Nevşehir province. The location and location of Nevşehir province, which is the subject of the research, is shown in Figure 1.

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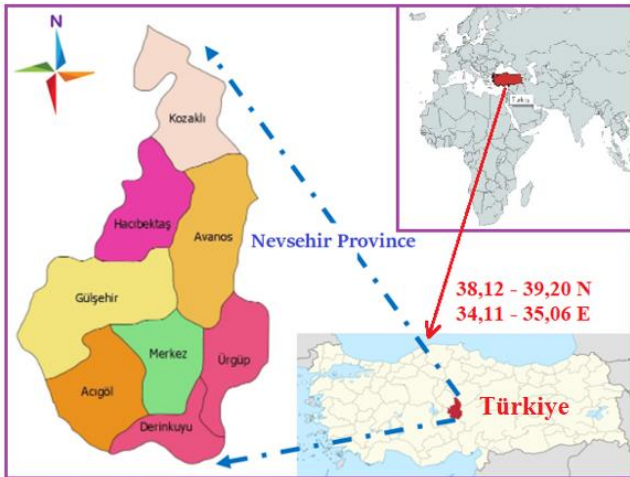


Fig 1. The location of research area

Nevşehir province is located in the Central Anatolian Region of Türkiye. The longest river of Nevşehir province, Kızılırmak, passes through this region. The center of Nevşehir province was established on the western slopes of the wide and high plains known as the Kızılırmak plateau. 538,630 hectares (2.5%) of Nevşehir Province is forest, 65.4% is arable land, 18.8% is unsuitable for agriculture and 13.3% is meadow-pasture. 56.1% of the agricultural production area use in Nevşehir consists of grain cultivation areas.

Nevşehir province has a surface area of 5.485 km² and consists of a total of 23 municipalities and 153 villages, 8 of which are districts (including the central district), 15 of which are town municipalities. Nevşehir has a warm and temperate climate. In winter, there is much more rainfall than in other months. Nevşehir has an average annual temperature of 10.73 °C and an average precipitation of 362.9 mm. Considering the climatic characteristics of the study area, the continental climate is dominant in Nevşehir. Summers are hot and dry, winters are cold. In a study conducted with 50 years of data covering the years 1986-2019 in Nevşehir, it was seen that the annual average precipitation amount was 362.9 mm. Total precipitation is 130.3 mm in spring, 123.5 mm in winter, 71.6 mm in autumn and 37.5 mm in summer throughout the province [10].

In order to spatially evaluate some soil features related to the study area, 1/25.000 scale digital soil maps were used [11]. Arc GIS 10.3.1 which is one of the Geography Information Systems software, was used to evaluate the land features in terms of space [12]. By using digital maps, the current land uses, elevation and aspect characteristics of the study area were evaluated spatially. The evaluations regarding the current land use were interpreted in accordance with the criteria specified in the Soil and Land Classification Standards of the Ministry of Agriculture and Forestry in Türkiye and spatial distribution maps of soil and land characteristics were created [13]. Terrain elevation distributions and aspect characteristics were determined by using digital elevation models with 10 m leveling intervals.

III. RESULT AND DISCUSSION

Spatial Analysis of Current Land Classes

Current land uses of Nevşehir province are classified using 1/25.000 scaled digital soil maps. Spatial distributions of current land uses are presented in Figure 2.

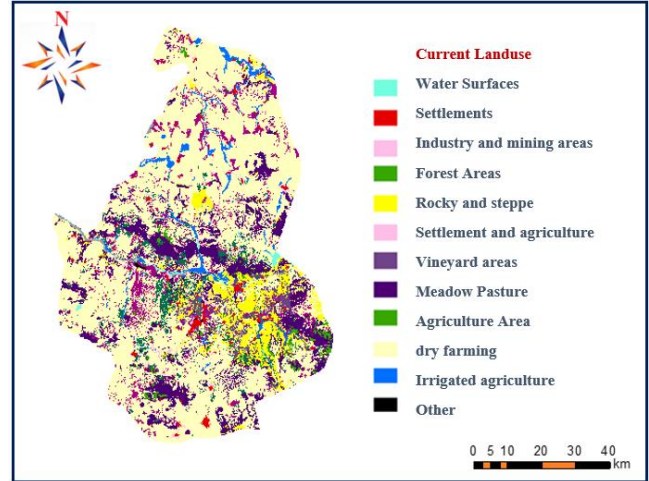


Fig 2. Spatial distributions of current land uses

It is seen that there are many dry agricultural areas in Nevşehir province. Mostly meadow and pasture areas are seen in the south of Nevşehir province. In the southeast of the study area, rocky and steppe lands are dominant. In the center and north of the study area, more irrigated agriculture was distributed. In the east of the study area, mostly vineyard areas are seen. The spatial distribution amounts of the current land uses of Nevşehir province are given in Table 4.

TABLE 1: AREAL AMOUNTS OF CURRENT LANDUSES

Current Landuse	Area (ha)	Ratio (%)
Water Surfaces	4498,02	0,81
Settlements	7869,53	1,41
Industry and Mining Areas	2314,64	0,42
Forest Areas	7763,87	1,39
Rocky and Steppe	35027,48	6,29
Settlement and agriculture	5617,00	1,01
Vineyard area	12242,27	2,20
Meadow Pasture	109180,06	19,61
Agriculture area	21036,05	3,78
Dry farming	336653,36	60,47
Irrigated agriculture	13527,73	2,43
Others	44599,38	7,43

It has been observed that the area covers an area of 336653,36 hectares dominated by dry agricultural areas. The area covered by dry agricultural lands constitutes 60.47% of the total area. The meadow pasture area covers a part of 109180.06 hectares. Rocky and steppe areas show 6.29% of the area. Planted agriculture constitutes 21036.05 hectares of Nevşehir province. Irrigated agricultural areas dominate 2.43% of the study area.

Spatial analysis of land elevation classes

Spatial distribution of land elevation classes in Nevşehir province was carried out using numerical elevation models with 10 m grading intervals. In this context, the topographic elevation changes of the land were analyzed in the GIS environment and the classification of the elevations from the highest to the lowest was carried out. The spatial distribution of the land elevation characteristics of the study area is given in Figure 3.

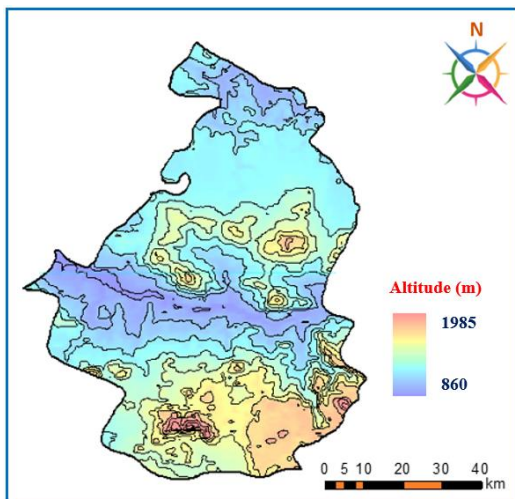


Fig 3. Spatial distribution of land elevation classes

Due to the fact that there are great differences in terms of altitude values throughout Nevşehir and they are far from each other, the changing role of altitude on climate has been revealed. Thus, the climatic conditions and features are different in the entire province of Nevşehir. In terms of altitude values, the highest elevation is seen as 1985 m and the lowest as 860 m. It seems that flat and nearly flat areas are scarce in Nevşehir province. It has been seen in the field studies that generally settlements and agricultural areas are distributed in flat areas.

Spatial Analysis of Land Aspect Features

Aspect (direction) properties of the study area were analyzed using numerical elevation models with 10 m leveling curves. Spatial distribution of land aspect characteristics of Nevşehir province is given in Figure 4.

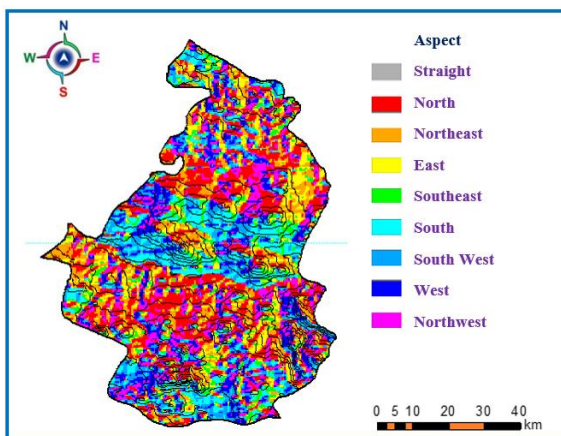


Fig 4. Spatial distributions of land aspect features

It seems that the dominant aspect in Nevşehir province is in the northern direction group (North, Northeast, Northwest). It is mostly located in the northern aspect group of the study area. Compared to the other parts of the province in the eastern direction group, soil temperatures are in an important position for agricultural activities. The second dominant aspect group in the research area is east, southeast, south and southwest directions. In the study area, it can be seen in flat and nearly flat areas.

Spatial evaluation of some land features is important for appropriate land use and management decisions. In the literature, it is possible to come across many studies on the spatial evaluation of land use and properties. For example; In a study conducted to evaluate soil properties in Bursa province, some soil properties were analyzed spatially by using Arc GIS program from geographic information systems software [14]. In another study conducted in Tokat province, large soil groups were evaluated and classified as spatial [15]. In a study conducted in Mardin, the land use capability classes of the research area were analyzed and spatial distribution maps were produced. As a result of the study, it was seen that the 1st class lands of the province throughout the province of Mardin constitute 16.48% of the total area [16]. In a study conducted in the GIS environment in the Umurbey Stream Basin (Çanakkale-Lapseki), land use capabilities were examined and classified as spatial. As a result of the study VII. It has been determined that class lands have a distribution of 71.8% in the total area [17]. In another study conducted in Malatya region, landslide zones and land use were determined by using multi-criteria analysis methods [18].

A study was carried out on the spatial evaluation of some land soil properties in the GIS environment in Hatila Valley National Park. As a result of the study, the aspect characteristics and height distributions of the seams were evaluated in terms of space [19]. When we look at the literature, it is possible to come across many studies on the evaluation of soil and land characteristics in terms of space in the provinces of Kırşehir, Nevşehir, Kayseri, Niğde and Thrace with the help of geographic information systems. In all the studies mentioned above, land features were evaluated spatially and the results were classified and presented on a map-based basis [20,21,22,23,24,25,26,27,28,29,30,31].

In this study, the current land uses were analyzed spatially with the help of 1/25.000 scaled digital soil maps of Nevşehir province. In addition, some terrain features of the study area were evaluated using digital elevation models. It will be inevitable that the results obtained will make significant contributions to the public institutions operating in the region, local governments and the private sector.

IV. CONCLUSION AND RECOMENDATION

This study was carried out in order to evaluate the current land uses, land elevation and aspect characteristics spatially by using 1/25.000 scaled digital soil maps in Nevşehir province. For this purpose and spatial analysis, Arc GIS 10.3.1 software was used. As a result of the research, it was seen that the study area covers an area of 336653.36 hectares, which is dominated by dry agricultural areas.

The area covered by dry agricultural lands constitutes 60.47% of the total area. Meadow and pasture areas, on the other hand, are distributed over an area of 109180.06 hectares. In terms of altitude values of the research area, the height varies between 860-1985 m. When the aspect (direction) conditions of the lands were examined, it was seen that the distribution was higher in the northern direction group. As a result of the study, the current land uses and elevation and aspect characteristics of Nevşehir province were revealed spatially. It is thought that the results obtained will make significant contributions to public institutions and private sector investments operating in the region.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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