World Research Journal of Agricultural Sciences
WRJAS
Vol. 8(1), pp. 265-277, November, 2020. © www.premierpublishers.org. ISSN: 2326-3997

Research Article

GIS Mapping of Large Soil Groups, Current Land Use, Soil Depths and Slopes, Erosian in Kırşehir Province of Turkey

M. Cüneyt Bağdatlı[1]* Oğuzhan Arslan[2]
[1]Nevsehir Hacı Bektas Veli University, Engineering and Architecture Faculty, Department of Biosystem Engineering, Nevsehir, Turkey
[2]Nevsehir Hacı Bektas Veli University, Institute of Science, Department of Environmental Engineering, Nevsehir, Turkey
***Corresponding Author Email:** cuneytbagdatli@gmail.com

This study was conducted within the scope of the spatial evaluation of the current land uses, large soil groups, soil depth and slope distributions and soil erosion data in Kırşehir province of Turkey. In the study, digital soil maps produced by the Abolished General Directorate of Rural Services in Turkey were used. Geographical Information Systems (GIS) (Arc GIS 10.3.1) software was used for the spatial evaluation of soil data in the study. According to the spatial analysis results; Dry marginal agricultural areas with 2857.7 km^2 constitute a large part of the current land use of Kırşehir Province. This area covers 44% of the total. When the large soil groups of Kırşehir province are examined, brown soils constitute a large part of the region. It has been determined that brown soils correspond to 2710.4 km^2 area and 41% of the existing area. The soil depth structure has been observed to be generally medium depth soils. Medium deep soils have an area of 2052.1 km^2 and constitute 31% of the total area. As for the soil slope class, it was seen that a large part of the region was between the 2nd degree slope group (7-12%) and the 3rd degree slope group (13-20%). When the soil erosion degree was examined, it was seen that a large part of the region had 2nd degree erosion. Soils with 2nd degree erosion group constitute an area of 2294.3 km^2 (35%). Sharing the digital land use data obtained in the study will provide significant contributions to the investor organizations that will invest in the region and contribute to agricultural production.

Keywords: Current Land Use, Large Soil Groups, Slope, Soil Depth, Spatial Analysis, GIS Mapping, Kırsehir Province, Turkey

INTRODUCTION

Soil is an important factor in obtaining most of the nutrients necessary for living life. In addition, most of the animals feed on land and human life takes place on the land. The population in the world shows a rapid increase. This increase also increases the need for food consumption. Most of the nutrients in the world are provided by agricultural activities. With the increasing population, industrial activities also show development and increase. In this increase, the raw material of many industrial establishments depends on the soil together with agricultural production. The characteristic structure of the soil in agricultural production is of great importance in terms of production.

The properties of the soils vary according to their location. Determining all the characteristics of existing soils in order to identify and solve problems, management techniques applied from the beginning to the end of the production should serve the sustainable and efficient use of soils (Tunçay and Bayramin, 2010).

Landowners and managers concerned with the conservation of land uses have stated that rational and sustainable land use is important for the benefit of the current and future population (Dengiz *et al*., 2009).

For the sustainable use of production areas, at this stage, it is necessary to determine all the characteristics of the existing soils and to review the management techniques applied from the beginning to the end in order to identify and resolve the problems. Therefore, detailed soil survey and mapping studies are of great importance (Özbek *et al*., 1979).

Geographical Information Systems (GIS) is of great importance in the mapping of numerical data. GIS; It is a computer system designed to collect geographical data about human, place and space in a database with their real references on earth, to make various analyzes on them, and to show the results in the form of maps, tables and graphs (Fitzpatrick and Maguire, 2000). In this way, Geographic Information Systems play an important role in the decision-making processes, in the production and planning of high-accuracy, up-to-date information due to the quality of modeling, analysis and spatial perception (Karaca *et al*. 2019; Mitchell, 1999).

GIS facilitates the evaluation of data. The most important component of GIS is data. GIS can combine spatial data with other data sources. Thus, data of many institutions and organizations are organized and spatial data are integrated (Uzun, 2012).

Today, the rapid development of technology provides many conveniences. Being comprehensive of GIS will play an active role in reaching many data as well as analyzing and storing numerical data. Revealing the geographical distribution of important soil characteristics is a necessary prerequisite for sustainable use and management of soils and is a guide for which applications can be made in which areas (Doğan and Aslan, 2013).

This study is aimed at analyzing the land uses and soil properties of Kırşehir province spatially. Digital soil maps were used in the research (Anonyomous, 2000). Digital soil maps were spatially analyzed using Arc GIS 10.3.1 software. Numerical soil information has been classified and current land use, large soil groups, erosion degrees, soil depths and slope distributions related to the study area have been revealed. Sharing the results obtained will make significant contributions to investor organizations that will invest in the region and contribute to agricultural production.

MATERIAL and METHOD

Material

This study was carried out within the borders of Kırşehir province in the Central Anatolia region of Turkey. The location of the province is between 38º50 '-39º50' north latitudes and 33º30'-34º50' east longitudes. Kırşehir province is between Nevşehir, Aksaray, Kırıkkale, Yozgat and Ankara and its neighboring borders (Kıymaz, 2011). Kırşehir has a continental climate with cold and snowy winters and hot and dry summers. Kırşehir has a semi-arid climate. The annual average temperature in the province is 11.3 °C and the annual precipitation is less than 400 mm (Anonymous, 2008). There are 6 districts and 189 villages in Kırşehir province (Anonymous, 2020). Its area is 6570 km^2 and its altitude is 985 m. The width of Kırşehir lands is 8 per thousand of country lands and 2.9% of Central Anatolia Region lands (Anonymous 2008). 454720 hectares (69.14%) arable land, 132450 hectares (20.16%) meadows and pastures, 25063 hectares (3.74%) forests and nurseries, 45446 hectares (6.96%) for agriculture It covers unsuitable areas (Anonymous, 2007).

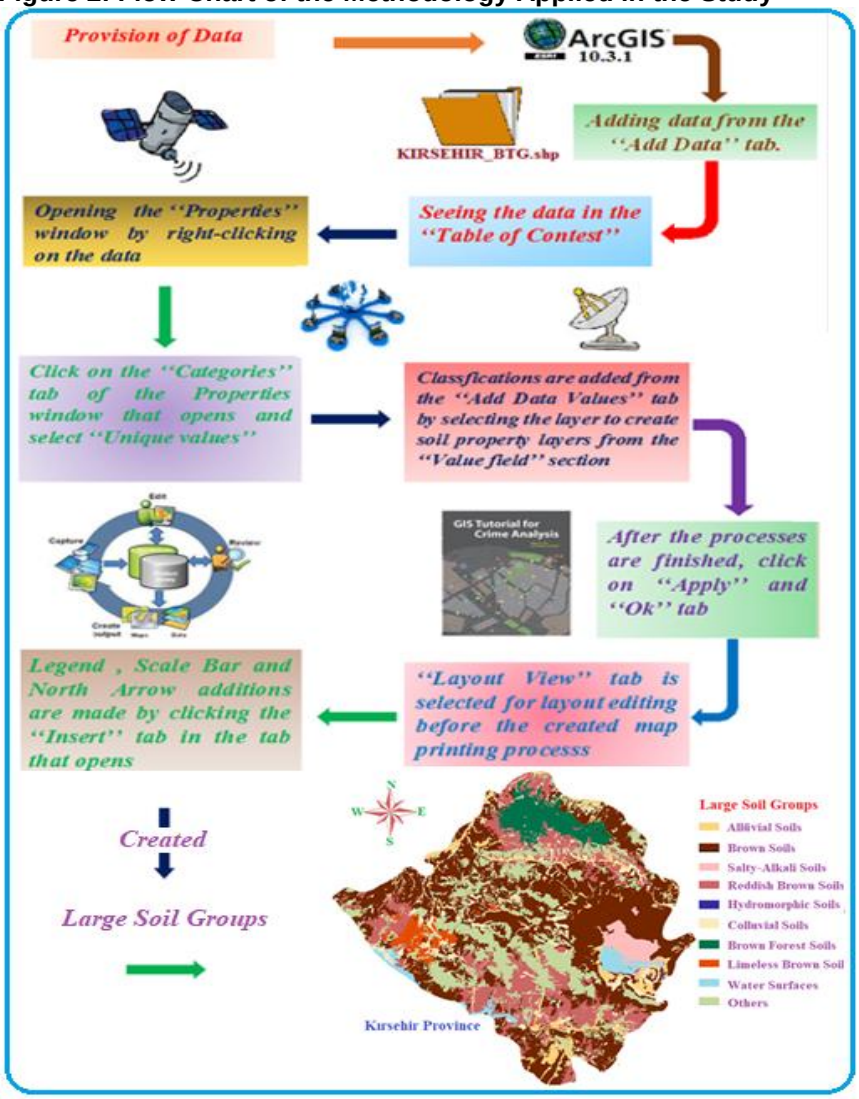
Considering the soil and topographic situation of Kırşehir province, it has been determined that 366222 hectares of the agricultural land, which is 454720 hectares, are irrigable. In short, although 80.54% of the agricultural land is irrigable, only 6.84% can be irrigated (Kıymaz, 2011). The location of Kırşehir province, which is the subject of the study, can be seen on the map given in Figure 1.

Figure 1: Location of the Study Area

Method

In the study, 1/ 25.000 scaled digital soil maps of Kırşehir province were used. (Anonyomous, 2000). Digital soil maps were transferred to Arc GIS 10.3.1 software environment and subjected to spatial analysis layered. Within the scope of the research, current land uses, large soil groups, soil depths, slopes and soil erosion were analyzed as spatially. The flow chart of the methodology applied in the study is given in Figure 2.

Figure 2: Flow Chart of the Methodology Applied in the Study



Current land uses were evaluated spatially within the scope of the research. In this context, the Ministry of Agriculture and Forestry Soil and Land Classification Standards Technical Instruction (Anonymous, 2005). Layer information of existing land uses, large soil groups, soil depths and slopes and erosion classes in the study are presented in Tables 1, 2, 3, 4 and 5.

Table 1: Current Land Use (Anonymous, 2005)

Current Land Use	
Water Surfaces	Steppe
Residential Area	Dry Marginal Agricultural Areas
Fruit Trees	Dry Absolute Agricultural Areas
Landscape and Range Areas	Irrigated Marginal Agricultural Areas
Industry And Mine Areas	Irrigated Absolute Agriculture Areas
Forest Areas	

Table 2: Large Soil Groups (Anonymous, 2005)

Large Soil Groups	Aluvial Soils	Colluvial Soils
	Brown Soils	Regosol Soils
	Saline-Alkaline Soils	Brown Forest Soils
	Chestnut Soils	Vertisols
	Reddish Chestnut Soils	Sierozems
	Red Brown Mediterranean Lands	Limeless Brown Forest Soils
	Limeless Brown Soils	Organic Soils
	High Mountain Meadow Soils	Red Yellow Podzolic Soils
	Reddish Brown Soils	Rendzina Soils
	Gray Brown Podzolic Soils	Red Mediterranean Lands
	Hydromorphic Soils	Basaltic Soils

Table 3: Soil Depth Classification (Anonymous, 2005)

Depth Class	Explanation	Soil Depth (cm)
A	Very Deep	150<
B	Deep	100-150
C	Medium Deep	50-100
D	Shallow	25-50
E	Very shallow	0-25

Table 4: Land Slope Classification (Anonymous, 2005)

Slope Groups	Explanation
0	Flat and Near Flat areas (%0-2)
1	Slightly sloping (%3-6)
2	Medium Slope (%7-12)
3	Inclined Slope (%13-20)
4	Very Steep Slope (%20-30)
5	Steep Slope (%30-45)
6	Very Steep Slope (greater than %45)

Table 5: Soil Erosion Degrees (Anonymous, 2005)

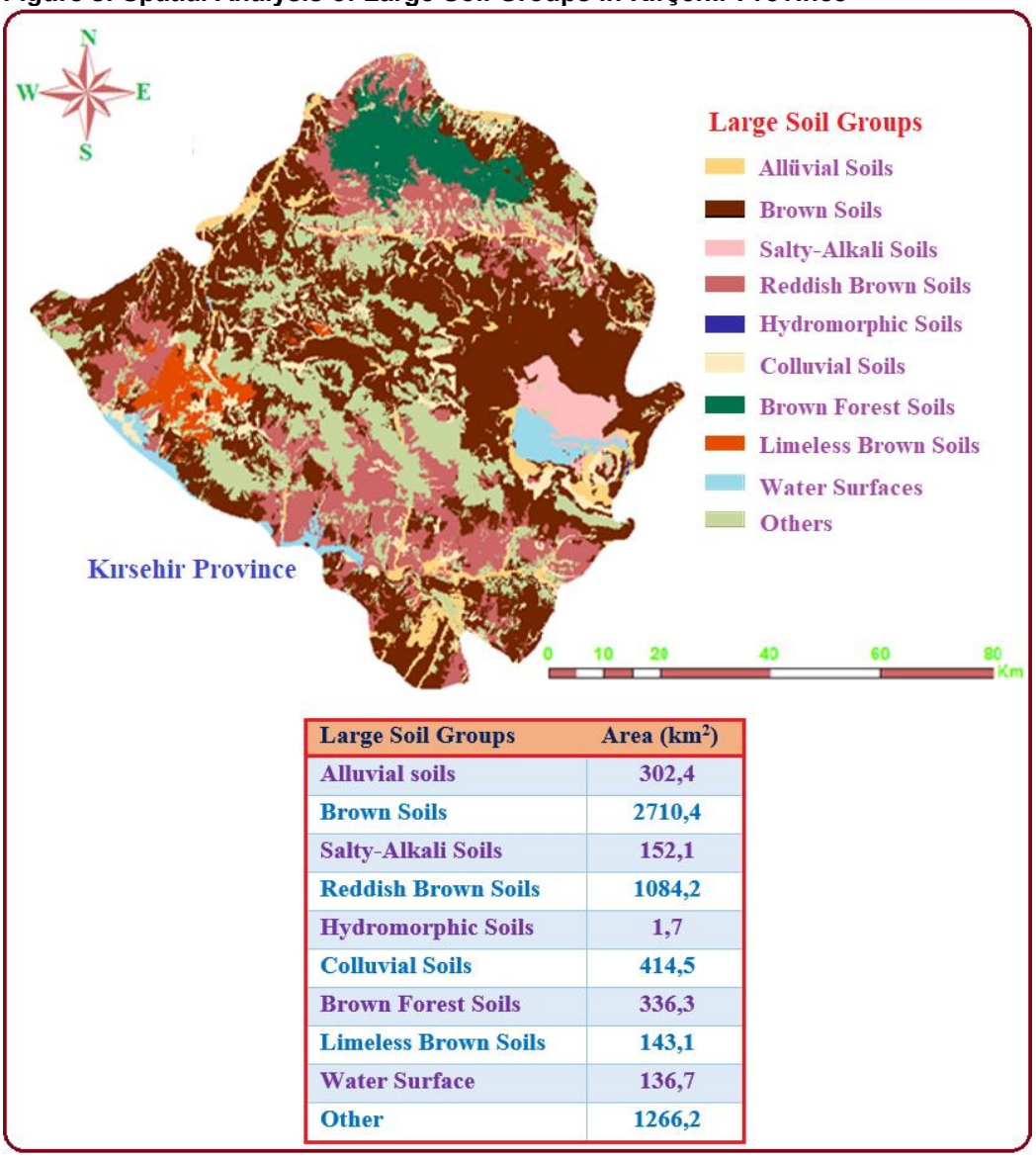
Eurosian Degrees	Class	Explanation
I. Degree	Light Surface Erosion	No erosion damage or applied plow or topsoil Less than %25 are gone.
II. Degree	Medium Surface Erosion	%25-75 of the plowed floor or top layer of soil is gone.
III. Degree	Severe Surface Erosion	More than 75% of the upper layer of soil or 25% of the accumulation horizon is gone
IV. Degree	Very Severe Surface Erosion	%25-75 of the accumulation horizon has gone or galleries have emerged.

RESEARCH FINDINGS

Spatial Distributions of Large Soil Groups

Large soil groups of Kırşehir province were analyzed spatially. The spatial distribution map of the large soil groups obtained as a result of the analysis is given in Figure 3.

Figure 3: Spatial Analysis of Large Soil Groups in Kırşehir Province



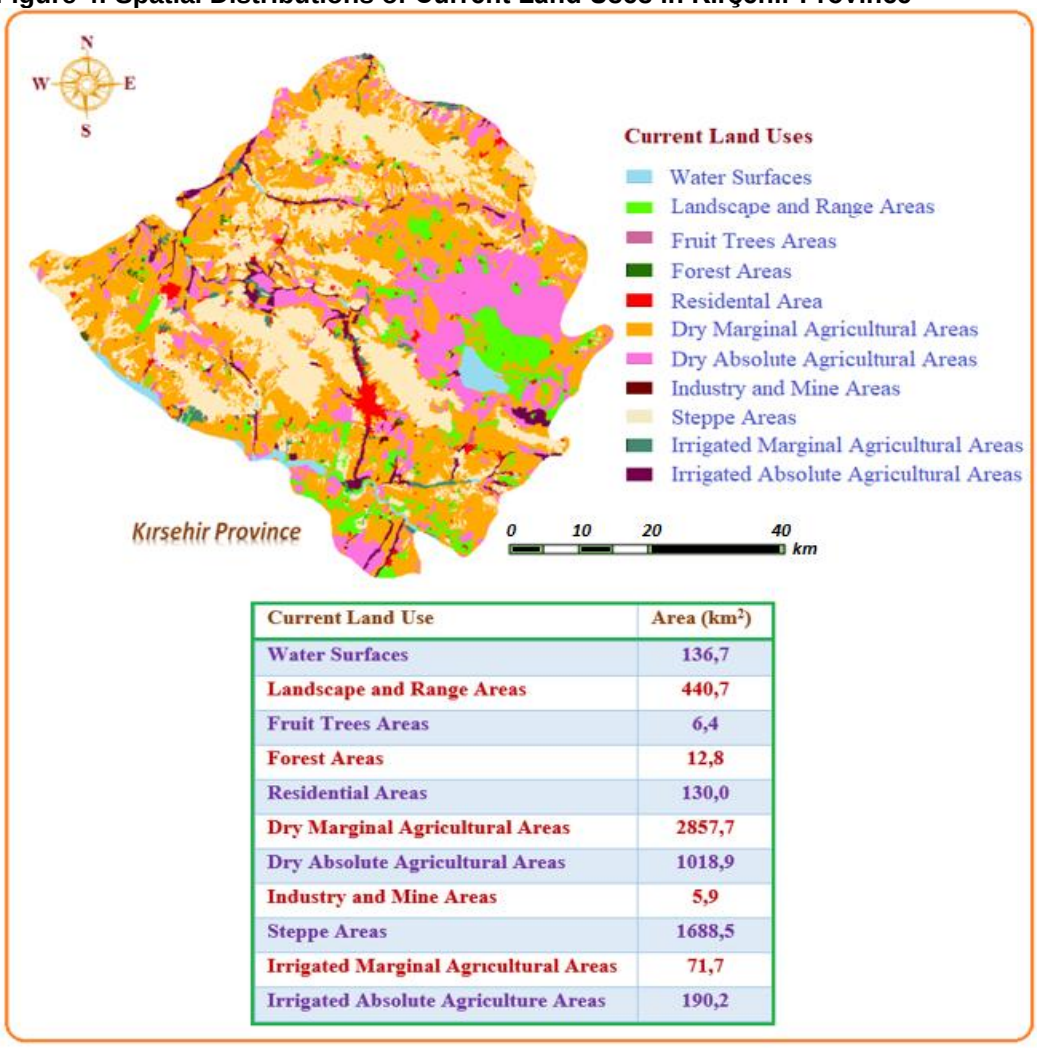
Large Soil Groups	Area (km^2)
Alluvial soils	302,4
Brown Soils	2710,4
Salty-Alkali Soils	152,1
Reddish Brown Soils	1084,2
Hydromorphic Soils	1,7
Colluvial Soils	414,5
Brown Forest Soils	336,3
Limeless Brown Soils	143,1
Water Surface	136,7
Other	1266,2

It has been observed that a large part of the soil structure of Kırşehir province consists brown soils. Brown soils have an area of 2710.4 km^2. This value constitutes 41% of the total area. Red brown soils, on the other hand, have an area of 1084.2 km^2 and constitute 16% of the total area. Brown soils are mostly found in arid and semi-arid climates. The natural vegetation on them consists of short grass and shrubs. They have a lot of calcium in their profile. They are rich in plant nutrients. Natural drainage is good. Their color is brown as their name suggests. Alluvial soils cover an area of 302.4 km^2. It has been determined that salty-alkaline soils cover an area of 152.1 km^2.

Spatial Distributions of Current Land Use

The existing land uses of Kırşehir province were analyzed spatially. The spatial distribution map of the existing land uses obtained as a result of the analysis is given in Figure 4.

Figure 4: Spatial Distributions of Current Land Uses in Kırşehir Province



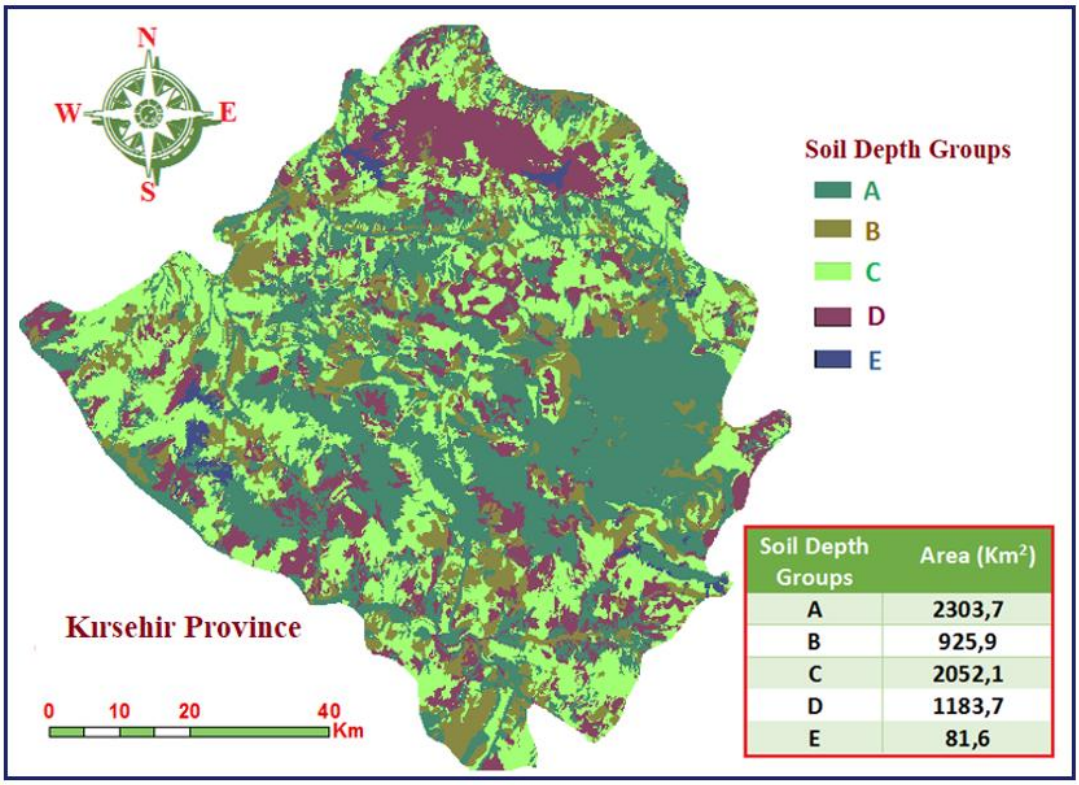
Current Land Use	Area (km²)
Water Surfaces	136,7
Landscape and Range Areas	440,7
Fruit Trees Areas	6,4
Forest Areas	12,8
Residential Areas	130,0
Dry Marginal Agricultural Areas	2857,7
Dry Absolute Agricultural Areas	1018,9
Industry and Mine Areas	5,9
Steppe Areas	1688,5
Irrigated Marginal Agricultural Areas	71,7
Irrigated Absolute Agriculture Areas	190,2

Dry marginal agricultural areas constitute a large part of the land assets of Kırşehir Province. Dry marginal agricultural areas are followed by steppes and dry absolute agricultural areas according to the size of the area they cover. Dry marginal agriculture has an area of 2857.7 km^2 and covers 44% of the current area. The steppes have an area of 1688.5 km^2 and cover 26% of the existing surface area. Dry absolute agricultural areas have an area of 1018.9 km^2 and cover 16% of the current area. Generally, Kırşehir province consists of dry marginal agricultural areas and steppes. Marginal agricultural lands Except for absolute agricultural lands, special crop lands and planted agricultural lands, they are agricultural lands due to local importance or local needs. The land and topographical limitations of these lands are high and their agricultural production potential is low (Anonymous, 2005). Therefore, agricultural restrictions may be encountered in the region.

Spatial Distributions of Soil Depth Classes

Soil depth classes of Kırşehir province were analyzed spatially. The spatial distribution map of the soil depth classes obtained as a result of the analysis is given in Figure 5.

Figure 5: Spatial Distributions of Soil Depth Groups in Kırşehir Province



Soil Depth Groups	Area (Km²)
A	2303,7
B	925,9
C	2052,1
D	1183,7
E	81,6

Group A represents the largest part of Kırşehir province, "very deep" soil depth class greater than 150 cm. The very deep soil area of Kırşehir province was found as 2303.7 km^2. This situation constitutes 35% of the total area. It was observed that very deep soil areas were concentrated in the eastern part of Kırşehir province.

Group B represents the "deep" soil class with a soil depth of 100-150 cm. The spatial distribution (deep soil classes) of the B group soil depth class constitutes an area of 925.9 km^2.

The C group soil depth represents the "medium deep" soil depth class between 100-150 cm. Medium deep soil areas were found to be 2052.1 km^2. This situation constitutes 31% of the total area.

D group soil class represents shallow soils (25-50 cm). In the province of Kırşehir, the shallow soil group covers an area of 1183.7 km^2.

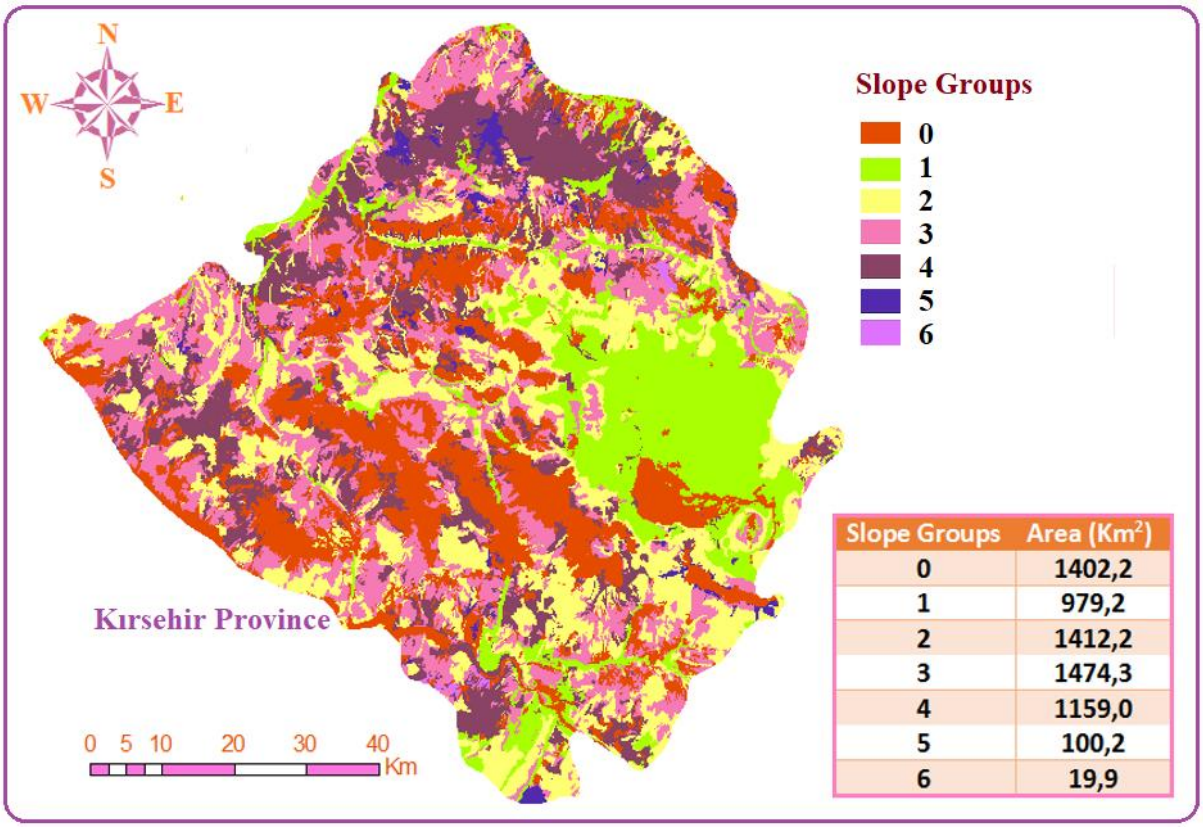
The E group soil depth class represents soils with very shallow (0-25 cm) depth. It has been determined that the E class soil group in Kırşehir province covers an area of 81.6 km^2.

In general, it is seen that most of the soil depth of Kırşehir province consists of very deep (A) and medium deep (C) soil parts.

Spatial Distributions of Soil Slope Groups

Soil slope groups of Kırşehir province were analyzed spatially. The distribution map of the soil slope groups spatial classes obtained as a result of the analysis is given in Figure 6.

Figure 6: Spatial Distributions of Soil Slope Groups



Slope Groups	Area (Km²)
0	1402,2
1	979,2
2	1412,2
3	1474,3
4	1159,0
5	100,2
6	19,9

Soil slope groups of Kırşehir province are classified between 0-6. The areas with the largest slope group are the areas in the 3rd degree slope group with an area of 1474.3 km^2.

The zero slope group includes flat and nearly flat areas (0-2%). It has been determined that there is an area of 1402.2 km^2 in the zero slope group in Kırşehir province. The 1st degree slope group includes areas with slight slope (3-6%). In the 1st degree slope group, it was determined that there was an area of 979.2 km^2 and this situation was found to cover 15% of the total area.

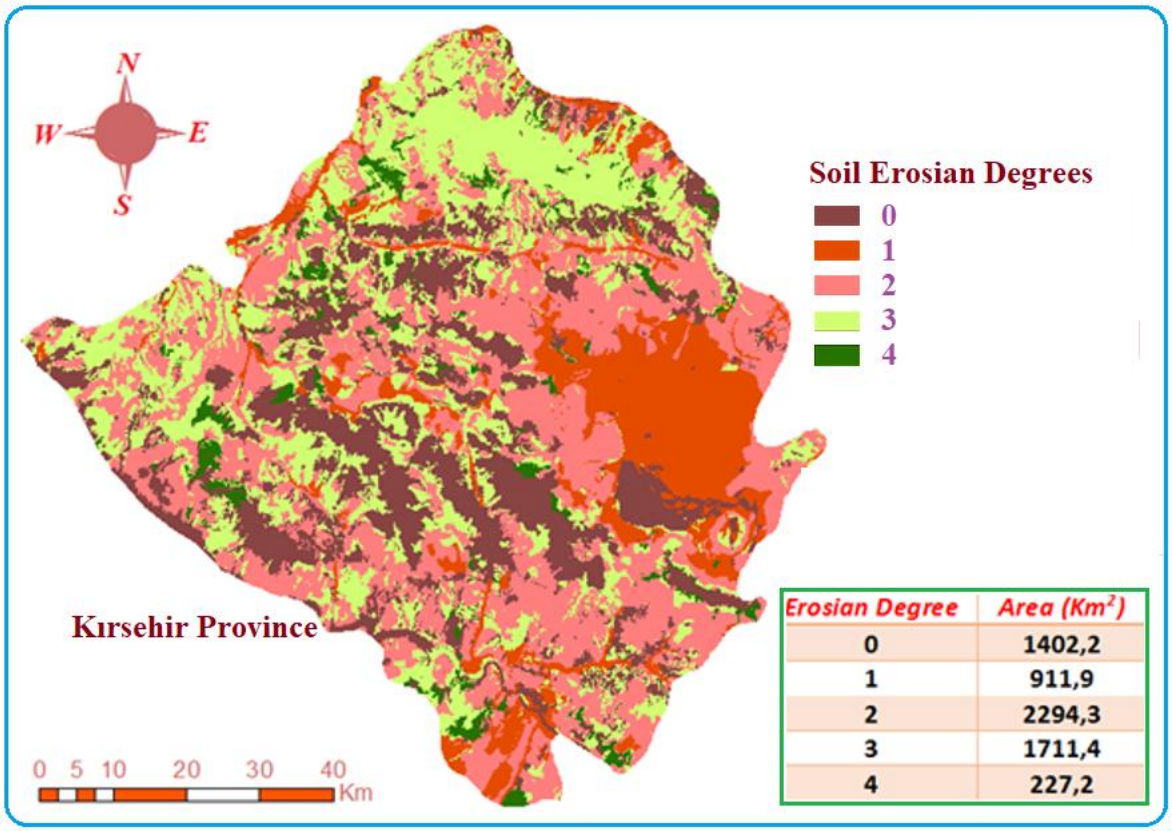
In the 2nd degree slope group (medium slope, 7-12%), it has been calculated that there is an area of 1412.2 km^2. The 2nd degree slope group also corresponds to 22% of the total area. The 4th slope group is a very steeply inclined class and it has been calculated to cover an area of 1159 km^2.

It is concluded that this situation corresponds to 18% of the total area. The 6th degree slope group includes areas with very steep slopes (more than 45%). These areas cover an area of 19.9 km^2 in the province of Kırşehir.

Spatial Analysis of Soil Erosion Degrees

Soil erosion degrees of Kırşehir province were analyzed spatially. The spatial distribution map of soil erosion degrees obtained as a result of the analysis is given in Figure 7.

Figure 7: Spatial Analysis of Soil Erosion Degrees in Kırşehir province

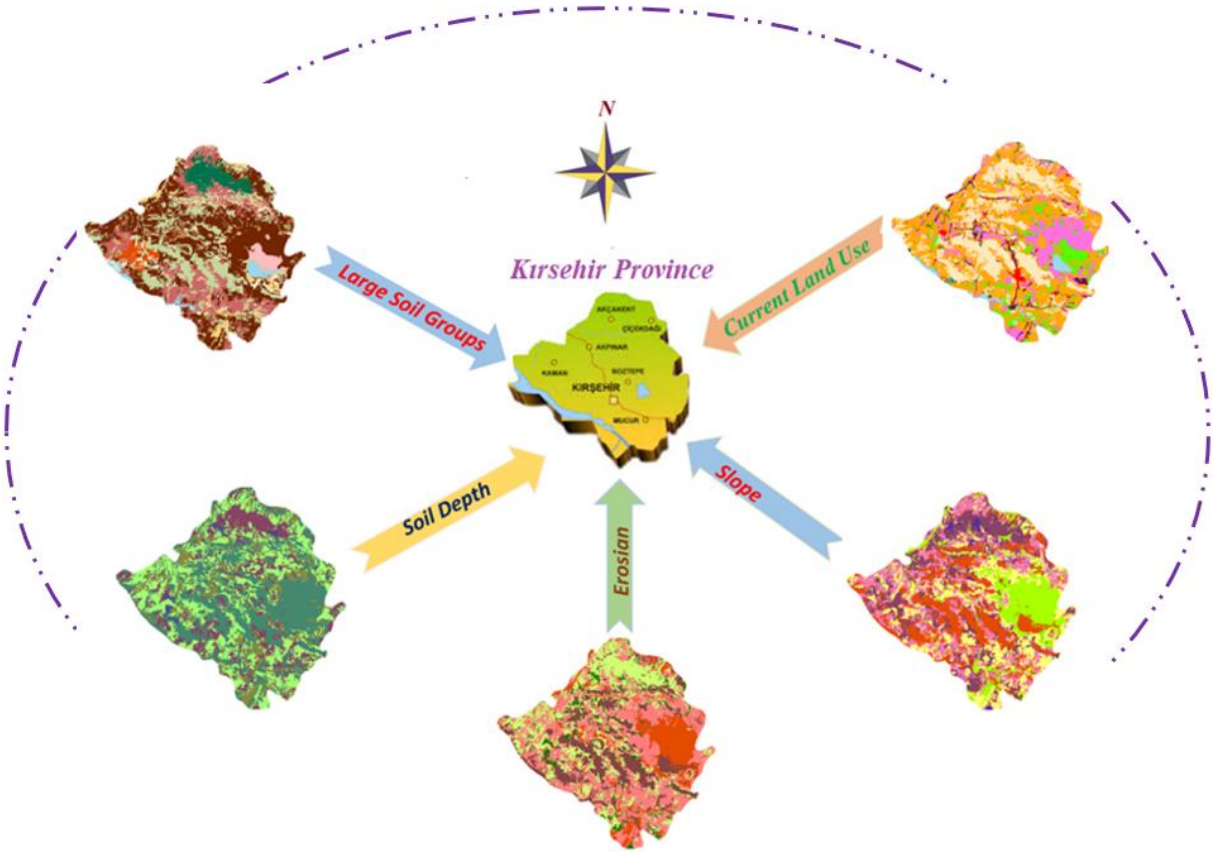


2nd degree soil erosion was determined in the province of Kırşehir. Areas that may be exposed to 2nd degree erosion have an area of 2294.3 km^2. This situation corresponds to 35% of the total area. Areas with 3rd degree erosion are defined as severe erosion. This situation constitutes 26% of the total area with an area of 1711.4 km^2. Soils with 4th degree erosion are areas that can be subject to very severe erosion. It has been determined that the areas with 4th erosion degree in Kırşehir province have an area of 227.2 km^2.

Spatial Analysis Results of Soil Layers

According to the spatial analysis results, all data obtained were evaluated according to the Technical Instruction of Soil and Land Classification Standards (Anonymous, 2005). Within the scope of the study, the land use potential of Kırşehir province is shown schematically in Figure 8

Figure 8: Spatial Analysis Distribution of Land Use Potential in Kırşehir Province



According to the current land use results of Kırşehir province; the largest area with 2857.7 km^2 was determined as dry marginal agricultural areas. Steppes are 1688.5 km^2, dry absolute agricultural lands 1018.9 km^2, meadow and pasture areas 440.7 km^2, irrigated absolute agricultural areas 190.2 km^2, water surfaces 136.2 km^2, settlements 130 km^2, irrigated marginal agricultural areas 71.7 km^2, forest areas 12.8 km^2, planted fruit trees 6.4 km^2 and industrial areas 5.9 km^2. Total area of Kırşehir province has been found to be 6,547 km^2. For this reason, dry marginal agricultural areas cover 43%, steppes 26%, dry absolute agricultural lands 16% and the remaining 15% cover other areas according to the total area.

According to the spatial analysis results of large soil groups; Most of the existing soil structure of Kırşehir province consists of brown soils. Brown soils are determined to be 2710.4 km^2. Red brown soils 1084.2 km^2, brown forest soils 336.3 km^2, colluvial soils 414.5 km^2, hydromorphic soils 1.7 km^2, salty alkali and saline alkali mixed soils 152.1 km^2, alluvial soils 302.4 km^2, 1266 The area of 2 km^2 is classified as other. Total area of Kırşehir province has been found as 6,547 km^2. For this reason, brown soils constitute 41% and red brown soils constitute 16% according to the total area.

According to the spatial distribution of soil depth classes; Most of the lands of Kırşehir province are in the very deep and medium deep soil class. Very deep soils represent the depth class greater than 150 cm. The area of 2303.7 km^2 in the province of Kırşehir is in the very deep soil class. Deep soils are between 100-150 cm and an area of 925.9 km^2 has been found in Kırşehir. Medium deep soils are between 50-100 cm and an area of 2052.1 km^2 has been found for Kırşehir province.

Areas with shallow soil depth are between 25-50 cm and have been found to be 1183.7 km^2 for Kırşehir province. Areas with very shallow soil depth are between 0-25 cm and 81.6 km^2 for Kırşehir province. When the evaluation is made according to the total area, very deep soils constitute 35% of the total area, medium deep soils 31% and shallow depth soils constitute 18% of the total area.

According to the spatial analysis results of soil slope groups; The land slope of Kırşehir province varies between 0-30%. The areas given as 0 in the slope group and the slope varying between 0-2% are 1402.2 km^2, the areas given as the 1st degree slope and the slope varying between 3-6% are 979.2 km^2, the slope given as the 2nd degree slope group and the slope is

7-12% (1412.2 km^2). 3rd degree slope group and with the slope varying between 13-20% 1474.3 km^2, the areas given as the 4th degree slope group and with the slope of 20-30%, 1159 km^2, The areas given as the 5th degree slope group and whose slope varies between 30-45% are given as 100.2 km^2 and the 6th degree slope group and the areas with the slope greater than 45% are calculated as 19.9 km^2. When the evaluation is made according to the total area, the areas in the 0 degree slope group constitute 21% of the total area, the areas in the 1st degree slope group 14% of the total area, the areas in the 2nd degree slope group 22%, and the areas in the 3rd degree slope group 23%. and the areas in the 4th degree slope group constitute 18% of the total area.

According to soil erosion degrees; Moderate and severe erosion levels are seen high in Kırşehir province. Areas with 0 degree erosion at all 1402.2 km^2, 1st degree mild erosion areas 911.9 km^2, 2nd degree moderate erosion areas 2294.3 km^2, 3rd degree severe erosion 1711.4 km^2, 4th degree areas with very severe erosion were found to be 227.2 km^2. When the total area is evaluated, 0. degree erosion accounts for 21% of the total area, 1st degree erosion 14%, 2nd degree erosion 35%, 3rd degree erosion 26% and 4th degree erosion 4% constitute the reputation.

CONCLUSION and RECOMMENDATIONS

Soil resources are of great importance in the agricultural course of a region together with water resources. As a result of this study, the spatial analysis of the numerical maps with the existing soil potential of Kırşehir province was made and the analysis results were shared as map outputs.

There is no study conducted on the general soil structure such as soil composition, recreation and total amount of salt, lime and organic matter in Kırşehir province (Kıymaz, 2011).

The use of geographic information system techniques, which provide great advantages in terms of speed, accuracy, cost and time compared to terrestrial measurements and classical methods, plays an important role in determining and updating the changes in land cover / land use types (Özsoy, 2007).

In this case, the use of the lands in accordance with the most appropriate land use plans is necessary to protect natural resources, soil and water, increase productivity and quality in agricultural production, and reveal the crop production pattern with production planning. It will be possible to prevent rural migration by initiating rural development by making and expanding these plans (Saykılı et. al., 2017).

In this study, spatial analyzes were carried out with 1/25.000 scaled digital soil maps made by the Abolished General Directorate of Rural Services in Turkey. The classification has been made using Arc GIS 10.3.1 software for current land use, large soil groups, soil depth groups, soil slope group and erosion degrees and presented in detail as map outputs.

In this context, soil potential of Kırşehir province has been tried to be determined by using Geographical Information System. It will be inevitable that the results obtained will provide infrastructure support to the investor organizations in the region. By transferring this study to users in a digital environment, creating a database and thus setting a precedent for the study, it will guide similar studies.

REFERENCES

Anonyomous, (2000). Sayısal Toprak Haritaları, Mülga Köy Hizmetleri Genel Müdürlüğü, Ankara, Turkey (in Turkish)

Anonymous, (2005). Toprak ve Arazi Sınıflaması Standartları Teknik Talimatı, Tarım ve Orman Bakanlığı, Ankara, Erişim tarihi: 10 Nisan 2020 (in Turkish) https://www.tarimorman.gov.tr/Belgeler/Mevzuat/Talimatlar/ToprakAraziSiniflamasiStandartlariTeknikTalimativeIlgiliMevzuat_yeni.pdf

Anonymous, (2007). Kırşehir Tarımsal Verileri, Tarım ve Orman İl Müdürlüğü, Kırşehir, Turkey (in Turkish)

Anonymous, (2008). Kırşehir İl Çevre Durum Raporu, Kırşehir İl Çevre ve Orman Müdürlüğü, Kırşehir, Turkey (in Turkish)

Anonymous, (2020). Kırşehir İl Kültür ve Turizm Müdürlüğü, Genel Bilgiler, Kırşehir, Turkey https://kirsehir.ktb.gov.tr/TR-64747/genel-bilgiler.html, Erişim: 16 Nisan 2020 (in Turkish)

Dengiz, O., Sağlam, M., Özaytekin, H. H., Baskan, O., (2013). Weathering rates and some physico-chemical characteristics of soils developed on a calcic toposequences. Carpathian Journal of Earth and Environmental Sciences, 8(2): 13-24

Doğan, H.M., Aslan, S., (2013). Aşağı Kelkit Havzası`nın Bazı Toprak Özelliklerinin Coğrafi Bilgi Sistemleri ve Uzaktan Algılama ile Haritalanması, Gaziosmanpaşa Bilimsel Araştırma Dergisi, 3 :25-33 (in Turkish)

Fitzpatrick, C., Maguire, D. J., (2000). GIS in schools: Infrastructure, methodology and role, In GIS: A Sourcebook for Schools, Edited by: Green, New York: Taylor & Francis.

Karaca, S., Sarğın, B., Türkmen, F., (2019). Bazı Arazi ve Toprak Niteliklerinin Coğrafi Bilgi Sistem Analizleriyle İncelenmesi: Van İli Arazi ve Toprak Özellikleri, Türkiye Tarımsal Araştırmalar Dergisi, 6(2): 199-205 (in Turkish)

Kıymaz, S., (2011). Kırşehir İli Toprak ve Su Kaynaklarının Tarımsal Açıdan Değerlendirilmesi, Süleyman Demirel

Üniversitesi Ziraat Fakültesi Dergisi 6 (2):76-85 (in Turkish) Mitchell, A., 1999. GIS Analysis, Volume 1, California, ESRI.
Özsoy, G., (2007). Uzaktan Algılama (UA) ve Coğrafi Bilgi Sistemi (CBS) Teknikleri Kullanılarak Erozyon Riskinin Belirlenmesi, Uludağ Üniversitesi, Fen Bilimleri Enst., Toprak Anabilim Dalı, Doktora Tezi, s.20, Bursa (in Turkish)
Özbek, H., Dinç., U, Berkman., A, Şenol, S., Kapur, S., (1979). Tarım Toprakları ve Endüstri İlişkileri, Çukurova'da Endüstrinin Kapladığı Tarım Toprakları ve Sorunları Üzerine Bir Araştırma. Toprak İlmi Derneği 7. ve 8. Bilimsel Toplantı Tebliğleri. Yayın no:3, Ankara.
Saykılı, İ., Birdal, A.C., Türk, T., (2017). En Uygun Arazi Kullanım Planlarının CBS ile İncelenmesi: Sivas İli Dikmencik Köyü Örneği, Geomatik Dergisi ,2(3);126-134 (in Turkish)
Tunçay, T., Bayramin, İ., (2010). Çiçekdağı-Kırşehir Tarım İşletmesi Topraklarının Detaylı Toprak Etüt ve Haritalanması, Anadolu Tarım Bilim Dergisi, 25(1):53-60 (in Turkish)
Uzun, N., (2012). Mera Hayvancılığında Uydu Görüntü İşleme Teknikleri ve Coğrafi Bilgi Sistemi Kullanımı, Süleyman Demirel Üniversitesi, Fen Bilimleri Enstitüsü, Zootekni Anabilim Dalı, Yüksek Lisans Tezi (in Turkish)

Accepted 5 December 2020

Citation: M. Cüneyt B., Oğuzhan A. (2020). GIS Mapping of Large Soil Groups, Current Land Use, Soil Depths and Slopes, Erosian in kırşehir Province of Turkey. World Research Journal of Agricultural Sciences, 8(1): 265-277.