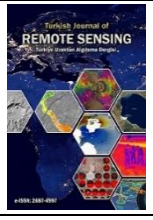
Araştırma Makalesi/Research Article
https://doi.org/10.51489/tuzal.1394585

2024; 6(1); 01-11

Turkish Journal of Remote Sensing

https://dergipark.org.tr/en/pub/tuzal

e-ISSN 2687-4997



A Case Study of the Impact of University Establishment on Urbanization in Turkey's Medium-Sized City of Osmaniye

Ceren Yağcı*[1], Dilşah Erkek[2], Fatih İşcan[2]

[1]Osmaniye Korkutata University, Faculty of Engineering, Geomatics Engineering, Osmaniye, Turkey
[2]Konya Technical University, Faculty of Engineering, Geomatics Engineering, Konya, Turkey

Keywords:
Land Cover / Use
Urban Growth
Medium-Sized City
Change Detection

ABSTRACT

The rapid increase in the urban population increases the space requirement of the cities and this situation causes the growth of them. As cities grow, problems such as agricultural lands, irregular settlements and destruction of natural areas arise. City managers respond to these problems with various political solutions and new technologies. Developments in computer technology are very important in analyzing the rapid changes in land use and ensuring sustainable and planned land use. In this study, the change in land cover/ use during the process of the establishment of Osmaniye Korkut Ata University in the province of Osmaniye is examined. This situation revealed that the most important dynamic that accelerates urbanization in the region is the university. The study area is Osmaniye city center and the land use change according to years in the university region (Fakıuşağı district) has been discussed. For this purpose, a pixel-based controlled classification technique was applied to satellite images of 1999 - 2009 - 2019. The city areas triggered by the university and the amount of changing land cover in the province of Osmaniye were revealed spatially and spatially with the help of satellite images of each year. It was observed that the settlement class in both Osmaniye and Fakıuşağı districts has increased considerably. While the settlement class in Osmaniye province increased 2.5 times from 1999 to 2019, the increase in Fakıuşağı district increased approximately 10 times from 1999 to 2019. It has been observed that the establishment of the university, apart from the natural population increase, increased the migration to the city and led to the opening of new zoning areas in the determined 20-year period. In this process, it has been concluded that while settlements have expanded, agricultural lands have decreased, and pastures and forests have been destructed in recent years.

Türkiye'nin Orta Ölçekli Kenti Osmaniye'de Üniversite Kuruluşunun Kentleşmeye Etkisi Üzerine Bir Vaka Çalışması

Anahtar Kelimeler:
Arazi Örtüsü Kullanımı
Kentsel Büyüme
Orta Ölçekli Kent
Değişiklik Tespiti

ÖZ

Kent nüfusundaki hızlı artış, kentlerin alan kullanım ihtiyacını artırmakta ve bu durum kentlerin büyümesine neden olmaktadır. Kentler büyüdükçe, tarım arazileri, düzensiz yapılaşmalar ve doğal alanların tahrip edilmesi gibi sorunlar ortaya çıkmaktadır. Kent yöneticileri, bu sorunlara çeşitli politik çözümler ve yeni teknolojilerle karşılık vermektedir. Bilgisayar teknolojisinde yaşanan gelişmeler arazi kullanımındaki hızlı değişimleri analiz etmek, sürdürülebilir ve planlı arazi kullanımını sağlamak açısından oldukça önemlidir. Bu çalışmada, Osmaniye iline Osmaniye Korkut Ata Üniversitesi'nin kurulmasıyla yaşanan süreçte arazi örtüsü/kullanımındaki değişimi incelenmektedir. Bu durum bölgede, kentleşmeyi hızlandıran en önemli dinamiğin üniversite olduğunu ortaya koymuştur. Çalışma alanı Osmaniye il merkezi olarak ve üniversite bölgesi özelinde (Fakıuşağı Mahallesi) yıllara göre arazi kullanımı değişimi ele alınmıştır. Bu amaçla 1999- 2009- 2019 yıllarına ait uydu görüntülerine piksel tabanlı kontrollü sınıflandırma tekniği uygulanmıştır. Belirlenen her yıla ait uydu görüntüleri yardımıyla Osmaniye ilinde, üniversitenin tetiklediği kent alanları ve değişen arazi örtüsü miktarı alansal ve konumsal olarak ortaya konmuştur. Hem Osmaniye hem de Fakıuşağı Mahallesi'ndeki yerleşim sınıfının oldukça arttığı

Article Info

Received: 23/11/2023
Accepted: 21/12/2024
Published: 30/06/2024

Citation:

Yağcı, C., Erkek, D. & İşcan, F. (2024). A Case Study of the Impact of University Establishment on Urbanization in Turkey's Medium-Sized City of Osmaniye. Turkish Journal of Remote Sensing, 6 (1), 01-11.

***Corresponding Author:** Ceren Yağcı, cerenavciyagci@gmail.com, +90 328 827 10 00 (3629)

gözlenmiştir. Osmaniye İl'indeki yerleşim sınıfı 1999 yılından 2019 yılına yaklaşık 2.5 katına çıkarken, Fakıuşağı Mahallesi'ndeki artış 1999 yılından 2019 yılına yaklaşık 10 katına çıkmıştır. Belirlenen 20 yıllık süreçte doğal nüfus artışının dışında üniversitenin kuruluşunun, kente olan göçleri arttırdığı ve yeni imar alanlarının açılmasına sebep olduğu gözlenmiştir. Bu süreç içerisinde yerleşim yerleri genişlerken tarım arazilerinin azaldığı, mera ve ormanlıkların da son yıllarda tahrip edildiği sonucuna ulaşılmıştır.

1. INTRODUCTION

After the industrial revolution, the rapidly increasing population and the initiation of migration from rural areas to cities accelerated urbanization. Cities that experience the urbanization process rapidly, in order to benefit more from the unit area; have started to consume natural resources and turn the areas that cannot be used economically into new economic activity areas. This situation also accompanied the problem of unintended land use (Zhang & Song, 2003). The increase in non-purpose land use destroys agricultural areas, ecosystems, water resources and land cover, which adversely affects environmental plans (Caniberk et al., 2015). Changes in land cover use occurred especially in agriculture and forestry areas. Agriculture and forestry areas have turned into residential areas under the pressure of urbanization. The growing settlement areas have started to negatively affect the life in the cities along with the economic, social and political change processes (Sönmez, 2011). This process experienced in cities has revealed the necessity of renewal and planning of the city (Breuste, 2004). Geographical Information Systems (GIS) and Remote Sensing (RS) technologies have been widely used in urbanization studies in recent years in order to stop unplanned cities, to prevent wrong land use and offer solutions. Thanks to the developments in these technologies, it has become possible to obtain data on the earth quickly and with high precision. In addition, it was very useful to obtain and process periodic data kept at regular intervals in order to detect land use change in order to observe change in cities. In brief, by processing satellite images with the Remote Sensing method and using them as a base map. In Geographical Information Systems, it enables the analysis, interpretation and developing solution proposals of many urbanization problems (Masser, 2001). Many academic studies prepared with the integrated use of GIS and Remote Sensing techniques in determining the land cover change are encountered. These studies have been evaluated under three different headings. These are the studies of misuse of agricultural lands (Hadeel, AS, Jabbar, & Chen, 2011;Dengiz & Turan, 2014; Bayar, 2018; Çolak & Memişoğlu, 2018; Köse, 2023) misuse of natural resources such as forests and pastures (Tucker, et al., 1985; Genç & Bostancı, 2007; Safari, et al., 2017; Aydın & Durduran, 2021) and the dynamics that accelerate urbanization process (Aydın, 2009; Başer, 2019; Çelikoyan & Şeker, 2005; Green, et al., 1994; Gülersoy, 2013; Kara & Karatepe, 2012; Özdemir & Bahadır, 2008; Treitz, et al., 1992; Weng, 2002). With these studies, land use changes in cities were determined. Providing effective positional awareness about the development of the city to decision-makers on land use is a very important step in ensuring sustainability in the city. In this way, it becomes possible to determine the dynamics that trigger urbanization. Identifying these dynamics in cities is very important in order to produce effective solutions in areas under the pressure of urbanization. In general, industrial facilities, foreign migration, health institutions, transportation networks, tourism and educational institutions accelerate urbanization. Universities established in cities in recent years have become one of the most important dynamics of the city over time. As in many countries such as England, Australia, Finland and the USA, it has been observed that universities in Turkey are important for urban development and affect the city economically directly or indirectly (Armstrong et al., 1994; Bleaney, et al., 1992; Borland, et al., 2000; Çayı, & Yapraklı, 2014; Görkemli, 2009; Huggins & Cooke 1997; Öztürk, et al., 2011; Penn State Extension & Penn College-MSETC, 2012; Serel, & Kaşlı, 2008; Tavoletti, 2007; Tösten, et al., 2013; Tiuzbaian, 2003; Newland, 2003). In addition, universities are institutions that play a role in the formation of urban areas and contribute to major developments in the fields of commerce, arts, health, education, economy, tourism and science as a result of collaborations with the state and industry (Andersson, et al., 2009). For this reason, universities are seen as extremely important economic factors. It is an undeniable fact that especially universities established in low-populated Anatolian cities bring socio-cultural as well as economic dynamism to cities (Arslan, 2014).

The impact of Bartın University in Bartın, Mehmet Akif Ersoy University in Burdur province, Çankırı Karatekin University in Çankırı, Kilis 7 Aralık University in Kilis, Kütahya Dumlupınar University in Kütahya, Muş Alparslan University in Muş and Sivas Cumhuriyet University in Sivas province on the city, urban dwellers, population, economic growth, construction and employment opportunities in Sivas province has been revealed by the researches (Arslan, 2014; Ceyhan, & Güney, 2011; Çayın & Özer, 2015; Dalğar, et al., 2009; Demireli & Taşkın, 2013; Ergün 2014; Erkekoğlu, 2000; Sönmez & Başkaya, 2013). However, in these studies, the impact of universities on urbanization has not been addressed. Especially, small and medium-sized cities in Turkey with universities can enter a rapid growth process (Ergün, 2014). It has been observed that in these

cities, big dynamics such as the university, especially urbanization in the environment where the university campus is located, and the increase in unplanned growing areas have been observed to be more affected than the big cities.

This study addresses a critical research gap by investigating the impact of recently established universities on the status of small and medium-sized cities, with a specific emphasis on Osmaniye. The research aims to elucidate the developmental trajectories of these cities, particularly focusing on the influence of Osmaniye Korkut Ata University on urbanization, analyzed through Remote Sensing and Geographic Information System.

The study's findings unveil substantial changes in land use within Osmaniye province subsequent to the establishment of Osmaniye Korkut Ata University. The analysis, centered on the Fakıuşağı neighborhood, encompassing the university campus, signifies a noteworthy acceleration in residential area expansion. Concurrently, a reduction in pasture and agricultural areas within the study scope is evident.

These observations affirm the proposition that medium-sized cities, driven by the presence of universities, experience a rapid growth process. The study contributes to a nuanced comprehension of the transformative effects of higher education institutions on urban landscapes in regions like Osmaniye.

2. MATERIAL AND METHOD

2.1. Material

The basic material of the study consists of the satellite images taken in 1999-2009-2019 to examine the land use change in Osmaniye province and the neighborhood border data taken from the Osmaniye municipality. To determine land use classes basic data set in the United States Downloadable Landsat-5 TM and Landsat 8 satellite images with low cloud rate and 30 m terrestrial resolution were selected by the Geological Survey (USGS) for the years 1999-2009-2019 (URL-1). These images (174 Path, 34 Row) were processed in an area of 100 thousand square meters determined in the ArcGIS environment to cover the city center of Osmaniye and Fakıuşağı. Following this, supervised classification of satellite images for each year within the same software was created of four distinct land use classes (Table 1).

2.2. Study Area

Osmaniye Province is located in the east of them Mediterranean Region and Çukurova. It is surrounded by Gaziantep in the east, Hatay in the south, Adana in the west, and Kahramanmaraş in the north. Osmaniye, which had been made a district in 1933 and connected to Adana, gained its new administrative structure as the 80th province of Turkey on 24.10.1996 (URL 2). The area of the province is 3222 square kilometers, 121 m above sea level and 20 km from the Mediterranean Sea. Osmaniye is the 67th largest city of Turkey in terms of geographical area. Osmaniye is located between 35°52'-36°42 'east longitudes and 36°57'-37°45' north latitudes in the northern hemisphere (Fig. 1).

Figure 1. Study area

Osmaniye is a medium-sized city. Although there is no complete explanation about the concept of medium-sized cities, settlements with a population of at least 50,000 and a maximum of 750000 are considered to be medium-sized urban areas (Üzmez, 2012). People earn their livelihood primarily from livestock and agriculture. The main agricultural products are peanuts, oranges and cotton. There is a total of 40,000 decares of meadow pasture in the province. Most of the meadow pasture areas in the province are bottom and irrigable areas. Irrigation possibilities of pasture areas on medium

and slightly inclined slopes are insufficient. Pasture areas in the base lands are generally used as cattle pasture. (URL-2)

According to the general population census data in the TUIK database, the population of Osmaniye was 438,372 in 1997 and 471,804 in 2009. In 2019, it reached 538,759. An increase of 100,387 was observed from the year it reached the provincial status until 2019 (URL-3). The population chart by years is given in Figure 2. The reasons for the increase in population are the proximity of the province of Osmaniye, especially to the ports of Ceyhan and Iskenderun, and accordingly the settlement of Iskenderun Iron and Steel Factory workers in Osmaniye, the opening of various trade centers, the city's providing employment opportunities at a good level and the establishment of the university.

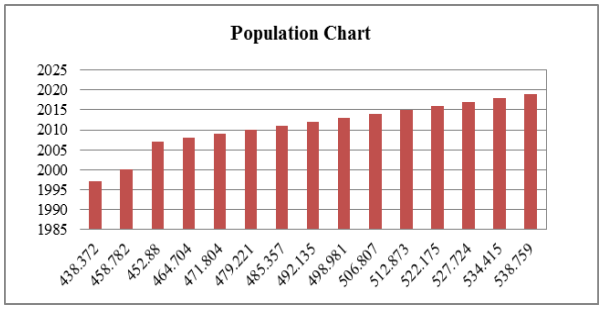


Figure 2. Population chart

2.3. Method

Today, Remote sensing is benefitted to detect land use changes. Remote sensing technology provides data to the Geographical Information System. GIS analyzes, interrogates and visualizes the digital data which it obtains. With the development of science and space technologies, the rapid development of spectral and spatial characteristics of sensors in satellites has intensely increased R.S applications. It has provided the opportunity to easily transfer digital data to the GIS environment and to provide analysis opportunities to users, in other words, the integration of Remote Sensing and Geographical Information Systems. R.S and GIS integration are used in a wide variety of areas such as forest, coastal destruction, urban, environmental and ecological changes (Figure 3).With such an integration, it provides convenience in determining, analyzing, planning and managing temporal change (Dengiz & Turan 2014).

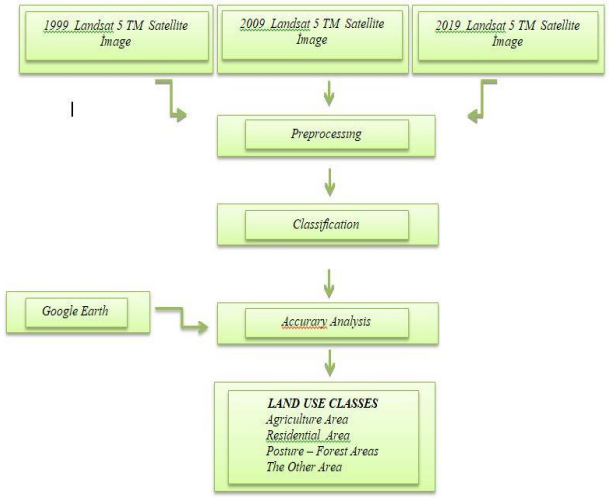


Figure 3. Flow chart

In the process of processing satellite images of the province of Osmaniye and obtaining land use maps, firstly, satellite images were obtained and the land classes to be used were designed. These classes are; settlement, agriculture, pasture and forest areas and others.

The process of determining the feature group of each pixel value in an image and assigning pixels with similar spectral characteristics to the feature groups for the selected bands is defined as classification (Gürbüz et al., 2012; Balçık et al., 2011; Dhanaraj & Angadi, 2022). For this purpose, first of all, controlled classification process was performed on Landsat satellite images. After the field classes are determined, the first stage of the controlled classification, the training part, is carried out. Training part means collection of sample regions. The collection of sample regions is the stage where it is applied by taking samples with an even distribution from the pixels that they know approximately which class they represent on the land. Landsat satellite images were used as a base for the sampling areas. After this stage, the supervised classification of the image was completed using the maximum likelihood algorithm with the reference of the samples taken. After the accuracy analysis of the thematic maps where the supervised classification process was applied, the land cover uses of each three years were obtained.

Accuracy analysis was applied to the classified images and the land use change of the study area in 1999-2009-2019 was tested. In addition, the land use change in the district of Fakıuşağı, where Osmaniye Korkut Ata University is located, in the province of Osmaniye has been examined.

3. RESULTS

3.1. Land Use Change

Land use maps obtained by using Landsat 4-5 TM satellite image are given in Figure 4 for the years 1999, 2009 and 2019. Accuracy values obtained by

controlled classification of satellite images are 80%, 85% and 87.5% for the years 1999, 2009 and 2019, respectively.

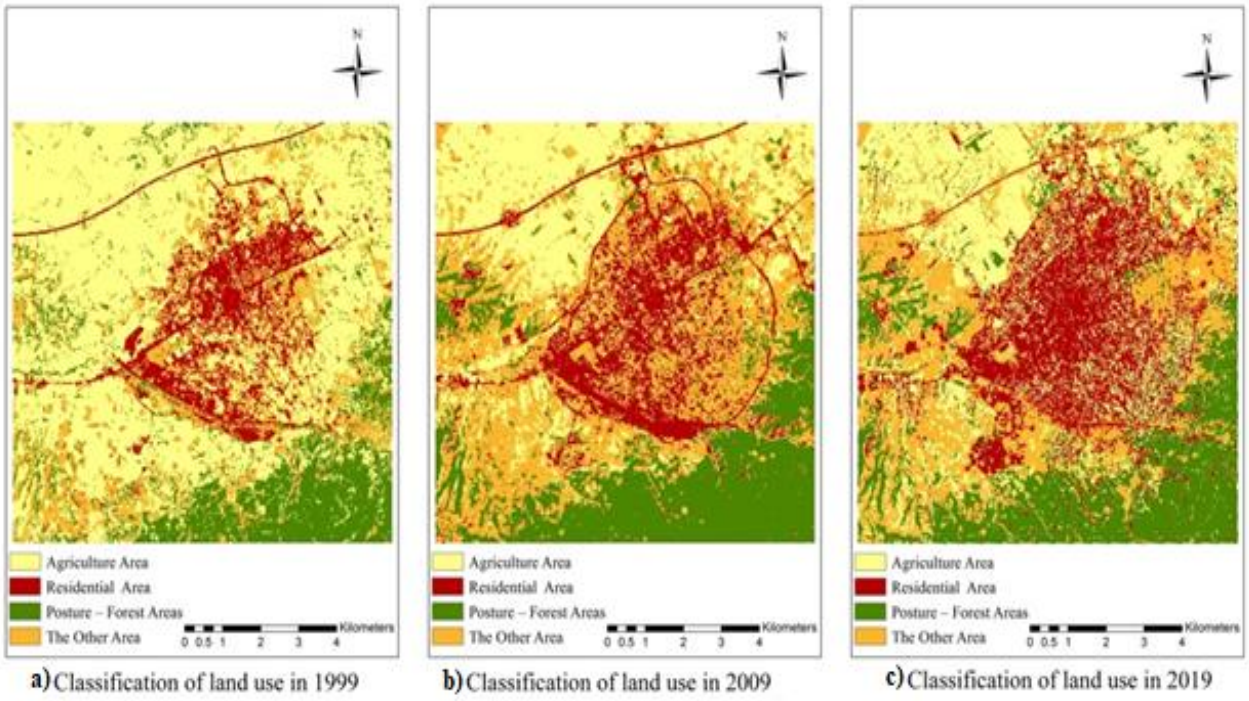


Figure 4. Controlled classification of satellite images, respectively; (a)1999-year (b)2009-year (c) 2019 year

Land use maps obtained by using Landsat 4-5 TM satellite image are given in Figure 4 for the years 1999, 2009 and 2019. Accuracy values obtained by controlled classification of satellite images are 80%, 85% and 87.5% for the years 1999, 2009 and 2019, respectively. Within this period, the residential area increased by 1814.84 ha, while the other (unusable infertile soils, bare surfaces) area also increased by 633.61 ha. It was determined that one of the least land losses was pasture and forest areas with an area of 532.79 ha (Table 1).

Table 1. Area of land use classes

Osmaniye of Province	**1999**		**2009**		**2019**	
Land use classes	**Area (Ha)**	**Percent (%)**	**Area (Ha)**	**Percent (%)**	**Area (Ha)**	**Percent (%)**
Agriculture Area	5514.89	55.15	3083.9	30.84	2533.65	25.34
Residential Area	1083.20	10.83	1466.42	14.66	2898.04	28.98
Pasture and Forest Areas	1454.56	14.55	2187.83	21.88	1987.35	19.87
The Other Area	1947.35	19.47	3261.85	32.62	2580.96	25.81
Total Area	10000	100	10000	100	10000	100

According to the evaluation made in Fakıuşağı neighbourhood, where the University was established in 2007, it has been determined that there has been an increase in settlement areas and other areas in 20 years, and a decrease in agricultural land and forest/pasture areas (Figure 4). While settlements in Fakıuşağı district had an area of 6% in 1999, it reached an area of 60% in 2019. Settlements have increased by 54%. Agricultural lands were 135 hectares in 1999, but decreased to 36 hectares in 2019. The bare surfaces class, expressed as the other, increased between 1999 and 2009, and a decrease occurred in the following years. While pasture and forest areas increased between 1999 and 2009, as in the province of Osmaniye, a decrease was observed between 2009 and 2019 (Table 2).

Table 2. Fakıuşağı neighborhood land use classes areas

Osmaniye of Province	**1999**		**2009**		**2019**	
Land use classes	**Area (Ha)**	**Percent (%)**	**Area (Ha)**	**Percent (%)**	**Area (Ha)**	**Percent (%)**
Agriculture Area	134.56	71	45.07	24	36.22	134.56
Residential Area	12.11	6	39.82	21	113.09	12.11
Pasture and Forest Areas	8.57	5	21.17	11	10.65	8.57
The Other Area	34.76	18	83.94	44	30.04	34.76
Total Area	190	100	190	100	190	190

The land use status of Fakıuşağı district by years is given in Figure 5.

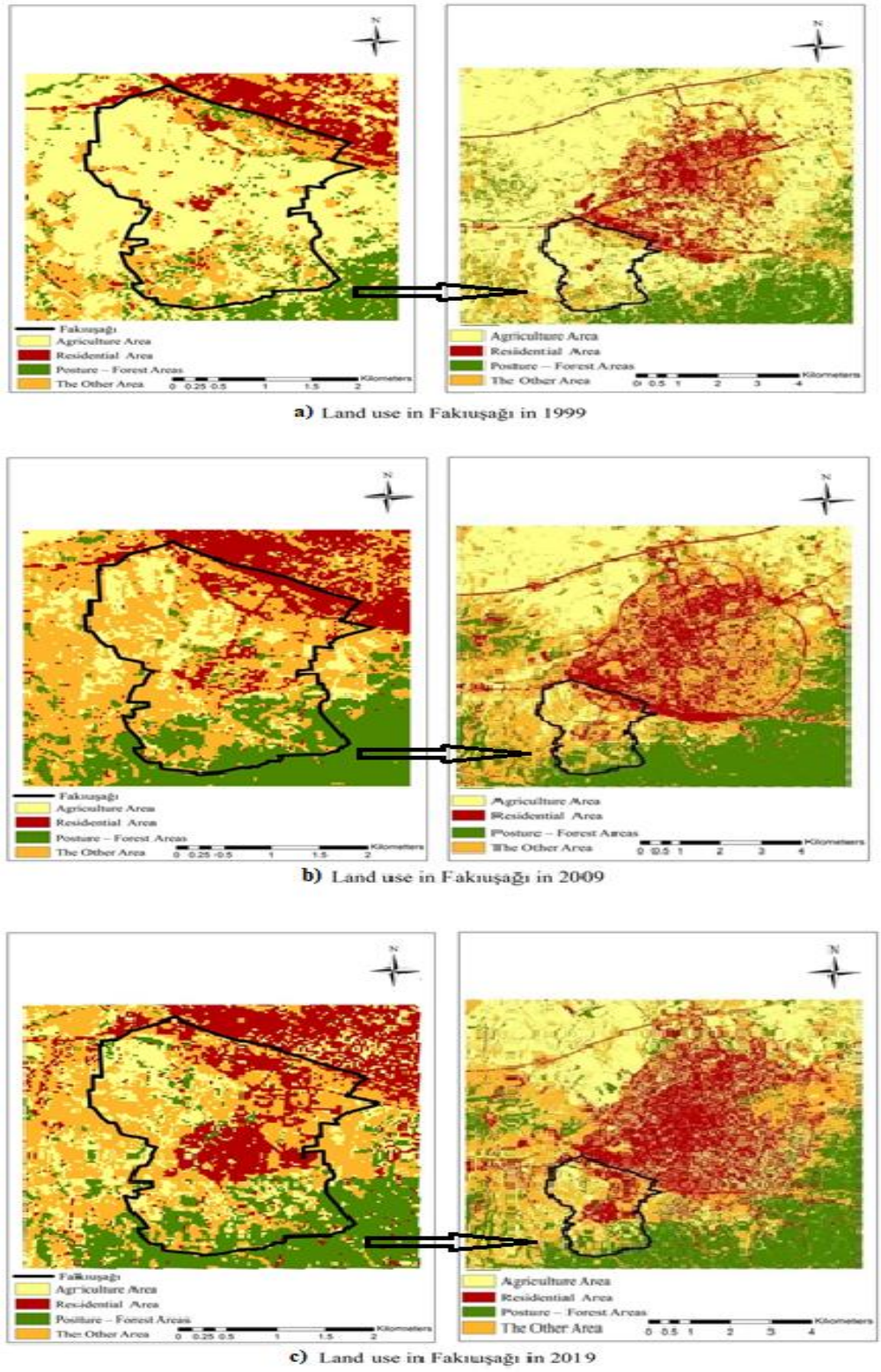


Figure 5. Fakıuşağı neighbourhood land use maps (a) 1999 year, (b) 2009 year, (c) 2019 year

When the change maps are examined by years, it is seen that there are important developments in Osmaniye between 1999-2009. It can be seen that there are important developments in almost the whole city. However, when the analysis of change for the years 2009-2019 is examined, it is determined that there is more movement towards the north of the city, and changes are experienced in the close locations of the university established in the north of the city. When the change maps are examined, in other words, it can be concluded that with the establishment of Korkut Ata University in 2007, the city shifted to the north direction in the next 10 years.

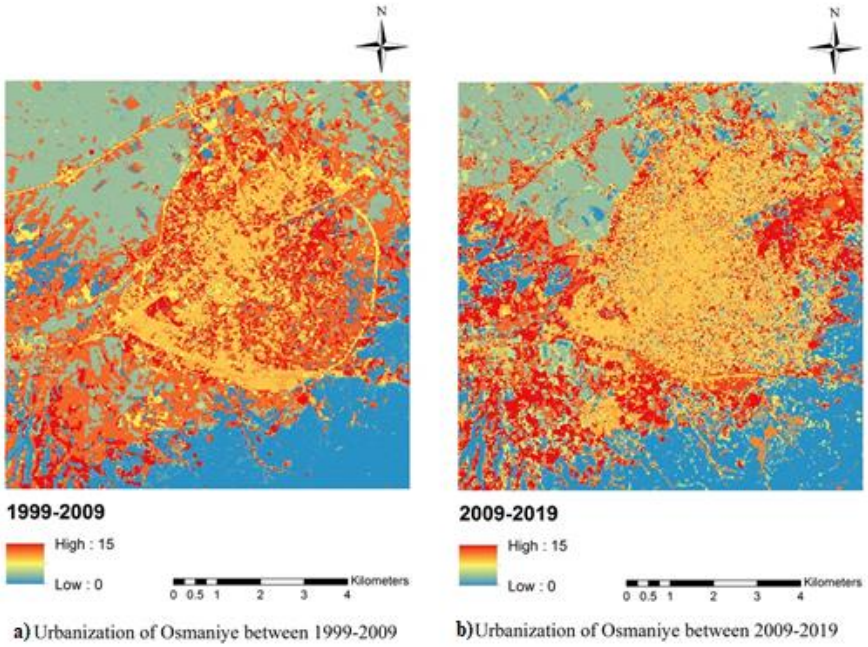


Figure 6. Map of Osmaniye land use change a) 1999-2009 years b) 2009-2019 years

4. DISCUSSION

In order to minimize the effects of agricultural, pasture and forest areas from rapid population growth, land use areas should be determined precisely and sustainable land use plans should be developed and implemented. It is very important to use the concept of land or soil, which is one of the limited resources, in a planned way. Geographical Information Technologies also makes it possible to plan land use, obtain, collect location-based data about setting/place and space, analyze and produce new solutions to problems with the obtained data. Studies in the literature on GIS and Remote Sensing Technologies, which are a part of it, were discussed under three headings as stated in the introduction. These studies consist of widely used topics that examine the misuse of agricultural lands, misuse of natural resources, and urbanization and the process of urbanization. When examining the studies dealing with urbanization and the dynamics that trigger the urbanization process, it was seen that the rapidly increasing human population and the rapid growth in the city were mostly due to migration due to industrialization. (Aydın, 2009; Çelikoyan & Şeker, 2005; Green, et al., 1994; Gülersoy, 2013; Kara & Karatepe, 2012; Özdemir & Bahadır, 2008; Weng, 2002). In the literature, there are also urbanization studies in which road services and tourism are effective as well as urban movements brought by industrialization (Başer, 2019; Özdemir & Bahadır, 2008; Treitz et al., 1992). However, when the studies are examined, no study has been found that examines the change in the land cover in the city caused by a dynamic as a university. The local economic impacts of universities are very effective in terms of both income and employment, knowledge production, investment increase, cultural and social standards established by universities to improve the social infrastructure, and the formation of subsectors. (Amstrong et al., 1994; Bleaney et al., 1992; Borland et al., 2000; Çayın & Özer 2015; Görkemli, 2009; Huggins & Cooke 1997; Öztürk et al., 2011; Pen State Extensionand & Penn College-MSETC, 2012; Serel, & Kaşlı, 2008; Tavoletti, 2007; Tösten et al., 2013; Tiuzbaian, 2003; Newland, 2003). It is stated that universities established in small and medium-sized cities in Turkey are more effective than big cities in the economic development of the city (Arslan, 2014; Ceyhan & Güney, 2011; Çayın & Özer, 2015; Demireli & Taşkın, 2013; Ergün, 2014; Erkekoğlu, 2000; Sönmez & Başkaya, 2013). With the existence of the university, educational opportunities increase, intellectual accumulation increases and new residential areas are created (Tösten, 2013). The difficulty of finding hundreds of acres of land in city centres and the high cost of land in city centers, even if found, cause universities to be established far from or outside the city centre (Öncel, 2019). In the province of Osmaniye, where this situation was experienced, the change in land use was determined within the scope of the study and the effect of the university, which is one of the biggest dynamics of the city, on the city was determined spatially. The change in land use in Osmaniye city centre and university region (Fakıuşağı district) was evaluated temporarily. In the 20-year period, the establishment process of Osmaniye Korkut Ata University, the opening of various trade centres and the changes in the administrative structure of the city in the process caused considerable changes in land use.

Despite the valuable insights provided by Keleş & Durduran in their 2019 study on the spatial changes in Osmaniye since its establishment as an administrative province in 1996. Nevertheless, it is

crucial to underscore that their research did not specifically delve into the influence of a key element within the city namely, the university on land use dynamics. Therefore, this study aims to fill this gap by examining the classification results of settlement areas for the years 1999, 2009, and 2019, which reveal a notable increase from 1083.20 ha to 2898.04 ha. The subsequent analysis will delve into the specific influence of the university on this observed spatial transformation. In this study, according to the classification results, the settlement area amounts for the years 1999, 2009 and 2019 are 1083.20 ha, 1466.42 ha and 2898.04 ha, respectively. The settlement area in Fakıuşağı district was 12 hectares in 1999. In 1999, the university was not established yet, and it was being educated as a vocational college on the university grounds. With the establishment of Osmaniye Korkut Ata University on 29 May 2007, the residential area in Fakıuşağı district increased to 40 hectares in 2009. In 2019, it was determined that the residential area increased rapidly and reached 113 hectares. In this neighborhood, it has been observed that there has been an increase of 54% in the residential areas within 20 years with the effect of the university. It has also been observed that this increase caused a significant decrease in agriculture and other land classes.

According to the land use maps made in the province of Osmaniye, it was observed that the agricultural areas, which were 5514.89 hectares in 1999, decreased to 3083.9 hectares in 2009 and 2533.65 hectares in 2019. Especially the agricultural areas in the Fakıuşağı neighborhood negatively affected the establishment of the university. The agricultural area, which was 145 hectares in 1999, decreased to 36 hectares in 2019 after the university was established. There was a decrease of about 21%. In the forest and pasture areas, the area in Osmaniye province, which was 1454.56 ha in 1999, increased to 2187.83 ha in 2009. This 7% increase is thought to be due to the inclusion of the province of Osmaniye in the "National Afforestation and Erosion Control Mobilization" afforestation works carried out in Turkey in 2007. However, this afforestation study was not sustainable, forest areas decreased by approximately 2% in 2019 compared to 1999 and decreased to 1987.35 hectares. The same situation was experienced in the forest and pasture areas in Fakıuşağı district. The forest and pasture areas, which were 9 hectares in 1999, increased by 21 hectares in 2009 and decreased to 11 hectares in 2019.

In the province of Osmaniye, areas in the other class increased from 19.47% to 25.81% in 20 years. In the Fakıuşağı district, the areas in this class were 18% in 1999 and increased to 44% in 2009. However, this area was determined to be 15% in 2019. The reason for the decrease in this class in 2019 is that between 2009-2019, the new settlements in the region were covered from these unproductive lands instead of agricultural lands. Because, in 2005, the Soil Protection and Land Use Law No. 5403, which aims to protect agricultural lands in Turkey, entered into force. With this law, the misuse of agricultural lands has started to be prevented.

5. CONCLUSION

Agricultural lands are often used without proper planning, leading to the occupation of fertile areas for settlements or trade centers. This haphazard approach can have negative consequences, impacting resource utilization and sustainable development. Therefore, a closer look at land-use patterns is essential for making informed decisions and developing effective policies that balance urban development with the preservation of agricultural productivity.

Agricultural lands, especially in developing countries, are under pressure due to reasons such as wrong and unplanned land use, high population growth, insufficient institutional support, or soil erosion. This pressure decreases the fertility value of the soil and shows how important planned land use is. This situation necessitates the creation of land use plans for sectors such as forestry, agriculture, and settlement, which are based on land, taking into account social, economic, and environmental variables.

This study examined the temporal change in the land use of Osmaniye province and revealed that a large dynamic such as a university affects a small or medium-sized city very much. According to the results, it has been observed that the need for new settlements caused by rapid population growth damages natural and agricultural areas. The agricultural land class experienced a 20 percent loss between 1999 and 2019, and was the most affected by population growth and urbanization pressure.

(Most affected by population growth and urbanization pressure, with a loss of 20% has been class.) The residential areas class shows a significant population increase in the region with an increase of approximately 2.5 times and the formation of new urban areas. Established in 2007, the university has become one of the most important reasons for the increase in settlements in this process. The establishment of the university caused the population of the city to increase and at the same time, this neighborhood, which was a village in the past, gradually to become more structured. In addition, it has also caused the destruction of natural habitats, agriculture, pasture and forest areas. Before the university was established in 2007, the neighborhood did not even have a settlement of 1000 people, while it reached a population of 2940 in 2009 and 11352 in 2019. This situation shows that the establishment and development of the university increases the residential areas of the city, as well as provides new job opportunities, meeting the needs of the society in both economic and social city studies. The establishment of universities in a city,

on the one hand, improves the social-economic infrastructure facilities in the region where the university is established, and on the other hand changes the land use in the region. Considering this situation in landscaping plans, effective policy arrangements should be made to protect the agriculture, pasture and forest areas around the university area.

GIS and Remote Sensing technologies should be widely used to detect changes in land use, to reduce the negative effects of newly established universities on urban growth, especially in small and medium-sized provinces, and to develop sustainable development strategies for the city.

Author contributions

C. Yağcı: Designed the research Investigation, Writing the manuscript–review and editing.
D. Erkek: Collected the datasets and analyzed the data, Methodology, Validation.

F. İşcan: Investigation, writing–review and editing, Commented on the manuscript.

Conflicts of Interest

The authors declare no conflict of interest

Research and publication ethics statement

In the study, the authors declare that there is no violation of research and publication ethics and that the study does not require ethics committee approval.

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