DETECTING CLEAR - CUT AREA USING REMOTELY SENSED DATA IN ISTANBUL - SILE REGION

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ABSTRACT

As is known to all, the world's natural sources are limited. For this reason, land management strategies are getting more important day by day. Remote sensing is one of the main solution for geographic information systems issues such as producing land cover-land use maps for presenting total forest areas, urban fabric and cadastral areas especially for cosmopolite cities. In turkey, Istanbul is the first city come to mind for correct city planning in order to monitor the boundaries especially forest cadastres. Nowadays, Remote Sensing technologies are commonly used for detecting cut-clear areas in worldwide forests. In Anatolian side of Istanbul, north-east part of city, pits areas because of mine work are observed in forest boundaries with using change detection methods. For this aim, remotely sensed images of Istanbul's are used with ten year period. Medium resolution images: Landsat 7 ETM + and high altitude aerial orthophotos are used as data source. The process was carried out with three different two-dimensional change detection methods. In the end of the study, classified raster images converted to vector format for determining clear-cut areas.

Key words: change detection, clear-cut, forest cadastre, remote sensing

ÖZET

Bilindiği üzere, dünyada doğal kaynaklar oldukça limitli ve son yıllarda doğal kaynaklarımız gün geçtikçe azalmaktadır. Bu nedenle, doğal kaynakların bilinçli bir şekilde kullanılması ve takip edilmesi açısından arazi yönetimi günden güne daha da önem kazanmaktadır. Coğrafi bilgi sistemlerinde, Uzaktan Algılama teknolojileri bu konuda kullanılan tekniklerin başında gelmektedir. Özellikle nüfus artışıyla beraber kentleşmenin arttığı şehirlerde orman alanları, yerleşim bölgeleri, endüstriyel alanlar vb. alanlar yeryüzü kullanım/örtüsü haritaları ile birbirinden ayırt edilerek farklı haritalar ve planlarla gösterilebilmektedir. Günümüzde önemli yerleşim şehirlerinden olan İstanbul'da orman alanları sınırlarının yüksek doğrulukla gösterilmesi orman kadastrosu açısından önemli konulardan biridir. Dünya ölçeğinde olduğu gibi ülkemizde de, orman alanlarının sınır takibinde Uzaktan Algılama teknolojileri kullanımı oldukça yaygındır. Bu çalışmada, İstanbul ilinin Anadolu yakasında bulunan kuzey orman alanlarındaki değişimler farklı yöntemler ile on yılda meydana gelen değişimler hesaplanmıştır.

Çalışmada kullanılacak veri olarak, orta çözünürlüklü Landsat 7 ETM + ve yüksek çözünürlüklü ortofotolar seçilmiştir. Veriler üzerinde iki farklı görüntü işleme analizi -NDVI ve PCA- ile ormandaki alanları ayrı tarihler için hesaplanıp, daha hassas alan sonucu verebilecek ortofotolar üzerinden hesaplanan alan ile kıyaslanmıştır. Bu kıyaslama sonucunda, NDVI analizi sonucunda elde edilen bulguların, PCA analizi sonucundaki bulgulara kıyasla orman alanındaki değişimi daha isabetli olduğu görülmüştür.

INTRODUCTION

Forest area plays important role of the country land. In this context, % 27.7 of Turkey's total land area belongs to forests (URL-1). In Turkey, there is a related ministry (Ministry of Forest & Water Affairs) and diractorate (General Directorate of Forestry) for pursuiting the forest boundaries all over the country.

Istanbul is a metropol, gets immigration excessively a lot especially in the last decades. It affects the city's natural texture negatively. Besides Istanbul's demographic alteration, industry and production sites' density getting more and more. Also, raw materials need is increasing in the same ratio. As is known, natural resources are used all over the country sometimes unconsciously, including metropols. In Istanbul, there are many new tree planting areas except for sowing and planting areas in order to inrease the total green area. Nevertheless, due to several reasons; deforestration threats are reducing the total forest areas day by day. Some changes are due to natural events or accidents such as forest fires and some of these are illegal individual actions. However, in some instances clear-cut due to big public projects requirements.

Istanbul city is appropriate for forest nascency due to the geography, topography, climate and soil qualifications (No Name, 1993). As is known, forest cadastre is the procedure of detection with place, limitation, measurement, and registration. So, chasing forest borders is crucial issue about forest cadastre. According to year 2010 statistics Istanbul total area is 537,917.7 hectares; it is 238,710.4 hectares of forest area constitutes (URL-2).

Multi-temporal analysis depend on remote sensing data has been used to assess the impact of land cover and land use change (LCLUC), over the past three decades((Abd El-Kawy, Rød, Ismail, &Suliman, 2011; Weng, 2002),forest cover monitoring (Coppin & Bauer, 1994; Hais et al., 2009; Woodcock, Macomber, Pax-Lenney, & Cohen, 2001), and biodiversity (Hansen et al.,2001).Landsat products such as MMS,TM and ETM+ are extensively used as they provide a good accommodation between the spatial resolution and the temporal coverage (Williams, 2006) and are available cost free from the United States Geological Survey (USGS) (Woodcock et al., 2008).

In Istanbul-Şile region, mining continues for at least ten years. Hence, total forest areas are affected by these work. In this study, we focus on that region's forest coverage alteration in the last decade and determining of clear cut areas with using different methods and data.

MATERIAL AND METHOD

Test Site and Data

The study area covers more than 35 km^2 and is located in northern İstanbul, Şile Region (fig.1). In this area forests are dominated by, cermes oaks, chestnuts, maquis, pinus pineas and oaks (URL-3). Clear-cutting and leaving the areas for natural re-growth is pretty much in study site. Furthermore, significant forest change resulting from logging activities.

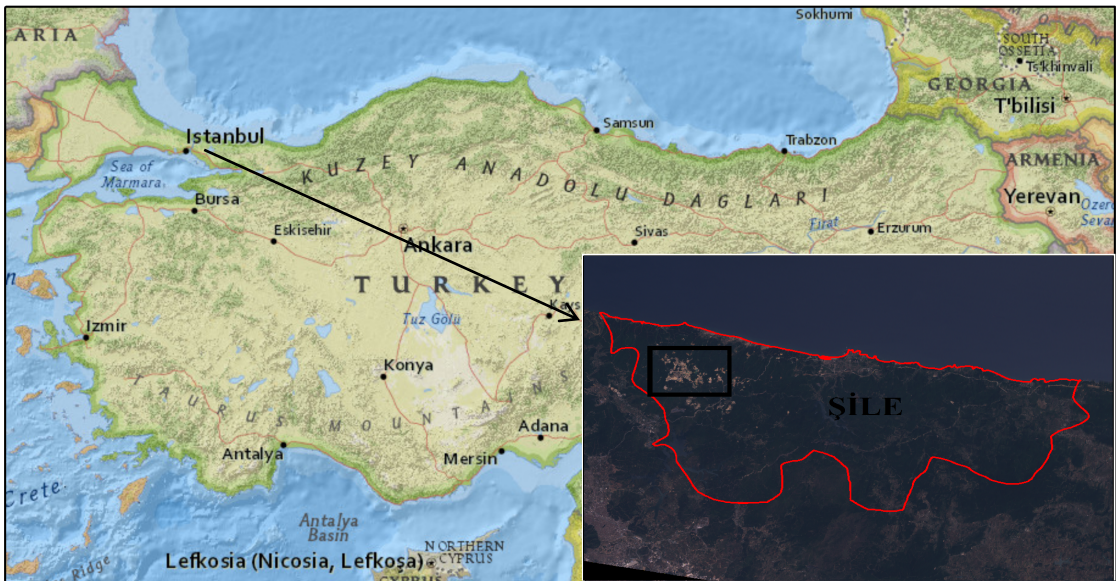


Fig. 1. Study area

The study area is fully covered by 6 aerial ortophotos and 7 Landsat 7 ETM+ images. Landsat Images and aerial orthophotos were used as listed in Table-1. A total of images having less than 30% cloud cover. In data pre-processing stage, each of the satellite image are radiometrically and geometrically corrected.

Table 1. Remote sensing data used in this study

Sensor	Acguisition Date	Spatial Resolution
Landsat 7 ETM +	15 May 2000	30 m
Landsat 7 ETM +	2 July 2000	30 m
Landsat 7 ETM +	7 November 2000	30 m
Landsat 7 ETM +	25 April 2010	30 m
Landsat 7 ETM +	27 May 2010	30 m
Landsat 7 ETM +	12 June 2010	30 m
Landsat 7 ETM +	16 September 2010	30 m
6 Aerial Orthophotos (Mosaicked)	2010	0.3 m

The Landsat 7 ETM+ images used for this study are available cost free from the U.S. Geological Survey (USGS) Earth Resources Observation and Science (EROS) Data Center via the Earth Explorer USGS web interface (URL-4). The Landsat 7 ETM+ data in GeoTIFF format in the Universal Transverse Mercator (UTM) map projection with a World Geodetic System 84 (WGS84) datum. Each image consisted of six spectral reflective bands, two thermal bands and

a panchromatic band. Six ETM+bands were processed and included in the final composite image: blue band 1 (450-520nm), green band 2 (520-600nm), red band 3 (630–690 nm), near infrared band 4 (760–900 nm), and two mid infrared bands 5 (1550–1750) and 7 (2080–2350 nm).

The 6 mosaicked aerial ortophotos belonging to year 2010 were acquired from Istanbul Metropolitan Municipality Map Department. The ortophotos were mosaicked and transformed to UTM map projection and WGS 84 datum.

Clear-Cut Detection Approach

Remotely sensed data's time, should be considered well first, especially for forest boundaries' change detection. Because, some types of tree groups have seasonal changes . For preventing this delusion, choosing data, acqusition times in the meaning of month are important. In this case, for this study it is considered.

In this study mutitemporal images and aerial orthophotos were used to determine clear-cut areas. Three different techniques for clear-cut detection were tested: (1) multitemporal NDVI analysis (2) multitemporal PCA analysis and (3) screen on digitizing (fig.2).

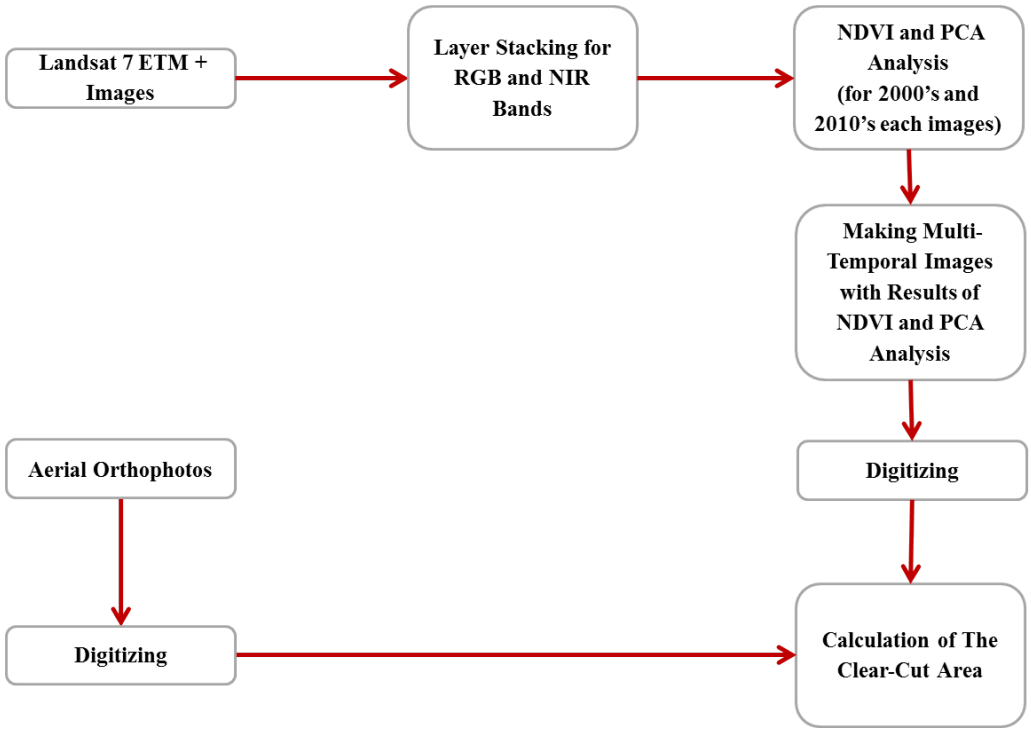
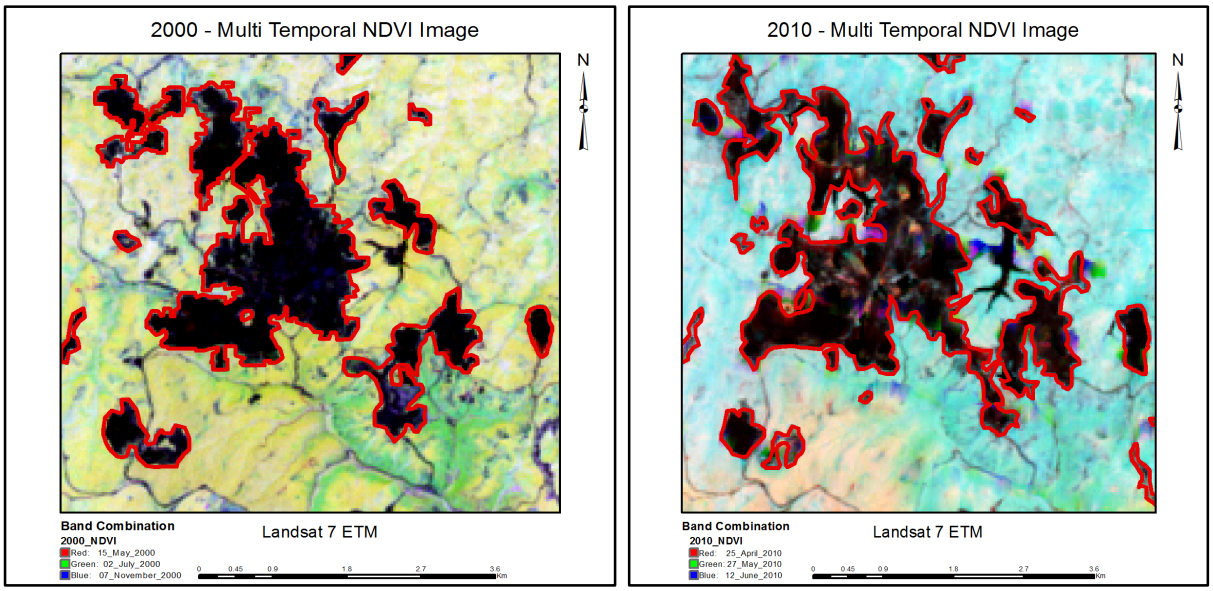


Fig. 2. Workflow diagram

In order to determine the area of a 10 year land use/cover change of the mining areas, 2000s and 2010s Landsat 7ETM + images were used. Moreover, high resolution aerial orthophotos were used to determine the land use/cover of clear-cut areas in 2010. The clear-cut areas in satellite images were compared with theaerial orthophotos.

NDVI is a mathematical expression that uses the Near Infrared and visible red bands to seperate the differences between vegetation and non-vegetation (Morawitz et al., 2006). NDVI is used to measure change in green vegetation. In land use/cover change detection studies, NDVI differencing has been used widely (Singh, 1989; Mas, 1999). Multitemporal NDVI images were created for the study area using Landsat 7 ETM+ data from year 2000 and year 2010 and they were combined to create a single image to detect clear-cut areas. In 2000, the date of 15 May, 2 July, 7 November of NDVI images were created and multitemporal NDVI image were stacked by combining three NDVI images and in year 2010, the date of 25 April, 27 May, 12 June, 16 September of NDVI images were created and multitemporal NDVI image were created by combining four NDVI images (fig.3).

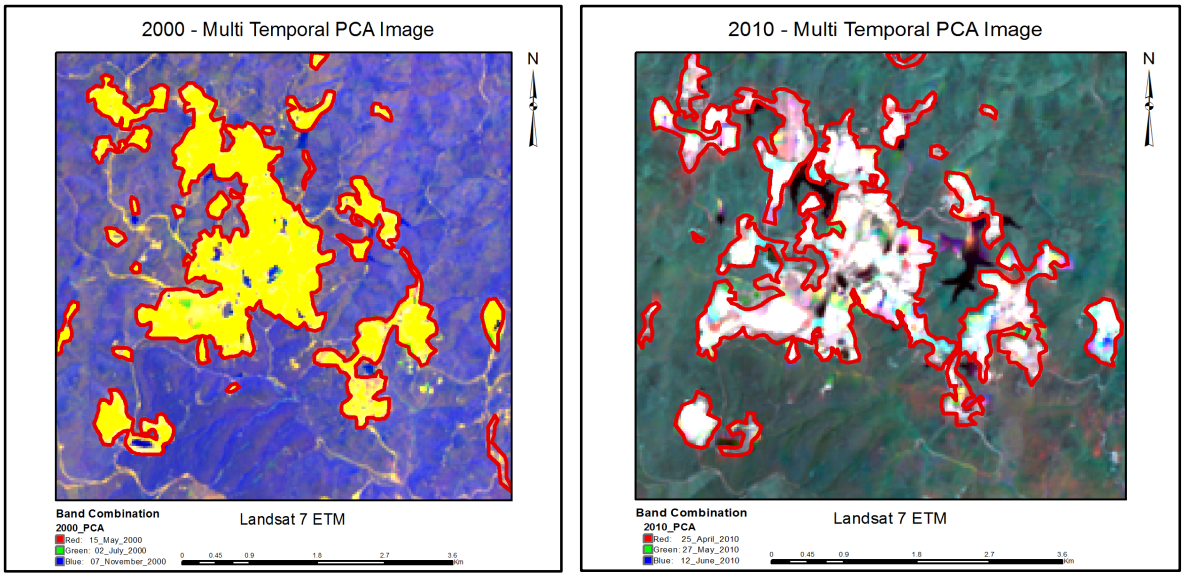


a) 2000 multitemporal NDVI b) 2010 multitemporal NDVI

Fig. 3. Multitemporal NDVI analysis

As a result of digitizing, clear-cut areas in the multitemporal NDVI image of the year 2000 and year 2010 was calculated 752.59 ha and 844.74 ha respectively.

According to Hirosowa et al. (1996), "PCA is a linear transformation of correlated variables into uncorrelated variables which does not change the number of variables (spectral or temporal bands)". In this study, PCA was used to detect localized changes in forest clear-cut areas in multitemporal datasets. In year 2000, the date of 15 May, 2 July, 7 November of PCA images were created and multitemporal PCA image were created by combining three PCA images. In year 2010, the date of 25 April, 27 May, 12 June, 16 September of PCA images were created and multitemporal PCA image were created by combining four PCA images (fig.4).



a) 2000 multitemporal PCA b) 2010 multitemporal PCA

Fig. 4. Multitemporal PCA analysis

As a result of digitizing, clear-cut areas in the multitemporal PCA image of the year 2000 and year 2010 was calculated 708.29 ha and 799.42 ha respectively. In order to calculate the clear-cut areas through aerial orthophoto applied to digitizing method and clear-cut areas were calculated (fig. 5).

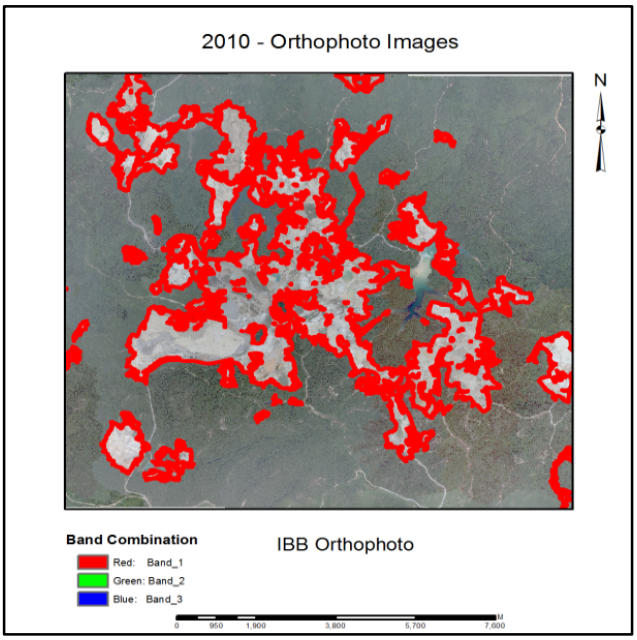


Fig. 5. 2010 Aerial Orthophoto Digitizing

As a result of digitizing, clear-cut areas in orthophotos of the year 2010 was calculated as 769 ha.

RESULTS AND DISCUSSION

NDVI and PCA analysis were performed to distinguish clear-cut area from land objects around the mine areas, especially forest and green areas. The clear-cut area is determined by the digitizing methods. Furthermore, determination of clear-cut area on aerial orthophotos is performed by digitizing methods.

In the end of the study, total clear cut area change was detected for the last decade in North forests of Istanbul. In year 2000, after multitemporal PCA analysis the area was calculated as 708.29 ha and year 2010 multitemporal PCA analysis was calculated as 799.42 ha. The difference of the total area was determined 91.13 ha. Another technique in order to find the clear-cut area detection in study region was NDVI. In year 2000, multitemporal NDVI analysis showed that clear-cut area was 752.59 ha. After ten year of this, the area was calculated 844.74 ha with NDVI in year 2010. The difference of area was 92.15 ha, for this technique. For more comprehensive study in this region, aerial orthophotos were chosen due to being high resolution data than the other data that used. With using aerial orthophotos, the mine area was calculated as 769 ha in 2010. On-screen digitizing technique is used for all area calculations.

When digitizing method was carried out, mining areas on NDVI and PCA images were compared with natural Landsat 7 ETM + images for visual interpretation and spectral values of water surfaces on NDVI and PCA images were taken into account. Moreover, water areas were distinguished from mining areas on PCA images. However, NDVI image water areas had same visual awareness with mining areas.

When comparing of two analysis: PCA and NDVI approaches, we can say that using PCA for calculating the clear-cut area would be more proper for this study. It is prooved that the result of the aerial ortho-photos is closer to PCA result more than NDVI. Because, orthophoto -high spatial resolution (0.3m)- take advantages for precise results than -medium spatial resolutions of (30 m) – Landsat 7 ETM +.

The paper is focused on the issues related to forestry cadastrel works. In this context, Remote Sensing technologies integration are used efficiently with comparing different methods and data.

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KIRGIZİSTAN CUMHURİYETİ ORMANCILIK COĞRAFİ BİLGİ SİSTEMİ TEKNOLOJİSİ

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ABSTRACT

Ormanların sınırlarının belirlenmesi (kadastro) ve mülkiyetinin tespiti için yapılan aplikasyon işleri ile sınırları kesinleşen yerlerin tapuya tescil işlemleri orman kadastrosunun konusudur. Kırgızistan Orman Müdürlüğünce orman envanterinin belirlenmesi, ülke çapında orman envanterinin merkezi sistemle yönetilmesi, ülke çapında karar destek sisteminin oluşturulması amacıyla bilgi ve iletişim teknolojilerinden azami ölçüde faydalanılma kapsamında Kırgızistan'da Orman Kadastro Bilgi Sistemi faaliyetleri başlatılmıştır. Proje ile; Orman şeflikleri envanterinde bulunan, günümüze kadar farklı kanun ve yönetmeliklere uygun üretilmiş, kısmen sayısal halde farklı kişilerin bilgisayarlarında dosyalar halinde tutulan kadastro verilerinin standartlaştırılması, akıllandırılması ve merkezi bir veri tabanında toplanması hedeflenmiştir. Proje, orman alanlarına ait kadastro haritaları ve sözel verilerin Orman Bölge / İşletme Müdürlükleri tarafından girilerek Genel Müdürlük veri tabanında toplanması, landsat, Google earth gibi harita altlıkları kullanılarak internet ortamından sunulması, ilişkili verinin istatistiki sorgu sonuçlarının tematik haritalanması ile verinin etkin biçimde görselleştirmesini ve paylaşımını kapsamaktadır. Projede NETCAD GIS çözümler kullanılmaktadır. Pilot uygulama tamamlanmış olup, 2015 yılı içerisinde 7 ayrı bölgede, 70 uç kullanıcı tarafından üretilecek veriler dinamik olarak merkezi veri tabanına gönderilebilecek ve Kırgızistan ölçeğinde veri tabanı sorgu, raporlama ve tematik haritalama işlemleri yapılabilecektir. Verinin üretildiği noktadan itibaren onay ve yayınlama süreçleri içerisinde izlediği adımlar takip edilebilecek, standartlara uygun, doğru verinin üretimi sağlanacaktır.

Key words: Kırgızistan Orman Kadastro, Kırgızistan Orman CBS

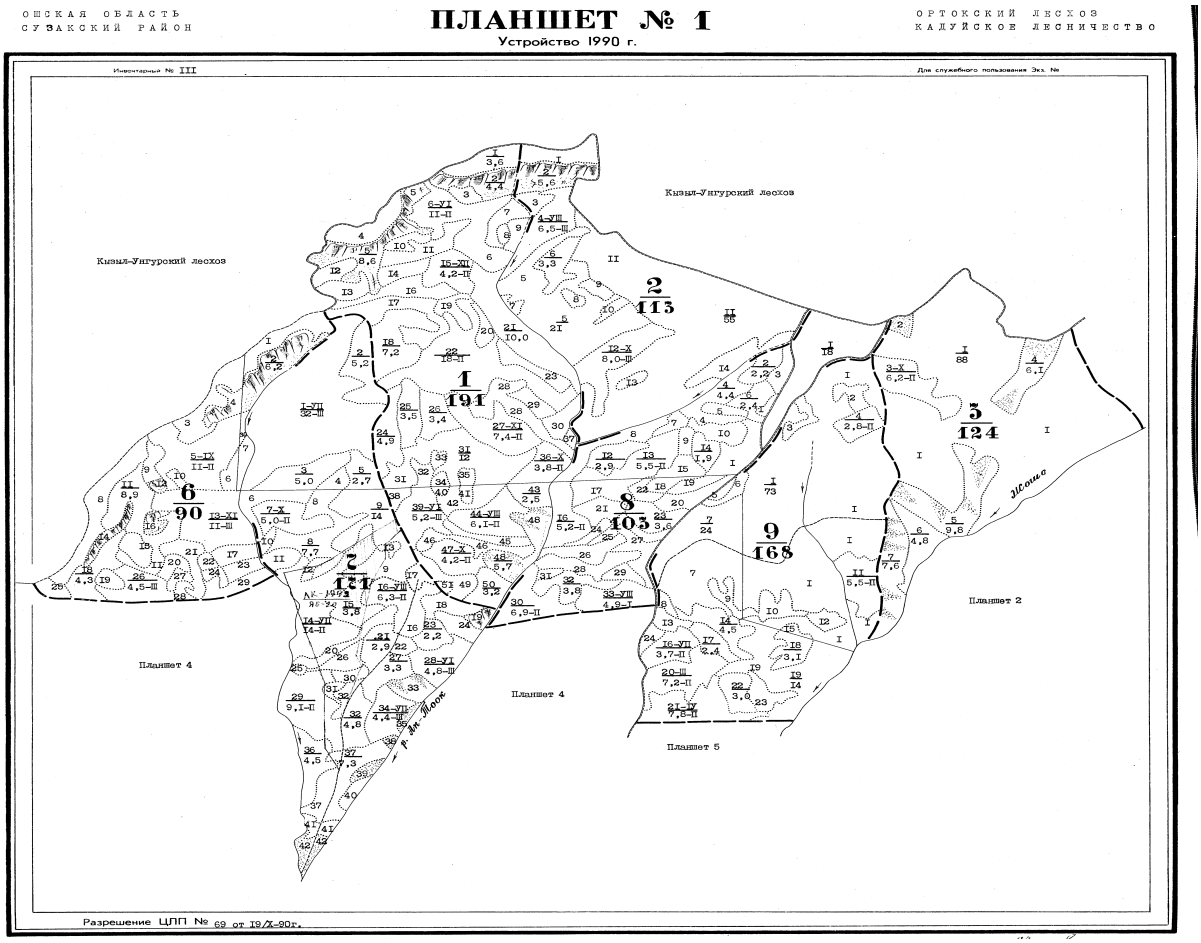
PROJE AMACI VE KAPSAMI

Ormancılık CBS teknolojisi orman kaynakları ve orman haritalama çalışmaları olarak tek bir veritabanına bağlı yürütülmektedir. Orman kaynak veritabanı 2000 yılından beri orman yönetimi ve ulusal orman envanteri parçası olarak oluşturulmuştur. Bugüne kadar orman kaynakları ve Özel Korunan Alanlar veri tabanı oluşturulmuştur.

Kırgızistan-İsviçre Programı desteği ile geliştirilen yazılım (Data Base Delphi) kullanılmaktadır. Bu yazılımın lisanslı olmaması, diğer haritalama programları ile bir işlemi gerçekleştirmek için uzun bir zaman gerektirmesi, mevcut yazılım ile sadece orman işletmelerinin düzeyinde orman kaynaklarına ilişkin bilginin alınabilmesinin mümkün olması, ülke ve bölge seviyesinde bilgi almanın mümkün olmaması teknolojik olarak bizleri yeni arayışlara sevk etmiştir.

HARİTALAMA ÇALIŞMALARI

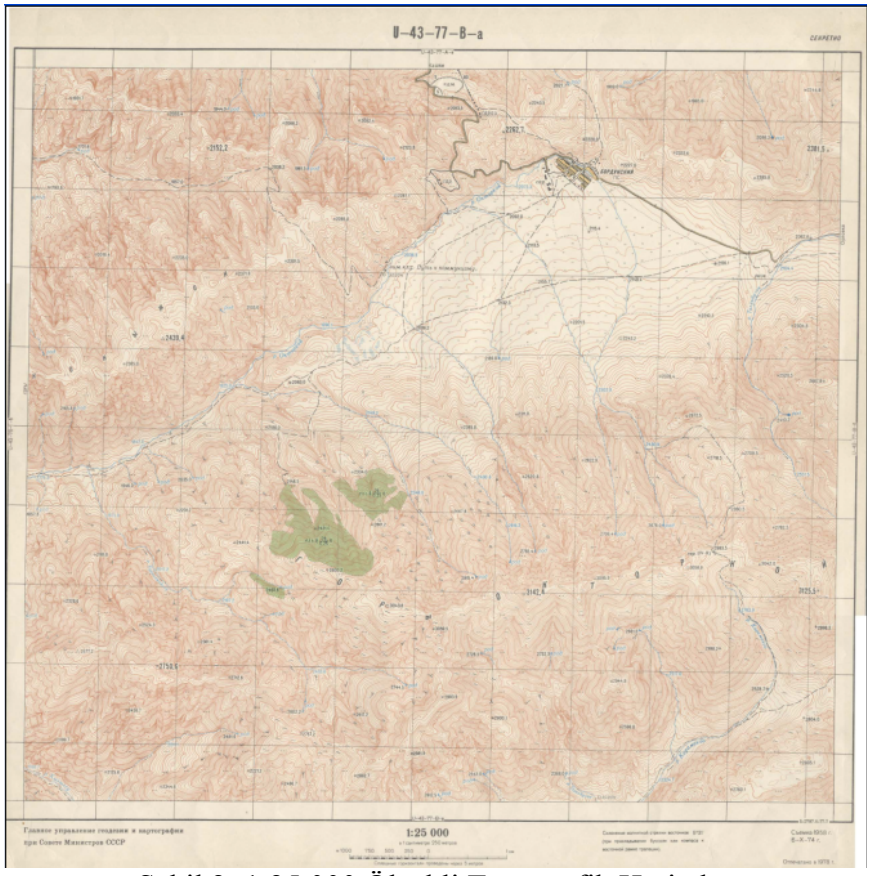
Orman Kaynaklarının ve Özel Korunan Alanlarının haritalama işleri de2000 yılında başladı. Bugüne kadar yükseklikler, araziler, dış sınırları ve iç durumları sayısallaştırıldı. Haritalama işlerinin gelişmesi şöyledir: 90'lı yıllarda Moskova veya Kazak Orman Envanteri tarafından elle yapılan plakaları orman yönetimi tarafından kullanılmıştır (Şekil 1).



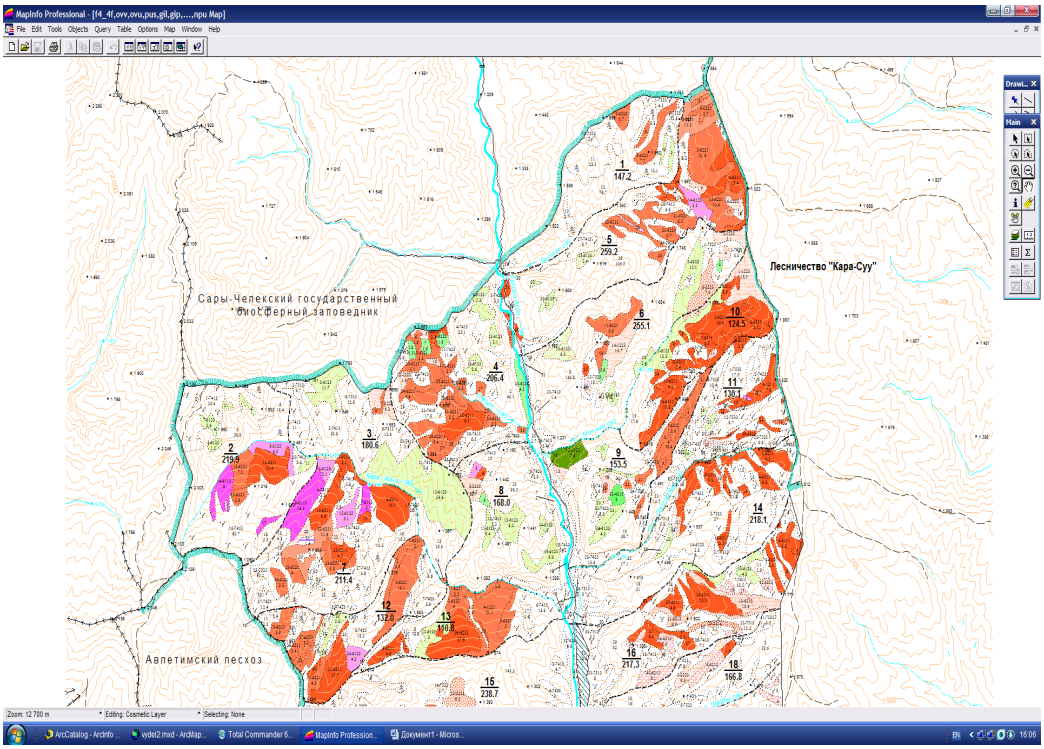
Şekil 1: 90'lı yıllarda elle yapılan plakalar

Çalışmalarda 1:25.000 ölçekli Topoğrafik Haritalar kullanılmıştır. (Şekil 2). 2000 yılından bu yana önceki orman yönetimi tabletler ve topografik kabartmalar haritaları GeoDraw ve MapInfo yazılımı ile sayısallaştırılmıştır. Bu sayısal haritalar ağaçlandırma planlarının yapımında kullanılmaktadır (Şekil 3).

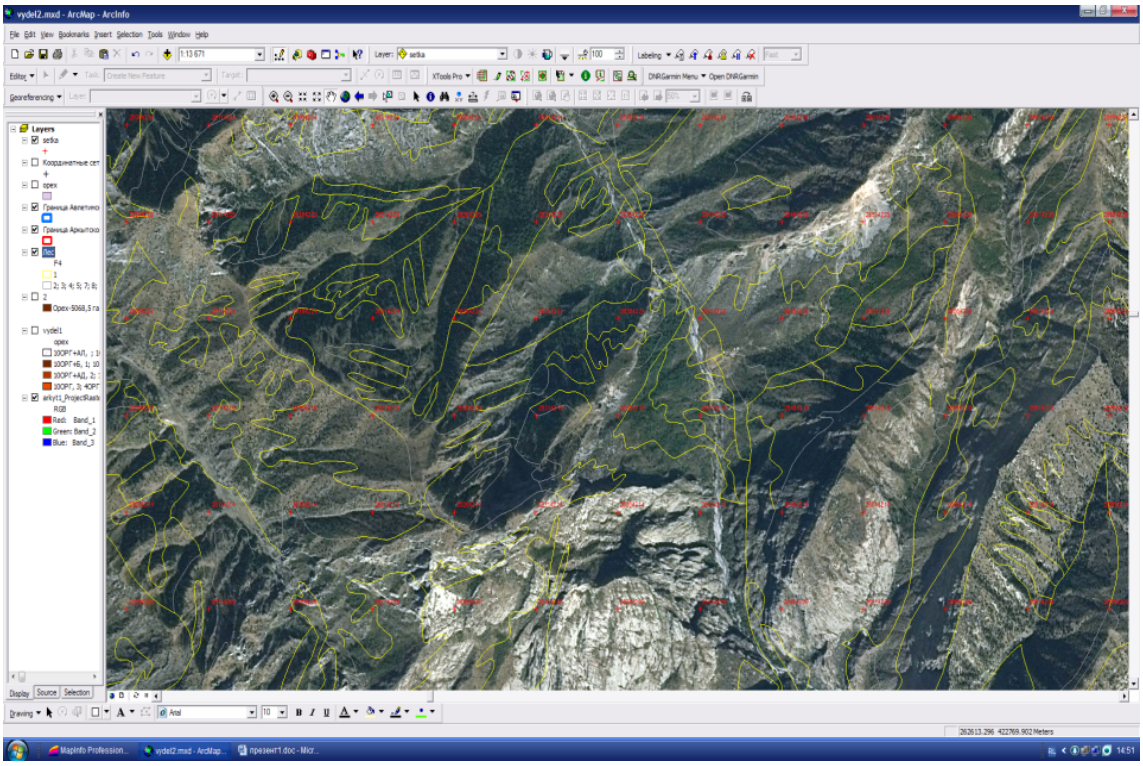
2010 yılından bu yana çalışmalarda uydu görüntüleri kullanılmaya başlandı. Orman Kaynakları ve Özel Korunan Alanlar üzerinde analiz işleri yapıldı. Dijital haritalarda **ArcGis** yazılımı kullanarak **Landsat** uydu görüntülerine başvuruldu. Bunun bir sonucu olarak, dış sınırı ve iç durumları SFF toprakları 2 cm ile 0.2 mm arasında kaydırıldı (Şekil 4).



Şekil 2: 1:25.000 Ölçekli Topoğrafik Haritalar



Şekil 3: Sayısal Haritalar ile Üretilen Ağaçlandırma Planları

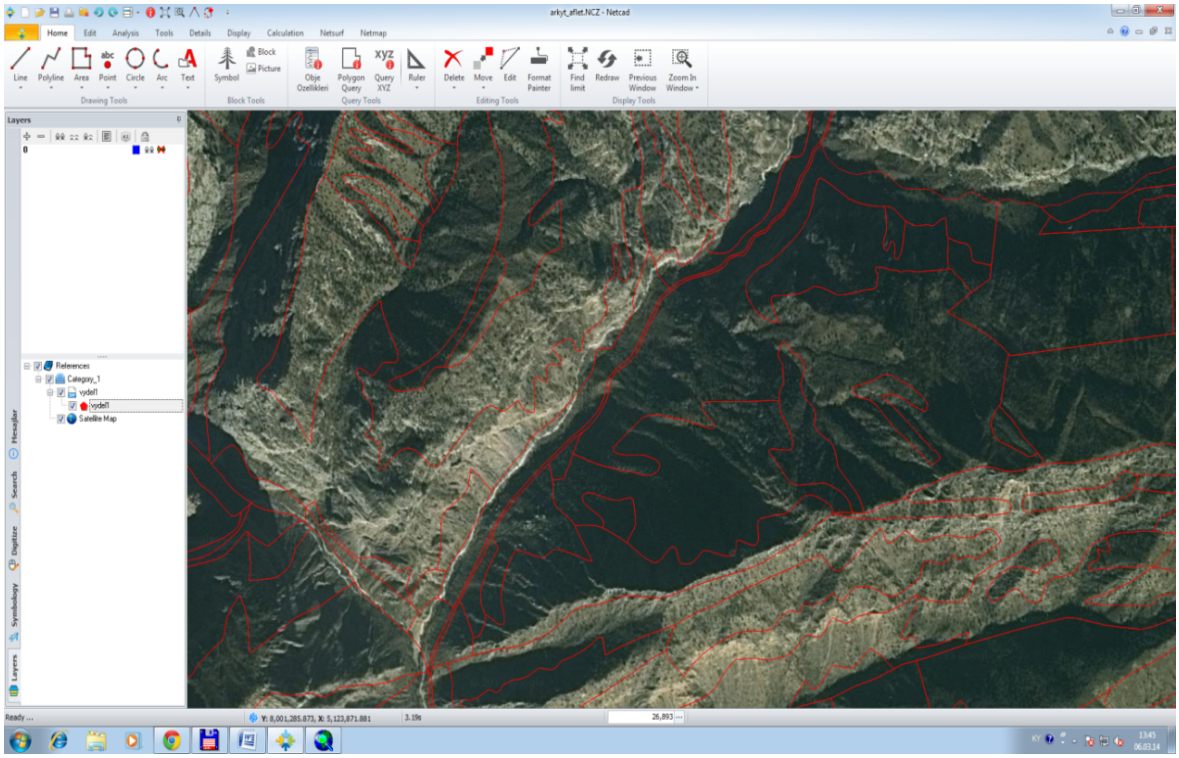


Şekil 4: ArcGis yazılımı ile çalışmalar

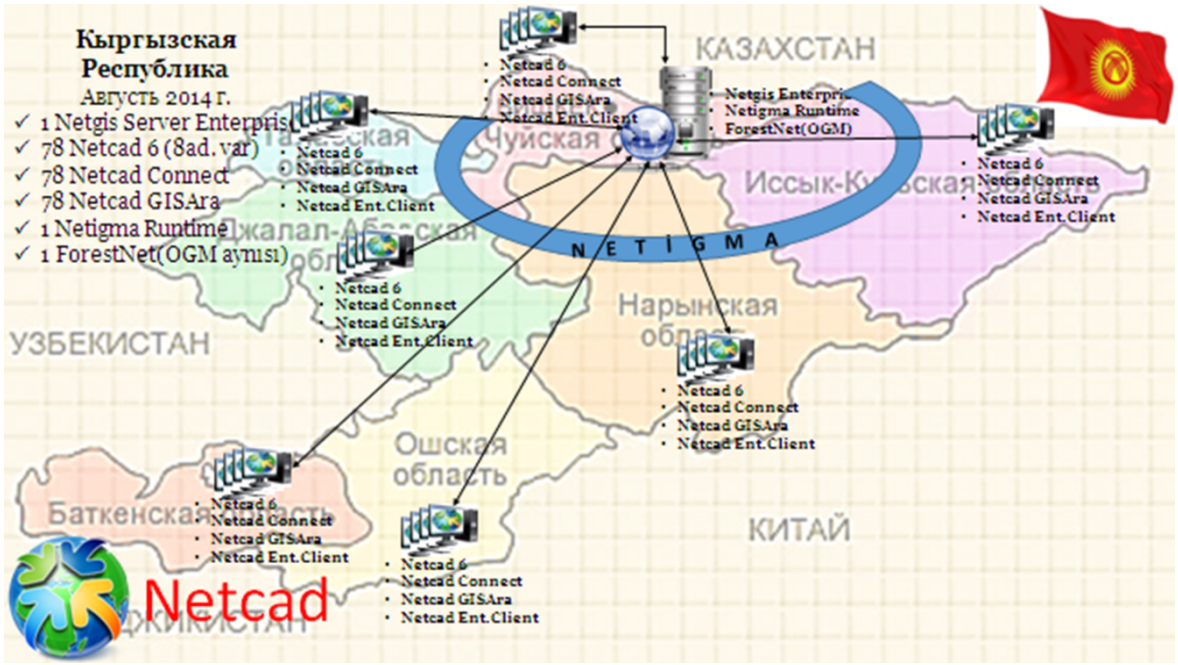
Kullanılan Arcgis yazılımı lisanslı değildi, internetten yüklenerek elde edildi. Bir çok araç aktif değildi ve periyodik kullanımında sıkıntılar yaşanıyordu. Bu bağlamda işlemlerde çok zorluklar vardı. Diğer yandan Lisanslı ArcGis yazılım satın almak için ciddi mali kaynak gerekiyordu. Bakım ve eğitim için de mali kaynak gerekiyordu. Bu süreçte Türkiye Orman Genel Müdürlüğü yetkilileri ile beraber ülkemizi ziyarette bulunan Netcad Yazılım temsilcileri yaptığımız işleri yerinde incelediler, bu işleri Netcad çözümleri ile çok daha kolay ve hızlı yapabileceğimize ilişkin yararlı sunumlarda bulundular. Devamında üç adet bilgisayar ile Netcad yazılımları birimimize lisanslı olarak hediye edildi, eğitimler verildi. Aynı uygulamaları Netcad ile daha hızlı ve kolay yapıldığını gördük ve ikna olduk ve Netcad yazılımlarını kullanmaya başladık. Şekil 5

İlk etapta haritaların sayısallaştırılması amacıyla kullanımı düşünülen Netcad çözümleri ile orta ve uzun vadede Kırgızistan Ormancılık Coğrafi Bilgi Sistemi kurulması planlanmaktadır. Merkezde sayısallaştırma için temin edilen ilave 5 adet Netcad yazılımı ile sayısallaştırma işlemleri devam etmektedir.

Ulusal ve bölgesel iki seviyeli olacak olan bilgi-analitik merkezinin kurulma planı oluşturulmuştur. Ulusal seviyede merkezi bir sunucu olacak ve 7 ayrı bölgede, 70 uç kullanıcı tarafından üretilecek veriler dinamik olarak merkezi veri tabanına gönderilebilecek ve Kırgızistan ölçeğinde veri tabanı sorgu, raporlama ve tematik haritalama işlemleri yapılabilecektir. Şekil 6.



Şekil 5: Netcad yazılımı ile çalışmalar



Şekil 6: Bilgi-Analitik Merkezi Şeması

Bilgi-Analitik Merkezinin oluşturulması iki aşamada gerçekleştirilecektir:
Aşama 1 –Orman Enventeri Departmanında birleşik bir bilgi portalı oluşturulması.
Aşama 2 - Orman işletmeleri, rezervleri ve doğal parklar düzeyinde birleşik bir bilgi portalı oluşturulması

TÜRKİYE İLE İŞBİRLİĞİ

- Kırgız Cumhuriyeti Hükümeti TC Hükümeti arasında 10 Nisan 2013 tarihinde ormancılık alanında işbirliği anlaşması imzalanmıştır.
- Bu anlaşmanın bir parçası olarak resmi bir istek 2014 yılında Kırgız Cumhuriyeti Hükümeti altında Çevre Koruma ve Orman Devlet Ajansı Müdürü, bilgi sistemi geliştirilmesi projesi kapsamında TİKA tarafından "CBS, uzaktan algılama ve fonksiyonel ormancılık planlaması ve kapasite geliştirme tanıtımı " amacıyla 7-14 Nisan 2014 tarihlerinde Türkiye'de bir eğitim turu düzenlendi. Bu kapsamda Ankara, İstanbul, İzmit ve İstanbul gibi şehirlerde çalışma turu, yapıldı. Çalışma sırasında ziyaret edilen yerlenden yaralı sunumlar alındı.
- Bu projede. Türkiye Orman (OGM) ve Türk İşbirliği ve Koordinasyon Ajansı (TİKA) Genel Müdürlüğü arasındaki işbirliği üç bölümden oluşmaktadır
    - Orman yönetim planının hazırlanması,
    - Sürdürülebilir Orman Yönetimi
    - Uzaktan Algılama ve CBS sistemi.
- 26.04.2014- 01.06.2014 tarihleri arasında 10 uzman personelimiz Türkiye Orman Yönetimi ve Planlama Bölümü'nde aşağıdaki konularda eğitim almıştır.
    - Uydu görüntüleri;
    - Ormancılıkta CBS teknolojisinin kullanımı;
    - Orman envanteri.
- 26.08.2014 tarihinde Kırgızistan daha fazla işbirliği için TİKA'ya mektup göndermiştir.
- Kırgızistan orman yönetimi için eğitim planlarının geliştirilmesi iyileştirilmesi orman yönetim planları kapsamında projenin bir sonraki aşaması için Orman Genel Müdürlüğü Orman İdaresi Planlama Dairesi Başkanlığı ile beraber iki pilot ormancılık alanı seçtik
    - Celal-Abad bölgesinde ceviz ormanlarının yer aldığı Ortok ormancılık
    - Issık-Kul bölgesinde ladin ormanlarının yer aldığı Jets-Oğuz ormancılık,
- 2013 yılında, Türk Uluslararası İşbirliği Ajansı (TIKA), Türk firmaları Netcad ile işbirliği önerdi:
- Kırgızistan Heyeti 2013 yılında düzenlenen Netcad, Uluslararası Kullancılar Konferansına katıldı.
- 2013 yılında Netcad tarafından 3 adet bilgisayar ve netcad yazılımı kurumumuza lisanslı olarak hediye edildi. Gerekli eğitimler ücretsiz olarak sağlandı.
- 2014 yılında 5 adet Netcad lisansı alımı gerçekleştirildi.

PROJENİN GELECEĞİNE YÖNELİK BEKLENTİLER

- Projenin olumlu yönleri - yeni teknolojilerin kullanımı ve orman yönetim planlarının (planlar) içeriği ve revizyonuna ilişkin yeni bilgiler elde edilmiştir.
- Bu projeler TİKA ve Türkiye Orman Genel Müdürlüğü tarafından organize edilmektedir.
- Projeden Beklentiler
    - Ormancılıkta CBS teknolojisi oluşturulması, orman yönetimi planlarının (plan) geliştirilmesine ve
    - Türkiye Orman Yönetimi ve Planlama Bölümü'nden bir mühendis tarafından uzun süreli bir eğitime ihtiyaç duyulmaktadır.

FOREST CADASTRAL SURVEYS IN TURKEY

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ABSTRACT

In Turkey the forest is one of the most important natural resources. Sustainable forest management is required for the forests meet the social, economic, ecological, cultural and spiritual needs of the next generation. To prevent deforestation is possible with the cadastral studies. Of the forest lands for which cadastre works were completed, 65% were registered to the land registers and the registration for the remaining 35% failed. This situation is among the major causes of boundary and possession disputes between the people and the forest administration. A protocol was signed between General Directorate of Forestry and General Directorate of Land Registry and Cadastre in the later 2013. In this context, forest cadastre works were started at a total of 5.527 units and an area of about 20 000 km² and are targeted to complete by the end of 2016. Real property cadastre works were finished in the ratio of 99 percent by the end of 2014. Although real property cadastre works were almost completed, forest cadastre works weren't registered significantly.

Key words: Cadastre, Forest, Forest Cadastre,

ÖZET

Ormanlar ülkemizin zenginlikleri arasında sayılırken, ülkemizin temel orman sorunu ormansızlaşma olmaktadır. Ormanların gelecek kuşakların sosyal, ekonomik, ekolojik, kültürel ve ruhsal gereksinimlerini karşılayabilmesi için sürdürülebilir yönetimi gerekmektedir. Orman alanlarının korunması ve güvence altına alınması, sürdürülebilir orman yönetimi için ilk yapılması gereken çalışmadır. 2011 yılı sonu itibariyle kadastro çalışmalarının tamamlandığı alanların % 65'inin tapuya tescili yaptırılmış, %35‟inin ise tapuya tescili sağlanamamıştır. Bu durum halk ile orman idaresi arasında mevcut ciddi sınır ve mülkiyet ihtilaflarının önemli nedenleri arasında yer almaktadır. Orman kadastro çalışmalarının kısa zaman içerisinde tamamlanması amacıyla Orman Genel Müdürlüğü ile Tapu Kadastro Genel Müdürlüğü arasında 2013 yılı sonu itibariyle protokol yapılmıştır. Bu kapsamda toplam 5.527 birimde ve yaklaşık 20 000 km²'lik alanda orman kadastrosu çalışmaları başlatılmış ve 2016 yılı sonu itibariyle çalışmaların tamamlanması hedeflenmektedir. 2014 yılı sonu itibariyle mülkiyet kadastro çalışmaları %99 oranında tamamlanmıştır. Mülkiyet kadastro çalışmaları bir taraftan tamamlanırken, diğer taraftan orman kadastro çalışmaları önemli oranda tescil edilememiştir.

INTRODUCTION

The Ottoman Empire was about to collapse when cadastral works began in Europe. Meanwhile Empire lost its power on land properties; gradually lands were civilized day by day. Therefore among other problems the most important problem was the land civilization when Republic of Turkey was established. New regulations and laws such as acquire by prescription on land management brought in to force to make easier land civilization. After that, one more thing was to be considered that was the finding real ownerships of the land properties and arrange their safety. For this aim, the method called "inspection" was applied in addition to cadastral works (Bıyık, 1987). In Turkey, the "forestry cadastre" works and "ownership cadastre" works are carried out by different institutions and by using different technical standards. The forestry cadastre, defined as "demarcation of forests and their registration into the land registry in the name of 'state' as a public property", is carried out in Turkey by forestry cadastral committees formed by five members appointed by the Ministry of Environment and Forestry. These committees functioning in subordination to the General Directorate of Forestry perform their works in accordance with the Forestry Law No. 6831 dated 1956 and the Implementation Regulation dated 11 April 1990 (Köktürk and Köktürk, 2007).

Forest cadastral works began in 1937 by governing law numbered 3116. In contrast to other developed countries the reason for, why forest cadastral works made by institute different from national cadastral department was the great lack of technical problems and technicians at that time because beyond ordinary land management and cadastral planning there was a need of planning forested lands. When socially and economically considered, the forest villager's income depends mostly on agricultural activities therefore forested land planned to extend agricultural areas in favor of villagers (Tüdeş and Bıyık, 1995). Because of the these negative conditions, in 1921 "Coppice Law" brought in to force to meet the need of villagers and give to them live assurance, according to this law 2 hectare of forest land left for their private usage. In contrast to expectations, a great deal forest land devastated after this regulation brought in to force. Shortly after these forest lands were turned in to arable areas by the villages and their ignorance of the forest. This event showed that forested land must be considered real property and nationalized and must not be served to privatization. This played very important role to make general rule on land management politics (Ayaz, 1998).

After so-called 4785 "Nationalizes the Forest Area law" put in to force, all forestry land (foundation's land, private land, legal entity) was considered for public use and nationalized. Even if since 1945, 4785 so called law governs forestry land, forestry cadastral planning was not carried out in parallel with this rule and some arid or forest areas became mixed. As result when some areas became agricultural areas some others remained heavily forested. In the course of time, this mixing caused important problems in real rights of ownerships. Hanging up the application of new regulation was not a remedy actually it was turned to huge problem day by day. Different problems were encountered when forest cadastral works put in action. By passage of nearly half century, characteristic of forestland was mixed and turned to almost unsolvable. Many civil cases were opened between forestry department and landowners. To make the local forestry department more effective and productive, investigation of ownership and ownership rights relation must be clear and secure. Land ownership problem became very important according to time and proposed forestry management plans and income. In the context of the forestry management and planning that problem plays very important role.

FOREST CADASTRE AND OWNERSHIP

Area, position and owners of the forests should be determined while developing policies for sustainable forest management. Depend on forest management plans approximate data are known. However real and absolute scores will ensure with completing forest cadastre (Ayaz and Alkan, 2009). From foundation years of Turkish Republic, forests that procure habitability are seen as one of main principle of development. By law of estovers, forest lands were assigned to forest peasants, who just came out of war and had no staying power, for using at their need. Also need of taking all forests under protection was alleged (Diker, 1947). By the law no 3116 which was the first tidy promulgated forest law, determining owners and boundaries of country's forests as soon as possible was aimed. The law foresaw that forestry organization start bordering forests and finish works within 10 years. Unfortunately a period over 75 years passed but forest cadastre couldn't be completed although a great number of law amendment made. Causes that forest cadastre cannot be finished until now are laws which were legislated constantly and changing at the definition of forests which generates legal basis of these works (Özdönmez et al., 1996). In consequence of instability at legal structure, works returned to beginning many times at forest cadastre and sometimes work requirement was ensued 4-5 times at the same area (Ayaz, 1996).

In view of continuously changing at the definition of forest property, difficulty of forest cadastre works can be understood easier. According to the law no 3116 effectuated at 1937, compass distance measuring method was implemented at forest cadastre works. By this method, application mean error of forest boundaries was identified as ±7.85 m (Tokmanoğlu, 1978). The law no 4785 which was forest nationalization law, was enacted at 1945. As of this date, owning forests with deed of real estate was lost validity and these areas were processed as public property with cadastral works. Because of that people living at forest related villages reacted, some amendment was done at the forest law no 3116 at 1950. Reactions of people were continued about cadastral works due to amendment failed to satisfy about expectation of community who wants to own forest with registration (Atasoy, 2004). Forest law no 6831 went in effect at 1956. There was no changing at frame of forest restriction committee by the law. But because of reasons such as adopted personnel policy, not existed enough personnel, not to attached importance to by political power and technical equipment deficiency, expected return didn't procure (Table 1) (DPT, 1999).

Forest cadastral works were continued by compass until 1965. After this date photogrammetric cadastral mapping was added to agenda. Taking aerial photographs was started for forest activities as of this planned period at 1963. These aerial photographs were used both forest management plans and forest cadastral works. By this method, 1/20.000 scaled panchromatic aerial photographs were taken by General Command of Mapping by marking forest boundary points at terrain. By plotting forest boundaries on these aerial photographs, maps were produced scaled-up 1/10.000 and mean error of location was identified as ± 28.38 m (Erdin, 1978; Tokmanoğlu, 1978).

According to Forest Cadastre Regulations and Forest Cadastre Prospectus, forest boundaries measured by ground surveying methods official reports were made at areas 1/5000 scaled standard topographic map and coordinates of boundaries were calculated and charted. Also forest boundaries neighboring valuable lands were measured by ground surveying methods and

plotted. Tachometric method, used real property cadastre works, was also started to use at determining forest boundaries (Bıyık and Acar, 1999). Ground surveying method was begun to use instead of photogrammetric assessment method at 1982. By this way, susceptibility increased but productivity was decreased at a considerable amount. By introducing regulation at 1986, electronic distance measurement were started to use for base line measurement to increase susceptibility and velocity.

Table 1. Forest cadastre and 2B applications planned period and before (DPT, 1999)

Planned Periods	Year	Forest Cadastre		Application	2B Application
		Programmed (Ha)	Completed (Ha)	Completed (Ha)	Completed (Ha)
	Before PP		3.839.936		
I	1963-1967		800.391		
II	1968-1972		1.766.824		
III	1973-1977		1.368.156	1.396.231	62.564
IV	1978-1982		1.463.202	1.334.442	39.996
V	1984		51.992	533.401	11.707
VI	1985-1989	1.577.500	1.401.639	1.117.031	147.721
VII	1990-1994	3.850.000	2.292.260	1.331.279	130.974
VIII	1995-1999	4.960.000	2.448.990	966.210	55.448
Total		10.387.500	15.433.390	6.678.591	448.410

Rural cadastre was finished faster than forest cadastre and at forest villages, land registrations were done without completing forest cadastre. Because of that, broad forest areas were registered in the name of individuals. In this context forest organization sued numerously. At 1987, cadastre law no 3402 that aimed to be worked forest cadastre and real property cadastre in coordination for increasing property problems. Although it was made progress at forest cadastre by upholding amendment at cadastre law, problems weren't overcome. At many areas forest organization couldn't determine forest boundaries that would be a base for rural cadastre and was faced local objection (Ayaz and Alkan, 2009).

Key issues of failure cause of land and forest cadastre works in east black sea areas are that forest and urban areas are in complex frame, social unrests rises after cadastre works and as a result of these a great number of cases about forest property sued (Atasoy, 2004). Real property, forest and pasture cadastre works were made by 3 different institutes and it was caused multiple problems such as lack of coordination, delayed cadastre works and in coordination of maps that were produced with different scales (Atasoy and Bıyık, 2005). For making cadastre works faster, ensuring works will be resumed even if local expert not participate and creating the coordination between institutes, the law no 5304 was produced in 2005 by amendment of some clauses in cadastre law no 3402 (Ayaz and Alkan, 2009).

Service Procurement from Private Sector

Within the completion of the Cadastre Project was actualized by the General Directorate of Land Registry and Cadastre, property cadastre works was completed the percentage of 99 by the end of the 2014. Countrywide, cadastre works have been completed in 51.622 units of totally 52.161 and it's aimed that cadastre works will be completed by the end of the 2015 on other 247 units that about the complete, except 292 units which has problems (Cadastre rejected by the citizens, boundary conflict, security, Expert problem etc.) in terms of cadastre. While

property cadastre works will be completed soon, forest cadastre works have not been registered yet substantially. Forest cadastre maps which have been produced in previous years don't have the standards that necessary for registration. So it hasn't been registered by the directorate of land registry.

On the other hand, with amendments at cadastre law no 3402 at 2005 both property cadastre works and forest cadastre works were recorded significant progress. After these years, technical works which have been made by private sector in cadastral works have been an important factor in the completion of cadastre. By the end of the 2011, by lawful amendments of 2005, within the law no 5304, forest cadastre has been completed at 9.104 unit, 14.141 parcels and 80.785 km² area by General Directorate of Land Registry and Cadastre. For where the cadastral realization rate is disadvantaged, a major breakthrough has been achieved with law no 5304 that provide comprehensive works. Cadastral works, accelerated efforts with the implementation of the law, have become more qualified technically in terms of location and it has been taken important steps about providing coordination between institutions. To prevent deforestation is possible with the cadastral studies. Of the forest lands for which cadastre works were completed, 65% were registered to the land registers and the registration for the remaining 35% failed. This situation is among the major causes of boundary and possession disputes between the people and the forest administration. Currently, part of forest cadastral works are conducted by forest cadastral commissions under the General Directorate of Forestry, and the other part of forest cadastral works are conducted by a team composed of land surveying teams of General Directorate of Land Registry and Cadastre with the participation of a forest engineer representing the General Directorate of Forestry.

Practices of law resolved problems at determining forest boundary works were done simultaneously, harmonization of different scaled map, to be found forest boundary point easily and recovered cadastre commission about liability at determining forest boundary. But it couldn't measure up personnel working simultaneously and compatible and not to hinder each others' job (Ayaz and Alkan, 2009). It can't be said that mistakes don't be made again, works are cleared sailing and people are adopted forest cadastre. Relying on fifth article which was added to law no 3402 by law no 6495 published in the official gazette 02.08.2013 dated and no 28726, a protocol was signed for completing forest cadastre and application between General Directorate of Forestry and General Directorate of Land Registry and Cadastre. Works is targeted to finish at 2016 if enough fund is allocated and it hasn't a delay in the process of tender because of reasons such as objection, cancellation etc. Within this framework forest cadastre works are aimed in 3 steps, totally 5.527 units and almost 20.000 km² area.

Table 2. Cadastre and registration state in forest areas, 2014

Type	Area (hectare)
Lands with Cadastral Plan Made	21,064,959
Lands with Registration	15,543,952
Lands without Registration	5,521,007

CONCLUSION

Area, position and owners of the forests should be determined while developing policies for sustainable forest management. Depend on forest management plans approximate data are

known. However real and absolute scores will ensure with completing forest cadastre. Within the completion of the Cadastre Project was actualized by the General Directorate of Land Registry and Cadastre, property cadastre works was completed the percentage of 99 by the end of the 2014. While property cadastre works will be completed soon, forest cadastre works have not been registered yet substantially. Forest cadastre maps which have been produced in previous years don't have the standards that necessary for registration. So it hasn't been registered by the directorate of land registry.

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INVESTIGATION OF THE VERTICAL DIMENSION RESTRICTED REAL ESTATES IN LAND CONSOLIDATION PROJECTS

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ABSTRACT

Similar to the earth, the population in our country also has been increased but the agricultural lands not. For fulfilling the sustainable nutrition needs of the society, per area should be used effectively to have the maximum efficiency. Land consolidation is one of the methods; for getting the efficient use from per area. Land consolidation: generally means gathering the scattered and formless lands and creating proper areas and in addition to these; it accomplishes irrigation, road and farm development services. In the land consolidation studies: after the arrangement, the property structure has been different than before. For protecting the property rights of the real estate owners, for the sake and acceptability of the arrangement; the fair distribution is needed. For a fair distribution; the grading works must be done rightfully. In the land consolidation project areas; there may be established easement lands which have limitations on the vertical dimension of the real estate because of the electric transmission, oil, gas and etc. lines. In easement lands; while paying the easement fee to the owner or the owners, there can be restricted areas. In the land consolidation areas, at the end of the distribution; the easement lands and the owners can stay at the same location or while the lands are fixed at their place, the location of the owners may be changed. With the distribution, the owner of the land which has no easement rights before has been restricted without any financial benefit and an unfair distribution in land consolidation may happen. This situation may cause the not protection of the owner's easement rights and prolongation of the land consolidation process. In this study, the situation of the established easement lands before and after the land consolidation projects were investigated. Some suggestions were done on grading stage of the easement lands.

Key words: Land, Land Consolidation, Grading, Easement Right

INTRODUCTION

Land consolidation (LC); It's called that parcels which are scattered and situated in different places, owned by persons, and are not suitable for agricultural activities due to their shape are combined by being gathered in such a manner and size that will increase agricultural activities (Çay, Erkan 1985, Kara 1980).

Land Consolidation according to the law of Soil Conservation and Land use numbered 5403 (RG: 19.7.2005/25880) and the regulation related to Conservation and Use of Agricultural Land and Land Consolidation (RG:24.7.2009/27298) : It states that preventing lands from being

destroyed and fragmentation due to natural and artificial affects,creating more functional new parcels in economical and social way by paying regard to natural features, integrity of use, right of property in scattered lands and determining usage of them by evaluating features and square of these parcels, providing development services of village and land.

City maps, grading maps, interviews of farmers, and block maps need to have been prepared well in order to be achieve LC projects succesfully. To make grading works best and accurately with ground will make parcelling processes being planned more reliable,accurate and the least objection (Sert 2011). According to the 23rd article of the regulation related to Conservation and Use of Agricultural Land and Land Consolidation(RG:24.7.2009/27298)

1) The lands in which situated the consolidation areas are graded by paying regard to soil and fertility surveys which determine permanent and changeable features of soil, distance to residential areas and company offices and other land features by the comission of Land Grading with the aim of giving new lands that have same value by done by project unit or having it done. Of by multiplying determined coefficients with cadastral parcel areas, values in units are acquired. By using this value, new parcelling is done.
(2) In land grading, stationary plant on the land is not taken into consideration.
(3) Land grading boundaries are done through the map showing features of soil and land according to principles specified in the first article by not paying attention to possession limits. To make owners inform easily, land grading maps are prepared in suitable scale.

GRADING APPROACHES IN LAND CONSOLIDATION PROJECTS

LC studies in our country are done according to two laws basically:
1.Agricultural Reform Law regarding land arrangement in Irrigation Aregas numbered 3083 (RG: 01.12.1984/18592).
2.Soil Conservation and Land Use Law numbered 5403 (RG: 19.7.2005/25880).

Grading According To Soil Conservation And Land Use Law Numbered 5403

In LC studies, rules about grading processes are explained in the regulations of Land Consolidation (RG: 7.5.1982/17687). The land to which LC project will be applied is graded according toactivities of factors specified under 6 main headings. These are:

1. Soil Index
2. Fertility Index
3. Location of Parcels
4. Parcel Index
5. Share of Collective Plants
6. Determination of Grading Conversion Factor

Soil Index
A- Soil Profile Group
B- Top-soil Body
C- Slope of Land
X- Other Features (Salinity, Alkalinity, PH, drainage, erosion, microrelief)

Soil Survey Engieener searches detailed soil surveys by using 1/5000 scaled STK map and analyze examples taken from soil punctiliously and primarily in lab. He determines soil index of every parcel in the project area and different parts in parcel when required and give it to the assessing authority.

Soil Index (TE)= AxBxCxX

Soil Index is calculated through the formula above. *Soil Index is determined between 0 and 100.*

Fertility Index

Grading Instutition chooses sample parcels such as to represent dominant vegetation and sufficient number of plants with different sizes and distances and proper distrubition of them on the project area. Agriculture Engineer : If there are researches that are made previously in that region, he informs the members of instutition by applying its result to sample parcels.If there is no researches that are made previously and members of instutition find it necessary, Fertility Analysis is done in examples which will be taken from parcels having been chosen earlier according to principles specified.

Fertility Index Points are determined between 0 and 100 depending upon observations that will be made on parcels and according to the results of fertility analysis by the members of instutition. These values found in sample parcels are extandable to the other parcels.

Location of Parcels

The distance of parcels to the residential areas, its shape and road condition are given. Written instructions arranged this subject such as :

a- The distance of parcel to the company offices
b- Transportation Condition between parcel and company office
c- Irrigation Condition of parcel at present state
d- Parcel's situating on the side of stream,watercourse and river
e- Parcel having energy, PTT transmission line or pipelines
f- Parcel's situating in settling area or urban area
g- Geometrical Figure of Parcel etc.

The members of instutition determine the factors above with a report in what way they evaluate for a project area. The location of parcels is determined between 0 and 20.

Parcel Index

% 70 of the index (TE) obtained from soil surveys is taken. Parcel index is determined by adding specified index points for fertility index (V) and location index (K). Grading of Parcels (Table 1) is done according to parcels index of them.

Parcel Index (PE) = *TE*%70+V+K*

Table.1Rating of Grading according to Parcel Index

Grade	Parcel Index	Grade	Parcel Index
1	91-100	6	41-50
2	81-90	7	31-40
3	71-80	8	21-30
4	61-70	9	11-20
5	51-60	10	0-10

Lands between 1 and 7 are consolidated among themselves and the ones between 8 and 10 are consolidated among themselves.

Parcel Value Number (PDS): Index figure found according to index of soil fertility and location is multiplied with parcel area, divided by 100 and the figure found is parcel value number.

$$PDS = \frac{PE}{100} \text{ x AREA}$$

Share of Collective Plants (OTKP)

The area covering roads, drainage canals in project area is met byexternal places not resignated.The ones which are not met are reduced from total land to be given to owners in proportion to land sizes of companies.After planning of parcel, the rest of lands and villages is registered in the name of legal entity.

Determination of Grading Conversion Factor (DDKT)

a) After determined parcels which are in the project area, weighted mean of the parcels which are in the same degree is found acording to the grading table.
b) After calculated mean of index figures for each degree determined in the project area, coofficients of them are found by means of diving each other and arranged in a table. These coofficients found are drawn on the side of the map as scaled. In grading, (1) soil index and (2) market value index are made use of. At the end of grading process, one parcel unit value for each parcel is found (Çay, Demirel 2005, Sert 2011).

Grading According To The Agricultural Reform Law Regarding Land Arrangement In Irrigation Areas Numbered 3083

Soil Index (TE)

It's determined depending upon soil surveys performed by expert agriculture engineers in the project region.

TE= A*B*C*D

A: Soil Profile Group
B: Body of top-soil
C: Slope of Land
D: Other Features (Salinity, Alkalinity, PH, drainage, erosion, microrelief etc)

The parcels which are in the application take soil index point between 0 and 100 according to the results of surveys. Index values are imprinted on the index maps.

Market Value Index (R B E)

The comission determines market values of the parcel's unit area by taking the factors below into consideration and asking the commission members. By giving 100 point to the highest price determined, the rest is scored proportionately according to this.

These are the factors taken into consideration in valuation:

- Natural Fertility of the Land
- Kind of Crops being grown and will be grown
- Soil Features
- Condition of Irrigation
- The distance to road and irrigation canal
- The distance to the village and market
- Transportation facilities

The parts having same soil index in the parcel is given same market value point. However, Different market value point may be given to the parcel whose parts showing different soil features.

Parcel Unit Value And Calculation Of Parcel Mean Value

Parcel unit values of parcels or each section having different soil index and market value point is calculated like this:

PBD=(TE+RBE)/2

Parcel unit value in parcels which have more than one soil index and market value point becomes more than one. For these kinds of parcels, weighted mean of parcel unit values is calculated. Calculated indexes are shown on the index map with their borders (Çay, Demirel 2005).

$$POD=[(PBD_1 * PA_1)+(PBD_2 * PA_2)]/(PA_1+PA_2)$$

EASEMENT

When property owner allows corresponding real property to be used by another person or other instutitions, the emerging right of usufruct and/or right of use is called as easement (URL-1 2015).

Easement is a limited real right prohibiting being used some of authorities of the real property's owner related to possession on behalf of owner of easement. In other words, they are limitations over real property which is a subject of private ownership (Gül 2012).

In the article 4 of expropriation law(RG:08.11.1983/18215) numbered 2942, expropriation of constitution of servitude states as " Instead of expropriation of real estate ownership, as long as it's enoug for the purpose certain easement is can be founded over certain part, heighth, depth of the real estate or source".

Easement can be founded over real estate on behalf of government without changing the owner of real estate.According to this: The moment when decision of public utilities is taken, It's not a must to expropriate the ownershio of real estate.Easement will be able to be founded over sufficient part, heighth, depth of it or sources by means of expropriation. So, the government by paying less will be able to also make saving over real estate.

According to the article I of the article 11 indicating determination principles of expropriation's price of expropriation law numbered 2942; In the constitution of servitude by means of expropriation, loss in value that will happen on real estate and source due to expropriation is indicated with reasons.This loss in value is determined as expropriation price.
Together with easement founded on real estates, various difficulties happen. These are the factors affecting adversely value of the real estate at the same time:

1- Thrashing of pylon places and other trasmission lines happening because of heavy construction vehicles working on land
2- Limitation of market depth and disorder of drainage,
3- Limiting vegetation that will be planted and raised and alterations in production pattern,
4- While pipe lines are being installed, decrease and depletion of fertile top-soil on field,
5- Work force, inputs and passage of animals with equipment and machines from one part to another occupying much time relatively and besides danger probability during passages
6- Because of shapeless parcels' creation and generation of more borderline compared to before, of the areas which are not planted with machines and harvested remaining, these causing thrashing at business management and increasing of business expenses
7- The stones rising to the surface of the field during excavation works and firm ground soil making soil cultivation, care and harvest difficult,
8- Construction of road, water canal and pipes, investment of land improvement like pit and fence, operation buildings and some part of the barnyard causing destruction and requirement of some expenses in order to make these become functional
9- Psychological reasons (putting an annotation buying and selling due to easement) and decrease of labor productivity of workers
10- Other risks (4).

Constitution of servitude is divided into half in terms of period. It's founded as permanent and temporary constitution of servitude:

a) Temporary constitution of servitude: Its period is 2-10 years.
b) Permanent constitution of servitude: Its period is 11-99 years. It's generally taken as 49-99 years.

Temporal Constitution Of Servitude

In the area where temporal easement is founded, net income decrease that will happen in the specified year is calculated. In the event that temporal constitution of servitude is founded, loss in value is not calculated as if there was permanent constitution of servitude on real estate: By taking lost incomes damages and rent into consideration during the period of constitution of servitude on that part of real estate, loss is determined (Gül 2012). This calculation ; $So = S * (qn - 1) / fqn$ It's found by being used this formula.

So = Present value of income loss will happen in the specified period (n) year
S = net income loss of the year

q = 1+f
f = It states real interest rate

Permanent Easement

If set up time of easement is long, It is defined as indefinite easement like 49-99 years. The difference between former and next value of constitution of servitude of the land constitutes of easement price. Constitution of servitude price is impairment happening in the price of the land (Gül 2012).

According to easement price, expropriation law and supreme court practices : At constitution of servitude, loss in value that will happen on real estate due to expropriation is expropriation price. While determining this price, It's determined by taking kind of real estate (land or field), its usage, its size, the location of sharing area, its surface area, its geometrical condition and quality and route of sharing into consideration (Gül 2012).

$D = R / f$ It's calculated by using this formula.

D: Easement Price
R: Net income decrease of the year
f : Capitalisation interest rate

CONDITION OF REAL ESTATES WHOSE CONSTITUTION OF SERVITUDE FOUNDED IN THE LAND CONSOLİDATION PROJECTS

In order to perform public services such as electrict, water, natural gas and oil transmission lines etc., easement is acquired by making limitations in a vertical way on real estates. Beucase of this limitation, loss in value at real estates happen. The money is paid to owners of real estate in return by calculating loss in value happened.

When real estates on which easement was founded encounter the areas where LC projects are done, either it's left at the scene or the owners of parcels on which easement was founded may change. For this reason, owners of the real estates on which easement was founded may move to the area on which easement has not been founded yet or the owners of real estates on which easement has been founded may be renewed. So loss of a right may happen.

In this study, LC projects that are done in the various regions of Turkey and easement has been founded on field of application. These are the projects to be studied:

1. Manyas Right Beach LC Project Kulak village
2. Burdur County of Tefenni Seydiler and Yuvalak LC Project

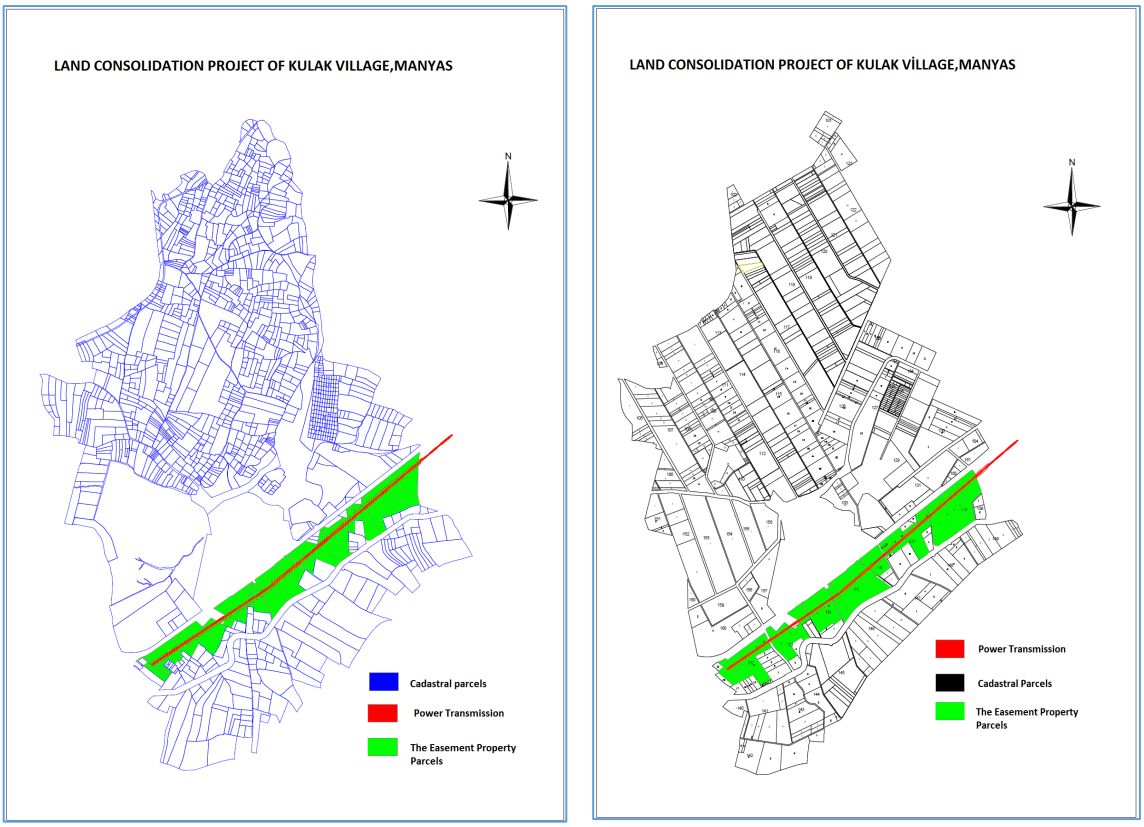
Manyas Right Beach Lc Project Kulak Village

In Kulak Village, Manyas County, Balıkesir city, works of land consolidation have been done by general directorate of state hydraulic works. In the area where LC study is done and energy

transmission line is placed, there are real estates on which easement has been founded (Figure 1a).

Former and next conditions of the real estates on which easement has been founded before regulation were studied. The real estates on which easement has been founded, its owners, its areas are searched in their new locations whether there is constitution of servitude or not after LC is applied.It is examined that the real estates having constitution of servitude before LC projects is done and new locations of these real estates after LC project is done and whether their constitution of servitude continues or not (Table 2). In the land consolidation project borders;

- The number of real estates on which easement has been found is 38.
- The number of firms affected from constitution of servitude is 63.
- The number of parcel on which easement has not been founded in the places after regulation is 8.
- After regulation the number of firms getting rid of constitution of servitude is 17



a) Before b) After

Figure 1. The real estates on which easement has been founded and cadastral map before and after Kulak Village LC Project

17 firms earned income due to constitution of servitude before LC works. But It got rid of constitution of servitude with the application of LC project (Figure 1b).

After LC project, examinations were made based upon new parcelling plan. According to new parcelling plan it is examined that the real estates having constitution of servitude, owners of

real estates, its areas and whether they have constitution of servitude or not (Table 3). In Kulak village where LC project is applied;

- The number of parcels on which easement has been founded after land consolidation project is 28.
- The number of firms affected from constitution of servitude is 58.
- The number of parcels on which easement has been found after regulation is 4.
- The number of firms affected from constitution of servitude after regulation is 8.

Table 2. The real estates on which easement has been founded

Düzenlemeden Önce İrtifak Hakkı Tesis Edilmiş Parseller					
S.NO	**İşletme No**	**Parsel**	**Alan**	**Yeni Ada/Parsel**	**İrtifak Hakkı Tesisi**
1	407	1443	5701.06	137/2	Var
2	338	1444	5440.83	137/3	Yok
3	271	1446	6133.67	136/2	Yok
4	36	1447	5744.22	137/7	Var
5	24	1499	3337.07	137/15	Var
6	613	1500	15757.09	137/8	Yok
7	40	1504	6455.99	137/11	Var
8	408-410-411-412-484	1739	19472.51	132/15	Yok
9	566	1740	5669.53	133/4	Yok
10	234-239	1798	1488.11	132/5	Yok
11	234-239	1799	4753.74	132/5	Yok
12	208	2045	28863.41	138/4-139/1	Var
13	59-67-318-329-536	2047	25162.48	138/2	Var
14	443	2051	5312.36	137/1	Var
15	644	2055	17644.91	137/11	Var
16	186-188-190-401	2067	20826.01	134/2	Var
17	186-188-190	2069	6764.74	134/2	Var
18	590	2071	10312.91	132/22	Var
19	176-237-243-246-365-645	2073	9699.82	132/6	Var
20	437-438	2075	38457.60	133/8	Var
21	529-532	2091	7142.46	132/21	Var
22	131-278-279-280-281-282	2103	4241.84	132/19	Var
23	131-279-280-282	2105	20408.90	136/3	Var
24	44	2107	8663.78	138/6	Var
25	278-281	2109	19949.24	136/4	Var
26	29	2115	18558.71	133/1	Var
27	440	2117	34127.84	134/4	Var
28	142	2123	45741.42	138/7	Var
29	27	2129	27249.71	135/3	Var
30	469-470-471	2131	28289.24	132/8	Var
31	624	2133	13640.56	132/7	Var
32	562-564	2135	27527.80	138/3	Var
33	156-216-341-442-636-638	2165	21604.17	137/9	Yok
34	118	2225	25808.16	138/1	Var
35	102	2227	36297.40	135/2	Var
36	118	2230	25643.38	138/1	Var
37	105-142-485	2233	33710.73	135/1-146/6	Var
38	102	2236	25047.89	135/2	Var

There isn't constitution of servitude at 4 parcels belonging to 8 firms that have land in the region before application of LC project. But easement has been founded on these real estates without paying a prica after LC project applied.

Table 3. Farm Firms that are exposed to constitution of servitude after application of LC project

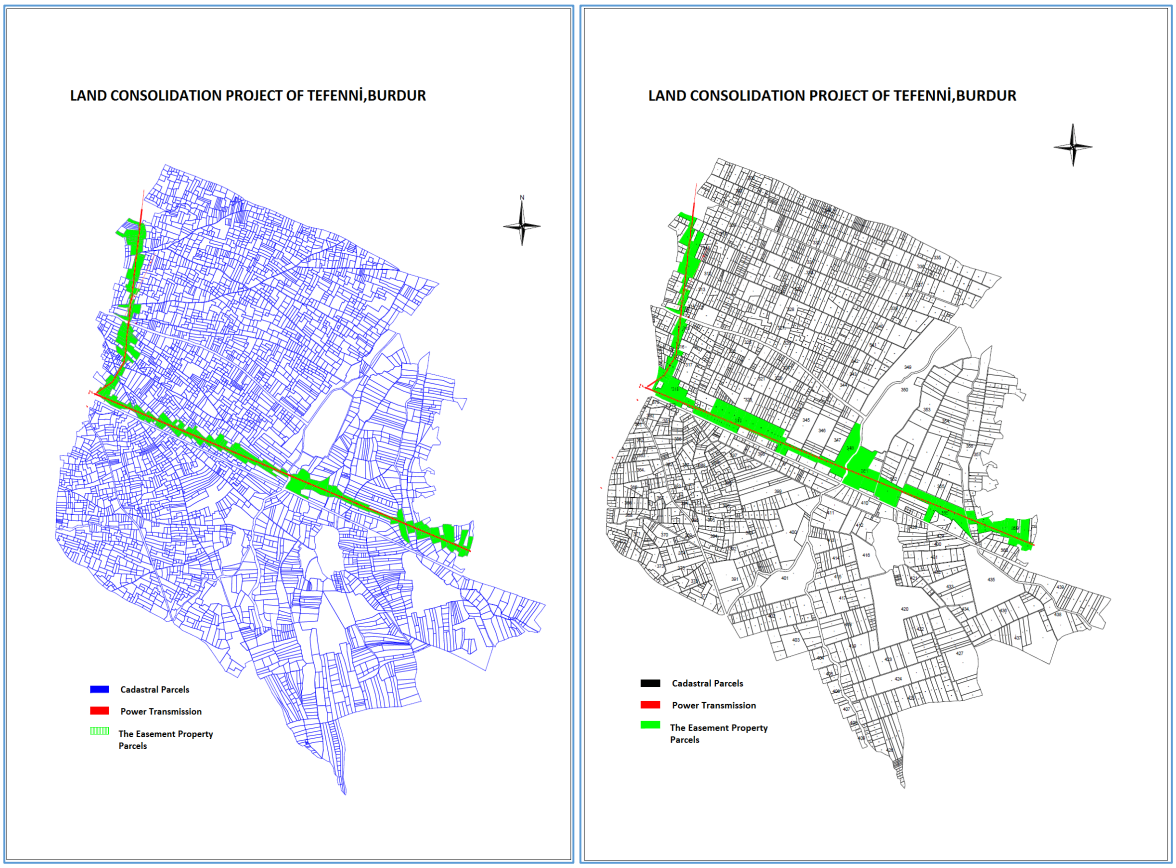
Düzenlemeden Sonra İrtifak Hakkı Tesisine Maruz İşletmeler					
S.No	**İşletme No**	**Parsel**	**Alan**	**Ada/Parsel**	**İrtifak Hakkı Tesisi**
1	365-176-237-243-246-645	2073	9079.17	132/6	Var
2	624	2133	12858.86	132/7	Var
3	471-469-470	2131	37407.83	132/8	Var
4	131-282-280-279-281-278	2103	28126.05	132/19	Var
5	529-532	2091	6747.17	132/21	Var
6	594-64-593-590	1715-1719	13114.41	132/22	Yok
7	129	2115	17811.13	133/1	Var
8	412-484-411-410-408	1739	18281.86	133/7	Var
9	437-438	2075	35648.94	133/8	Var
10	190-188-186-401	2069-2067	30324.79	134/2	Var
11	400	2186-2184	43223.69	134/4	Yok
12	142-485	2233	22125.03	135/1	Var
13	101-102	2173-2175	90254.92	135/2	Yok
14	27	2129	25385.67	135/3	Var
15	131-282-280-279	2105	19075.43	136/3	Var
16	281-278	2109	18876.40	136/4	Var
17	443	2051	5008.97	137/1	Var
18	407	1443	14200.44	137/2	Var
19	41-36	1447	35956.87	137/7	Var
20	40	1504	5924.67	137/10	Var
21	644	2055	17829.83	137/11	Var
22	24	1499	3103.40	137/15	Var
23	118	2225	48096.46	138/1	Var
24	536-67-319-59-318	2047	25092.14	138/2	Var
25	562-564	2135	25570.00	138/3	Var
26	208	2045	20277.21	138/4	Var
27	369	2145-2147	8219.00	138/5	Yok
28	44	2107	42742.56	138/6	Var

Burdur City Tefenni County Yuvalak Seydiler LC Project

LC studies have been performed in Tefenni County, Burdur City by general directorate of agricultural reform. The real estates by which power lines pass have been expropriated for pylon places. The real estates by which electric wires pass have constitution of servitude. In the borders of LC project of Tefenni county, there are 128 real estates on which constitution of servitude has been founded (Figure 2a). When the former and next conditions of real estates on which easement has been founded on were examined before LC project applied;

- The number of real estates having constitution of servitude is 128,
- The number of real estates on which easement has been foundedn on after regulation is 71,
- The number of real estates on which easement has been founded on after LC project is 97
- Before and after LC project, the number of real estates on which easement has been founded is 60

- The number of real estates on which easement has been not founded before regulation but after regulation founded is 37
- It is understood that the number of real estates on which easement has not been founded after regulation is 57.



a) Before b) After

Figure 2. Cadastral map and real estates on which easement has been founded before and after LC project of Tefenni County

In these premises; the owners of 57 real estates earned income due to constitution of servitude before LC studies but they got rid of constitution of servitude thanks to application of LC project. The owners of 37 real estates; they encountered constitution of servitude after application of LC project. While restrictions are placed on their real estates, It doesn't make income against great expense (Figure 2b).

"Instead of expropriation of real estate ownership, as long as it's enoug for the purpose, certain easement is can be founded over certain part, heighth, depth of the real estate or source."

RESULTS AND SUGGESTIONS

According to our legislations; restrictions can be placed on real estates for the public weal in return for its price by state institutions and organizations. Registrations of restrictions on height and depth of real estates happen as constitution of servitude. There can be real estates on which easement has been founded application fields of LC projects. The real estates on which

easement has been founded and the owners of real estates by which power lines etc. pass can remain same or change when LC projects are applied. This situation causes loss of a right.

In this study, LC projects done according to 2 different laws, the conditions of real estates on which easement has been founded placing restrictions on real estates in a vertical way were examined.

There is not a detailed regulation related to regions having constitution of servitude at LC projects done according to two different laws numbered 3083 and 5403. The owners of real estates which do not have constitution of servitude before regulation of LC projects own real estates on which easement has been founded after regulation. This situation causes loss of a right from the point of owner of real estates. The owners of real estates that are situated in the area on which easement has been founded before regulation have acquired illegally by being given real estates which do not have constitution of servitude after regulation.

According to Soil Conservation and Land Use Law numbered 5403, there is " Power, PTT trasmission line or pipe line being on the parcel "between factors affecting location index during grading. According to the law, location index of the region having constitution of servitude during grading should be given lower than their similars.

While easement is founded, by calculating decrease on parcel price, it's paid to right holder. During grading of LC projects, the ratio of this price to parcel price should be reduced from location index point.

$$\text{Location Index (KE)} - \frac{\text{Easement Price}}{\text{Parcel Price}}$$

According to the Agricultural Reform Law regarding land arrangement in Irrigation Aregas numbered 3083, during grading of LC projects, wealth point is given. Wealth point of real estates on which easement has been founded should be given lower than their similars.

$$\text{Wealth Point} - \frac{\text{Easement Price}}{\text{Parcel Price}}$$

So, If real estates from different places will be given to the owners of real estates on which easement has been founded during grading, the field will be able to be given dwindlingly as areal. If the real estates by which power etc. lines pass will be given to the owners of real estates on which easement has not been founded, the field will be able to be allocated extensionally as areal. The acquired income while easement is being founded will be delivered fairly by giving real estates to the places which do not have constitution of servititude after regulation decreasingly. At the same time, when other similar regions come to the region on which easement has been founded, It will come extensionally as areal. The price of restrictions caused by constitution of servitude will be compensated as areal. So, It will be able to enable more righteous parcelling plan.

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UPDATING AND MAINTAINING LAND PARCEL TYPES THROUGH CROWD-SOURCED LAND USE/COVER CLASSIFICATION

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ABSTRACT

Modern (Multi-Purpose) Land Administration Systems have difficulty in managing up-to-date land parcel types. Managing external land use/cover information together with land parcels in an integrated manner may be a robust solution to this problem. In this study, inspired from common international land use/cover classification systems (FAO Land Cover Classification System, CORINE land cover and INSPIRE land use/cover theme) and spatial data management issues within agricultural policy implementation both in EU and in Turkey, a new land use/cover classification system was designed and land use/cover data sets was produced for three districts in Kayseri Province of Turkey. Further, rules for the integration of land use/cover data with cadastral land parcel data and accordingly updating/maintenance procedures were defined. Due to complexity of updating and maintenance procedures, use of crowd sourcing techniques with the contribution of related government agencies and also citizens was proposed. The study has been continuing as a component of a national project no 112Y027 that is financially supported by the Scientific and Technological Research Council of Turkey.

Key words: land parcel type, sub-parcel, land use/cover classification, crowdsourcing

ÖZET

Modern (Çok-Amaçlı) Arazi İdare Sistemleri güncel parsel türü/cinsi bilgilerini tam manasıyla yönetememektedirler. Farklı kaynaklardan elde edilen arazi örtüsü/kullanımı bilgilerinin parsellerle birlikte bütünleşik olarak yönetimi bu problem için sağlıklı bir çözüm olabilir. Bu çalışmada, uluslararası alanda yaygın olarak bilinen arazi örtüsü/kullanımı sınıflama sistemlerinden (FAO Arazi Örtüsü Sınıflama Sistemi, CORINE arazi örtüsü ve INSPIRE arazi örtüsü/kullanımı teması) ve Avrupa'da ve Türkiye'deki tarım politikası uygulamalarıyla ilgili konumsal veri yönetimi problemlerinden esinlenilerek yeni bir arazi örtüsü/kullanımı sınıflama sistemi tasarlanmış ve Kayseri ilinde üç mahalle için arazi örtüsü/kullanımı veri setleri üretilmiştir. Buna ilaveten, arazi örtüsü/kullanımı verileri ile kadastro parsel verilerinin bütünleştirilmesi için kurallar ve bu doğrultuda güncelleme ve bakım prosedürleri tanımlanmıştır. Güncelleme ve bakım prosedürlerinin karmaşık olması nedeniyle, ilgili resmi kuruluşların ve halkın da katılımı ile kitlesel temin (crowd sourcing) tekniğinin kullanımı

önerilmektedir. Bu çalışma, TÜBİTAK tarafından mali olarak desteklenen 112Y027 numaralı ulusal bir projenin bir bileşeni olarak devam etmektedir.

INTRODUCTION

Within the Turkish Land Administration (Land Registry and Cadastre) System (LAS), land parcel types are formally registered as attribute information. This information may include both the type of land use/cover and also natural and man made features (trees, buildings, wells) (see Uzun and Inan, 2007). This study focusses only on land use/cover information in this respect.

Updating registered land use/cover information within the Turkish LAS relies basically on related personal or governmental procedures (construction permit, subdivision, property tax, farmer support, land readjustment, land consolidation, etc.). Therefore, real time update of land use/cover information is impossible through such procedures. On the other hand, due to the fact that land/use cover type within a land parcel is not always homogeneous, determination of the exact amount of land use/cover is impossible. In fact, the amount information is the spatial component of land use/cover information. So, spatial representation of different land use/cover types within land parcels is the main focus of this study. This problem was previously introduced by Inan et al. (2010).

Incorporating land use/cover information as one of the most important components of modern LASs may be regarded as a basic requirement (see Enemark, 2005). However, such an incorporation depends basically on the availability of land use/cover data. In addition, data quality, type of land use/cover classification (depending on the original production purpose), methodology of incorporation, and updating procedures may be listed as other related issues. This study basically aims at resolving or discussing these issues as part of a national scientific project no 112Y027 financially supported by the Scientific and Technological Research Council of Turkey.

Depending basically on the purpose and data quality, there may be several types of land use/cover classification systems. Internationally well known ones are FAO Land Cover Classification System (LCCS) (Di Gregorio and Jansen, 1998), CORINE land cover (EC, 1995) and INSPIRE land use/cover theme (INSPIRE D2.3, 2007; INSPIRE D2.8.II.2, 2013). Based on FAO LCCS, there has been an international standardization initiative (see ISO 19144-1, 2009; ISO 19144-2, 2012).

Inspired from agricultural policy implementation and related spatial data management issues in Europe (Kay, 2002; Kay and Milenow, 2006; Inan, 2010; Inan et. al., 2010; Sagris et al, 2013) and Turkey (WB, 2005; Goeman et al., 2007; Inan, 2010), in this study, a new land use/cover classification system was developed (see Inan and Dursun, 2014 for preliminary development stage) and incorporated with cadastral land parcels by defining robust geometry and topology rules (the so-called sub-parcel data model). Further, inspired from emerging crowd sourcing (McLaren, 2011) techniques in land administration and related fields, in order to update related land parcel and spatially associated land use/cover information, work on multi-tier updating strategies with the contribution of related governmental institutions and also citizens has been continuing. Apart from its original development aim, the study will be presented, in the

following sections, in terms of its contribution to the management of spatial land parcel types (incorporated land use/cover information).

MATERIALS and METHODOLOGY

Pilot application of this study has been carried out in three districts (Elagoz, Karahoyuk and Vatan) in Kocasinan county of Kayseri province, Turkey.

For the production of land use/cover data, at the first stage, a tree level special classification system was developed. Number of designed classes is two, nine and eighteen in the first, second and third levels respectively (see Section 3 for classes). At the second stage, land use/cover classes were digitized using visual interpretation techniques on Very High Resolution (VHR) satellite imagery (WorldView-2). To assist in visual interpretation, VHR images of two different years (2010 and 2013) were used. Unchanged land use/cover information (fixed boundaries) where digitized and changes over years were also considered in accordance with the rules for digitization procedure. Sub-parcel data structure (see Inan et al., 2010) was used as part of digitization procedure. To implement this data structure, cadastral land parcel boundaries data sets of three districts were used. As a result, using a total of 3640 land parcels (as spatial template) in three districts, a total of 6811 spatial sub divisions of land parcels were produced as spatial land parcel types (land use/cover classes).

Digitization process was done by trained operators. Later, at the data quality control stage, digitization and classification control processes were carried out by an expert. At the last stage of control procedure, topology control and accordingly semi-automated correction procedures were applied by a database specialist. In this stage, two topology rules namely “Must Not Overlap” and “Must Not Have Gaps” were utilized within an ESRI ArcGIS geodatabase, and as a result hundreds of topological errors were corrected.

The digitization process was carried out by using a static (un-changed) data structure. That is to say no updates to cadastral land parcels and similarly to sub-parcels have been applied. In fact, dynamic structures of these two data sets must be considered. To realize this fact, study on the integration of produced sub-parcel data set with an online cadastral land parcel data set by using WFS web service provided by the General Directorate of Land Registry and Cadastre (GDLRC) has been continuing. Similarly, to be able to update dynamic changes on sub parcels, study on serving this data set together with cadastral land parcels and background VHR images to related users via WMS and/or WFS has also been continuing. These users may be representatives of governmental institutions and also citizens who engaged in agricultural land use. Some of these users are planned to be data providers in different levels for dynamic updata procedures via croud sourcing techniques.

RESULTS and DISCUSSION

Land Use/Cover Classes

Inspired from agricultural policy implementation and related spatial data management issues in Europe and Turkey, in this study, a new land use/cover classification system was developed (see Inan and Dursun, 2014 for preliminary development stage).

Table 1. Hierarchic levels and classes of proposed land use/cover classification system

Land Use/Cover Classes		
I. Level Classes	**II. Level Classes**	**III. Level Classes**
Agricultural Land (Tarım Potansiyeli Olan)	Cultivated Agricultural (Ekili Tarım)	Fertile (Tarla)
		Protected (Örtü Altı)
		Garden (Bahçe)
	Planted/Perennial Agriculture (Dikili Tarım)	Vineyard (Bağlık)
		Orchard (Meyvelik)
		Olive Grove (Zeytinlik)
		Other Planted (Diğer Dikili)
	Grassland/Pasture (Otlak/Mera)	Pasture (Mera)
		Grassland (Çayır/Otlak)
	Transition Agri. (Geçiş Tarım)	Abandoned (Terk Edilmiş Tarla)
		Uncultivated (Tarım Dışı)
		Immature (Ham Toprak)
	Other Agri. (Diğer Tarım)	Mixed Agri. (Karışık Tarım)
		Uninterpretable (Yorumlanamayan)
Non-Agri-cultural Land (Tarım Potansiyeli Olmayan)	Settlement (Yerleşim)	Settlement
	Built-up (Arsa)	Buit-up
	Infertile (Elverişsiz)	Infertile
	Other (Diğer)	Uninterpretable (Yorumlanamayan)

In the development stage, possible use of internationally well known classification systems namely FAO Land Cover Classification System (LCCS) (Di Gregorio and Jansen, 1998), CORINE land cover (EC, 1995) and INSPIRE land use/cover theme (INSPIRE D2.3, 2007; INSPIRE D2.8.II.2, 2013) was considered and some application tests were carried out. However, it was experienced that visual interpretation on VHR is not a practical method for the classification of land outside agricultural areas. Therefore, a new hybrid classification system which classifies agricultural land in detail and classifies rest of the land only in generic classes is required. The developed classification system has classes in three levels. The first level only differentiates the main type of land which has or does not have agricultural potential. The second level includes eight major land use/cover types. The third level includes eighteen land use/cover types, yet focusses only on detailed classification of agricultural land (see Table 1).

Land Use/Cover Data Sets

In land use/cover production stage, by using a total of 3640 land parcels (as spatial template) in three districts, a total of 6811 spatial sub divisions of land parcels were produced as spatial land parcel types (land use/cover classes) (see Fig. 1).

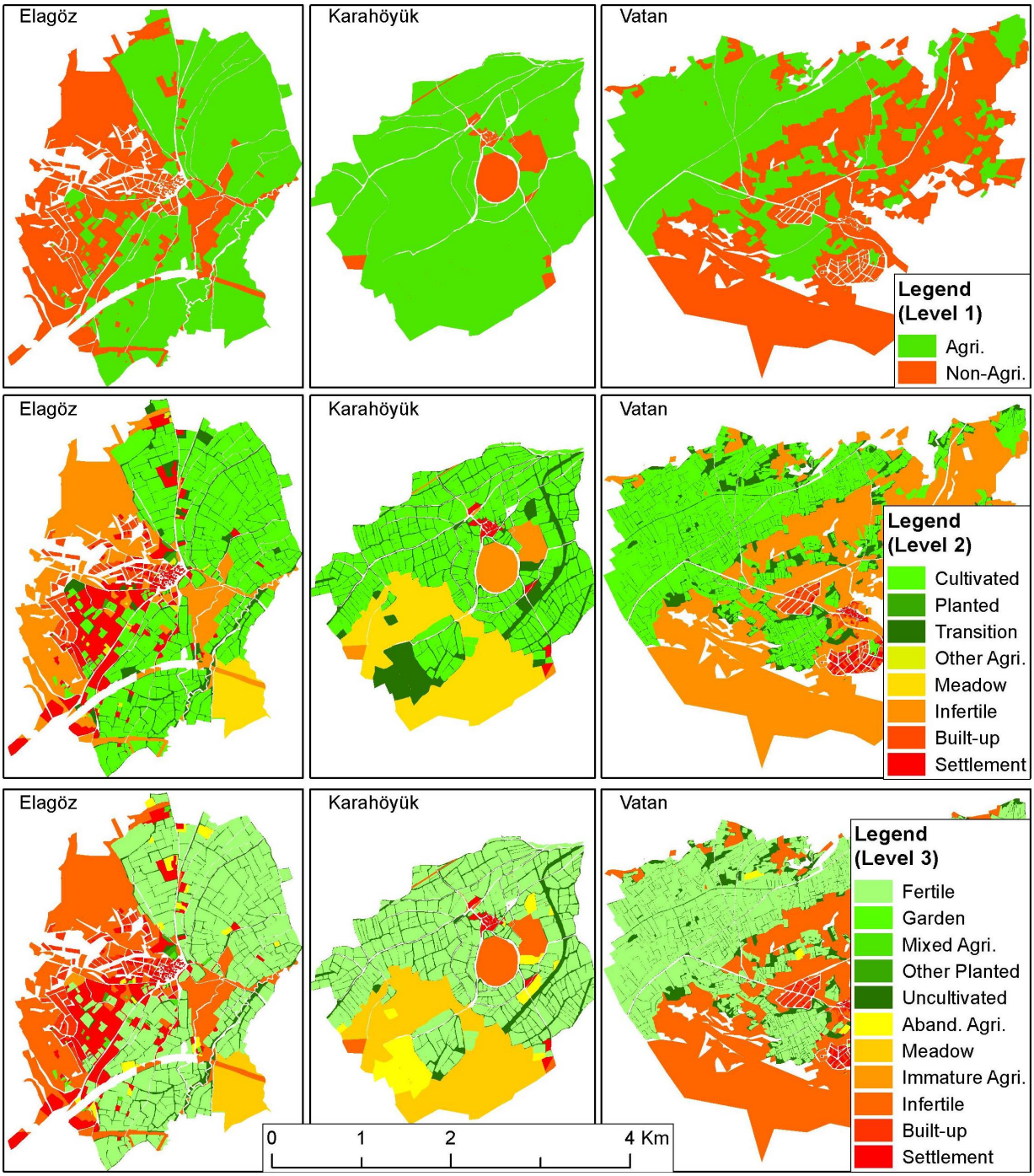

Fig. 1. Land use/cover data and three levels of classification in pilot application areas

In the production of land use/cover data sets, the main focus is the production of the most detailed Level 3 data. Data in lower levels are generalized versions of Level 3 data. Because instances of all classes designed in Level 3 (see Table 1) are absent in three application areas, the number of classes in Level 2 and 3 are not far different in Fig. 1.

Integrity of Cadastral Land Parcels and Land Use/Cover Data

Data Structure

Sub-parcel data structure (see Inan et al., 2010) was used for the integrity between cadastral land parcels and land use/cover data. This data model requires the use of robust geometry and topology rules. Basic rules are as follows. A land use/cover unit (sub-parcel) must geometrically be a sub set of the specially coinciding cadastral land parcel. Similarly, data quality of cadastral land parcels must be used for shared boundaries although spatial data quality of cadastral land parcels and land use/cover units may be different. Land use/cover units within a cadastral land parcel must not overlap and may not have gaps only for exceptional cases. The produced data sets were checked and corrected against all these basic rules.

During implementation, these basic rules combined with updating and maintenance rules will always be implemented. The implementation strategy may differ depending on the type of process. Possible processes may be updating cadastral parcel boundaries and related land use/cover units, simply updating land use/cover units within a cadastral land parcel, a regular maintenance operation, a crowd source contribution with real geometry or only a spot indicating some sort of change etc. Study on these issues has been continuing.

Updating and Maintenance by Crowdsourcing

Cadastral land parcels lives (updated) legally depending on land administration procedures. On the other hand, changes of land use cover information on cadastral land parcels can not always be traced legally. This may only be possible in planned urban areas where all land use activity especially construction activities are legally monitored. For the majority of unplanned rural areas this is not the case. Therefore, this study focusses on classifying, updating and maintaining land use/cover data in rural areas. However, real time update of land use/cover data in such areas is almost impossible. Updating strategies proposed with this study concentrates basically on increasing the number of related legal (by adding the domain of agricultural policy) or illegal (well organized) procedures by sharing data all related parties (who have a potential contribution by crowdsourcing).

Updating of cadastral land parcels, in this study, is fully dependent on the WFS web service which provide the most up-to-date digital information about cadastral land parcels. For land use/cover information updates, the classification and visual interpretation methodology which reflects easily understandable fixed or clearly identifiable land use/cover boundaries makes the development of a robust updating methodology. Another advantage is that land use/cover information in three levels has the potential to serve for a vast variety of disciplines. In fact, changes of fixed or clear boundaries on VHR images or alternatively by field visits may be identified easily even in the absence of an expert. Therefore, contribution by expert or non-expert crowdsourcing will be possible (This is called as multi-tier updating in this study). Yet, the key development for the implementation of such a task is serving related data to the users in an easy and convenient way. In this context, web services usable on desktop, tablet and mobile devices will be developed both for data share and contribution by crowd sourcing.

Software development for this purpose has been continuing. Study on the determination of related foundations and accordingly custodians has partly been completed.

Due to the robust data structure which must be maintained by only experts, crowd sourcing can not be the first order source for updating. It must be at later orders depending on the expertise of the data provider. It must only be used as supporting evidence for updating procedures. For the management of such a complex, multi-tier updating strategy, management of metadata must have a crucial role.

Apart from crowd sourcing, some periodical update operations may be required. These may be done using VHR images and/or aerial photography. In the absence of up-to-date imagery or photography, field visits may also be another alternative. However, during visits, identification of changes may not be possible, and accordingly measurement of all (suspected) land use/cover boundaries may not be possible. Yet, a rapid field survey without boundary surveying may be useful for the determination of the need for imagery/photography update.

CONCLUSIONS

As part of modern land administration which serves not only for land market but also for other related disciplines (agricultural policy implementation in this study), management of up-to-date land parcel type information is of utmost importance. Similarly, instead of causing burden to related land administration foundations, using interoperable data structures/models (e.g. sub-parcel data structure) maintained in close collaboration with related foundations or even citizens is also required. However, management of conventional land parcel type information which is not capable of representing amount of land use/cover type spatially is not a convenient way. Instead, in terms of developing effective updating and maintenance procedures, using a well defined land use/cover classification system may be a robust solution. For the effectiveness of such multi-tier maintenance procedures, storing and managing related metadata about contributors, equipment used and also methodology of data acquisition are strictly required.

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