A SOUND APPROACH FOR RESOLVING THE FOREST PROPERTY PROBLEMS WITH DIGITAL PHOTOGRAMETRIC METHOD

M. Atasoy[a*], C. Biyik[a], O. Demir[a], F. Karsli[a a]

[a]KTU, Engineering and Architecture Faculty, 61080 Trabzon, Turkey
(amustafa, cbiyik, odemir, fkarsli)@ktu.edu.tr

Commission VII, WG VII/3

KEY WORDS: Forestry, Photogrammetry, Image, Digital, Method

ABSTRACT:

The Turkey's general cadastre works have not been completed as yet. Even some of the areas where cadastre has been finalised, forest properties are still under social pressure and as such these areas are in conflict with residential uses calling upon courts to resolve the problem. In order to determine precisely the right historical land cover status of the areas under dispute, it is possible to benchmark the new and old aerial images of the same area except in case where legal documents are present. Any changes occurred in forest cover types over half a century could only be detected and monitored with this approach. 1/25000 scale standard topographic maps, historically taken aerial images and forest management plans are used as evidence documents for lots under dispute and in the court. The classic evaluation methods such as visual inspection are seen inadequate and inaccurate in resolving forest property problems. Creating digital maps from aerial images using the digital photogrammetric method has proven possibilities with desired accuracy. Such approach is more reliable and faster than the classical methods. Using the digital photogrammetric method, more accurate data can be gathered and used to solve the problems in forest properties. Then courts will make right, fast and reliable decisions about the problems.
In this study, a district whose property cadastre works was completed in 1985 and with many lots in dispute is selected as a pilot area for a case study. Panchromatic aerial images covering the case study area were taken in 1955 and 1982 in the scales of 1/35000 and 1/23000 respectively, and scanned with 21 micron geometric precisions. Adequate number of control points for digital photogrammetric evaluation are established in the pilot region. These control points are surveyed with the nation-wide coordinate system using GPS technology. As a result of digital photogrammetric evaluation, the forest property's boundaries are determined with ±1-1.5m accuracy using these aerial images. With this approach, creating digital maps based on forest cadastre maps and forest management plans will be formed. The approach provides important contribution to the forest cadastre works that have been major bottleneck in Turkey. Furthermore the forest property problems will be solved easily and the objections will decrease in forest property boundaries.

1. 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).

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, after this regulation brought in to force a great deal forested land devastated. Shortly after these forested 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 (Diker, 1947; Bingöl, 1990; Ayaz, 1998).

After so-called 4785 "Nationalizes The Forest Area law" put in to force, all forestry land (foundation's land, private land, legal

* Corresponding author.

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.

1.2 Land And Ownership Relation

Once depleted, land is one of the most important natural resources that could not be renewed. Generally land is considered commonwealth, existence reason of countries and investment means this add extra value to their estate and makes it inevitable in terms of future assurance in Turkey. Land consists of mines, forest and other natural resources. The importance of forested areas for governments and their protection make ownership problematic. The evaluation and governance of disagreements between private and public authorities could not be saw equally, especially in cities that land ownership has great deals such as İstanbul, Antalya, Muğla etc. because in these cities forested areas are occupied and soled maliciously.

Figure 1. A view of the damaged forestlands

Cadastral work has been undesirable department where cadastral planning is not carried out yet. Available governing regulations suggest not only protection, renewal and enhancement forested areas but also sum these properties in favor of public estate. This consideration forces some malicious people to damage forested lands (Fig. 1). Previous works show that although the land is not suitable for agriculture when there is disagreement between public and private peoples case in question forested land is damaged and served inhabitable for forest ecosystem.

1.3 Objective

Generally, land ownership trials are ended in favor of public increase reaction of civilian people to cadastral works. As result, there is an inherent foolish confidence problem between public and private sector.

In this study ownership problem is investigated by taking in to account and compare ownership certificate with aerial photos and maps by using digital photogrammetry techniques. For this purpose the Işıklar district is selected as a study area (Fig. 2). The cadastral works of this county were completed by the time this study was carried out. Some example real trials that were ruled previously were examined by using so called photogrametric technique.

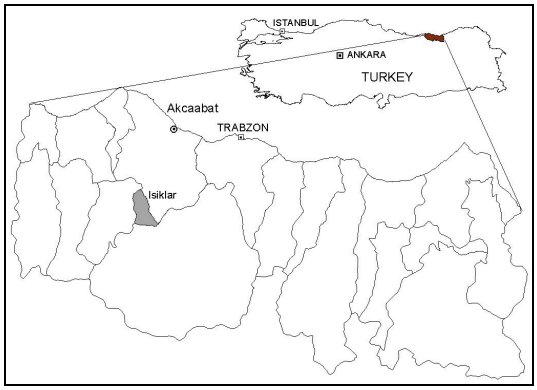

Figure 2. The location of the study area

1.4 Digitizing and Obtaining Regional Maps of Study Area

The cadastre maps were obtained from cadastral department. These maps were digitized in scale 1/1000. Five landmarks were used to translate the regional coordinates into WGS coordinate system and fixed by using the GPS technologies. According to the findings root mean square error was found (mo) 0.015 by using affin transformation method.

1.5 Forest-Property Defendant Parcels

2471 parcels and approximately 341 hectares could define study area. Cadastral works began in 1982 and ended in 1985. As a result National Local Forestry Department opened the 188-court case that claim these parcels' ownerships belong to public forestland. The 185 of court cases were ended and other 3-court case is still in progress. Among ended cases 65 parcels and approximately 18.1 hectares are decided to belong to public forestland. 108 parcels (approximately 23.8 hectares) are decided in favor of private property. 12 parcels were decided partly private and forest types parcels and showed in figure 3.

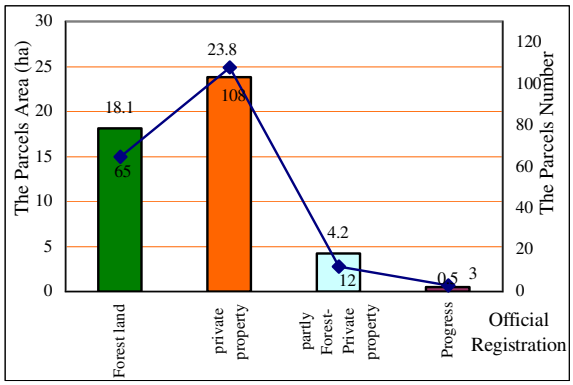

Figure 3. The number of the court cases

2. PHOTOGRAMMETRIC EVALUATION

2..1 Used Photogrammetric System

In this study, Z/I Imaging Digital Photogrammetric designed by Zeiss and Intergraph initiative was used. Photogrammetric processes were made by Stereo Softcopy Kits (SSK) include ISPM, ISMS, IS, ISDM, ISSD, ISFC, ISBR, I/RAS C. Microstation V.8 by Bentley Inc. was used as a CAD tool in this study (Z/I Imaging, 2001).

2.2 Obtaining Aerial Photographs

Time series aerial photos of study area were obtained from General Command of Mapping (HGK) and General Directorate of Forestry (OGM) in digital format. These photos were produced for different purposes during 1955-2002 periods table 1, figure 4, 5, 6, 7 and 8.

Taken Year	Scale	Feature	Aim	Resulation Micron	Public Institution
1955	1/35000	Black White	STH	21	HGK
1973	1/23000	Black White	Forestry	21	HGK
1982	1/25000	Black White	STH Renew	21	HGK
2002	1/16000	Color-Infrared	Forestry	21	OGM

Table 1. The aerial images features

2.3 Evaluation of the Aerial Images

Pre-processing phases of the aerial images were made according to following instructions, first, image pyramids were made by using Many-Files-Converter module that enhance and ease image processing then the image is represented in three part overview, intermediate and detail. Finally, image orientation is made and process is continued.

To get absolute orientation and superposed to National Coordinate System was used. Pre-defined reference points such as the old schools, buildings and mosques corners were used to get the best result for references. These reference points are evaluated and fixed comparatively.

Figure 4. The aerial images of 1955 year

Figure 5. The aerial images of 2002 year

Figure 6. GPS measurements for absolute orientation

3. DETERMINING THE FORESTRY BOUNDARY USING THE AERIAL IMAGES

Available forested lands and cadastral units were compared according to related processes. The format transformation between .dgn and .dxf were made and finally the gained data was evaluated by using ArcInfo and ArcView softwares.

3.1 The Analysis of the Forest Property

The change of the forest presence in study area is given in figure 9 and 10. It is seen in this figure that this area covered

approximately the 120 hectare forest in 1955. According to the digital photogrammetric survey using the aerial photograph taken in 1973 the forest area is determined to be 130 hectare. Thus, it is seen that the forest area is increased approximately 10hectare. It is thought that one of the most important reasons of this increase reason of the forest area is the migration from rural area to urban area especially in 1960's.

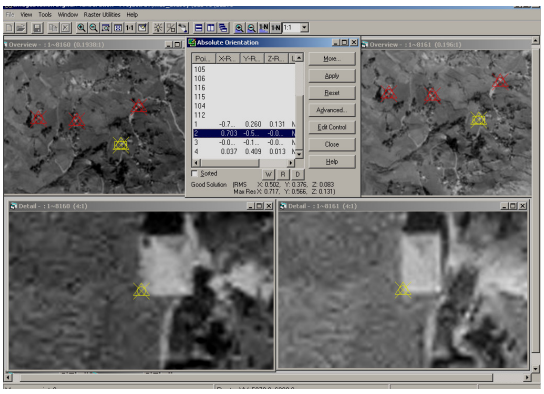

Figure 7. The old building corners for absolute orientation

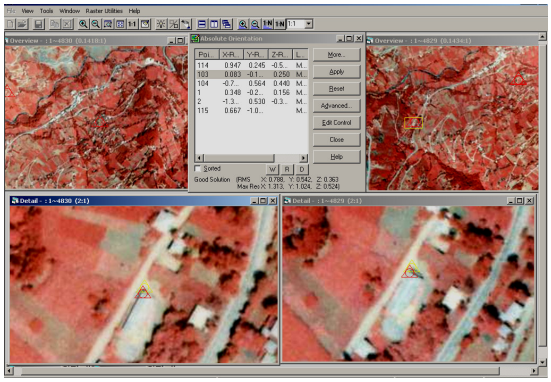

Figure 8. The old school corners for absolute orientation

The forest presence in the study area between 1970 and 1982 is decreasing. It is determined that this forest cover is almost 3 hectare. It can be state that one of the basic reasons of this is cadastre works in this region. Because, the state had brought a suit against the owners in the 188 parcels after the cadastre works had completed. Because of this situation some residents in this region had cut down the forest cover in their parcels. But, the significant increase of the forest cover between 1982 and 2002 years is seen. It can be two important reasons for this increase on the forest area. One of these reasons is migration. The other reason is the property and forest cadastre works completed in the region. If the cadastre works had completed in this region, the forest cover could not be seen as a threat for the property ownership right. Because of this, the residents do not destroy the forest cover naturally formed in their parcels.

The attribute change of the parcels about forest cover is given on figure 6 in the study area. According to this figure the state has brought a suit against the parcels owner, which cover the 25 hectare forest area, after the cadastre works did in 1982. In spite of the forest cover the parcels, totally 13.4 hectare, registered as a private property in Title deeds.

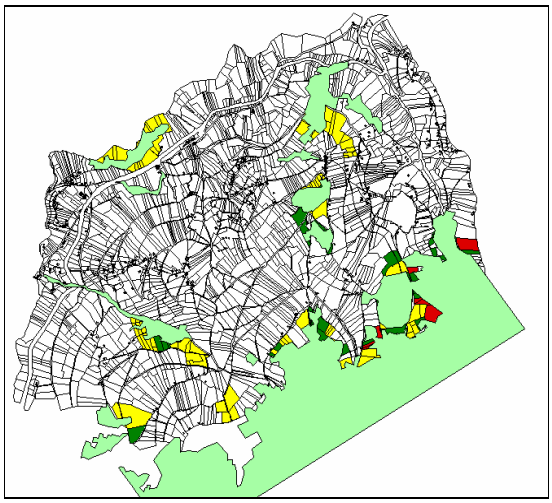

Figure 9. The forest boundaries in 1955

According to aerial photograph taken in 1973, it is found that the state had not brought a suit against the private owners parcels covered 17hectare forest cover. In respect to cadastre works in 1982 there is 14.1 hectare forest area that the state did not bring a suit against their ownerships.

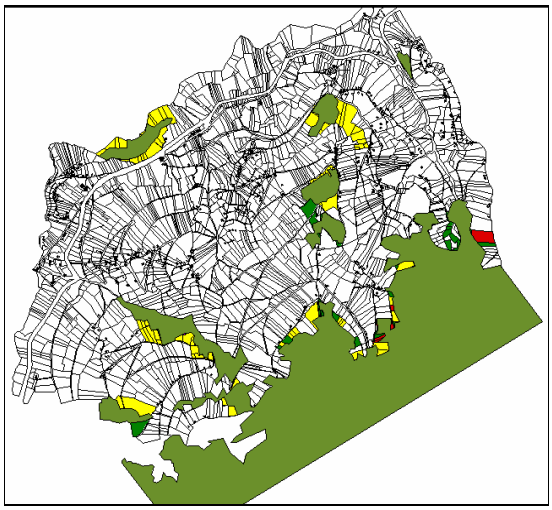

Figure 10. The forest boundaries in 1982

It is seen that the results of suits about forest property are not the same as the de facto of the parcels ownership for the change of the forest presence with time. Therefore, the some forest property demarcations have not been determined properly according to decision of the law court. So the residents live in this region have reacted against the law court decisions stated above about determining the forest property demarcations. This situation has affected the cadastral works to be negative in the region.

In spite of the all of the impossible conditions it is determined that there is important increase in the forest cover after cadastral works in the region.

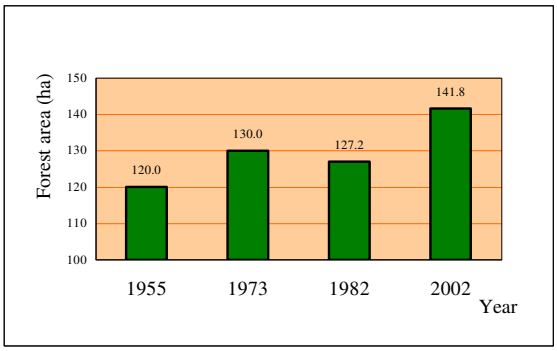

Figure 11. The forestland change according to years

That kind of the forest cover increase is bigger than in the past in the parcels has, which not have a suit with the state about forest property. The forest cover in the disputed parcels about property right has cut down by the residents. But, it is found that the forest cover on the private ownership parcels is increasing day by day in the region. It is seen on the figure 6 that there has been the 10 hectare forest cover increase between 1982 and 2002 years in the private ownership parcels. It is concluded from these situations that the forest cover has been negative affected on the disputed parcels about property right (Fig. 11 and 12).

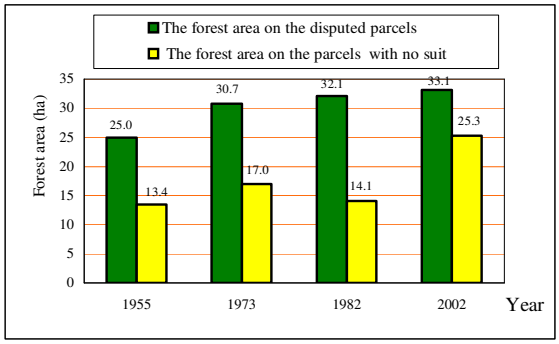

Figure 12. The forest presence change on the parcels after cadastre

It is determined that there was not forest cover presence on the number of 44 disputed parcels, totally 8.4 hectare, in 1955 on the study area. Therefore it is determined that it is not necessary to suit against these parcels about forest property right. In spite of this the 65 parcels, totally 18.1 hectare, had been registered with law court decision to be forest property But, it is found that the 35 parcels, totally 7.8 hectare, are completely in the forest area with analyzing of the gained data. The number of 12 parcels has registered partly private property by law court according to expert reports. According to the result of our determining the number of 109 parcels must be registered as partly private property.

It is interfered from this situation that the experts have not prepared clear reports about determining the forest boundaries truly.

4. CONCLUSION

The Turkey cadastre has been completed %98 in cities and 68% in towns. But these ratios are very low in the East Black Sea region. The main cause of this is property problems, which has not been solved yet. This problem is increasing day by day in the region. Determining the true forest property boundaries is possible with using the contemporary techniques. For this, it can be benefited from the aerial photographs taken in the past and now. It is understood that the objective decision can be taken by law court with comparing the current and past positions of the same disputed parcels about property right using these photographs. Thus the cadastre works can be completed earlier than planned one.

References

Ayaz, H., 1998. Orman Sınırları Dışına Çıkarma Uygulamasının Yasal Boyutu ve Sosyoekonomik Nedenleri Üzerine Bir Araştırma (Ordu ili örneği), KTÜ, FBE, Yüksek Lisan Tezi, Trabzon.

Bıyık, C., 1987. Doğu Karadeniz Bölgesinde Tapulama Çalışmalarının Organizasyonu, Doktora Tezi, KÜ, FBE, Trabzon.

Bingöl, İ., 1990. Geçmişten-Günümüze Ormanlarımız ve Ormancılığımız, *Ormancılık Eğitim ve Kültür Vakfı*, Yayın No:4, Cilt I, Matbaa Teknisyenleri Basımevi, İstanbul.

Diker, M., 1947. Türkiye'de Ormancılığın Dün-Bugün-Yarın, TC, *Tarım Bakanlığı OGM Yayınları*, sayı 61, Akın Matbaası, Ankara.

Tüdeş, T., Bıyık, C., 1995. Orman Kadastrosu ile Mülkiyet Kadastrosu Arasındaki Uyuşmazlıklar, *1. Ulusal Karadeniz Ormancılık Kongresi*, Bildiriler, 3. Cilt, Trabzon.

Z/I Imaging, 2001. User Manuels.