

# Analyses of the Results of Land Consolidation Studies by GIS

Fatih ISCAN, Turkey

**Key words:** Land consolidation, GIS, landholding, planning, spatial analyse

## SUMMARY

Rural development generally refers to the process of improving the quality of life and economic well-being of people living in relatively isolated and sparsely populated areas. Rural planning is the type of planning which solves physical, economic and social problems in rural areas. The first goal of the rural planning is economic development which will be revealed to the enhancement of agricultural production. Land consolidation is one of the most important steps in finding solutions to the problems of rural development. Land consolidation studies are being carried out in most country of the world for increase productivity and provide sustainable production. Putting into practice of land consolidation projects as soon as possible is depend on the collecting and processing the data required for planning stage in a short time and properly. In addition, evaluation of the results of land consolidation projects is very important. There is a great necessity to have numerical and alphanumeric information and to have accelerated working without error in order to carry out land consolidation works. Therefore, a Geographic Information System for land consolidation studies should be established such complicated framework. So that, all information can be accessed readily, related to each other analysed efficiently.

In this study, it is tried to find out whether it is possible the analyses of land consolidation results and planning studies, which is one of most important phase of land consolidation studies using Geographic Information System techniques. Study was carried out in Gumusgun Village of Isparta-Gonen district. Land consolidation data which are graphical and non-graphical were transferred to the ArcGIS software. Spatial analyses and queries on land consolidation were carried out using geographical information system. Spatial analyses and queries were chosen as follows: The number of parcels and shares, areas of parcels, parcels owned landholdings, landholdings maps, the number of parcels in the agricultural block, areas of agricultural blocks, the creation of thematic maps,..etc. According to the results, the use of geographical information system for Land Consolidation has led to convenience and speed in these studies. Also, the geographic information system is very helpful in making decisions on planning practitioners.

# Analyses of the Results of Land Consolidation Studies by GIS

Fatih ISCAN, Turkey

## 1. INTRODUCTION

Because of distinctive characteristics of agriculture and of record-keeping problem, data supply is highly hard. Because of that, agriculture must adapt to developing technology and innovations, which technology brings. One of these innovations is Geographic Information System (GIS). GIS, which can be used nearly in all branches, has also a wide application area in agriculture and it provides some considerable convenience. Especially by means of GIS, problems that occur in valuation of agricultural lands can easily be overcome. By using GIS technology, data can be kept in digital environment, their update gets easier and it is possible to develop a standard by creating models with available data (Karakayaci and Oguz, 2007).

Land consolidation is essential for ensuring the economic viability of rural areas, facilitating environmental management, or rationalising urban growth (Sonnenberg, 1996; Van den Brink, 1999; Van Lier, 2000; Crecente et al., 2002).

For rapidly improving of agriculture in Turkey, land consolidation is one of the foremost applications. In order to be able to carry out land regulation easily and properly and, to reach a higher level in it, it is needed to use GIS.

The planning studies of land consolidation compose the most important and fundamental part of land consolidation project. The accuracy of the planning depends on the accuracy of data that are obtained. Data, obtained accurately in a short span of time, will enable project designing and application steps to be worked more rapidly and accurately.

To carry out all these planning, project designing and application studies faster and accurately, land consolidation projects must be done in GIS.

In this study, it is tried to find out whether it is possible the analyses of land consolidation results and planning studies, which is one of most important phase of land consolidation studies using GIS techniques. Study was carried out in Gumusgun Village of Isparta-Gonen district. Land consolidation data which are graphical and non-graphical were transferred to the ArcGIS software. Spatial analyses and queries on land consolidation were carried out using GIS. Spatial analyses and queries were chosen as follows: The number of parcels and shares, areas of parcels, parcels owned landholdings, landholdings maps, the number of parcels in the agricultural block, areas of agricultural blocks, the creation of thematic maps,..etc. According to the results, the use of geographical information system for Land Consolidation has led to convenience and speed in these studies. Also, the GIS is very helpful in making decisions on planning practitioners.

## 2. APPLICATION

### 2.1 Introduction of Application Area

The Gumusgun Village, which is linked to Gonen County of Isparta, has been chosen as the application area. The village is 16.7 miles away from city centre and 7.4 miles from county center. The population of the village is 746. Young population left the village to study or work. The population that is over middle age still lives in the village.

The project area is 215.00 hectares. There are 397 landholdings in the application area. The number of cadastral parcels before land consolidation is 659 (Figure 1). The number of parcels that occur after land consolidation is 372. While average parcel size was 3253 m<sup>2</sup> before land consolidation, it became 5764 m<sup>2</sup> after land consolidation.



**Figure 1:** Isparta – Gonen - Gumusgun Village Cadastre Map

In this study, NETCAD program has been used to computerize footers of application area, which are obtained. Besides ArcGIS program, which can process graphical and non-graphical data, associate them to each other, do inquiry and analysis has been used.

### 2.2 Inquiry and Analyses

Basic footers of application area have been transferred to information system as layers. After transfer of data to information system, relations between graphical and non-graphical data have been set up, inquiry and analyses have been done.

## 2.2.1 Presentation of Jointly Owned Lands

The share states of landholdings' parcels can be questioned in the information system. Thus, information about share states of parcels can easily be provided. In the application area, the number of jointly owned cadastral parcels and their presentation is seen in Figure 2. According to inquiry, there are 50 cadastral parcels shared between two.

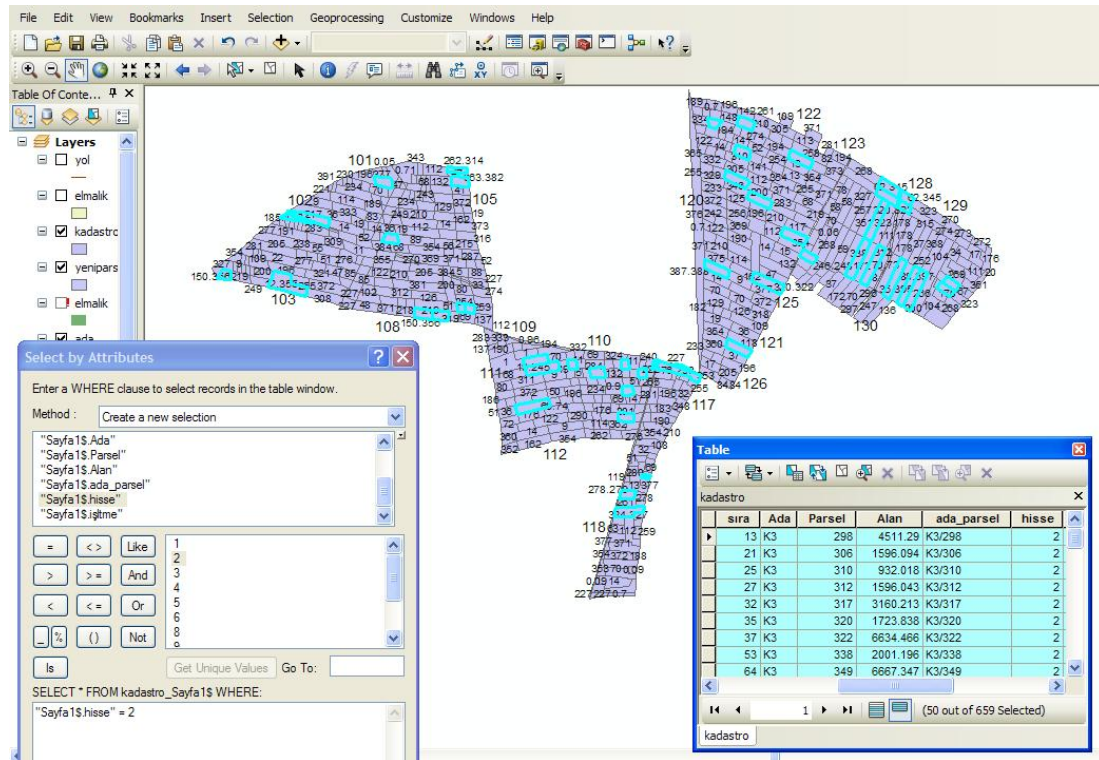
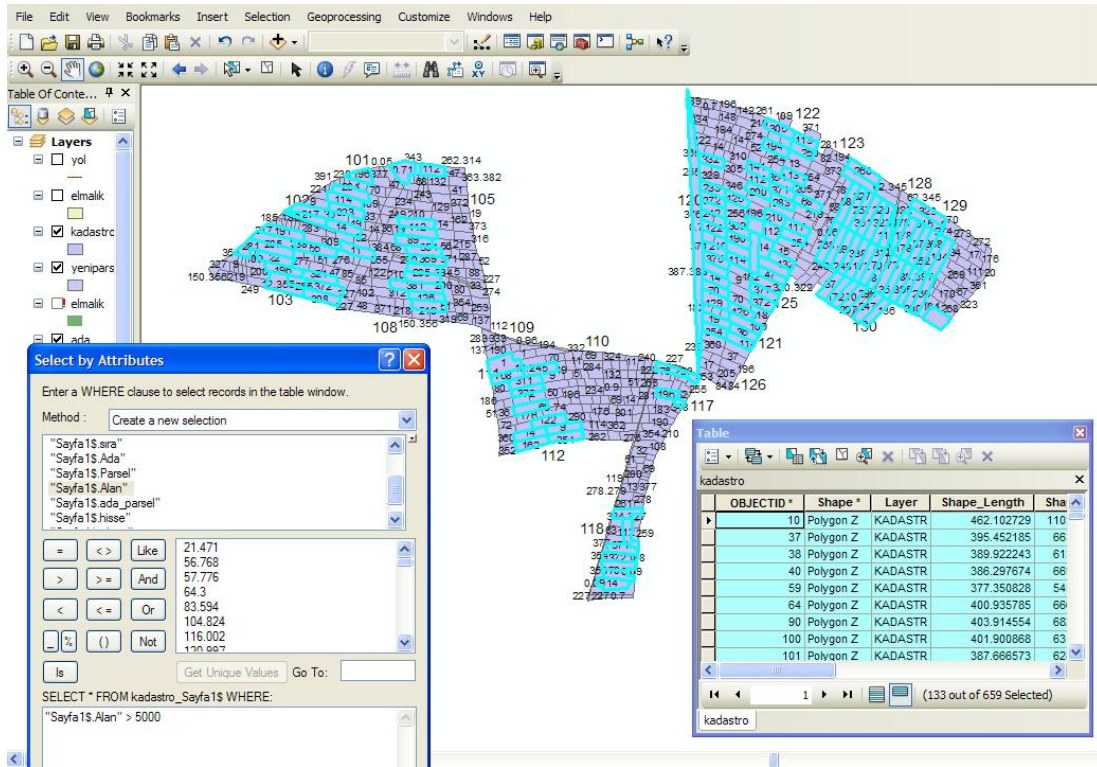


Figure 2: Jointly Owned Cadastral Parcels

## 2.2.2 Parcels Larger than 5000 m<sup>2</sup>

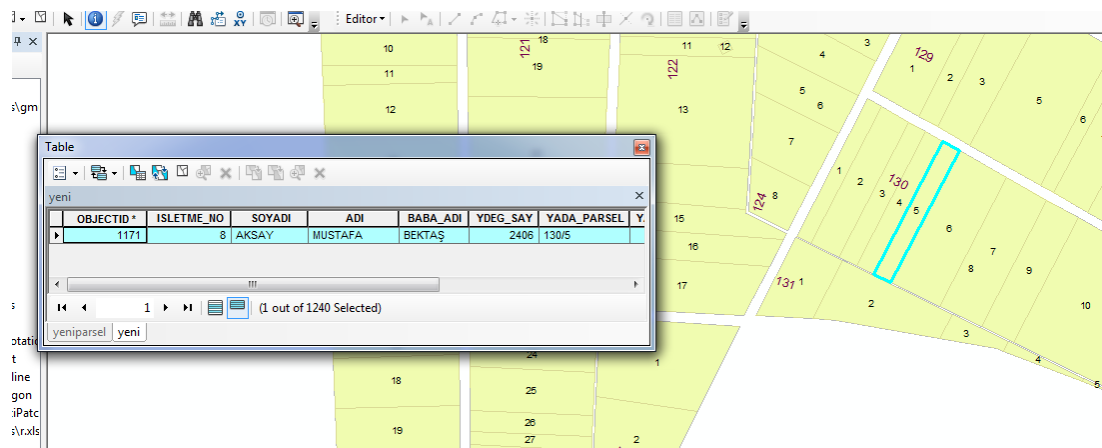
Area inquiries can be done in GIS environment, as well. For instance, information can be obtained about large or small parcels from a particular area. That convenience is highly important in terms of better assessment of the project. In the application area, there are 133 parcels that are larger than 5000 m<sup>2</sup> (Figure 3).



**Figure 3:** Parcels Larger than 5000 m<sup>2</sup>

### 2.2.3 Parcels belonging to Landholdings with the Family Name of Aksay

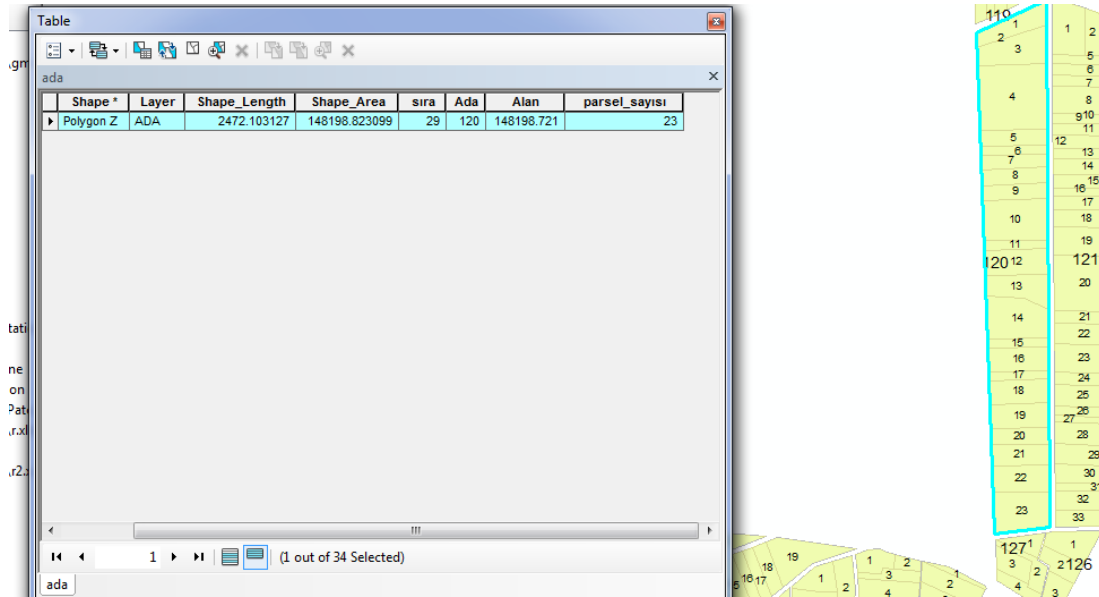
How many parcels landholdings have or to whom these parcels belong are highly important in land consolidation projects. Reaching the information in GIS environment is quite easy. For instance; while a landholding with the family name of Aksay had 4 parcels before land consolidation, it had 1 parcel after land consolidation (Figure 4).



**Figure 4:** Parcels belonging to the Landholding with the Family Name of Aksay after Land Consolidation

## 2.2.4 Parcel Number in Block

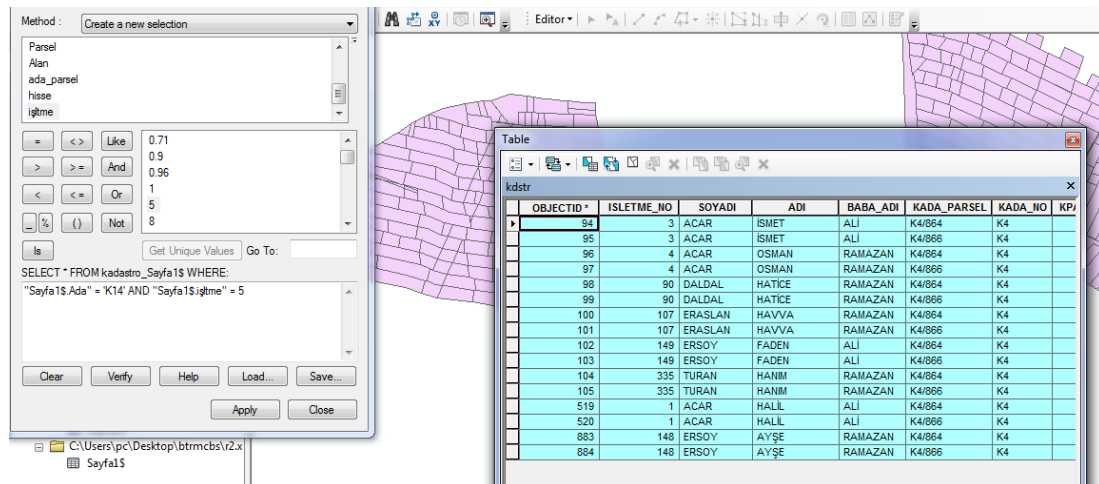
How many parcels there are in a block can be analyzed. In the block no.120 in the application area, there are 23 blocks (Figure 5).



**Figure 5:** Parcel Number of the Block no.120

## 2.2.5 Parcels of Landholdings in Blocks

As a result of the inquiry, it has been fixed that there are 15 parcels of landholding no.5 in the block no.114 (Figure 6).



**Figure 6:** Parcels of Landholding no.5 in the Block no.114

## 2.2.6 Creating of Landholding Maps

Creation of landholding maps in land consolidation is of vital importance in terms of determining states of landholding parcels' fragmentation and conveniences that will enable in interview process. By means of GIS, a figure can be obtained very fast and easily. Landholding map of application is given in Figure 7.



Figure 7: Landholding Map of Gumusgun Village

## 2.2.7 Creating Thematic Maps

Thematic map that shows the shareholding status of parcels is as in Figure 8.

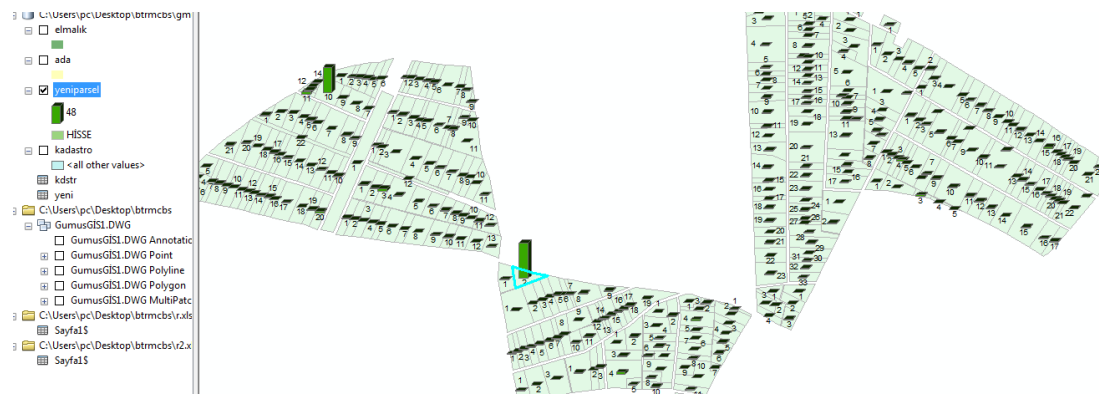


Figure 8: Thematic map showing the shareholding status of parcels

## 3. CONCLUSION

It is important in land consolidation process to obtain many raw data in a short time, to process and control them, to keep them ready to use as accessible every time and fast for various purposes, to show results as verbal, numerical and linear. It is possible with GIS to do all these applications fast and accurately.

The study has shown that conveniences, which GIS bring, can be used in every step of land consolidation projects. Besides that, facilities of GIS can be used to interpret success and results of land consolidation projects. That can make contributions in applying land consolidation projects in larger areas. Moreover, more introduction of usage of GIS to consolidation projects will enable created databases to be used in other projects.

## REFERENCES

Crecente R., Alvarez C, Fra U (2002). Economic, Social and Environmental Impact of Land Consolidation in Galicia. *Land Use Policy* 19: 135–147.

Karakayaci, Z., Oguz, C., 2007. Application Geographic Information Systems in Appraisal of Agricultural Lands. Congress of National Geographic Information systems, 30 October- 02 November 2007, Trabzon/Turkey.

Sonnenberg J (1996). The European Dimensions and Land Management—Policy Issues(Land Readjustment and Land Consolidation as Tools For Development). Land Management in the Process of Transition. FIG Commission 7. Budapest.

Van den Brink A (1999). Sustainable development and land consolidation. In: Dixon-Gough, R.W. (Ed.), *Land Reform and Sustainable Development*. Ashgate. Aldershot, pp. 61–68.

Van Lier HN (2000). Land use planning and land consolidation in the future in Europe. *Zeitschrift für Kulturtechnik und Landentwicklung* 41 (3), 138–144.

## BIOGRAPHICAL NOTES

Dr. Fatih Iscan is an Assoc. Prof. Dr. of Geomatic Engineering at the Selcuk University of Konya, Turkey. He has been with Selcuk University since 2000. He completed his PhD study at Selcuk University (2009), in “Application of Fuzzy Logic in Land Consolidation Activities” subject. He has an MSc from Selcuk University, Department of Geomatic Engineering (2003), and a BSc from Yildiz Technical University (2000), in Geomatic Engineering. His research interests; Land consolidation, public works, cadastre law and GIS.

## CONTACTS

Assoc. Prof. Dr. Fatih ISCAN  
University of Selcuk  
Faculty of Engineering  
Department of Geomatics  
42075 Konya  
TURKEY  
Tel. +90 332 223 19 12  
Fax +90 332 241 06 35  
Email: [fiscan@selcuk.edu.tr](mailto:fiscan@selcuk.edu.tr)