

Geographical Information Systems are also providing graphical illustrations with attribute data. Graphics can be used to compare different values or same values with different time or depth. In Figure 6, graphical information illustration of pH values are compared according to the different depth values. The graphic is an illustration of Figure 5a, 5b and 5c.

CONCLUSIONS

Soil as a natural system mediates the energy and material fluxes at the earths' surface. It is characterized by uncertainties, inexactness and ambiguity (Webster, 2000). Nevertheless, information about spatial distribution of soil attributes in a given area is an essential part of land surface requirements for environmental purposes, agriculture and other land uses (Chukwu 2007). Geographical Information Systems are providing an integration platform for sustainable agricultural management in land consolidation. Irrigation planning can be done with GIS based systems according to the needing and land properties. Also fertilization planning can be examined with this system considering soil survey results with desired crop. Efficient use of this system should be opened to the users to query or view the results for crop planning. This can be succeed with web based GIS systems. Web based GIS systems are providing web interfaces to access and view spatial data via internet. Queries and results can be seen with web interfaces. Thus, the results are being shared with third party user. Web based GIS systems are being a share platform between planners, users and other authorities to realize agricultural monitoring and sustainable land planning.

ACKNOWLEDGMENTS

The research is supported by Selcuk University Scientific Research Projects Coordination Unit, Project No. 14701227. In addition, we thanks to the Konya Turkish

Republic General Directorate of Agrarian Reform due to provision of the data used in this study and technical support.

Библиографический список References

1. Aslan, T., Gündoğdu, K., Arıcı, S., (2002). Application of Geographical Information Systems in Land Consolidation Planning Studies. International Symposium on GIS, September 23-26, 2002, Istanbul, Turkey.
2. Capron, H.L., Perron, D.J, (1993). Computers & Information Systems: Tools for an Information Age. The Benjamin/Cummings Publishing Company, Inc., Redwood City, CA, USA.
3. Carmelo, D., Giuseppe, P., Ignazio, P., (2013). Integrating soil survey, land use management and political ecology: A case study in a border area between Peru and Ecuador. Land Use Policy 35, 302-311.
4. Chukwu, G.O., Ezenwa, M.I.S., Osunde, A.O., Asiedu, R., (2007). Spatial distribution of N, P and K in major yam soils of southeastern Nigeria, African Journal of Biotechnology Vol. 6 (24), pp. 2803-2806, 17 December.
5. Fountas, S., Phd Thesis. (2004). Systems Analysis of Precision Agriculture. The Royal Veterinary and Agricultural University Department of Agricultural Sciences Section of AgroTechnology.
6. Koory, J.L., Medley, D.B., (1987). Management Information Systems: Planning and Decision-Making. South-Western publishing Co., USA.
7. Mittra, S.S., (1986). Decision Support Systems: Tools and Techniques. John Wiley & Sons, Inc. Cincinnati, Ohio, USA.
8. Wang, Q., Jin, X., Zhou, Y., (2010). A GIS-embedded system for land consolidation project location: Spatial optimization and fuzzy evaluation. The 18th International Conference on Geoinformatics: GIScience in Change, Geoinformatics, Peking University, Beijing, China, June, 18-20.
9. Webster W (2000). Is soil variation random?, Geoderma 97: 149-163.



УДК 332:711.163(560)

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ПЕРЕПЛАНИРОВКА СЕЛЬСКОХОЗЯЙСТВЕННЫХ УГОДИЙ ПОСРЕДСТВОМ ПРОЕКТОВ ПО УКРУПНЕНИЮ ЗЕМЕЛЬНЫХ УЧАСТКОВ (НА ПРИМЕРЕ РАЙОНА КИСЕЦИК)

REARRANGEMENT OF THE AGRICULTURAL LANDS VIA LAND CONSOLIDATION PROJECTS; A CASE STUDY KISECIK

Ключевые слова: земельные ресурсы, развитие сельской местности, сельскохозяйственные угодья, укрупнение земельных участков.

Keywords: land resource, rural development, agricultural land, land consolidation.

Перестройка отношений между почвой и человеком, который её обрабатывает, составляет основу сельскохозяйственных реформ. Учитывая тот факт, что значительная часть населения многих стран по-прежнему зарабатывает себе на жизнь в сельском хозяйстве, роль сельскохозяйственной деятельности в национальных экономиках нельзя недооценивать. Для увеличения сельскохозяйственного производства и доходов от сельского хозяйства необходимо восстановить и вернуть в сельскохозяйственный оборот некоторые заброшенные земли. Кроме того, необходимо получать самую высокую отдачу от существующих сельскохозяйственных угодий. Перепланировка сельскохозяйственных земель возможна только путем укрупнения земельных участков. Посредством укрупнения разрозненные, мелкие и бесформенные сельскохозяйственные угодья переустраиваются таким образом, когда возможно вести производство. По этой причине укрупнение земельных участков является обычной практикой во многих странах. Данное исследование рассматривает район Кисецик турецкой провинции Караман в качестве примера осуществления проекта по укрупнению земельных участков. Данная сельскохозяйственная структура в месте осуществления проекта исследуется с точки зрения типов почв, особенностей рельефа, приводится сравнение ситуации до и после осуществления проекта.

Rearrangement of relationship between the soil and the human being cultivating it constitutes the foundation of agricultural reform applications. Given the fact that a significant part of population in many countries make their living still from agriculture, the place of agricultural activities in the national economies cannot be disregarded. So that the agricultural production and agricultural revenues can be increased, some obsolete lands must be reformed and introduced to agriculture and also the highest productivity must be achieved from the existing agricultural lands. Rearrangement of the agricultural lands is only possible through the land consolidation. With land consolidation, the agricultural lands which are fragmented, shrank and have become deformed are consolidated and rearrangement in a manner allowing for economic production. For this reason, the land consolidation is a common implementation in many countries. This study dwells on the agricultural sector and land consolidation activities and investigates Kisecik land consolidation in Karaman province of Turkey, as an example implementation site for land consolidation. The existing agricultural structure in the project site has been examined according to the distribution of soil, terrain features, with comparison of their situations before and after the project.

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1. INTRODUCTION

The human being has an indispensable relationship with the soil to sustain its most vital and agricultural activities. In countries where the agricultural industry takes an important place, improvement of soil and water resources and ensuring their sustainability is of great importance (bnal et. al. 2010). In recent years, agriculture has become an important industry for societies, with the increase of population. Because of the population increase across the world, the hunger problem seen in some countries today and is likely to occur also in other countries in the future disturbs the societies. Such disturbance has made it possible on the one hand to implement new techniques for boosting production in current cultivable areas, and on the other hand to introduce today's unproductive lands into agriculture, and

so that the production volume of agricultural goods can be increased (Sayılı et. al. 2012). The expert views reveal that food will be at a strategic position in the 21st century, that soil is one of the indispensable drivers of production for meeting the nutrition requirements of increasing world population and stress that the capabilities and characteristics of lands must be determined and Land Usage Planning must be created (Anonymous, 2000).

Rapid increase of the global population in the XXI. century brought about problem in the usage and sharing of global resources. The global population, which was 900 million at the beginning of the century, rose to 3.0 billion in 1960, to 5.0 in 1987 and exceeded 7 billion at the end of 2012. The case in Turkey is no different from the global reality. While the population of Turkey was 13.5 million in year

1927, it climbed up to 28 million in 1960, by doubling just in 33 years, with an increasing rate higher than the global one, and today it rose to 75.6 million according to Turkish Statistics Institute data. Whereas the humanity has one world, 1.3 world is required for the satisfaction of demands. That the global resources stagnate, despite such rapid rates of increase in population causes fragmentation of agricultural or non-agricultural lands. Land is the greatest asset of a nation and the fundamental riches of rural settlement. Such fragmentation of agricultural lands, makes it difficult to use the existing resources (Akşit, 2013). As a result, the land consolidation, known as creating parcels in certain geometric forms has become the pioneer of a brand new idea which has been started to be implemented in different regions of the world. In this context, land consolidation translates into a comprehensive rearrangement in agricultural or forest enterprises (Vitikainen, 2005).

It is impossible that the agricultural lands will expand at the same rate with the rapidly increasing population. In order to achieve more product and revenue from the existing and limited lands, appropriate methods must be selected to ensure that the lands are disposed and used in a manner yielding the highest benefit in economic and technical terms. For this purpose, first of all, it is an indispensable necessity to take various measures so that the agricultural body is reformed and the reformed structure is protected. On the other hand, land consolidation is the primary thing to do for eliminating the defects in agricultural body (Sayılan 2013).

One of the biggest problems of agricultural industry in Turkey is the distorted operating structure. In Turkey, small, fragmented and distributed character of agricultural lands leads to the inability to adequately benefit from the irrigation and transportation network and also makes it difficult to act as irrigation enterprise, and challenges the realization of benefits expected from water and land resources. Since this situation causes especially loss of labor, capital and production and affects agricultural production negatively, the agricultural lands which are fragmented to the extent that no economic production is possible must be consolidated (Ayten 2007).

2. LAND CONSOLIDATION

The land consolidation is defined in two ways (Boyras, et. al. 2008). In a narrow sense, land consolidation is the "unification of fragmented properties, without foreseeing and infrastructure activity". In a broad sense, consolidation entails also "irrigation, drainage, transportation, soil-water protection measures and all infrastructure services needed in a rural settlement, beside

the unification of fragmented properties" (Zevik and Tekinel, 1987). This definition in broad sense is explained by Zay (2001) as the rearrangement of rural space in a manner conforming with the requirements of today's advancing technology and in line with the needs of society and individuals and taking all kinds of measures for the more efficient operation of agricultural enterprises. In short, land consolidation studies aim to take all kinds of technical, social, cultural and economical precautions which will raise the living standard of farmers.

The issues covered by land consolidation studies carried out for this purpose have been stated by Akdeniz (2008) as follows:

- Consolidation of very fragmented, distributed lands according to the modern operating principles.
- Building of road network, surface discharge system and irrigation facilities within the land.
- Making the necessary land leveling and soil reform.
- Rearrangement of villages, environmental planning, providing sewerage and electrification services, meeting the housing and land demands.
- Protection of rural land and arrangement of green areas.
- Taking necessary measures to protect the settlement places and soils in rural area from the effects of wind and floods.
- Without making expropriation within the consolidation plans, providing the lands required for social services such as sport fields, parks, swimming pools, festival-market place, play ground for children, school, health care center and mass housing building.
- Taking the necessary measures for the reformation and rearrangement of enterprises, and providing them the opportunities for working efficiently.
- Arrangement of roads inside the villages, reformation or rearrangement of farm buildings, provision of means such as fresh water, electricity and telephone.

By relying on all these explanations, one can suggest that the land consolidation studies are intended to re-regulate and reform the rural life. On the other hand, the aforementioned land consolidation projects which have been explained in broad sense play a crucial role on the solution of the most vital matters of today and future such as shrinking of arable lands, pollution of natural resources due to industrialization, as well as provision of reliable food, protection of natural and ecological balance.

Today, land consolidation projects are realized in many countries for the purpose of

boosting the production and productivity, and consequently, ensuring sustainable products. At the same time, the land consolidations are used as an effective and efficient means in sustainable rural development plans (Sayılan 2013).

3. EXAMINATION OF KISECIK LAND CONSOLIDATION PROJECT

In this study, the impacts of land consolidations on rural areas have been reviewed on the basis of land consolidation project executed in 2009 by the General Directorate of Agricultural Reform. Karaman Province, Kisecik town is 35 km away from the city center of Karaman and is between İslihar and Kaşoba villages (Figure 1). Karaman is located between the northern parallel 37.11 and eastern meridian 33.15 in the south of Central Anatolia Region. Its altitude is about 1033 meters. On the project site are usually colluvial soils at the flat skirts of mountains and valley entries. Such soils have medium body, medium depth and slight inclination. They are exposed to moderate level of erosion and there are pebbles in some parts.

Kisecik land consolidation project comprises a land of 34 334 decares. This land consists of 2265 parcels and the number of people owning such parcels is 1015. And, out of 2265 parcels, 31 are used as participation to death benefits and 41 belongs to the treasury of state (Table 1).

According to the cadastral situation before and after the project;

- while the average parcel area is 16 decares before the project, it rises to 36.1 decares after the project,
- while the average number of parcels per enterprise is 2.23 before the project, it declines to 1 after the project,
- while the length of mass transport system is 55 km before the project, it increases to 32.15 m/ha after the project (Table 2).
- while the length of road as per unit site is 15.35 m/ha before the project, it rises to 32.15 m/ha after the project (Table 2).

When we examine the agricultural lands used on the project site (Table 3), we see that while the number of parcels in rectangular form is 575 before the project to correspond to 25% of total number of parcels, it increases to 900 corresponding to 89% of the number of parcels after the project. Now that the most suitable lands for modern agriculture are those divided into rectangular parcels, it is estimated that the majority of lands in the project site are improved in terms of form. Likewise, given the fact that the average parcel size increased from 16 decares to 36 decares, it is understood that the agricultural lands have been rectified in terms of both form and area. According to such figures, the consolidation was realized at a rate of 55%, and the project achieved the targets expected from land consolidation.

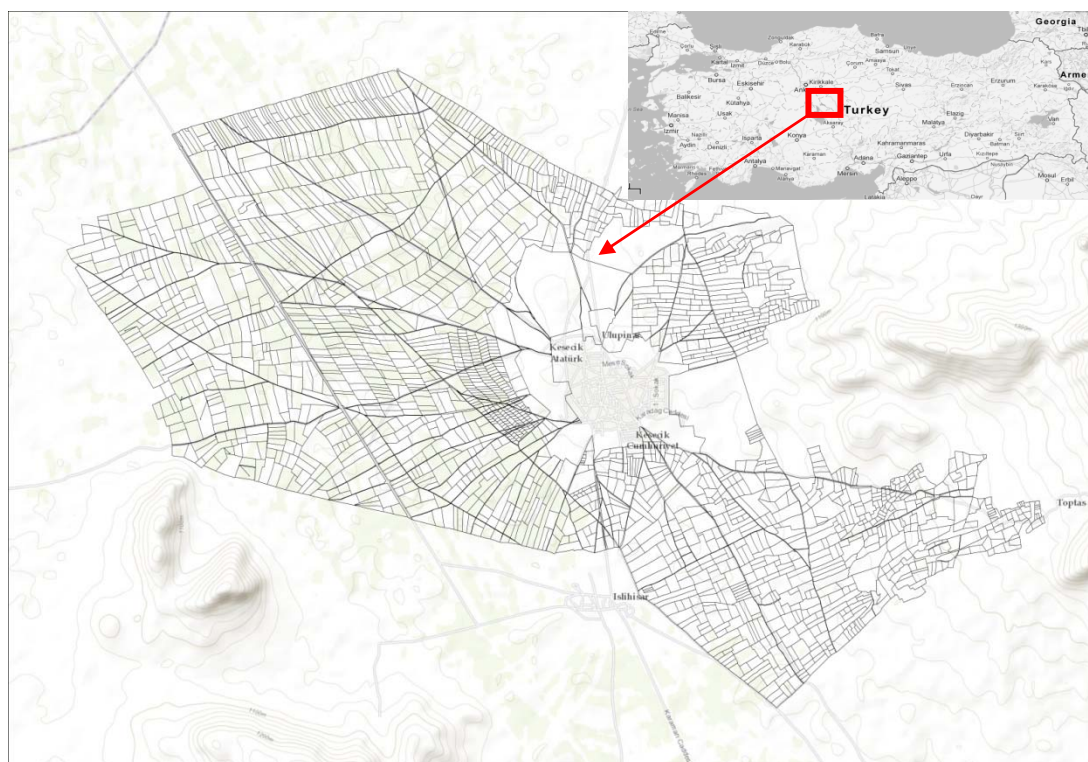


Figure 1. The geographical position of the project area

Project area Information before land consolidation

Project Area Information	Unit	Value
Project Area	decares	34.334
Parcels	Number	2265
Owners	Number	1015
Community property by inheritance	Number	31
State lands	Number	41

Table 1

most are the blocks where class 1, 2 and 3 lands. These blocks are fertile, flat lands with plenty of water.

Information of Project area before and after land consolidation

Information	Before	After
Parcel count	2265	1008
Average	1.61 ha	2.61 ha
Increasing ratio	2.25%	
Average parcel count for per owner	2.23	0.99
Decreasing ratio	224.70%	
Transportation road lengths	55887 m	117019 m
Average road length for unit area	15.35 m	32.15 m
Land consolidation ratio	55.50%	
Owner	1015	

Table 2

The blocks which are not demanded in parceling area are the lands between the block 290 and 320, because they are located at the skirt of mountain and are infertile. According to the new parceling plan, most of these blocks have been allocated as treasury land, leading to many expected objections. These blocks are of 9th degree and their soil structure are not convenient for agriculture. The cadastre parcels included in 288 blocks are protected areas and the state gave to the owners of parcels their former places and no parcel was added to this block from another place. The reason for deformations in new conditions of some parcels according to the parceling plan derives from the irrigation channel built before.

Parcel shapes before and after

Parcel shape	Before	After
Rectangle	575	900
Trapezoid	1325	0
Square	25	0
Triangle	340	108
Total	2265	1008

Table 3

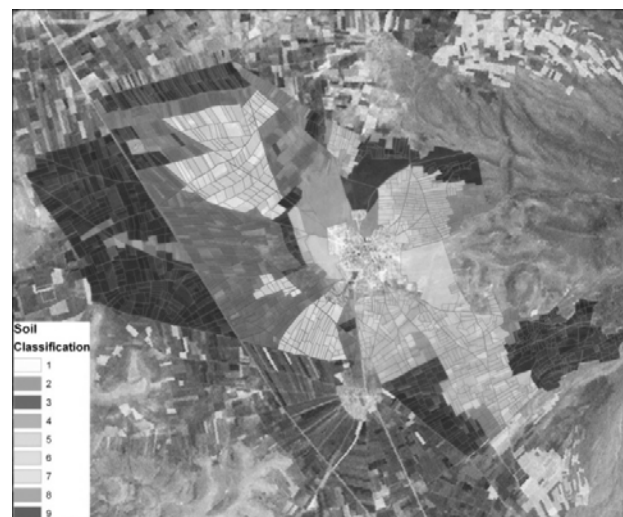


Figure 2. Soil classifications and block planning

In the consolidation site in Kisecik Town the blocks which are demanded by citizens the

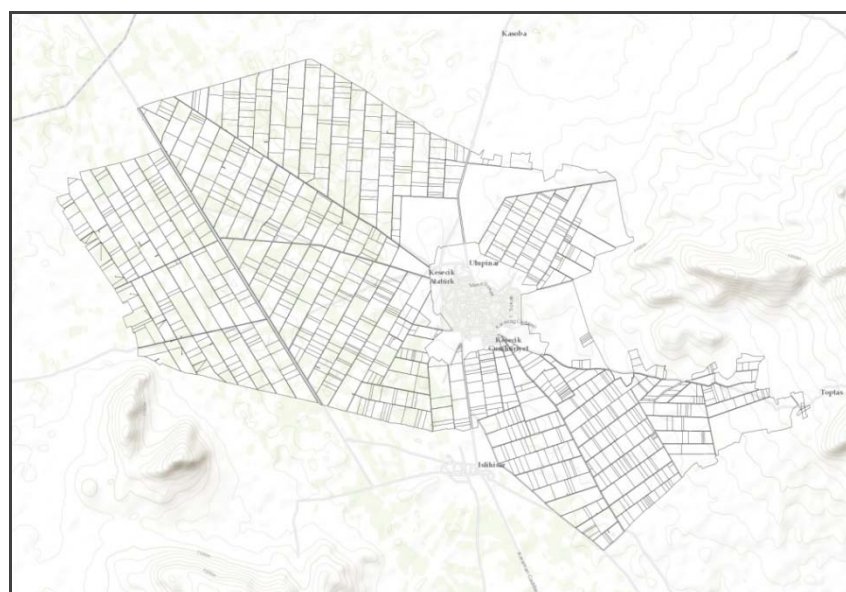


Figure 3. Parcels after land consolidation

It is observed that, during the implementation of the project, while the new parcel planning was being made, due importance was given to the preferences of farmers. Reviewing the data in Table 4, we see that 464 of totally 1015 farmers in the project site, in other words, 46% of them were placed in line with their preferences. According to the same data, 80% of the farmers were placed in line with their first 3 preferences. This reduced the number of objections to the new project, and also ensured that the farmers embrace the project. It can be suggested that achieving such figures have been in an issue vital for human life such as change of ownership has been one of the keys of executing the project successfully.

Table 4
Choice realization for new parcel planning

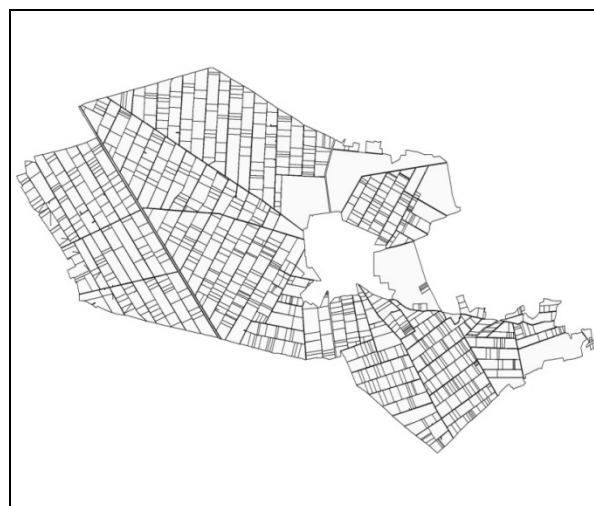
Preference Information	Unit	Value
First choice realization	Number	464
Second choice realization	Number	230
Third choice realization	Number	118
Fourth choice realization	Number	203
Total	Number	1015

4. CONCLUSIONS

Through land consolidation, it is aimed first of all to develop agriculture and increase the quantity and quality of agricultural products, to economize the labor in agriculture and finally raise the net revenues of agricultural enterprises (Arıci, 1994). Thus, different production drivers will be improved and the living standard of farmer families will be raised (Yaganoglu, et. al., 2000). On the other hand, the purpose of land consolidation is not only serving for agriculture, but also serving for the environment, protection of nature and regional development. These three basic duties are divided into sub duties, depending on the needs of countries. Among the environmental protection, we address to the protection of pastoral view and character, and hence, protection of plants and animals (Lapple, 1989). The land consolidation studies applied in Turkey are planned in a multifaceted manner and many of the infrastructure projects are executed along with such projects. Consequently, the project allows not only to consolidate the deformed parcels whose way of distribution are not convenient for economic operating, but also to provide the infrastructure services easier and for a cheaper cost. These infrastructure projects must be implemented in consolidation projects on a project site which is suitable for agricultural production and they must be executed according to the current condition of climate, environment and water resource and in line with the demands of enterprise owners (Eser 2006).



a. Before



b. After

Figure 5. Parcel situations both before and after land consolidation project

Reduction of parcel number after the project, expansion of average parcel area, diminishing of distance between the enterprise center and the parcels, rectification of parcel forms, raising wheat, barley, sugar beet commonly on the project area, using labor and machine during the production activities, easier irrigation, saving from time, and harmony between the enterprises will make positive contributions to the production inputs after the project.

ACKNOWLEDGMENTS

The research is supported by Selcuk University Scientific Research Projects Coordination Unit, Project No. 14701266. In addition, we thanks to the Konya Turkish Republic General Directorate of Agrarian Reform due to provision of the data used in this study and technical support.

References

Библиографический список

1. Akdeniz, H., (2008), Toprak Koruma, Arazi Kullanımı ve Toplulaştırma, II. Kadastro Kongresi, 21-24 Mayıs, Ankara. (In Turkish)
2. Aksit, S., (2013). Farmer's Perception on Land Consolidation: Yeşildere Case (Denizli). International Journal of Social Science, Volume 6 Issue 3, p. 1-19.
3. Anonim, 2000. DPT, VIII. Beş Yıllık Kalkınma Planı (2001-2005). Arazi Kullanımı, Arazi ve Arsa Politikaları ve Arazi Toplulaştırması Alt Komisyonu Raporu, 17 Ocak, Ankara. (In Turkish)
4. Arıcı, İ., (1994). Arazi Toplulaştırması. U.Ü. Ziraat Fakültesi Ders Notları, No:60, Bursa, 121s. (In Turkish)
5. Ayten, T., (2007). Arazi Toplulaştırma Çalışmalarında Optimizasyon, Yüksek Lisans Tezi, Selçuk Üniversitesi Fen Bilimleri Enstitüsü Jeodezi ve Fotogrametri Anabilim Dalı, 74 syf, Konya. (In Turkish)
6. Boyraz, Z., Üstündağ, Ö., (2008), Kırsal Alanlarda Arazi Toplulaştırma Çalışmalarının Önemi, e-Journal of New World Sciences Academy, ISSN:1306-3111, Volume: 3, Number: 3, Article Number: C0076.
7. Çay, T., (2001), Arazi Düzenlemesi ve Mevzuatı, Petek Ofset, Konya. (In Turkish)
8. Çevik, B. ve Tekinel, O., (1987). Arazi Toplulaştırması. Çukurova Üniversitesi Ders Notları, Adana. (In Turkish)
9. Eser, Ö., (2006). Gaziantep Nurdağı Gedikli Köyü Arazi Toplulaştırması Etkinliği. Yüksek Lisans Tezi, Kahramanmaraş Sütçü İmam Üniversitesi Fen Bilimleri Enstitüsü Tarımsal Yapılar ve Sulama Anabilim Dalı, 34 syf, Kahramanmaraş. (In Turkish)
10. Lapple, E.C., (1989). Europäische Fachtagung Flurbereinnigung, Z.F. Kulturtechnik und Landentwicklung 30, Verlag Paul Parej, Berlin, 30s.
11. Sayılı, M., Ekinci, K., (2012). Samsun İli Bafra Ovası Arazi Toplulaştırması Projesinde Çiftçi Davranışlarının Belirlenmesi ve Projenin Sosyo-Ekonomik Yararları, Tarımsal Ekonomi ve Politika Geliştirme Enstitüsü – TEPGE, TEPGE Yayın No: 202, ISBN: 978-975-407-345-4, Ankara. (In Turkish)
12. Sayılan, H., (2013), Place and Importance of Land Consolidation in The Sustainable Use of Turkey's Rural Land Resources. 3rd International Geography Symposium - GEOMED 2013, Symposium Proceedings, ISBN: 978-605-62253-8-3, s:531-540, Antalya, Turkey.
13. Ünal Çalışkan, A.B., Ünal, H.B., (2005). Menemen Ovası Sulama Şebekesinin Arazi Toplulaştırması Öncesi ve Sonrası Durumunun Değerlendirilmesi. Ege Üniv. Ziraat Fak. Derg., 42(2):109-120, ISSN 1018-8851. (In Turkish)
14. Vitikainen, A. (2004), An Overview of Land Consolidation in Europe, Nordic Journal of Surveying and Real Estate Research 1, 25-44.
15. Yaganoğlu, A.V., Okuroğlu M., Hanay, A., (2000). Arazi Toplulaştırması, Atatürk Üniversitesi Ziraat Fakültesi Ders Yayınları No:159, Erzurum, 169s. (In Turkish).

