

Technical and ecological approach to the Beypınarı land consolidation project

Yasemin Kuşlu

Atatürk University, Faculty of Agriculture, Department of Agricultural Structures and Irrigation 25240, Erzurum-Türkiye

Abstract

This research examines the technical and ecological adequacy of the Beypınarı land consolidation project in Erzurum – Aziziye. To this end, the technical success of the Beypınarı consolidation was determined. Simultaneously, a study was conducted to assess the extent to which the Beypınarı consolidation project met ecological requirements. According to the results, the consolidation rate in the Beypınarı settlement was 47.78%, and the increase in the average parcel area was 93.96%. In this project, the rate of direct access to road, irrigation, and drainage facilities for the parcels was 98%. No renovation was carried out in the village settlement. However, as is generally the case in rural area studies, no inventory study was conducted to improve the social and cultural structure. The Karasu Stream, which flows along the south-facing slope of the rural settlement, is also a wetland with a very high groundwater level. A detailed evaluation study on this aspect was not included in the project. In our country, land consolidation efforts, which fall within the scope of rural planning, require a multifaceted approach that considers social, economic, cultural, and physical factors.

Keywords: Rural planning, Land consolidation, Ecological approach, Erzurum, Beypınarı

Introduction

In parallel with the desired economic development in rural areas, it is essential to plan for the desired social and physical developments in these areas. Physical planning is the comprehensive reorganization of settlements, taking into account social, economic, and cultural opportunities and their future development. Measures affecting efficiency and production in agriculture can be listed as: development of water and soil resources, drainage and irrigation services, provision of drinking and utility water, physical planning of rural areas, and planning of farmyards.

One of the most significant problems in agricultural economics is the fragmentation of agricultural land. Land fragmentation refers to the division of agricultural land due to the encroachment of other businesses or parcels used for non-agricultural purposes. This results in both irregular shapes that make farming difficult and the necessity of using neighboring parcels to access intertwined farm parcels. Fragmented and irregularly geometric agricultural lands are generally divided into thin slices downhill. Implementing soil conservation measures is very difficult in such parcels. Another negative impact of land fragmentation on land use is that it makes it difficult to protect meadows and pastures (Kuşlu, 2004:23).

It is necessary to accurately determine the people living in agricultural areas and the land use status of the agricultural area. In general, in the world, agricultural areas are not considered only as the living space of people working in agriculture (Boztoprak et al., 2015:2).

Those living in rural areas can be categorized as follows: those who engage solely in agricultural production; those who engage in agriculture for supplementary income, such as ornamental plant production, animal husbandry, and fruit and vegetable production; those who come to agricultural areas for recreation during holidays; and those who live in these areas for short or long periods because the natural structure of the rural area is preserved and environmental pollution is less severe (Peker and Dağdelen, 2016:26).

Land consolidation in rural areas is a multifaceted approach that supports agricultural production planning, improves the living standards and working conditions of those engaged in agriculture, reduces production inputs in agricultural activities, and ultimately contributes to rural development. Perceived as the reorganization of fragmented land holdings owned by various enterprises, the scope of this work has expanded over time, and due to its role in the multifaceted development of rural areas, it has acquired a dynamic and modern structure in many countries (Kuşlu, 2004:30).

Land consolidation is the process of bringing together and reorganizing scattered plots of land in rural areas, located in different directions from the village center and irregularly shaped according to agricultural management principles, in accordance with environmental requirements and connected to road, drainage, and irrigation networks (İlhan and Erpul, 2015:2). One of the goals of land consolidation is to provide access to all parcels through a transportation network. To ensure access without encroaching on the boundaries of other parcels, a portion of each parcel must border a road. In a parcel and road plan, access to all parcels is sought with a minimum road length (Demirel and Işık, 2000:1; Kuşlu and Ertem, 2019:275).

In a narrow sense, land consolidation is the process of bringing together fragmented and scattered plots or shares of agricultural land owned by the same farm or farming family into geometrically regular shapes. This type of consolidation is less time-consuming and cheaper. However, it is not sufficiently effective for rural development on its own because land consolidation in this narrow sense does not involve any structural work (Boztoprak et al., 2015:5).



More broadly, land consolidation is a reorganization of an agricultural space that includes all technological, social, and economic measures to be taken for purposes such as bringing together irregularly geometric and scattered parcels of land belonging to an agricultural enterprise, as well as regulating the living and working conditions of the owners and employees, protecting nature and soil, achieving sustainable agricultural development, and increasing agricultural production efficiency (Kuşlu, 2004: 31).

Comprehensive land consolidation efforts should include the following investments and services (Peker and Dağdelen, 2016:27; İlhan and Erpul, 2015:3; Kuslu, 2009:613; Kuslu, 2021: 743):

- Arrangement of field shapes;
- Bringing together irregularly shaped, multi-part plots of land,
- Creating plot shapes that are suitable in terms of quality and size for agricultural businesses, taking into account the evolving technological level of the day.
- Ensuring that at least one edge of the plots is connected to the irrigation, drainage, and road network.
- Improving the production and working conditions of farmers;
- Improving the chemical and physical properties of soils,
- Construction of irrigation and drainage facilities,
- Land leveling,
- Improving fertilizer application conditions that prioritize environmental soil and water characteristics,
- Mechanization and improving the proper operating conditions of machines.
- Improving the quality of life for farming families and other people living in rural areas;
- Correcting unsuitable environmental conditions (wastewater treatment, eliminating the threat posed by factory waste, etc.),
- Improving the health and safety of rural housing, designing buildings in a way that reflects village culture and promotes ecotourism,
- Construction of health and education facilities, assembly facilities, social, religious, and cultural facilities,
- Establishing an adequate transportation network within the village settlement area, between villages, within the fields, and across the entire land.

In Erzurum, the first compulsory land consolidation decision was made in 2004 in 13 village settlements. This research focuses on the Erzurum-Beypinarı land consolidation project, one of the areas where compulsory consolidation was implemented. The study examines the dimensions of rural planning studies that can enhance the social and cultural impacts of land consolidation efforts in the settlement.

Material and Methods

The research material consists of the rural settlement of Beypinarı in Erzurum. The situation before and after the land consolidation application is shown in Figures 1 and 2, respectively.

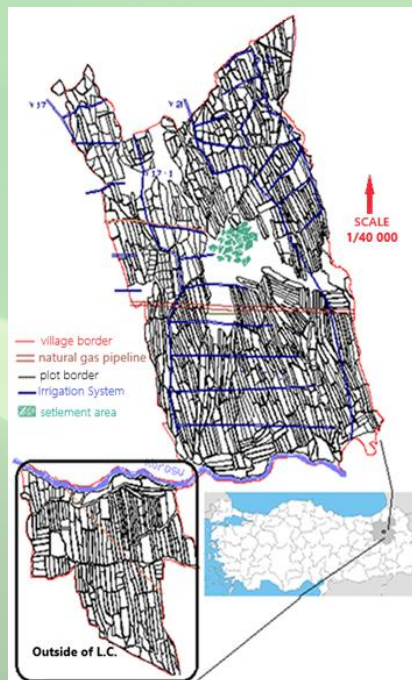


Figure 1. Parceling situation before Beypinarı land consolidation project





Figure 2. Parceling situation after Beypınarı land consolidation project

Beypınarı is located approximately 16 km from the city center of Erzurum, between approximately 41° east longitude and 40° north latitude. According to TÜİK (Turkish Statistical Institute) data, the settlement has a population of 419 and an altitude of 1770 meters. Examination of soil characteristics reveals that the area consists of Class I, II, and III agricultural lands composed of alluvial and fine-textured soils with a depth of approximately 90 cm (Kuşlu, 2004:48). The average land slope varies between 0-2%, and the region has a flat or nearly flat topographical structure.

The research area, located in the Northeast Anatolian climate zone, has cool and dry summers and rainy and cold winters. There is a significant temperature difference between day and night. According to long-term meteorological data (1929-2024), the average annual temperature is 5.8 °C. January is the coldest month with an average temperature of -9.0 °C, while August is the warmest with 19.5 °C. The average annual rainfall is 430.9 mm, with May being the wettest month with 73.1 mm and August the driest with 17.6 mm. 51.5% (222.05 mm) of the annual rainfall occurs during the plant production period, from May 1st to October 20th. Relative humidity is lowest at 47% in August and highest at 75% in January, with an average annual relative humidity of 63% (MGM, 2025).

In this study, the sampling formula recommended for finite population and limited variance situations was used to determine the minimum number of surveys (Çiçek and Erkan, 1996:36).

$$n = \frac{N * \sigma^2}{(N - 1) * D^2 + \sigma^2}$$

In the equation; n is the number of units in the sample, N is the number of units in the population, σ^2 is the population variance, and D is the possible error value.

The minimum number of farm holder to be surveyed (n) was determined to be 9. However, considering the possibility of missing or lost data in the surveys, as well as the reliability of the research and the attainment of accurate information, the sample size was increased by 10% to 10 (Bender et al., 1982).

A face-to-face survey was conducted with 10 farm holders living in the rural settlement of Beypınarı.

NetCAD 8.5.0 GIS software, a CAD-based software, was used for digitizing the maps.

Information on old and new parcels and maps related to the Beypınarı land consolidation project was obtained from the DSI VIII Regional Directorate.

Results and Discussion

Some of the main objectives of land consolidation projects are: to bring smaller parcels of land up to the determined standard, to transform irregularly shaped parcels into suitable, regular geometric forms for agricultural activities, and to provide parcels with access to roads, irrigation networks, and drainage networks (Akdeniz and Temizel, 2018:151; Akkaya Aslan, 2018:365; Çakmak and Eminoğlu, 2013:40; Değirmenci et al., 2017:183).

Among the farm holders that were surveyed, three farms were engaged in agricultural production on 1-10 plots; three on 11-15 plots; two on 16-20 plots; and the remaining two on more than 20 plots before the land consolidation project. After consolidation, all farms were able to farm on 1-10 plots. Five farms now own only one plot. The consolidation rate was lowest in farm number 6 (68.8%) and highest in farm number 5 (95.8%). As can be seen from the table, the average consolidation rate was quite high at 87.8%.

In the Beypınarı land consolidation project, the reduction in the number of parcels, which was one of the objectives, has been achieved. The parcel shapes, which were quite deteriorated before consolidation, have



improved (Figures 1 and 2). The rate at which parcels have gained access to irrigation, drainage, and road networks through consolidation efforts has reached 98% (Figure 2).

The section of Beypınarı south of the Karasu stream, which was excluded from land consolidation, has a very high groundwater level. Although this area was a wetland before the 1950s, later drained and reclaimed for agriculture, it remains a habitat for numerous bird populations.

However, as is generally the case with rural development projects, this project did not include an inventory study aimed at improving the social and cultural structure. The potential for utilizing the Karasu stream, which flows along the south-facing side of the village, was not examined in detail.

The scope of land consolidation efforts did not include aspects such as developing the settlement area, identifying elements of local tourism in the surrounding area, and highlighting the beauty of the rural landscape. This situation is not unique to the Beypınarı project. A lack of a social and cultural approach is evident in all land consolidation projects implemented in Türkiye.

Conclusion

Settlements established in rural areas are shaped by traditional building systems and mostly local materials, influenced by climate and topography. Therefore, rural settlements need to be approached differently from urban settlements in terms of construction and planning. Furthermore, developing solutions that match the potential of rural areas is essential for addressing these problems. Rural areas mustn't compete with cities, but rather focus on protecting natural resources, supporting agricultural production, improving living conditions, and implementing high-level planning. When preparing infrastructure projects in villages, the local settlement pattern must be considered in depth. Additionally, assumptions regarding development criteria and methods for preserving the local structure should be established.

In the context of the Beypınarı land consolidation, identifying the potential of the Karasu stream for rural landscape and recreation planning could enhance the project's success. Furthermore, conducting birdwatching studies in the area south of the village, known in the literature as the Erzurum Wetlands, is important for its ecological tourism potential.

References

- Akdeniz, M. & Temizel, K. (2018). Arazi toplulaştırma projelerinde başarının değişik göstergelere göre değerlendirilmesi. *Anadolu Tarım Bilimleri Derg.*, 33 (2): 149-161.
- Akkaya Aslan, Ş.T. (2018). Arazi toplulaştırma öncesi ve sonrası arazi parçalılık değişiminin analizi: Denizli Tavas İlçesi Pınarlar Köyü örneği. *Türk Tarım ve Doğa Bilimleri Derg.*, 5(3): 364-371.
- Bender, F. E., Douglass, L.W. & Kramer, A., 1982. *Statistical Methods for Food and Agriculture*. ISBN 0-87055-476-X, The Saybrook Press, Inc, USA.
- Boztoprak, T., Demir, O., Çoruhlu, Y.E. & Nişancı, R. (2015). Arazi toplulaştırmasının tarımsal işletmelere etkilerinin araştırılması, S.Ü. Müh. Bilim ve Teknik Dergisi, 3 (3): 1-11.
- Çakmak, B. & Emiñoğlu, G. (2013). Burdur-Kemer-Elmacık Köyü arazi toplulaştırma etkinliğinin değerlendirilmesi. *Gaziosmanpaşa Bilimsel Araştırma Derg.*, 5: 39-53.
- Çiçek, A. & Erkan, O. (1996). Tarım Ekonomisinde Araştırma ve Örneklemeye Yöntemleri. Gaziosmanpaşa Üniversitesi Ziraat Fakültesi Yay. No: 12, Ders Notları Serisi No: 6, Tokat.
- Değirmenci, H., Arslan, F., Tonçer, R. & Yoğun, E. (2017). Arazi toplulaştırma öncesi parsel şekilleri ve arazi parçalanmasının değerlendirilmesi: Niğde Misli Ovası Tırhan Köyü örneği. *Gaziosmanpaşa Üniversitesi Ziraat Fak. Derg.*, 34 (3): 182-189.
- Demirel, Z., & Işık A. (2000). Ülkemiz koşulları için köy yenileme-canlandırma ve Bergama Kadıköy Örneği. Kırsal Alan Düzenlemesi, *Arazi Toplulaştırma Sempozyumu*, 13-14 Aralık, TMMOB, Ankara.
- İlhan, H., & Erpul, G. (2015). Arazi toplulaştırma çalışmasında başarı analizi (fiziksel, sosyal ve ekonomik değerlendirmeler): Erzurum İli, Daphan Ovası Projesi. TMMOB Harita ve Kadastro Mühendisleri Odası, *Türkiye Harita Bilimsel Teknik Kurultayı*, 25-28 Mart, 2015, Ankara.
- Kuşlu, Y. (2004). Kuzgun Barajı Sulama Alanında Arazi Toplulaştırma Potansiyelinin Belirlenmesi, PhD Thesis, Atatürk Univ. Science Inst. Erzurum, Turkey.
- Kuşlu, Y. (2009). Effects of an irrigation project in prevention of migration from rural areas. *Water Resource Management*, 22, 611-619. DOI 10.1007/s11269-007-9181-0.
- Kuşlu Y. (2021). Evaluation of the Beypınarı land consolidation project of Erzurum province in terms of quantitative features. *YYU J AGR SCI* 31 (3): 742-751.
- Kuşlu Y. & Ertem, E. (2019). Erzurum ili Beypınarı Mahallesi arazi toplulaştırma projesinin yol ağı yeterliliği açısından değerlendirilmesi. *Atatürk Üniv. Ziraat Fak. Derg.*, 50 (3): 274 - 281.
- MGM, (2025). Meteoroloji Genel Müdürlüğü, İllerimize Ait Genel İstatistik Verileri <https://www.mgm.gov.tr/veridegerlendirme/il-ve-ilceler-istatistik.aspx?k=A&m=ERZURUM> (Erişim Tarihi, 29.11.2025)
- Peker, M. & Dağdelen, N. (2016). Aydın bölgesi toplulaştırma sahalarında toplulaştırma öncesi ve sonrası kültürteknik hizmetlerinin irdelenmesi, *ADÜ Ziraat Fak. Derg.*, 13 (1): 25-33.

