

Relocation and part-to-whole approach in land consolidation: The example of Yeğenli neighbourhood of İzmir province Tire district

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Abstract

Land consolidation projects are one of the most important factors of rural development in our country. In order to support rural development, the application area of land consolidation projects has expanded and as a result, various applications have been implemented in each region.

In this study, the land consolidation project implemented in the rural areas of Yeğenli neighbourhood of Tire district of İzmir was examined in terms of mathematical model and land reallocation method, the total amount of relocation of cadastral parcels after land reallocation was determined as 288.81 metres with the relocation approach, it was determined that there was a 15.90 % decrease in the number of immovable properties with the part-to-whole approach and 36.15 % of the consolidation parcels were obtained with this approach. With the interview conducted in the field, inferences were made on the effect of these approaches on satisfaction.

1. Introduction

The rapid increase in the world's population in recent years and the increase in the rate of consumption of natural resources by the human population cause deterioration in the balance of nature, and this situation brings disasters from time to time. The concept of land management, which has recently entered our lives, is defined as "decision-making processes for basic land management policies such as ensuring the effective use of land resources to support the ever-increasing population; preventing the degradation of the natural environment; creating new, livable settlement areas; protecting watersheds and wetlands; developing social and technical infrastructure areas; providing equal access to the economic returns of the land real estate market; and supporting government services through taxes and fees related to land and structures." [1]. With this concept, the necessity of ensuring the continuity of agricultural lands in order to prevent the deterioration of the natural environment, to meet the needs of the increasing human population and to provide the expected benefit from agricultural lands has been reunderstood. In this context, in order to provide the expected benefit from agricultural lands, the realisation of land consolidation projects has accelerated the planned use of agricultural lands by rearranging them according to soil classes. However, the rapid implementation of consolidation projects has also paved the way for the discussion of the concept of fragmented ownership. Land fragmentation is defined as the reduction of land width by dividing the land owned by an enterprise into separate and numerous parts [2]. In our country, the definition of land consolidation in the Regulation on Land Consolidation and In-Field Development Services prepared on the basis of the Soil Conservation Law No. 5403 is as follows: "To prevent the degradation and fragmentation of agricultural lands by natural and artificial influences, and to ensure the creation of new parcels that are more functional in terms of economic, ecological and social aspects by combining more than one piece of land by considering the natural characteristics, integrity of use and property rights in fragmented lands [3]." as can be understood from the definition, it is legally guaranteed by official institutions that the primary purpose of consolidation projects is to ensure the unification of land pieces.

Relocation or relocation is defined as a change in the position of an object in physics. In land consolidation implementation, it is considered as the change in the position of immovables before and after the implementation. The change in the location of the land is an important variable that directly affects the business owners. For this reason, the desire to stay in the same place is among the most objected topics during the suspension process of land consolidation practices [4].

In Eldelek village of Salihli district of Manisa province, a comparison was made between the consolidated area and the non-consolidated area with the help of geographical information systems. While the average parcel size in the consolidated area was 6.81 da, it was calculated as 14.22 da in the non-aggregated area [5].

In the consolidation practice implemented in Gedikli village of Nurdağı district of Gaziantep province, the consolidation rate was calculated as 47 %. The number of parcels subjected to the implementation decreased by 52 % compared to before the implementation [6].

The land consolidation project in Kuskuncuk village of Ereğli district of Konya province was examined in terms of land fragmentation and its effects at enterprise scale. The number of parcels, which was 1073 before consolidation, was determined as 791 after consolidation. At the end of the consolidation, 863 of the parcels in the project area were converted into 1 share, which corresponds to 80.43 % of the total number of parcels. While the number of parcels with 1 share was 288 before consolidation, it increased to 352 parcels after consolidation [7].

Ertunç and Janus [8] evaluated the impact of land consolidation projects on land fragmentation by considering the spatial land reallocation of parcels before and after land consolidation in Turkey and Poland. Average distance of a hectare index, Grouping index, Structural index, Scattering index, Januszewski index and Simmons's index were used to measure land fragmentation. In addition, the use of land fragmentation indices (Average distance of a hectare index, Grouping index, Structural index, Scattering index) that take into account the distance between parcels in measuring land fragmentation in land consolidation projects is proposed.

Akdeniz and Temizel [9] examined the situation before and after the consolidation according to 17 parameters such as the average number and size of parcels, the average parcel size, and the parcel status of the owners in order to reveal the success of the consolidation projects carried out in a total of 60 project areas in Samsun, Amasya and Sinop provinces. In the study area, while the average parcel size was 8.03 da before the consolidation, it was determined as 12.24 da after the implementation. The total number of parcels in the project area decreased by 35 %.

Tunalı and Dağdelen [10] examined the reallocation phase of the land consolidation project in Aydın Yenipazar region through two different methods. They concluded that the interview-based allocation method has more single parcel areas, while the fuzzy logic method is more advantageous in terms of consolidation rate, number of holdings and average parcel size values. As a result of the comparison of all parameters, he stated that the fuzzy logic method was more successful than the other method.

Alturk [11], in order to determine the degree of shape of agricultural parcels in Tekirdağ province, the parcels were divided into four groups as highly irregular, irregular, regular and near optimum. Accordingly, 53% of the parcels in the study area were highly irregular and irregular, while 47% were regular and near optimum.

Basista [12] evaluated the land consolidation project in the areas of Ilkowice, Rajsco-Niedzieliska-Szczurowa and Łukowa in Poland through geographic information system software. He compared the pre- and post-consolidation situations and presented numerical data on the distribution, number and area of parcels. Accordingly, the average plot area increased by about 25% in Ilkowice and 48% in Łukowa, the number of plots decreased by about 25% in Ilkowice and 48% in Łukowa, and the average distribution of plots in units decreased by about 20% in Ilkowice and 22% in Łukowa.

Davidović et al., [13] In order to analyze the impacts of land consolidation projects, a comparison of the number of parcels, average parcel size, road and canal network surface, before and after consolidation in the Šašinci area of Vojvodina, Serbia was made. According to the quantitative data obtained in the results section, it was found that the benefits of land consolidation were great, the number of parcels decreased by 59% on average per cadastre and the road and canal network surface increased significantly.

In this study, the land consolidation project implemented in Yeğenli neighbourhood of Tire district of Izmir [14] was examined under 4 different headings. In the first examination phase, the cadastral parcels before consolidation and the consolidation parcels were overlapped and coloured with the geographical information systems application. In order to compare the before and after conditions of the coloured cadastral parcels, enterprise numbers were used.

In the second phase of the study, it was aimed to analyse the land reallocation table of the consolidation and to present the mathematical model of the deduction shares. In order to reveal the change in the location of the parcels after the land reallocation, the average change in location value of the consolidation project was determined by calculating how many metres the cadastral parcels before consolidation were displaced after the arrangement. According to this average value, if the location changes of the immovable properties were below or above the average value, the colour green was assigned to those below and red to those above.

In the third phase of the examination of the consolidation project, in the light of the data obtained in the first and second phases, it was tried to determine the satisfaction rate of the landowners about their ownership status before and after consolidation by interviewing with the neighbourhood headman. The satisfaction rate obtained

within the scope of this study was accepted as a criterion for measuring the rate of benefit from the consolidation project.

In the last phase of the analysis, the data obtained in the second and third phases were compared. In this comparison, inferences were made through tables in order to reveal the effect of relocation and the part-to-whole approach on satisfaction. The evaluation of relocation and part-to-whole approach together distinguishes this study from similar studies.

2. Material and Method

In order to examine the project area, the first cadastral map of Yeğenli neighbourhood and the cadastral map after consolidation were obtained. GIS software was used for the evaluation and colouring of these cadastral maps. The land reallocation and deduction share lists, which are the most important part of the consolidation project, were obtained from the mukhtar archive and the mathematical model of land reallocation and deduction shares was studied. An excell table was prepared to determine the mathematical model. In the same excel table, the relocation values of the immovables were also determined.

In order to measure the satisfaction rate of the project, a question and answer interview was held with the headman of Yeğenli neighbourhood about the contributions/disadvantages of the project, which was approved and implemented in 2017, during the implementation phase and after 3 years for the neighbourhood.

Comparison tables were prepared with the help of excel programme in order to determine and compare the reduction in the number of parcels, part-to-whole approach and change of location. published.

3. Application

3.1. Introduction of the Application Area

The cadastral data of Yeğenli neighbourhood of Tire district of Izmir constitute the basic material of the research. According to Article 17 of the "Regulation on the Protection and Use of Agricultural Lands and Land Consolidation" dated 24/07/2009 and numbered 2009/15154, Yeğenli neighbourhood was included in the scope of the study according to the decree dated 19.10.2009 and numbered 2009/15614 by the General Directorate of State Hydraulic Works (DSİ) within the scope of Special Land Consolidation, and Yeğenli neighbourhood was included in the scope of compulsory land consolidation application with the decree dated 14/11/2011 and numbered 2011/2405. The application entered into force on 28/07/2017.

Yeğenli neighbourhood is a typical Aegean village established at the foot of Aydın Mountains in the south of Izmir. The distance to Tire district centre is 18 km, to Ödemiş district centre is 15 km and to İzmir province centre is 113 km. Tire-Ödemiş highway passes through the neighbourhood. To the south of the highway is the built-up area of the neighbourhood. According to TURKSTAT 2019 data, the population of the neighbourhood is 484 people and the total area is 10.78 km². There are Kirtepe neighbourhoods to the west, Kızılcahavlı to the north, Çamlıca to the south and Kazanlı to the east.

According to the Land Registry and Cadastre data, there were 1014 immovable property records before the consolidation project. After the consolidation, this number was recorded as 899. The elevation of the neighbourhood decreases from south to north. The agricultural lands in the northern part are also located within the Küçük Menderes Plain. These lands have been taken under protection within the scope of Büyükova Protection Area and are supported by the Ministry of Agriculture and Forestry for crop production [15-16].

3.2. Preparatory Work and Data Collection

The cadastral data of the study area were obtained from Tire Cadastre Unit. The land reallocation and maps of the said Consolidation Project were obtained from the mukhtar archive.

3.2.1. Cadastral Data

At this stage, the first cadastral data (Figure 1) and the consolidation data (Figure 2) were coloured in GIS environment. By overlapping the coloured data (Figure 3), the enterprise number of each owner in the consolidation land reallocation list was determined. Enterprise numbers represent the property owners and all of the cadastral parcels of the property owner were subjected to the application over the enterprise numbers. The total number of properties included in the application is 648 and the number of new properties formed as a result of consolidation is 545.



Figure 1. First cadastre

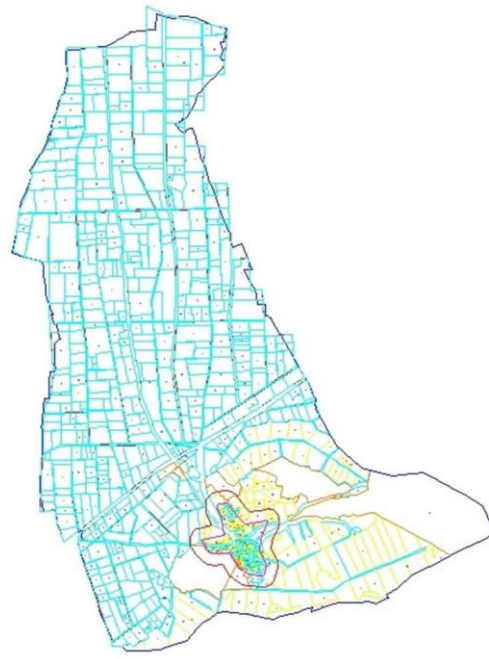


Figure 2. Consolidation



Figure 3. Overlaid view

3.2.2. Mathematical Model and Relocation Calculation

At this stage, the land reallocation tables were analysed in order to present the mathematical model of the aggregation. In order to reveal this model, firstly, the before and after status of the enterprise numbers in the tables were analysed in order to understand the basic principle of land reallocation. During the land reallocation phase, it was observed that the property owners were assigned enterprise numbers and the parcel index and parcel value number of each enterprise were calculated. After deducting the 4.20 % deduction share of each enterprise, it was distributed within the blocks according to the block priority land reallocation model. It was determined that an enterprise with shares in more than one immovable was placed in a single parcel after the land reallocation (Table 1). Thus, it is seen that the mathematical model of the land reallocation is block-priority and the principle of integrating the fragmented lands is applied.

Table 1. Block Priority Land Reallocation Model

LIST OF LAND CONSOLIDATION (New Block Parcel Sequence)															Schedule No: LC-8					
Neighbourhood Name : Yeğenli										Deduction Rate: 0.042			Page No: 1/31							
Households No	Title Deed Holder				Block No	Parcel No	Area (m ²)	Share	Area per Share (m ²)	Regulation		Parcel Index	Parcel Value Number	Deduction Amount	Block Location	New Block Index	New Parcel Value Number	Block No	New Parcel No	New Parcel Area
	ID No	Name	Surname	Father's Name						Non-entry	Entry									
217	S***T	G***K	M***T	-	1	18560	1/2	9280	9280	0.8318	7719.1	324.2	101	0.8315	7394.9	101	1	36667		
217	S***T	G***K	M***T	-	2	18000	1/4	4500	4500	0.8318	3743.1	157.21	101							
217	S***T	G***K	M***T	-	15	22720	Tam	22720	22720	0.8318	18899	793.74	101							
217	S***T	G***K	M***T	-	23	3520	1/2	1760	1760	0.8318	1464	61.49	102							

In the second step of this stage, in order to determine the relocation of the immovables, the geometric midpoints of the first cadastral and consolidation lands were determined with the help of GIS programme and the relocation amounts (Figure 4) were determined in metres and entered into an Excel table. Again, the average of the total relocation of the lands was calculated on the Excell table and the lands above the average were assigned red colour and the lands below the average were assigned green colour (Table 2).

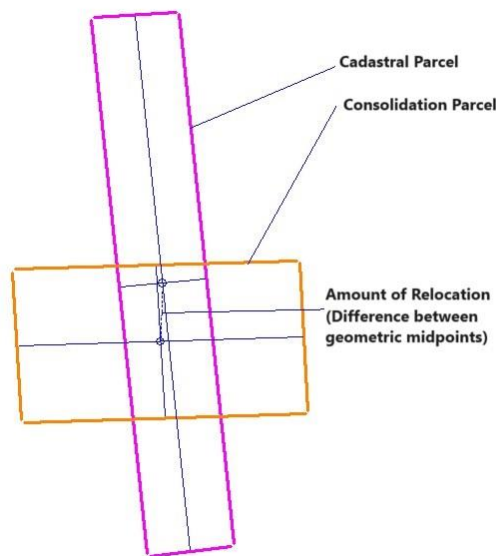


Figure 4. Relocation Calculation

3.2.3. Interview

At this stage of the study, an interview was conducted with Ünal Sayran, the mukhtar of Yeğenli neighbourhood, in the village square in order to reveal the satisfaction rate of the consolidation. During the question and answer interview, he stated that there are 165 households and 540 people living in the village, that he was the headman at the time when the land consolidation project was implemented, that he closely followed the process, and that he continuously informed the immovable owners by obtaining the land reallocation and map documents from DSİ.

As a result of the questions asked to the neighbourhood mukhtar and the answers received in order to determine the satisfaction rate of the consolidation;

- The scattered fields were brought together as a result of the implementation and the work from the part to the whole was welcomed,
- The fact that the lands become road fronted with the consolidation eliminates many disputes,
- With the immovables being connected to the drainage channels, the problems in irrigation have been overcome,
- Keeping the deduction rate between 3 per cent and 5 per cent is acceptable,
- Only two property owners were dissatisfied with the land reallocation, one of whom filed a lawsuit,
- It has been determined that the electricity poles located on the old cadastral roads remained within the properties after the arrangement, and no result has been obtained despite the three years that have passed.

As a result of the interviews, the satisfaction rate of the consolidation was accepted as a high value of 90 %. Due to Covid measures, it was not possible to interview all citizens one by one, so all questions were directed to the neighbourhood mukhtar.

Table 2. Mathematical Model and Relocation

Households No	Block No	Parcel No	Area	Old Parcel No	Area	Deduction Area	Deduction Rate (%)	Relocation (m)
217	101	1	36667.14	1, 2, 15, 23	38260.00	1592.86	4.20	258.19
102	101	2	10421.40	2,378	20780.00	10358.60	4.20	1711.78
153,166	101	3	16079.68	14,18,19	21086.67	5006.99	4.20	225.24
168	101	4	24103.28	1, 2, 16, 17, 23	25160.00	1056.72	4.20	245.15
322	101	5	10291.86	18, 408	14933.00	4641.14	4.20	1623.9
502,174,216,163,51	101	6	14178.38	20	14800.00	621.62	4.20	25.81
429	102	1	32996.01	3,4	37800.00	4803.99	4.20	127.2
299,231	102	2	19945.56	5	20820.00	874.44	4.20	40.02
198	102	3	8478.30	6	8850.00	371.70	4.20	128.48
389,156	102	4	16048.91	7, 34	16752.00	703.09	4.20	259.98
347, 348	102	5	11821.72	14	12340.00	518.28	4.20	29.57
384	102	6	16358.74	11, 12, 13, 22, 24	19095.00	2736.26	4.20	65.65
46	103	1	14791.52	49	15440.00	64848	4.20	80.41
386, 390	103	2	34842.46	6, 30	36370.00	1527.54	4.20	108.26
387, 388, 391	103	3	31479.85	7, 8, 9, 34	33689.50	2209.65	4.20	133.72
373	103	4	11208.60	10, 28	11700.00	491.40	4.20	89.73
381	103	5	3851.15	26	4020.00	168.85	4.20	52.04
519	103	6	8277.12	29	8640.00	362.88	4.20	81.4
382	103	7	9235.12	27	9640.00	404.88	4.20	104.95
138	104	1	46059.14	54, 58, 491	49071.00	3011.86	4.20	1354.07
129	104	2	41227.08	35, 46, 50, 1098	49780.00	8552.92	4.20	254.7
132	104	3	10750.67	54	11222.00	471.33	4.20	426.02
225	104	4	14791.52	49	15440.00	64848	4.20	232.98
507	104	5	13316.21	36	13900.00	583.79	4.20	101.78
286	104	6	12243.24	48	12780.00	536.76	4.20	31.12
490	104	7	10154.80	44	10600.00	445.20	4.20	78.24
357, 355	104	8	40501.80	32, 38, 39, 1098	42420.00	1918.20	4.20	89.75
123	105	1	50105.50	54, 55, 56	52605.00	2499.50	4.20	120.63
136	105	2	30542.76	54	31067.00	524.24	4.20	154.52
302	105	3	29817.79	54	29857.00	39.21	4.20	171
301	105	4	25575.82	54	25258.00	-317.82	4.20	287.74
160, 159	105	5	28356.80	53, 60	29600.00	1243.20	4.20	149.08
368, 372	105	6	32045.34	47, 52	34300.00	2254.66	4.20	159.96
197	105	7	15711.20	45	16400.00	688.80	4.20	81.63
8, 1008	105	8	4057.24	99, 1092	41055.20	36997.96	4.20	1088.5
327	105	9	18015.83	52	20000.00	1984.17	4.20	177.76
458	105	10	16343.75	51	17000.00	656.25	4.20	147.82
TOTAL								288.81

4. Discussion

4.1. Part to Whole Approach

In the study area, 648 immovable properties were regulated and 545 consolidation parcels were created. With the part-to-whole approach, the number of parcels decreased by 15.90 %. Since the reduction rate is not meaningful by itself, the change in the number of parcels based on block priority in the study Comparison of Interview and Block Priority Based Land reallocation Models in Land Consolidation Projects [17] was compared with this study (Table 3).

Table 3. Comparison Table

Consolidation Area	Number of Cadastral Parcels	Number of Consolidation Parcels	Reduction Rate (%)
İzmir-Tire-Yeğenli	648	545	15.90
Konya-İlgın-Ağalar	1536	718	53.26

According to the evaluation made on the land reallocation tables, it was determined that 197 of 545 consolidation parcels were formed by bringing together the fragmented shares of one or more property owners. It is seen that 36.15 % of the 545 consolidation parcels have been formed following the part-to-whole approach.

4.2. Relocation Approach

In the Table 4, 5 blocks (101, 102, 103, 104, 105) were evaluated. The amount of relocation was determined for the cadastral parcels evaluated and the average of these values was determined as 288.81 metres. According to the average relocation value, 32 of the 37 consolidation parcels were assigned green colour (below the average relocation value) and 5 of them were assigned red colour (above the average relocation value). 86,49 % of the

immovables were below the average change of location and 13,51 % were above the average change of location. According to the relocation table, the smallest relocation was 25.81 metres and the largest relocation was 1711.78 metres (Table 4).

Table 4. Relocation

	Number of Parcels Analysed	Number of Parcels Under Relocation Value	Number of Parcels Above Relocation Value
	37	32	5
Rate (%)	100	86.49	13.51
	Min. Relocation (m)	25.81	
	Max. Relocation (m)	1711.78	

5. Conclusion

In this study, in order to evaluate the consolidation project, the mathematical model, deduction shares, relocation amounts, part-to-whole approach and satisfaction rate were examined.

Block priority mathematical model is the most frequently used method in land consolidation projects in our country. In this project, a deduction of 4.20 % was made from the holdings distributed with the block priority model. In the interview with the neighbourhood headman, it was understood that the deduction rate was accepted as a low rate by the owners, and the importance given to the interview in the land reallocation brought the satisfaction rate of the consolidation to 90 %. Only 2 immovable owners reported dissatisfaction due to the land reallocation, the other dissatisfaction was not due to land reallocation but due to external factors.

The number of parcels decreased by 15.90% after consolidation. This decrease is in accordance with the main logic of consolidation, but it is lower than the rate of another consolidation project sampled (53.26%). The number of parcels decreased in accordance with the part-to-whole approach is directly proportional to the total number of fragmented properties in the consolidation area, and a healthier result can be obtained by comparing the number of fragmented properties in the sampled project with the number in this project. Of the 545 parcels obtained by consolidation, 197 parcels were formed as a result of bringing together fragmented properties. The ratio of part to whole was determined as 36,15 %. Again, in accordance with the main principle of consolidation, fragmented ownerships were brought together to ensure land integrity. In order for the ratio of 36.15 % to become meaningful, more than one consolidation project should be examined with the same method and an average value should be determined by comparison tables.

According to the relocation calculation made over 37 parcels in the consolidation area, it was determined that the lands were mostly located in the same region with their former locations. The most important conclusion obtained from the relocation table is that the part-to-whole approach affects the relocation calculation to a great extent. Although the change of location is an undesirable situation for the property owners, it is obvious that this situation is overcome with the part-to-whole approach. In fact, 4 out of 5 immovable properties that are above the value of change of location are examples of the part-to-whole approach.

Considering that the satisfaction rate of the consolidation project is a result of the amount of relocation and the part-to-whole approach, it is important to develop and implement these two concepts, and the most accurate approach is based on the interview basis.

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