Effect of Human Factor to Reallocation Phase of Land Consolidation

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Abstract: Land consolidation is one of the important devices provide productivity growth in agricultural production. Land reallocation is a process which is time-consuming, high execution costly and causes a lot of disagreements between landowners. In block reallocation process of land consolidation studies; after road and irrigation network is passed, plots covered by road and irrigation networks (block) are placed locationally according to claimed amounts by considering soil graduation. Regular parcels are created grafically according to shape of the blocks after this placing and given to the landowners. Reallocation and creating new parcels should be made equally and fairly between employers. Otherwise there will be rejections, farmer satisfaction will not be provided and project will not be accepted. From this point of view it can be said that block reallocation is the most sensitive and care demanding process of land consolidation. In this study, acquired results of block priority based reallocation method, which is applied by two different person, are compared. According to this comparison, effect of human factor to reallocation is studied.

Keywords: *Land consolidation, land reallocation, interview based reallocation, block priority reallocation*

İnsan Faktörünün Arazi Toplulaştırmasında Yeniden Tahsise Etkisi

Özet: Arazi toplulaştırması tarımsal üretimde verimlilik artışını sağlayan önemli araçlardan birisidir. Arazi dağıtımı; uzun zaman alan, yüksek işletim maliyeti gerektiren ve arazi sahipleri arasında anlaşmazlıkların sık meydana geldiği bir süreçtir. Arazi toplulaştırma çalışmalarının blok dağıtım aşamasında; proje sahasında yol ve sulama ağı geçirildikten sonra yol ve sulama ağının çevrelediği arazi parçalarına (blok), toprak derecelendirmesi dikkate alınarak kadastro parselleri hakediş miktarlarına göre alansal olarak yerleştirilirler. Bu yerleştirmeden sonra blokların şekline göre grafik olarak düzenli parseller oluşturulur ve işletme sahiplerine verilir. Dağıtım ve yeni parsellerin oluşturulması, işletme sahipleri açısından eşit ve adil bir şekilde yapılmalıdır. Aksi takdirde projeye sürekli itirazlar gelecek, çiftçi memnuniyeti sağlanamayacak ve proje kabul görmeyecektir. Bu açıdan bakıldığında blok dağıtımının arazi toplulaştırmanın en hassas ve özen gösterilmesi gereken bir aşaması olduğu söylenebilir. Bu çalışmada, iki farklı kişi tarafından yapılan blok öncelik esaslı dağıtım yöntemine göre elde edilen sonuçlar karşılaştırılmıştır. Bu karşılaştırmaya göre, insan faktörünün dağıtıma olan etkisi incelenmiştir.

Anahtar Sözcükler: *Arazi toplulaştırma, arazi dağıtımı, mülakat esaslı dağıtım, blok öncelikli dağıtım*

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INTRODUCTION

Land, as one of the basic inputs of agriculture sector, is definitely an irreplaceable natural resource for humankind's maintaining his life, development of countries and providing welfare. Development of civilizations and life standards of people have been effected by land-human relation throughout history. In this two-way relationship, humankind has an important effect on the land too [1], [2].

As it is not possible to increase agricultural lands in parallel with population growth, the solution is to find methods and techniques for increasing efficiency of existing limited agricultural lands. Although the necessity of using existed agricultural lands more efficiently is so clear, provisions in Inheritance Laws, shared and divided sales, construction of irrigation canals and roadworks cause small, divided, disordered agricultural lands and this situation causes loss of labour, capital and production and effects agricultural efficiency negatively.

Land consolidation can be defined as reconstruction and rearrangement of agricultural parcels in a planned way and considering ownership status of these parcels; land disruption can be decreased by presenting irrigation system and road network services by agricultural structures after the application [3], [4], [5].

Land consolidation is one of the important devices which provides increase in agricultural production efficiency. Land consolidation does not only unite divided lands but also improve agricultural, technical, social and cultural standards of land owners [5], [6], [7]. In this sense, land consolidation is not only limited with agricultural improvement but also contributes to development of natural resources and rural development [8]. Land consolidation is most effective land management approach which solves the problem of sustainable rural development and agricultural development [9]. Land consolidation is applied in 26 of 28 countries in European Union in different countries of the world such as China, India, Thailand, Moracco, Kenya, Australia.

In block reallocation stage of land consolidation studies; after road and irrigation network is built in project, remaining land pieces (block) around road and irrigation network, are spatially located according to claimed amounts considering soil graduation. After this locating regular parcels are created according to shape of he blocks and given to enterprise owners. Otherwise there will be objections for the project and farmer satisfaction will not be provided and project will not be accepted. From this point of view, it can be said that block reallocation is the most sensitive and care needed phase of land consolidation [10].

In this study, results of block priority based reallocation method, which are applied by two different person, are compared. According to this comparison, effect of human factor on reallocation is studied.

MATERIAL AND METHOD

Key material of the study is Konya- Çumra-Üçhüyük (Turkey) application area datas. Project is executed according to General Directorate of Agricultural Reform's (TRGM) 3083 numbered regulations of Agricultural Reform Law for Land Consolidation in Irrigation Areas. Block plans are prepared by TRGM. 17 blocks are created in block phase.

Üçhüyük Neighborhood of Çumra district belonging to Konya city (Turkey), which is under continental climate effect, was chosen as research area (Figure 1).

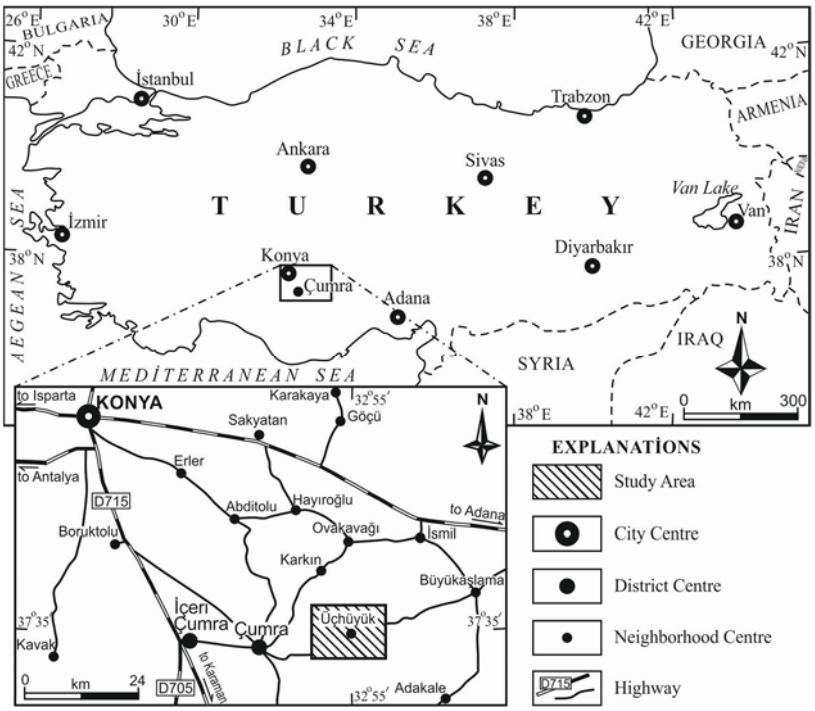

Figure 1. The study area which located in Üçhüyük Neighborhood of Çumra district belonging to Konya city

Poject area of Üçhüyük Neighborhood is 875,69 hectars, number of enterprises 275, cadastral parcel number is 265 (Figure 2) and 17 blocks. Total size of the cadastral parcels are 33 da.

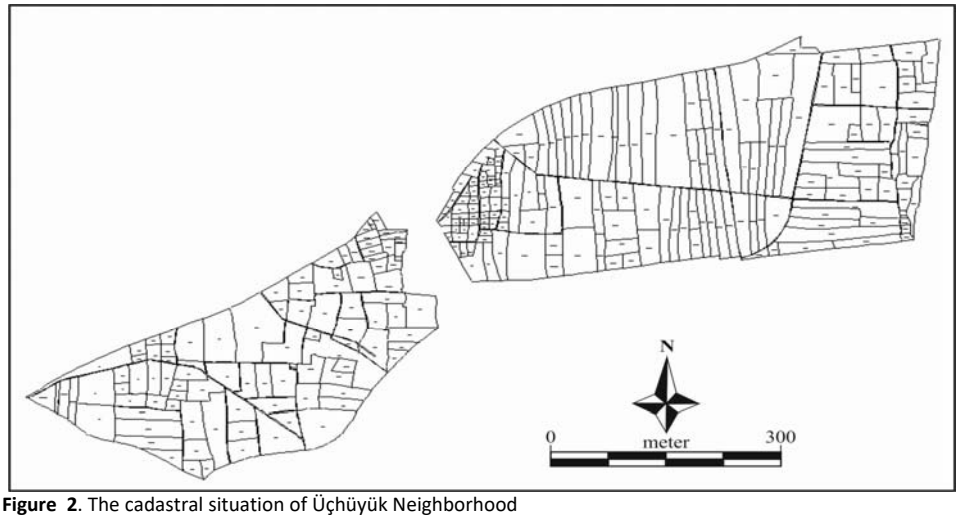

Figure 2. The cadastral situation of Üçhüyük Neighborhood

İnterview based reallocation method

In planning process of Land Consolidation studies, farmers are asked for three choice in interview, for joining points or choosing block. This order of choice is considered while placing lands of the farmers to new blocks. This kind of block reallocation is called as "interview based reallocation model".

Block priority reallocation model

Reallocation is executed according to the biggest owned parcel of enterprises in block priority reallocation model. In this method, the biggest parcels of enterprises and blocks of these parcels are determined. The land is given to enterprises from their biggest parcel's block during reallocation. If enterprise has a permanent facility, the land given to the enterprise is chosen from the block of this facility. Enterprises which can not fully fit to their biggest parcel according to occupancy rate of the block are placed to their biggest second or third parcel. Block reallocation continues until empty spots of blocks are zeroed. After that parcelation is made according to block reallocation result.

RESULTS

Parcel numbers in reallocation models

Average size of new parcels after reallocation according to this model is 36948.96 $m^{2.}$ Decreasing rate of new parcels after reallocation is 11% compared to old parcels. 224 new parcels are created according to 2nd block priority based reallocation results. Average parcel size is 39093.32 m^2. Decreasing rate of new parcels after reallocation is 15% according to old parcels. Parcel number is less in second block priority based reallocation result as seen in Table 1.

Table 1. Parcel numbers of reallocation models

Parcel Size (da)	CADASTRAL STATE	INTERVIEW BASED MODEL	BLOCK PRIORITY BASED MODEL-1	BLOCK PRIORITY BASED MODEL-2
	Number of Parcel	Number of Parcel	Number of Parcel	Number of Parcel
0-5	32	25	15	11
5-10	37	20	19	30
10-20	42	48	55	49
20-30	38	43	36	33
30-40	44	28	28	25
40-50	20	22	28	20
50-60	16	23	18	16
60-80	16	14	14	11
80-100	9	8	12	15
100-120	6	7	7	7
120-150	2	5	4	4
150+	3	0	1	3
Total	**265**	**243**	**237**	**224**
Consolidation Ratio (%)	-	**8**	**11**	**15**

There are also big differences in parcel sizes considering reallocation results of both block priority reallocation results. As it is understood from the table that there are differences between two different block reallocation results. The reason of this difference is approach of distributor people's approach on shared parcels. The person who makes 1st block priority based reallocation model, considers minimum agricultural land size as 0,5 hectar, which is cultivated agricultural lands, according to 5403 numbered Soil Conservation and Land Usage Law; separates shares in lands bigger than 0,5 hectars. In 2nd block priority based reallocation model, 0,3 hectar parcelling condition of greenhouse cultivation is considered and bigger shares than this size are separated.

Average parcel size of reallocation models

As seen in Table 2, average parcel size has increased 12% according to 1st block based reallocation model result and 18% according to 2nd block priority reallocation model result. The reason of this difference is parcel numbers.

Table 2. Average parcel size of reallocation models

The Average Size of Parcel	Area (m^2)	Increase Percentage (%)
Cadastral State	33044.92	-
Interview Based Model	36063.64	9
Block Priority Based Model-1	36948.96	12
Block Priority Based Model-2	39093.32	18

Number of shared parcels in reallocation model

Although there are decrease in both reallocation, 1st block based reallocation model is more successful in this subject (Table 3). As it is understood from here, mood, experience, ability and such factors of person who executes reallocation effects the reallocation.

Table 3. Number of shared parcels in reallocation models

The Number of Share in Parcel	Cadastral State	Interview Based Model	Block Priority Based Model-1	Block Priority Based Model-2
1	201	220	208	190
2	34	8	15	15
3	14	4	6	6
4	6	6	4	7
5	2	1	1	3
6	3	-	1	2
7	1	2	-	-
8	1	-	1	1
9	-	-	1	-
10	1	1	-	-
11	1	-	-	-
13	1	1	-	-
The number of jointly owned parcel	64	23	29	34
Total	**265**	**243**	**237**	**224**

Distance of enterprise parcels to village center

Distance of enterprises' parcels centers in application areas with village center are determined by considering existing road networks and measuring the shortest distance of transportation one by one. Then these values are averaged. In the study of Ayrancı [11], the acceptable distance betwen enterprise parcels and village centers is determined as 3 km under every condition for enterprise economy and land usage. Distance of enterprises in Üçhüyük application area to village center is given in Table 4. According to table, while the amount of parcels, which are until 3 km away from village center, are 82% before land consolidation, it has been 81% in 1st block based reallocation model results after land consolidation and it has been 76% in 2nd block based reallocation model results. Accordingly, there are 5% differences in distance of enterprise parcels to village centers.

Table 4. Distance of Üçhüyük enterprise parcels to village centers

DISTANCE (m)	CADASTRAL		INTERVIEW BASED MODEL		BLOCK PRIORITY BASED MODEL-1		BLOCK PRIORITY BASED MODEL-2	
	The Number of Parcels	%	The Number of Parcels	%	The Number of Parcels	%	The Number of Parcels	%
0-500	10	4	8	3	7	3	9	4
501-1000	71	27	54	22	40	17	38	17
1001-1500	37	14	38	16	39	17	41	18
1501-2000	29	11	33	14	36	15	27	12
2001-2500	35	13	30	12	32	14	25	11
2501-3000	36	13	35	14	36	15	32	14
3001-3500	19	7	17	7	22	9	26	12
3501-4000	24	9	23	10	21	8	23	10
4001-4500	4	2	5	2	4	2	3	2
4501-5000	-	0	-	0	-	0	-	0
5000+	-	0	-	0	-	0	-	0
Total	**265**	**100**	**243**	**100**	**237**	**100**	**224**	**100**

Parcel numbers of enterprises in reallocation models

Parcel numbers of the enterprises in Üçhüyük applicatin area are shown in Table 5.

Table 5. Number of parcel for enterprises in reallocation models

The Number of Parcel	CADASTRAL		INTERVIEW BASED MODEL		BLOCK PRIORITY BASED MODEL-1		BLOCK PRIORITY BASED MODEL-2	
	The Number of Enterprises	%	The Number of Enterprises	%	The Number of Enterprises	%	The Number of Enterprises	%
1	202	73.50	249	90.60	256	93.09	252	91.64
2	40	14.60	19	6.90	17	6.18	18	6.54
3	17	6.20	6	2.20	2	0.73	5	1.82
4	8	2.90	1	0.30	-	-	-	-
5	5	1.80	-	-	-	-	-	-
6	2	0.70	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-
9	1	0.30	-	-	-	-	-	-
Total	**275**	**100**	**275**	**100**	**275**	**100**	**275**	**100**

According to Table 5, number of enterprises, which has one parcel before the application, is 202 (73.50%). This number is 256 (93.09%) after consolidation according to 1st block priority based model, and 252 (91.64%) according to 2nd block priority based model. Accordingly, 1st block based model is more successful with regards to parcel per enterprise.

Aspect ratio of enterprise parcels

It will be proper to choose between values 1/4 - 1/5, considering aspect ratio's cultural technical services related factors in consolidation projects [12]. This rate can be between 1/2 - 1/7 in compulsory situations considering size of the land [13], [14].

Aspect ratio rates of parcels in Üçhüyük application area are given in Table 6. According to Table 6, while aspect ratio rate of parcels between 1/4 - 1/5 gap was 3% before land consolidation, it has been 12% in interview based reallocation model, 13% in 1st block based model and 9% in 2nd block based model. While parcel aspect ratio rate between 1/2 - 1/7 gaps were 39%, after land consolidation it has been 61% in 1st block based model, 41% in 2nd block based model. It is seen that there is a 20% difference in both model after block based reallocation.

Table 6. Aspect ratio rates of Üçhüyük enterprise parcels

THE WİDTH / LENGTH RATIOS OF THE ENTERPRİSE PARCELS BELONGING TO ÜÇHÜYÜK REGION																
	CADASTRAL				INTERVIEW-BASED REALLOCATION MODEL				BLOCK PRIORITY BASED MODEL -1				BLOCK PRIORITY BASED MODEL -1			
Width / Length Group	Width / Length Ratio	Width / Length Fraction	The Number of Parcels	%	Width / Length Ratio	Width / Length Fraction	The Number of Parcels	%	Width / Length Ratio	Width / Length Fraction	The Number of Parcels	%	Width / Length Ratio	Width / Length Fraction	The Number of Parcels	%
0-0.05	0.045	0	1	1	0.045	0	1	1	0.045	0	-	-	0.045	0	6	3
0.05-0.07	0.064	0	7	3	0.065	0	7	3	0.064	0	-	-	0.064	0	13	6
0.07-0.10	0.089	0	17	6	0.085	0	10	4	0.089	0	-	-	0.089	0	31	14
0.10-0.12	0.111	1/9	16	6	0.109	1/9	7	3	0.111	1/9	2	1	0.111	1/9	24	11
0.12-0.14	0.127	1/8	9	3	0.130	1/8	6	2	0.127	1/8	7	3	0.127	1/8	13	6
0.14-0.16	0.150	1/7	6	2	0.150	1/7	16	6	0.150	1/7	3	1	0.150	1/7	12	5
0.16-0.18	0.175	1/6	6	2	0.171	1/6	12	5	0.175	1/6	2	1	0.175	1/6	10	4
0.18-0.20	0.191	1/5	8	3	0.188	1/5	2	1	0.191	1/5	5	2	0.191	1/5	5	2
0.20-0.25	0.226	2/9	7	3	0.226	2/9	30	12	0.226	2/9	30	13	0.226	2/9	20	9
0.25-0.30	0.274	2/7	12	4	0.272	2/7	28	11	0.274	2/7	32	14	0.274	2/7	20	9
0.30-0.35	0.325	1/3	21	8	0.322	1/3	15	6	0.325	1/3	15	6	0.325	1/3	7	3
0.35-0.40	0.374	3/8	13	5	0.373	3/8	18	7	0.374	3/8	24	10	0.374	3/8	10	4
0.40-0.45	0.429	3/7	14	5	0.425	3/7	14	6	0.429	3/7	21	9	0.429	3/7	9	4
0.45-0.50	0.472	1/2	18	7	0.478	1/2	17	7	0.472	1/2	13	5	0.472	1/2	3	1
0.50-0.60	0.543	5/9	28	11	0.554	5/9	21	9	0.543	5/9	26	11	0.543	5/9	16	7
0.60-0.70	0.654	2/3	35	13	0.665	2/3	14	6	0.654	2/3	17	7	0.654	2/3	8	4
0.70-0.80	0.725	3/4	20	8	0.743	3/4	14	6	0.725	3/4	21	9	0.725	3/4	4	2
0.80-0.90	0.850	6/7	16	6	0.843	6/7	10	4	0.850	6/7	11	5	0.850	6/7	9	4
0.90-1.00	0.944	1	11	4	0.955	1	1	1	0.944	1	8	3	0.944	1	4	2
Total	-	-	**265**	**100**	-	-	**243**	**100**	-	-	**237**	**100**	-	-	**224**	**100**

DISCUSSION

Decreasing rate of new parcels, which are created after 1st block based reallocation model, is 11% compared to old cadastral parcels. This rate is 15% in 2nd block based reallocation model. When we check average parcel size, while it was 3.30 hectars in cadastral situation, it has risen to 3,60 hectars in 1st block based reallocation and 3,90 hectars in 2nd block based reallocation model. While there was 64 shared parcels before land consolidation, this number has become

29,2 according to 1st block based reallocation and 34 according to 2nd block based reallocation. There has been a 5% difference in distance to village center as a result of both block based reallocation models. There is a 20% difference in aspect ratio of parcels after both reallocation models.

Block reallocation step of land consolidation studies is a process which effects the success of land consolidation directly. As it is seen from acquired results; factors such as mood, experience, ability of project operator effect reallocation. Reallocation process of land consolidation is a multi criteria problem in which humans also play an important role. So using computer supported systems in reallocation process of land consolidation will increase efficiency and also contribute in shortening time consumption.

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