Plot Size and Shape in Field Crops Cultivation in Türkiye

Türkiye'de Tarla Bitkileri Yetiştiriciliğinde Parsel Büyüklüğü ve Şekli

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Abstract

The size and shape of the agricultural parcel are important factors in improving the agricultural structure. These factors positively affect farmers, especially in matters such as the use of agricultural tools and machines in field crop cultivation, time saving and good soil cultivation. In this context, the size and aspect ratio of the existing parcels are directly linked to the income to be obtained from the unit area. Land consolidation projects are ongoing in approximately 30% of the total agricultural area in Türkiye. In addition, the state's efforts to give agricultural land to landless farmers continue in Türkiye. Considering our current agricultural production capacity, planning the new parcels to be created during these studies will significantly contribute to our field crop production. For this purpose, the average parcel size was determined by analysing the land distribution norm values of 4321 settlement units within the scope of the Agricultural Reform Law No. 3083 on Land Arrangement in Irrigation Areas, published in 1984, and the size of 1868 sufficient income lands within the scope of the Soil Conservation and Land Use Law No. 5403, published in 2014. As a result of this study, it was concluded that, on average, an agricultural parcel of 64 decares in irrigated lands and 157 decares in dry agricultural lands is the most suitable size for growing field crops. Likewise, it was concluded that the parcels were rectangular in shape and the aspect ratio was close to 1:2.

Key words: parcel size, field crops, parcel aspect ratio, yield

Özet

Tarımsal yapının iyileştirilmesinde, tarım parselinin büyüklüğü ve şekli önemli faktörlerdendir. Bu faktörlerin optimum durumda olması, özellikle tarla bitkileri yetiştiriciliğinde tarım alet ve makinelerinin kullanımı, zaman tasarrufu ve iyi toprak işleme vb. konularda çiftçileri olumlu yönde etkilemektedir. Bu bağlamda, mevcut parsellerin büyüklüğü ve en boy oranı ile birim alandan elde edilecek gelirle doğrudan bağlantılıdır. Türkiye'de toplam tarım alanının yaklaşık %30'un da arazi toplulaştırma projeleri devam etmektedir. Ayrıca Türkiye'de topraksız çiftçilere devlet tarafından tarım arazisi verilmesi çalışmaları devam etmektedir. Bu çalışmalar esnasında oluşturulacak yeni parsellerin mevcut tarımsal üretim kapasitemizin düşünülerek planlanması, tarla bitkileri üretimine önemli katkısı olacaktır. Bu amaçla; 1984 yılında yayınlanan 3083 sayılı Sulama Alanlarında Arazi Düzenlemesine Dair Tarım Reformu Kanunu kapsamındaki 4321 yerleşim birimine ait arazi dağıtım normu değerleri ve 2014 tarihinde yayınlanan 5403 sayılı Toprak Koruma ve Arazi Kullanım Kanunu kapsamındaki 1868 adet yeter gelirli arazi büyüklüğü analiz edilerek ortalama parsel büyüklüğü belirlenmiştir. Bu çalışma sonucun da ortalama olarak tarla bitkileri yetiştiriciliğinde sulu arazilerde 64 dekar, kuru tarım arazilerinde 157 dekar tarım parselinin en uygun büyüklük olduğu sonucuna varılmıştır. Aynı şekilde parsellerin dikdörtgen şekilli ve en boy oranının da 1'e 2 yakın değerlerde olması kanaatine varılmıştır.

Anahtar kelimeler: parsel büyüklüğü, tarla bitkileri, parsel en boy oranı, verim

1- Introduction

With the rapid increase in the world population and especially the effect of global climate change, adequate and balanced nutrition of people has become much more important. Under the negative impact of the global climate change on agricultural production, the importance of obtaining higher efficiency and net income per unit area has increased even more. The world population is increasing every year. In addition, the importance of food supply is increasing day by day, especially due to irregular migration in Türkiye and the population growth rate being higher

than expected. In this regard, it has been revealed that the shape and size of agricultural land is an element that should be taken into consideration, as well as efforts to increase efficiency in agricultural production (TUİK 2023).

In many countries of the world and Türkiye, there are legal regulations regarding the normal size of agricultural lands or the size of agricultural land with sufficient income. Particularly in field crops grown on large lands, parcel size and parcel shape increase their importance. In Türkiye, grains, especially wheat, are grown mostly on large lands where dry farming is done. In irrigated lands, they are also grown, but their weight is increasing in corn and other field crops.

Agricultural reform practices have been carried out in many countries around the world, and in these practices, agricultural parcels of different sizes have been distributed to farmers, taking into account the climate, soil and other conditions of the countries. It is known that within the scope of land reform, 20 decares of dry land and 8 decares of irrigated land were distributed to farmers in Egypt, and 20 decares of dry land or 8 decares of irrigated land were distributed to farmers in India. Similarly, it is known that 250 decares of agricultural land were distributed to farmers in Pakistan, 62 to 96 decares in Italy, and 28 decares in Bulgaria (Türker, 2010).

It has been reported that in Türkiye, within the scope of Law No. 3083, the distribution of more than 1 million decares of land has been carried out to approximately 17,000 landless farmers in 180 villages or towns in 15 provinces since 1984 (Keşli, 2010).

Especially when consolidation is carried out in irrigation projects, blocks are formed by taking into account criteria such as irrigation planning, soil structure and topography of the land, irrigation length, and aspect ratios of the parcels. Thus, the usage areas of the parcels increase and production increases are achieved with the application of technical agricultural methods such as irrigation, mechanization, alternation and production planning, soil cultivation and harvesting tasks become easier. Time and labour losses, as well as increased input costs, are caused by some parcels in the consolidation area not being able to

benefit from existing service roads, irrigation and drainage channels. With land consolidation, fragmented lands are combined into well-shaped parcels, access to the parcels becomes easier and business income increases. It has been determined that there will be a 25% net increase in the income of agricultural enterprises with land consolidation (Küsek et al., 2015)

Since tillage carried out on square-sided plots with a certain aspect ratio is more successful in terms of mechanization efficiency, divided and misshapen plots should be rearranged and brought into agriculture in a short time. There is a close relationship between the shapes of parcels and agricultural income. The shapes of the parcels directly affect agricultural mechanization and intra-parcel irrigation. More labour and materials will be required to irrigate an improperly constructed parcel, regardless of the method used. This situation will also increase production costs (Bursalı, 2007).

Important studies were carried out, especially in the Netherlands and Germany, on the effect of parcel shapes on agricultural mechanization practices. Cordes (1970) and Dinçer (1971) compared different parcel shapes in terms of agricultural mechanization and when the time-rectangular unit was taken to cultivate equal-sized parcels, they gave the losses in other shapes as follows: Rectangular: 1.00, trapezoidal: 1.10, square: 1.20, triangle: 1.30. In those studies, they stated that rectangular parcels with smooth edges resulted in higher income per unit area, as less expense was incurred.

In a study aimed at determining the relationship between the parcel size of agricultural lands and the income to be obtained from the unit area, results were obtained on the aspect ratio of the parcels. In that study conducted on small-scale agricultural parcels, it was stated that in a rectangular parcel, the aspect ratio of the parcel also affects the agricultural mechanization within the parcel. It was explained that the most appropriate parcel width/height ratio was 1/5-1/4 (Çevik and Tekinel, 1989).

In the study conducted by Ayrancı (2004), which aimed to determine the most suitable parcel aspect ratio; the monetary values of edge and border effect losses, which

are two main factors effective in the activities carried out on the parcel, were taken into account. Therefore, the point where the total costs were lowest was accepted as the most suitable parcel aspect ratio. As a result of the study, it was determined that the most suitable parcel length/width ratio should be between 2-2.5.

In the study conducted by Polat and Manavbaşı (2012), it was calculated that 48.8 L/ha was saved in fuel consumption during a production period after consolidation in on-field crop production activities. The research concluded that land consolidation not only increases agricultural production and productivity in rural areas but also contributes greatly to the protection of air quality. Reducing fuel consumption and carbon emissions, especially in rural areas, will prevent the negative effects of air pollution and climate change to some extent.

It is stated in the sub-legislation that the parcel shape to be created in the land distribution studies carried out within the scope of Law No. 3083 should be as rectangular as possible and the aspect ratio should be close to 1:2 (TT 2021).

In a study conducted in Konya province, they determined that the number of tractors per 1000 ha area was 65.72; and the processed area per tractor is 152 decares (Oğuz et al., 2017). In that study, it was seen that dry and irrigated lands were evaluated together and an average parcel size was given. In this sense, it was determined that the farmers who have a sufficient income land size or land equal to the land norm own a tractor.

In a study conducted with the proportional sampling method in Çumra district of Konya province, it was concluded that the examined enterprises had an average of 212 decares of land and processed an average of 176 decares of land per tractor (Berk and Keskin, 2020).

Akıncı et al. (2002) conducted research to determine combine harvester operating values during wheat and corn harvest. According to the findings, it is stated that an average combine harvester can harvest an area of 128 decares after 8 hours of work.

The land size distributed in the last period of the

Ottoman Empire and the beginning of the Republic of Türkiye was generally evaluated as the size of the land that a pair of oxen could plough. The definition of farmer derives from here. People who own a pair of oxen and carry out agricultural activities by ploughing the field in this way are called farmers. The agricultural lands that a family with a pair of oxen could cultivate annually with this pair of oxen formed the basis of land reform. It would be more appropriate to think of what is meant by cultivation here as the size of the land that a family can use by ploughing the land and then doing maintenance, harvesting and threshing. However, after the transition to mechanized agriculture, land sizes again evolved to the land that a family with a tractor could cultivate annually.

In Article 8 under the title of land distribution of the Agricultural Reform Law No. 3083 on Land Arrangement in Irrigation Areas, which became law in 1984; "This is the amount to be found, taking into account the land size and soil properties to be given to those who will benefit from the distribution, and the types of agricultural enterprises envisaged for the region, provided that the annual agricultural enterprise income is not less than one million liras, according to the 1984 wholesale price index." There is a provision. In line with this provision, the land distribution norm was expressed and the work continued within this scope.

The basic logic of calculating both land norm and sufficient income land size is the land size that a farmer family (4 people, including father, mother and 2 children) can cultivate using only their labour and earn their annual living from the land they cultivate. This is how basic logic has developed in the world. It is still going on.

2- Material and Method

The sufficient income land sizes determined separately for each district and central districts included in the annexe of the Soil Conservation and Land Use Law No. 5403, published in the Official Gazette on 15/05/2014, were transferred to the computer environment and calculations were made. A total of 934 values, including 922 districts and 12 central districts of 81 provinces, were transferred to the computer environment. Irrigated, dry, planted and greenhouse values are given separately for each district and central districts. Since the sufficient income land size for planted agricultural lands in each district was determined as 10 decares, and the sufficient income land size for greenhouses was determined as 3 decares (since it did not show any variation), it was not included in the calculations. Only irrigated and dry land sizes with sufficient income were taken into account (since they vary). 1868 values determined for dry and irrigated lands (934x2=1868) were included in the calculation.

Within the scope of the agricultural reform law No. 3083 on Land Arrangement in Irrigation Areas, land distribution norms determined in 58 provinces, 264 districts of these provinces and a total of 4351 settlement units (villages, towns, neighbourhoods) connected to these districts have been determined in 1983 and published in the Official Gazette. Calculations were made by transferring them to the environment. Although norm values have been determined in some settlements within the scope of Law No. 3083 for special products grown in that region, such as paddy, olives, fruit trees, citrus fruits, pomegranates, vineyards, pistachios, almonds, walnuts, figs, apricots, sour cherries, cherries and apples, these values have not been included in the calculations.

In the calculations made within the scope of Law No. 3083, the provincial arithmetic averages of the dry and irrigated land distribution norms determined in that province were taken. The general average was reached based on these values. Similarly, the sufficient income land sizes determined within the scope of Law No. 5403 were first taken as provincial averages and the arithmetic average values of each province were used in the calculations. After taking the arithmetic averages of each province, weighted averages were calculated by taking into account the shares of the provinces in Türkiye's agricultural areas. The general average values were reached after first taking the arithmetic and then the weighted averages of the values within the scope of Laws No. 5403 and 3083.

The results were obtained by analysing the land distribution norm and sufficient income agricultural enterprise size figures declared within the scope of laws no.

3083 and 5403 in Türkiye in a computer environment. By taking the weighted average values, the average parcel size for Türkiye was concluded.

Paragraph (1) of the 3rd article under the definitions heading of the Soil Conservation and Land Use Law No. 5403 states, "Agricultural land size with sufficient income: Considering the regional differences, the agricultural land sizes with sufficient income determined in the attached list number (1) of the provinces and districts." expressed. As a basic approach, these determined sizes express the land size that will provide a living for a farmer family mentioned in Law No. 3083. The definitions of "land norm" or "sufficient income agricultural land size" mentioned in both laws are the results of the same approach. It is just expressed differently in accordance with the purposes and periods of the two laws.

Law No. 3083 was accepted by the Turkish Grand National Assembly on 22/11/1984 and came into force by being published in the Official Gazette on 1/12/1984. Accordingly, in the calculations made, the equivalent of 1 million Turkish lira on that date (22/11/1984) was 158 226 TL (5823 Dollars) in 2023 (September). Dividing this value by 12 months gives 13 185 TL (485 USD). Considering that the minimum wage in Türkiye for 2023 (September) is 11 402 TL (419 dollars), agricultural lands with an agricultural net income slightly above the minimum wage are determined as the land distribution norm (land norm) or the size of agricultural land with sufficient income (PDH 2023).

3- Results and Discussion

There have been significant changes in the use of agricultural lands in Turkey between 2001 and 2022. While total agricultural areas were around 40 million hectares in 2001, they decreased to 38 million hectares by the end of 2022. Meadow and pasture lands have not changed significantly in these years. The area under cultivation of cereals and other plant crops continued to decline, despite a decrease in fallow area. Fallow areas have been in a continuous decreasing trend since 2001 and have decreased from approximately 5 million hectares to 3 million hectares by 2022. While it was expected that grains and other plant products would increase as a result of the decrease in fallow areas, on the contrary, it was determined that there was a decrease in the planting areas of grains and other plant products in the period from 2001 to 2022. From 2001 to 2022, there has been an increase of approximately 1 million hectares in the production area of fruits, beverages and spice plants (TUİK 2023).

Field crops are produced in approximately 16 million hectares of land in Turkey. Since Turkey has semi-arid climate conditions, the production amount is quite high, especially in dry conditions. Therefore, under these conditions, parcel size and shape in field crops are very important for the sustainability of agricultural production.

Cereals constitute the most important share in Turkey's agricultural production. It is known that in 2022, approximately 1/3 of our country's agricultural areas (6.6 million hectares) will be wheat cultivated areas. Although wheat cultivation area has decreased in the total agricultural area compared to 2001, it is still the most cultivated product today. In addition, the total cultivation areas of basic field crops such as barley, corn, sunflower, cotton and sugar beet are quite high. This situation is enough to emphasize the importance of parcel size and shape in field crops (TUİK 2023).

It is possible to say that the areas where wheat and barley are produced, especially the more productive ones, are shifting towards corn and sunflower. It is possible to see from field observations that wheat and barley production areas are squeezed into lands with lower productivity capacity. Therefore, it is possible to infer that the sensitivity regarding the parcel size and shape of wheat and barley production areas has increased. It is thought that this disadvantageous situation will benefit by improving the size and shape of the partially less productive agricultural lands, especially where wheat and barley are produced.

Table 1. Smallest and largest dry land norm table within the scope of Law No. 3083 (20 provinces)

Nu.	City	District	Decision of the Council of Ministers	Official Gazette Date	Official Gazette Issue	Dry land (da)	Irrigated land(da)
1	Osmaniye	Merkez	2012/3857	7.11.2012	28460	40	20
2	Hatay	Hassa	2012/3857	7.11.2012	28460	50	20
3	Adana	Sarıçam	2012/3538	8.09.2012	28405	70	35
4	Bitlis	Ahlat	2014/5791	6.02.2014	28905	80	40
5	Aydın	Merkez	2006/9965	17.02.2006	26083	94	34
6	Edirne	Keşan	95/6596	30/03/1995	22243	100	35
7	Ankara	Evren	2012/3857	7.11.2012	28460	110	40
8	Isparta	Keçiborlu	2006/10454	21.07.2007	26589	120	48
9	Antalya	Aksu	2014/6412	19.06.2014	29035	130	60
10	Burdur	Tefenni	2006/11177	21.07.2009	26589	140	55
11	Afyon	Evciler	2010/99	27.02.2010	27506	150	60
12	Kilis	Merkez	2010/353	3.06.2010	27600	160	60
13	Bayburt	Merkez	2011/1385	13.02.2011	27845	172	57
14	Malatya	Yazıhan	2009/15251	28.07.2009	27302	180	80
15	Konya	Çeltik	95/6596	30/03/1995	22243	197	49
16	Yozgat	Çekerek	2011/2281	28.10.2011	28098	200	75
17	Iğdır	Karakoyunlu	95/6596	30/03/1995	22243	220	56
18	Kırıkkale	Delice	2008/14143	11.10.2008	27021	260	90
19	Nevşehir	Hacıbektaş	2008/14143	11.10.2008	27021	270	95
20	Muş	Merkez	2009/14773	15.03.2009	27170	295	80

Source: General Directorate of Agricultural Reform data (Anonymous 2023)

In Table 1, the smallest dry agricultural land norm determined within the scope of Law No. 3083 was determined as 40 decares in the central settlement of Osmaniye Province, while this value was 295 decares in the Central District of Muş Province, which was the province with the highest value in Türkiye. Since the values of all provinces cannot fit into the table, 20 province values representing the lowest and highest values are given. While the land norm is determined low in provinces with high agricultural production potential, the agricultural production potential is determined much higher, especially in places where climatic conditions are harsh.

Table 2. Smallest and largest irrigated land norm table within the scope of Law No. 3083 (20 provinces)

Nu.	City	District	Decision of the Council of Ministers	Official Gazette Date	Official Gazette Issue	Dry land (da)	Irrigated land(da)
1	Osmaniye	Merkez	2012/3857	7.11.2012	28460	40	20
2	Samsun	Bafra	2001/3201	23.11.2001	24592	50	28
3	Mersin	Tarsus	2001/2708	22.07.2001	24470	114	29
4	Elazığ	Karakoçan	2012/3857	7.11.2012	28460	70	30
5	Balıkesir	Susurluk	2012/3857	7.11.2012	28460	52	32
6	Amasya	Göynücek	2005/8675	24.04.2005	25795	80	40
7	Şanlıurfa	Birecik	2002/4285	28.06.2002	24799	143	43
8	Gaziantep	Karkamış	2010/99	27.02.2010	27506	105	45
9	Konya	Ereğli	2010/99	27.02.2010	27506	228	52
10	Bayburt	Merkez	2011/1385	13.02.2011	27845	172	57
11	Eskişehir	Beylikova	2009/15354	03.09.2009	27338	174	65
12	Bilecik	Bozüyük	2010/196	11.03.2010	27518	214	69
13	Niğde	Bor	2007/12959	25.12.2007	26737	120	70
14	Kars	Arpaçay	2006/10454	21.07.2007	26589	204	72
15	Karaman	Kazımkarabekir	2012/2682	17.01.2012	28176	200	75
16	Malatya	Yazıhan	2009/15251	28.07.2009	27302	180	80
17	Sivas	Zara	2010/99	27.02.2010	27506	212	86
18	Bitlis	Mutki	2014/6412	20.06.2014	29035	185	90
19	Kırşehir	Çiçekdağı	2010/223	9.04.2010	27547	226	95
20	Van	Merkez	2014/6412	19.06.2014	29035	200	100

Source: General Directorate of Agricultural Reform data (Anonymous 2023)

In Table 2, the smallest irrigated agricultural land norm determined within the scope of Law No. 3083 is determined as 20 decares in the central settlement of Osmaniye Province, while this value is determined as 100 decares in the Central District of Van Province. Since all values cannot fit in the table, 20 provinces are given with the lowest and highest values. In addition to these minimum and maximum values, sample figures between these values reveal how the land distribution norm varies by province.

Table 3. Law No. 5403, smallest and largest dry and sufficient income agricultural land sizes (22 provinces)

Nu.	City	District	Irrigated land (da)	Dry land (da)
1	Adana	Saimbeyli	90	120
2	Edirne	Uzunköprü	50	125

3	Antalya	Aksu	60	130
4	Sivas	Ulaş	80	135
5	Şanlıurfa	Halfeti	65	135
6	Yozgat	Yerköy	75	140
7	Tunceli	Çemişgezek	70	145
8	Uşak	Ulubey	80	145
9	Batman	Beşiri	60	155
10	Yozgat	Sarıkaya	90	155
11	Zonguldak	Merkez	75	160
12	Ankara	Bala	70	165
13	Adıyaman	Gerger	70	170
14	Amasya	Merkez	75	170
15	Yozgat	Kadışehri	90	175
16	Zonguldak	Çaycuma	100	180
17	Aksaray	Merkez	75	185
18	Çankırı	Korgun	80	185
19	Elazığ	Karakoçan	85	185
20	Sivas	Doğanşar	90	190
21	Tunceli	Nazımiye	85	195
22	Van	Saray	100	200

In Table 3. the smallest dry and sufficient income agricultural land size determined within the scope of Law No. 5403 was determined as 120 decares in Seyhan District of Adana Province, while this value was determined as the highest size with 200 decares in Saray District of Van Province. Since not all values can fit in the table, the lowest and highest values are given. In addition to these minimum and maximum values, sample figures between these values reveal how the size of agricultural land with sufficient income varies by province. In provinces with high agricultural production potential, dry and sufficient income agricultural land sizes are determined to be low, while agricultural production potential is determined to be higher.

Table 4. Law No. 5403, smallest and largest irrigated and sufficient income agricultural land sizes (22 provinces)

Nu.	City	District	Irrigated land (decares)	Dry land (decares)
1	Adana	Ceyhan	50	160
2	Adıyaman	Çelikhan	55	140
3	Afyonkarahisar	Dinar	60	200

4	Tokat	Erbaa	65	150
5	Yalova	Termal	70	155
6	Zonguldak	Devrek	70	150
7	Yozgat	Yerköy	75	140
8	Elazığ	Ağın	75	175
9	Tunceli	Pülümür	80	160
10	Amasya	Hamamözü	85	190
11	Ardahan	Çıldır	85	175
12	Bartın	Ulus	85	135
13	Bursa	Büyükorhan	85	165
14	Denizli	Bekilli	85	165
15	Düzce	Gümüşova	85	155
16	Elazığ	Karakoçan	85	185
17	Isparta	Gelendost	85	170
18	İzmir	Çeşme	85	170
19	Zonguldak	Gökçebey	90	160
20	Bartın	Merkez	95	135
21	Yozgat	Çayıralan	95	170
22	Van	Saray	100	200

As seen in Table 4. while the smallest irrigated and sufficient income agricultural land size determined within the scope of Law No. 5403 was determined as 50 decares in Ceyhan District of Adana Province, the highest value was determined as 100 decares in Saray District of Van Province. The lowest and highest values are given since not all values can fit in the table. In addition to these minimum and maximum values, sample figures between these values reveal how the size of agricultural land with sufficient income varies by province.

Table 5. Data for 58 provinces whose land norms are determined within the scope of Law No. 3083.

City	Total area (da)	Ratio of 58 provinces to total area (%)	Dry Land Norm Avg. (decare)	Irrigated Land Norm Avg. (decare)	Dry Land Norm Weighted average coefficient	Irrigated Land Norm Weighted average coefficient
TR521 Konya	18896147	9.01	175	56	15.8	5.0
TR510 Ankara	11624268	5.54	148	41	8.2	2.3
TRC21 Şanlıurfa	11041577	5.26	143	43	7.5	2.3
TR722 Sivas	8055893	3.84	169	67	6.5	2.6
TR723 Yozgat	6095201	2.91	231	87	6.7	2.5

TRC22 Diyarbakır	5758477	2.75	145	42	4.0	1.2
TR332 Afyonkarahisar	5520519	2.63	186	69	4.9	1.8
TR412 Eskişehir	5478028	2.61	176	52	4.6	1.4
TR833 Çorum	5374037	2.56	216	67	5.5	1.7
TR721 Kayseri	5366411	2.56	190	65	4.9	1.7
TR621 Adana	5046224	2.41	103	45	2.5	1.1
TRA11 Erzurum	4194829	2.00	163	75	3.3	1.5
TR211 Tekirdağ	4153674	1.98	95	41	1.9	0.8
TR712 Aksaray	4104083	1.96	150	73	2.9	1.4
TR221 Balıkesir	3908805	1.86	52	32	1.0	0.6
TRB21 Van	3813413	1.82	180	90	3.3	1.6
TR831 Samsun	3785032	1.80	90	31	1.6	0.6
TR321 Aydın	3693447	1.76	92	32	1.6	0.6
TR322 Denizli	3690191	1.76	129	49	2.3	0.9
TR632 Kahramanmaraş	3559292	1.70	160	68	2.7	1.2
TRA21 Ağrı	3518720	1.68	187	90	3.1	1.5
TR611 Antalya	3478565	1.66	133	61	2.2	1.0
TRC11 Gaziantep	3467162	1.65	108	46	1.8	0.8
TR212 Edirne	3411076	1.63	99	33	1.6	0.5
TR522 Karaman	3370455	1.61	196	67	3.1	1.1
TR715 Kırşehir	3316724	1.58	186	64	2.9	1.0
TR714 Nevşehir	3305052	1.58	180	61	2.8	1.0
TR622 Mersin	3293121	1.57	126	27	2.0	0.4
TRC31 Mardin	3261656	1.55	150	50	2.3	0.8
TR832 Tokat	3137226	1.50	167	64	2.5	1.0
TR333 Kütahya	3101750	1.48	70	20	1.0	0.3
TR711 Kırıkkale	3076512	1.47	195	65	2.9	1.0
TR222 Çanakkale	3005234	1.43	80	40	1.1	0.6
TR411 Bursa	2996454	1.43	166	57	2.4	0.8
TRB22 Muş	2811568	1.34	288	78	3.9	1.0
TR713 Niğde	2760728	1.32	120	70	1.6	0.9
TRB11 Malatya	2723394	1.30	146	57	1.9	0.7
TR213 Kırklareli	2484407	1.18	92	39	1.1	0.5
TR834 Amasya	2442795	1.16	126	46	1.5	0.5
TR631 Hatay	2379337	1.13	50	20	0.6	0.2
TRA22 Kars	2307152	1.10	204	75	2.2	0.8
TRC12 Adıyaman	2263390	1.08	200	90	2.2	1.0
TR334 Uşak	2238657	1.07	165	75	1.8	0.8
TR822 Çankırı	2206328	1.05	167	43	1.8	0.5
TR612 Isparta	1920487	0.92	122	47	1.1	0.4
TRB12 Elazığ	1824912	0.87	72	31	0.6	0.3

TR613 Burdur	1576784	0.75	117	49	0.9	0.4
TRB23 Bitlis	1410398	0.67	117	56	0.8	0.4
TR633 Osmaniye	1261406	0.60	46	23	0.3	0.1
TRA23 Iğdır	1142427	0.54	214	59	1.2	0.3
TRA13 Bayburt	1139612	0.54	172	57	0.9	0.3
TRC13 Kilis	1024756	0.49	173	71	0.8	0.3
TR906 Gümüşhane	950689	0.45	172	57	0.8	0.3
TRC32 Batman	914896	0.44	270	90	1.2	0.4
TR413 Bilecik	869914	0.41	214	69	0.9	0.3
TR421 Kocaeli	793596	0.38	152	70	0.6	0.3
TR823 Sinop	742418	0.35	134	41	0.5	0.1
TRB13 Bingöl	686756	0.32	150	60	0.5	0.2
TR Türkiye (Total of 58 provinces)	209776062	100	150	56	153	55

TUİK 2023 data (. is used as decimal separator)

As seen in Table 5. the total amount of agricultural land in 58 provinces (81/58) where the land distribution norm is determined within the scope of Law No. 3083 is 209776062 decares. The arithmetic average of the dry land norms of 58 provinces has been determined as 150 decares. The arithmetic average of the irrigated land norms of 58 provinces was found to be 56 decares. In the analysis made by taking the weighted averages of 58 provinces, it was concluded that the dry lands were 153 decares. The weighted average and arithmetic average of the norm values in irrigated lands of 58 provinces were found to be the same at 55 decares.

Table 6. Agricultural land sizes with sufficient income for 81 provinces within the scope of Law No. 5403

City	Total area (da)	Ratio of 81provinces to total area (%)	Dry Land Norm Avg. (decare)	Irrigated Land Norm Avg. (decare)	Dry Land Norm Weighted average coefficient	Irrigated Land Norm Weighted average coefficient
TR521 Konya	18896147	7.92	171	63	13.54	4.99
TR510 Ankara	11624268	4.87	188	80	9.16	3.90
TRC21 Şanlıurfa	11041577	4.63	147	61	6.80	2.82
TR722 Sivas	8055 893	3.38	146	78	4.93	2.63
TR723 Yozgat	6095201	2.55	155	80	3.96	2.04
TRC22 Diyarbakır	5758477	2.41	151	63	3.64	1.52
TR332 Afyonkarahisar	5520519	2.31	186	70	4.30	1.62
TR412 Eskişehir	5478028	2.30	144	68	3.31	1.56
TR833 Çorum	5374037	2.25	156	86	3.51	1.94
TR721 Kayseri	5366411	2.25	173	74	3.89	1.66

TR331 Manisa	5073527	2.13	162	68	3.44	1.45
TR621 Adana	5046224	2.11	147	67	3.11	1.42
TRA11 Erzurum	4194829	1.76	154	96	2.71	1.69
TR211 Tekirdağ	4153674	1.74	124	52	2.16	0.91
TR712 Aksaray	4104083	1.72	184	72	3.16	1.24
TR221 Balıkesir	3908805	1.64	171	76	2.80	1.24
TRB21 Van	3813413	1.60	191	92	3.05	1.47
TR831 Samsun	3785032	1.59	165	76	2.62	1.21
TR321 Aydın	3693447	1.55	140	57	2.17	0.88
TR322 Denizli	3690191	1.55	170	65	2.63	1.01
TR632 Kahramanmaraş	3559292	1.49	157	66	2.34	0.98
TRA21 Ağrı	3518720	1.47	191	95	2.82	1.40
TR611 Antalya	3478565	1.46	155	72	2.26	1.05
TRC11 Gaziantep	3467162	1.45	159	67	2.31	0.97
TR310 İzmir	3418312	1.43	143	59	2.05	0.85
TR212 Edirne	3411076	1.43	130	52	1.86	0.74
TR522 Karaman	3370455	1.41	155	67	2.19	0.95
TR715 Kırşehir	3316724	1.39	154	79	2.14	1.10
TR714 Nevşehir	3305052	1.38	154	76	2.13	1.05
TR622 Mersin	3293121	1.38	160	77	2.21	1.06
TRC31 Mardin	3261656	1.37	140	65	1.91	0.89
TR832 Tokat	3137226	1.31	161	81	2.12	1.06
TR333 Kütahya	3101750	1.30	161	67	2.09	0.87
TR711 Kırıkkale	3076512	1.29	157	81	2.02	1.04
TR222 Çanakkale	3005234	1.26	122	55	1.54	0.69
TR411 Bursa	2996454	1.26	150	71	1.88	0.89
TRB22 Muş	2811568	1.18	185	97	2.18	1.14
TR713 Niğde	2760728	1.16	169	77	1.96	0.89
TRB11 Malatya	2723394	1.14	184	88	2.10	1.00
TR902 Ordu	2587722	1.08	168	73	1.82	0.79
TR213 Kırklareli	2484407	1.04	136	59	1.42	0.61
TR834 Amasya	2442795	1.02	174	76	1.78	0.78
TR631 Hatay	2379337	1.00	146	61	1.46	0.61
TRA22 Kars	2307152	0.97	163	90	1.58	0.87
TRC12 Adıyaman	2263390	0.95	156	64	1.48	0.61
TR334 Uşak	2238657	0.94	155	83	1.45	0.78
TR822 Çankırı	2206328	0.92	172	78	1.59	0.72

TR323 Muğla	2049976	0.86	174	85	1.49	0.73
TR612 Isparta	1920487	0.80	160	89	1.29	0.72
TRB12 Elazığ	1824912	0.76	170	83	1.30	0.63
TR422 Sakarya	1747242	0.73	143	66	1.05	0.48
TR613 Burdur	1576784	0.66	180	85	1.19	0.56
TR903 Giresun	1533565	0.64	120	50	0.77	0.32
TR821 Kastamonu	1452285	0.61	175	79	1.06	0.48
TRB23 Bitlis	1410398	0.59	187	93	1.11	0.55
TRA12 Erzincan	1405189	0.59	177	88	1.04	0.52
TR633 Osmaniye	1261406	0.53	121	61	0.64	0.32
TRA23 Iğdır	1142427	0.48	150	50	0.72	0.24
TRA13 Bayburt	1139612	0.48	180	70	0.86	0.33
TR424 Bolu	1107323	0.46	165	91	0.77	0.42
TRC33 Şırnak	1068607	0.45	162	76	0.73	0.34
TR901 Trabzon	1063286	0.45	120	50	0.53	0.22
TRC13 Kilis	1024756	0.43	153	64	0.66	0.27
TR906 Gümüşhane	950689	0.40	175	83	0.70	0.33
TRC34 Siirt	934877	0.39	146	73	0.57	0.29
TRC32 Batman	914896	0.38	157	63	0.60	0.24
TR413 Bilecik	869914	0.36	157	73	0.57	0.27
TR421 Kocaeli	793596	0.33	154	71	0.51	0.24
TRA24 Ardahan	770190	0.32	189	93	0.61	0.30
TR100 İstanbul	768433	0.32	148	63	0.48	0.20
TR423 Düzce	751128	0.31	153	73	0.48	0.23
TR823 Sinop	742418	0.31	168	76	0.52	0.24
TRB13 Bingöl	686756	0.29	196	98	0.56	0.28
TR904 Rize	556992	0.23	165	70	0.39	0.16
TRB14 Tunceli	468235	0.20	165	81	0.32	0.16
TR812 Karabük	428424	0.18	152	70	0.27	0.13
TRB24 Hakkari	427582	0.18	180	90	0.32	0.16
TR813 Bartın	406174	0.17	134	80	0.23	0.14
TR811 Zonguldak	402764	0.17	165	81	0.28	0.14
TR905 Artvin	322722	0.15	198	76	0.27	0.10
TR425 Yalova	118864	0.05	157	80	0.08	0.04
TR Türkiye Total (da)	238639481	100	160	74	161	72

TUİK 2023 data (. is used as decimal separator)

As seen in Table 6, the total agricultural land size in 81 provinces of Türkiye is 238639481 decares. The province with the largest agricultural land is Konya with 18896147 decares. It is seen that Yalova is the province with the least amount of agricultural land, with 118864 decares of agricultural land. Within the scope of Law No. 5403, agricultural land sizes with sufficient income were determined and published on a district basis. Provincial averages were found by taking the average of the sufficient income land sizes determined in the districts of each province. The weighted average value was found based on the averages of the central district and other districts of the province. While the arithmetic average of the provinces was 160 decares for dry lands, the arithmetic average for irrigated lands was found to be 74 decares. In the analysis made by taking the weighted averages of 81 provinces, the weighted average of dry lands was found to be 161 decares and the weighted average of irrigated lands was 72 decares.

Table 7. Arithmetic and weighted averages of land norms and sufficient income land sizes in Türkiye

Arithmetic/Weighted Average	Dry Land (decares)	Irrigated land (decares)
Arithmetic average of "land norm" within the scope of Law No. 3083	150	56
Arithmetic average of "sufficient income land size" within the scope of Law No. 5403	160	74
Average	155	65
Weighted average of "soil norm" within the scope of Law No. 3083	153	55
Weighted average of "sufficient income land size" within the scope of Law No. 5403	161	72
Average	157	64

As seen in Table 7, the arithmetic average of the soil norm/sufficient income agricultural land size in dry lands determined within the scope of laws no. 3083 and 5403 in Türkiye was found to be 155 decares. In irrigated lands, this value was found to be 65 decares. The weighted average of the soil norm/sufficient income agricultural land size in dry lands determined within the scope of laws no. 3083 and 5403 was found to be 157 decares. In irrigated lands, this value was found to be 64 decares.

4- Conclusion

A general conclusion was reached by determining the size of the lands that are irrigated and cultivated in dry conditions, which will provide a living for a farmer's family, as determined within the scope of laws no. 3083 and 5403 in Türkiye. Studies on the size of agricultural lands as well as their shape should have been examined. In the studies examined, it was concluded that the shape of agricultural lands, especially large agricultural lands where field crops are grown, should be rectangular. Likewise, it was concluded that the parcels were rectangular in shape and the aspect ratio was close to 1:2. It is understood from the studies that it is very important that the edges of these rectangular parcels to be created are straight or nearly straight.

In Türkiye, ideal average parcel sizes have been determined for basic field crops such as wheat, barley and sunflower, which are grown on large lands in dry and irrigated conditions, and corn and cotton, which are grown by a farmer family in irrigated conditions.

Accordingly, the ideal parcel size in large lands where dry farming is done is 157 decares, and in large lands where irrigated farming is done, the ideal land size is 64 decares. These values are also supported by the work efficiency values of agricultural machines such as tractors, seeders and combine harvesters, which are used in very important tasks such as planting, tillage and harvesting in field crop cultivation. These values are valid for farming that a farmer family can do with their own means. It should not be overlooked that more productive results can be obtained on agricultural lands above these determined sizes.

Considering the land structure and climatic conditions in Türkiye, it will be of great benefit to pay utmost attention to these values, especially in areas where consolidation is being carried out, and to ensure that the parcel sizes to be created are close to these values. It is very important to create a parcel plan by paying attention to these values in the projects of parcelling out large treasury lands and distributing them to farmer families, in the efforts to land landless farmers, which are still ongoing, albeit to a small extent, in our country. It is considered important that these values are not overlooked in the sharing to be made due to heritage in order to ensure the sustainability of our agricultural lands.

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References

Akıncı, İ., Çanakcı, M., & Topakcı M. (2002). Determination of Basic Machinery Management Data for a Combine Harvester. Proceedings of the 8th International Congress on Mechanization and Energy in Agriculture: 366-371, Kuşadası.

Ayrancı, Y. (2004). Bir Parselde Optimum Boy/En Oranının Belirlenmesinde Bir Yaklaşım, S.Ü. Ziraat Fakültesi Dergisi 18(33): (2004) 1-7

Berk A. & Keskin A.H. (2020). Tarım İşletmelerinde Traktör Kullanım Durumu ve Marka Tercihleri; Konya İli Çumra İlçesi Örneği Araştırma Makalesi, Ziraat Mühendisliği Dergisi Yıl: 2020 Sayı: 370 (370), 4-17 DOI: 10.33724/zm.710528

Bursalı, O. (2007). Arazi Toplulaştırma Projesi Yapılan Bir Köyde Yeşil Alan Ve Rekreasyonel Alan Planlaması (Malatya İli Yeşilyurt İlçesi Görgü Köyü Örneği), Çukurova Üniversitesi Fen Bilimleri Enstitüsü Yüksek Lisans Tezi Peyzaj Mimarlığı Ana Bilim Dalı, Adana

Cordes, W. (1970). Flachengröbe, Flackenform und Feld-Hofentfernung, Praktische Landtechnik, h.15,Wien.

Çevik, B. &Tekinel, O. (1989). Arazi Toplulaştırması, Ç.Ü. Ziraat Fakültesi Ders Kitabı No. 45, Adana.

Dinçer, H. (1971). Erzurum İlinde Çeki Hayvanları İle Yapılan Tarla Çalışmalarında Tarla Şeklinin Efektif İş Başarısına Etkisi Üzerinde Bir Araştırma, Ankara Üniversitesi Ziraat Fakültesi Yıllığı, Yıl:21, Fasikül 2'den Ayrı basım, Ankara.

Keşli, Y. (2010). 3083 sayılı kanun kapsamında çiftçileri topraklandırma çalışmaları. Ziraat Mühendisliği Dergisi. Ocak-Temmuz 2010, Sayı 354, Sayfa 28-33

Küsek, G., Türker, M., Gülsever Şaban, F.T.Z. & Şahin, G. (2015). Türkiye'de Arazi Toplulaştırmasında Gelişmeler Ve Arazi Bankacılığının Uygulanma İmkânları, 1. Ulusal Biyosistem Mühendisliği Kongresi, 9-11 Haziran 2015, Bursa

Oğuz C., Bayramoğlu Z., Ağızan S. & Ağızan K. (2017). Tarım işletmelerinde tarımsal mekanizasyon kullanım düzeyi, Konya ili örneği, Selçuk Tarım ve Gıda Bilimleri Dergisi, ISSN: 2458-8377, (2017) 31 (1), 63-72, DOI: 10.15316/ SJAFS.2017.8, Konya.

Parasal Değer Hesaplama İnternet sitesi (PDH 2023). (https://parasal-deger.hesaplama.net/)

Polat, H. E. & Manavbaşı, İ. D. (2012). Arazi toplulaştırmasının kırsal alanda yakıt tüketimi ve karbondioksit salınımına etkisinin belirlenmesi. Journal of Agricultural Sciences, 18, 157-165.

General Directorate of Agricultural Reform data

(Anonymous 2023). Web sitesi: https://www.tarimorman.gov.tr/TRGM/Link/22/3083-Sayili-Kanuna-Gore-Uygulama-Alanlari

General Directorate of Agricultural Reform. Expropriation, Leasing and Distribution Technical Instruction (TT 2021).

Ministry of Agriculture and Forestry Data (2023). Web Sitesi; https://www.tarimorman.gov.tr/Haber/5616/Toplulastirilan-Arazi-Buyuklugunun-2023te-85-Milyon-Hektara-Ulasmasi-Hedefleniyor

Türker, M. (2010) Dünya'da ve Ülkemizde Toprak ve Tarım Reformu Uygulamaları. Üçüncü Sektör Kooperatifçilik, 2010, 45, (3): 38-5

Turkish Statistical Institute (TUİK). (2023) (https://data.tuik.gov.tr/Kategori/GetKategori?p=tarim-111&dil=1)