



Farmer Satisfaction with Agricultural Land Consolidation Projects in Aydın

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Abstract Land Consolidation (LC) studies are carried out to help increase agricultural income in Turkey as well as all over the world. In this context, efforts are being made to unite scattered pieces of land, correct the land savings system, and contribute to the expansion of small agricultural enterprises' lands. Thus, the living standard of farmers can be increased by correcting and improving different production factors. In this study, within the scope of Aydın Merkez-Yenipazar Participatory LC and Aydın Merkez-Yenipazar Plain On-Farm Development Services (OFDS), which was completed in 2011, the satisfaction status after LC was investigated in five neighborhoods (Alhan, Çulhan, Dalama, Dereköy, and Hamzabali) of Yenipazar District. As a result of the study, 61% of the surveyed farmers stated that their irrigation costs decreased and 69% of them stated that fuel costs decreased. In addition, 44% of the farmers stated that they were partially satisfied with the LC project, and 84% stated that they would recommend LC to other villages.

Keywords Farmer Satisfaction Level, Survey Evaluation, Yenipazar Plain

Introduction

LC can be defined as a planned reconstruction and reorganization of agricultural plots. It also reduces the fragmentation of lands by providing services such as irrigation systems and road services, thanks to the land quality and agricultural infrastructures that will come after the implementation, taking into account the ownership status in these parcels. Thus, it will also significantly transform land-use patterns [1-2-3].

LC studies, which started to be applied for the first time in the world in the 16th century, gained great momentum, especially in the 19th century. Today, many developed and some developing countries have completed their LC studies as well as other land and agricultural reform practices. Although LC studies have been carried out for a long time in Turkey, which is a country whose economy is based on agriculture and agro-industry, the number and area of implemented projects are not at the desired level. The most important reason for this, among other factors, is that LC studies are very time-consuming and dependent on personal skills [4].

LC works were first started in 1985 in Aydın province, and the project was completed on an area of 67,495 hectares in 2018. After 2018, as a result of the institution change, all LC operations were transferred to the State Hydraulic Works (DSI) (Table 1).



Table 1: Distribution of LC Studies conducted in Aydın Province by Institutions [5].

Years	Institutions	Status	Project Number (pcs)	Area (ha)	Settlement (pcs)
(1985-2004)- (2004-2008)	Rural Services - Special Administration Period	Completed	26	33,895	69
(2006-2011)- (2011-2018)	General Directorate of Agricultural Reform (TRGM) – Ministry of Food, Agriculture, and Livestock (GTHB)	Completed	6	33,600	60
(2018-2021)	DSİ	Continues	2	21,900	43
Total		-	34	89,395	172

In this study, within the scope of Aydın Merkez-Yenipazar Participatory LC and Aydın Merkez-Yenipazar Plain OFDS, which was completed in 2011, the satisfaction status was investigated in the Alhan, Çulhan, Dalama, Dereköy and Hamzabali neighborhoods.

Materials and Methods

This research was carried out in the districts where LC and OFDS were implemented as two separate projects in the Alhan, Çulhan, Dalama, Dereköy, and Hamzabali neighborhoods of Aydın province Yenipazar district in the Aegean Region, and Aydın Merkez-Yenipazar Participant LC and Aydın Merkez-Yenipazar Plain OFDS project areas belonging to these neighborhoods. (Figure 1). The main material of the research is the survey data conducted to determine the farmer satisfaction level in the aforementioned neighborhoods.

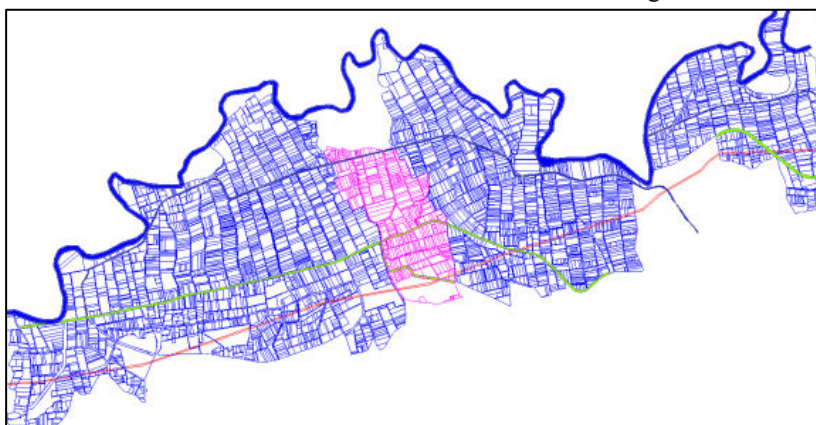


Figure 1: Aydın Merkez-Yenipazar Participant LC and Aydın Merkez-Yenipazar Plain OFDS project sites
The five neighborhoods considered within the scope of the project are located in the Aegean region, Aydın province, and Yenipazar district. Some information about the mentioned neighborhoods is given in Table 2.

Table 2: Research Area Geographical location and Population information

Neighborhoods	Longitude	Latitude	Distance to Yenipazar Town Center (km)	Distance to Aydın City Center (km)	Population (pcs)
Alhan	28° 10' east	37° 48' north	3.3	36.6	115
Çulhan	28° 09' east	37° 48' north	4.3	35.8	210
Dalama	28°04' east	37° 47' north	12.9	28.0	1615
Dereköy	28° 08' east	37° 48' north	5.1	35.2	364
Hamzabali	28° 07' east	37° 48' north	7.6	32.6	818

Mediterranean climate prevails in Alhan, Çulhan, Dalama, Dereköy, and Hamzabali located in the research area. Summers are hot and dry, and winters are rainy and mild. The products of farmers in Alhan, Çulhan, Dalama, Dereköy, and Hamzabali registered in the Farmer Registration System in 2019 are generally forage crops,



cotton, and vegetables. The people also cultivate fruit trees such as olives, oranges, and tangerines. Apart from this, livestock is also engaged.

After the LC project, it was decided to take the opinions of the farmers who benefited from the LC project to determine the satisfaction levels of the farmers. By determining the questions to be directed to the farmers, 250 questionnaires were conducted in Alhan, Çulhan, Dalama, Dereköy, and Hamzabali to examine whether the farmers were satisfied with these works after the LC. The questionnaire forms filled in for the producers in the enterprises within the scope of the research were examined one by one and the necessary control, completion, and editing processes were carried out, and this information was transferred to the Excel tables prepared beforehand. The answers given to the survey questions are expressed as percentages in tables and these expressions are shown visually with the graphic method. The questionnaire form used in the study is given in Figure 2.

Figure 2: LC and OFDS Projects Satisfaction Evaluation Survey Questions

Results & Discussion

In the survey conducted in 5 villages of Yenipazar district, the income status of the producers was asked, and 45% of the respondents stated that they live from agriculture and 6% from livestock. Most of the surveyed farmers (49%) stated that they make a living from both agriculture and animal husbandry. It is known that the LC project carried out in this research area is mostly beneficial for the farmers engaged in agriculture.

While the surface irrigation method was applied before LC in Alhan, Çulhan, Hamzabali, Dereköy, and Dalama regions where LC was made, the situation did not change after LC, and the surface irrigation method was continued in 27% of the enterprises. Before the LC was made, farmers ran irrigation channels across neighboring land boundaries to irrigate their fields. After the LC, this situation disappeared and irrigation points and water intake points of each farmer were determined. Satisfied with this situation, the farmers (73%) answered yes to the question of whether there was a change in their irrigation system (Figure 3).

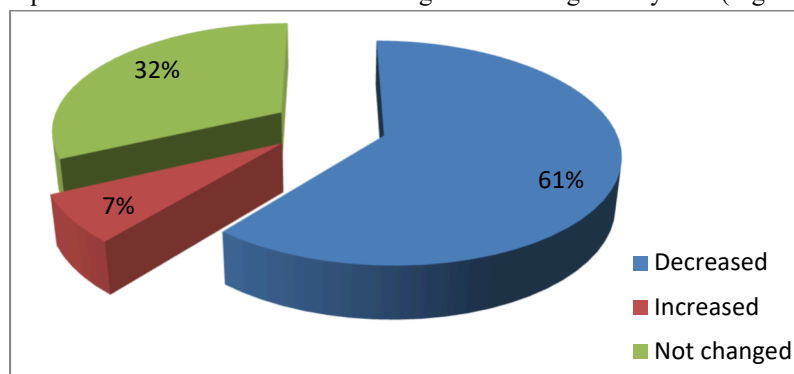


Figure 3: Changing the situation in irrigation costs after LC



According to the answers given, the farmers who want their irrigation systems to be pressurized closed irrigation systems instead of surface irrigation, still have not laid the irrigation canal or even though irrigation canals have been laid, they are faced with the problem of water not going forward from some parts of the irrigation canal due to the contractor's coding errors, so there has been no change in the irrigation system they have answered. After the LC, approximately 4% of the farmers irrigate their parcels by using groundwater resources with their means. The rate of those who stated that there was no change regarding the decrease in the amount of water used with LC is 74%. On the other hand, when the irrigation method has changed after the LC project, it has been understood that this has not changed at the rate of 70% and that surface irrigation methods are still applied [6]. In the Aydın Agriculture Master Plan [7], it was reported that as a result of the studies carried out within the scope of the Aydın Center - Yenipazar Plain Participatory LC Project, the parcels were brought into an ideal shape to make optimum use of the irrigation network. This situation has led to a positive change in irrigation systems as it enables many businesses that do not have irrigation facilities to benefit from irrigation water.

Difficulties are encountered in irrigation applications, and it causes the costs of irrigation networks to increase, the irrigation efficiency and irrigation rate to remain low despite the high investment cost [8]. During the meeting with the irrigation union officials of the region where the LC project was carried out, it was determined that there was no change in the irrigation fees before and after the LC. Looking at the results in Figure 5, most of the farmers who participated in the survey stated that irrigation costs have decreased. While the irrigation system was brought to many places after the LC was made, it was determined that the irrigation system was not introduced in some regions yet. In addition, it has been determined that the farmers irrigate their lands with the help of pumping, which causes an increase in irrigation costs. 70% of the farmers benefited from the irrigation network in the plain before the LC works, on the other hand, about 30% of them complained about the inadequacy of the irrigation network. [9] reported in their study that business owners generally have the view that it would be more appropriate and beneficial to carry out irrigation and LC projects together. [10] reported in the study of the Aydın – Yenipazar – Hamzabali LC field that the cost of a drip irrigation system per unit area varies according to the land characteristics, but it is 523.00 and 686.46 TL/da for cotton and 3.116.31 TL/da for strawberry. The researcher also stated that there is a need for alternative proposals for the establishment of a farm irrigation system within the scope of the LC project.

It has been determined that many farmers are not satisfied with both the waste of time and the fuel costs used total when planting, on their way to and from their land, due to the scattering of their lands. As a result of the LC project, it is planned to combine scattered lands and thus less fuel costs. As can be seen in Figure 4, according to the answers given by 69% of the farmers to the questionnaires, the combination of their lands, which are more than half of them in different places, as well as the fact that the combined lands are suitable for agricultural machinery, and the roads are smooth and the lands are close to the road. While they stated that there was a decrease in their costs, 3% of them stated that they had problems since there were no changes in the location of the lands with fixed facilities (vineyards, gardens, houses, artesian, etc.) They also stated that they did not experience any change in their expenses.

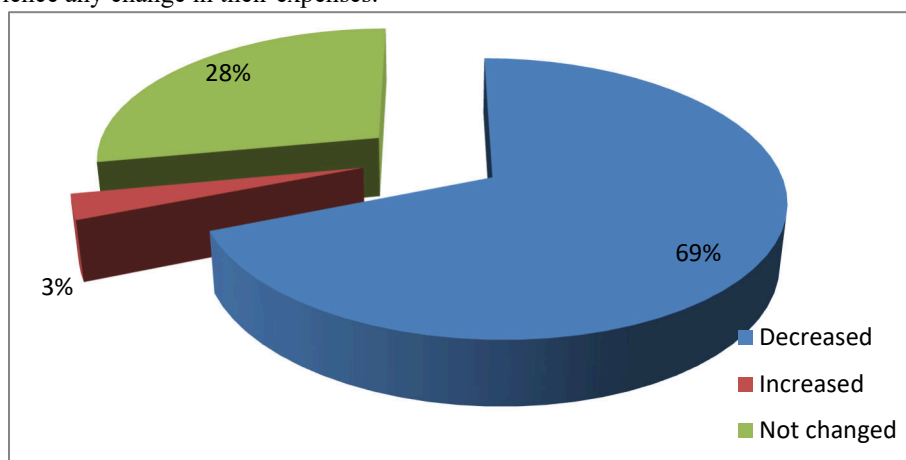


Figure 4: Reduction in diesel costs after LC



Fuel consumption depends on the road length as well as the smoothness of the roads. Therefore, while paying attention to the smoothness of the new roads to be built with the LC, the problematic roads before the LC project were slightly corrected with the LC. [11] conducted a study to investigate the effect of LC on fuel consumption and carbon dioxide emissions, and examined the effects of agricultural holdings on the topographic structure, distribution of parcels, size, road lengths, fuel consumption of tractors, and, accordingly, carbon dioxide emissions. As a result, they reported that after LC, fuel consumption and carbon dioxide emissions decreased due to the construction of new roads and the improvement of parcel shapes. [9] examined the reduction in the energy (fuel) cost of the LC project for irrigation and stated that 86% of the farmer's energy cost decreased and 14% did not. [12] in their study where they compared the road length and fuel consumption values before and after LC, reported that the use of tractors and machinery tools increased, and the use of combine harvesters decreased inversely. They concluded that the use of correct and efficient mechanization enables growth and development in agricultural enterprises. [13] analyzed the road lengths in LC projects and examined the bird flight distances from the operation centers to the parcels, the changes in the lengths of the field roads, and the fuel consumption values. They reported that after the LC project, as road lengths decreased, fuel consumption decreased accordingly, thus reducing carbon dioxide emissions and land operation times. [14] used the road network, area-road length suitability, and bird flight area-road length suitability values in their study to evaluate the road network efficiency of LC projects. Researchers determined the average road length value between the operation center and the parcels decreased by around 7%. They also reported that the operating system values of the roads between the village center and the enterprise parcels have improved. They determined that the decrease in the difference between road length and bird flight path length, which is an important indicator of the improvement in the operating system, reduces fuel consumption and the time spent on field roads, and stated that the most effective way that can be used in the development of road infrastructure in rural areas is provided by LC projects.

The scattered and small size of the parcels necessitates the use of more machinery and people during production activities and prevents intensive agriculture. Different geometric shapes, which are formed as a result of the shrinkage of the parcels with the increase in fragmentation, cause difficulties in transportation, loss of time, delay in planting, and prevent the parcels from benefiting from the infrastructure facilities. One of the main purposes of the LC is to correct the parcel shapes, and it is desired that the parcels in the lands to be planted should be as long and rectangular as possible because the agricultural machines work along the long side and make difficult turns on the short sides. When we look at the survey results in Figure 5, 89% of the farmers answered that planting was easy as a result of the ease of use of machines in the areas where planting and planting will be done by correcting the parcel shapes together with the LC, while 11% stated that there was no ease of planting in their lands.

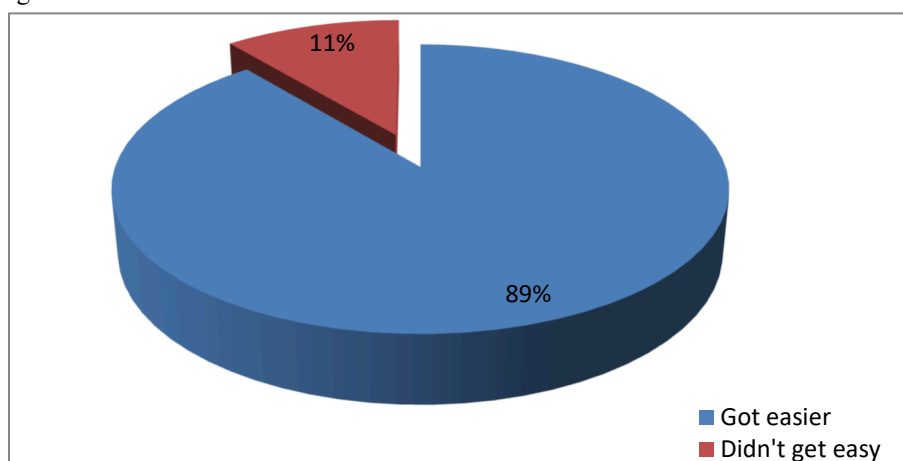


Figure 5: The situation of the ease of planting resulting from the correction of parcel shapes as a result of LC. When the workforce reduction with LC in the project is examined, it is observed that it has decreased by 90%. The formation of properly shaped parcels in the LC and connecting each parcel to the irrigation network reduces the need for labor [9]. [15] stated in their study that land fragmentation harms many stages of agricultural

production. Some stages of this agricultural production can be listed as planting, maintenance, fertilization, irrigation, and harvesting. They added that plot shapes are also an important factor that causes the decrease in agricultural production.

It is a situation that prevents successful agricultural mechanization as a result of the shrinkage of the parcels in agricultural areas and therefore the increase in fragmentation. While factors such as parcel size, parcel edge ratio, and parcel shape are of great importance in agricultural mechanization, tractors, and machinery suitable for the lands cannot be used because the majority of agricultural lands in our country are multi-part and small. As a result of not using machines that are suitable for the land, the success of the machine decreases, planting, fertilizing, harvesting times, and worker costs increase. As the parcel size increases after LC, the degree of planting, fertilizing, spraying, and harvesting machines increases, and thus, an increase is observed in the products obtained (Figure 6).

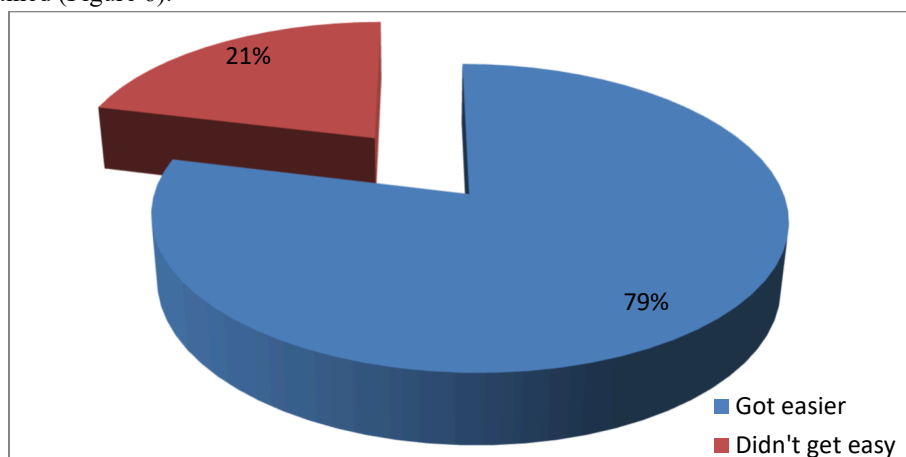


Figure 6: Planting, fertilizing, spraying, and harvest time status as a result of correcting the shape of the parcels with LC application

It has been seen that the long-sided and rectangular shape of the parcels after LC plays an important role in increasing the success of planting, fertilizing, and spraying machines. In the project area, while the rectangular parcel was 17.23% before LC, the proportion of rectangular parcels after LC reached 69.76%. The rate of crooked and shapeless parcels was determined as 9.52% and 16.19% [9]. [16] used the Kayseri-Pınarbaşı LC project as a material to investigate the effects of LC on agricultural enterprises. It was determined that there was a 35% decrease in the number of parcels after LC and a 35% decrease in the number of parcels per enterprise. In addition to the decrease in the number of parcels and the increase in the size of the parcels, it was determined that the time taken for tillage decreased and the time spent on the road shortened. For this reason, they stated that the dissemination of LC projects to solve some problems in agriculture would be beneficial for the country's agricultural sector.

Before the LC, farmers who thought that the mechanization expenses to be made for the processing of small and fragmented lands were more than the income from the products, left their very small lands empty. With the combination of small and fragmented lands after LC, farmers observed that they experienced an increase in yield per hectare when they started to use the lands they left empty. Looking at the survey results, which are graphically indicated in Figure 7, 68% of the farmers said that the yield increased; 32% of the farmers, whose lands are not close to the road, whose lands have not changed due to irrigation and drainage channels passing through their lands, who have conflicts with neighboring lands, have fenced their lands, and these fences, which are erected by the farmers, prevent some land works (soil cultivation, fertilization, spraying, irrigation). As a result, farmers stated that they did not experience an increase in the yield per hectare.



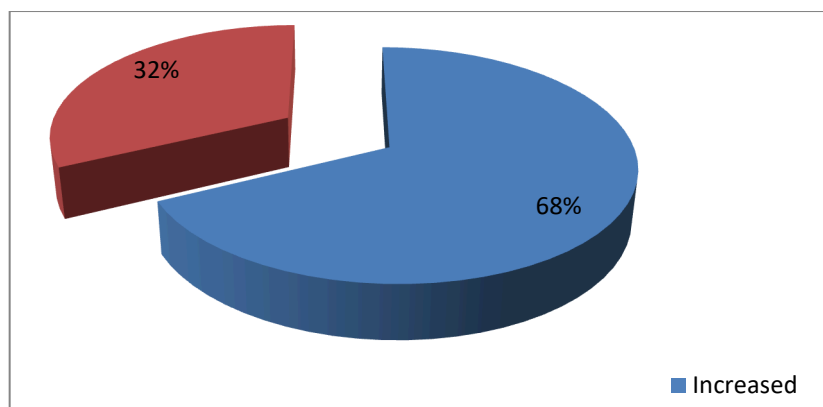


Figure 7: Yield per hectare with LC

[17] investigated the effect of LC on the land value by surveying 50 business owners in their study in Konya Province Alanözü Town. At the end of the study, it was determined that with the increase in irrigation and transportation opportunities provided by LC, a significant increase in yield was achieved in the lands and this allowed the increase in the land value. In their study, [18] measured the inefficiency caused by fragmentation, especially the damages caused by the border effect in the parcels, and discussed possible measures to reduce the losses. As a result, it was determined that the land fragmentation in olive groves significantly reduced the yield of olive groves. [9] reported that for 80% of the farmers in the area where LC was made, an increase in the efficiency in the irrigation area was achieved, and it was stated by the farmers that this increase in yield occurred with LC.

In Alhan, Çulhan, Dalama, Dereköy, and Hamzabali where LC was made, 58% of the farmers stated that the value of their lands increased due to the increase in yield, the easy and low cost of irrigation opportunities, and the closeness of their lands to the road after the project; 42% of the farmers stated that there was no change in their lands due to conflicts with neighboring lands and the problems of having fixed facilities on their lands and that there was no increase in the land value of the farmers (Figure 8).

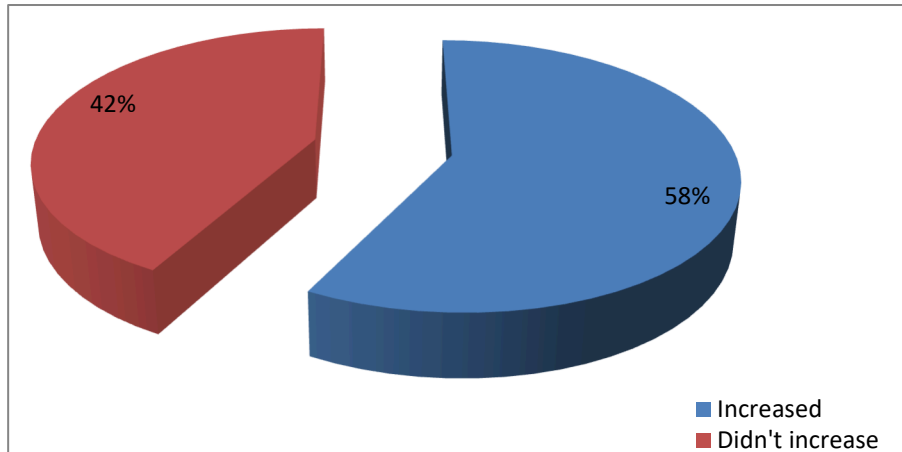


Figure 8: Land value after completion of LC

With LC, the number of parcels decreased from 1108 to 420. After the LC project was completed, it was observed that there was a 37% decrease in the number of parcels before the project started. The average parcel size increased from 0.48 hectares to 1.27 hectares [6; 10]. [17] investigated the effect of LC on the land value by surveying 50 business owners in their study in Konya Province Alanözü Town. At the end of the study, it was determined that with the increase in irrigation and transportation opportunities provided by LC, a significant increase in yield was achieved in the lands and this allowed the increase in the land value. With the LC project, the land fragmentation was reduced and it was determined that the improvement of the parcel shapes increased the land value. The consolidation rate value of the Dalama neighborhood was determined as 62%, and the irrigation rate value was determined as 94.69%. The number of rectangular parcels in the study area, which was 17.23% before the LC project was completed, increased to 69.76% after the project was completed [9]. In the



survey study conducted by [10] in the village of Hamzabali on the Yenipazar Plain, the reasons for the satisfaction of the farmers with the project were asked. The most important return of LC in the project area is the collection of lands, although there is a certain change depending on the land presence. In order of importance, the second positive effect of LC is the increase in the land value of the enterprises, and the third important issue is the improvement of the roads to their lands.

It has been tried to determine how satisfied or not the farmers are with the LC studies. If they are not satisfied, why? What should be done to increase the level of satisfaction, and what is missing in the LC project? This study aimed to determine with the results of the survey. Thus, considering these deficiencies in the LC studies to be conducted from now on, it is aimed to carry out the studies in a way that will increase the satisfaction level of the farmers (Figure 9).

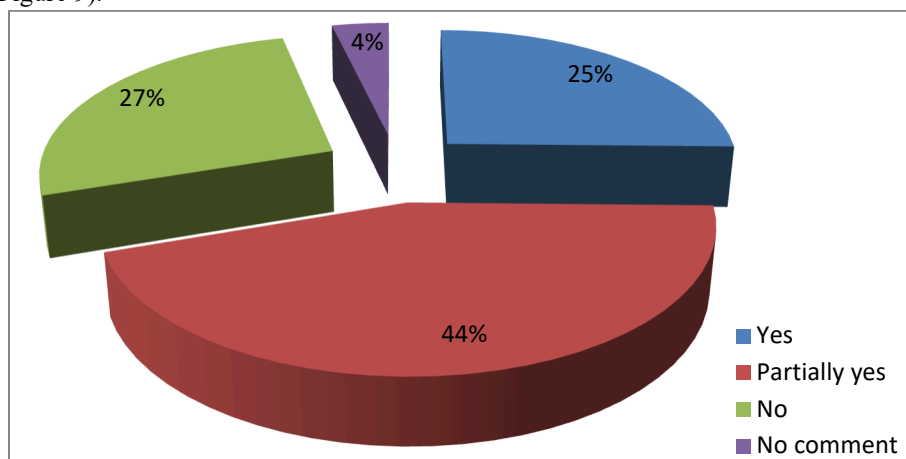


Figure 9: Farmer satisfaction with LC

When we look at the results of the survey, it was determined that 25% of the farmers were satisfied with their LC, 44% would be satisfied if the problems in our irrigation system were corrected, and 27%, did not have any change in their land areas because they had fixed facilities, partially answered no. [19] conducted a study in Eskişehir Beyazaltın Village to evaluate irrigation performance in the LC area. In the survey study, those who participated in the survey reported the satisfaction level of water service as 100%. The road service provided by LC is another development that makes the farmers very satisfied. [20] examined the land assets of 161 owners, their wishes for participation in the LC, and their ideas and thoughts after the LC in their research to determine the awareness levels and satisfaction levels of farmers about LC. In the study, they concluded that raising the awareness of business owners is very important in the success of LC projects. As a result of the interviews [10] conducted with the business owners in the Hamzabali village of Aydın Yenipazar plain, it was seen that the business owners were generally satisfied with the location of the lands they owned after the project. However, when we look at the rates, it has been observed that as the land assets decrease, the satisfaction of the farmers decreases in direct proportion to the fact that the demands of the enterprises are not met. As a result of the surveys, it was seen that 45% of the surveyed business owners were satisfied with the LC project. Although this rate is not generally seen as a high figure, it should be noted that the OFDS project, which was carried out together with the LC project, was not yet completed at the time of the surveys. Factors such as the incomplete drainage work in certain regions and the fact that some of the irrigation canals have not been actively used yet affect the satisfaction of the farmers. It is thought that 24% of business owners report that they are undecided because of such incomplete field development services.

To the question “Would you recommend the LC project to the villages that have not been consolidated?”, which was asked to the farmers in the region where the LC project was carried out, 84% of the farmers answered yes, I would (Figure 10).



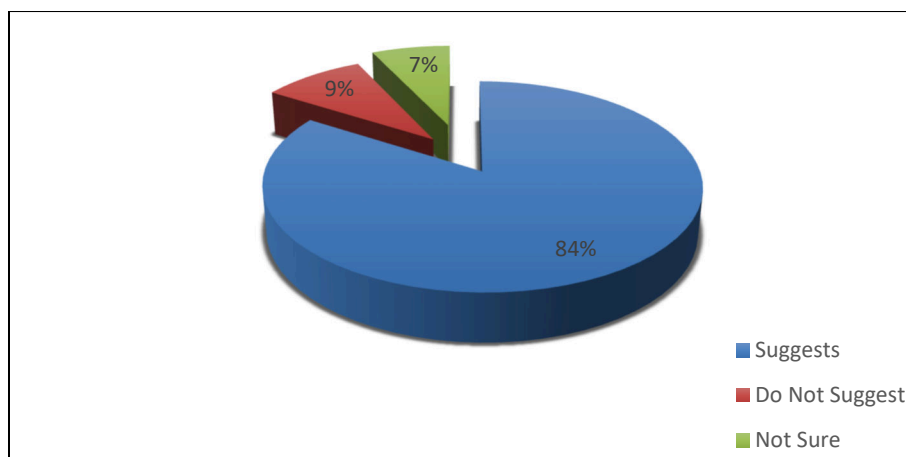


Figure 10: The situation of the farmers benefiting from the LC Project suggests the project to other villages

Thanks to the works done with the LC project, the value of our land, the quality of our products, and the yield of our products have increased, while we want our fellow farmers to benefit from them; It was observed that 9% of the farmers who thought that the results of the surveys would not be evaluated answered: "I am not sure". Finally, looking at the results of the survey, it was determined that 7% of the farmers who were uncomfortable with the irrigation system answered "no" to solve the problems in the irrigation systems. [21] stated that land fragmentation is one of the factors that hinder the development of rural areas. In their study in the Southeast Galicia region of Spain, the state and business owners reported that small-scale land sizes pose a problem. Researchers stated that they did not recommend traditional LC studies in their studies due to the high level of land fragmentation and high cost. In their studies, they stated that it is possible to prevent land fragmentation and sustainable agricultural enterprises can be established by considering the rights of farmers and more suitable for LC. They stated that this can be solved by preventing land abandonment, that is, leaving the lands empty or out of use for other reasons, protecting property rights, and increasing labor efficiency.

Conclusion

The increase in water use as a result of the fragmented, small, and shapeless agricultural lands is due to insufficient field development services. To solve these problems, these services need to be improved. Since the improvement of field development services and the increase in production will contribute to the country's economy, LC and irrigation investments should be made together with LC studies. In this research, within the scope of Aydın Merkez-Yenipazar Participant LC and Aydın Merkez-Yenipazar Plain OFDS, the satisfaction of farmers as a result of field development services in Alhan, Çulhan, Dalama, Dereköy and Hamzabali neighborhoods was tried to be determined by questionnaires.

Since LC studies are long-term studies, the realization of these projects is time-consuming and requires multi-faceted studies, so they have to be applied together with many infrastructure services. This situation creates results such as satisfaction or dissatisfaction in farmers. These two situations have been examined in the survey studies, and the satisfied farmers are satisfied for many reasons such as the fact that their lands are in the collective area and the land values are increased accordingly, the field roads are repaired, the input costs are reduced by leveling, and the time is saved. When we look at the survey studies, the high rate of recommending LC studies to other farmers, such as 84%, shows that LC is beneficial to farmers and other farmers are requested to benefit from these studies. Another important element of carrying out these survey studies is to learn what kind of problems the farmers have here and their expectations, and they can continue their work by considering these problems in the LC project to be carried out in another place.

When we look at the results of the survey, considering the wishes of the farmers who are not satisfied with this study, studies should be carried out on the improvement of the roads, irrigation canals, and land leveling in the project area. Thus, it is ensured that all farmers benefiting from the project are satisfied.



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