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AGRIBUSINESS

Production costs and land appraisal: A case study of Polatlı, Turkey

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ABSTRACT: *In this study, the share of land rent in the fixed costs of wheat production was examined, and the aim of the study was to find land values using cost tables. To this purpose, we showed the effect of these on land values from the difference between field rents and net income. The study covered the district of Polatlı in Ankara province. Data on wheat production in Polatlı in 2017 was collected from six villages and 37 farms by means of a questionnaire. In selecting the farms, the ability to determine the land rent was taken into account as a selection criterion. The farms examined used on average per hectare, 11.9 hours of labor, 7.7 hours of draft power, 354.3 kg of fertilizer, 205.5 kg of seed, and 1.5 liters of agricultural chemicals. The average wheat production cost per hectare was $865.42; the average unit production cost was $0.23, and the production value was reported to be $1012.40/da. In this study, the land rent was of $225.40, and the net income from the land was reported to be $372.42. It was reported an evaluation performed using the taxation tables that land values according to rental incomes were $4508.80/ha, and $7448.40 when the land was worked by the landowner. Land rent constituted 26.05% of total production costs, and were equivalent to 22.26% of production value. When crop prices increased by 1%, income from the land increased by 4.49%.*
Key words: *production cost, physical inputs, land rent, income capitalization method.*

Custos de produção e avaliação de terras: Um estudo de caso de Polatlı, Turquia

RESUMO: *Neste estudo, a participação do arrendamento da terra nos custos fixos da produção de trigo foi examinada, e o objetivo do estudo foi encontrar os valores da terra usando tabelas de custos. Para tanto, buscou-se mostrar o efeito destes nos valores dos terrenos a partir da diferença entre os aluguéis dos campos e a receita líquida. O estudo cobriu o distrito de Polatlı na província de Ancara. Os dados sobre a produção de trigo em Polatlı, em 2017, foram coletados em seis aldeias e 37 fazendas por meio de um questionário. Na seleção das fazendas, a capacidade de determinar o aluguel da terra foi levada em consideração como um critério de seleção. As fazendas examinadas consumiam em média por hectare 11,9 horas de mão de obra, 7,7 horas de força de tracção, 354,3 kg de fertilizante, 205,5 kg de semente e 1,5 litro de agroquímicos. O custo médio de produção de trigo por hectare foi de $ 865,42; o custo de produção unitário médio foi de $ 0,23, e o valor de produção foi de $ 1.012,40 / da. Neste estudo, o arrendamento da terra foi determinado em $ 225,40 e a renda líquida da terra em $ 372,42. A partir de uma avaliação realizada com base nas tabelas de tributação, verificou-se que os valores dos terrenos de acordo com a renda do arrendamento eram de $ 4508,80 / ha e $ 7.448,40 quando a terra era trabalhada pelo proprietário. A renda da terra constituiu 26,05% dos custos totais de produção e foi equivalente a 22,26% do valor da produção. Quando os preços das safras aumentaram 1%, a renda da terra aumentou 4,49%.*
Palavras-chave: *custo de produção, insumos físicos, aluguel da terra, método de capitalização de renda.*

INTRODUCTION

Agricultural crop costs are frequently used by agriculture experts in determining land values, along with their use as policy determinants in many fields such as intervention purchases and effect analyses. In Turkey, the valuation studies, which have the greatest need for production costs are appropriation, consolidation, damages assessment, application for credit, and determination of farmers' income.

In Turkey, there are various problems concerning calculating production costs and their use in valuing land, and in general high production costs continue to be the most important current problem in agriculture (KESKİN et al., 2014). The most important reasons for this are high input costs and dependence on the outside for energy, and the lack of an organized structure for inputs to be provided under suitable conditions. As well as being used in the evaluation of the economic efficiency of farms, production costs

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and income research can be used for many different purposes such as business accounting, producer welfare analysis, agricultural income calculations, regional, national, and international competitive strength analyses, profitability, productivity calculations, agricultural policy analysis, production planning, and agricultural projections (KIRAL et al., 1999). At the same time, accounting records are not kept in farms, so data was collected by questionnaire, and cost studies by provincial or district agriculture authorities and academic studies by researchers are the only data sources.

Of the three million farms in Turkey, 64.8% are less than five hectares in area, and these farms constitute 21.3% of the total of farmed land. Crop production and animal rearing are conducted together on 67% of farms, while 3% of all farms practice animal rearing alone. According to the results of the Agricultural Structure Management Study, there has been an approximately twofold increase in the number of farms which are rented, and in 2016, the proportion of these farms rose to 3% (TUİK, 2020).

The main crop in Turkey in terms of planted area and production quantity is wheat, which also has a strategic importance for all countries for food security. Wheat production provides farmers with food security, while animal rearing is a source of income and a long tradition, so that these activities are carried out on almost all farms. Recently, grain has been used not only for food, but also in increasing quantities as a renewable energy source. So that if world energy policies continue in the same way, the demand for food will be accompanied by non-food demand (DELLAL & KESKİN, 2008), and an increase in the demand for land will cause a change in land prices (TİETZ, 2019). The district of Polatlı has a climate and land area which are suitable for cereal production, and high potential for marketing and storage, being the region's grain storehouse (KOÇAK & AYDIN, 2020). Approximately 1.7% of Turkey's wheat production takes place in this district, and wheat is produced on approximately 76.5% of the 1.7 million da of the land where field crops are grown (ANONYMOUS, 2017). According to data from the Farmers' Registration System (FRS) and the district directorate, wheat is produced in all villages of the district.

In this study, wheat costs were calculated for villages where there was field activity and where field rents could be ascertained in Polatlı, which is the most important district in Ankara province for wheat production. An examination was made on the difference between field rents and net income, and the use of this in valuing land. The particular value of this study is to show that the type of farm is also important in determining land values according to the capitalization of incomes method, and to point out that with an increase in the future in farms, which are rented, this will also be important in evaluations.

MATERIALS AND METHODS

The material of this research consisted of data collected by questionnaire from farms producing wheat in the district of Polatlı. The questionnaires were completed by face-to-face interviews with the farmers in January 2018, and covered the production season of 2017. The questionnaires used in data collection were prepared with the help of cost tables used in studies of agricultural economy.

In selecting villages where intensive wheat production was conducted, FRS data and the views of technical staff working in the area were taken into account. Thus, farms producing wheat in the villages of Şabanözü, Yeniköseler, Çanakçı, Eskikasnak, Yenice, and Basri, which represented the area in terms of agricultural technique, formed the population of the study, and data obtained from 37 farms was used in the analysis. In the selection of the farms, the possibility of determining land rent was also taken into account as a selection criterion.

Data collected in the field consisted of the amount of physical input use, production procedures and time, and input and output prices. In calculating costs, the prices paid by the farmers for input, which they bought and farmyard prices of output were taken into account. Product cost tables were created taking account of all work carried out by others for pay, and for this reason, the tables do not show factors such as depreciation and interest.

The ideal way of valuing agricultural land is by evaluating it according to market prices. However, market prices are not always accessible either because no comparable land is being sold in the area or because sales are not taking place under free market conditions (KÖHNE, 1993; GEKLE, 2002; MÜLAYIM, 1993). In Turkey, the agricultural land market is static, and there is little buying and selling unless it is compulsory, so that valuation must be performed according to income. For this reason, the income capitalization method is the method most used in determining agricultural land values, and the only sources for experts to calculate net income are crop cost tables.

In the study, wheat production costs were first calculated, and land values were determined from cost tables. Because there was information on yield

and crop prices on the production cost tables, it was possible to calculate income. In the study, economic profit was reported by subtracting total production expenditures from total wheat production value. Positive economic profit depended on the net income obtained from the land being greater than the land rent. The greater this difference, the more the profit will be correspondingly. When the landowner works the land himself, the net income goes directly to the landowner, but when the land is rented out, the rent is determined by the two sides, according to supply and demand, and the rent received by the landowner constitutes the rental income (KÖHNE, 1993). Calculating the net income allows the farmer to value the land, and it determines a limit in offering a rental price, which can be paid for the land (GARVERT, 2017; ANONYMOUS, 2012).

Thus, the main factor in determining economic income is the net income to be obtained from the land. However, the main factor used in calculating the net income is different according to whether the land is rented out or whether it is worked by the landowner himself. In this study, the approaches set out below were used in determining land values in both of these cases (KÖHNE, 1993; MÜLAYIM, 1993; KESKİN, 2000; GWARTNEY, 2014; ENGİNDENİZ et al., 2015).

When the landowner works the land himself,

Net income = gross production value - production expenditure other than land rent

Gross production value = (main crop yield * main crop price) + (byproduct yield * byproduct price)

Production expenditure other than land rent = running costs (seed, fertilizer, marketing costs, etc.) + labor costs + machine rental + working capital interest + general administrative expenses + land tax.
In the case of rental,

Net income =∑(e)-∑(m)

where e = rent in cash or kind, and m = landowner's expenditures (land tax, etc.)

Unit cost = (Total costs – byproduct income) / Main product yield

Total costs = Variable costs + Fixed costs
Variable costs = running costs (seed, fertilizer, marketing costs, etc.) + labor costs + machine rentals + working capital interest
Fixed costs = General administrative expenses + Land rent

In this study, the land rent in the wheat cost tables was reported by taking into account the average rents of similar land in the area, and represented opportunity cost. There was no property tax on land because of pre-2020 regulations. Therefore, in rental, net income was directly accepted as the land rent in the cost tables.

In determining land values according to income, it is necessary first to find the net income and to determine a suitable capitalization interest rate for the area (KÖHNE, 1993; MÜLAYIM, 2001; GWARTNEY, 2014). Thus, the capitalization interest rate used in experts' reports was accepted as 5%, and land values were determined using the following equation (MÜLAYIM, 1993; MUNDT, 2018; KOESTER & von CRAMON-TAUBADEL, 2019):

$$D = R/f$$

where D = land value; R = net income, and F = capitalization interest rate.

Because accounting records are not kept on farms in Turkey, crop costs and land valuations were assessed from data collected in the field by questionnaire. When experts assess land for various reasons, the most important sources are the cost tables prepared by the provincial or district Agriculture Organizations. Therefore, the focus was placed on the use of cost tables in valuation, and the year 2017 was selected because it had an average production season agriculturally. Also, it was intended in this study to bring attention only to differences in method which emerged, without paying attention to crop rotation.

The most important limitations of the study are that records are not kept on the farms, and that most of the time, true land sales cannot be securely ascertained. For this reason, the income method is frequently used, especially because of expropriation, in the determination of land values. The most important particular value of this study is that it shows that when land values are determined by the income method, the type of farm is important.

Literature

It is seen in many studies of production costs that land rents are an important part of production costs (TÜZÜN, 1993; GÜNDOĞMUŞ et al., 2001; BİRİNCİ & KÜÇÜK 2004; DEMİRCAN et al., 2005; ALEMDAR et al., 2014; SUBAŞI et al., 2016; SEMERCİ, 2020).

DOLL & KLARE (1996) stated that the main determinant of land rents was the natural fertility of the land, and that in multiple regression analysis, 70-80% of the variation in the net income from land was explained by fertility.

KESKİN (1997) carried out a study in order to determine the capitalization rate, and it was found that both land characteristics and the type of management affect land value. Individual capitalization rates are calculated for irrigated land and dry base lands and

dry side lands cultivated by sharecropper, tenancy or Land-owner, and the reasons for the differences among these rates are interpreted accordingly.

In a study assessing methods used in the calculation of production costs, ÇAKIR (2005) summarized the problems arising from them. In this study, cost calculation methods of Turkey and other countries were compared, and the methods of calculating agricultural production costs and differences in technique of agricultural institutions were assessed.

Teuvsen (2007) stated that all the risks and opportunities in land rental belong to the tenant, and that any fall in yield or significant reduction in crop prices will have a negative effect on the tenant's income and liquidity. When rent prices are determined on base values, the tenant and the landowner shoulder risk and opportunities arising because of changes in yield, and the price of crops jointly.

HABERMANN & BREUSTEDT (2009) researched regional rent differences in Germany using Agricultural Structure Questionnaires, and reported that the income of a well-run farm increased rent by 10%, and that this value affected neighboring farms, which showed an increase of 7%. It was determined that regional differences in rents were explained by natural conditions and different farm structures and characteristics related to this, and that the state of regional competition played an important role. In studies relying on a regional-econometric approach, HABERMANN & ERNST (2010) concluded that land rents were significantly positively affected by wheat yield, the share of sugar beet and potatoes, traditional cattle rearing, and the share of horticulture. The rental payment is related to the net income to be obtained by the tenant, while on the other it is related to how much other potential tenants will pay according to the competition in the area.

In the valuation of land, the net income obtained from the land and the land rent are important factors. In economics, there are two basic approaches to the source and origin of net income, the classical and neoclassical approach and the Marxist approach. In the classical school of economics, the foundation of the concept of net income was laid by Adam Smith and David Ricardo, and in the Marxist approach by Marx. From the time of Ricardo and Marx until now, the most talked-about topics in economics have been landing rent and costs, and net income. Many studies have been performed on the concept of net income, and the factors determining the relationship of net income to land and land rents, and rents and land values (KÖHNE, 1993; DOLL & KLARE 1996; GEKLE, 2002; ÖNAL, 2004; SOYAK, 2007; HABERMANN & BREUSTEDT, 2009; HABERMANN & ERNST, 2010; GWARTNEY, 2014; ENGİNDENİZ et al., 2015; ÖZEL 2015; GÜLTEKİN et al., 2016; GARVERT, 2017; WÜRSCH et al., 2018; YALÇIN et al., 2018; GÜNDOĞDU, 2019; KOESTER & von CRAMON-TAUBADEL 2019; TIETZ, 2019).

GWARTNEY (2014), in describing valuation methods, examined the determination of rents and land value, and stated that rent could be determined by many methods. These methods are as follows: land rental comparison, proportional land rental relationship, developmental analysis land residual, allocation land ratio, extraction of land rental value, ground rent of leased land, and subdivision development estimating land rental value.

ENGİNDENİZ et al. (2015) stated that in order to be able to make valuations of agricultural land by the income method, an attempt was made to determine net income obtained from land of unknown condition. For this reason, they stated that it was necessary not to include rent, which could be evaluated as the net income of the land, in production expenses.

GARVERT (2017) stated that net income had an important effect on land rent in farms, and that for this reason rent variation between farms and increases in rents over time directly explained price increases. Calculation of the net income of the land shows the landlord the maximum level in determining rent. However, the effect of an entrepreneurial personality and land with the same characteristics bring about a willingness to pay differently, the tenant does not give the whole of the net income of the land to the landowner, and the distribution of this between tenant and landowner varies according to regions.

KOESTER & von CRAMON-TAUBADEL (2019) assessed the relationships between land rent and sale value by explaining the relationship between net income and land rent, and examined the importance of expectations in the setting of prices. The relationships between rent and sale price in the condition of having complete knowledge of land price were also analyzed with mathematical models. According to this, in the model which they used when explaining the relationship between crop prices and net income, they reported that a change in crop prices would bring about a greater change in net income. Koester and von CRAMON-TAUBADEL (2019) proved mathematically that percentage change in net income ($\frac{dP^B}{P^B}$) was equal to percentage change in crop prices ($\frac{dP}{P}$) multiplied by the share of the rent in production income ($\frac{P\theta}{\theta^B P^B}$).

Research findings

Table 1 shows the amounts of physical input used in wheat production. According to this, it was reported that for each hectare, 354.30 kg of fertilizer, 205.50 kg of seed, 1.50 liters of chemicals, 11.90 hours of labor, and 7.70 hours of mechanical power were used (Table 1). It was found in a study by TÜZÜN (1993) that 11.0 hours of labor, 7.90 hours of mechanization, 193.00 kg of seed, 260.00 kg of fertilizer, and 0.97 liters of chemicals were used. In another study conducted in the district of Polatlı, it was found that an average of 190-345 kg of fertilizer, 195-270 kg of seed, 6.40 hours of mechanization, and 7.70-8.90 hours of labor were used (ŞEN, 2005). Finally, GÜNDOĞMUŞ et al. (2001) determined an average use of 15.6 hours of labor, 8.8 hours of traction power, and 215.8 kg of seed.

In the Polatlı region, sowing generally takes place in October, and an average of 200-250 kg per hectare of seed is used. The Esperia and Bezostia seed varieties are mostly preferred in the region. At sowing, 150-200 kg per hectare of DAP fertilizer is applied. The first application of fertilizer after sowing is in February or March, using 100-300 kg per hectare of urea fertilizer. The use of composite (20-20-20) and 26% nitrogen fertilizer is seen on fewer farms. Nitrogen fertilizer is applied at 100-200 kg ha, and composite fertilizers at 180-200 kg ha. Application of agricultural chemicals generally takes place in April, and the herbicides Ester and Granstar are generally used against weeds. Also, measures are taken against corn bugs *(Eurygaster integriceps)* if these are seen.

Harvesting and threshing begins at the end of June, and continues to the middle of July. The crop is taken to the Land Products Office in Polatlı, where it is sold. In this study sometimes the byproduct of straw is given in payment to the person performing the harvesting and threshing. Only four farms in the study insured their crop, and it was found that most farmers owned tractors, but that most of the tractors had passed their depreciation threshold.

According to table 2, which shows the distribution of cost factors by production operations, the average variable costs in wheat production were $621.34/ha (71.80%), fixed costs were $244.08/ha (28.20%), and the average cost of wheat was $0.23/ha.

In this study, land rents constituted 26% of the costs of wheat production, and 22% of the production value obtained from the land went to the land rent. According to the mathematical equation used by KOESTER & von CRAMON-TAUBADEL (2019), a 1% change in crop prices would cause a 4.49% change in net income.

Land rent forming 26.05% of total costs was seen to be a very high proportion. In other studies conducted in Polatlı, this figure was found to be 17.79% by TÜZÜN (1993), 4.03% by ŞEN (2005), and 36.86% by GÜNDOĞMUŞ (2001). The value reported in this study shows that the demand for agricultural land has increased, and a similar situation has been observed in studies conducted recently in various provinces by chambers of agriculture and provincial agriculture directorates (ALTINTAŞ & ALTINTAŞ 2012; YILDIRIM & DEMIRKOL 2019). In addition to this, the increase in land rents has been greater than inflation (GWARTNEY, 2014).

Wheat farming is a production activity, which depends on agricultural mechanization and uses little labor. Table 3 shows the farms' average labor costs and productivity. It was found in this study that labor was 3.55% of costs, and mechanical power 30.81%. Mechanical power costs were found to be high: the average price of diesel fuel in 2017 was 4.69TL with a dollar rate of above 3.65TL, and the depreciation threshold of the tractors used had mostly passed. GÜNDOĞMUŞ et al. (2001) reported labor to have a 2.72% share of wheat production costs in the district of Polatlı, while mechanical power had a 16.65% share.

Figure 1 shows the net income, land rent, and economic profit of the farms examined. For the economic profit of the farms to be positive, net

Table 1 - Farms' Average Input Use.

	Farm average
Labor (h/ha)	11.90
Machine power (h/ha)	7.70
Chemical fertilizers (kg/ha)	354.30
Seed (kg/ha)	205.50
Chemicals (lt/ha)	1.50

Table 2 - The Cost of Wheat Production in Polatlı District (US$/ha) (2017).

	US$/ha	%
Plowing	151.11	17.46
Sowing	182.36	21.07
Chemical fertilizers	87.32	10.09
Application of chemicals	41.12	4.75
Irrigation	45.75	5.29
Harvesting and threshing	36.16	4.18
Baling	15.90	1.84
Transport to storage	18.86	2.18
Transport to market and sale	12.38	1.43
Crop insurance	0.80	0.09
Variable costs	591.75	68.38
Working capital interest (5%)	29.59	3.42
Total variable costs	621.34	71.80
Land rental fee	225.44	26.05
General administrative expenditure (%3)	18.64	2.15
Total fixed costs	244.08	28.20
TOTAL COSTS (TC)	865.42	100.00
Yield (kg/ha)	3 407.22	-
Selling price (US$/kg)	0.27	-
Byproduct yield (kg/ha)	1 513.74	-
Byproduct selling price (US$/kg)	0.05	-
Cost (US$/kg)	0.23	-
Gross Production Value (US$/ha)	1 012.40	-
Net profit (Gross Production Value -TC)	146.98	
Relative profit (Gross Production Value /TC)	1.17	

income must be greater than rent. Otherwise, there will be no profit, because it will not be possible to meet land rent payments. As the difference between net income and rent increases, economic profit will also be high. In this way, the rent of some farms was found to be higher than the net income. This shows the risk concerning the viability of the farms: if the landowner does not want to carry on production on the land himself, potential tenants will not rent the land. In functional markets, successful farms are effective in determining prices, and the net profit of these farms determines rent (GARVERT, 2017).

Land rental shows significant differences between countries, and these differences concern not only the proportion of land which is rented, but also whether farms or fields are rented. There is a difference between renting a whole farm, and renting a part of the land (GARVERT, 2017; KÖHNE 1993). Rent decisions for farms are made according to short and medium-term evaluations, while land purchases are made according to long-term expectations (HABERMANN & von CRAMON-TAUBADEL, 2019. If the farm is always rented out, its value must be assessed according to rental income, but if the landowner is working the land himself, net income should be considered. It can be seen in table 4 that there is a significant difference between the two. In Turkey, approximately 3% of farmers rent land (TUİK, 2020). In the research area of Polatlı district, ŞEN (2005) reported that a total of 7.8% of farmers were tenants, and GÜNDOĞMUŞ et al. (2001) found the figure to be 7.4%. The widespread situation in agricultural renting in Turkey is not that all farms are rented, but that in renting, the agreement is generally verbal and for one growing season.

There are no studies of the capitalization rate in the region, and experts use 5% as the rate for both managements, and so the capitalization rate was taken as 5% in this study. However, because of the difference between net rent and net income, land values showed a significant difference according to the way they were managed (Figure 2). An increase in land price and rent reduces earnings, and it is important for producers in the region what the maximum rent will be. In some

Table 3 - Productivity in Wheat Production on the Farms Examined (2017).

	Farm average
Labor cost (US$/ha)	30.72
Mechanical power cost (US$/ha)	266.62
Seed, fertilizer and chemicals cost (US$/ha)	225.14
Labor cost share (%)	3.55
Mechanical power share (%)	30.81
Seed, fertilizer and chemicals share (%)	26.02
Labor productivity (US$/h)[1]	85.00
Labor productivity (US$/h)[2]	12.34
Labor productivity (kg/h)[3]	286.06
Land productivity (US$/ha)[4]	4.49

[1]Gross production value/labor demand [2]Net profit/labor demand [3]Yield by decare/labor demand [4]Gross production value/land rent.

studies, it is stated that the maximum rental payment which people are willing to make for land is the net income of the land, and that rent can be found as 2/3 of the net income of the land, or the remaining value of the net income after a certain monetary remuneration per hectare (ANONYMOUS, 2012). According to this, the highest rent payment, which the tenant will tolerate is $372.42/ha, which is the net income obtained from the land, and if rent is accepted as 2/3 of the net income, the rental payment will be $248.28/ha.

DISCUSSION AND CONCLUSION

In this study, in which a cost analysis was made of wheat production in the district of Polatlı, and land values were determined according to cost tables, it was found that in the production year of 2017, the price of 1 kg of wheat was $0.27, and the cost of wheat was on average $0.23. The income approach was used in the study in valuing land to examine the values of rented and owner-farmed land

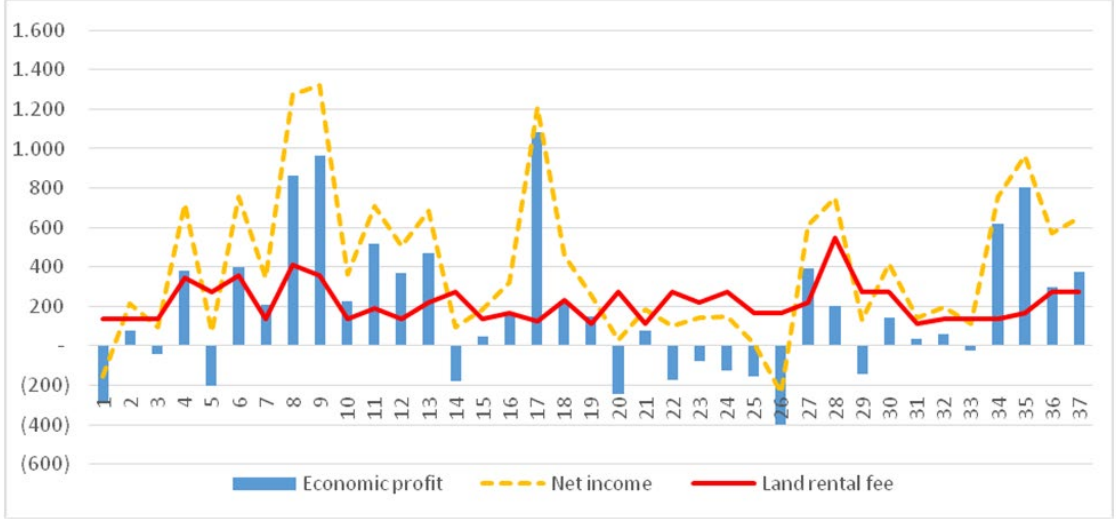

Figure 1 - Land rent, net income and economic profit (US$/ha).

Table 4 - Average land values according to type of management (US$/ha).

	Rented	Farmed by owner	Difference
Net income	225.44	372.42	146.98
Capitalization rate (%)	5.00	5.00	-
Land value	4 508.80	7 448.40	2 939.60

and the differences between them. In this way, it was reported that the average rent for wheat land in the area was $255.44/ha, net income was $372.42/ha, and land value was $4 508.80/ha for rented land and $7 448.40 for land worked by the owner. These values, which were found by the income capitalization method, are average values for the region, and are important for deciding sale prices. However, because the land is heterogeneous, expectations relating to the future and specific conditions of the land must be known, and if there is a market price that can be determined, a comparison must be made with these (KÖHNE, 1993; MÜLAYİM, 2001; KOESTER & von CRAMON-TAUBADEL 2019). In this study, according to the mathematical model used in the study by KOESTER & von CRAMON-TAUBADEL (2019) proving that the variation in net land income was greater than the variation in crop prices, land rent was equivalent to 22.26% of production value, and when there is a 1% increase in crop prices, net income rises by 4.49%. When land is scarce or in high demand, this is reflected in rents, which at $255.44 is below $372.42/ha, which is the maximum acceptable as rental value, whereas it was reported to be close to $248.28, which is 2/3 of the net income. Agricultural land is not homogeneous and it is not always possible to find suitable land with which to make a comparison, and this makes it difficult to make assessments by the market price method (KÖHNE, 1993; MUNDT, 2018). In Turkey, there is little buying and selling of land, and most sales are not normal sales, so it is seen that evaluation carried out according to income obtained from the land is the only method, which can be applied.

In conclusion, in this study in which land values were determined according to the income method using cost tables, it was found that the lower limit of land values was $4 508.80/ha in renting, and the upper value was $7 448.40/ha in farms operated

Figure 2 - Land values by net income (US$/ha).

by the landowner. According to data obtained from this study, it can be said that this will continue in the future because of the margin between the rent demanded from the tenants ($255.44/ha) and net income ($372.42). As well as the connection between the continued demand to rent land and the income obtained by the tenant, there are various economic and social reasons why landowners continue to want to rent out their land. Therefore, the reasons for renting out land and the economic and social factors which affect rent should be investigated in future studies. In this regard, an investigation should be made of how support for agriculture affects land values.

One of the important limitations of this study is that because there is no record system on the farms, it was not possible to access previous years' data. For this reason, no investigation was made in the study of how land rents and costs changed over time. When regional data are determined, it will be possible to determine the relation between supports and land rents; and therefore, it will be appropriate to concentrate future studies on this area.

DECLARATION OF CONFLICT OF INTERESTS

The authors declare no conflict of interest.

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AUTHORS' CONTRIBUTIONS

Author critically revised the manuscript and approved of the final version.

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