An economic analysis of different size of farms in Turkey: the case of Trakya Region

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Abstract

The study is conducted in sunflower and wheat producing farms in the Trakya region, Turkey. Face-to-face surveys are conducted with 113 farms and their capital structures are examined. Profitability ratios are calculated by making economic analysis of the different size farms. Farms are divided into two groups as group I (20-150 da) and group II (150 da +). The average land size of the farms is 90.85 da for group I and 305.50 da for group II. Assets are 11805.58 TL/da in group I and 15268.51 TL/da in group II. Land capital has the highest share in assets with 89.19%. The share of debts to liabilities is 2.40% in group I and 1.97% in group II. Gross profit for group I and group II are 307.80 TL/da and 390.79 TL/da respectively. Profitability factor for group I and group II is 24.98 and 38.94; economic profitability is 1.23 and 1.66; economic profitability is 0.81 and 1.28, respectively. According to the calculated profitability ratios and financial ratios, it is determined that as the size of the farm increases, the capital is used more efficiently. As the farm scale grows, costs decrease, and profitability increases with the decrease of unit costs. Agricultural policies aimed at increasing the size of the farm should be given priority.

Keywords: Gross margin. Capital structure. Financial profitability.

1. Introduction

The agricultural sector in many countries, including Turkey, maintains its importance for reasons such as meeting the nutritional need, providing employment opportunities, creating the raw material source of the agriculture-based industry, having positive effects on the balance of payments, preventing foreign dependency in the related field (Çoban et al., 2010).

Turkey has an agricultural structure in which farms have a very fragmented land and inadequate farm size and most of the farms are small family farms. The average number of land parts per farm is 5.9 and the average land size is 12.9 decares per part (TSI, 2020). In Turkey, profitability in agricultural production is not at the desired level due to structural problems such as the inability of the average farm size in Turkey which is 60 decares (Anonymous, 2017), fragmentation of agricultural land, high input costs, and low education level of farmers. The limited-production factors in agricultural production and the inability to combine them properly cause low productivity in production.

In the study, it is aimed to determine the social and economic structures of the farms producing sunflower and wheat in the Trakya region, to reveal the income and cost items and the annual productivity results.

2. Literature Review

Profitability in crop and animal production is the main objective in farm management. Farmers achieve this goal when they use production factors more effectively (İnan, 1994). For the effective use of production factors, it is necessary to conduct economic analysis and planning studies, to reveal the current situation and to determine the farm organizations that will yield the highest income.

Thus, it can be provided to determine adequate agricultural policies and to assist farmers in production decisions that increase profitability.

There are too many studies are in national (Peker and Özer (1998), Aksoyak (2004), Şen (2005), Karabak et al. (2012), Altıntaş (2015), Aydın and Unakıtan (2016), Yılmaz (2018), Kamburoğlu Çebi et al. (2019), Semerci (2019)) and international (Shahan et al. (2008), Khan et al. (2010), Todorović and Filipović (2010), Yahaya et al. (2015), Socoloski et al. (2017), Arya and Zechariah (2018), Belarmino et al. (2019), Reis et al. (2019), Faleiros et al. (2020)) about economic analysis of different agricultural product in literature.

3. Material and method
3.1. Material

The research material consists of data obtained from the agricultural farms producing only sunflower and wheat in the provinces of Tekirdağ, Edirne, and Kırklareli. Survey data belongs to the production period of 2018/2019.

Information such as the number and size of the agricultural farms is obtained from Provincial Directorates of the Ministry of Agriculture and Forestry in Edirne, Kırklareli, and Tekirdağ. Sampling is done in two stages. In the first stage, the number of villages is selected, and then in the second stage, the number of farms from the selected villages are determined. The stratified random sampling formula of Neyman Method (Equation 2.1) is used to determine the number of villages and farms to be surveyed (Yamane, 2001). The stratification is made according to the number of farms for the villages and according to the size for the farms. Equation 2.2 is used to determine the number of villages and farms in the strata.

$$n = \frac{(\sum N_h * S_h)^2}{N^2 * D^2 + \sum(N_h * S_h^2)} \tag{2.1}$$

$$n_i = \frac{N_h * S_h}{\sum N_h * S_h} * n \tag{2.2}$$

$$D^2 = \frac{d^2}{Z^2} \tag{2.3}$$

N_h : Number of farms in strata Z : Table value of confidence level

S_h : Standard deviation of the strata S_h^2: Variance of strata

N : Population size n_i : Number of samples per strata

d : Sampling error n : Sample size

The number of farms in the villages of the Trakya region are divided into three strata as 0-50, 51-100, 101+. The number of villages is 9 in the first strata, 9 in the second strata, and 20 in the third strata. The villages surveyed are selected randomly.

Agricultural farms in 38 villages included in the sample are divided into two strata depending on the farm size as 20-150 da, 150+ da. The 113 farms included in the sample are distributed in strata as 43 and 70, respectively.

3.2. Method

In the study, an economic analysis is made to the farms producing sunflower and wheat in the Trakya region. As a result of this analysis, the current situation of the farms is revealed by calculating the criteria used to measure the success of agricultural farms. Also, by calculating the profitability, a comparison between the groups is achieved. In the study, the capital structure and annual production results of the farms are analyzed.

The total operating costs of the farms for their agricultural activities are calculated separately as variable and fixed operating costs.

Variable costs consist of labor, seed, fertilizer, pesticides, fuel, bale tying, machine repair and maintenance, machine rents, and crop insurances. While calculating the fixed operating costs, the maintenance costs of the buildings, machine and building depreciation, insurance - tax costs, etc. are considered. Family labor wage is calculated by multiplying the hours of family labor in the farm and 2/3 of the daily wage amount in the region (Mülayim, 2001).

Gross production value is calculated by multiplying the amount of products and producer price in the region (Erkuş et al., 1995).

Gross profit is calculated by deducting variable operating costs from the gross production value of the farms (İnan, 2017).

The gross income is obtained by adding the off-farm income and the rent of the residential buildings to the gross production value. 5% of the residential building values are determined as rental income (Erkuş et al., 1995). In the calculation of off-farm income, the revenues (harvester operation, machine rental, etc.) obtained from outside the farm are used.

Pure income is calculated by subtracting operating costs from gross income (Cinemre and Kılıç, 2011).

Agricultural income is generated by adding family labor wage to pure income and subtracting debt interest and tenancy-partnership costs from it (Erkuş et al., 1995).

Return on equity is calculated by subtracting debt interest and rent value of the land from pure income (Tipi, 2002).

In order a farm to produce agricultural products, it needs to have a certain amount and a certain e quality of capital. Assets are obtained by adding up all the capital elements invested in the farm. Farm capital consists of land capital, land reclamation capital, building capital, and plant capital. The farm capital consists of non-current (animal and tool-machine) assets and current assets (stocks, cash, and account receivables).

To compare farms correctly with each other, farms should be made free of debt and rent (Aras, 1988). For this purpose, rented land values are shown in liabilities as nominal debts and in assets by being included in the land capital.

Owner's equity is calculated by subtracting off-farm capital from assets (Demirci, 1978).

The profitability ratios, capital turnover ratio, financial leverage ratio, current ratio, and liquidity ratio used to determine farm profitability and compare farms with each other are calculated as follows (Erkuş et al, 1995).

(2.4)

$$Profitability\ factor = \frac{Pure\ income}{Gross\ product} \times 100$$

(2.5)

$$Economic\ profitability = \frac{Pure\ income}{Investment\ capital} \times 100$$

(2.6)

$$Financial\ profitability = \frac{Return\ on\ equity}{Owner's\ equity} \times 100$$

(2.7)

$$Capital\ turnover\ ratio = \frac{Gross\ production\ value}{Investment\ capital} \times 100$$

(2.8)

$$Financial\ leverage\ ratio = \frac{Financial\ profitability}{Economic\ profitability}$$

$$(2.9)$$

$$Current\ ratio = \frac{Current\ assets}{Short\ term\ debt}$$

$$(2.10)$$

$$Liquidity\ ratio = \frac{Liquid\ assets}{Short\ term\ debt}$$

$$(2.11)$$

$$The\ ratio\ of\ owner's\ equity\ to\ long-term\ debt = \frac{Owner's\ equity}{Long\ term\ debt}$$

4. Results

4.1. General information about farms

The farms in the study are grouped under two groups according to their land sizes and the average land size of group I is 90.85 da, group II is 305.50 da (Table 1). The average parcel numbers of group I and group II are 6.56 and 12.51 da and their average parcel size are 13.85 and 24.41 da respectively. These results are above Turkey's average (5.9 parts and 12.9 in / parcel) for both groups. The average age of farmers is 53.07 and the education year of farmers is 7.68.

Table 1: General information about farms

	Group I (20-150 da)	Group II (150 da +)	All farms
Age	55.07	51.84	53.07
Education (years)	7.14	8.01	7.68
Total farm land size (da)	90.85	305.5	223.82
Average number of parcels	6.56	12.51	10.25
Average parcel size (da)	13.85	24.41	21.84

The total labor in the farms is calculated in terms of man labor unit (MLU, amount of work performed by the average worker in one hour) and shown in Table 2. Average family labor is 1.27 MLU in group I and 1.54 MLU in group II. The average hired labor in group I is 0.22 MLU and in group II, it is 0.14 MLU. Farm size per MLU in farms is 87.64 da/MLU in group I and 246.19 da / MLU in group II.

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Table 2: The labor used in farms (MLU)

Labor (MLU)	Group I (20-150 da)	Group II (150 da +)	All farms
Family labor	1.27	1.54	1.44
Hired labor	0.22	0.14	0.17
Total MLU	1.49	1.68	1.61
Farm size (da/MLU)	87.64	246.19	185.86

4.2. Economic Analysis of Farms
4.2.1. Capital Structure of Farms

When the capital structures of farms are examined, assets are 11805.58 TL/da in group I and 15268.51 TL/da in group II. Assets and liabilities distributions of farms according to groups are shown in Table 3.

Current assets make up 0.41% of group I and 0.60% of group II assets. In group I, tractor constitutes 5.03% of assets, tool-machine constitutes 2.16%, building constitutes 8.78%, plant constitutes 0.76% and land constitutes 82.86%. In group II, tractor constitutes 2.94% of assets, tool-machine constitutes 1.33%, building constitutes 4.42%, plant constitutes 0.64% and land constitutes 90.07%.

Land capital has the highest share in both farm groups. These shares are 82.86% and 90.07% respectively. The high land value in the Trakya region is an important factor that increases the share of land capital in farms. Also, the fact that the farms included in the study do not produce livestock raises the share of land capital and is a factor in the low share of the building capital.

The share of debts to liabilities is 2.40% in group I and 1.97% in group II. The shares are close to each other in farm groups

The share of owner's equity to assets is 97.38% in group I and 97.80% in group II. It is thought that the reason for the low share of off-farm capital in farms is due to the high loan rates and the difficulties in obtaining loans.

Table 3: Capital structure by farm size (TL/da)

	ASSETS			LIABILITIES		
	Group I (20-150 da)	Group II (150 da +)	All farms	Group I (20-150 da)	Group II (150 da +)	All farms

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	TL	%	TL	%	TL	%		TL	%	TL	%	TL	%
Current assets							Debts						
Cash	16.13	0.14	49.85	0.33	44.64	0.30	Debts to firms	2.05	0.02	9.00	0.06	7.93	0.05
Accounts receivable	11.49	0.10	32.98	0.22	29.66	0.20	Debts to banks and cooperatives	280.83	2.38	291.52	1.91	289.86	1.97
Stocks	19.56	0.17	7.99	0.05	9.78	0.07	Rented land value	26.15	0.22	35.48	0.23	34.04	0.23
Non-current assets													
Tractor	593.86	5.03	448.58	2.94	471.02	3.20	Equity	11496.55	97.38	14932.51	97.80	14401.78	97.75
Tool-machine	254.97	2.16	202.54	1.33	210.63	1.43							
Building	1037.21	8.78	675.24	4.42	731.15	4.96							
Plant	89.65	0.76	97.19	0.64	96.03	0.65							
Land	9782.73	82.86	13754.15	90.07	13140.71	89.19							
TOTAL	11805.58	100.00	15268.51	100.00	14733.61	100.00	TOTAL	11805.58	100.00	15268.51	100.00	14733.61	100.00

4.2.2. Annual results of farms

4.2.2.1. Operating costs

The variable and fixed costs of the farms are calculated and given in Table 4 and Table 5. The average variable costs for all farms is 240.70 TL/da. Fuel (27.03%) has the highest share in variable costs, followed by fertilizers (21.18%), seeds (14.54%), machinery rent (9.91%), machinery maintenance (9.57%), pharmaceuticals. (8.29%), other transactions (6.08%), crop insurance (2.57%) and hired labor (0.83%). Variable costs according to farm groups are calculated as 249.87 TL/da and 239.03 TL/da, respectively

Table 4: Variable costs in farms (TL/da)

Variable costs	Group I (20-150 da)		Group II (150 da +)		All farms	
	Total	%	Total	%	Total	%
Seed	35.97	14.40	34.82	14.57	34.99	14.54
Fertilizer	48.98	19.60	51.37	21.49	51.00	21.18
Pesticide	17.44	6.98	20.40	8.54	19.94	8.29
Fuel	65.42	26.18	65.00	27.19	65.06	27.03
Hired labor	1.47	0.59	2.09	0.87	1.99	0.83
Machinery maintenance	29.67	11.88	21.83	9.13	23.04	9.57
Machinery rent	31.11	12.45	22.53	9.43	23.87	9.91
Crop insurance	6.03	2.41	6.20	2.60	6.18	2.57

Other	13.78	5.51	14.79	6.18	14.63	6.08
Total (TL/da)	249.87	100.00	239.03	100.00	240.70	100.00

The fixed costs of farms are 163.17 TL/da. Fixed costs consist of 39.29% depreciation, 36.85% family labor wage, 16.88% debt interest, 5.65% building repair - maintenance and 1.33% tax-insurance. The depreciation consists of 51.20% tractor depreciation, 25.56% building depreciation, and 23.25% tool-machine depreciation. Fixed costs are 186.16 TL/da in group I and 158.96 TL/da in group II. Tractor depreciation gets the highest share with 51.20% of total depreciation.

Table 5: Fixed costs in farms (TL/da)

Fixed costs		Group I (20-150 da)		Group II (150 da +)		All farms	
		Total	%	Total	%	Total	%
Depreciation	Tractor depreciation	33.65	46.63*	32.67	52.16*	32.82	51.20*
	Building depreciation	22.95	31.80*	15.18	24.25*	16.39	25.56*
	Tool-machine depreciation	15.56	21.57*	14.78	23.59*	14.90	23.25*
Total depreciation		72.16	38.76	62.63	39.40	64.11	39.29
Building repair - maintenance		15.37	8.26	8.09	5.09	9.21	5.65
Family labor wage		69.60	37.39	58.40	36.74	60.13	36.85
Tax-insurance		2.75	1.48	2.06	1.30	2.17	1.33
Debt interest		26.28	14.11	27.78	17.47	27.55	16.88
Total (TL/da)		186.16	100.00	158.96	100.00	163.17	100.00

* Share in total depreciation

4.2.2.2. Gross production value

Gross production value is 557.67 TL/da in group I and 629.82 TL/da in group II (Table 6). In all farms, sunflower gross production value is calculated as 596.88 TL/da and wheat gross production value as 637.35 TL/da.

Table 6: Gross production values of farms (TL/da)

	Group I (20-150 da)	Group II (150 da +)	All farms
Sunflower			
Yield (kg/da)	236.09	246.15	244.44
Price (TL/kg)	2.40	2.45	2.44
Gross production value	566.09	603.18	596.88
Wheat			
Yield (kg/da)	399.48	433.97	429.10
Price (TL/kg)	1.19	1.33	1.31
Byproduct	74.37	73.96	74.02
Gross production value	549.00	651.90	637.35
Total gross production value	557.67	629.82	618.68

4.2.2.3. Gross profit analysis

Gross profit is 307.80 TL/da in group I and 390.79 TL/da in group II (Table 7). In group II, gross profit is higher due to high gross production value and low variable costs.

Table 7: Gross profit of farms (TL/da)

	Group I (20-150 da)	Group II (150 da +)	All farms
Gross production value	557.67	629.82	618.68
Variable costs	249.87	239.03	240.70
Gross profit	307.80	390.79	377.98

4.2.2.4. Gross income

The average gross income of the farms is 640.93 TL/da (Table 8). 96.53% of the gross product comes from gross production value, 1.52% from residence rental, and 1.95% from off-farm income. Gross income in group I is 581.19 TL/da and in group II, it is 651.84 TL/da. The reason for the higher gross income in group II is the higher gross production value

Pure income is 145.16 TL/da in group I and 253.84 TL/da in group II (Table 8). Pure income of group II is higher than group I because when compared to group I the gross income is higher and operating costs are low in this group.

Agricultural income in group I and group II are 162.33 TL/da and 248.98 TL/da respectively. Family labor wage is close to each other in both groups. The difference in agricultural income is due to the difference in the pure income of the groups.

Return on equity is 92.73 TL/da in group I and 190.58 TL/da in group II. Due to the high gross production value and low total costs, group II has a higher return on equity than group I.

Table 8: Gross income, pure income, agricultural income, and return on equity of farms (TL/da)

	Group I (20-150 da)	Group II (150 da +)	All farms
Gross production value	557.67	629.82	618.68
Off-farm agricultural income	5.63	10.48	9.73
Residence rent	17.89	11.54	12.52
Gross income	**581.19**	**651.84**	**640.93**
Operating costs	436.03	398.00	403.87
Pure income	**145.16**	**253.84**	**237.06**
Family labor wage	69.60	58.40	60.13
Debt interest	26.28	27.78	27.55
Value of the rented/ partnership's land	26.15	35.48	34.04
Agricultural income	**162.33**	**248.98**	**235.60**
Return on equity	**92.73**	**190.58**	**175.47**

4.2.3. Financial Ratios of Farms

The profitability factor, economic and financial profitability ratios, capital turnover ratio, and financial leverage ratio of the farms are shown in Table 9. The profitability factor, which shows what percentage of the gross income is the pure income, is 24.98 in group I and 38.94 in group II. These ratios show that 24.98 TL of each 100 TL of gross income in group I and 38.94 TL of each 100 TL of gross income in group II is pure income. The economic profitability of group I and group II are 1.23 and 1.66 respectively. The calculated values are lower than the interest rates indicate that the farms cannot use their investment capital effectively. In group I financial profitability is 0.81 and in group II, it is 1.28. While group II makes a profit of 1.28 TL for every 100 TL of owner's equity, group I make a profit of 0.81 TL for each 100 TL of owner's equity. The fact that the financial profitability ratio is lower than the economic profitability ratio shows that the owner's equity is not used efficiently. In other words, the cost of benefiting from off-farm resources is high.

The capital turnover ratio is 4.72% in group I and 4.12% in group II. While group I afford 4.72% of their investment capital with the annual gross production value, group II afford 4.12%. The capital turnover ratio of the farms is low, and this is indicated that farmers invest too much in production factors such as land, machinery, etc.

The financial leverage ratio is less than 1 for all farms. This shows that the ratio of owner's equity profitability is lower than the ratio of total investment capital profitability. This situation can be interpreted as that off-farm capital is not used well, and the return of off-farm capital is lower than its cost.

The current ratios of the farms are less than 1. This shows that the current assets of the farms are not at enough level and therefore they cannot pay their short-term debts with the current assets. In other words, farms will have to convert their medium and long-lasting assets into money to afford their current debts.

The liquidity ratio is 0.62 in all farms. This shows that the liquid assets of the farms, except stocks, can pay off just 62% of the short-term debts. This ratio is 17% in group I and 74% in group II.

The ratio of owner's equity to long-term debt is 80.66 for all farms. In other words, it is not difficult for farms to pay off their long-term debts. This ratio is calculated as 96,17 in group I and 78.87 in group II.

Table 9: Profitability ratios and financial ratios in farms

	Group I (20-150 da)	Group II (150 da +)	All farms
Profitability factor	24.98	38.94	36.99
Economic profitability	1.23	1.66	1.61
Financial profitability	0.81	1.28	1.22
Capital turnover ratio	4.72	4.12	4.20
Financial leverage ratio	0.66	0.77	0.76
Current ratio	0.29	0.82	0.71
Liquidity ratio	0.17	0.74	0.62
The ratio of owner's equity to long-term debt	96.17	78.87	80.66

5. Conclusion

When the capital structures of the farms are examined, the assets total is 11805.58 TL/da in group I and 15268.51 TL/da in group II. In both groups, land capital has the highest share in assets and this is 89.19% in all farms. In the studies of Altıntaş (2015) and Aydın and Unakıtan (2016), the share of land capital in assets is calculated as 42.31% and 63.36%, respectively. The high share of the land capital can be explained by the high land values in the study area and the fact that the farms do not engage in animal husbandry activities. When mechanization capital is analyzed according to groups, the share of mechanization capital in assets is 7.19% in group I and 4.27% in group II. Accordingly, it is understood that small-scale farms have a higher mechanization capital compared to their assets.

When the annual economic activities of the farms are examined, the gross production value in group I and in group II are 557.67 TL/da and 629.82 TL/da respectively. The reason for the high gross production value of group II is that their average product yield is higher than group I. Accordingly, there is a difference between the gross profits of the groups and gross profit is 307.80 TL/da in group I and 390.79 TL/da in group II. The reason of the difference between the two groups is the gross production value is lower and variable costs are higher in group I. In the studies of Aksoyak (2004), Aydın and Unakıtan (2016), and Yılmaz (2018), it is seen that when the increases farm size, the gross production value, and gross profits increase.

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Economic profitability, which is one of the major profitability ratios used in the comparison of farms, is calculated 1.23 in group I and 1.66 in group II. Even if the calculated profitability ratios are low, it shows that a positive interest income can be obtained for assets and owner's equity invested in farms. However, farms are not considered economically profitable because the calculated ratios are lower than the current interest rate in the market and this indicates that farms receive less profit than their opportunity cost. It is thought that the overvaluation of non-current assets such as land and buildings, which are included in the assets of farms, due to inflation, negatively affects the profitability ratios.

The financial profitability ratio is calculated in group I as 0.81 and group II as 1.28. The economic profitability ratio is higher than the financial profitability ratio in both groups. This shows that the cost of benefiting from off-farm resources of farms is higher than normal. In other words, these farms are profitable but lose money due to the capital they receive from off-farm sources. In the farms with debt, it is necessary to analyze the loan interest and the return on the loan well and to use the borrowed debts effectively. The fact that the financial and economic profitability ratios of the farms are close to each other can be explained by the very low use of off-farm capital in farms.

When the results are compared with the Aydın and Unakıtan's (2016) results, it is seen that the profitability factor is higher, while the economic profitability and financial profitability are lower. The high profitability factor is due to the higher calculation of pure income due to lower operating costs. Although the pure income is higher, the economic profitability ratio is lower than the Aydın and Unakıtan (2016) study is due to the higher investment capital of farms. The low financial profitability ratio is due to the low return on equity

The capital turnover ratio is 4.72% in group I and 4.12% in group II. This indicates that the farmers invest too much in production factors such as land and mechanization capital. Farms should either reduce their investment in production factors or increase their gross production value.

According to the results of analysis based on profitability measurements, group II farms are more profitable than group I. This can be interpreted as capital is used more efficiently as the farm size increases.

In general, when the economic and financial profitability ratios of the farms are examined, it is observed that large-scale farms have higher success ratios. This is an important fact that comes from taking advantage of economies of scale. Theoretically, the growth of farm scale positively affects resource utilization efficiency. As the farm scale grows, the costs

decrease as the unit costs decrease. While determining the farm scale, the optimum farm size and production plan should be determined, which both ensure the efficient use of resources and reduce unit costs. For this purpose, the Ministry of Agriculture and Forestry should cooperate with universities and regional basis studies should be done. By conducting economic analysis and planning studies regionally, it can be ensured that agricultural policies are determined specifically for that region and help the decision-making procedure of farmers.

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