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ECONOMIC ANALYSIS OF TOMATO PRODUCTION IN GEOTHERMAL GREENHOUSES: A CASE STUDY OF AFYONKARAHISAR PROVINCE, TURKEY

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Abstract

The purpose of this study was to carry out an economic analysis for tomato production in geothermal greenhouses in Afyonkarahisar province which has a high potential with regards to geothermal greenhouse production. The primary material of the study consisted of original data collected by face-to-face questionnaires conducted with 20 producers carrying out their geothermal greenhouse production activities at Sandıklı district of Afyonkarahisar province. Results showed that the average greenhouse area of producers was 39.85 decare (da) and that the producers carried out their production activities in accordance with soilless (substrate culture) production. The total yield was calculated as 50.05 ton/da according to the average of all enterprises. The establishment cost per decare of geothermal greenhouses was 479 176.41 Turkish Lira (TL) and the majority of this expense consisted of greenhouse construction cost (73.80 %). Gross product value per decare was 170,415.81 TL according to the average of all enterprises. Whereas general gross profit, net profit, and relative return per decare were 102 424.62TL, 49,016.01 TL, and 1.40 respectively. It was found that large producers were more advantageous than smaller ones in terms of gross, net, and relative return criteria.

Key words: *geothermal greenhouse, tomato, cost, profitability*

INTRODUCTION

World population is increasing and with increasing income level there will be more need for food supplies. Thus, in order to sufficiently feed the world, food production should be increased. This will only be possible by industrialization coupled with advances in the agriculture sector. Nowadays, soil, weather, and water pollution and their continuous consumption result in a decline in agricultural production which in turn increases unhealthy and low quality food production. In addition, the increasing demand in world markets for food items makes it necessary to carry out production activities for export. Thus, it is necessary to take some measures for increasing and developing agricultural production. One of these measures is greenhouse production that ensures quality and continuous production possible [7]. Greenhouse production has rapidly increased in Turkey starting from the 1970s. Greenhouse production is more frequently observed in southern provinces where climate conditions are more suitable. The most important reason why greenhouse production cannot advance in other provinces is the fact that temperatures in the winter months are lower compared with southern provinces. The most important factor in greenhouse production is the establishment of the conditions that will provide the desired temperature. Heating is required when the desired temperature cannot be obtained due to climate conditions which leads to an increase in the costs involved [8]. Geothermal energy encompasses benefiting directly or indirectly from the hot water and vapor sources which can include substantial amounts of molten minerals, various salts and gases generated by the heat accumulated deep within the earth's crust. Due to its heat content, geothermal energy is used in industry, lumbering, chemical substance production and electricity generation [4]. Geothermal sources comprise an important source of energy for greenhouse heating, fishing, and drying sectors in addition to the agriculture sector as well. The use of geothermal energy in various areas of

agricultural production enables the producer to provide the plant with the required temperature in addition to continuing production in all periods of the year excluding excessively hot periods. Thus, geothermal sources are of significant importance for agricultural production in addition to the benefits they provide to other areas of use [8].

Turkey's geothermal energy potential is around 31,500 MWt (megawatt heat). Turkey is ranked seven in the world with this potential and has the ability to meet 30 % of its thermal energy requirement. A total of 225 geothermal fields that are above 35–40 °C have been identified in Turkey [1].

The total geothermal greenhouse area in Turkey is 3908 da according to 2015 data. Izmir is ranked number one in terms of geothermal greenhouse area with a share of 20.97 % followed respectively by Manisa (19.34 %), Afyonkarahisar (17.01 %), Denizli (12.16 %), Şanlıurfa (10.82 %) and Kütahya (6.63 %) provinces. Of the total 3,908 da area on which geothermal greenhouse production takes place, "Good Agricultural Practices" are applied in 76 % and "Soilless Agriculture" in 90 % [2]. Afyonkarahisar province where the present study was conducted is ranked number 3 in Turkey in terms of geothermal greenhouse area. Soilless agriculture and good agricultural practices are implemented in all of these geothermal greenhouses examined for the study. The purpose of this study was to carry out an economic analysis for tomato production in the geothermal greenhouses located in Afyonkarahisar province which has a high potential with regards to geothermal greenhouse production in Turkey. General information such as family size, education level, age, experience, average enterprise size was collected for tomato producers according to different enterprise groups; whereas success criteria such as greenhouse establishment costs, production costs, gross product value, gross profit, net profit and relative return which were compared according to enterprise groups. The literature review showed that there has been insufficient studies analyzing geothermal greenhouse tomato production from an economic perspective. It is expected that the results obtained in the present study will be beneficial for policymakers, tomato producers, researchers, and related institutions and enterprises.

MATERIALS AND METHODS

The main material of the study consisted of original data obtained by face to face questionnaire applied to enterprises involved in tomato production activities at Sandıklı district of Afyonkarahisar province. Reports and statistics obtained from similar studies carried out by related individuals and institutions were also used. Questionnaire data included the 2019 production period. The total number and addresses of enterprises involved in geothermal greenhouses tomato production were obtained from Afyonkarahisar Provincial Directorate of Agriculture and Forestry. Records showed that 76.92 % of the total number of enterprises (26) and 68.87 % of the total geothermal greenhouse area in Afyonkarahisar province (1,157.27 da) were located in Sandıklı district. Thus, Sandıklı district was selected as the study area. All the enterprises in Sandıklı district were included in the study and questionnaires were conducted by face-to-face interviews with 20 enterprises [3]. Since the sizes of the areas owned by the enterprises differed, it was decided to classify them into different groups in order to ensure that the study population is homogeneous. Accordingly, enterprises were classified as group 1 (1-30 decares; 11 enterprises) and group 2 (>30 decares; 9 enterprises). The data obtained by questionnaire from enterprises were entered and calculated using Microsoft Excel and SPSS software. The questionnaire form included general information such as age, education, experience, family size, occupation outside of greenhousing, greenhouse area, age of greenhouse and production method along with questions on the economic activities of the enterprises such as the inputs used in the greenhouse and during production along with the expenses, yield and price. Of the total variable costs, 3 % was considered as general administration costs. Revolving fund interest is a variable cost that reflects the opportunity

cost for the capital invested in the production activity. Revolving fund interest was calculated by applying half of the interest applied by Turkish Republic Ziraat Bank to greenhouse plant production credits (2.75 %) to the variable costs. Land rent was taken as 5 % of the bare land value. Greenhouse and machinery-equipment capital interest was calculated by applying 1.97 % real interest on total greenhouse and machinery-equipments' half-value [11]. Depreciation cost was found by multiplying greenhouse and machinery-equipments' value by 0.05 (5 %). Profitability indicators were calculated to report the level of success of geothermal greenhouse tomato production activities. Gross product value was calculated by multiplying the total tomatoes produced with the tomatoes sale prices. Gross profit was calculated by subtracting variable costs from gross product value, whereas, net profit was calculated by subtracting production costs from gross product value [12]. The relative return was calculated by dividing the gross product value by production cost [6].

RESULTS AND DISCUSSIONS

General information on tomato producers in geothermal greenhouses such as age, education, experience in geothermal greenhousing and family size are provided in Table 1. Average age of all producers was 49.7 years. The average age of the producers in the 1st group was lower than 2nd group. The average ages of the producers in groups 1 and 2 were 46.64 and 53.44 years, respectively, and differed from each other (P<0.1). The average education level of the producers was 14.2 years. When the two groups were compared in terms of average education level, producers in the 2nd group had higher education level than those in 1st group (P<0.1). The average education levels of producers in the 1st and 2nd groups were 13.91 and 14.56 years, respectively. The average experience of the producers in geothermal greenhousing was 4.35 years. The average experience of the producers in the 2nd group was longer than those in the 1st group. The average family size of the producers was 3.85 person. The family size of 1st group was larger than those in the 2nd group. The family sizes of the producers in the 1st and 2nd groups were 4 and 3.67 persons (P>0.05). The occupations of producers outside of greenhousing are provided in Table 2. As it can be observed from the table that only 10 % of the producers carry out only geothermal greenhousing. Whereas 90 % of the producers had other occupations outside of greenhousing. When the occupations of producers outside of greenhousing were examined it was found that 50 % of the occupations are not related with agriculture (doctor, pharmacist, civil engineer, self-employed, retired). Of the producers, only 10 % were graduates of Agricultural Faculty and 30 % were dealing with occupations outside of greenhousing. Geothermal greenhouse areas of the producers are provided in Table 3. The average geothermal greenhouse area of 1st and 2nd groups were 21.73, and 60 da, respectively. Whereas the average geothermal greenhouse area for all enterprises was 39.85 da. It was found that all the producers preferred plastic covers as greenhouse type and soilless agriculture as production method. When the ages of the greenhouses were examined, it was found that the greenhouses of the producers in the 1st group were newer than those in the 2nd group. The mean age of the greenhouses in the 1st and 2nd groups were 3.27 and 5.67 years, respectively (P<0.05). Average greenhouse age was 4.35 years for all producers.

Table 1. General information about producers

Features	Enterprise groups (da)		General	P value
	1. Group	2. Group		
Age (year)	46.64	53.44	49.70	0.076***
Education level (year)	13.91	14.56	14.20	0.075***
Experience in geothermal greenhousing (year)	3.27	5.67	4.35	0.142
Family size (person)	4.00	3.67	3.85	0.973

***: p<0.10
Source: Authors' calculation.

Table 2. Producers' occupation outside of greenhousing

Occupations	Enterprise groups (da)				General	
	1. Group		2. Group			
	N	(%)	N	(%)	N	(%)
No occupation	1	9.09	1	11.11	2	10.00
Farmer	4	36.36	2	22.22	6	30.00
Doctor	1	9.09	2	22.22	3	15.00
Self-employment	2	18.18	2	22.22	4	20.00
Construction engineer	1	9.09	0	0.00	1	5.00
Pharmacist	1	9.09	0	0.00	1	5.00
Retired	1	9.09	0	0.00	1	5.00
Agricultural engineer	0	0.00	2	22.22	2	10.00
Total	11	100.00	9	100.00	20	100.00

Source: Authors' calculation.

Table 3. Geothermal greenhouse area of producers

	Enterprise groups (da)		General	P value
	1. Group	2. Group		
Greenhouse type				
Plastic (da/farm)	21.73	62.00	39.85	0.037**
Production method				
Soilless agriculture (da/farm)	21.73	62.00	39.85	0.037**
Age of greenhouse (year)	3.27	5.67	4.35	0.142

**: $p<0.05$
Source: Authors' calculation.

Table 4. Geothermal greenhouse establishment cost (TL/da)

	Enterprise groups (da)				General		P value
	1. Group		2. Group				
	TL	%	TL	%	TL	%	
Greenhouse construction cost	360,831.64	73.24	344,850.96	74.54	353,640.33	73.80	0.195
Heating system cost	31,827.07	6.46	31,838.11	6.88	31,832.04	6.64	0.354
Fee paid to municipality	37,363.64	7.58	31,888.89	6.89	34,900.00	7.28	0.479
Greenhouse automation cost	62,668.80	12.72	54,080.44	11.69	58,804.04	12.27	0.253
Total greenhouse establishment cost	492,691.14	100.00	462,658.40	100.00	479,176.41	100.00	0.295

TL: Turkish Lira; 1 USD= 5.67 TL
Source: Authors' calculation.

Geothermal greenhouse establishment costs are provided in Table 4. The total average greenhouse establishment cost was 479,176.41 Turkish Lira (TL) per decare (da). Of this value, 73.80 % consisted of greenhouse construction cost, 12.27 % consisted of greenhouse automation cost, 7.28 % consisted of the fees paid to the municipality for geothermal connections and 6.64 % consisted of the heating system cost. Total greenhouse establishment costs for the 1st group were higher than those in the 2nd group. Total greenhouse establishment cost for the 1st group was 492,691.14 TL per decare, and the breakdown of this cost was as such: 73.24 % for greenhouse construction, 12.72 % for greenhouse automation, 7.58 % for fees paid to the municipality and 6.46 % for the heating system. Whereas the total greenhouse establishment cost for 2nd group was 462,658.40 TL per decare with 74.54 %, 11.69 %, 6.89 % and 6.88 % corresponding to greenhouse construction cost, greenhouse automation cost, fees paid to the municipality for geothermal connections and heating system respectively. A study conducted by Serpen et al. (2008) [13] indicated that the establishment cost for a geothermal greenhouse was 5 million $/ha. Since the exchange rate for dollar was 1.15 TL on

average in 2008, the establishment cost per 1 decare of greenhouse was 434,782.61 TL.

Cost items related with geothermal greenhouse tomato production activity were analyzed by classifying into groups of fixed and variable costs. Variable costs are the costs that either decrease or increase according to production volume. These costs emerge in times of production and vary with production amount. Whereas fixed costs are those that do not change with production volume or in other words those that are present regardless of whether production is made or not [9]. Production costs per decare in tomato production are given in Table 5. As can be seen in the table, variable costs include seedling, pesticide, fertilizer, bumble bee, insurance, cocopeat, greenhouse heating, water analysis, machinery-equipment repair and maintenance, packaging, transport, electricity, meal, rope, and revolving fund interest. Whereas fixed costs consist of administrative costs, permanent labor, machinery-equipment depreciation, machinery-equipment capital interest, land rent, greenhouse depreciation, and greenhouse capital interest. Variable costs comprised the majority of the costs. The proportion of variable costs in total production costs was 55.19 % and 57.27 % for 1st and 2nd group respectively. The average proportion of variable and fixed costs were 56.01 % and 43.99 %. The proportion of packaging costs in total production costs was 21.57 %. Other important cost items were fertilizer (7.57 %), transport (5.89 %), seedling (4.88 %), cocopeat (4.28%) and greenhouse heating (3.74 %). Greenhouse capital depreciation (19.74 %) and permanent labor cost (16.25 %) had the highest proportion in fixed costs. A significant difference was observed between the groups with regard to water analysis, transport and land rent costs ($p<0.05$).

Table 5. Production costs in greenhouse enterprises

	Enterprise groups (da)				General		P value
	1. Group		2. Group				
Cost elements	TL/da	(%)	TL/da	(%)	TL/da	(%)	
Seedling	5,989.09	4.45	5,847.67	5.56	5,925.45	4.88	0.356
Pesticide	3,010.78	2.23	2,633.64	2.50	2,841.07	2.34	0.643
Fertilizer	9,693.33	7.20	8,561.81	8.14	9,184.15	7.57	0.446
Bumble bee	36.06	0.03	35.97	0.03	36.02	0.03	0.440
Insurance	762.27	0.57	560.38	0.53	671.42	0.55	0.963
Cocopeat	5,158.18	3.83	5,251.11	4.99	5,200.00	4.28	0.191
Greenhouse heating	6,145.21	4.56	2,566.32	2.44	4,534.71	3.74	0.152
Water analysis	47.96	0.04	17.62	0.02	34.31	0.03	0.029**
Machinery- equipment repair and maintenance	3,373.80	2.50	2,533.93	2.41	2,995.86	2.47	0.423
Packaging	28,546.05	21.19	23,312.43	22.17	26,190.92	21.57	0.193
Transport	8,033.36	5.96	6,063.17	5.77	7,146.78	5.89	0.040**
Electricity	507.40	0.38	415.95	0.40	466.24	0.38	0.528
Meal	515.88	0.38	398.44	0.38	463.03	0.38	0.321
Rope	550.18	0.41	397.62	0.38	481.53	0.40	0.500
Revolving fund interest	1,990.16	1.48	1,611.39	1.53	1,819.72	1.50	0.602
A. Total variable costs	74,359.72	55.19	60,207.45	57.27	67,991.20	56.01	0.602
Administrative costs	2,230.79	1.66	1,806.22	1.72	2,039.74	1.68	0.602
Permanent labour	25,648.85	19.04	12,478.09	11.87	19,722.01	16.25	0.697
Machinery-equipment depreciation	1,059.15	0.79	953.06	0.91	1,011.41	0.83	0.129
Machinery-equipment capital interest	208.65	0.15	208.38	0.20	199.25	0.16	0.129
Land rent	1,727.27	1.28	1,794.44	1.71	1,757.50	1.45	0.029**
Greenhouse depreciation	24,634.56	18.29	23,132.92	22.00	23,958.82	19.74	0.295
Greenhouse capital interest	4,853.01	3.60	4,557.19	4.33	4,719.89	3.89	0.295
B. Total fixed costs	60,362.28	44.81	44,930.30	42.73	53,408.61	43.99	0.396
C. Total production costs (A+B)	134,722.00	100.00	105,137.74	100.00	121,399.81	100.00	0.784

**: $p<0.05$

Source: Authors' calculation.

Table 6. Tomato yield and prices by months in greenhouse enterprises

Months	Enterprise groups (da)				General	
	1. Group		2. Group			
	Yield (ton/da)	Price (TL/kg)	Yield (ton/da)	Price (TL/kg)	Yield (ton/da)	Price (TL/kg)
March	1.00	6.13	1.11	6.29	1.05	6.20
April	3.27	6.22	3.44	6.37	3.35	6.29
May	4.64	3.12	4.44	3.23	4.55	3.17
June	6.55	2.15	6.78	2.23	6.65	2.19
July	8.09	3.03	8.33	3.07	8.20	3.05
August	8.18	2.09	8.78	2.26	8.45	2.17
September	6.00	2.65	6.22	2.92	6.10	2.78
October	4.91	4.17	5.22	4.41	5.05	4.28
November	3.73	3.28	4.00	3.42	3.85	3.34
December	2.73	3.07	2.89	3.16	2.80	3.11
Total	49.09	3.59	51.22	3.74	50.05	3.66

Source: Authors' calculation.

Tomato yield and prices by months in greenhouse enterprises are given in Table 6. As it can be seen from the table that the average tomato yield of 2nd group was higher than that of 1st group. Average tomato yield was 49.09, 51.22 and 50.05 tons/da for 1st group, 2nd group and all enterprises average respectively. When average tomato yields by months were examined, it was observed that yield increased continuously during March-August but decreased after August which continued until December. While tomato yield per decare was 1.05 tons in March, it increased by about 8 fold reaching 8.45 tons in August. Tomato yield decreased by about 3 folds during August-December from 8.45 tons to 2.80 tons. It was found that tomato yield was highest in August and lowest in March. When tomato prices were examined, it was found that the producers in the 2nd group sold tomatoes at a slightly higher price. Average tomato prices for 1st group, 2nd group and general enterprises were 3.59, 3.74 and 3.66 TL/kg, respectively. A fluctuation was observed in tomato prices by months. Highest tomato prices were observed in March and April. The prices in these months were 6.20 and 6.29 TL/kg respectively. Whereas the prices in other months generally varied between 2-4 TL/kg. In a study conducted on the geothermal greenhouses in Afyonkarahisar province, Kervankıran (2011) [10] found that tomato yield per decare varied between 60-70 tons in soilless production method. Sipahioğlu (2014) [14] found that tomato yields for conventional and soilless agriculture systems were 19. 8 and 31 tons/da respectively.

The gross product value of a production activity is the sum of the values based on market prices for the products obtained as a result of the agricultural activity and the annual productive inventory stock increases that emerge as a result of the aforementioned production activities [12]. Gross product value in greenhouse enterprises per decare for enterprise size groups is provided in Table 7. As it can be seen from the figure, gross product value is comprised of tomato product value and agricultural supports. It was found that the gross product value in enterprises increased parallel to enterprise size. Gross product value per decare for 1st and 2nd group enterprises was 165,072.76 TL and 177,146.16 TL respectively. Gross product value per decare for general average was 170,415.81 TL. Tomato product value comprised majority of the gross product value (93.84 %). It was observed that the producers received good agricultural practices, bumble bee use and biological control supports. In addition, it was also found that the producers received support from Turkish Employment Agency (İŞKUR) because they were employing female workers. The proportion of agricultural supports in total gross product value was 6.16 %.

Gross profit, net profit and relative return values per decare according to enterprise size

groups are given in Table 8. Gross profit is an important success criteria for identifying the competitive powers of the production activities with regard to the use of the current scarce production factors in the enterprise. In other words, gross profit is an important criteria indicating the success of the enterprise organization [6]. It was found that gross profit increased with increase in enterprise size and that the gross profit per decare was greater in 2nd group than 1st group. Gross profits per decare were 90,713.04 and 116,938.72TL for 1st and 2nd group, respectively. It was shown that net profit per decare also increased with increase in enterprise size. Net profit per decare was 30,350.76 and 72,008.42 TL for 1st and 2nd group, respectively. Relative return values for the enterprise groups were 1.23 and 1.68 respectively. Relative return should be greater than 1 for an enterprise to be considered profitable. Both groups of enterprises were profitable based on obtained results. Profitability increased with increasing enterprise size. It can be stated that the 2nd group was more advantageous than the 1st group with regard to profitability indicators. In a study conducted on soilless agriculture tomato production in geothermal greenhouses, Eren (2017) [5] found that relative return was 1.70. Sipahioğlu (2014) [14] found out that relative return for soilless agriculture tomato production was 1.18.

The profit margin per kg and ratio of profit margin to sales price of tomato in enterprises are given in Table 9. It was found that profit margin increased with increase in enterprise size and that the profit margin per kg was greater in 2nd group than 1st group. Profit margin per kg were 0.85 and 1.69 TL for 1st and 2nd group, respectively. The ratio of profit margin to sales price (profit margin/sales price*100) criterion was calculated to determine how much of the sales price of tomato was cost and profit. The ratio of profit margin to sales price were 23.68 and 45.19% for 1st and 2nd group, respectively. Accordingly, it can be said that 23.68% of each one kg of tomato sold was profit in 1st group and 45.19% of each one kg of tomato sold was profit in 2nd group.

Table 7. Gross product value in greenhouse enterprises

Income elements	Enterprise groups (da)				General		P value
	1. Group		2. Group				
	TL/da	(%)	TL/da	(%)	TL/da	(%)	
Tomato product value	153,645.87	93.08	167,783.95	94.71	159,924.85	93.84	0.860
Agricultural Supports	11,426.90	6.92	9,362.21	5.29	10,490.96	6.16	0.141
Good agricultural practices	9,435.58	5.72	7,978.45	4.50	8,779.87	5.15	0.239
Biological control	659.36	0.40	466.25	0.26	572.46	0.34	0.324
Bumble bee use	362.11	0.22	339.35	0.19	345.04	0.20	0.764
Women labour support	969.85	0.59	578.16	0.33	793.59	0.47	0.594
Total gross product value	165,072.76	100.00	177,146.16	100.00	170,415.81	100.00	0.925

Source: Authors' calculation.

Table 8. Gross profit, net profit and relative return in greenhouse enterprises

Profitability indicators	Enterprise groups (da)		General	P value
	1. Group	2. Group		
Tomato product value (TL/da)	153,645.87	167,783.95	159,924.85	0.860
Agricultural support (TL/da)	11,426.90	9,362.21	10,490.96	0.141
Gross product value (TL/da)	165,072.76	177,146.16	170,415.81	0.925
Variable costs (TL/da)	74,359.72	60,207.45	67,991.20	0.602
Production cost (TL/da)	134,722.00	105,137.74	121,399.81	0.784
Gross profit (TL/da)	90,713.04	116,938.72	102,424.62	0.830
Net profit (TL/da)	30,350.76	72,008.42	49,016.01	0.711
Relative return	1.23	1.68	1.40	0.106

Source: Authors' calculation.

Table 9. The profit margin per kg and ratio of profit margin to sales price of tomato in enterprises

	Enterprise groups (da)			
	1. Group	2. Group	General	P value
Tomato production cost (TL/da)	134,722.00	105,137.74	121,399.81	0.784
Tomato yield (ton/da)	49.09	51.22	50.05	0.261
Tomato production cost per kg (TL/kg)	2.74	2.05	2.43	0.658
Tomato sale price per kg (TL/kg)	3.59	3.74	3.66	0.268
Profit margin per kg (TL/kg)	0.85	1.69	1.23	0.857
The ratio of profit margin to the sales price (%)	23.68	45.19	33.60	0.542

Source: Authors' calculation.

CONCLUSIONS

It was found that the average greenhouse area was 39.85 decare and that the average greenhouse age was 4.35 year that the producers carried out production activities according to both soilless agriculture and good agriculture practices. Average total greenhouse establishment cost per decare was 479,176.41 TL. Of this total greenhouse establishment cost, 73.80 % was greenhouse construction cost, 12.27 % greenhouse automation cost, 7.28 % fee paid to municipality for geothermal connections and 6.64 % as heating system cost. Total production costs per decare for all enterprises average was 121,399.81 TL with the proportion of variable and fixed costs in production costs being 56.01 % and 43.99 % respectively. It was observed that tomato yield increased continuously during March-August but decreased after August and that the decrease continued until December. It was found that the highest tomato yield took place in August whereas the lowest was in March. A fluctuation was observed in monthly tomato prices. Highest tomato prices were observed in March and April. Gross product value per decare for the average of all enterprises was 170,415.81 TL. A major portion of the gross product value was comprised of tomato product value (%93.84). The proportion of agricultural supports in total gross product value was 6.16%. It was observed that the producers in the 2nd group were more advantageous than those in the 1st group in terms of gross profit, net profit and relative return. Average gross profit, net profit and relative return per decare for all enterprises were 102,424.62 TL, 49,016.01 TL and 1.40, respectively.

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