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Production Economy of Pomegranate in Manisa Province

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Abstract

In this study, pomegranate production economy, input use in pomegranate production, cost, profitability and productivity analyzes were discussed. The survey data for 2018 were obtained from face to face interviews with 82 pomegranate producers selected by a stratified sampling method. In this study, demographic structure, input usage; fertilizer and chemigation usage amounts, machinery and labor use, production activity costs and profitability were examined. As a result of the study, pomegranate production cost was calculated as 1950.4 TL per decare and 2440 kg per decare pomegranate was obtained in response to these production costs. As a result of marketing activities, gross profit was 1496.8 TL per da and net profit was 834.5 TL per decare.

Keywords: Pomegranate, Production economics, Cost, Profitability, Manisa

Introduction

Pomegranate production in Manisa, between 2004 and 2018, both in terms of production area and production amount and number of pomegranate trees with or without fruit showed positive and negative developments. As can be seen in Table 1 as the number of pomegranate trees in fruit-bearing age, it has started to increase gradually since 2004 (35.380 units). In 2013, it increased by 134% compared to the previous year 2012 and by 653% increased (231.198) number of fruit-bearing pomegranate trees were reached. As a result of this rapid change, as of 2014, pomegranate has become one of the most important fruits grown in Manisa province, which has high potential in terms of climate and other geographic and agricultural conditions for many varieties of fruits, especially viticulture. In 2014, 6.214 ton production quantities reaching the highest point of pomegranate production, according to the data 2018 to about 1% of the total amount of pomegranate production in Turkey with 4,867 tons were produced in Manisa (Turkstat 2018).

As can be seen from the statistical information above, increases have been observed compared to the previous year until 2014 and after 2014 there has been a decrease. However, according to the 2004 index, the number of pomegranate trees yielding fruit increased continuously.

Table 2 provides information regarding to number of pomegranate trees not producing fruits (2004-2018). As can be seen from Table 2, although the number of non-fruit trees in Manisa in 2015 decreased by -19% compared to the previous year and increased by 1164% compared to 2004.

Table 3 shows the pomegranate production areas in Manisa between the years 2004-2018. Accordingly, the highest production area was reached in 2014 with 5,568 da. This area means an increase of 1,591% compared to 2004. The year in which the highest increase was compared to the previous year was 2008. In parallel with the increase in the number of fruitless pomegranate trees, the production area increased by 659% in 2008 compared to 2004.

In Table 4, yields per fruit-bearing tree for 2004 to 2018 are given. Accordingly, the yield varies between 18 and 25 kg. However, as shown in Table-7 in our study in the production areas, the yield was determined to be 45.9 kg per fruit-bearing tree. Even if the average yield per tree is 25 kg, which is the highest given statistics, producers cannot afford to pay half of their costs.

Table 5 shows the annual production of pomegranate between 2004 and 2018. Accordingly, the highest production

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amount was reached in 2014 with 6,214 tons. This amount means an increase of 802% compared to 2004. Although the increase in pomegranate production in 2014 was parallel to the increase in the number of fruit trees in 2014, it remained low compared to the increase in pomegranate production in 2014. Determination of input usage amounts, costs and revenues in agricultural products is of great importance for micro level producers and economic policy makers. The results of research on agricultural product costs are an important tool that governments can use to determine price policies. In addition, agricultural product costs are widely used in planning activities such as determining the usage levels of physical production inputs, workforce planning, making financing programs, preparing product budgets and investment projects, etc. (Ozkan and Yilmaz 1999; Ozalp and Yilmaz 2013).

In this study, it was aimed to determine the input usage, cost, annual activity results and comparative analysis of pomegranate production in Manisa province and to make profitability and productivity analyzes. In addition, it is aimed to reveal the reasons why pomegranate production is preferred by producers in recent years. Another issue is whether the net profit and agricultural income obtained are sufficient to meet the livelihood and needs of the farmer family. Some values of Manisa pomegranate production are given in the graphs below.

Table 1. Number of fruit pomegranate trees in Manisa province (2004-2018)

Topic	Year	Amount (kg)	Change compared to previous year (%)*	Tendency	Change compared to 2004 (%)*	Tendency
Number of Fruit Producing Trees (Pieces)	2004	35380	100	►	100	►
	2005	36020	2	▲	102	▲
	2006	37640	4	▲	106	▲
	2007	41990	12	▲	119	▲
	2008	42510	1	▲	120	▲
	2009	43010	1	▲	122	▲
	2010	73810	72	▲	209	▲
	2011	91660	24	▲	259	▲
	2012	98619	8	▲	279	▲
	2013	231198	134	▲	653	▲
	2014	243756	5	▲	689	▲
	2015	232890	-4	▼	658	▲
	2016	230781	-1	▼	652	▲
	2017	220126	-5	▼	622	▲
	2018	207496	-6	▼	586	▲

Source: Turkstat (2018) Access Date: 17.04.2019

* The index for the year 2004 was taken as 100

Table 2. Number of pomegranate trees not producing fruits (2015-2018)

Topic	Year	Amount (kg)	Change compared to previous year (%)*	Tendency	Change compared to 2004 (%)*	Tendency
	2015	63430	-19	▼	1164	▲
	2016	61966	-2	▼	1137	▲
	2017	42879	-31	▼	787	▲
	2018	37482	-13	▼	688	▲

Source: Turkstat (2018) Access Date: 17.04.2019

* The index for the year 2004 was taken as 100

Table3. Manisa province pomegranate production area (2004-2018)

Topic	Year	Area (da)	Change compared to previous year (%)*	Tendency	Change compared to 2004 (%)*	Tendency
Production area (da)	2004	350	100	►	100	►
	2005	360	3	▲	103	▲
	2006	545	51	▲	156	▲
	2007	1060	94	▲	303	▲
	2008	2308	118	▲	659	▲
	2009	2660	15	▲	760	▲
	2010	4026	51	▲	1150	▲
	2011	4396	9	▲	1256	▲
	2012	4413	0	▲	1261	▲
	2013	5479	24	▲	1565	▲
	2014	5568	2	▲	1591	▲
	2015	5355	-4	▼	1530	▲
	2016	5276	-1	▼	1507	▲
	2017	4638	-12	▼	1325	▲
	2018	4078	-12	▼	1165	▲

Source: Turkstat (2018) Access Date: 17.04.2019

* The index for the year 2004 was taken as 100

Table 4. Pomegranate yield in Manisa province (2004-2018)

Topic	Year	Amount (kg)	Change compared to previous year (%)*	Tendency	Change compared to 2004 (%)*	Tendency
Yield per fruit producing tree	2004	22	100	►	100	►
	2005	22	0	►	100	►
	2006	25	14	▲	114	▲
	2007	18	-28	▼	82	▼
	2008	21	17	▲	95	▼
	2009	23	10	▲	105	▲
	2010	19	-17	▼	86	▼
	2011	19	0	►	86	▼
	2012	18	-5	▼	82	▼
	2013	25	39	▲	114	▲
	2014	25	0	►	114	▲
	2015	24	-4	▼	109	▲
	2016	23	-4	▼	105	▲
	2017	25	9	▲	114	▲
	2018	23	-8	▼	105	▲

Source: Turkstat (2018) Access Date: 17.04.2019
* The index for the year 2004 was taken as 100

Table 5. Pomegranate production amount in Manisa province (2004-2018)

Topic	Year	Amount (tons)	Change compared to previous year (%)*	Tendency	Change compared to 2004 (%)*	Tendency
Production (tons)	2004	775	100	►	100	►
	2005	783	1	▲	101	▲
	2006	931	19	▲	120	▲
	2007	735	-21	▼	95	▼
	2008	876	19	▲	113	▲
	2009	985	12	▲	127	▲
	2010	1410	43	▲	182	▲
	2011	1785	27	▲	230	▲
	2012	1814	2	▲	234	▲
	2013	5673	213	▲	732	▲
	2014	6214	10	▲	802	▲
	2015	5605	-10	▼	723	▲
	2016	5295	-6	▼	683	▲
	2017	5470	3	▲	706	▲
	2018	4864	-11	▼	628	▲

Source: Turkstat (2018) Access Date: 17.04.2019

* The index for the year 2004 was taken as 100

Material and Method

The main material of this research are data obtained by the survey method in 2018. Data were obtained from the pomegranate producers of especially Salihli district, Köprübaşı, Şehzadeler, Akhisar, Gölmarmara and Alaşehir districts of Manisa. Data represented about 77.1% of the pomegranate production area in Manisa, 79.1% of the amount of pomegranate production and about 78% of the number of fruit pomegranate trees. In addition to the information obtained from previous studies on the subject, the data obtained from provincial and district directorates of agriculture were also used as secondary data.

In the research, only pomegranate production activities of the enterprises were examined. In the research, stratified sampling method was used to determine the number of sample enterprises. In this method, a more healthy and detailed study is possible by separating the main mass into homogenous layers with fewer samples (Gunes and Arikan, 1988). The sampling was based on pomegranate production areas of the producers and the following formula based on Neyman distribution was used to find the number of samples. The number of sample enterprises that should be studied with a 5% deviation from the average and 95% confidence level was found 82.

$n = (\sum NhSh)^2 / N^2 D^2 + \sum Nh\ Sh^2$

In the formula above; n is the sample volume, N is the total number of producers, Nh is the number of producers in the layer. D = d / z, and d is the expected deviation from the average, z is standard normal distribution value while Sh^2 is the layer variance.

An analysis of variance was conducted to determine whether the differences between the various elements related to pomegranate production between plants or producers assessed by land groups were significant. The number of pomegranate producers surveyed by land groups is given in Table 6 below.

Research Findings

This research was carried out by creating land groups of pomegranate production gardens at 0-30 da, 31-60 da, 61-100 da and 101 da.

Manisa has made a great leap forward in pomegranate production by establishing new garden facilities especially since 2008. Naturally, it is possible to see the results of these plants from the earliest third year, but normal production starts at the fifth year and the ideal yield year at the ninth or tenth year.

The planting of pomegranate trees in Manisa in 2008 started to give obvious results in 2013 and 2014. The year 2014 was the highest (6214 tons) production. In 2018, production decreased to 4864 tons. This ratio was approximately 1% of Turkey's pomegranate production. The production in 2012 was 1814 tons. One of the aims of this research is to reveal the causes of this rise and fall.

Demographic and general production information

First of all, some demographic and general information of Manisa pomegranate producers are given in Table 7.

The average age of Manisa pomegranate producers is 47.2 and the average of pomegranate production experiences is 12.7 years. The average size of the family is 4.9 people and the average duration of education is 10.1 school years. In the pomegranate production activity, the average number of trees per decare is 51.4 and the average yield is 45.9 kg per decare.

Input Usage Cases of Manisa Pomegranate Production

As can be seen in Table 8, some input usage values of Manisa pomegranate production activity can be seen. Accordingly, the weighted average use of machinery in pomegranate pro-

duction is 2.56 hours per decare. The lowest machine use was observed in enterprises with production area of 101 dacares and above. As the scale of production increases, machine usage time per unit decreases. In terms of machine use, the difference between land groups was found to be statistically significant (p= 0.02) according to variance analysis.

The weighted average labor force usage period in pomegranate production activity is determined as 31.29 hours per decare. Approximately 80% of this period is used during maintenance and harvesting period. The lowest labor force per unit was possible in enterprises of 101 and above. In terms of labor use, the difference between land groups was found to be statistically significant (p= 0.02) according to variance analysis.

As can be seen in Table 8, the average weight of fertilizer use per decare was 55.92 kg. It is seen that the most fertilizer use belongs to the plants smaller than 30 decares.

It can be said that there is a possibility that the use of fertilizer will change inversely in proportion to the plant size to the lowest possible fertilizer utilization level. In terms of fertilizer use, the difference between land groups was found to be statistically significant (p= 0.01) according to variance analysis.

When the level of chemigation use is considered, it is seen that the active ingredient per decare is 6.99 kg. It is seen that the enterprises with the highest amount of chemigation use belong to the enterprises under the size of 30 as in the use of fertilizer. In terms of chemigation use, the difference between land groups was found to be statistically significant (p=0.002) according to variance analysis.

Manisa province pomegranate production cost elements

Table 9 shows the cost elements within the scope of Manisa pomegranate production activity. Accordingly, the total average cost per decare is 1950.4 TL and 66% of this cost is variable and 34% is fixed expenses.

The highest share among the variable expenditures is firstly harvested with 19.6%, then with 14% chemigation and 8.12% fertilizer. The lowest share belongs to marketing activity with 0.64.

In fixed expenses, the highest expense belongs to land rental cost with 14.2% and the lowest expense belongs to management expense with 1.12%.

Manisa province pomegranate production GPV, cost and profitability values

Table 10 shows the GPV, yield, sales price gross and net profit values of Manisa pomegranate production activity. Accordingly, as of 2018, average selling price of pomegranate is 1.14 TL per kg, yield per decare is 2440.6 kg per decare, GPV per decare is 2786.8 TL, average cost is 0.8 TL per kg, gross profit is 1496.8 TL per decare and net profit is 834.52 TL per decare on average. In terms of GPV, the difference between land groups was found to be statistically significant (p= 0.03) according to analysis of variance and the difference between land groups was statistically significant (p= 0.03) in terms of gross profit.

The highest yield per decare is observed in enterprises with 101 and above with 49.1 kg per tree and the cost belongs to large scale enterprises with a return of 0.62 TL/ kg and gross profit of 2187 TL per decare.

Cost-profitability values of pomegranate production in Manisa province in terms of GPV and net profit

Table 11 shows the cost and profitability values of Manisa pomegranate production activities. Accordingly, the GPV value of the machine use per unit is 9.02 TL, the labor force is 5.55 TL, the average total cost is 1.43 TL and the net profit is 0.43 TL. It is seen that the highest net profit belongs to big enterprises with 0.94 TL and 101 and above, the least net profit belongs to enterprises with 0.40 TL and less than 30 da.

Table 6. Production area, production facility and surveyed facility

Pomegranate production area (da)	Production facility in the layer (pcs)	Surveyed facility (pcs)
1-30	875	51
31-60	395	21
61-100	134	8
101- +	6	2
Total	1410	82

Table 7. Some demographic and general production information of Manisa pomegranate production

Age average (year)	Experience (year)	Family average (person)	Male labor force (person)	Average training (academic year)	Number of pomegranate trees (da/trees)	Yield average (kg/tree)
47.2	12.7	4.9	3.59	10.1	51.4	45.9

Table 8. Some input usage values of Manisa pomegranate production

Pomegranate production area (da)	Machine usage (da/h)	Labor use (da/h)	Fertilizer usage (pure-kg/da)	Chemigation use (active sub kg/da)
0.1-30	2.71	32.18	58.39	7.34
31-60	2.44	30.78	53.41	6.82
61-100	1.97	27.41	47.72	5.32
101- +	1.41	21.88	44.64	5.18
Weighted Average	2.56	31.29	55.92	6.99

Table 9. Manisa province pomegranate production cost elements (TL/da)

Cost Elements	Production Area (10-30 da)	Production Area (31-60 da)	Production Area (61-100 da)	Production Area (100-+ da)	Weighted Average	Ratio (%)
Fertilizer	154	161	177	186	158.3	8.12
Chemigation	267	282	291	302	273.6	14
Electricity-Fuel-Water	241	238	232	183	239.1	12.3
Machine Use	72	69	64	56	70.3	3.61
Labor (Excluding harvest)	129	112	101	97	121.4	6.23
Harvest Labor	386	376	372	368	381.8	19.6
packing	30	32	36	41	31.2	1.60
Marketing	11	14	17	19	12.4	0.64
Variable Charges	1290	1284	1290	1252	1288.2	66
Management Share	18	27	31	38	21.8	1.12
Family Labor Share	210	239	164	28	213.0	10.9
Land Rental Cost	276	279	285	296	277.8	14.2
Fixed Capital Interest	124.4	81.9	82.4	64.1	108.2	5.55
Depreciation	33.5	49.1	68.3	92.7	41.4	2.12
Fixed Costs	661.9	676	630.7	518.8	662.3	34
Total Cost	1951.9	1960	1920.7	1770.8	1950.4	100

Table 10. Manisa province pomegranate production, gross production value (GPV), cost and profitability values

Production area (da)	Yield (tree/da)	Yield (kg/da)	Sale cost (TL/kg)	GPV (TL/da)	Cost (TL/kg)	Gross profit (TL/da)	Net Profit (TL/da)
0-30 da	45.4	2419	1.13	2733.5	0.81	1443.47	781.57
31-60 da	46.4	2456	1,16	2849	0.80	1558.96	882.96
61-100 da	47.7	2518	1,16	2920.9	0.76	1630.88	1000.2
101-+ da	49.1	2850	1.22	3477	0.62	2187	1668.2
Weighted Average	45.91	2440.6	1.14	2786.8	0.80	1496.8	834.52

Table 11. Gross production value (GPV) and cost elements of Manisa province pomegranate production

Production Area (da)	GPV/Machine Cost (TL)	GPV/Labor Cost (TL)	GPV/Total Cost (TL)	GPV/Variable Cost (TL)	GPV/Fixed Cost (TL)	Net Profit/Total Cost (TL)
0-30 da	8.73	5.31	1.40	2.12	4.13	0.40
31-60 da	9.28	5.84	1.45	2.22	4.21	0.45
61-100 da	9.87	6.18	1.49	2.26	4.63	0.52
101-+ da	14.55	7.48	1.77	2.78	6.70	0.94
Weighted average	9.02	5.55	1.43	2.16	4.21	0.43

Conclusion

This study held in Manisa where approximately 1% pomegranate production of Turkey's occurs, comparative analysis for profitability and production levels in pomegranate production were intended. Within the scope of the research, findings related to input use, labor, machine use, fertilizer, chemigation and other inputs were considered and the cost of pomegranate production was determined.

As a result of the research, it was found that 2.56 hours/da machine use, 31.29 hours/da labor, 55.92 kg/da fertilizer as pure substance and 6.99 kg/da chemigation including pesticide as active substance. As a result of statistical comparisons between pomegranate width, production regions and education level groups, significant differences were found in pomegranate production area width groups in decare labor and machine use. This finding reveals that as the scale increases, that is, as the size of the garden increases, the mentioned inputs decrease. Similar results were obtained for chemigation use. However, there was no significant difference in the use of input per decare, regionally and according to the producer's level of education.

In the research area, pomegranate production cost per unit area was determined as 1950.4 TL, 66% of which was variable cost and 34% was fixed cost.

In response to these production costs, 2440.6 kg/da pomegranate yield was obtained. The gross sales value calculated by multiplying the average selling price (1.14 TL/kg) and pomegranate yield was calculated as 2786.8 TL/da. The average gross and net profit values were calculated as 1496.8 TL/ da and 834.52 TL/da, respectively. Medicine and machinery costs per decare decrease as the pomegranate grows. This difference was also statistically significant.

The break-even analysis indicated that net profit from pomegranate production in the region's farms and the minimum monthly income required for the livelihood of the farmer's family (at least 3600 TL/month, for 2018) should produce at least 55 tons and more pomegranates. In this case, the pomegranate production area should be at least 25 da or more. It can be said that the efficiency and profitability levels achieved for pomegranate production are not satisfactory and therefore the pomegranate production areas in the region are rapidly decreasing.

Although it seems adequate income derived from pomegranate production in Manisa compared to Turkey agricultural income, alternative products such as Sultani seedless grapes, higher production cost of pomegranate Manisa' Pomegranate trees will be removed and Sultani seedless grape production will continue to transition.

To date, the increase in pomegranate production has been offset by an increase in domestic consumption and exports.

However, in 2018 conditions, it is observed that the saturation of domestic and foreign demand for pomegranate, both for fresh consumption and for processing, has been reached. In this case, the increase in the supply caused a decrease in the prices of pomegranate both in the domestic market and in export prices by half. While the pomegranate export price was USD 1.1 / kg on average in 2010, it decreased to USD 0.52 / kg in 2018 (Turkstat, 2018).

In this respect, it is critical to continue increasing pomegranate exports both freshly and processed, while increasing productivity and lowering costs.

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