



## Research Article

# Economic Analysis of Plum Production in Izmir Province, Turkey

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**Abstract** | Plum ranks third in the world in stone fruit production after olives and peaches. In Turkey, plum production comes after olive, apricot, peach, cherry and cherry production. Turkey is among the important plum producing countries of the world. Izmir province has a high potential in terms of climate and geographical features in terms of fruit growing. Leading plum production regions are the Mediterranean Region, the Aegean region, the Marmara Region and the Central Anatolia Region. In the last 10 years, plum production increased by 113.34% and reached 11,373 tons in Izmir. It has been determined that plum production and area will increase in the next five years. Within the scope of the research, cost and profitability of plum production for 2018 were calculated in Izmir province. The data of this paper is derived from Izmir Directorate of Provincial Agriculture and Forestry. Total production costs are determined as 4215.74 US\$ ha<sup>-1</sup> and variable costs as 1496.88 US\$ ha<sup>-1</sup>. Net profit per decare in plum cultivation was calculated as 816.82 US\$ ha<sup>-1</sup>, relative profit 1.19 and unit plum cost was calculated as 0.44 US\$ ha<sup>-1</sup>.

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## Introduction

Fruits are widely cultivated by producers worldwide due to their contribution to human nutrition and their economic value. Plum, which is an important member of stone fruit variety, is grown in a wide geography in the world. Plum is considered to contain plenty of B-vitamins, as well as rich in potassium and magnesium minerals. It also contains a rich variety of vitamins (A, B1, B2, B3, B6, C and E) (Tunalıoglu and Keskin, 2004; Baran *et al.*, 2017a).

According to FAO's 2018 data, 5.6 million hectares of plums were produced in the world and 3.9 million tons of plums were obtained in this field. In the period of 2009-2018, world plum production area increased

by 7.29% and plum production increased by 17.11%. Countries that are important in plum production and their share in production are China (53.84%), Romania (6.68%), Serbia (3.41%), the United States (3.11%) and India (2.15%) (FAO, 2019).

Plum ranks third in the world in stone fruit production after olives and peaches. In Turkey, plum production comes after olive, apricot, peach, cherry and cherry production. In 2018, Turkey provides 2.35% share of world production to 296,878 tons of plum production. Turkey has carried 68,140 tons of plum exports of US\$ 22.1 million in 2018 (FAO, 2019). According to TURKSTAT data for 2019; 317,946 tons of plums are provided from 8.82 million plum trees in Turkey. Leading plum production regions are

the Mediterranean Region, the Aegean region, the Marmara Region and the Central Anatolia Region. Mersin (19.56%), Bursa (8.80%), Adana (5.29%), Izmir (4.84 %), Antalya (4.76%) and Manisa (4.31%) which are important provinces for plum production (TURKSTAT, 2020).

Plum cultivars grown in Turkey, generally belong to *Prunus cerasifera* Ehrh., *Prunus domestica* L., *Prunus institia* L., *Prunus spinosa* L., *Prunus divaricata* Led., *Prunus salisina* Lindl (Gunes, 2003). Some important varieties grown in various regions of Turkey are: green plums cultivars (Papaz, Can, Havran, Aynali), Japanese plums cultivars (Formasa, Climax, Santa Rosa), and European plums cultivars (Stanley, President, Sugar, Giant) (MoNE, 2011).

Plum production in Turkey is generally realized in mixed gardens with other fruits. Especially in recent years, as a result of the fact that the plum has found a level of value to satisfy the producer and the results of the research on the plum have been transferred to practice, the number of closed plum orchards based on early and late plum varieties is increasing rapidly. The increase in demand for plum saplings is an indicator of this. However, it cannot be said that the potential is fully utilized in plum exports. Thanks to the climate zone it is in and the ecological differences it has, Turkey allows the cultivation of many plum species and varieties. To prolong the export season with the production of early and late varieties, especially by using altitude differences, it is possible to have a say in world markets (Karamursel et al., 2007).

In Turkey, several researches have been conducted on economic analysis of different fruits. For example, studies have been conducted on economic analysis of apple (Demircan et al., 2005); fig (Yercan and Engindeniz, 2003); cherry (Akçay and Uzunoğlu, 2006); peach (Engindeniz and Cukur, 2003; Uzunoğlu and Akçay, 2009); pomegranate (Ozalp and Yilmaz, 2013); grape (Kizilaslan and Elmalı, 2012); apple (Akdemir et al., 2012); pear (Aydin et al., 2017); apricot (Ucar et al., 2017). On the other hand, several studies have been published on economic analysis of plum production in the world (Ward and Faris, 1968; Stankovic, 1978; Karić and Čejvanović, 2004; Vávra et al., 2006; Knutsen and Haukås, 2007; Milošević et al., 2008; Tabatabaie et al., 2012; Tshabalala, 2015; Day et al., 2016; Majid et al., 2018; Cross et al., 2019). However, limited number of studies have

been done on the cost and profitability analysis of plum production in Turkey (Karamursel et al., 2007; Karamursel, 2010; Buyukarikan and Gul, 2016; Balci et al., 2016; Bolat et al., 2007). Therefore, new and detailed studies are needed to investigate the cost and profitability of plum production.

The aim of this study is to analyze the cost and profitability of plum production in Izmir, Turkey. The results obtained in this study can be a guide for farmers and entrepreneurs who will invest to establish a plum plant.

## Materials and Methods

This study was performed in Izmir province, Turkey (Figure 1). The data of this paper is derived from Izmir Directorate of Provincial Agriculture and Forestry. Further data were also obtained from FAOSTAT and TURKSTAT for the various years. In this study, 2018 data were used for economic analysis of plum production.



Figure 1: Research area in Turkey.

The gross profit, net profit and relative profit indices were used to assess economic performance of plum production. The following formulas were used in the calculation of these indices (Acil and Demirci, 1984; Aydin et al., 2019).

$$\begin{aligned} \text{Gross profit} &= \text{Gross production value} - \text{Variable costs} \\ \text{Net profit} &= \text{Gross Production value} - \text{Production costs} \\ \text{Relative profit} &= \text{Gross production value} / \text{Production cost} \end{aligned}$$

Plum production costs were divided into constant and variable costs. Constant costs consist of management costs, annual depreciation costs, revolving fund interest and land rent. Variable costs included inputs associated with plum production such as labor, machinery, fertilizer, pesticides, water, electricity, etc. In this study, revolving fund interest

was calculated by charging a simple interest rate of 8%. Management costs were estimated 3% of total variable costs (Engindeniz and Ozturk, 2013; Ucar *et al.*, 2020). Data are presented in dollars. In addition, Trend analysis was used to determine the trend of production and area of plum for the period of 2020-2024. Trend values were calculated using the ordinary least squares method.

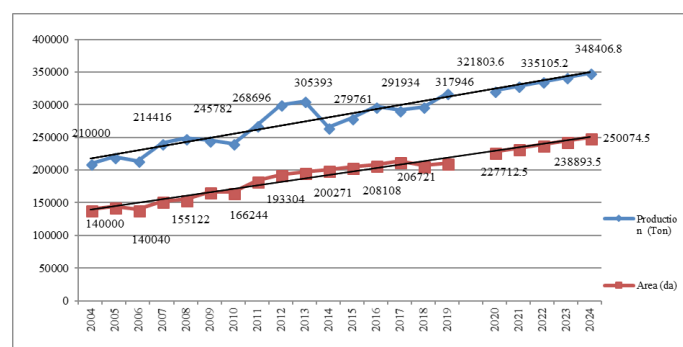
## Results and Discussion

### Plum production in Turkey and Izmir province

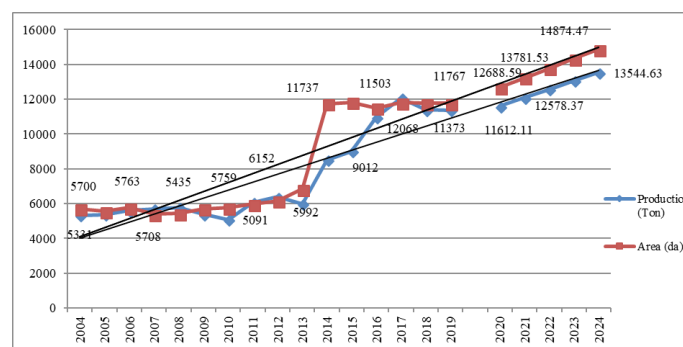
Turkey plum production in 2004-2019 period reached 317,946 tons of plums increased by 51.40%. In addition, the plum area increased by 127.10% and became 21,058 hectares. In the same period, the production of plums in Izmir province increased by 113.34% and reached 11,373 tons, while the plum area increased by 106.44% and reached 1,177 hectares (Table 1). In the province of Izmir; Odemis, Kemalpaşa and Menemen districts are leading in plum production with a share of 44.56%, 20.27% and 10.73%, respectively (TURKSTAT, 2020). Some factors that increase production can be summarized as; different climatic conditions of Turkey, development and cultivation of species and varieties adaptable to various ecologies, formation of modern orchards and developments in crop processing techniques (Karamursel, 2011; Osmanoglu *et al.*, 2013; Gecer *et al.*, 2015).

In period of 2020-2024, plum production amount and production area estimated in Turkey and in Izmir province by trend analysis. According to results of forecast, it has been determined that the amount of plum will be 348,408.60 tons and the plum area will

be 25,007.45 hectares in Turkey (y (Plum Production) = 210991 + 6309.60 \* t, y (Plum Area) = 134567 + 5303.60 \* t). Plum production will reach 13,544.63 tons and plum area will reach 1,487.45 hectares in Izmir (y (Plum Production) = 3398.90 + 483.13 \* t, y (Plum Area) = 3398.60 + 546.47 \* t) (Figures 2 and 3).



**Figure 2:** Changes plum production amount and production area in Turkey. Source: TURKSTAT, 2020.



**Figure 3:** Changes in plum production amount and area in Izmir province. Source: TURKSTAT, 2020.

### Cost and profitability of plum production

Calculation of production costs in agricultural crops provides important information in terms of production activities, resource utilization efficiency, planning, policy making and determination of resource demand (Kiral *et al.*, 1999).

**Table 1:** Plum production amount and area in Turkey and Izmir province.

Years	Turkey				Izmir Province			
	Plum Production (Ton)	Index (2004=100)	Plum Area (ha)	Index (2004=100)	Plum Production (Ton)	Index (2004=100)	Plum Area (ha)	Index (2004=100)
2004	210,000	100.00	14,000	100.00	5,331	100.00	570	100.00
2006	214,416	102.10	14,004	100.03	5,602	105.08	576	101.11
2008	248,736	118.45	15,512	110.80	5,791	108.63	544	95.35
2010	240,806	114.67	16,624	118.75	5,091	95.50	576	101.04
2012	300,046	142.88	19,330	214.32	6,393	119.92	615	107.93
2014	265,490	126.42	20,027	189.64	8,512	159.67	1,174	205.91
2016	297,589	141.71	20,811	212.56	10,979	205.95	1,150	201.81
2018	296,878	141.37	20,672	212.06	11,391	213.67	1,177	206.51
2019	317,946	151.40	21,058	227.10	11,373	213.34	1,177	206.44

Source: TURKSTAT, 2020.

Plum production per hectare and plum yield per tree are given in Table 2. Total plum production value was 9,678 kg ha<sup>-1</sup>, number of tree per hectare was 400 and plum yield per tree was 24.20 kg. Baran *et al.* (2017a) calculated plum production value as 6,375 kg ha<sup>-1</sup>.

**Table 2:** Yield per hectare and tree of plum growing in Izmir province (2018).

Total plum production (kg ha <sup>-1</sup> )	9,678.00
Number of tree per hectare	400.00
Plum yield per tree (kg tree <sup>-1</sup> )	24.20

**Table 3:** Cost items for plum production in Izmir province (2018).

Cost Items	T total costs (US\$ ha <sup>-1</sup> )	(%)
<b>A. Variable Costs</b>		
<b>1. Material Costs</b>		
Fertilizer	114.35	2.71
Water	99.79	2.37
Pesticides	135.14	3.21
Total Material Cost (a)	349.27	8.28
<b>2. Labor and Machine Cost</b>		
Tillage	135.14	3.21
Pruning	155.93	3.70
Fertilizer	93.56	2.22
Irrigation	72.77	1.73
Pest Management	93.56	2.22
Hoeing	83.16	1.97
Harvest	384.62	9.12
Total Labor and Machine Cost (b)	1018.71	24.16
<b>3. Other Costs</b>		
Transport	103.95	2.47
Packing	24.95	0.59
Total Other Costs (c)	128.90	3.06
Total Variable Cost (a+b+c)	1496.88	35.51
<b>B. Constant Costs</b>		
Revolving fund interest (%8)	119.75	2.84
Management costs (3%)	44.91	1.07
Rent equivalent of land	1663.20	39.45
Annual depreciation costs (*)	891.00	21.14
Total Constant Cost(d)	2718.86	64.49
Production Cost (a+b+c+d)	4215.74	100.00

\* The economic life of plum plantations was estimated as 30 years.

Production costs per hectare were calculated as 4215.74 US\$. Total variable cost has been calculated as 1496.88 US\$ ha<sup>-1</sup>. The share of variable costs was

35.51%, whereas the share of constant costs was 64.49%. In previous studies for other fruits indicated the share of variable cost was 46.43% for cherry (Bilgili *et al.*, 2019); 64.52% for apricot (Uçar *et al.*, 2017) 61.7%; for apple (Uzunoz and Akcay, 2006); 89.79% for melon (Yilmaz *et al.*, 2011); 45.46% for tangerine (Can and Yercan, 2006).

Variable costs for plum production are comprised of material costs, labor costs and other costs. It was determined that labor costs had the highest share among all variable costs (24.16%). Labor costs were followed by material costs (8.28%) and other costs (3.06%) (Table 3).

Karamursel (2010) carried out a study in which it was reported that variable costs of plum production were 2686.67 US\$ ha<sup>-1</sup> and the total cost of production was 5506.67 US\$ ha<sup>-1</sup>. Tabatabaie *et al.* (2012) calculated that the shares of variable cost from total cost was 65% and 61% for Ghatreh Tala and Shablon production, respectively.

In this study, cost to produce 1 kg of plum was calculated to be 0.44 US\$ (Table 4). In a study conducted by Knutsen and Haukås (2007) the cost of producing 1 kg of Jubileum plum, the cheapest to produce, was calculated to be NOK 14.63, while Victoria plum, the most expensive to produce, was calculated to be NOK 19.18 per kg.

**Table 4:** Unit cost of plum production in Izmir province (US\$ kg<sup>-1</sup>) (2018).

Cost items	
Plum yield per hectare (kg) (1)	9,678.00
Total production cost (US\$) (2)	4,215.74
Unit plum cost (US\$ kg <sup>-1</sup> ) (2/1)	0.44

Gross production value per hectare from plum cultivation is 5,032.56 US\$, net profit per hectare is 816.82 US\$ and relative profit is 1.19 (Table 5). The product sales price is 0.52 US\$ kg<sup>-1</sup>. Producers use 73.60% of the sales price they receive as an cost (Table 5). However, in a similar study the total cost for the Ghatreh Tala cultivar and Shablon cultivar production were determined to be 11,267.43 \$ ha<sup>-1</sup> and 9,504.94 \$ ha<sup>-1</sup> while the gross production value were found to be 47,145.93 \$ ha<sup>-1</sup> and 23,358.46 \$ ha<sup>-1</sup> respectively. Balci *et al.* (2016) calculated the net profit as 322.11 US\$ ha<sup>-1</sup>. The



economic research in other crops indicated the relative profit was 2.05 for almond (Demircan *et al.*, 2019); 1.20 for wheat and 1.02 for sunflower (Unakitan and Aydin, 2018); 2.37 for orange and 1.89 for lemon (Ozkan *et al.*, 2004); 1.88 for walnut (Baran *et al.*, 2017b); 1.36 for table tomato and 1.15 for processing tomato (Engindeniz and Ozturk, 2013).

**Table 5:** Net income obtained from plum production in Izmir province (US\$ ha<sup>-1</sup>) (2018).

Income items	
Yield per hectare (kg ha <sup>-1</sup> ) (1)	9,678.00
Plum price (US\$ kg <sup>-1</sup> ) (2)	0.52
Gross production value (US\$ ha <sup>-1</sup> ) (3=1x2)	5,032.56
Variable costs US\$ ha <sup>-1</sup>	1,496.88
Total production cost (US\$ ha <sup>-1</sup> ) (4)	4,215.74
Net profit (US\$ ha <sup>-1</sup> ) (3-4)	816.82
Relative profit (3/4)	1.19

## Conclusions and Recommendations

Plum has spread over wide areas thanks to the multitude of subspecies with different characteristics, its adaptability to different ecologies and the richness of rootstocks. Due to the ease of cultural processes in plum cultivation, the long harvest season and the high nutritional value, the interest in plum cultivation is increasing in the world and in Turkey. In addition to the large number of subspecies, it is possible to see plum varieties in the country market for 5-6 months due to the opportunities provided by different ecological regions in Turkey.

Izmir fruit production potential is high, it has an industry that processes fruits, and its export potential is high due to its geographical location. Plum production in Izmir province contributes significantly to the economy of the country and the livelihood of producers. Plum production and area of Turkey and Izmir provinces have reached the conclusion to continue to grow in future years. Plum production was found to be profitable in terms of net profit and relative profit. In the evaluation made in terms of variable costs in plum cultivation; labor costs and material costs take an important value. Plum is consumed fresh and dried on the market.

It is necessary to take some measures for the development of plum production and for the producers to maintain this production branch. The use of plum

as raw material should be increased. Producers should be encouraged to use certified seedlings. Training and extension studies on fertilization and spraying should be done for producers. In order to be less affected by agricultural frost damage, suitable species and varieties of plum trees should be grown.

Agricultural insurance should be done to reduce the economic risk caused by agricultural frost. Producers should be encouraged to produce organic plums. In order not to be affected by the negativity of low plum prices, it should be ensured to establish cold stores where the products can be kept. Producers should be encouraged to cooperate.

As a result, the implementation of branding and marketing systems that will ensure the preference of patented local products in the marketing of fresh and processed plums, the development of market information system and e-marketing, the establishment of a product exchange for plums in the province, the implementation of the contracted production system and the development of agricultural marketing infrastructure should be ensured.

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## Novelty Statement

The authors of this study have developed a collaboration to prepare the publication. The authors first carried out a study on plum production and economy, which is one of the important fruits.

Many studies have been done on plums before in Turkey. However, there is a need for studies that can be a guide especially for producers and entrepreneurs. This study was prepared with data collected from Izmir Directorate of Provincial Agriculture and Forestry.

## Author's Contribution

**Sait Engindeniz:** Conceived and coordinated the study, wrote conclusion and recommendations.

**Kubilay Ucar:** collected data, acquired the results and contributed to introduction, material and methods.

**Görkem Oruk:** Made revisions of the manuscript and wrote introduction, material and methods. The final manuscript had been read and approved by all authors.

### Conflict of interest

The authors have declared no conflict of interest.

## References

- Acil, A.F. and R. Demirci. 1984. Agricultural economics subjects. Ankara University, Agricultural Faculty Editions, Edition No: 880, Ankara, Turkey.
- Akçay, Y. and M. Uzunoğlu. 2006. An investment analysis of peach and cherry growing in the Middle Black Sea Region. *J. Agric. Food Inf.*, 7(1): 57-65. [https://doi.org/10.1300/J108v07n01\\_06](https://doi.org/10.1300/J108v07n01_06)
- Akdemir, S., H. Akcaoz and H. Kizilay. 2012. An analysis of energy use and input costs for apple production in Turkey. *J. Food Agric. Environ.*, 10(2): 473-479.
- MoNE, 2011. Plum Growing, Horticulture, Republic of Turkey Ministry of National Education <http://hbogm.meb.gov.tr/> Accessed February, 2021
- Can, A.B. and M. Yercan. 2006. Economic analysis of tangerine production in Seferihisar, Izmir. *J. Ege Univ. Agric. Fac.*, 43(1): 133-144.
- Aydin, B., D. Akturk, E. Ozkan, H. Hurma and M.A. Kiracı. 2017. Comparatively energy use efficiency and economic analysis in pear farming: Case of Thrace Region. *Turk. J. Agric. Food Sci. Technol.*, 5(9): 1072-1079.
- Aydin, B., D. Akturk, E. Ozkan, H. Hurma and M.A. Kiracı. 2019. Comparative energy use efficiency and economic analysis of apple production in Turkey: Case of Thrace Region. *Erwerbs-Obstbau*, 61: 39-45. <https://doi.org/10.1007/s10341-018-0387-5>
- Balcı, C., M. Demirkol and O. Sahin. 2016. Costs and tree values of some agricultural products in 2016. The Turkish Ministry of Agriculture and Forestry, Tokat, Turkey.
- Baran, M.F., I.H. Oguz and O. Gokdogan. 2017a. Determination of energy input-output analysis in plum (*Prunus domestica* L.) production. *Erwerbs-Obstbau*, 59: 331-335. <https://doi.org/10.1007/s10341-017-0332-z>
- Baran, M.F., O. Gokdogan and I.H. Oguz. 2017b. Determining the energy usage efficiency of walnut (*Juglans regia* l.) cultivation in Turkey. *Erwerbs-Obstbau*, 59: 77-82. <https://doi.org/10.1007/s10341-016-0301-y>
- Bilgili, G., G. Ozcingirak, U. Guler and S. Engindeniz. 2019. Cost and profitability analysis in cherry production: A case study for Kemalpaşa district of Izmir province. *J. Agric. Econ. Res.*, 4(1): 1-8.
- Bolat, I., B.E. Ak, I. Acar and A. İkinci. 2007. Plum culture in Turkey. *Acta Hort.*, 1175: 15-18. <https://doi.org/10.17660/ActaHortic.2017.1175.4>
- Buyukarikan, U. and M. Gul. 2014. Economic analysis of certified nursery producing enterprises in temperate climate fruits: A case of Isparta province, *Custos e @gronegocio on line*, 10(4): 60-72.
- Cross, J., A. Dalton, T. Biddlecombe, T. Hulme, C. Highwood and O. Doubleday. 2019. The best practice guide for UK plum production: Economic analysis of UK plum production. NIAB EMR Science for Environment, Food and Horticulture, England.
- Day, K.R., K. Klonsky, D.A. Sumner and D. Stewart. 2016. Sample costs to establish and produce plums: San Joaquin Valley-South 2016. UC Agriculture and Natural Resources Cooperative Extension Agricultural Issues Center, UC Davis Department of Agricultural and Resource Economics.
- Demircan, V., F. Yatagan and A. Dalgic. 2019. Economic analysis of almond production: a case study of Mugla province, Turkey. *Sci. Pap. Ser. Manage. Econ. Eng. Agric. Rural Dev.*, 19(3): 141-148.
- Dellal, İ. and A.A. Koc. 2003. An econometric analysis of apricot supply and export demand in Turkey. *Turk. J. Agric. For.*, 27: 313-321.
- Demircan, V., H. Yilmaz and T. Binici. 2005. Determination of cost and return of apple production in Isparta province. *J. Agric. Econ.*, 11: 71-80.
- Engindeniz, S. and F. Cukur. 2003. A research on technical and economic analysis of peach production in Kemalpaşa, Izmir. *J. Ege Univ. Agric. Fac.*, 40(2): 65-72.
- Engindeniz, S. and G. Ozturk. 2013. Economic and technical efficiency analysis of tomato production in Izmir province. *Ege J. Agric. Res.*, 50(1): 67-75.

- FAO, 2019. Agricultural statistics. (<http://faostat.fao.org>). Accessed: March, 2021.
- Gecer, M.K., Y.E. Erturk, S. Yalcin and M. Gundogdu. 2015. Plum production and marketing in Turkey. Proc. Sixth Int. Sci. Agric. Symp. Agrosym 2015, Jahorina, Bosnia and Herzegovina, October 15-18, pp. 632-639.
- Gunes, M., 2003. Some local plum varieties grown in Tokat province. J. Appl. Sci., 3(5): 291-295. <https://doi.org/10.3923/jas.2003.291.295>
- Karić, M. and F. Čejvanović. 2004. Cost-Benefit analysis for making decisions on incentives for investments in plum trees planting. Poljoprivreda (Agriculture), 10(2): 46-52.
- Karamursel, D., F.P. Ozturk, O.F. Karamürsel and M. Emre. 2007. Plum production, marketing and export potential in Turkey. Proc. Turkey V. Natl. Hortic. Congress, September 4-7 2007, Erzurum-Turkey, pp. 825-829.
- Karamursel, D., 2010. Structural situation and development possibilities of the farms made plum production in Afyon. Msc. thesis, The Graduate School of Natural and Applied Science of Selcuk University, Turkey.
- Karamursel, O.F., 2011. Plum farming. Fruit research station:6, Isparta, Turkey.
- Kiral, T., H. Kasnakoglu, F. Tatlıdil, H. Fidan and E. Gundogmus. 1999. Cost calculation methodology for agricultural crops and database guide. Project Report 1999-13, Edition No: 37, Ankara, Turkey.
- Kizilaslan, H. and O. Elmali. 2012. Grape production costs and marketing margins in Turkey (The Example from Tokat Province). J. New Results Sci., 19: 26-32.
- Knutsen, H. and T. Haukås. 2007. Economics of plum production in Norway. Acta Hortic., 734: 241-247. <https://doi.org/10.17660/ActaHortic.2007.734.30>
- Majid, I., A. Khalil and N. Nazir. 2018. Economic analysis of high density orchards. Int. J. Adv. Res. Sci. Eng., 7(4): 821-829.
- Milošević, T., B. ZornićIvana and G. Glišić. 2008. A comparison of low-density and high-density plum plantings for differences in establishment and management costs, and in returns over the first three growing seasons- A mini-review. J. Hortic. Sci. Biotechnol., 83(5): 539-542. <https://doi.org/10.1080/14620316.2008.11512419>
- Osmanoglu, A., M. Simsek and A. Sanli. 2013. A Research on the Performance of Some Standard Plum Cultivars in Bingol Ecology. YYU J. Agric. Sci., 23(2): 126-133.
- Ozalp, A. and I. Yilmaz. 2013. Input usage, profitability and productivity analysis of pomegranate production in Antalya province. J. Akdeniz Univ. Agric. Fac., 26(1): 19-26.
- Ozkan, B., H. Akcaoz and C.F. Karadeniz. 2004. Energy requirement and economic analysis of citrus production in Turkey. Energy Conv. Manage., 45: 1812-1830. <https://doi.org/10.1016/j.enconman.2003.10.002>
- Stankovic, D.M., 1978. Role and direction of breeding in the increase of economic value of plum cultivars. Acta Hortic., 74: 29-34. <https://doi.org/10.17660/ActaHortic.1978.74.1>
- Tabatabaie, S.M.H., S. Rafiee and A. Keyhani. 2012. Energy consumption flow and econometric models of two plum cultivars productions in Tehran province of Iran. Energy, 44(1): 211-216. <https://doi.org/10.1016/j.energy.2012.06.036>
- Tshabalala, P.M., 2015. Estimating the Economic Rate of Return to Plum Research Investments in South Africa, ARC-LNR, Economic Services Unit Agricultural Research Council, Hatfield, Pretoria, pp. 67.
- Tunalioglu, R., and G. Keskin. 2004. Plum, Agricultural Economic and Policy Development Institute, TEAE View, 7(9): 1-4.
- TurkStat, 2020. Agricultural statistics. (<http://www.tuik.gov.tr>). Accessed: March, 2021.
- Ucar, K., G. Saner and S. Engindeniz. 2017. The comparative economic analysis of organic and conventional dried apricot production: A case study for Turkey. Fresenius Environ. Bull., 26(7): 4555-4560.
- Ucar, K., S. Engindeniz, J. Palkovic. 2020. Risk and return analysis of open-field tomato grown in Turkey: A monte carlo simulation approach. Sarhad J. Agric., 36(4): 1236-1243. <https://doi.org/10.17582/journal.sja/2020/36.4.1236.1243>
- Unakitan, G. and B. Aydin. 2018. A comparison of energy use efficiency and economic analysis of wheat and sunflower production in Turkey: A case study in Thrace Region. Energy, 149: 279-285. <https://doi.org/10.1016/j.energy.2018.02.033>
- Uzunoz, M. and Y. Akcay. 2006. A profitability analysis of investment of peach and apple growing in Turkey. J. Agric. Rural Dev. Trop. Subtrop., 107(1): 11-18.

- Ward, L.E. and J.E. Faris. 1968. A stochastic approach to replacement policies for plum trees. California agricultural experiment station, giannini foundation monograph number 22, pp. 39.
- Vávra, R., J. Blažek, J. Mazánek and L. Bartoníček. 2006. The economics of modern plum orchards in the Czech Republic. Hort. Sci., 33(2): 47-56. <https://doi.org/10.17221/3739-HORTSCI>
- Yercan, M. and S. Engindeniz. 2003. The determination of cost and profitability of dried fig production: A case study for Turkey. Agriculture, 9(1): 46-50. <https://doi.org/10.37855/jah.2002.v04i01.02>
- Yilmaz, H., V. Demircan and S. Kurtluk. 2011. An economic analysis of open-field melon (*Cucumis melo* L.) production in Cankiri province of Turkey. Bulgar. J. Agric. Sci., 17(4): 484-490.