

Economic and Technical Evaluation of Fruit Sector in Turkey

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Abstract: Turkey is very suitable climate for fruit growing and all over the country has origin of a lot of fruit species. However it is suitable for growing of temperate fruits (hazelnut, pistachio, walnut, apple, pear, quince, apricot, sweet and sour cherries etc.) and subtropics fruits (such as orange, mandarin, lemon, fig), in the last years, some new species (avocado and kiwifruit) have been successfully grown. The fruit growing in Turkey have tended to develop in recent years. Fruit production and export values have also increased. Today, Turkey is the first in respect of hazelnut, sweet cherry and fig production, is the second for apricot production and is the third producer country for sour cherry, chestnut, olive, pistachio and quince production. Increase in fruit prices caused by increase in consumer consciousness about health benefits of fruit, application of advanced fruit growing techniques, supports and encouragements by Turkish Government effected increase in fruit production. On the other hand, consumption of produced fruit is also important. Prevention of fruit loss during production, postharvest and other process period will increase profitability of fruit growers and help to be attractive of fruit growing in Turkey. In this research, growing, advances and contributions of fruit growing to economy were examined with an overview. Some practical and reasonable recommendations will be suggested at the end of the study.

Keywords: Fruit, economy, market, applying technics, supports and encouragements, investment.

1. Introduction

Increasing chronic diseases in recent years have encouraged consumer interest in fruit and therefore increased fruit production and exports around the world. Fruit growing is a labor intensive production zone that is widespread in many parts of the world. Turkey, due to its geographical location, has suitable ecological conditions for all fruit species with the exception of tropical species. In this respect, Turkey is birthplace of horticulture cultivation and origin of most of the fruit species which have growth at different places of the world. In Turkey, tea, hazelnut and kiwifruit in Black Sea region, pistachio in Southeast Anatolia region, chestnut, almond, peach, sweet cherry, fig in Marmara region, fig, quince in Aegean region, apricot in East Anatolia region, citrus species, apricot, banana, strawberry, avocado in Mediterranean region, apple, pear, quince, sweet and sour cherries, in Central Anatolia region have been successfully cultivated for a long time. Moreover, it is also known that fruit growing in Anatolia was done intensely during the Hittites period.

Fruit growing in Turkey mostly developed depending on ecological factors. While late spring

frosts in some years caused very huge damages in apricot and other temperate fruit, winter frosts in some years caused freezing injuries. Despite of these conditions, fruit growing in Turkey became one of the agricultural actions which has high profitability depending on input levels.

In our country, fruit growing area and fruit production tend to increase (Köksal & Tuna-Güneş, 2007). Besides some new species such as avocado and kiwifruit, some factors such as some selection of new cultivars for other fruit species, use of new cultivation techniques, applications of organic agriculture and good agricultural practices, beginning of greenhouse cultivation in fruit growing effected positively increase in fruit production (Köksal et al., 2010). Support and extension studies of Republic of Turkey Ministry of Food, Agriculture and Livestock and low interest credit offered by banks has increased the interest on fruit growing. On the other hand, there are some points need to be improved in Turkish fruit cultivation. Especially higher residue limits in fruit because of pest management is one of the most important problems. When we think that postharvest losses in our country are between 20-40%, the loss of increasing

production without reaching to the consumer is an important economic loss. For this reason, not only the fruit production should be increased but also the postharvest life of the fruit in the period until the fruit reaches to the consumption must be provided. For this purpose, harvest techniques should be improved, storage or keeping conditions during postharvest period should be arranged based on the postharvest physiology of each fruit species. In this point, design and management of cold stores are very important. The cold stores which are not properly designed and whose storage temperature and atmosphere compositions can't be adjusted are always factors that increase product losses.

2. Material and Methods

In this study, changes in fruit production and international trade was essentially examined in Turkey. In addition factors effecting fruit growing and contributions of fruit growing to Turkish economy were discussed. The material of this study was secondary data. During examination besides data of Republic of Turkey Ministry of Food, Agriculture and Livestock, Turkish Statistical Institute, Food and Agriculture Organization of the United Nations, domestic and foreign research results were also used. The developments in fruit cultivation were examined by the help of secondary data mentioned in this study, and the trends were analyzed by means of proportional and percentage changes of the data.

3. Results and Discussion

3.1. Some Chronological Points of Fruit Growing and Production in Turkey

Our country has a rich species and cultivars in terms of fruit growing. The reason for this can be listed as the fact that the climate and soil conditions of our country are suitable for cultivation a lot of fruit species and cultivars, the location of Turkey is on the migration routes of the birds, and the existence of many civilizations in Anatolia since the first ages of history. For today, approximately 75 fruit species of 138 fruit species which have been cultivated around the world can be successfully growth in Turkey. Apple, pear, quince, hawthorn, wild pear, raspberry, blackberry, strawberry, mulberry, gooseberry, plum, sweet and sour cherries, cornelian cherry,

rosehip, pistachio, almond, walnut, hazelnut, chestnut are among the fruit species which are the Anatolian origin. These are also important for fresh and dried fruit trade of the world (Ağaoğlu et al., 2010).

The cultivation of fruit species mentioned above has been realized since very old years in Turkey' land. In our country, there are archaeological data about fruit growing during the Hittite period (1600-117 B.C.). These data proved that apple and pear had extensively growth in Anatolia at that time. It is known that apricot, plum and cherry were spread from Anatolia to Greece and then to Europe, and they were brought to America by the first colonists (Özbek, 1977).

Since our country has different climatic regions, cultivation of the species having economic importance for Turkey and also for the world trade are concentrated in the regions where they can be economically grown. For this reason, apples, pears, cherries and cherries known as temperate climate fruit species are mainly concentrated in the Central Anatolia and in the Black Sea region, pistachio nut in the Southeastern Anatolia Region, and figs and citrus species in the coastal regions of Turkey.

The first statistical data on Turkish agricultural production were obtained in Ottoman Empire period, in 15th century. After establishment of Turkish Republic and Central Statistical Department in 1926, agricultural data have regularly gathered (Turkish Statistical Institute [TURKSTAT], 2017).

Important advances were observed in fruit growing with establishment of republic. Not only increase in fruits orchard number but also fruit production has gained a rapid momentum. Thanks to research studies carried out in universities and research institutes of Ministry of Food Agriculture and Livestock, updated knowledge about fruit growing have been transferred to the growers and this caused attractive developments in this sector. While it was too difficult to consume banana and citrus fruit such as mandarin, lemon and orange up to 1950s in Turkey, today it has become a self-sufficient country in terms of fruit production (Kaşka et al., 2005).

Table 1. The place of Turkey in the World production with respect of some fruit species (FAO, 2014)

Country	Production (1000 tonnes)	Share in world production (%)
Hazelnut		
Turkey	450,0	63,1
Italy	75,5	10,6
Georgia	37,4	5,2
World	713,5	100,0
Sweet cherry		
Turkey	445,6	19,8
USA	329,9	14,7
Iran	172,0	7,7
World	2.245,8	100,0
Fig		
Turkey	300,2	26,4
Egypt	176,1	15,5
Algeria	128,6	11,3
World	1.137,7	100,0
Apricot		
Uzbekistan	547,0	16,3
Turkey	278,2	8,3
Iran	252,7	7,5
World	3.365,7	100,0
Sour cherry		
Russia	198,0	14,5
Ukraine	182,9	14,4
Turkey	182,6	13,4
World	1.362,2	100,0
Chestnut		
China	1.683,8	82,1
Bolivia	77,9	3,8
Turkey	63,8	3,1
World	2.051,6	100,0
Olive		
Spain	4.560,4	29,6
Italy	1.963,7	12,7
Turkey	1.768,0	11,5
World	15.401,7	100,0
Pistachio		
Iran	415,5	48,4
USA	233,1	27,2
Turkey	80,0	9,3
World	857,9	100,0
Quince		
Uzbekistan	110,0	16,9
China	109,1	16,8
Turkey	107,2	16,5
World	649.364	100,0

Because of its suitable ecological conditions for fruit growing, Turkey has an important place in the world fruit production. The world total fruit production was 690 million tons in 2014 and Turkey supported 2,1% of world's production with a production value of 14,3 million tons. In this respect Turkey is the 10th biggest fruit producer country in the world after China, India, Brazil, USA, Mexico, Spain, Indonesia, Philippines and Italy. Moreover, in the same year, the highest quantity in sweet cherry (19,8%), fig (26,4%) and hazelnut (63,1%) in the world were produced in Turkey. It was 2nd producer in apricot (8,3%) and the 3rd producer in sour cherry (13,4%), chestnut (3,1%), olive (11,5%), pistachio nut (9,3%) and quince (16,5%) in the world (Table 1) (Food and Agricultural Organization [FAO], 2014).

Since establishment of Turkish Republic, fruit growing area has also increased (Table 2). While the rate of fruit growing area was 10,9% in total agricultural area in 1990, this rate increased to 13,7% in 2015. The most important reason for this is the increase in the income of agricultural enterprises engaged in fruit farming.

Fruit production quantity has tended to increase based on the years within Turkey's domestic production of most fruit species (Table 3). This tendency was negatively realized in some species for example olive because of alternate bearing. According to data of the last 13 years, the highest production occurred in kiwifruit (%1.564). This species was respectively followed by

pomegranate (642,8%), avocado (350,0%), pistachio nut (311,4%), banana (184,7%), sweet cherry (155,0%), raspberry (138,9%), kaki (124,7%), apricot (115,9%) and almond (95,1%). However olive production decreased at a rate of 5,5% (TURKSTAT, 2016).

1.1.Share of Fruit Growing in Turkish International Trade

Depending on increase in fruit production, fresh and dried fruit export in Turkey has increased in recent years (Özüpek et al., 2013). Export quantity increased at the highest rate in pomegranate as 46,2 fold. This species was followed by strawberry (29,3) shelled almond (15,7), fresh apricot (14,9), peach and nectarine (14,8), shelled walnut (13,7) and apple (11,0). For the other species, the increment rate was realized between 0,3 and 6,9 fold. Fruit export value has tended to increase at 4,6 fold for the last 15 years but the share of fruit export value in total export values decreased from 2,8% in 2000 to 2,5% in 2015. However fruit export value increased from 46,6% to 61,8% in 2015 within agricultural product export value and from 47,1% to 65,9% in 2015 in plant products export value. The fruit export value increased from 0,7 billion \$ to 3,6 billion \$ in this period. In this value, traditional export products such as dried fig, hazelnut, dried apricot, sweet cherry, lemon and mandarin have a special importance (Table 4) (TURKSTAT, 2017).

Table 2. Distribution of agricultural area in Turkey based on the years (TURKSTAT, 2016).

Production branch	1990		2002		2013		2014		2015	
	1000 ha	%	1000 ha	%	1000 ha	%	1000 ha	%	1000 ha	%
Field crops	18.868	67,7	17.935	67,5	15.613	65,6	15.789	66,0	15.738	66,0
Fallow	5.324	19,1	5.040	19,0	4.147	17,4	4.108	17,2	4.114	17,2
Vegetables	635	2,3	930	3,5	808	3,4	804	3,4	809	3,4
Fruit	3.029	10,9	2.674	10,1	3.232	13,6	3.238	13,5	3.284	13,7
TOTAL	27.856	100	26.579	100	23.800	100	23.939	100	23.949	100

Table 3. Fruit production in Turkey for the last 13 years (1000 tons, TURKSTAT, 2016)

Fruit Species	Years								% Increase (2002 to 2015)
	2002	2009	2010	2011	2012	2013	2014	2015	
Pome Fruit									
Apple	2.200,0	2.782,4	2.600,0	2.680,1	2.889,0	3.128,5	2.480,4	2.569,8	16,8
Pear	340,0	384,2	380,0	386,4	442,6	461,8	462,3	463,6	36,3
Quince	110,0	96,3	121,1	127,8	136,6	139,3	107,2	112,9	2,6
Stone Fruit									
Apricot	315,0	660,9	450,0	650,0	760,0	780,0	270,0	680,0	115,9
Plum	200,0	245,8	240,8	268,7	300,0	305,4	265,5	279,8	39,9
Peach	455,0	547,2	539,4	545,9	611,2	637,5	608,5	642,7	41,2
Sweet Cherry	210,0	417,7	417,9	438,5	470,9	494,3	445,5	535,6	155,0
Sour Cherry	100,0	192,7	195,0	182,2	186,4	179,7	182,6	183,5	83,5
Olive	1.800,0	1.271,0	1.415,0	1.750,0	1.820,0	1.676,0	1.768,0	1.700,0	-5,5
Citrus									
Orange	1.250,0	1.689,9	1.710,5	1.730,1	1.661,1	1.781,3	1.779,7	1.816,8	45,3
Mandarin	590,0	846,4	858,7	872,3	874,8	942,2	1.046,9	1.156,4	96,0
Lemon	525,0	783,6	787,1	790,2	710,2	726,3	725,2	750,5	42,9
Nuts									
Pistachio	35,0	81,8	128,0	112,0	150,0	88,6	80,0	144,0	311,4
Almond	41,0	54,8	55,4	69,8	80,3	82,8	73,2	80,0	95,1
Walnut	120,0	177,3	178,1	183,2	203,2	212,1	180,8	190,0	58,3
Hazelnut	600,0	500,0	600,0	430,0	660,0	549,0	412,0	646,0	7,6
Others									
Strawberry	145,0	292,0	300,0	302,4	351,8	372,5	376,1	375,8	159,2
Fig	250,0	240,3	254,8	260,5	275,0	298,9	300,3	300,6	20,24
Banana	95,0	204,5	210,2	206,5	207,7	215,5	252,0	270,5	184,7
Pomegranate	60,0	171,0	208,5	217,6	315,1	383,1	397,3	445,7	642,8
Kaki	15,0	25,3	26,3	28,3	32,4	33,2	33,5	33,7	124,7
Kiwifruit	2,5	23,7	26,5	29,2	37,2	41,6	31,8	41,6	1.564,0
Avocado	0,4	1,2	1,2	1,3	1,5	1,6	1,8	1,8	350,0
Raspberry	1,8	2,0	2,0	2,1	4,1	3,9	4,6	4,3	138,9

Table 4. Fruit export quantity and export value in Turkey (TURKSTAT, 2017).

Fruit Species	2000		2006		2012 ¹		2015	
	Quantity (1000 tons)	Value (1000 \$)	Quantity (1000 tons)	Value (1000 \$)	Quantity (1000 tons)	Value (1000 \$)	Quantity (1000 tons)	Value (1000 \$)
<i>Pome Fruit</i>								
Apple	12,9	5.394,5	24,9	10.355,5	69,1	28.605,0	142,1	50.195,1
Pear	8,4	2.583,4	5,9	4.388,9	16,2	10.255,1	20,7	11.055,2
Quince	3,4	1.985,3	5,3	4.280,9	10,4	8.695,6	8,7	8.022,7
TOTAL	24,7	9.963,2	36,1	19.025,3	95,7	47.555,7	171,5	69.273,0
<i>Stone Fruit</i>								
Sweet cherry	11,9	23.562,6	53,9	129.180,4	55,0	156.393,7	68,6	122.668,4
Sour cherry	0,1	89,0	0,1	80,5	1,4	1.857,0	0,1	49,1
Apricot	3,7	2.543,4	13,9	11.704,5	56,3	41.613,1	55,3	39.235,9
Peach-Nectarine	14,6	3.852,1	39,1	22.877,2	43,5	28.053,3	26,0	19.143,3
Plum	2,3	1.312,1	2,4	2.999,6	25,5	14.013,7	34,0	15.683,5
Total	32,6	31.359,2	109,4	166.842,2	181,7	241.930,8	184,0	196.780,2
Dried apricot	70,3	110.379,5	113,9	194.363,7	101,6	296.618,6	65,3	302.688,7
Dried plum	1,2	1.109,2	1,0	1.281,8	0,3	886,4	0,5	1.794,3
Total	71,5	111.488,7	114,9	195.645,5	101,9	297.505,0	65,8	304.483,0
TOTAL	104,1	142.847,9	224,3	362.487,7	283,6	539.435,8	249,8	501.263,2
<i>Nuts</i>								
Hazelnut	0,6	1.178,7	0,6	1.477,8	1,5	4.456,9	0,2	1.250,0
Almond	0,1	108,3	0,1	23,9	0,01	78,8	0,1	150,9
Walnut	0,1	14,3	0,1	15,0	0,1	343,1	0,1	12,8
Chestnut	5,3	5.408,0	3,7	6.527,1	5,5	16.292,8	5,5	14.794,2
Pistachio nut	0,2	1.575,8	0,9	9.748,4	2,3	28.856,8	0,5	4.539,5
Total	6,2	8.285,1	5,2	17.792,2	9,4	50.028,4	6,2	20.747,4
Hazelnut kernel	112,1	366.737,5	158,6	909.136,5	161,5	1.054.292,2	143,1	1.640.342,9
Almond kernel	0,3	837,5	0,6	5.455,9	7,5	65.189,4	4,7	64.061,1
Walnut kernel	0,3	1.184,6	0,3	1.765,8	5,4	59.756,9	4,1	58.490,6
Total	112,7	368.759,6	159,5	916.358,2	174,4	1.179.238,5	151,9	1.762.894,6
TOTAL	118,9	377.044,7	164,7	934.150,4	183,8	1.229.266,9	158,1	1.783.642,0
<i>Citrus Fruit</i>								
Mandarin	141,5	49.633,7	299,1	137.253,5	406,8	293.385,6	568,3	298.453,5
Lemon	164,7	67.703,6	323,1	153.316,9	367,6	266.781,2	470,9	293.723,4
Orange	91,0	30.578,8	246,4	99.249,0	327,5	230.493,8	331,8	166.757,6
Grapefruit	85,2	22.745,0	154,9	69.066,8	166,0	108.136,1	153,7	74.547,9
TOTAL	482,4	170.661,1	1.023,5	458.886,2	1.267,9	898.796,7	1.524,7	833.482,4
<i>Others</i>								
Pomegranate	3,2	1.755,5	10,9	11.126,90	84,70	73.768,90	147,8	96.685,6
Fig	6,1	7.990,9	8,9	17.793,70	14,40	29.772,90	14,4	37.917,4
Dried fig	36,9	60.047,6	54,2	120.697,00	49,70	166.981,40	52,8	214.262,4
Strawberry	0,6	83,2	11,8	11.781,80	21,40	19.855,80	17,6	21.680,9
Kiwifruit	0,1	13,3	0,1	2,70	0,19	160,50	0,3	199,8
GENERAL TOTAL	776,8	770.407,5	1.534,3	1.935.951,7	2.001,5	3.005.594,6	2.336,5	3.558.407,0
TOTAL EXPORT VALUE (1000 \$)		27.774.906,0		85.534.676,0		152.536.653,0		143.838.871,4
EXPORT VALUE OF AGRICULTURAL PRODUCTS (1000 \$)		1.651.912,0		3.466.631,0		5.168.807,0		5.756.596,1
EXPORT VALUE OF PLANT PRODUCTS (1000 \$)		1.636.595,0		3.428.295,0		4.798.477,0		5.397.752,1

1.2. Factors Effecting Fruit Growing in Turkey: Technical and Economic Overview

As mentioned above, Turkey has suitable ecological conditions for fruit growing and it has begun to use its advantages after 1950s. Some factors involved in fruit growing positively some others negatively affected fruit growing in Turkey. These can be summarized as follows.

1.2.1. New Species, Brand Cultivars, Earlier Cultivars

After 1950s, new species which are originated from other countries have begun to grow. For example kaki has originated from China and it has been cultivated since the end of 19th century (Özcan, 2005). Similarly, kiwifruit since 1994, avocado since the beginning of the 1970s years (Bayram et al., 2006) and pecan which has originated from North America Mississippi-Missouri since 1969 (Tuzcu & Yıldırım, 2000) have been growth in Anatolia.

Essential factors causing cultivation of new species can be summarized as follows:

- Adaptation studies were carried out by universities and Ministry of Food, Agriculture and Livestock,
- Encourage and supporting policy and regulations of related ministry,
- Promotion of cultivation of these species by the development of media,
- An increase in consumer awareness of the benefits of such species to human health.

As mentioned above, the highest increment was observed in kiwifruit production. This species has mostly grown in Black Sea and Marmara Regions of Turkey. It has an important contribution for grower income because of its high price in the market. In this species studies on selection the best cultivar with high yield were completed in 1990s year and demonstration orchards were establish with selected cultivars for encourage grower to grow kiwifruit.

For the universities and The Ministry of Food, Agriculture and Livestock, breeding studies are important and these studies have been financially supported within government policy. Via some breeding studies, we have new cultivars having

high quality fruit. In sweet cherry 0900 Ziraat cultivar has been recently bred and is too attractive for the consumers. Since it has high price in domestic markets, it has been preferred by most of the growers. Today, most of the sweet cherry export is carrying out with this cultivar. This situation caused to occur a brand as Turkish Sweet Cherry in international markets. Another sample is Tombul hazelnut cultivar and it has generally called as Turkish Hazelnut at international trade.

Most of the fruit grower increased their knowledge about characteristics cultivars by promotion studies of the government and demonstration studies of research institutes and universities. They learnt differences among fruit cultivars and now they can choose the high priced and the most suitable cultivars for their ecological region and microclimatological regions to grow. Turkey has a lot of microclimatological regions which enable earlier fruit growing. Earlier cultivars can sell at higher price in market and they can encourage the growers. For example in apricot, the first apricot harvest for fresh consumption has begun in Mediterranean Sea region at the last week of April and the last harvest has realized around Malatya county at the end of September. The apricot growers in Mediterranean Sea region have earned much more money with the first harvest than the others in other regions. It means that the more income the more fruit growing.

1.2.2. Advanced Cultivation Techniques

Using of more advanced growing techniques is one of the reasons in increase of fruit growing. As mentioned above, to earlier harvest in microclimatological regions the greenhouse cultivation is becoming widespread from day to day. In the southern regions of Turkey, apricot, plum and banana can growth by greenhouse cultivation. By this way, negative effect of inappropriate ecological conditions has been prevented and profitability has increased. For today, firstly banana and strawberry, secondly apricot, plum and peach-nectarine are the important species grown with greenhouse cultivation especially in the Southern regions of Turkey. Total greenhouse area used for their production is 82.361 da (Table 5) (TURKSTAT, 2016)

In recent years, fruit orchards has been established on clonal rootstocks. Especially in apple growing, dwarf rootstocks and pruning types suitable for dwarf rootstocks has been preferred for intensive growing because dwarf rootstocks enables more dense orchards. In these orchards mostly certified nursery plants have been used. The certified nursery plants also prevent transportation of soil-borne diseases. Turkish government also encourage to establish

new fruit orchards with these plants by giving the growers in cash financial supports. The Ministry of Food, Agriculture and Livestock has announced that the in cash financial supports are between 72 and 103 Euros depending on the species for 2017 season. In the last ten years mostly olive secondly walnut growers used them. These supports also caused to increase in fruit growing area in Turkey (Figure 1) (Data of the Ministry of Food, Agriculture and Livestock, 2017).

Table 5. Fruit species grown with greenhouse cultivation (TURKSTAT, 2016)

Species	2010		2015	
	Area (da)	Production (Tons)	Area (da)	Production (Tons)
Banana	24.756	149.233	40.794	252.149
Strawberry	32.690	122.316	41.071	168.191
Apricot	6	1	371	728
Plum	0	0	95	110
Peach-Nectarine	0	0	30	60
TOTAL	57.452	271.550	82.361	421.238

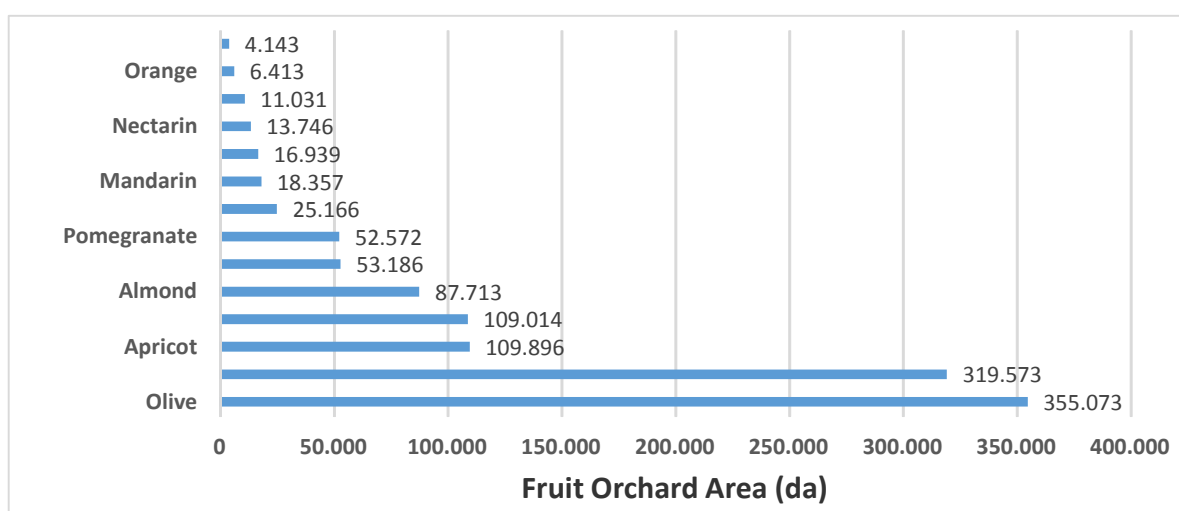


Figure 1. The area of fruit orchard established with certified nursery plants and government support in the last ten years (Data of the Ministry of Food, Agriculture and Livestock, 2017).

Important pome fruit species such as apple and pear have been grown on clonal rootstocks today. This means that an intensive cultivation causes higher production. Extension studies of the related ministry on pruning systems, integrative techniques for pest and diseases, plant growth regulators for high fruit quality are highly helpful for the growers of intensive orchards. In pome fruit cultivation, however fire blight (*Erwinia amylovora*) is the most important problem,

improved rootstocks and new antibiotics have had huge contribution to cope with this disease.

1.2.3. Foreign Investment

Fruit growing is attractive for foreign capital investment in Turkey. For this reason foreign companies are willing to agricultural investment, especially fruit growing. Indeed, investors from different countries, such as Italy and the United Arab Emirates, can become partners in businesses

that produce fruit in various regions. The most attractive factor in this situation is that individual fruit growing managements has been getting wider from day to day.

1.2.4. Encourage Policy on Fruit Growing of the Government

Besides certified nursery plant supports of The Ministry of Food, Agriculture and Livestock, it has many other regulations and supports based on its policy to increase fruit production with high quality. For example certified nursery plant production increased approximately 44 fold in the last ten years based on it's supporting regulations on certified nursery plant production (Figure 2) (Tüzün, 2015).

The direct and indirect encourage supports and regulations of this ministry are mostly focused on these points:

- Inputs for organic cultivation such as bambus bee, oil, pest and disease management
- Application of Good Agricultural practices
- Integrative methods for pest and disease management
- Geothermal energy usage in greenhouse cultivation

- Agricultural insurance
- Agricultural extension and consultancy services
- Biological and integrative pest management
- Supports on Research & Development projects etc.

Moreover The Ministry of Economy has supported fruit growing by some regulations in some selected counties. Some of them are as follows:

- Decrease of value-added tax or exemption
- Customs tax exemption
- Production land allocation
- Tax decrease
- Support on agricultural insurance premium
- Credit interest support
- Support for income tax withholding
- Storage and packaging house facilities

The supports of this ministry contributes not only fruit growing but also fruit export.

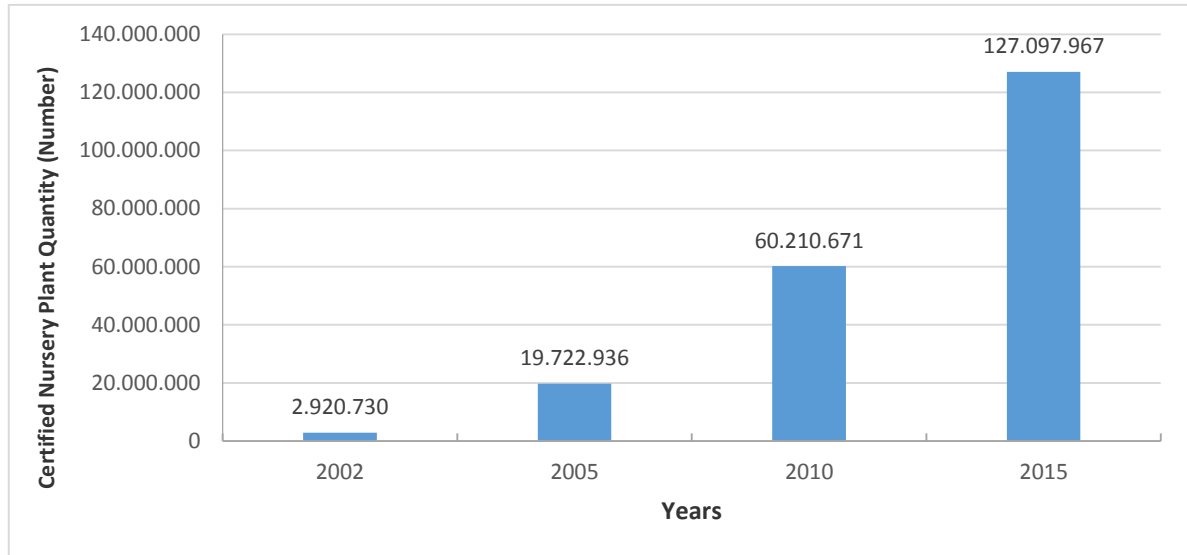


Figure 2. Certified nursery plant production supported by the government in Turkey (Tüzün, 2015).

1.2.5. Low-interest Credits by Private or Public Banks

Low-interest loans by both private and corporate banks were effective in increasing production. For this reason low-interest credit applications for greenhouse cultivation, use of certified nursery plant, production of certified plant production, organic agriculture, good agricultural practices etc. are available. There are 8 different banks which has supported fruit growing with low interest credits. With low-interest credits provided for irrigation and mechanization, more conscious and controlled irrigation is possible in fruit orchards (Devran, 2009).

1.2.6. Fruit Processing Industry

Changes in consumption forms of fruit over time are another factor that encourages fruit growing. Increase in fruit juice plants also cause to increase fruit demand in this sector. Contract farming applications between the fruit juice plants and fruit growers have increased grower's tendency to grow fruit species and/or cultivars whose market is ready. In fruit juice industry, rate of foreign investment has recently increased. For today the number of foreign investment enterprises on fruit juice is 13 (Anonymous, 2017, Data of The Union of Chambers and Commodity Exchanges of Turkey, 2017).

In recent years, increase in consumer demand on dried fruit in apple, pear, sweet and sour cherries etc. has allowed to evaluate these species by drying. Advanced drying technology was begun to apply in this sector and common dried species such as apricot. In this technology sun panels have mostly used for clean energy providing.

1.2.7. Advances in Postharvest and Packaging House Facilities

Fruit storage facilities have also developed in recent years. The first storage facilities were established as normal atmosphere storage in 1960s year in Turkey. While the number of cold storage facilities in Turkey was 17 in 1970, today it is 1861. Total cold storage capacity is approximately 7 million m³ (Türk, 2015). The government supports, especially of the Ministry of Economy, has a substantial effect on development of storage facilities. Between 2001 and 2014 years, totally 488.628 m² of cold storage was established by the government supports (Fig. 3). Within this period, approximately 453 million Euro was spent from the government budget for cold storage supports (Fig. 4) (Tüzün, 2015). However, the entrance of controlled atmosphere storage technology to Turkey is highly new, this technology has extended the availability period of fruit in the market (shelf life) and provided to find the consumer at a higher price, and caused to decrease fruit loss after harvest during storage period. All of these results mentioned here are the positive factors on the fruit growing. As a result of cooperation carried out within the framework of mutual profitability principle between producer and industrialist, the process of informing technical issues in production and marketing process is also increasing. For this reason, safe and high-quality production within the frame of sustainability also contribute sectoral improvement.

Between 2001 and 2014 years, some of packaging house facilities were supported by the government. In this period totally 83 packaging house was set with the public supports and totally 47.176.861 Euro was spent for them (Table 6) (Tüzün, 2015).

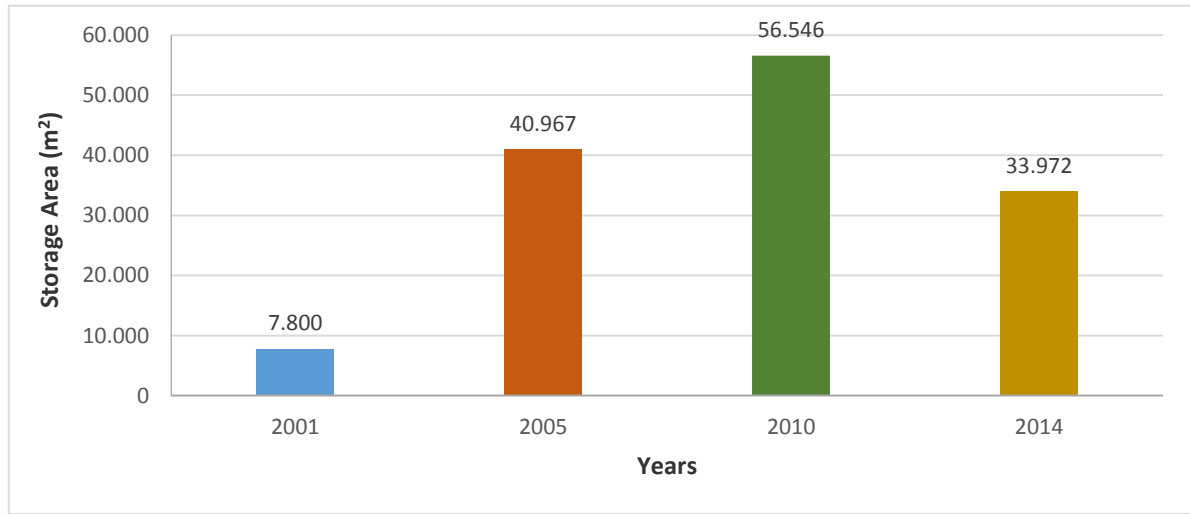


Figure 3. The storage area established with the government supports between 2001-2014 (Tüzün, 2015).

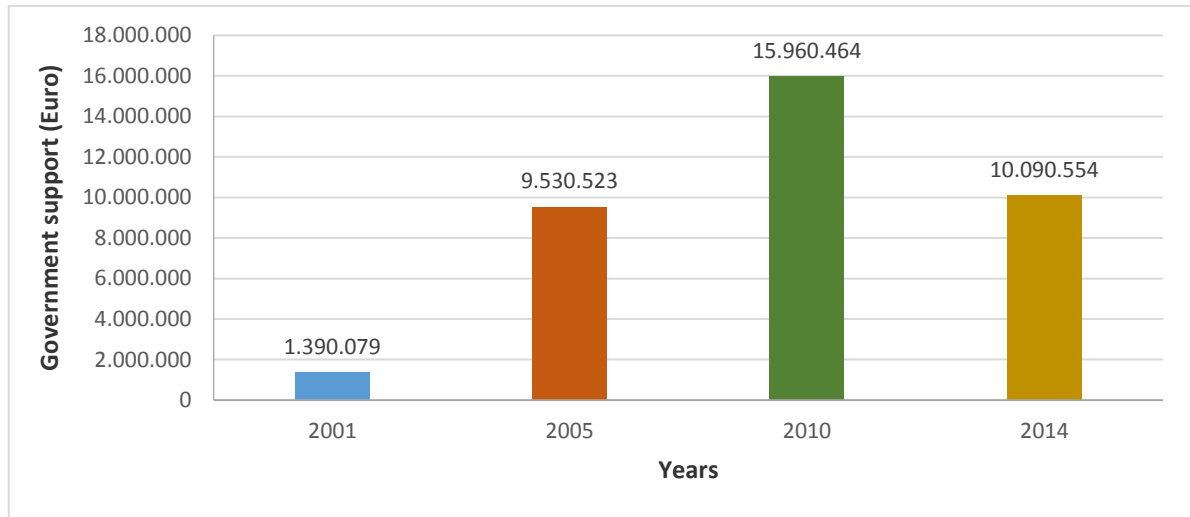


Figure 4. The government supports on cold storage between 2001-2014 (1 TL= 3,89 Euro) (Tüzün, 2015).

Table 6. Packaging house investment by government support in Turkey (Tüzün, 2015)

Years	Capacity (Ton/year)	Investment (Euro)	Quantity (Number)
2001	31.000	358.185	2
2005	47.396	3.418.182	4
2010	115.560	11.131.355	8
2014	15.500	1.607.368	2
Total (2001-2014)	2.110.726	47.176.861	83

1.2.8. National or International Research and Development Projects

Fruit production in Turkey mostly composed of temperate fruit species. While fruit growing is an intensive plant production branch, this production are has an important contribution for national economy. In Turkey, since 1960 a lot of research and development projects have been carried out to improve fruit growing. The major aims of these projects can be summarized as follows:

- Development of new cultivars by different breeding methods
- Adaptation of new species
- Application and demonstration of new growing techniques
- Integrative pest and disease management
- Development of organic growing and application of good agricultural practices
- Determination of fruit loss during and after harvest
- New storage technologies
- Increase in fruit quality with plant growth regulators
- Decrease of input during pre- and after harvest period etc.

All of these projects were supported by;

- The Universities
- The Ministry of Food, Agriculture and Livestock
- The Ministry of Economy
- The Scientific and Technological Research Council of Turkey (TUBITAK)
- European Union
- The World Bank
- Private Enterprises
- Public and Private Banks

4. Conclusion and Recommendations

Although Turkey has a huge potential for fruit growing, the existing potential is not sufficiently developed due to various problems within and

around the country. The problems and solution in fruit growing can be summarized as follows:

- Fruit orchards should be renewed with updated new cultivars based on the demand of international markets and consumers,
- The geographical marking, branding and promotional activities in some fruit products is too important,
- When planning of new fruit enterprises and orchards, global warming and its results such as flooding and drought should be taken into consideration,
- The old orchards should be renewed based on the new technological developments and sustainability,
- After harvest, standardization and packaging
- It is necessary to give an importance to standardization and packaging for fresh fruit and fruit products, to extend of cold storage facilities having new technology and to increase storage capacity,
- It is necessary to develop new marketing strategies to increase fresh fruit export
- In order to protect human health, managements applied during production and after harvest should be arranged depending on the residue limits in fruit,
- The laboratory quantity on residue analysis should be increased,
- In dried fruits such as fig, hazelnut, apricot, pistachio nut, necessary measures should be taken and if necessary drying machines should be used for drying,
- It is important to encourage and support the organization of fruit producers, which have many small-scale enterprises,
- It is necessary to increase the amount of support and credit in order to increase the chance of competition in the fruit growing area.

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