

Potential of Kırşehir Province in Terms of Horticulture

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Abstract: Kırşehir is located in the steppe belt of the Central Anatolia Region. In Kırşehir province, 3.988.774 decares of agricultural value produced in total agricultural area consists of 53.2% from plant production, 36.6 % from live animal and 10.2 % from animal product value. Due to the restrictive effect of the terrestrial climate seen in Kırşehir, the agricultural production value of the province is quite low and its share within the country is below 1%. Fruit is produced at 35.131 decares of total agricultural land and field vegetable production is done at 19.046 decares. In these production areas, 14.078 tonnes of tomatoes and 4.649 tonnes of vineyards are in the first place. In this study; Considering the restrictive effects of the soil, climate and water resources of Kırşehir provinces and districts, The Ministry of Food, Agriculture and Livestock and the Turkish Statistical Institute data, on the basis of various scientific articles on the subject, opinions and proposals for assessing the current status and potential of the horticulture in relation to the agricultural areas.

Keywords: Kırşehir, Horticulture, Fruit Growing, Vegetable Growing

1. Introduction

Kırşehir is the 68th most populated province out of 81 provinces with its 225.562 population and it is the least populated province in the TR71 region [3]. With its acreage of 6.665 km² it covers 0.8 % of the acreage of Turkey and 2.9 % of the acreage of the Central Anatolia Region. Kırşehir is ranked as the 53rd province among 81 in terms of the size of the acreage. The altitude of the center of the province is 985 metres and the terrain consists of 64.5 % of plateau, 17.2 % of mountainside and 18.3 % of lowland. With a total of 3.963.173 decares of land in Kırşehir, 2.317.534, 1.591.462, 35.131 and 19.046 decares of land is used for crop and other herbal products, fallowing, fruit and vegetable growing, respectively. The agricultural production value of Kırşehir is very low and its share in the country is below 1 %. The fact that the province can only irrigate 9.3 % of its agricultural areas limits plant production. Kırşehir has broadly a steppe-like vegetation cover. Most of the land of the province consists of uplands which are 900-1200 m high. The biggest plain in Kırşehir is the Malya Plain. After the low lake water which happened as a result of the tectonic formation the plain was formed. The area of the plain which is built above the Malya Agricultural Enterprises is 400 km². While the soil of the plain is the most fertile soils in terms of garden plants, the most significant factor limiting cultivation is the climate conditions due to the high altitude of the plain. The land of the province falls into the Kızılırmak watershed [2]. The relative humidity is 64 %. The average annual rainfall of Kırşehir varies between 350 and 500 mm. The maximum and minimum rainfall occurs in the spring and summer,

respectively. The average annual rainfall is 383.3 mm. The distribution of rainfall in Kırşehir is irregular and it receives the least rain in the summer when it needs rain the most. The province has several large and small streams. These streams flow into the Kızılırmak and the Delice River. There are scarcely any natural lakes inside the borders of the province. Seyfe Lake, which is located in the north of the Mucur district is the only natural lake. Although 366.222 ha agricultural land out of the 454.720 ha agricultural land that belongs to Kırşehir can be irrigated, only 31.924 ha is actually irrigated. In percentages, even though the province could irrigate 80.54 % of their agricultural land, only 6.84 % is irrigated. The water demand of these lands is met with watering lagoons, rivers, ground waters and particularly the Hirfanlı and Karaova dams.

The climate of Kırşehir is a typical continental climate with cold and snowy winters, hot and dry summers and rainfall in spring and fall. The Toros Mountains which surround Central Anatolia and the mountain range in North Anatolia disallow the entry of the Mediterranean and Black Sea mild climate to the inner parts of the country. Therefore, the area has the characteristics of a continental climate. The average wind speed in Kırşehir is 2.5 m/sec. The average temperature is 11.4°C and the monthly average values of the long term meteorological data is presented in Table 1. While the average temperature values are below zero during the months of January and February, they are as high as 23.2°C in the months of the summer. The lowest temperature was registered as -24.6°C in February and the highest temperature as 40.2°C in July during the extreme years [4].

Table 1: The monthly average values of the long term meteorological data of the province Kırşehir [4]

MONTHS	1	2	3	4	5	6	7	8	9	10	11	12
Av. temperature	-0.2	1.2	5.4	10.7	15.4	19.7	23.2	22.9	18.2	12.4	6.2	2.0
Av. max. temperature	12.07	14.32	20.51	25.06	28.59	32.51	35.41	35.21	31.86	27.32	19.89	14.45
Max. temperature	17.6	19.5	27.3	30.9	31.9	35.6	40.2	39.4	36.2	32.8	24.3	19.5
Av. min. temperature	-13.20	-12.45	-7.67	-1.99	3.02	7.21	10.97	10.78	5.30	-0.29	-5.82	-9.91
Min. temperature	-22.6	-24.6	-21.8	-8.2	-1.4	2.6	6.4	5.9	1.8	-6.6	-14.8	-22.0
Proportional moisture	78.18	74.27	67.45	63.65	60.73	53.98	48.08	48.40	53.09	63.54	72.79	78.70
Hours of sunshine	3.12	4.13	5.24	6.4	8.51	10.53	12.01	11.24	9.36	7.07	5.09	3.12
Intenseness of sunshine (kWh/m ² .day)	2.06	2.96	4.07	4.90	5.85	6.46	6.58	5.94	4.96	3.52	2.40	1.82
Number of frost days	23.10	19.00	13.7	2.6	-	-	-	-	-	1.3	11.0	19.4

Number of open days	3.6	2.8	4.4	3.3	5.0	9.4	16.3	17.0	14.5	9.6	5.7	3.4
Av. wind speed	2.0	2.3	2.5	2.5	2.4	2.9	3.6	3.5	2.7	2.2	1.9	1.9
Dominant wind direction	N	N	N	N	N	N	N	N	N	N	N	N

The texture class of the soils of the province is generally sandy, its pH is average and high, the lime extent is high, whereas the organic matter extent is low. The soil plant nutrient condition is low in terms of nitrogen and phosphorous, whereas the potassium level was high [5].

The present study was conducted to reveal the current state and potential of garden plant cultivation in Kırşehir which is located in the steppe zone of Central Anatolia, has a great potential in terms of agricultural production and does not have a market issue due to its proximity to big cities. For this purpose, the views and suggestions on the current state and improvement of this state is examined under the headings below.

1. The General State of the Fruit Growing in the Province

In the total 35.131 decare land where fruit growing is conducted in the province of Kırşehir, 9.982 ton fruit production is obtained [3]. As fruit growing facilities in the

province, growing of types of fruits, such as grape, walnut, apple and pear, is done. As presented in Table 2, the biggest production area is used for walnut production with 17.833 decare of land, the second biggest area is given to grape with 9.759 decare, and apple production is at the third rank. In terms of the production amount, grape production is in the first place with 4.649 tons and apple production is ranked as number two with 2.452 tons of production. The least amount of production is done of mulberry with 19 tons. Even though walnuts take its place as the type of fruit with the biggest production area, its production amount is 1.259 tons. The reason for this can be explained with the newly establishment of walnut gardens and no yet production of crops. For the “Walnut Action Plan” which was formed between the years of 2012-2016 by the Ministry of Forestry and Water Affairs, Edirne, Tekirdağ, Çorum and Kırşehir were selected as testing provinces. In this regard, it is considered that the newly established gardens of the Kaman walnut, which has an important place among the types of walnuts in Turkey, will have a great influence on the direction of the future facilities in fruit growing of Kırşehir.

Table 2: The production pattern of the fruit types grown in Kırşehir [3].

Types	Amount of production (ton)	Area (decare)	Average crop of each tree (kg)	Number of trees which bear fruit	Number of trees which do not bear fruit	Total number of trees
Grape	4649	9759	512.5			
Walnut	1 259	17 833	12	105 375	204 200	309 575
Apple	2 452	1 566	30	83 519	31 031	114 550
Pear	718	44	50	14 368	4 042	18 410
Apricot	253	229	9	22 683	4 071	26 694
Cherry	171	134	26	6 670	1 941	8 611
Almond	91	601	6	14 150	9 782	23 932
Plum	105	10	15	6 870	506	7 376
Sour cherry	80	12	15	5 480	980	6 460
Peach	46	12	15	3 010	130	3 140
Strawberry	32	10	3 200	10	0	10
Mulberry	19	0	12	1 640	115	1 755

Among all districts of Kırşehir, the most fruit growing is conducted in the center district and the most produced type of fruit is grape. The districts where the least food is produced are Akçakent and Boztepe, and there are some grape and apple trees. It was found that Akpınar mostly grows seeded table grapes, whereas Çiçekdağı does apple growing and grape growing with the newly set up vineyards. It was revealed that the most produced type of fruit in the district of Mucur is apple and that the number of walnut gardens has substantially increased in recent years. The most produced type of fruit in the district of Kaman was found to be grape and the Kaman walnut which takes its name from the district has an important role in the region. It is regarded that the percentage of the amount of fruit production can change with the start of receiving the yield of the walnut gardens.

2. The general state of the vegetable growing in the province

Although the economy of the province Kırşehir is dependent on agriculture, commercial facilities of vegetable growing have not sufficiently developed. While vegetable growing in

Turkey is done on an agricultural area of 804.000 ha which is 3.38 % of the total 23.763.000 ha agricultural land, in Kırşehir vegetable growing is done on an agricultural area of 19.271 ha which is 0.42 % of the total 454.720 ha agricultural land. 33.682 ton of vegetable is produced in Kırşehir. It is noticed that the potential of vegetable production of the province Kırşehir has a profoundly low proportion in the amount of vegetable production in Turkey (Table 3).

Table 3: Vegetable production and amount in Turkey and Kırşehir [3]

	Area (da)	Production (ton)
Turkey	8.040.000	28.629.023
Kırşehir	19.271	33.682
Proportion	0,24%	0,12%

An examination of the districts of Kırşehir, vegetable areas and the amount of vegetable production in Table 4 showed that the districts Kaman, Center and Çiçekdağı have a substantial potential.

Table 4: The data of vegetable production of the districts of Kırşehir [3]

Districts of Kırşehir	Area of Vegetable Production (da)	Amount of Vegetable Production (ton)
Center	7.109	9.205
Akçakent	108	74
Akpınar	2.375	1.158
Çiçekdağ	1.552	7.836
Kaman	5.277	11.088
Mucur	2.850	4.321
Total	19.271	33.682

The vast majority of the grown vegetables are produced for their fruit, and the growing of types of vegetables for subtropical climates is done in a limited amount (Table 5).

Table 5: The data of the most produced vegetables in Kırşehir [3].

Types of Vegetables	Cultivated Area (da)	Production (ton)
Tomatoes	3.352	14.072
Cucumber	1.412	1.381
Pepper	1.790	1.322
Green beans	1.337	896
Eggplant	411	796
Pumpkin (Seeds)	2.610	206
Watermelon	2.500	6.003
Melon	2.707	4.539
Onion	910	2.045
Garlic	530	393
Leek	50	74
Spinach	200	162
Lettuce	457	430
Cabbage	159	384
Mushroom	-	52

The most important factor that determines the appropriateness of vegetable growing in a certain region is the climate conditions. Especially the period between the spring and fall early frost is required to be enough for the vegetation of the type of vegetable that is grown. The first week of May when the average temperature is 15.4°C is the earliest seedling plating date in the climate conditions of Kırşehir, providing that cultivation of summer-growing vegetables starts with a seedling. On the other hand, the October month, when the average temperature drops to 12.4°C, is the date for the furthest production in open field conditions (Table 1). Therefore, the maximum period when open field vegetable growing can be conducted is 5-6 months in Kırşehir. The most important factor that increases the profit in vegetable growing is to consecutively cultivate more than one type of vegetable throughout the vegetation period insofar as the climate conditions permit. However, it is challenging to apply this in provinces which have a continental climate such as Kırşehir.

Kırşehir has 130.471 ha agricultural land which is considered as first degree important in terms of its agricultural potential, allows the production of all kinds of crop plants, possess adequate depth, a low level of salt and sodium, a rate of stone below 50 % and a slope rate below 6 %. 20.260 ha of this agricultural area is suitable for vegetable farming due to its irrigable feature. Nevertheless, facilities of vegetable growing is conducted on the 1.927 ha land which is 9.51 %

of the current potential in the province of Kırşehir. A study was conducted by the Ministry of Food, Agriculture and Livestock on the province of Kırşehir to determine the sub-basins of products which have agricultural potential, are appropriate to the ecology of the province, are economically produced, generates high agricultural profit, possesses export potential and is appropriate to the socio-economic structure of the province. As a result of the study, the map presented in Figure 1 was created.



Figure 1: The sub-basin map of the province Kırşehir and its districts

The province of Kırşehir was divided into 6 sub-basins depending on its potential of agricultural production, climate, soil features and topographical condition. The sub-basin numbered 112 on the map covers the agricultural land at the riverbank of the lake of Hirfanlı dam and Kızılırmak (Figure 1). This region is ecologically the most appropriate area for the production of vegetable in Kırşehir. This region, where approximately 2/3rd of the vegetable production is done, shows the properties of a microclimate with the influence of particularly the lake of the Hirfanlı dam. The villages Savcılı, Toklumen, Sıdıklı and Aydoğmuş, which are distinguished for their vegetable cultivation in Kırşehir, are located at this sub-basin. Because the region provides a longer vegetation period compared to the other sub-basin regions, summer-growing plants, such as tomatoes, watermelon, melon and beans are commonly grown. The types of vegetables of the subtropical climate, such as onion, potatoes, garlic are efficiently produced in a good quality. This region, particularly the surrounding of the lake of the Hirfanlı dam, is considered to be suitable for types of vegetables which were not attempted to produce in Kırşehir such as artichoke, asparagus and turnip radish. Vegetable cultivation started to be done in wider areas on the approximate 37.000 da land, in which the 112 numbered sub-basin and the Toklumen, Karaduraklı, Yeşilli, Uzunaliuşağı and Sıdıklı villages are located, owing to the Sıdıklı dam lake and the connected below ground water system.

The 137 numbered area is located on the Delice River sub-basin and is advantageous in terms of vegetable growing, especially due to its long vegetation period. Moreover, the producers are supported because the area is in the scope of the ÇATAK project. Melons, watermelons and onions are prevalently grown in this area. The narrowness of the area is narrow and large difference of temperature between night and day which is a typical feature of continental climate are disadvantages. Cucumber and vegetables of the salad-lettuce

group, whose vegetation period is short, can be grown shortly after the production of barley in this area.

The 190 numbered area on the map has large and small lagoons, such as the Karaova dam lagoon, which can enable the practice of irrigated farming. Although the area, which is mostly used for the growing of field crops, is not very suitable for summer-growing vegetables which require high temperatures due to its high altitude, it is particularly suitable for winter-growing vegetables such as cabbage, cauliflower, Brussels sprouts, turnip radish, leek and spinach.

The area numbered 101 in Figure 1 is the most suitable area for plant production both in terms of soil profile depth and soil structure. The temperature difference between night and day is great due to the high altitude of the area. The occurrence of fungal illnesses increases due to particularly the development of dew at the end of June. In the area, only 2007 decare of the 158.161 fertile agricultural land of the Malya Agricultural Enterprise affiliated to Tigem can be used for irrigated farming; however, the irrigable area would expand once water is directed from the Yamula Dam. Because the surrounding of Seyfe Lake, which is located in the area, is also funded in the name of the ÇATAK project, giving priority to facilities including particularly organic vegetable growing will gain benefit in terms of both the protection of natural resources and the profit of the producers.

Due to the total dominance of continental climate, the 74 numbered area on the map is not suitable for the production of summer-growing vegetables. Jerusalem artichokes are widely grown in this area because facilities of irrigation are limited.

Very little vegetable production is done in the 130 numbered area in Figure 1, except for the Çuğun, Çayağzı, Güzler and Kocabey villages. Bell peppers, which are known as “Cemele” and can be consumed fresh or dried, are widely grown in the Çayağzı town. The majority of the 553 tons of bell pepper production in Kırşehir consists of the Cemele bell pepper. This bell pepper, which has a thin shell thickness is considerably demanded by consumers due to its unique peppery taste and dark green color. The production of this bell pepper’s genotype, which does not create marketing difficulties and finds a buyer at a high price, is required. The 130 numbered sub-basin is also the area where the geothermal resources with high heating values are located. The geothermal areas Mahmutlu (65-76,5 °C), Terme (30,3-57°C) and Karakurt 46,1-57,8°C) have the appropriate hot water levels for greenhouse cultivation. 4646 ton tomatoes production has been conducted on the 202 decare geothermal area in Mahmutlu since the year 2016. The extension of greenhouse cultivation in the area where geothermal resources are used, will be effective in the cutting down of the negative effect the continental climate has on vegetable farming. Moreover, the Agricultural Organized Greenhouse Regions that will be established will significantly contribute greenhouse cultivation. The use of early vegetable farming in low cost greenhouse structures (low plastic tunnel, high plastic tunnel and PE greenhouse) of geothermal resources with low heating values (30-40°C) in Kırşehir will enable

vegetable farming to be more profitably.

3. The general state of ornamental plants growing in the province

All plants in nature can be used as ornamental plants due to their various features. Thus, the broad concept of ornamental plants can be generally evaluated under four headings: cut flowers, potted salon plants, outdoor ornamental plants and natural flower onion [1]. The commercially production of ornamental plants is mostly concentrated at the coastal regions in Turkey which has very different ecological conditions. The production areas are increasing day by day in Turkey and the analysis of the total production area of ornamental plants have shown that in 2011 it was 11.418 decare and in 2016 it was 48.580 decare [3]. However, economical production and farming of ornamental plants cannot be mentioned to exist in the provincial borders of Kırşehir yet. However, ornamental plants are included and grown both in cityscape planning and individual housing gardens despite not being commercially aimed. As the result of preliminary fieldwork of the natural floras of Kırşehir, approximately 50 types of geophytes, such as Tulipa spp., Muscari spp., Allium spp., İris spp., Gladiolus spp., Crocus spp, were found to be naturally grown. Therefore, Kırşehir has a ecology in which several types of geophytes which are grown as ornamental plants and are included in the culture of Kırşehir can be produced. Furthermore, the preliminary fieldwork done within our faculty revealed that seasonal flower production can be done in non-heating greenhouse conditions. The controlled greenhouses which will be established with the use of the geothermal resources of Kırşehir will enable the farming of cut flowers. Considering all these potential, Kırşehir has a great potential to be an important contributor to the ornamental plants sector in Turkey.

2. Conclusions

Kırşehir, located between 38°50'-39°50' north latitudes and 33°30'-34°50' east longitudes in the world, is considered suitable for the cultivation of horticulture when evaluated in terms of latitude and longitude. Located in the middle of the Central Anatolian region, Kırşehir is easily accessible from Turkey due to its location on the highway transport network from east to west from south to north. Closeness plays an important role in the marketing of agricultural products. In this context, it is envisaged that there will be no problem in the marketing of agricultural products that can be produced in Kırşehir. It is necessary to establish alternative business possibilities with the support given to cultivation of ornamental plants, in particular to obtain the trademark value that is cultivated by Kaman walnut, to use modern greenhouse by using geothermal energy resources and to increase the incomes of local people. At the same time, species and varieties suitable for ecology should be identified and adaptation studies should be carried out and importance should be given to the cultivation of horticulture. Thus, it is a reality that the region's people and therefore the country's economy, will have more positive contributions.

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