Fruit production and research in Hungary – An overview

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Summary: Hungary is traditionally a food producer country. 63% of its total land area can be cultivated. Horticulture is one of the fundamental agricultural branches. The country has a moderate continental climate, with a mean temperature of 10 °C. The average hours of sunshine ranges 1,700 to 2,100 hours. Under the geographical condition in the Carpathian Basin the chemical composition of the fruits has a good harmony. The total fruit acreage is 97,000 ha with a crop of 800,000 to 900,000 tons yearly. In 1982 1,934,000 tons of fruit crop were produced since then it has decreased. The most important fruits are apple, European plum, sour cherry and raspberry. The percentage of apple reaches almost up to 60%. In the new plantings sour cherry, apple and black elderberry is popular. The most important fruit-producing region is situated at the North-eastern part of the country. More than 40% of Hungary's fruit production is concentrated there. In ranking the 2nd place is taken by fruit growing area in the middle of Hungary, where the production of stone fruits and small fruits has a considerable proportion.
In the 70s and 80s of last century there was a developed research structure and wide range of research activity in Hungary. From that time the research capacity has considerably decreased first of all in the field of technological development. The main research area is fruit breeding and variety evaluation.
Fruit scientists and fruit grower specialists are held together by the Hungarian. Society for Horticultural Sciences which has a membership in ISHS. Fruit researches and scientists having academic degree are belonged to the Horticultural Board of Hungarian Academy of Sciences.

Key words: fruit production in Hungary, fruit area, crop, variety selection, rootstock, research.

Introduction

Hungary is situated in Central Europe in the Carpathian Basin bordering seven countries. The surface of the country is 93000 sqkm, the number of inhabitants is 10.2 million, showing decreasing tendency. Hungary consists of 19 counties and 6 regions between 16° and 23° longitudes and 45° and 48° northern latitudes.

The last 15 years of Hungary were characterized by marked social and political changes. The socialist system was converted into market system resulting in joining the European Union in May 2004. Significant changes occurred in the structure of economy.

Hungary has traditions in agricultural production. The cultivated area reaches the 63% of the total territory of the country. The development of the agriculture is not as quick as that of policy and economy. The Hungarian agricultural production was highly influenced by unfavourable effects so that the total value of production decreased significantly. The total value of agricultural production in 2002 was only the 74.7% of the average of years between 1989 and 1991. The structure of agriculture is disadvantageous, featuring little farms.

Horticulture is important branch of agriculture in Hungary. The climate provides good conditions for profitable growing in all the five sectors of horticulture.

Hungary occupies the central part of the Carpathian Basin. The climate shows the features of temperate zone but the Atlantic Ocean and the Mediterranean Sea also influence the weather. The Carpathian Mountains and the Alps defend the climate of the country. The annual average temperature is around 10 °C. The summer is hot in July and August, the temperature often exceeds 32 to 36 °C. In December, January and February, the temperature goes down below -15 or -20 °C causing winter frost damages. In the spring, frost injuries of various extent occur in almost every year in fruit orchards. The average number of sunny hours is between 1700 to 2100. The average rainfall varies from 500 to 800 mm.

The soil characteristics of Hungary are diversified. It is easy to find lands suitable for fruit growing. The fruit production is limited by the small average size of farms.

Characteristics of Hungarian fruit growing

The favourable ecological conditions of Hungary make the growing of approximately 20 temperate zone fruit species possible. 12 fruit crops can be cultivated profitably. The chemical composition and taste of fruits are special due to the climatic conditions of the Carpathian Basin.

The Hungarian fruit growing was extensive through centuries. The world economic crisis of the last century initiated the development of fruit growing. Large fruit orchards were established by state support in the 60s and 70s. The majority of orchards were planted into less fertile, that is, sandy soils.

The ecological conditions of Hungary are favourable for the growing of apple, sour cherry, European plum, sweet cherry, strawberry, red currant and black elderberry. These fruit species may be planted everywhere in our country. Other fruit species like pear, peach, apricot, walnut, raspberry, black currant and blackberry need good sites for profitable growing. These species show high yearly fluctuation of yield.

One percent of the territory of the country was used for fruit growing in 2002. The changes in the size of fruit growing area are shown in *Table 1*. The surface of orchards remarkably increased until 1970 and later decreased. The distribution of the fruit orchards was the following in 2002: apple fruits 48.1%, stone fruits 39.8%, nuts 4.7%, small fruits 7.4%. More than 40% of the fruit growing area is found in North-East Hungary. The Hungarian fruit growing is traditionally concentrated in this region. The good ecological conditions are combined with satisfactory living labour-power here. More than 50% of the Hungarian fruit yield is produced here. The outstanding county, Szabolcs-Szatmár-Bereg gives approximately 40% of the fruit production of the country. The most important species are apple, plum and sour cherry.

The second fruit growing region of Hungary lies in the central part of the country, between rivers Danube and Tisza. This region gives more than 20% of the Hungarian fruit production. The most important species of thi region are stone fruits (peach, sour cherry, sweet cherry, apricot, plum) and small fruits (raspberry, strawberry, red currant, black currant).

The data on fruit consumption are given in *Table 2*. The annual fruit consumption per head is stagnant while the consumption of import fruits increases. In Hungary there is a national program supporting fruit consumption.

Table 1 The total orchard area in Hungary

Year	1.000 ha
1950	58
1956–1960	71
1961–1965	135
1966–1970	171
1971–1975	166
1976–1980	152
1981–1985	115
1986–1990	96
1991–1995	94
1996–2000	96
2001	98
2002	97
2003 98	

Source: Hungarian Central Statistical Office

Table 2 Annual fruit consumption per capita in Hungary (kg)

Year	total	of which: import
1990	72.3	10.7
1991	70.4.	11.6
1992	72.5	12.0
1993	76.2	13.5
1994	69.6	14.7
1995	57.7	16.0
1996	63.6	14.4
1997	61.8	12.3
1998	67.5	14.2
1999	70.4	16.4

Source: Hungarian Central Statistical Office

The analysis of Hungarian fruit industry

The annual total fruit yield is shown in *Table 3*. The annual fruit production significantly increased from 1950 to 1986. This tendency turned back after 1986 because of ageing of orchards and reduction of planting. The fruit production reached its peak in 1986.

Table 3 Annual total fruit production in Hungary (1000 t)

1938	406.6
1950	586.9
1956–1960	764.2
1961–1965	955.3
1966–1970	1218.1
1971–1975	1378.6
1976–1980	1509.8
1981–1985	1730.9
1986–1990	1821.5
1991–1995	1629.1
1996–2000	1097.5
2001	911.5
2002	916.6
2003	699.2

Source: Hungarian Central Statistical Office

The average yields of different fruit species between 1996 and 2002 are given in *Table 4*. The average crop of these years did not reach the half of the yield of 1986. The new plantations could not supplement the yield of the liquidated orchards of the previous state farms and co-operatives. The average orchard size was 1.5 ha in 2001. The most important species are apple, plum, peach and sour cherry. The most important small fruit is raspberry.

The forecast of fruit production in 2010 is found in *Table 5*. The total surface of fruit orchards will decrease. However, the development of cultivation system and growing technology will result in an increase of 10 to 15% in average crops. Nowadays, the most popular fruit species are apple, sour cherry, walnut and black elder from the aspect of planting new orchards. The fruits of black elderberry were picked from plants growing wild a few years ago but now the surface of new plantations has reached 1600 ha.

Table 4 Annual average fruit crop from 1996 to 2002 (1000 t)

Total	**881.9**
of which	
Apple	543.6
Pear	32.0
sweet cherry	17.7
sour cherry	52.5
Plum	95.6
Apricot	24.1
Peach	58.3
Walnut	3.8
Raspberry	17.6
Currant	11.5
Gooseberry	3.4
Strawberry	11.7
Others	15.1

Source: Hungarian Central Statistical Office

Table 5 Forecast fruit production for 2010 (1000 t)

fruit crop	average from 1996 to 2002	2010 forecast
Apple	543.6	600–700
Pear	32.0	40–50
sweet cherry	17.7	25–30
sour cherry	52.5	80–90
Plum	95.6	100–120
Apricot	24.1	40–50
Peach	58.3	60–70
Nut	3.8	5–10
Raspberry	17.6	15–20
Strawberry	11.7	12–15
Currant	11.5	15–20
Gooseberry	3.5	3–4
black elderberry	–	10–20
Others	10.1	–
Total	881.9	1000–1200

Hungarian fruit production has a considerable annual fluctuation. This phenomenon is demonstrated in *Figure 1* by the crop of apricot between 1990 and 2002. Under our climate, the fluctuation is the biggest in the case of apricot, because of its sensitivity to winter and spring frost damage.

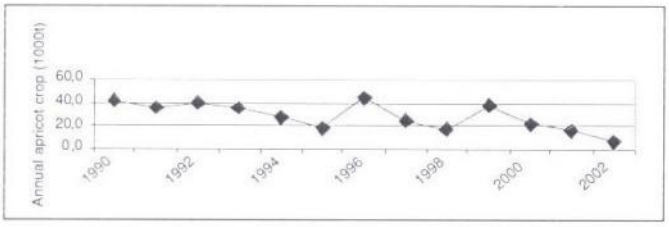

Figure1 Annual alternation of apricot crop in Hungary

The apple became our most important fruit crop in the 30s of the last century, after the great word economic crisis. The development of the Hungarian apple production is demonstrated in *Table 6*. The volume of apple production was ten times more in 1986 than in 1950 and its percentage almost reached 70% of the total fruit crop. Now the proportion of apple is lower but nearly 60%.

A lot of apple orchards are to be cut down in the near future because more than 40% of the present orchard surface is older than 25 years. The ratio of apple orchards younger than five years was only 16% in 2002. The rootstock and variety usage of young orchards is up-to-date. The new orchards are more dense. The usage of rootstocks is shown in *Table 7*. The most important rootstock is *M 9*, the second is *MM 106*. The new orchards feature slender spindle or free spindle training system. The variety usage in the new orchards is summarised in *Table 8*. The most important varieties are belonged to *Jonagold* and *Golden Delicious* groups. *Idared* and *Gala* are also popular. The proportion of apple scab resistant varieties also increases. The processing industry uses 70 to 80% of the apple crop, mainly for apple concentrate production. Data on Hungarian apple concentrate export are given in *Table 9*. The export for fresh consumption and the import are not significant.

Of the stone fruits the prospects of the growing of sour cherry, plum and sweet cherry are promising under the climatic conditions of Hungary. The growing of sour cherry was the most profitable in the last decade so that it is popular among growers. We have valuable variety assortment as a consequence of the breeding and selection work of Hungarian researchers. The usage of Hungarian varieties is totally dominant. The propagation data of main varieties are given in *Table 10*. These varieties are self-fertile with medium or big fruits and have high and steady productivity. The profitability of the Hungarian sour cherry growing is based on the great percentage of export. More than 70% of the annual yield is exported as fresh fruit or processed product.

The climate limits the growing of peach and apricot in Hungary. However, these fruits are popular because of their good taste and valuable chemical composition. The most popular training system of stone fruits is vase. In peach, the lower version of vase (kettle) is wide-spread. Low spindle form is also used for table fruit production.

Table 6 Apple production in Hungary

Year	1000 tons	% from total fruit production
1938	80.5	26.6
1950	134.0	22.8
1960	290.0	39.3
1970	660.8	50.5
1980	1 106.0	61.4
1986	1 259.9	69.1
1990	945.5	65.4
from 1991 to 1995	670.9	61.1
from 1996 to 2000	534.6	73.6
2001	605.4	58.3
2002	526.9	57.5

Source: Hungarian Central Statistical Office

Table 7 The main apple rootstocks in percentage of the propagated trees in 2002

Rootstock	%
M 9	46.5
M26	11.7
MM106	37.5
Others	4.3

References: National Institut for Agricultural Quality Control

Table 8. Composition of using apple varieties in new orchards (%)

Variety	2000	2001	2002	average
Jonathan	7.1	5.2	3.4	5.2
Idared	15.3	15.9	10.6	13.3
Jonagold types	20.1	13.9	14.5	16.2
Golden D. types	10.1	18.6	15.9	14.9
Starking	0	1.7	3.9	2.8
Gala	13.4	9.9	10.3	11.2
Granny Smith	0	1.2	5.2	3.2
Florina	6.7	3.6	3.5	4.6
Braeburn	1.4	1.4	3.7	2.2
Re selections	2.6	11.8	16.1	10.2
Others	23.3	16.8	12.9	15.6

Reference: National Institute for Agricultural Quality Control

Table 9 Apple concentrate export in Hungary (tons)

	tons
1997	19.051
1998	14.120
1999	14.553
2000	35.271
2001	28.945

Table 10 Distribution of the sour cherry varieties in percentage of the propagated trees in 2002

Variety	%
Érdi bőtermő	32.8
Debreceni bőtermő	20.4
Újfehértói fürtös	19.8
Kántorjánosi	14.4
Others	12.6
Total	100.0

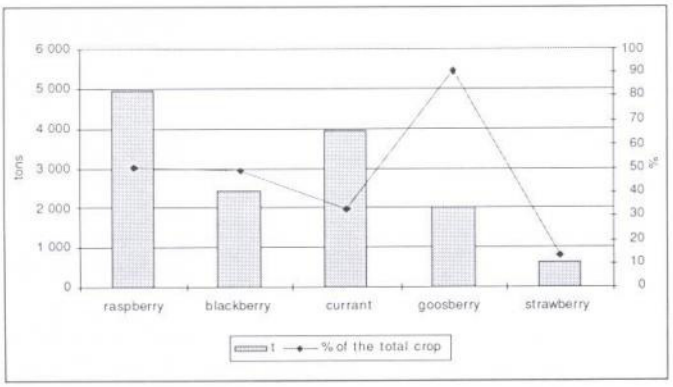

Figure 2 Fresh and frozen fruit export of small fruit crops in Hungary

The most important small fruit is raspberry in Hungary. The raspberry production regions are located in the small hilly areas in Hungary. The raspberry production is based on using Hungarian raspberry varieties. The reduction of crop was not so apparent in the case of small fruits in the last two decades. The export plays expressive role in the marketing of small fruits *(Figure 2)*. We have significant import from strawberry that reaches 30% of the inner production.

The structure of production and sale marketing

The big orchards of state farms and co-operatives were privatized after the collapse of the socialist system. A lot of new owners were old and had not enough knowledge and capital. The co-operation of fruit growers has just started again in order to establish marketing organizations. The advisory system has not entirely born yet. The most important associations of fruit growers are Hungarian Fruit and Vegetable Interprofessional Organization and Hungarian Apple Board.

The future of Hungarian fruit growing is highly determined by the marketing co-operation of growers. Meaningful part of the Hungarian fruit production (20 to 40%) is to be exported. The most important processed fruit products are concentrates, deep frozen products and the special Hungarian fruit distillate ('pálinka') appreciated by the EU as hungaricum.

Education and research

The horticultural university education features high level in Hungary. Horticulture is taught at five universities and at four high schools. A University Faculty of Horticulture is working in Budapest and a high school faculty is found in Kecskemét. Three independent departments of fruit science are working in our country. It is possible to get Ph.D. degree in horticulture al science at four universities.

The research work is done at university departments and regional research stations. The financial background of fruit science research is provided by state competitions. The main research activities of university and high school departments are breeding, variety evaluation, flowering and fertilization biology, rootstock usage and investigation of training systems. Advisory work is also made by university and high school departments.

Four regional research centers in Hungary deal with fruit growing research and advising. The main research purposes of these research institutes are different.

The Research Institute for Fruit Growing and Ornamentals (Budapest-Érd) is particularly involved in breeding of self-fertile sour cherry varieties, sweet cherry varieties of different ripening time and walnut varieties. This institute has 89 registered fruit varieties in 9 species. Its virus free superelite orchard supplies commercial nurseries with mother plants. The gene bank of the institute has 200 to 300 Prunus varieties and several walnut and hazelnut varieties.

The main activity of the Research and Extension Centre for Fruit Growing (Újfehértó) is the evaluation of apple varieties with special emphasis on their resistance. The gene bank of apple varieties is in Hungary. The institute has good results in sour cherry selection based on the gene sources of the region. They have worked out IP technology for apple and sour cherry growing.

Apricot and plum breeding, variety evaluation and rootstock selection for stone fruits are the most relevant targets of the Research and Extension Institute (Cegléd). The virus free rootstock seed production orchard of Hungary is held here.

The Research Institute for Fruit Growing (Fertőd) is especially interested in breeding and variety testing of small fruits and their virus free propagation. Their results in raspberry and blackberry breeding are appreciated internationally. These varieties are dominant in the new raspberry plantations.

Conclusions

The importance of horticulture and fruit growing **will grow** in the near future in the Hungarian agriculture. The development of horticulture is national priority. **The ecological conditions, the traditions** and the research results give the background of competitive Hungarian fruit growing in the European Union.

References

Fruit orchards in Hungary 2001: Hungarian Central Statistical Office, Budapest

Kállay Tamásné, 2004: Magyarország gyümölcsültetvényei a KSH összeírás tükrében. Fruit orchards in Hungary on the basis of the data by the Hungarian Central Statistical Office. Kertgazdaság, 36(1): 63–69.

Statistical Yearbooks of Agriculture, Hungarian Central Statistical Office, Budapest