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The Hungarian peach production risks

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Summary: Hungary possesses very good agroecological conditions even in a European comparison. Agriculture and food production is highly important despite its decreasing relative economic significance, since providing high quality and affordable food for the population is a basic social necessity and one of the decisive factors in quality of life. The development of vegetable and fruit production is of great importance both from a healthy nutrition as well as from a comparative advantage (cheap labour, expertise, production traditions, favourable climate) point of view. Vegetable and fruit consumption per capita is lower than in developed countries, which is a decisive indicator of healthy nutrition, but improvement is continuous and desired. Appropriate quality and quantity in production is a requirement to meet customers' needs in a highly competitive market from one year to the next. Hungary can only be competitive if production results are improved while risks are reduced. Fruit production is a sector with high capital requirements, risk assessment is very important from a production, investment as well as from a national economy point of view. Our examinations will focus on production risk, which is present in the annual fluctuation of average yields, especially as a result of extreme weather factors.

Key words: peach, production, Hungary, risks

Introduction

Hungary lies on the northern border of economical peach production. Early spring and winter frosts represent the primary risk of production. This fruit can only be produced safely in areas with lower risk of frost, such as hilltops and hillsides. The frost tolerance of plant parts is a result of a long process. Peach sprouts and parts above ground are only significantly damaged below $-20\text{ }^{\circ}\text{C}$ during deep dormancy. Warming up following deep dormancy results in accelerated vital processes. One or two week long warmer periods in January and February are common in Hungary during which plant parts lose their frost tolerance. If vegetation starts later, the risk of frost is lower (eg.: on the north, north west slopes and in the case of cold tolerant types). Parts above ground are damaged to some extent every year in Hungary due to winter cooling down. Due to early autumn (October, November) cooling down, the not ripened shoots or not yet acclimatised parts (ends of shoots) get frostbitten. Development of plant tissues is slow due to bad nutrient supply in the narrow branches therefore frostbite often occurs. Frost damage, which results in the significant loss of yield, usually occurs twice of four times over the course of ten years on production sites of the Hungarian plains. Damages to buds of peach types can reach 100% in certain years. Weather following frost damage, especially during flowering, strongly influences yield. Beneficial conditions for yield, such as average daily temperatures exceeding $10\text{ }^{\circ}\text{C}$ and dry,

windless conditions, could result in outstanding yield quantities (20–30 t/ha) even for trees with 30–40% damage, or a 50–80% frost damage can be followed by medium (10–15 t/ha) or good (15–20 t/ha) yields (Szabó et al., 2004). All these factors can also influence plant protection (Soltész & Holb, 2007).

Materials and methods

Production risk is calculated by applying variance and relative deviation indicators. Technological development has to be taken into consideration in case of long time sequences and the trend effect has to be examined in the data sequences. Because of this, we began the evaluation with trend analysis and applied trend functions in the data sequences. The periodical development of a phenomenon is determined by the joint effect of several factors, resulting in the actual or experienced results. These results are the following:

- basic tendency or trend
- periodical fluctuation (within and beyond a year)
- random fluctuation (Ertsey, 1990).

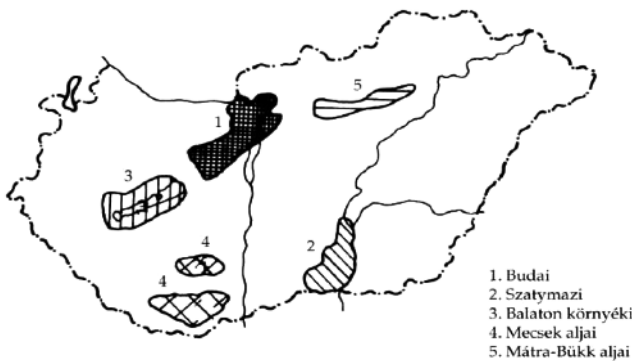
The random effect can be defined numerically with the error of the trend function, the so-called residual deviation, which is in direct proportion to the degree of the risk.

The database for our examination was based on own data collection as well as on data provided by the HCSO.

Areas suitable for peach production in Hungary

As it has been previously mentioned, Hungary lies on the northern border of peach production (between latitudes 46–48.), but still within the realistic zone of production, which means that necessary ecological conditions are not always provided and there are areas where economical peach production cannot be achieved (Timon, 2000).

The success of integrated peach production in Hungary depends primarily on the selection of cultivation site. This mediterranean species can only resist diseases and can be cultivated with less industrial materials (pest control, fertiliser) application, if it is cultivated in areas with the most suitable ecological conditions, especially in favourable locations and on soils. Selection of cultivation site is one of the most important questions of successful and profitable fruit production. The areas of peach cultivation are illustrated in figure 1.



Source: Timon, 2000

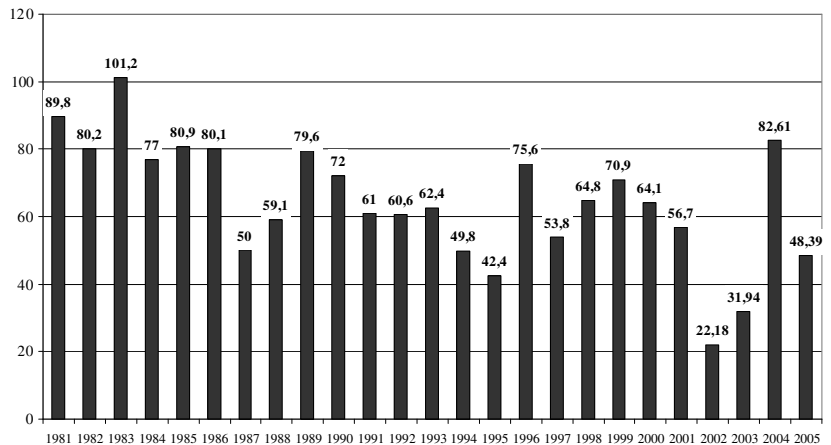
Figure 1. Regions most suitable for peach production in Hungary

The most suitable peach production areas are the following (Figure 1):

- vicinity of Buda, the protected southern slopes of Pilis, Gerecse and Vértesalja (1. cultivation site)
- not low lying sand ridges of Szeged-Szatymaz area (2. cultivation site)
- Balaton area, both northern and southern hillsides (3. cultivation site)
- Mecsekalja, southern hillsides of Baranya and Tolna (4. cultivation site)
- Mátraalja, from Pásztó to Eger (5. cultivation site)

Our peach production gradually decreased following the peak of the 1970s and reached its lowest point in the 90s (Timon, 2000). The highest yield was achieved in 1972 (131 800 tonnes), and fluctuated between 42 000 and 75 000 tonnes in the 90s. The yield quantity of peach in Hungary between 1981 and 2005 can be seen in Figure 2.

The yield averages of peach production and its relative deviation in the counties covering the main cultivation



Source: HCSO

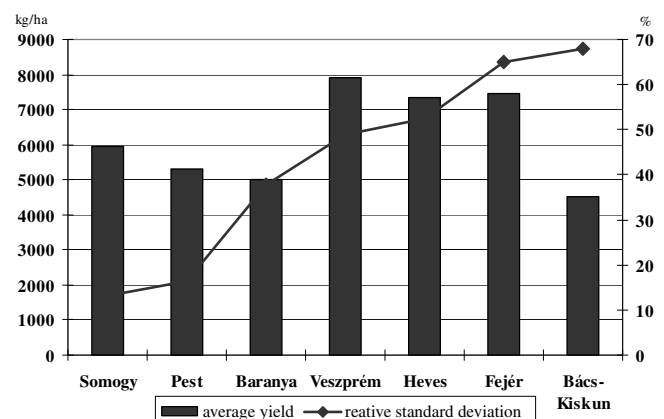
Figure 2. Yield quantities of peach in Hungary between 1981–2005

regions in Hungary are shown in Table 1. The average yields are the averages of yields in 2002, 2003, 2004 and 2005. As it can be seen in Table 1. Hungarian peach production is characterised by low production standard and significant differences can be detected among the various counties as well. The standard of production is highest in Veszprém county and lowest in Bács-Kiskun county. Production is the most unfavourable in Bács-Kiskun county, most favourable in Somogy county, where relative yield fluctuation is only 13.26%. The abovementioned is illustrated in Figure 3.

Table 1. Average yield and relative deviation of main peach producing counties in 2002 and 2005

County	Producing region	Yield average kg/ha	Relative deviation %
Somogy	4.	5957.5	13.26
Pest	1.	5292.5	16.42
Baranya	4.	5017.5	37.72
Veszprém	3.	7912.5	48.80
Heves	5.	7335.0	52.55
Fejér	1.	7455.0	65.07
Bács-Kiskun	4.	4517.5	67.86

Source: own calculation based on HCSO data

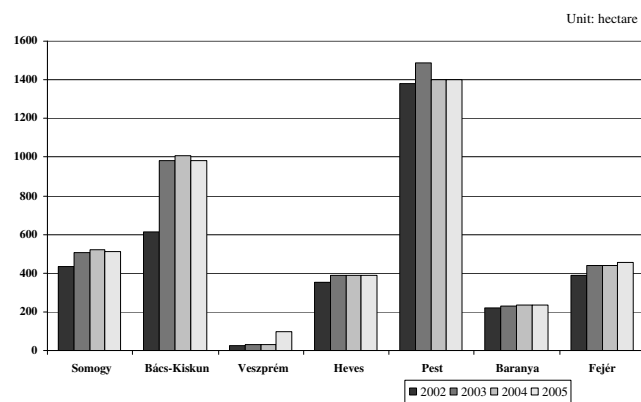


Source: own compilation

Figure 3. Yield average and relative deviation in different counties

The size of peach cultivation area does not follow risk indicators. We can see in *Figure 4*, that cultivation area is the largest in Pest county in cultivation site 1., which is determined by relative low risk and proximity of the purchasing market. The second largest production area can be found in Bács-Kiskun county, where production risk is the highest (68%), which means an extreme fluctuation of yields. This cultivation site located on a plain is traditionally a fruit, grapes and vegetable production area because of weak soil characteristics. Peach production is primarily present due to processing capacities in the proximity (fruit juice) and it is still competitive with other sectors within this region despite high risks.

The characteristics of three specific orchards are shown below in connection with the previously mentioned outstanding production regions.



Source: HCSO

Figure 4. Production area of peach in the major producing counties of Hungary

Siófok plantation

The introduced peach plantation is old in the relatively low risk production area and, as it can be seen from *Figure 5*, yield averages strongly decreased in 1998–2007 and risk significantly exceeds the average of the cultivation site (32%).

The characteristics of the plantation can be seen in *Table 2*.

Gyöngyös plantation

The Gyöngyös plantation can be found in Heves county in the Mátra-Bükk foothill cultivation site. The yield average of this new, modern plantation is three times that of the previously mentioned plantation. Production risk is 37%, which is significantly lower than the average of the production region. The characteristics of the plantation are shown in *Table 3*.

Mezőnyárád plantation

It is located on the edge of the Mátra-Bükk foothill cultivation area, the elevation does not reach the desired 300 meters above sea level, as it is only at 136 meters (Nyéki, 2004). 2007 was especially severe in agriculture. Significant

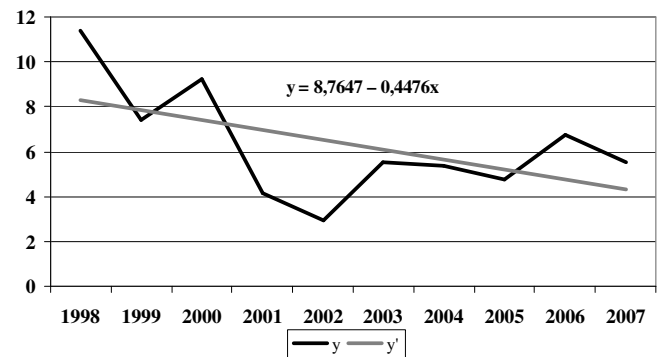
ice and frost damage accompanied drought. The biggest damages were caused by winter and spring cooling offs, but the negative effects of high temperatures can also be detected (Szabó, 1997). On 22–23 April, 2007. and 2–3 May brought frost damages unparalleled for sixty years affecting almost the entire fruit production area of Hungary. The extent of

Table 2. Characteristics of the plantation in Siófok

Type	Suncrest, Regina, Redhaven*, Cardinal
Year of plantation	1975
Subject	bitter almond
Crown shape	Fat cone
Row distance and distance between trees	6.5 * 4
Size of plot (ha)	35.93
Soil quality (AK)	37
Irrigation	yes
Method of irrigation	sprinkle
Frequency of frost damage	2 cases / 10 year
Protection against frost	no
Frequency of frost damage	3 cases / 10 years
Protection against frost	no

Source: own compilation

Comment: *excellent frost tolerance



Source: own calculation

Figure 5. Yield average trend of the fruit plantation of Siófok between 1998 and 2007

Table 3. Characteristics of the plantation in Gyöngyös

Type	Elberta, Redhaven*
Year of plantation	1996
Subject	bitter almond
Crown shape	Vase
Row distance and distance between trees	5.5 * 3.5
Size of plot (ha)	1.5
Soil quality (AK)33	
Irrigation	yes
Method of irrigation	drip
Frequency of frost damage	3 cases / 10 years
Protection against frost	no
Frequency of frost damage	3 cases / 10 years
Protection against frost	no

Source: own compilation

Comment: * excellent frost tolerance

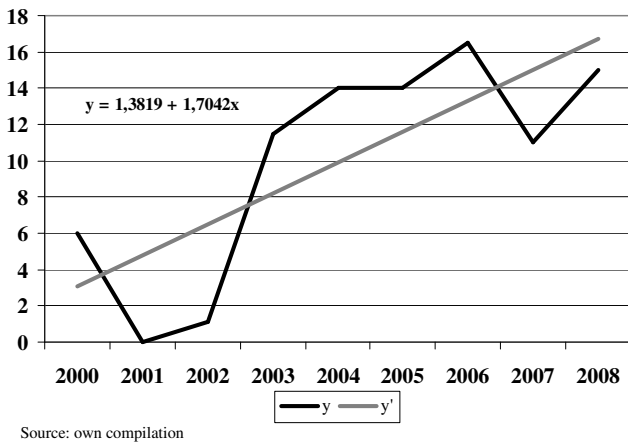
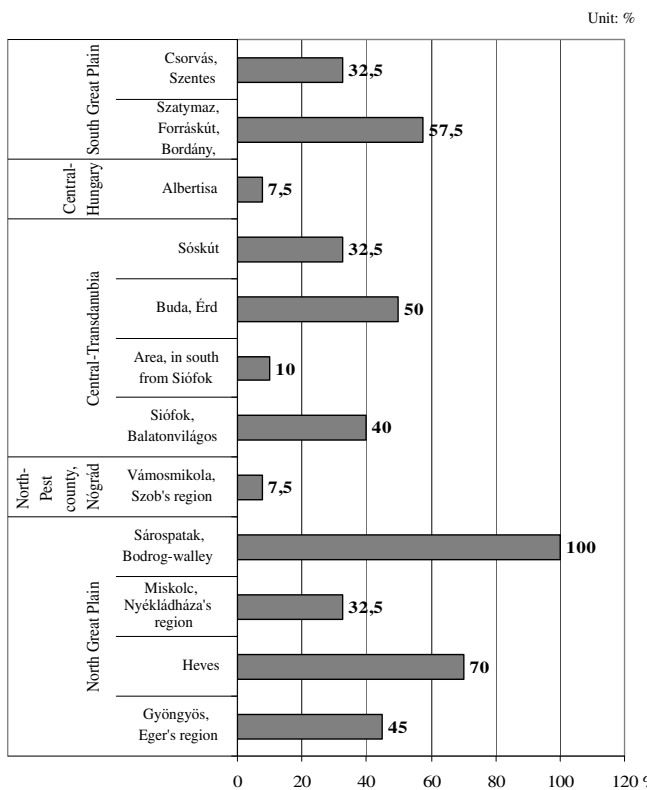


Figure 6. Yield average trend of the fruit plantation of Gyöngyös between 2000 and 2008



Source: Zöldség- és gyümölcs piac (Vegetable and fruit market), 2007

Figure 7. Frost damages affecting peach between 22–23 April, 2007 and 2–3 May

frost damages of 2007 can be seen in Figure 7. Frost did not occur in the middle part of the country (Northern-Pest county, Nógrád, Central-Hungary), damages were only 7.5%. The most severe frost damage affected the Northern-Plain region, where the extent of frost reached 100%-ot (Sárospatak, Bodrogvölgye).

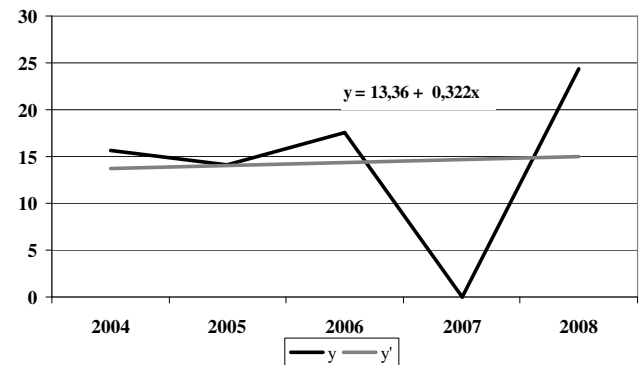
Total yield loss occurred in the examined plantation due to frost damage in 2007 (Figure 8). Based on the provided database, production risk is calculated at 56% for 5 years, which is in accordance with the average of the cultivation area. The characteristics of the plantation are shown in Table 4.

Table 4. Characteristics of the plantation in Mezőnyárad

Type	Redhaven*, Suncrest, Elberta, Ford*, Red June Champion*, Flavortop, Incrocchio Pieri*
Year of plantation	2000
Subject	wild autumn
Crown shape	Vase
Row distance and distance between trees	6 * 4
Size of plot (ha)	5
Soil quality (AK)	32-33
Irrigation	yes
Method of irrigation	drip
Frequency of frost damage	2 cases / 10 years
Protection against frost	no
Frequency of frost damage	0 case / 10 years
Protection against frost	no

Source: own compilation

Comment: * excellent frost tolerance



Source: own compilation

Figure 8. Yield average trend of the fruit plantation of Mezőnyárad between 2004 and 2008

Summary

Hungary possesses very favourable agroecological potential even in a European comparison. Fruit production has great traditions alongside plant production. Healthy nutrition requires high standards from fresh and processed vegetable and fruit products. The economic-social transformation characterising the change of regime severely affected both sectors. The efficiency of fruit production and especially production risk is determined by conditions of the cultivation site, this is especially true for sectors that are on the border of their productivity. Peach production in Hungary reached its peak in the 70s. Currently, we produce 50-60% of this quantity. Most of the production is concentrated on 5 cultivation sites, differing in size, production standard as well as in production risk. Peach is produced with relatively low risk on the largest cultivation site around Budapest and Pest county. On the other hand, peach is produced with high risks on large plantation areas integrated by fruit processors on sandy plains. It is apparent from different case studies that it

is primarily the cultivation site that determines the risk of production in Hungary, but the age, modernity and cold tolerance of the used species also plays a role in this.

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