

## INCOME GENERATING CAPACITY AND CAPITAL REQUIREMENT OF YOUNG FARMERS: VEGETABLE PRODUCTION IN GREENHOUSE

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### ABSTRACT

*The study examines Hungarian horticultural enterprises led by young farmers from economic viewpoint. This paper deals with the assessment of income and capital needs of the greenhouse cultivation sector based on the scoring system of the Rural Development Programme tenders. The number of farms of young people in specialized horticultural production increased greatly in recent years, and the results of farm business management have always been closely related with production structure. On these farms the amount of income basically depends on the structure of production, income generating capacity, capital requirements, the amount of subsidy and the utilization of intersectoral relations. Due to the diversity of vegetable crops in-depth professional knowledge of young farmers is needed both in the planning and in the operational period for the successful business.*

**Keywords:** *young farmer, greenhouse, income, capital requirement, EUME*

### INTRODUCTION

Hungary's has been the breadbasket of Europe for centuries through its natural endowments, the knowledge and diligence of the people working in agricultural businesses, In addition to the excellent climatic and soil conditions central location of the country made it possible to deliver foods at a relatively low cost to the markets of the neighbouring countries. The whole Hungarian agrarian economy including greenhouse vegetable production was in its heyday in the 1970-80s, when the thermal water explored while seeking oil was used in horticulture. The greenhouse vegetable production requires a lot of labour, which solved the employment of many thousands of people in regions hit hard by unemployment, while the produced high-quality early vegetables reduced our dependence on imports, and had a large revenue and profit per unit area. This contributed to the increase in the living standards of those growing greenhouse vegetables [5].

The greenhouse technology is designed to develop a single place providing ideal growing conditions with the optimal use of natural resources and the necessary inputs. Vegetable forcing and nursery is carried out in foil tunnels or perhaps greenhouses covered with glass, known as growing facilities. These are used, on the one hand, to protect the plants from environmental impacts; on the other hand, we can control the temperature and humidity, or light and carbon dioxide concentrations as welling this confined space. In our country, vegetable production is carried out mainly in foil tunnel facilities; the territorial share of greenhouses is only a few percent.

Currently, about 20% of plant growing facilities are heated, typically with gas, wood or geothermal water [6].

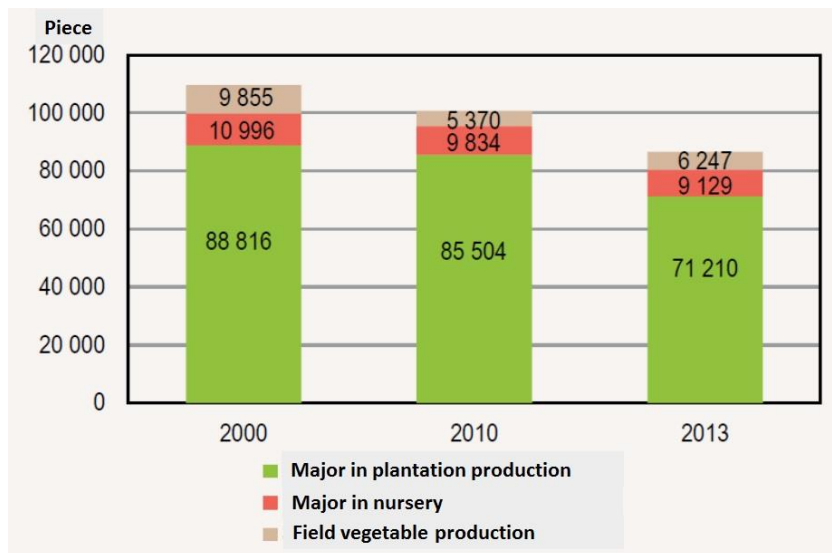
Compared with the agricultural and horticultural field production, plant growing in greenhouses is carried out in more closed, more sheltered conditions. If we are talking about precision farming, the it does not focus especially on the growing-place centred

farming in a classic sense, but rather the establishment of a single production place to provide the most ideal conditions for the growth of a given plant species in closed, sheltered conditions.

Tomato and pepper cultivation is done in the modern greenhouses with hydroponics technology, not only without soil, but it is not even on the ground, but elevated and placed on a special pendant sewer system media (most commonly made of rock wool or coconut), so any unevenness of soil (structure, nutrient content, pH, etc.) and its equalization does not appear as a criterion.

To establish and maintain a single, controlled environment there are numerous, easily and affordably available technical, electronic, and production technology means and applications that are increasingly being found among domestic greenhouse gardeners as well. The expertise to use the tools, and applications tailored to the plants currently available due to both on the supply side as well as the ever more extensive consulting background [8].

The number of workers active in the horticultural sector decreased to a much lesser degree, as seen in the case of the total economy. In fact, in 13 years the number of specialised nurseries dedicated fell back the least. Generally speaking, a kind of specialization took place, most of the mixed farms disappeared. As a result of the restructuring the proportion of nurseries of the total economy increased from 11% in 2000 to 18% in 2013 (Figure 1).



Source: KSH, 2016

**Figure 1. Changes in the horticultural sector in Hungary (2000-2013)**

In our country today, vegetables are grown on about 100,000 hectares. More than 70% of the cultivation area on the Great Plains, and the Southern Plain Region dominates in vegetable forcing on approximately 5,000 hectares as well. Vegetable seeds production takes place on 3,000 hectares, the vast majority of these surfaces produce pea seed. The annual yield is up to 1.5-2 million tons, of which nearly three-quarters of field vegetables, the rest comes from vegetable forcing (0.4-0.5 million tons) and mushroom production (30-40 tons). Approximately 40-45% of the produced vegetables will be for export, mainly as processed products. The yields are relatively low by international comparison, but there are major differences in this respect among the farms of different stages of development. 80% of the production comes from private farms, the vast majority of which have less than 5 hectares area. It is estimated that today about 70-100 thousand families have their income from vegetable cultivation. Currently there are 100-120 hectares of up-to-date heated greenhouses operating in Hungary. [10]

### Horticultural crops for food in Hungary

In our country the average per capita vegetable consumption is 90-100 kg per year, from which a total of 40-45% is processed goods. Consumption shows a decreasing however still significant seasonality. The vegetables are important vitamins sources (e.g., vitamin C, peppers, cabbage, carotenoids - tomatoes, carrots; Vitamin D - mushrooms) and minerals (leafy vegetables) sources. The protein content of green peas, green beans and mushrooms is significant. Due to their fibre content they play an important role in proper digestion. With few exceptions, their energy content is not significant. Some vegetables (e.g. garlic, peppers, broccoli and pumpkin) are biologically active substances in the pharmaceutical industry use. However, mainly the leaf vegetables might build up significant amounts of materials harmful to human body, such as nitrates, oxalic acid. [6]

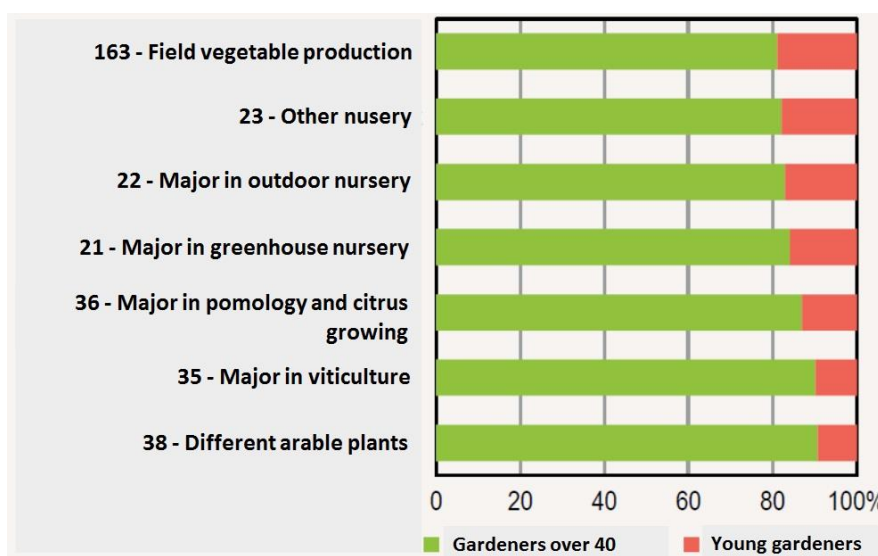
### Growing number of young farmers working in horticulture

The rate of young farmers working in horticulture was 12% in 2013; a total of 10.5 thousand farms, which were led by farmers younger than 40. There is no significant difference compared to other economies, because in their case the rate is 13%. The proportion of young growers of field vegetables was the highest (19%), among the various horticulture managers 16%, among the crop growers, however, lower than the average (11%). The rate of the young among the large number of and significant fruit producers was average (13%) while among the also significant number of viticulturists, however, it was only 9.7%. [7]

The distribution of farms in the horticultural sector is shown in Figure 2.

## MATERIALS AND METHODS

Our investigations were confined to Hungarian vegetable-growing areas in the South Great Plain Region (Csongrád, Bács-Kiskun and Békés Counties), therefore they are non-representative. Qualitative research method was used with interviews in which our questions were grouped in themes and topics defined previously. The questions were asked directly from young farmers, who operated the farm, then we recorded and analysed the replies.



Source: KSH, 2016

Figure 2. The distribution of farms in the horticultural sector in Hungary (2013)

The interview subjects were mainly the leaders of already existing farms, run by young farmers, who have been operating for 1 to 5 years. The cost and income conditions were projected to 1 m<sup>2</sup>, or 1 kg, expressed as a net amount without any contributions. Among the costs the land rental fees were not considered, as they are approximately the same as the value of the support provided with regard to the size of the area for producing a certain type of cultivated plant (TERA). Our results thus obtained only apply to small farms (1-5 ha), since the size of the farms operated by young farmers were all within this volume. There is no doubt that large farms can be managed more profitably, they can achieve greater bargaining power in sourcing of inputs, as well as significant savings in fertilizer and diesel fuel use, and their profitability is also reflected in the transport and expenditure as well.

Mainly tomatoes and peppers produced in greenhouse were studied considering the specific costs, the expected yield, variety, irrigation and mechanized humidification of the soil or soil-free cultivation and quality. The development of heating systems was also considered, and the following aspects were analysed: seeds, seedlings, pesticides, fertilizer, diesel fuel, and the wages were taken into account as well.

Expenditures estimation:

Greenhouse cost of over 5,000 m<sup>2</sup>: 30-32,000 EUR/m<sup>2</sup> (the maximum eligible cost in the Rural Development Program is 35,000 EUR/m<sup>2</sup>).

The cost of foil tunnel block-based greenhouse, over 5,000 m<sup>2</sup> space: 16-18,000 EUR/m<sup>2</sup> (the maximum eligible cost in the Rural Development Program is 20,000 EUR/m<sup>2</sup>).

Planting costs of tomatoes: 2.5 seedling plants/ m<sup>2</sup> that is 2-3 EUR/plant, and of pepper for 3.6 seedling plants/ m<sup>2</sup> that is 0.7-1 EUR/plant.

Annual yields for heated greenhouse tomatoes: 40-60 kg/m<sup>2</sup>, for pepper 15-24 kg/m<sup>2</sup>.

Ideally 8-10 people are required to operate 1 hectare greenhouse. On average, young farmers usually count one person for 1000 m<sup>2</sup> production area.

In up-to-date greenhouses heated with thermal water, 40-50% energy savings can be expected. A thermal water well can provide safely for 3-5 hectares of greenhouse heating. The cost of thermal water well or a double well is 480-810,000 EUR [11].

Sales prices for tomatoes in 2015 were between 0.58 and 0.81 EUR/kg; and for pepper from 0.81 to 1.03 EUR/kg depending on seasonality.

To determine the specific income conditions for young farmers in our survey in the year 2015 was not easy, since the young farmers produced in various facilities of different sizes, heating systems, production technologies and modernity. None of them made itemized cost calculation.

Specific income statement was not prepared due to the different growing conditions; however, a the gross margin was calculated. The annual gross margin of thermal water-based high technology greenhouses for tomatoes growing was 40-45 kg/m<sup>2</sup>; while for pepper it was 12-15 kg/m<sup>2</sup>.

The total area of plastic tunnels and greenhouses was 2.3 thousand hectares, according to the 2013 farm structure survey data. On 71% of the total (1.6 hectares) vegetables were grown. Among vegetables, the largest area (31% of the total area) was occupied by green peppers in 2013. Tomatoes accounted for 15% cucumbers for 8% and lettuces for 3% (Figure 3). 17% of the area was used by farmers younger than 40. Their production structure is similar to that of all the other farms, however the proportion of fresh vegetables is somewhat greater in their crop structure.

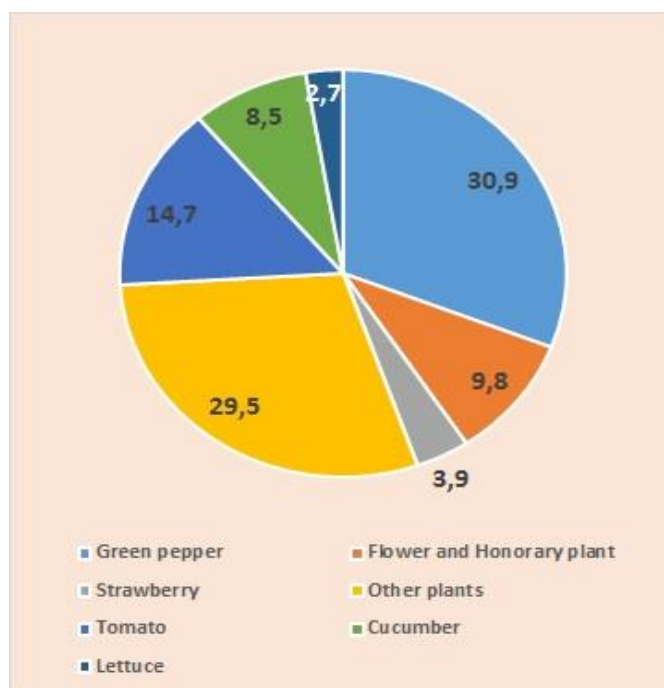
## RESEARCH RESULTS

### The production capacity of greenhouse horticulture

The income generating ability of horticulture is expressed by a so-called EUME (European Units for Measurement) value derived from an SGM (Standard Gross Margin) value based on test farm income calculations. In the 2007-2013 budget period in Hungary there were three tenders, while in 2014 and 2015 there were one tender each year, which were aimed to help start young farmers by up to € 40 000 HUF equivalent to 100% (90% + 10 %) support financed by the European Agricultural Fund for Rural Development. Both the 2014 [1] and the 2015 [2] tenders offered extra points for undertaking the production of horticultural produce, which was meant to encourage young farmers to take up this sector. Tenders offered extra points for the winning young farmer to undertake the task of changing the composition of their production by the fourth year of the operating period so that 84-100% will be animal husbandry, horticulture, or the two of them together.

Referring to the data base of the test-operation vegetable growing has three main areas; the specificity of the growing income-generating capacity is calculated accordingly. Thus, the separate categories are presented in Tables 1 based on SMG operational test.

### Calculation of the income-generating capacity of vegetable growing based on SGM operational test



Source: KSH, 2016

Figure 3. Greenhouse and plastic tunnel production and acreage in Hungary (2013)

Table 1

### The special position of greenhouses

Code	Denomination	Unit	SGM
D14A	Fresh vegetables, melons, strawberries open field, under low cover, arable crop rotation	EUR/ha	2,625
D14B	Fresh vegetables, melons, strawberries open field, under low cover, horticultural rotation	EUR/ha	3,078
D15	Fresh vegetables, melons, strawberries walk-in plastic tunnels or greenhouses	EUR/ha	26,322

Source: ANONIM, 2015b

Considering the income-generating capacity there is not too much difference between code D14a and code D14b, while code D15 is highly appreciated as a technology growing fresh vegetables in plastic tunnel or greenhouse, therefore it has high SGM value.

The tendency can be observed that in production code D15 production in greenhouses and production plastic tunnels are considered similarly, although their investment needs and income generating capacity are quite different. Not to mention the fact the specific greenhouse is heated or non-heated. So the young farmers who undertake the vegetable production in 84-100%, based on this high capital-intensive and cost intensive greenhouse technology by the fourth year of their production structure might receive significant additional scoring benefit, regardless of whether the production is implemented in greenhouses or plastic tunnels, under heated or unheated conditions.

### **The relations between the profitability and the capital requirements of greenhouse vegetable growing**

The profitability tests usually analyse relations with some other categories. The most common and also one of the longest-studied correlations is the relationship between size and profitability. If the above relation is applied to agriculture, to agriculture, within that to greenhouse vegetable growing, in this case, the large size ("size range") primarily applies to the production of paprika and tomato [9]. Even with the help of the state support programme called 'Land for farmers' it is difficult for young farmers to purchase or lease land therefore the possibility of producing paprika and tomato based on series size, as mentioned above, is rather limited at the beginning of the operation years.

The relationship between concentration and profitability is also a frequently studied context. Economically it is accepted that the higher concentrations are associated with higher profitability. In terms of pepper and tomato production a more modern generation of young farmers are characterized by a powerful concentration.

The relationship between concentration and profitability is also a frequently studied context. Economically it is accepted that the higher concentrations are associated with higher profitability. In terms of corn production a more modern generation of young farmers are characterized by a powerful concentration.

There is an interesting theoretical relationship between young farmers' profitability and financial situation. From the creditors' side one essential condition for the return is the profitable operation, however on the other hand borrowing can be intended to create a profitable operation is (for example, by purchasing new technology or equipment it can be said that the profitably working young farmer's debt level is lower and they have higher liquidity of stock (cash, marketable securities) than a non-profitable business partner. In case of greenhouse production based on specialization with high investment needs the creditors cannot assess the long-term history of the young farmer, because young farmers get the "young farmers" status "only" for five years Therefore a creditworthiness assessment can be made within this time period [9].

The direct and indirect agricultural support system must also be mentioned. It makes difference between vegetable production sectors based on greenhouse production technology in the 2014 to 2020 budget period focusing on the development of labour intensive sectors. In general, within the framework of the Rural Development Programme, a total of 60% support can be given to young farmers, which is comprised of 50% base fund + 10% support.

## CONCLUSIONS

In case of the control at the end of the fourth year of the operating period the legislature must have recognized the relationship between corn production and consumption and as a result the income and capital demand conditions. This sector is a capital intensive, innovative sector that requires high concentration and professional knowledge however the required input value is ensured on the long term by the diversity and marketability of the product offered for sale.

Through establishing an appropriate legislative background and scoring system for the tenders of young farmers it can surely be prevented that "coerced vegetable growers" get among the candidates who do not consider the capital needs and income situation of vegetable production based on greenhouse production technology [3].

During the research it became clear that despite the progress achieved only a thin slice of the issue was discussed because of space limitations.

Other possible directions are many and diverse:

- take into account other aspects; in case of different results explanations;
- extend the analysis for several years, strengthen the results and explore the different existing and potential trends;
- the analysis of the results by international standards could provide further valuable insights;
- a separate study could be prepared on the non-human factors that affect both the profitability and the need for capital;
- It would be wise to examine the impact of the tax system, of subsidies and deductions in the segments concerned.

Also it would be instructive to demonstrate the impact of education, within that the part of agricultural expertise on the performance of the company [3, 4].

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