# *The income generating capacity of vegetable forcing model farms*

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**Keywords: production value, variable costs, ESU, vegetable forcing, income.**

## *Summary findings, conclusions, recommendations*

**Within the branch of horticultural production, vegetable forcing can play a very significant role in the future employment of the rural labour force, due to its less seasonal employment and high workforce demand. Taking the ecological endowments of Hungary into consideration the farms of the South Great Plains may play a decisive role in this. During our research we examined eight model hydro-cultured vegetable forcing farms that are competitive due to their income-generating capacity and are suitable for further development. We concluded that pepper forcing farms of 1 ha generated €138,980 SGM, tomato forcing farms €129,486 SGM and cucumber forcing farms €121,641 SGM. By dividing the Standard Gross Margin by €1,200 we found that the farms examined belonged to the 111.65 ESU size category in the case of peppers, 107.91 ESU in the case of tomatoes and 101.37 ESU in the case of cucumbers, so they can be regarded as rather large farms according to the standards accepted within the EU. Within the category of variable costs, an increase in the Standard Gross Margin (SGM) of viable farms of the right size (in the economic sense of the word) is possible by decreasing heating costs. In the model farms examined the heating costs of greenhouses heated by thermal water was 60% less than those using forcing equipment fuelled by coal. The increasing costs of thermal water (environmental protection fines, mine charges, fees for using water deposits) significantly undermines this global competitive advantage.**

## *About farm sizes in general*

The increase of farm sizes is not a self-contained objective as it is worth dealing with as long as the costs per product, decisively fixed costs, can be reduced given the technical, technological, organisational etc. conditions and circumstances. In horticultural production it is mechanisation in certain areas while in other cases it is the available manual labour force, which can be mobilised at harvesting, that can limit farm sizes *(Csete – Stauder, 1981).*

Setting farm sizes is one of the most considered research topics in agricultural economics despite the fact that there can be such problems arising in connection with setting the size of a certain farm that can extremely make such examinations more difficult or sometimes even prevent them. Farm sizes in general can be measured by input indicators (area size, number of labour force, number of livestock), output indicators (revenue, profit) or the combination of the two (revenue per hectare or revenue per worker). It would be difficult to decide, however, which indicator is better. Within the EU, FADN (Farm Accountancy Data Network) database sets company sizes by defining farm size in the

economics sense in accordance with the so-called standard gross margin, which is the production capacity of the potential gross added value of the farm *(Fürjész, 2005)*.

The Standard Gross Margin (SGM) indicator is extremely important since our accession as based on EU regulations; the condition of the different EU grants and supports is economically viable agricultural enterprises or the ones that can be turned into them. SGM is able to compare different braches easily and in a controllable way (farm size in the economics sense) *(Francsovics, 2005)*.

The European size unit, ESU is in connection with SGM that equals 1200 € SGM (at present approximately 300,000 HUF). SGM is the difference between gross production value and variable costs necessary for production. As this way any production structure can be easily comparable, the minimal SGM value, with which an economically viable farm or plant can be associated, can be defined *(Dorgai et al., 2003)*.

## *Material and method*

During our research regarding cost calculations we relied on the economic data of 4 tomato- forcing, 2-pepper forcing and 2 cucumber-forcing farms in the South-Great Plains region. The heating of tomato-forcing and producing equipment was ensured by coal while the greenhouses for pepper and cucumber were supplied by thermal water. When selecting the farms we tried to choose such outstanding ones that have modern technology by European standards so due to their efficiency they can develop further in the future. These farms serve as models for horticulture dealing with hydro cultured vegetable forcing. It was not our objective to give an insight into the income-generating ability of such farms that can only reach a much lower production standard due to their old fashioned technology thus they can only realise low income. The choice of species is a key element in all farms. In the case of tomato Durinta F1, Grandella F1, pepper Hó F1 and cucumber Lassie F1 species met the requirements of intensive technology. In the case of forced vegetables (long cultured production) planting took place at the beginning of December and very high yields could be realised till the end of October in the next year. Its condition is a production equipment of the right size, which means a 4-4.5 m hollow height in the case of greenhouses made of plastic or glass. Cost calculations refer to the application of hydrocultural production technology under heated conditions. When grouping the average costs of farms we tried to separate fix and variable costs so that the European Size Units used later could be calculated. During the examination of size economics we wanted to answer the question how big ESU farm can a farm of 1 ha be regarded. Using the data of 10 farms producing on soil without heating examined in our previous research we also tried to answer the same question.

## *Results*

In the case of the examined model farms a great emphasis was put on the detailed examination of technology. In the long-cultured production of green pepper the planting of seedlings took place at the end of October in the amount of 3.1piece/m2. Tomato was planted at the end of December and the beginning of January in the amount of 3 piece/m2 that means 30,000 pieces per one hectare. In the case of cucumber production seedlings were planted out twice, at the beginning of January and the end of July in the amount of 2*1.4 piece/ m2 thus increasing variable costs. The application of the two successive cultures was necessary as the first one would

have been unsuitable for the use of the greenhouse all year from the point of view of plant protection. In the case of green pepper, picking the first crops started at the beginning of March and after that altogether 19 harvests were carried out. The first tomatoes ripened at the beginning of March, which greatly increased its production value as the selling price of this period reached then 2-2.2 € per kilogram. Tomato was harvested altogether 56 times by the farms. Regarding liquidity, cucumber was the best plant as one month after its planting out income was realised by the producers. Tables 1 and 2 show the dynamics of crop harvests and the formation of selling prices.

The condition of reaching higher selling price due to early production is the formation of a suitable climate in the case of all the three plants. The generative growth of plants and earlier crop production as a consequence were ensured by keeping the temperature level above 18 degrees Celsius at night.

The initial period lacking light had the worst effect on green pepper and the relatively low initial yield was caused by it. Due to precise technology, the proportion of first class crops of green pepper and tomato amounted nearly to 96%. At first the number of average tomatoes per square metre amounted to 4-5 pieces and the average weight was between 80-90 g. With the improvement of light conditions this value reached 110-120 grams by June-July. The quality of tomato was first class in 97% and only 3% was the proportion of cracked, damaged, unhealthy and improper quality crop. Keeping the stock in the proper condition was a basic point of view in the case of all the three plants to reach a high yield per square metre. This was made possible by creating the suitable climate, biological plant protection and nutrient supply (nutrient solutions) based on consultancy.

High yields were accompanied by relatively favourable selling prices (for the pleasure of producers). The level of prices was the highest in the early spring period. After the low summer prices, in autumn selling prices did not rise again in the case of any vegetable. The one hectare model farms reached a production value of 280,560 € in the case of green pepper, 347,340 € in tomato and 278,400 € in cucumber.

The price of plants belongs to variable costs. Its amount per hectare is 31 thousand pieces of green pepper, 30 thousand pieces of tomato and 28 thousand pieces of cucumber – due to dual culture. The unit price of plants comprises the production cost of the plant, the cost of seeds, the covering vernikulit as well as the cost of stick and clip for fixing. 4,661 pieces of rockwool blanket were used for tomato and cucumber per hectare and 10,000 pieces for green pepper at the unit price of 1.12 €. Among the foils used we calculated with polythene foil changed in every three years at a price of 6.2-6.4 thousand € per year, while the cost of foil used for soil coverage per hectare was about 4.4 € per square metre. Another significant cost was the cost of the applied mineral fertiliser that could mean approximately 400 €/ha daily variable cost in the summer period. 400 € cost of artificial fertiliser per day from the end of June to the first week of August had to be covered by the farmers for 21 days on average and in the cultivation period it incurred an average cost of 90-100 €/day.

The suitable climate, regular airing and heating can minimise the cost of chemicals in plant production. With the application of biological plant protection pesticides can totally be excluded from production cost is 0.74 € per square metre in the cultures. Regarding watering, the biggest amount of water (25 thousand cubic metres) was used in the case of cucumber in the long-cultured production at a unit price of 0.24 €/m$^3$. The heating of tomato

was carried out by coal in the model farms cost per square metre was 9.6 €/m². In the case of natural gas heating cost is 16-20 €/m2 while in the case of thermal water (for green pepper and cucumber) we can calculate with a price of 3.6 €/m². To ensure high yields and consistent crop ripening the input of $CO_2$ is necessary during production (0.8-1.1 €/m²). Further variable cost was electric energy, marketing, insurance and the cost of transportation values are included. The items included in the category of fixed costs are independent from the fact whether production is carried out or not. Among these costs amortisation is decisive that primarily refers to the structural parts of the forcing greenhouse supposing an amortisation period of 15 years. Regarding wages, the starting point was the workforce necessity of vegetable forcing. This value means 9-14 thousand working hours in the case of 1 ha. Green pepper forcing had the greatest workforce need (14 thousand hours/ha) followed by tomato forcing (10 thousand hours/ha), while the fewest hours were needed for the production of cucumber (9 thousand hours/ha). The hourly wage of workers is 4 €/hour, which still lags behind the Dutch 14-16 €. This way a worker can earn 640 € gross per month (160 working hours). The items of fixed costs are increased by the wage of the entrepreneur and its taxes as well as the costs of consultancy. The financial costs of the enterprise and the administrative costs of the office belong to the category of other fixed costs. The standard gross margin is the difference between the production value of the model farms and variable costs. When dividing the SGM value by 1200 €, we can get the European Size Unit (ESU). Table 1 and 2 shows the size economics division of the examined vegetable forcing farms.

Table 1

**The size economics division of 1 ha model farms in hydro cultured vegetable forcing**

| Name | | Green pepper forcing | Tomato forcing | Cucumber forcing |
|---|---|---|---|---|
| Hydrocultural production (heated) | Production value (€) | 280,560 | 347,340 | 278,400 |
| | Variable costs (€) | 146,580 | 217,854 | 156,759 |
| | SGM (€) | 133,980 | 129,486 | 121,641 |
| | ESU | 111.65 | 107.91 | 101.37 |
| The name of size category | | big-medium sized | big-medium sized | big-medium sized |

*Source:* Tégla (2007)

On the basis of all this we can state that in the case of hydrocultural production under heated conditions all the examined 1 hectare farms can be regarded small, based on their area size although according to the regulations accepted in the EU they can be regarded very big (100-250 ESU).

Table 2

**The size economics division of 1 ha model farms in production on soil without heating**

| Name | | Green pepper forcing | Tomato forcing | Cucumber forcing |
|---|---|---|---|---|
| Traditional production on soil (without heating) | Production value (€) | 63,040 | 78,000 | 64,800 |
| | Variable costs (€) | 23,120 | 35,080 | 31,760 |
| | SGM (€) | 39,920 | 42,920 | 33,040 |
| | ESU | 33.26 | 35.76 | 27.53 |
| The name of size category | | big-medium sized | big-medium sized | big-medium sized |

*Source:* Tégla (2007)

Using the data of farms producing on soil without heating as the result of our previous research we received a value of 27.53-33.26 EUME that corresponds to a big-medium sized farm (16-40 EUME) (Table 2).

Figure 1

**Yields per m² and the changes in the selling price of tomato in the model farms**

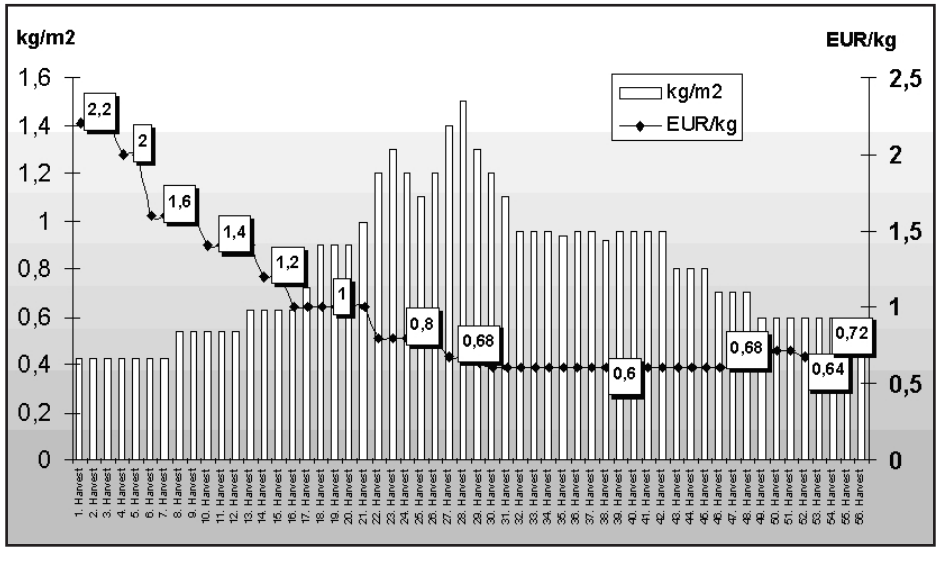
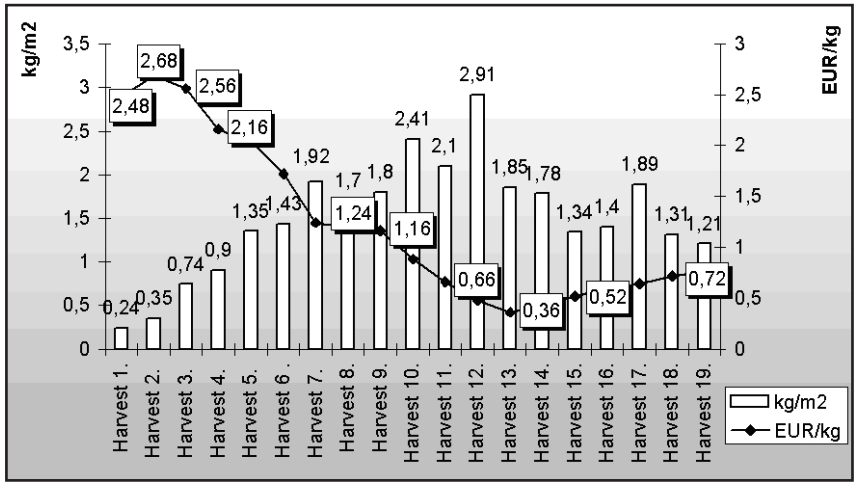


Figure 2

**Yields per m² and the changes in the selling price of green pepper in the model farms**

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