ECONOMIC ANALYSIS OF CAULIFLOWER PRODUCTION

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Abstract: *Our work focuses on one of Hungary's most promising vegetable, the cauliflower. We analyze the state of the art production technology, its cost and the sustaining capability of the plant. We have reviewed the operational costs of crop production and the production cost structure. Revenue from cauliflower production is determined based on quality, date of sales and marketability. We calculated the profitability of cultivation and indicators of production effectiveness with and without EU aid. In our calculations we took into account the characteristics of gross income pertaining to small-scale production. It can be concluded that with appropriate technology open field cauliflower production in Hungary can generate substantial income even without EU support.*

Key words: *sustaining capability of rural areas, economic analysis*

INTRODUCTION

Annual world production of cauliflower (and broccoli) is more than 20 million tons with China and India leading the way. Depending on climate conditions annual production of cauliflower varies but in the long term a growing trend is likely to remain (Balazs, 1996). In 2013 the highest production quantities of cauliflower (and broccoli) were in the following countries: China (9.2 million tonnes), India (7.9 million tonnes), Spain (541 thousand tons) and Mexico (481 thousand tons)(Sitkova, 2015). China produces half of the world's yield which is a huge revenue for the country. Annual harvest is over 10 million tonnes on 453 hectares. India is the second largest cauliflower producing country. The Chinese and Indian cauliflower sector accounts for over 75 percent of world production (Mulderij, 2016).

Europe's cauliflowers production is 2.5 million tons annually of which Spain shares 26%, Italy 17% and France 13%. Spain's annual harvest is 541 thousand tons which is produced on 30 thousand hectares with17.8 t/ha average yield. Italy is in the fifth place in the world in terms of the amount of cauliflower produced (FAOSTAT, 2013). France is also a key player on the market as the world's sixth largest cauliflower producer. The per capita cauliflower consumption is 3 kg per year which is still far behind Belgium where 10 kg / capita is consumed annually (www.franceagroalimentaire.com). Poland is also an important cauliflower producer in Europe where it is grown on about 7 thousand hectares annually of which 60-65 percent is sold to the processing industry (Rimóczi, 2015).

Looking at producer purchase prices there are very large differences between member states. In 2015 the lowest price was received by the Maltese producers, 197 Euro per ton. By comparison, about one and a half times this was paid on the Polish market. A 411 Euro / ton selling price was typical for Germany and Spain. In Hungary rates are similar (475-491 Euro / ton) to that of Croatia and Austria. The Czech (Euro 559 / ton) and Slovak (604 Euro / ton) growers are in a considerable better position. Among the eastern countries cauliflower has the best price in Romania (Euro 844 / ton). Denmark is worth mentioning where one ton of cauliflower can fetch 1185 euros.

MATERIALS AND METHODS

1. Test site

The test farm is located in a prominent cauliflower production region of Hungary. The area is ideal for agricultural cultivation. The analyzed firm is characterized by an old machine park due to which amortization cost is not counted. Manual labor demand mainly arises in planting and hand harvesting as, thanks to technology, almost all workflows are automated (soil preparation, fertilization, pest control). Due to the time limits at peak harvesting and planting times seasonal workers are utilized.

2. Research methods

Economic results were examined per hectare. In this study, we analyzed the necessary resources and corresponding costs per operational steps for cauliflower production. The amount of labor, material and associated costs were determined for each phase. The cost of labor was calculated based on the wages and overhead of seasonal workers employed and by multiplying the 2016 minimum wage by the labor hours utilized and adding any additional contributions paid by the enterprize.

Due to the nature of accounting used by these smaller businesses (see HAS), typical machine costs were calculated based on the type of cost. For some operations, due to varying performance, different fuel consumption rates was calculated. The test farms have older engines and equipment, therefore depreciation costs cannot be included. Among other expenses can be found maintenance costs (registration, insurance etc.), accountant fees, telephone and administration costs.

Revenues were calculated by adding sales revenues and area-based subsidies. As the company sells exclusively to wholesale markets, market prices were calculated based on a weekly average sales price. We took into account the various quality classes and the quantities sold from each type. Sales revenues include revenues received from area based subsidies which in 2016 was 147 euro / ha.

Profit before taxes is determined by subtracting the production cost from sales revenues. For assessing the company's activities we have calculated efficiency and profitability indicators. We have also examined the profitability of cauliflower production without area based support.

RESEARCH RESULTS

1. Production cost

The per hectare direct material cost trends are summarized in Table 1. Direct costs of raw materials are derived from the cost of fuel, fertilizers, pesticides, seedlings and packaging used at harvesting. The cost structure of cauliflower production is shown in Table 2.

Table 1.

Development of direct material costs per hectare

	Material cost type	Costs	Currency	
1.	Fuel	533	Euro	18.5%
2.	Fertilizers	274	Euro	9.5%
3.	Seedlings	1451	Euro	50.4%
4.	Water	306	Euro	10.6%
5.	Pesticide	292	Euro	10.1%
6.	Packaging	21	Euro	0.7%

Table 2.

Cost structure of cauliflower production

	Cost types	Costs	Currency
1.	Material	2878	Euro
2.	Labor and overhead	406	Euro
3.	Amortization	0	Euro
4.	Other	133	Euro

2. Sales Revenues

The company sells the harvested cauliflower on the wholesale markets in Budapest and Kecskemet. The goods are delivered bi-weekly (Wednesdays and Sundays) immediately after picking. Revenues from cauliflower production are included in Table 3.

Table 3.

Cauliflower revenue per hectare

Category	Sales Volume (kg)	Unit price (Euro/kg)	Revenues (Euro/ha)
Összesen	11 960	0.4	4340
Area based support:			147
Total Revenues			4487

4. Production efficiency

Table 4 presents the effectiveness of the company's cauliflower production. Cauliflower production is equally lucrative with and without subsidies.

Table 4.

Results for Cauliflower Production

Calculation unit	per unit of area (Euro/ha)	per product (Euro/kg)
Cultivation Costs	3241.7	0.27
Sales Revenues	4339.9	0.36
Area based subsidies	146.9	0.01
Results w/o support	1098.3	0.09
Results w/ support	1245.1	0.10

5. Performance indicators

$$\text{Efficiency}_1 = \frac{Production\,Cost}{Yield} == 2.83 \text{ Euro/ } 100 \text{ kg}$$

The analyzed firm on average can produce 100 kg of cauliflower at around 2.83 Euros which represents the product's unit costs.

$$\text{Efficiency}_2 = \frac{Yield}{Production\,Cost} = \frac{11960\,kg}{338.4\,Euro} = 35.3 \text{ kg/Euro}$$

For each invested euro, the studied enterprises, can produce 35.3 kg of cauliflower.

$$\text{Profitability \%} = \frac{Revenues\,\frac{W}{O}\,subsidies}{Production\,Cost} \text{ x } 100 = \text{ x } 100 = 33.8\ \%$$

$$\text{Profitability \%} = \frac{Revenues\,\frac{W}{\square}\,subsidies}{Production\,Cost} \text{ x } 100 = \frac{1245.1\ \textbf{Euro}}{3241.7\ Euro} \text{ x } 100 = 38.4\ \%$$

It can be concluded that both with and without area subsidies the profitability of the enterprise is satisfactory. Based on Table 4. additional profitability indicators can be calculated. Income per hectare without support is 1098.3 Euro while with support it is 1245.1 Euro. One kilogram produce brings 0.11 Euro profit with subsidy and 0.1 Euro without.

CONCLUSIONS

Cauliflower production, like all intensive cultivation vegetables, is significantly more expensive than arable plant production. At the same time, its revenues and profitability is also comparably more favorable. The effectiveness of cauliflower production is influenced by many factors including the condition of the available machines, soil quality, production costs (fuel, seeds, seedlings, containers), the effects of fertilizers and pesticides, weather and last but not least market conditions.

Based on our investigations, we can state that cauliflower can be grown successfully even on a smaller area. In Hungary, taking into account the available income, minimum wage and land-based support, open-field cultivation of cauliflower on or around 3.5 hectares could ensure one person's livelihood. In case of more family-members, a proportional increase in the area of cultivation, introduction of additional crops or vertical integration of food processing becomes necessary.

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