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Feasibility of investments in Hungarian grapewine sector

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Summary: Investments in the vine growing-wine making sector can be characterised by a high level of risk, and an important role of time, because there is a considerable time gap between the decision on investment and its consequences, whereas the ecological and economical factors should be considered as stochastic variables. Based on a real–life, typical vine–plantation project, the article analyses the profitability of vine growing-wine making sector as a function of different ecological and economical conditions depending on the added value content of products. Results of the investigations highlight: (1) the importance of subsidy for establishment of vine plantations; (2) the considerable influence of yields on rate of return of investment; (3) the role of increasing of added value content of products. Importance of the utilisation of alternative channels of distribution and the formation of producers' cooperatives are underlined, being based on calculation of return of investment.

Key words: risk, simulation, vine growing, wine production

Introduction

The vine growing and wine production branch is an important part of the Hungarian agriculture and food industry, because (1) vine growing offers a favourable possibility for the utilisation of the Hungarian agro-ecological potential (*Hajdúné*, 1997); (2) grapevine-growing is a labour-intensive activity, that's why there is a good opportunity for the agricultural employment of rural manpower (*Botos* et. al, 1995); (3) wine consumption is an integral part of Hungarian food consumption culture: the average per capita domestic wine consumption is 30–32 l per year, 95–99% of this demand is satisfied by domestic production (*HCSO*, 2004); (4) export of wine and of related industrial products has considerable traditions and volume, the quantity of export is 0.3–0.7 million hl, its value 40–70 million Euro (*Juhász* et al., 2006); (5) wine is an emblematic product of the Hungarian national economy, that's why the development of wines export contributes to the image building of Hungary, wine–tourism is a rapidly evolving sector of Hungarian tourism (*Hajdúné*, 2005); (6) vine growing is one of the cheapest way of defence of the traditional Hungarian landscape against the soil degradation and wind – deflation (*Kozma*, 1981).

Taking into consideration the above facts, the upgrading of competitiveness of the Hungarian wine sector is a question of primary importance not only for the vine growing-wine making sector, but also for the Hungarian agriculture as a whole.

From the point of view of competitiveness, the biological basis of production plays a decisive role. During the last decades' the vine growing territory decreased rapidly (*Figure 1*), as a consequence (1) of the low profitability of production (*Erdészné* et al., 2001), (2) often ill-founded strategies of privatisation (*Moulton & Botos*, 1993), (3) discrepancy between wine-offer and paying demand on the domestic as well as on import markets (*Hajdúné & Botos*, 2005).

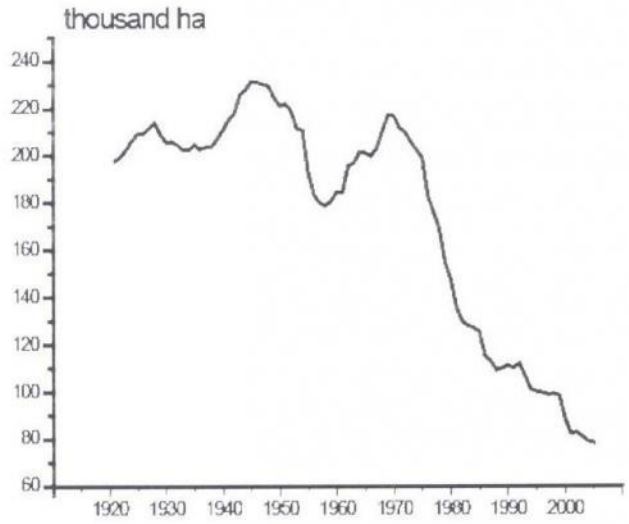

Figure 1 Decreasing of vine production area in Hungary (1921–2005) Source: Own data collection, based on different Statistical yearbooks of HCSO

Re-structuring of the basis of production by establishment of new plantations to replace of older ones offers a favourable possibility for the improvement of Hungarian wine economy. However, it would be a fatal error to increase the supply of Hungarian wines, produced by obsolete varieties, not taking into consideration the market demand and the feasibility of the investments. The establishment of a wine plantation is an especially risky activity, because the decision on the variety and the method of growing are separated in time from the date of the realisation of the first products, as a consequence of the biological laws of vine growing. The expected lifetime of a

vine plantation comprises at least 25–30 years, that's why the decisions taken at the time of investment will influence the economic feasibility of the investment (*Szidarovszky & Szenteleki*, 1987).

The aim of the current article is to analyse the economic efficiency of the investments in the grapevine-wine sector, taking into consideration of risks, the production involved and the rapidly changing economic environment.

Materials and methods

Economic value of money and risk

In the framework of our investigations we tried to determine the profitability of investment into vine growing and wine making projects under changing economic and economical circumstances. To achieve this goal we had applied the inventory of modern investment study and simulation methods.

In case of establishment of a wine plantation there is at least 4–5 years between the beginning of investment and the first return from sale of products. This raises the question of economic value of time. It is a basic axiom of microeconomics that the economic entities prefer to receive money today rather than the same amount in the future (*Drury*, 1995). Money we receive today is more valuable to us than money received in the future by the amount of interest we can earn with the money. This is referred to as the time value or cash value of money. This joins to the impatience of the economic entities (the time value of money in this approach is the value of deferred enjoyment of the benefits of money).

The in-and outflow of financial resources of enterprise is characterised by the difference of incomes and direct expenses (without amortisation). This economic value is called cash flow. Modern methods of investments of feasibility studies are based on discounting of the cash flows. There are three basic indicators of rates of return.

The most widely used method in evaluation of an investment proposal is to compute the net present value (NPV) at a chosen interest rate of all inflows expected form the investment and of all outlays required. The excess of the present value of profits over the present value of investments is known as the net present value of the investment; this quantity may either positive or negative in sign. A positive net present value means that the investment will yield a return higher than the chosen rate; if the NPV is zero at the chosen discount rate indicates that the company could not achieve a positive return.

$$NPV = \sum_{i=1}^{i=n} CF_i (1+d)^{-i} \qquad (1)$$

where

CF – the cash flow (profit and amortisation) in th year

C – capital invested in jth year

d – discount rate

i – number of years

n – total duration of period investigated (in years)

It is evident that the choice of an appropriate rate of discount is crucial to the net present value method, since a given investment may have a positive or negative NPV depending on the interest rate used to discount cash flows. In general, the investment rate chosen should be the minimum rate of return that the company is willing to accept for an investment, given the degree of risk involved. At the margin, this minimum rate should be the cost of capital, which is defined as the cost (expressed as a yield rate) of obtaining the necessary investment funds, whether through borrowing additional equity investment, or retention of earnings.

Logic of calculation of discounted cash flow (DCF) indicator is the same as that of NPV. The only difference is that DCF indicates not difference, but a ratio between the discounted sums of cash flow and investment.

$$DCF = \frac{\sum_{i=1}^{i=n} \frac{CF_i}{\left(\frac{1}{(1+d)^i}\right)}}{\sum_{j=1}^{j=m} \frac{T_i}{\left(\frac{1}{(1+d)^j}\right)}} \qquad (2)$$

where

T_i – invested capital in the ith year;

m – duration of period of the investment (in years)

The internal rate of return (IRR) is an alternative technique for use in making capital investment decisions, which also takes into account the time value of money. The internal rate of return is the investment rate when used to discount all cash flows resulting from an investment. It will equate the present value of the cash receipts to the present value of cash outlays. In other words, it is the discount rate which will cause the net present value of an investment to be zero.

In calculation of IRR we determine the value of d when the

$$\sum_{i=1}^{i=n} CF_i (1+d)^{-i} = 0, \qquad (3)$$

Alternatively, the internal rate of return can be described as the maximum const of capital which can be applied to finance a project without causing harm to the shareholders. The specialists have different opinions on the preference of NPV or IRR methods. For example *Brailey & Mayers* (1980) prefer NPV, *Bálint* (1988) prefers IRR approaches. In broad sense, risk analysis is any method – quantitative and/or qualitative – for assessing the impacts of risk on decision situations.

The risk

The risk in general is the quantifiable likelihood of loss or less-than-expected returns. In its broadest sense the expression "risk" means the possibility of suffering harm or loss: danger. Risk in such is an integral part of our lives in

Table 1 The cost-calculation of a vine plantation (1000 Euro/ha) on a hillside growing site, spatial system of production 2.4m×1.0 m with graft, middle-high form of vinestock

Cost	Cost-types						
	Material	Living labour	Machine work	Sum of direct cost	Other costs (tax, social security e.t.c.)	Sum	Cost of graft
Soil-preparation	0.908	0.044	0.568	1.516	0.368	1.896	0.456
Plantation	1.896	0.288	0.092	2.276	0.572	2.848	0.680
Vine-prop system	3.552	0.388	0.360	4.300	1.076	5.376	1.292
Cost of first year plant-care	0.064	0.160	0.240	0.508	0.124	0.632	0.152
Cost of second year plant-care	0.388	0.296	0.344	1.032	0.26	1.292	0.312
Cost of third year plant-care	0.304	0.288	0.332	0.920	0.232	1.152	0.280
Cost of fourth year plant-care	0.368	0.336	0.372	1.080	0.268	1.348	0.320
Total cost of the establishment of the plantation	7.48	1.800	2.308	11.632	2.9	14.544	3.492

** Under conditions of heavy soil in elevated country; Source: SZBKI, Kecskemét*

general and the horticultural enterprises in particular. The economic analysis of research of risk in horticulture has long traditions (*Storck*, 1965), and because it can only be estimated as a stochastic variable, simulations seem to be the only possibility of estimation of effects of different stochastic variables on profitability of the enterprise.

We have considered the different economic values as stochastic variables. The type and parameters of distribution of these variables have been evaluated, based on expert's opinion.

Model and assumptions

The model-plantation – in our calculations – is situated on heavy soil, on elevated growing site (*Table 1*). This ecologicaé condition is typical for Hungarian quality wine producing areas. The cost of establishment of plantation are summarised in *Table 1*. Economic data were determined originally in Hungarian Forint and converted into Euro in a course of 1 Euro=275 Ft. This course represents the monthly exchange rate in September 2006.

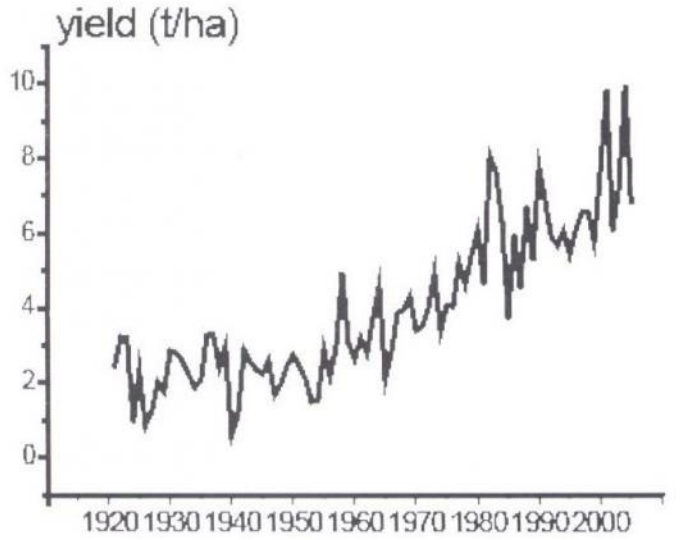

Figure 2 The change of yields of grape in Hungary (1921–2004) Source: Own data collection, based on different Statistical yearbooks of HCSO

The economic feasibility of the investment depends on stochastic variables, influenced by natural and/or economic factors. One of the most obvious stochastic variable is the average yield. However, on the long-term there is an increasing tendency in average yields (*Figure 2*), taking into consideration of differences between the production potential of plantations on different places as well as technologies, the experts' estimation seemed to be more reliable to determine the type and parameters of distribution of the yield function.

There were eight experts involved in investigations from Hungarian vine-growing and wine –making practice.

One of the basic theorems in microeconomics is the Marshallian relation between the supply, price and the demand (*Ernyei & Sipos*, 2005). For practical verification of this relationship in practice we needed some long time-series on yields of different grape varieties, and the market prices of winegrape as well as we did not find any such time series, that's why we had to simplify our calculations in such a way that we supposed a reciprocal compensation between the price and the average yield, that's why we omitted the stochastic interaction between the yield and the price. For simplicity, we supposed that the relatively lower prices of grapes in years with higher yield are compensated by higher prices in years with lower yield.

The change in purchasing power of money over time, the inflation is another factor, which influences the decision maker. For simplicity, we do not take into consideration inflation in our calculations. It will be presumed that for the economic entities the increases in their input prices will be able to shift to partners on the output-side.

It is evident, that beside the stochasticity of production there is a stochasticity in value of other variables, influencing the feasibility of production too. The most important variables in our model and their distributions are summarised in *Table 2*. The majority of experts asked estimated a normal distribution of stochastic parameters.

We have developed three models. In the first one we have supposed that the vine grower produces only grape without any processing. In the second one, we have supposed the

Table 2 The basic parameters of the initial model

No. of years	Average yield (t)	deviation of yield (t)	Grape price (Euro/kg)	deviation of price (Euro/kg)	Average price revenue (Thousand EuroFt)	Average gross margin (Thousand EuroFt)	Investmetn costs (Thousand EuroFt)	Deviation of investment costs (Thousand EuroFt)	Average Cash Flow (Thousand EuroFt)
1		0	0	0	0	-10.752	0.10752	-10.752	
2			0	0	0	0	-1.292	0.2584	-1.292
3			0	0	0	0	-1.152	0.23	-1.152
4			0	0	0	0	-1.348	0.2696	-1.348
5	3.1	1.0	0.32	0.064	0.992	-0.272	0	0	-0.264
6	7.5	1.0	0.32	0.064	2.4	0.916	0	0	0.916
7–25	8.0	1.0	0.32	0.064	2.56	1.052	0	0	1.052

Source: expert estimations

processing of vine to wine in barrels. In third model, we have supposed the production of a product with high added value content: production of quality bottled wine.

In our work, the cost of vine production has been divided into two parts: According to our approach, the costs of vine growing do not depend on yield, that's why we have calculated with a 2960 € cost of grape growing per hectare. The grape-harvest cost is influenced by numerous factors, and can be considered as a variable cost, being in linear relationship with production. The cost of harvest has been calculated as 50 € /t.

Based on these conditions, we estimated the expected profit of vine growing enterprise by the equation:

Profit=(average yield × price)-cost of grape production- (cost of harvest × average yield). (4)

Results

Analysing the results, it is obvious that without a considerable financial support under the circumstances investigated the profitability of the model of grape production is negative. Based on the basic model, there is a simple possibility to determine the yields and prices, when the breakeven point can be achieved. Analysing Figure 3, it is obvious that the yield is an extremely important factor of profitability.

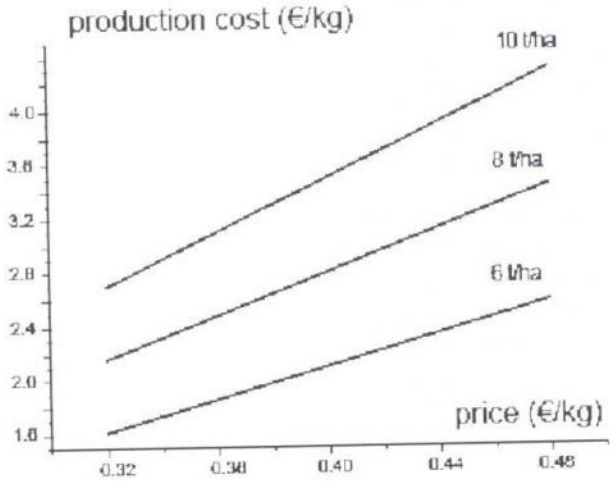

Figure 3 The relationship between the price, production cost and yield. Iso-yield lines to achieve the break-even point.

In the second phase of our investigations, we have tried to determine the profitability of the investment supposing an 50% state (EU) support for the costs of setting up a new plantation and a 10t/ha yield with 2 t/ha standard deviation. If we take into consideration this support, then the investment seems to be feasible, but the economic indicators of investment show a rather low return. E.g. the IRR will fall into the interval of 3.9%–6.7% (*Figure 4*). The investment is non-competitive one, compared with the other alternative capital-investment possibilities.

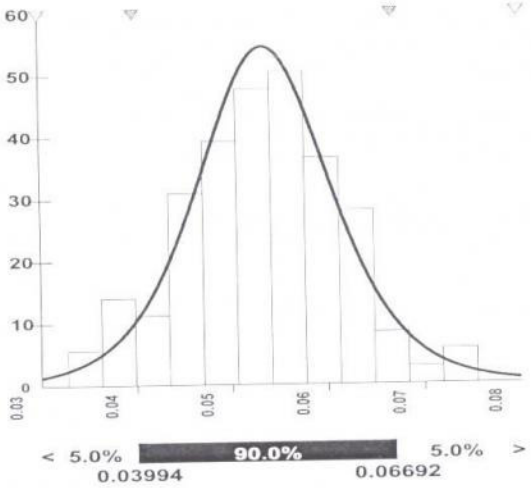

Figure 4 Density function of the IRR value

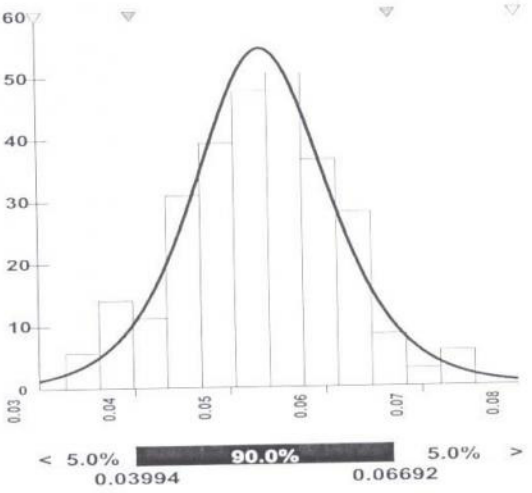

Figure 5 The distribution function of NPV of the vinegrape production scenario

Analysing the distribution function of NPV, it is obvious that there is a 75% probability of the positive value of this indicator (*Figure 5*). The average is only 0.623 thousand Euro and there is only 5% chance of achieving an NPV value, higher than 2.8 thousand Euro.

In model № 2 we have supposed that the activity of the agricultural producer is not limited to the production of

grape, but also encompasses the production of the wines in barrels. The price of wine, sold in barrels is 0.6 Euro/l, the standard deviation is 12%. The ratio between the quantity of grape and wine was 0.76%. Other parameters were the same as it is outlined in Table 2.

Analysing the results of estimation (*Figure 6*), it is obvious that the rate of return is below the conditions offered by the possibilities of financial markets, that's why under the above circumstances there is no reason to invest into this project. A logical solution would be the increasing of yields or the prices.

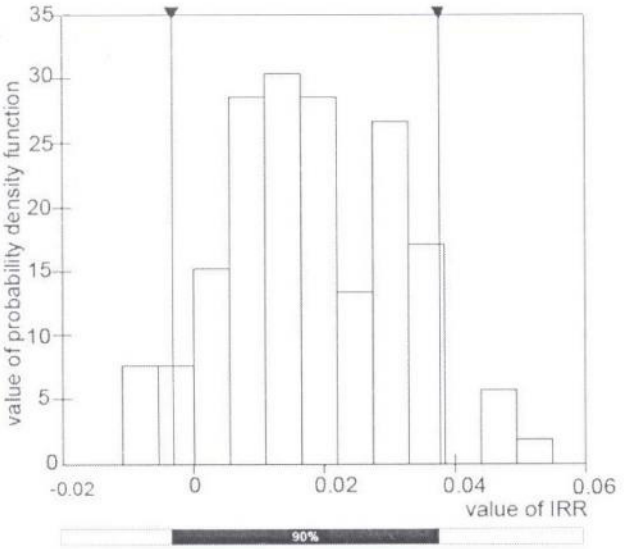

Figure 6 Density function of IRR value of model, based on wine – selling in barrels.

The results of investigations were rather unfavourable, that's why we have applied a more higher price: 0.72 Euro/l, with the same standard deviation leaving the basic parameters unchanged as described in table . In this case, the results became much more favourable (*Figure 7*). This fact emphasises the importance of the improvement of price formation and of marketing. The main frequently forwarded objection to the policy of increasing prices is the abuse of economic superiority of large market-chains, but it should be taken into consideration that the application of direct-selling

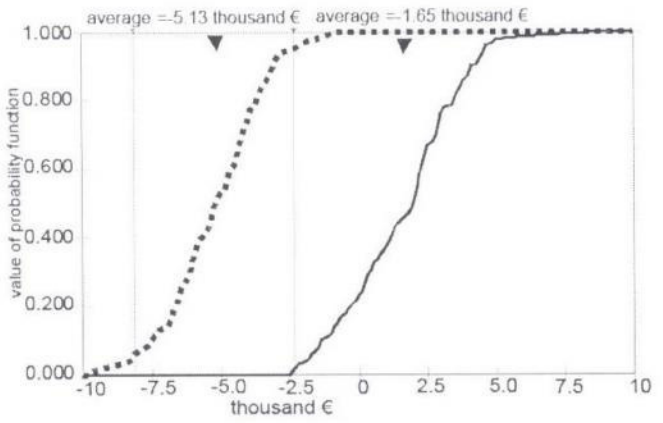

Figure 7 Distribution functions by assuming 0.60 and 0.72 Euro/l wine pricesa

of wines, e.g. in framework of wine tourism offers a new, hardly utilised possibility for the improvement of price conditions.

In model Nº 3 we have supposed that the activity of the grape growing enterprise is further augmented, and the agricultural entrepreneur bottles his(hers) product. In this case, the economic indicators are even more favourable, and the investment is competitive with other possibilities of capital-investment.

According to our estimations the cost of bottling is 1.05 Euro calculated per one litre wine. The estimated producer price is 2.4 Euro/l with a 10% standard deviation. For comparison, we have estimated an 8 t/ha yield. Summarising the comparison of three models of investment, it is obvious that the bottling of wine achieves by far the highest level of profitability (*Figure 8*).

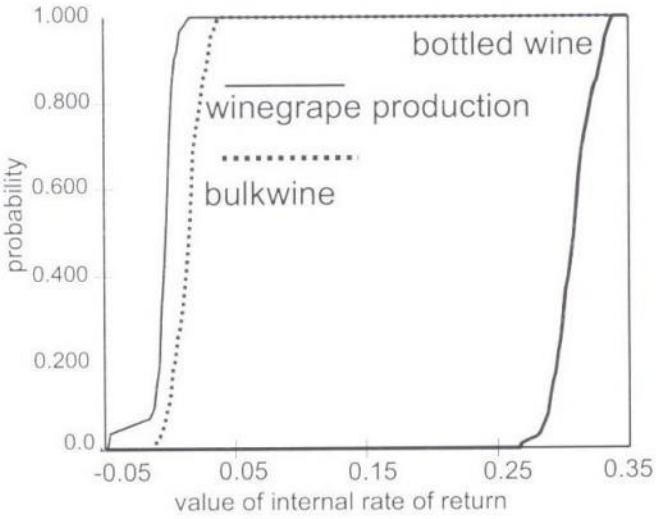

Figure 8 The distribution function of IRR value by different levels of added value content.

In this case, of course there is a need for a considerable capital-investment. The individual agricultural entrepreneurs have not enough monetary resources of setting up of small-scale apparatus for the wine making and handling (e.g. sophisticated centrifuges for decanting), that's why the co-operatives of individual entrepreneurs should be promoted.

Conclusions

As a summary of investigations it can be stated that the application of the computer-aided decision support systems offers a good possibility for the analysis of the vine growing and wine making sector. In this sector-like in case of the majority of farm-plantations the investments and the returns are separated from each other as a consequence of biological processes. Under these conditions, it is absolutely necessary to take into consideration the effect of time and the risk on the return of investments.

Based on our calculations summarised above, numerous conclusions can be drown. These offer new insight into the current problems and strategic directions of development of

Hungarian grapevine-wine sector. At the same time, the results of calculations offer numerous methodical lessons too.

1. The calculation of the internal rate of return and the net present value offer a favourable possibility for evaluation of expectable feasibility of the investment. These economic indicators do not substitute, but complement each other.
2. If we would like to set up a „shock-resistant" economic enterprise, able to resist to different – often adverse –economical and ecological conditions, the analysis of scenarios is a necessary precondition. In quantification of possible consequences the application of stochastic simulation method is an important tool.
3. Under the current conditions, if the producer produces grape without further processing, there is not real possibility to achieve economical feasibility without state subsidy.
4. Based on calculations, it can be stated that the increasing of yields is a necessary precondition of improvement of profitability. Of course, this statement is not necessary true for specific–quality (e.g. spätlese, ice–wine, aszu) wines, but it highlights the fact, that the actual average yield in Hungary is not sufficient to achieve an acceptable level of return on investments.
5. It has been proven that by increasing the added value content of the products, the profitability will increase. Under the current circumstances, taking into consideration of the relatively high number of producers and as a consequence of this their rather fragmented structure, it would not be a real goal to promote the establishment of bottling lines, but this fact highlights the importance of organisation of producers' cellar-cooperatives.
6. Of course, there remains a wide room for further investigations on economic aspects of feasibility of vine growing-wine producing enterprises. The most important are as follows:

(a) to analyse the economy of scale effect on feasibility of investments; (b) to analyse of effects of the application of different varieties; (c) analysis of different market-regulation measures of EU on profitability; (d) to analyse the effect of different regions of production on return.

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