

PhD THESIS

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**INVESTIGATION OF SOME EFFECTS OF THE EU ACCESSION IN DAIRY
FARMING WITH SIMULATION MODEL**

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1. Preliminaries and objectives of the study

Primarily, cattle is significant in beef and milk production, though it has a determining role in the challenges of the present time, such as use of pastures and by-products, maintenance of rural areas, sustainable development, healthy (protein and vitamin) feed supply, etc. The universality of the cattle makes it possible to comply with these challenges such way that meanwhile it produces income for the farmer. For Hungary – as a new member of the EU – has to face similar challenges in milk production. Not only the strict regulations but also the new criteria of milk quality and the future of direct payments will influence the profitability of the dairy farms. Both in the economy and in the science new methods give answers on the challenges. Beside logical and empirical methods new higher technologies based on mathematics and IT are available, such as linear programming, ÁKM balances, correlation, regression, simulation, etc. Far seeing analysis of dairy farms is a fundamental task, which can not only provide information on the changing frames of the production or further exploitable factors, but can also help the farmers in the development of their adaptive strategies.

In 1997, the German Federal Agricultural Research Centre started the International Farm Comparison Network (IFCN) with other European countries – among them with Hungary. Currently, IFCN surveys crop, dairy and – recently starting – beef production and their economics. Another doctoral dissertation dealt with the simulation of dairy production, which showed several farm-management strategies and their economic effects with the previous model of the IFCN.

The objective of the dissertation is to investigate some effects of the EU accession in dairy farming with simulation model. To achieve the previous this the following task should have completed:

- the milk production in Hungary and in the EU was studied;
- the *EU regulation of milk production* was reviewed;
- the IFCN and its work were studied
- and analyses of the economic effects of milk price, quality, yield, labour and land was carried out with the model TM.03
- alternative strategies were created to answer the challenges.

2. Material and method

Within the frame of the international co-operation, the members of the IFCN carry out analyses of agricultural producing units and farms that are typical in given regions. The investigations of the current dissertation will be shown through the example of a *400 cow dairy farm located in the northern part of Somogy*.

IFCN analyses the production of the farms within conditions expected in the future as well; which gives a picture on the future opportunities of the farmers in given regions. This work assumes the use of a *simulation model* that is suitable to analyse the milk production in currently 27 countries with highly different economic and production policy. During the whole (monetary, financial and natural) simulation of farming, the model uses the basic farm parameters (e.g. breeding, feeding, etc.), the economic conditions and the expected tendencies of these for the simulation period. The following table shows the *variables investigated during the simulation in different scenarios*.

Table 1: The scenarios and the analysed variables

SCENARIO	A	B	B1	F	FF
		Milk quality	Increase of wages	Improvement in labour effectiveness	Increase in land rent
VARIABLE					
MILK PRICE	CAP target price				
DIRECT PAYMENTS	CAP + national payment				
LAND RENT	Inflation rate			+40-50% of payments	+100% of payments
WAGE	Inflation rate	1.8 times in 8 years			

The projection of those variables that *were not analysed* but were basic parameters of the simulation is based on the findings from the review of the literature. Partly, projections based on the data of the Hungarian Central Statistical Office and of

other studies were used; and also the tendencies shown by the EU figures were taken into consideration. Those variables that were the *object of the analysis* (milk price, direct payments, milk quality, land and labour price) were taken into the simulation step-by-step in different scenarios.

The study analysed the following scenarios:

A: 4 % of the produced milk is lower quality than the EU admits in the years 2004 and in 2007

B: 80% of increase in the wages paid on the farm from 2001 to 2008

B1: 60% grow in labour productivity (kg milk produced per hour labour input)

F: land rent increases from with 40-50% of direct payments

FF: land rent increases from with 100% of direct payments

The results are shown by the following indicators listed below:

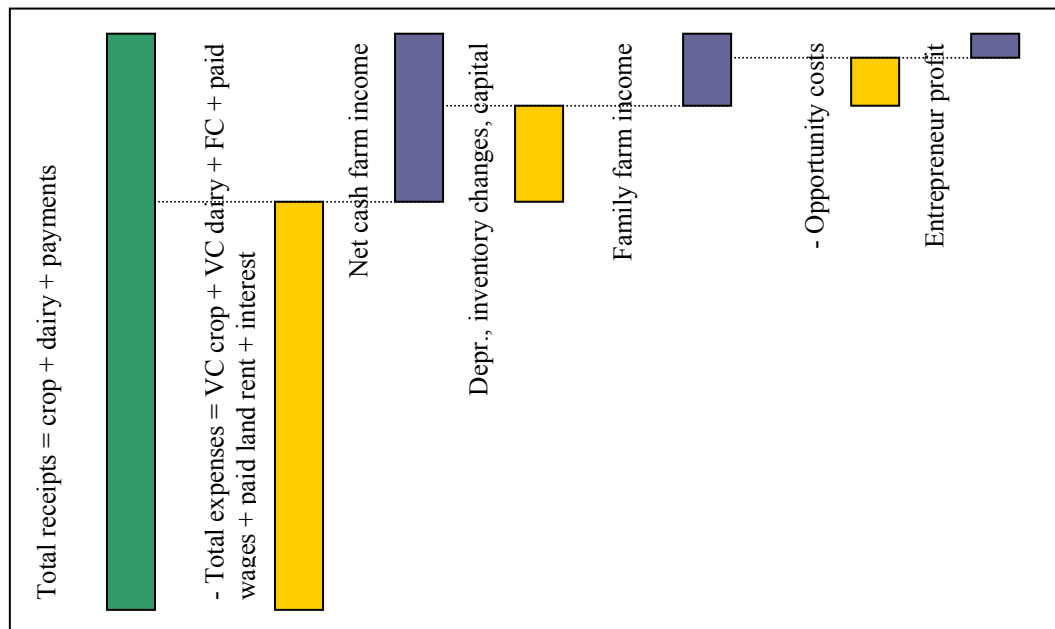


Figure 1: The result indicators of the simulation

VC- variable costs, FC- fix costs

3. Results

3.1. COMPARISON OF THE FARM RESULTS WITH NATIONAL AND INTERNATIONAL DATA IN 2001

The economic results of the farm are at least as good as or better than the Hungarian average parameters. Though, the production cost is higher than the FADN data (primarily because of the high fix costs), it is compensated by the higher returns achieved. The data reflects on that higher market returns can be reached even with lower price if the milk yield is taken more attention at. Besides the milk returns, other returns (e.g. animal sale, crop production, land rent out) contribute the income of the farm.

Efficiency of the production factors is not worse than that of the Hungarian average; however, in international level, the potential of improvement is high (labour productivity even two and a half times, land productivity eight times). The productivity can also be increased by improving the milk yield, which is above the Hungarian average data, but can be significantly increased from the point of the genetic potential.

The advantages of the model use appeared in the calculations of direct payments that project the changes of the approach of dairy farming in Hungary, too. The current way of thinking (that of the AKII as well) applies the theory of production cost per unit of the main product (e.g. the value of the by-products decrease the costs). The model is suitable to think on the farmer's mind at farm level, therefore it approaches the economic results from the point of the producer (e.g. non-milk returns), while the Hungarian analysis is different presently.

3.2. *EFFECTS OF THE MILK PRICE AND THE DIRECT PAYMENTS*

In Hungary, the milk returns giving the highest share of the returns in milk production is determined by the farm gate milk price – at given milk yield level. In the last years, the Hungarian milk price converged to that of the EU. From the aspect of this fact, (1) it is unlikely that the milk price further increases; (2) and the decrease of the EU target price will probably influence the milk price in Hungary, as well.

During the negotiations, the direct payments and their introduction in the new member countries were extreme disputes. This is understandable; hence both the huge costs and the WTO commitments lead to the decrease of the payments in the EU. In the simulation, the crop payments and specific (cattle) payments listed in the Copenhagen Agreement were used. The effects of the increase in milk price and of the direct payments were calculated. Based on the results obtained the following can be stated:

- (a) The returns of dairy farming will more depend on the direct payments. This fact revalues the role of the government and its responsibility.
- (b) The farm income decreases due to the drop in milk price despite of that the direct payments increased in the simulation period. In its reality though, the decrease of the EU payments and - in relation with it - the national payments can result in even a much worse situation. The final results will be influenced by the national guaranteed milk price going to be announced.
- (c) The expectable tendency of the milk price – together with the milk quota – will result in that the returns can not be influenced by the farmers. Because of it, the only opportunity to increase the income will be the improvement of the efficiency, that is, the reduction in the production costs.
- (d) Further on, the results call the attention that the crop returns will grow in the direct payment system; the improvement of the efficiency in feed production also contributes the increasing crop returns.

3.3. EFFECT OF MILK QUALITY

The European Union admits only one class of quality that is equal with the best (extra) class of the current quality system in Hungary, lower quality of milk can not be used for human consumption. This is a huge problem for a great part of the small dairy farmers, who can not fulfil the requirements of quality milk production. Only a small part of them can change their technologies, the others have to give up farming and choose – preferably – beef production or non-agricultural activities.

The large dairy farms are able to produce milk of the highest quality in 98 percent in average. In practice this means that around 2 percent of the produced milk will not generate returns if nothing changes. Besides, extra costs arise which lower the farm income.

In case of the farm investigated, out of the annual 2700 tons of milk, 108 tons will not be sold. Its economic effect can be seen in the following:

(a) In 2004, the total returns decrease with 2,81 HUF per kg FCM milk. As meanwhile the production costs remain at the same amount, the income per kg milk will be less by 29 percent than if the whole of the milk is sold.

(b) Contrary, at a worse income level in 2007, the income would drop by 32,6 percent.

(c) In case of dairy farms with lower profitability, the 4 percent of loss in the returns has much drastic consequences: it reduces or even eliminates the sources of development, thus questions the future of the production. This fact causes changes in the current structure of milk production: the number of the farmers will reduce and the size of the farms will grow:

(1) it needs significant amount of extra input, causes ineffective use of capacity and extra costs to improve the competitiveness of the small farms;

(2) the decision is made on macro level, because the larger and better producers are in advantage from economic point of view.

3.4. *EFFECT OF LABOUR PRICE*

In Hungary, the wages paid in the agriculture has risen significantly: in 2001, the average wage was double of that of 1996 and four times higher than in 1992. Despite of that, the labour price is still lower in Hungary than in western European dairy farms – as previous own studies and of other authors show. The Hungarian average wage is between the half and one tenth of the latter. Due to this fact, the efficiency of the use of labour is less intensive; the best IFCN farms have 2.8 times higher labour productivity than the farm investigated in the study.

The data of the last years show that the increase of labour price caused increase in the labour costs in dairy farming. Expectations towards free labour flow count on a sudden increase in the wages; however, it is more likely that a moderate grow will happen. This will certainly have economic consequences; the current analysis show the effect of labour price on labour cost and profitability, and also whether any increase in labour productivity eliminates the increase of costs. The investigation on the effect of labour price also covers the changes in the farmer's expected income after his own labour.

(a) The increase of the labour price studied is not significant from the aspect of the EU wages (114 000 HUF/month average wage). Despite of that, the effect of the increase is high in dairy farming.

(b) The increase in the labour costs resulted in 3 forint additional cost per kg litre milk, which in the end, reduces the farm income (78%) and the cost based competitiveness of the milk. In case of farms with lower cost efficiency, the increase of the costs could stop the production. The “price” of the owner's own labour also increases (183,4%), thus the cover of investment, risk and the expected income of own land and capital decreases.

(c) Based on the results, the loss in the farm income due to the growth of the agricultural wages can be compensated by 60% increase in the labour productivity (kg FCM per hour labour input).

(d) It can be said, that a large part of the Hungarian dairy farmers have got reserves both in milk yields and labour management. It is realistic and necessary to

improve the efficiency of the labour use in Hungary, as well. It is the only way if any to maintain the competitive advantage of less expensive labour.

3.5. *THE EFFECT OF LAND RENT*

The price of the Hungarian lands is still much lower than in the EU, even despite of an increase of some 10 times in the last decade. Further convergence will likely be a long process; the example of the eastern parts of Germany shows that even 10 years after the integration, a significant difference can be seen in the land prices.

In Hungary, the interests of land owners and users are departed and in many times are conflicting. The difference of the land rents in Hungary (50 USD) and in the EU (70 -France to 450 -NL USD per hectare) varies highly. The cheaper lands have twice, while the more expensive ones have 10 times higher price than in Hungary, based of the IFCN results, 2002. However, the EU agricultural prices are highly influenced by the great direct payments given the farmers; it is supposed that with more or less similar conditions, the Hungarian prices will converge. Because of the reduction of the payments, the agricultural prices can be expected to decrease, therefore, the land rents are not likely to grow in the EU.

From the point of the above mentioned a moderate increase of the land rents can be expected in Hungary, when these will reach the lowest land rents of the EU. The analysis was carried out to show the effect of a rent increase with 40-50 and 100 percent of the direct payments in the dairy farm investigated. The results show that

- (a) The area payments would increase the land rents with 100-200 percent; thus its share within the total cost rises up to 11-16 percent.
- (b) This increase means 4,3-8,6 Ft/kg extra cost compared to the value of year 2003. However this amount of money comes from the EU budget and the farm profit does not need to cover it; coming from the above analyses, the farm loses the half or the whole of its only profit.
- (c) The entrepreneur income would decrease from the years 2002 and 2003 even the farm receives the half of the direct payments.

(d) With the current level of efficiency, the farm is unable to produce profit (1,6-2 Ft/kg milk) without any area payments.

(e) Thus, compared to the western farmers who operate on mainly own land, much less sources for investments are available for the Hungarian producers. The increase of the input prices encourages the Hungarian farmers to produce more efficiently, as neither the milk price nor the payments make possible to increase their returns.

With the development of the milk yields (and with a complex improvement of the farm equipment and efficiency (machinery and feed production) the more effective use of the more expensive labour and land is necessary aim; however without financial sources it is unrealistic. Further investigations are needed to analyse the potentials of the development such as development of milk yields, investments and labour use, economic decisions relating the increasing price and role of the milk quota.

4. Conclusions

The *results obtained and the connecting observations and recommendations* can be listed in three groups of the fields of the dissertation.

I. Hungary has decided to join the European Union, which led to integration with an existing and operating community that is still changing. This *integration* is advantageous, because it provides a system for the production which makes the returns transparent and calculable. With a simple takeover, time can be saved, provided that the institutional and other conditions are set up. Its *disadvantage* is the limitation of the producers, that is, that it provides small scope for the farmers to modify their returns. In this way, the integration forces to exploit other sides of the production and encourages the more effective use of the inputs. In milk production, the previously mentioned limitations are presented in the tools of the market regulation:

(a) Hungary was given 1 947 280 tons of milk quota for the year 2004/05 and a further amount of 42 780 tons for 2006. Compared to the processed milk in 2002 (1 723 676 thousand litres), the quota is 11.6 percent and 2.2 percent higher in 2004/05 and 2006.

(b) The target price for cow milk is a less limiting element of the system, though through the national guaranteed price and in the end the farm gate milk price determine directly the milk-returns. Additionally, the strict quality requirements are further regulating elements.

Other elements of the milk market regulation (export subsidies, import levy, etc.), and horizontal measures also have important role in modifying the profitability of the Hungarian dairy farms. However, their influence was not investigated in the dissertation.

II. Based on the results obtained in the simulation of the scenarios, recommendations for the typical farm surveyed can be summarised, and a part of these can be stated as *opportunities and key points of the Hungarian milk production* as well.

The Hungarian dairy farmers are highly different. During the last four years, the private farms were in disadvantage on the bigger former corporate farms in size, milk yields, milk quality and - in connection with it - the milk returns. However, due to their smaller size, the overall costs were less; therefore the total production cost was lower. It was found that the typical farm operates with higher costs due to the costs of crop production; however the crop returns increased the farm returns also.

It is commonly said that the Hungarian farmers have comparative advantages on the Western European producers in the production factor prices. It was found in the international comparison of the usage of labour and land that the lower prices do not encourage effective use. In the case of the typical farm, there is a big potential in increasing the milk production per labour or land unit.

During the last decade, a dynamic increase of the prices of agricultural inputs could be seen and the prices fell into line with those in the EU. Meanwhile, the milk price reached that of the neighbouring countries in 2002; and has not moved any more. Further increase in milk price can not be expected, therefore, a more effective use of the inputs has to play role in improving the profitability of dairy farming.

It is likely that the intended decrease of the intervention prices will influence the farm gate milk price in the end. The milk quota and the price drop together limit the chances of the farmers to influence their returns. The analysis of the direct payments has shown that even in a very favourable situation the payments will not compensate the total price loss. However, the crop production will benefit from the direct payments.

The general expectations towards the „EU wages” are likely extreme; there is not a great chance to reach the EU level even in medium terms (e.g. East Germany). A moderate increase could be reasonable, though; thus the average paid wage would rise to the lowest salaries paid in the EU farms, which would be still a very modest income 5 years after the accession. Its economic influence is significant in the dairy farms hiring labour: increases the production costs, decreases the profit and also the cover of the expected income of the owner. In less favourable situation, it could lead to stop production.

In Hungary, the land rents are some half to one sixth of that in the EU. In the simulation, it was investigated that the rent increases to 35 thousand HUF per hectare on the farm, thus the production costs increase with even 10 percent. Beside that the land market is limited; this fact places the large scale farms – which are practically the basis of the milk production – in a highly challenging situation. The entrepreneur profit of a private farmer similarly decreases, consequently, the return on the owner's own labour drops or is lost.

The increase in the price of the analysed factors means that in order to maintain the current profitability of dairy farming in Hungary it is not enough to produce 7000 kilogram milk per cow – which was defined by Heinrich as the minimum yield in competitive farms.

The more strict quality criteria have different influence on the dairy farms. A part of the small producers will have to change from milk production sold to the processors. In larger farms, that milk return will be lost which would be paid after lower quality of milk. As the results show, the farm income decreases even with 7.6 to 16 percent; and the source of investments reduces or even is lost in less profitable dairy farms. Therefore, the current structure of milk producers is expected to change.

III. Further observations can be made on the *experiences of the model use*. Primarily it can be said that the model provides a unique method, which is suitable to analyse the costs, returns and income of dairy farming in international level. This is proven by the fact that the model is used in 27 countries of the world. Out of the previous, several advantages come, which reflect on the Hungarian milk production from a novel point of view – other than the traditional economic approach. The simulation model is suitable to (1) „think” of an agricultural producing unit, when it also lays emphasis on the expected returns on the owner's own production factors. (2) It clearly calculates with other than milk returns as components of the total farm income, which is in contrary with the traditional approach of calculating the production cost of only the milk.

As a method, the model is suitable to show the results and the mechanism of economic-political decisions, such as target price, quality requirements and minimal wage. It also gives exact answer on the changes of economic-political conditions affecting the milk production. Therefore, it is useful to create farm

strategies for the future. Its significant advantage is that the method is able to give quick and exact answers on extremely varying conditions and unique cases such way that in reality these should not have to happen. Besides its advantages, the method can only be applied with preliminary conditions; the results have to be interpreted with acknowledging the basic parameters of the simulation.

5. New scientific finding results

Based on the literature discussed and on the results of the simulation obtained the following new and novel scientific results can be defined:

1. I have made it possible to indicate the effects of economic-political decisions and measures on dairy farming by the inland adaptation and up-dating of the simulation model used.
2. The applied simulation process has proved that differences between the results of the analyses of different databases can be defined by the method used.

6. Recommendations

I. Recommendations for the farm investigated

I.1. Due to the likely decrease of the milk price the farm has to consider the opportunities for other returns (e.g. crop returns, contract works, manure sale).

I.2. The quality of the produced milk fulfils the EU requirements; it is reasonable to nominate the quality expectations of the management towards the employees (milking, feeding, etc.) within the wage system.

I.3. It will be necessary to compensate the likely increase of labour price on the farm, which in case of the analysed situation can be solved by rationalising the labour use (60 percent increase in labour production).

II. Economic-political decisions

II.1. The integration results in a more calculable farming due to the elements of the market regulation. Thus, it can be advised to supply the farmers and agricultural producers with exact (calculated) information on the expected consequences of certain decisions and measures intended to be launched and also on the alternative opportunities of the farmers.

II.2. The milk price is not expected to grow rather to decrease. Many less profitable farms will not be able to cover the likely growth of the production costs, therefore concentration of the herd is expected with a significant change of the farming structure. Also, the profitability of farming (and dairy farming) becomes a social issue (living of the families). The role of the direct payments and the government will increase in the farmers' life. Further solutions are offered by different target programs and other opportunities of the multifunctional CAP.

III. Recommendations on the use of the model and of widening the researches

III.1. The future profitability of dairy farming is not totally calculable despite of the strict quota policy and institutional prices. However, the method show is suitable to consider alternatives of future strategies of farms, of which economic results provide useful information for the farmers. It is advisable to use the method more widely in the production.

III.2. More detailed suggestions and advices should be given different production groups of farmers on their future opportunities.

III.3. Experiences and results obtained so far should be forwarded to other countries also accessing the EU. The frames of the international cooperation have to be drawn up in this field.

7. Publications on the field of the dissertation

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