IMPACT OF ECONOMIC ENVIRONMENT ON HERD SIZE AND MILK PRODUCTION ON A DAIRY CATTLE FARM

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Abstract: *In the last 10 years, the situation of Hungarian dairy farmers is critical. This condition can also be observed in EU Member States. The problem is caused by several factors. Increasing feedstuffs prices and low buying prices have serious effects on the situation of the farmers. The aim of this study is to determine the effect of economic environment on herd size and milk production. Data were collected for 4 years from 2012 to 2015 from a dairy cattle farm in South-Hungary. The number of cows was 419 at the end of 2015, having suffered a fall of 16% over the 4 years. The largest number of animals was seen at beginning of August 2013 (604 cows), the population decreased by 30% between the middle of 2013 and the end of 2015. The average milk production (mean/all cows) changed between 9.4 kg (2013 Third Q.) and 20.7 kg (2012. First Q.). This value of milked cows was 12.1 kg and 24.2 kg in same period. We found strong positive correlation between milk price and herd size (r=0.72; R^2=0.512) and weak correlation between milk price and average milk production (r=0.325; R^2=0.106). We conclude that decreasing milk price and increasing input prices have played a role in decreased population size and reduced milk production of population.*

Key words*: milk price, dairy cow economy, milk production*

INTRODUCTION

Over the past decade, dairy farming has faced many challenges. Farms must try to make their farming as efficient as possible with every available tool. It is needed to improve efficiency, the optimization of both external and internal processes. Altogether 122 million dairy farms in the world keep on average three cows per farm [3]. Net income per cow or per kilogram of milk produced is a key measure for determining how successful a dairy operation has been historically as well as an indicator of the financial success the dairy might have in the future. While macroeconomic factors impacting overall profitability in the dairy industry are important, producers' individual management skills are more important for long-term business survival [2].

Daily, herd managers are faced with decisions that influence the economic success of their program. Management teams should set goals, and use goals to guide day to day decisions. These goals should consider cows that leave the herd and cows that remain. Valuable resources, such as time, labour, and breeding expense should be used first for those cows remaining in the herd. Management should avoid extremely long and extremely short calving intervals [5]. It has been proven that a large number of cows leave the herd early in lactation largely due to metabolic health reasons, and the risk of death is the greatest early in lactation. Forced culling of cows early in lactation is expensive, from USD 500 to USD 1000 per cow [1].

MATERIAL AND METHODS

It is always analysed whether direct economic factors like milk price received, feed cost, labour, and other costs have a greater effect on net return variability or it is indirect factors like milk production or size of herd. Here the production and herd size are examined. Data were collected for 4 years from 2012 to 2015 from a dairy cattle farm in South-Hungary. Analyses over the past four years were evaluated to quantify relationships between certain economic factors and herd size as well as production level in a dairy

operation. Beyond the analysis of certain tendencies like herd size, the average milk production and the price of raw milk some correlations are also measured.

RESULTS

The change of animal herd size has been presented on figure 1. The total number of milking cows on the farm decreased steadily (20%) between 2012 and first quarter of 2013, resulting in 91 cows. The number of animals reported an even stronger increase of 36% within 2013, resulting in 216 animals. At the end of 2015 there were only 419 dairy cows, a fall of 12% (58 cows) compared to 2012 and 30% (183 cattle) compared to 2013.

This downward trend was not reported on all Hungarian farms within the same period. A moderate growth was observed in the livestock size (KSH, 2016). Their number increased by 9% from 335000 in 2012 to 368000 in 2015.

The lactation number is varied between 1 and 10. The average value was 2.29 which is similar to the trend in Hungary and also around the word. The highest value (2.9) can be experienced in the third of 2012. During this period, the proportion of the five or higher parity was 19%. Higher rates were observed in the first quarter of 2015 (23%). The lowest proportion of old cows were observed at the end of 2015 (max.=7). Prevalence of first parity cows changed between 18%-53%. The low prevalence (18%) is associated with the unfavorable economic situation that the farmer sells the pregnant heifers there is no money to buy feed. The lowest number of first lactation was found at the end of 2014 when the price of milk began to decline.

There has been a steady decline in the number of farms, farmers and livestock in Hungary. The farm observed have tried to increase its herd size in order to produce a greater milk yield. However, as it is seen, the herd size was fluctuating.

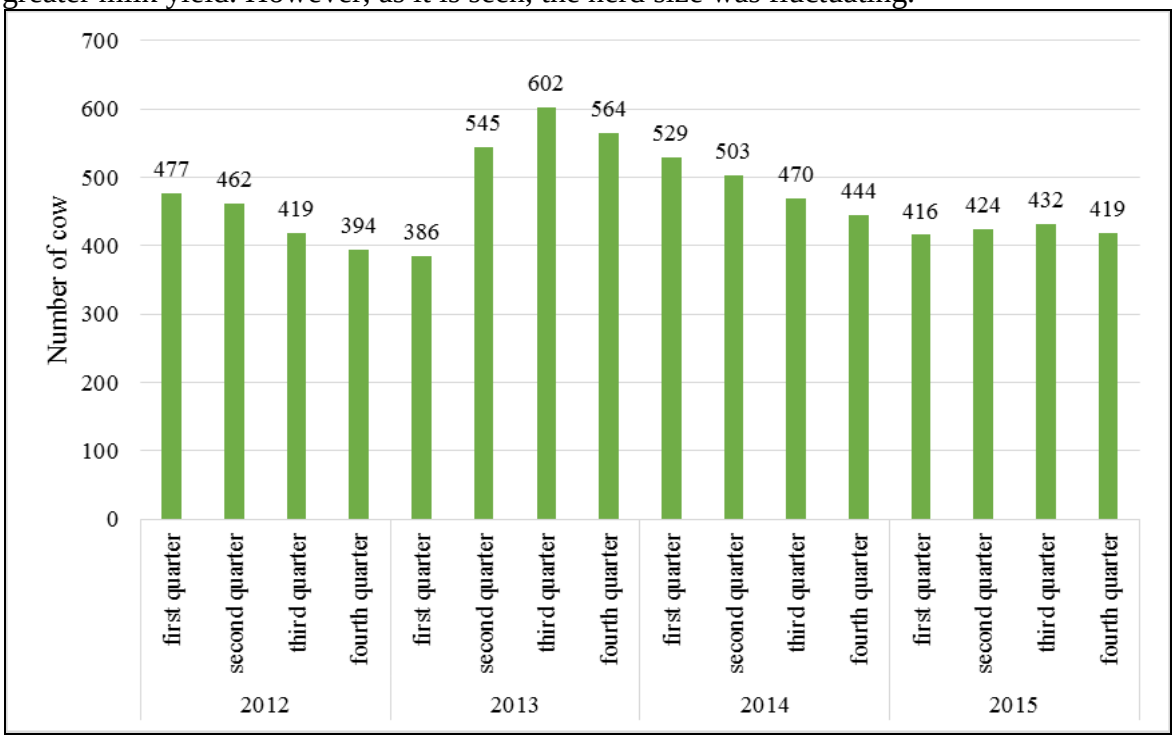

Figure 1 Herd size in the farm examined between 2012 and 2015

The number of cows a farm possesses is obviously shown to be a significant predictor of milk production. The cost-price squeeze in dairy farming has forced farmers to become more competitive in the market. In a dairy farming context there are many decisions to be made, for example what type of cows, what types and amounts of forage and supplements (inputs), type of milking shed (capital investment), the different quantities

of inputs, and the amount of milk to produce? As highlighted in the review, it may be beneficial to focus on milk component responses rather than milk volume changes, because differing payment schedules exist in many markets. All these factors comprise the farm system, and most farmers are interested in maximizing the profit from such a system. If production output is increased, farmers usually can achieve lower costs per unit of milk.

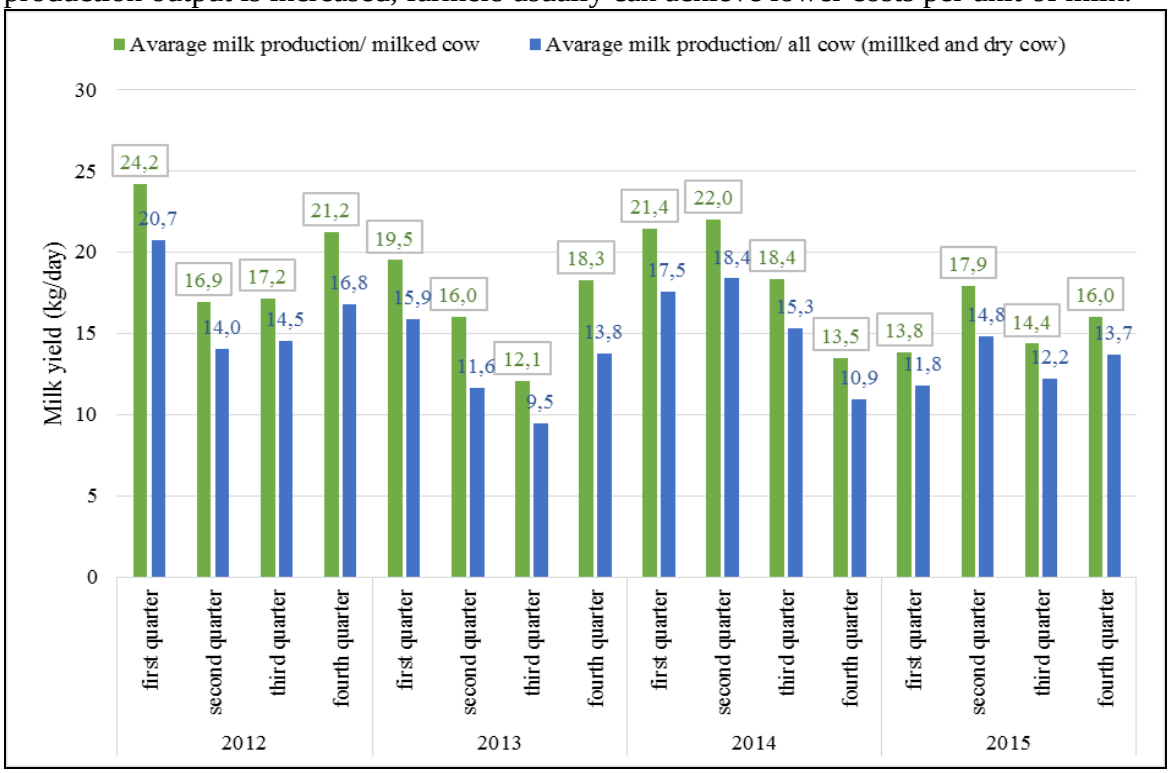

Figure 2 Average milk production n the farm examined

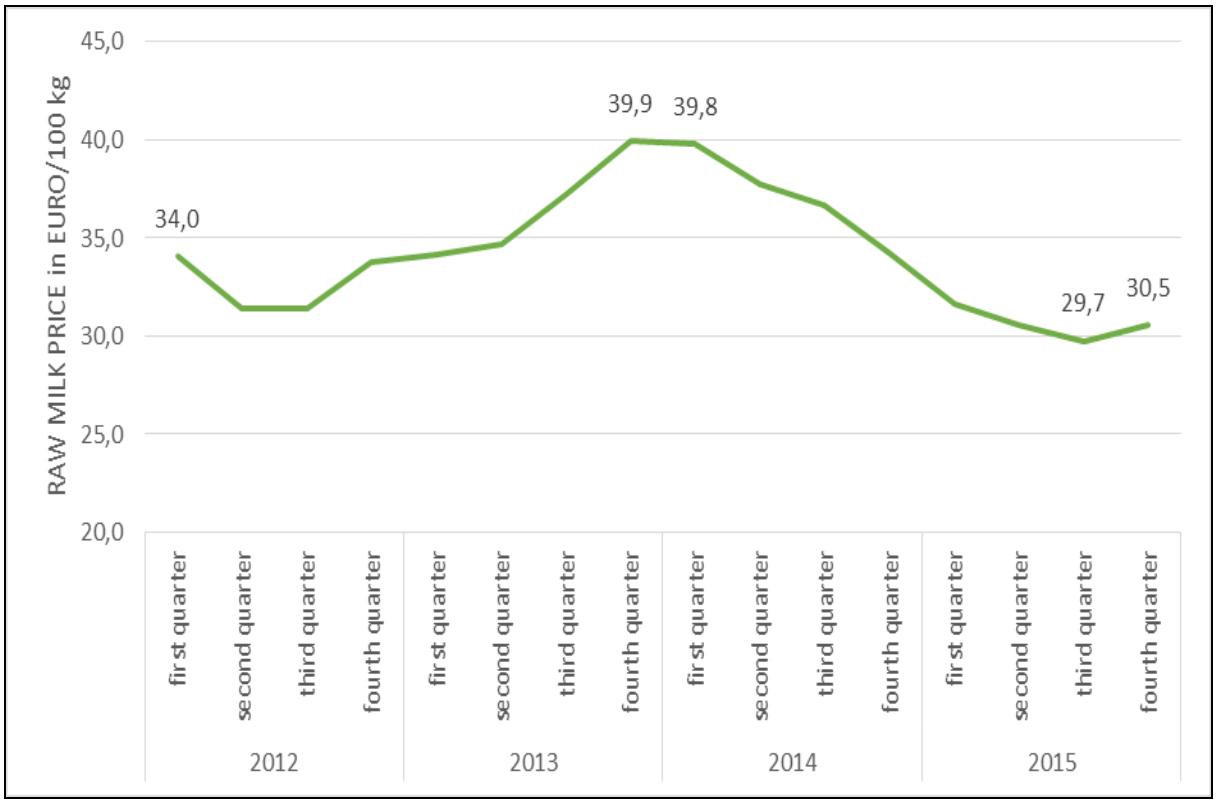

Figure 3 Change of the milk producer price

The year-to-year volatility in milk prices increased significantly in the past four years. Moreover, the prices fell back moderately in the past four years, as shown by Figure 3. At the same time the cost of milk production was increasing over the last fifteen years. However, global forecasts like IFCN expect that the costs of milk production will decline or stabilise in the next years [4]. According to the observation of [6] larger farms realize lower production costs.

Milk prices have fallen mainly because of greater supply on world markets, compounded in Europe by the impact of the Russian ban on imports on dairy products from European Union. The difference between the highest and lowest prices received was 10.2 Euro/100 kilogram. The key driver of profit and therefore the choice of farm system is dependent on relative prices such as the price index of inputs and the milk price. The relative price of inputs and outputs is constantly changing and therefore the profit maximizing point of production changes. Simply, if the milk price increases relative to the price of inputs it pays to increase inputs and thus increase milk production.

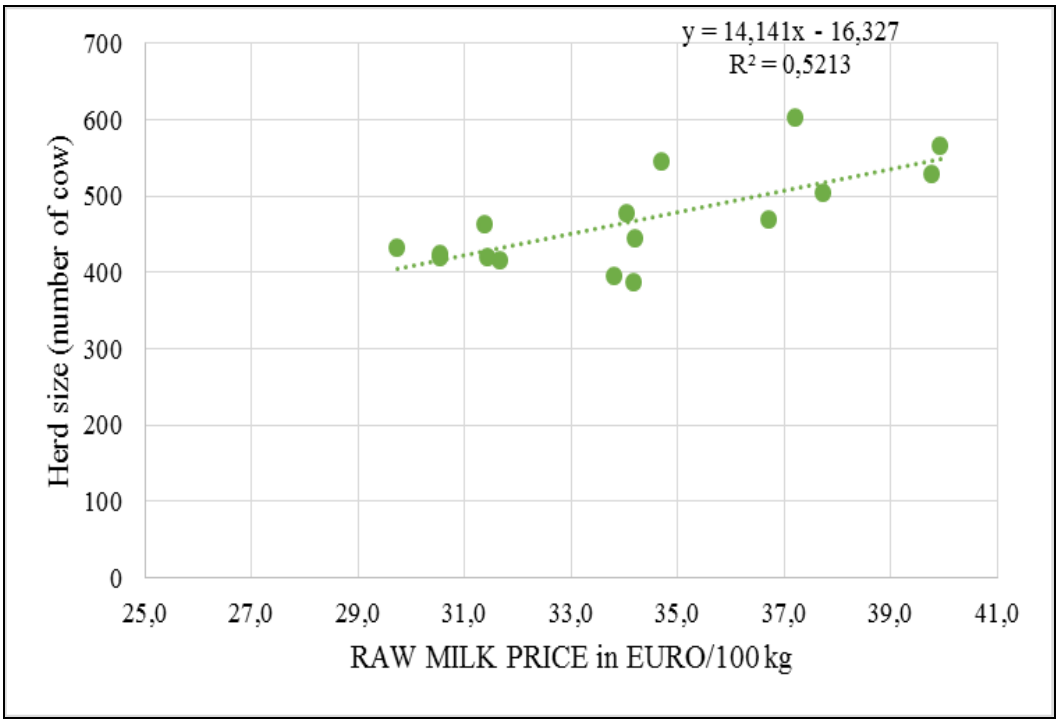

Figure 4 Correlation between herd size and raw milk price

We found strong positive correlation between milk price and herd size (r=0.72; R^2=0.512) and weak correlation between milk price and average milk production (r=0.325; R^2=0.106). These results show that the farm is encouraged to increase the herd size when the market price of raw milk rises. The weaker correlation between production level and milk price can be explained by the general concept of farmers, namely fixed costs can be kept moderate when the average milk production is relatively high. So the production level is not principally affected by the market price.

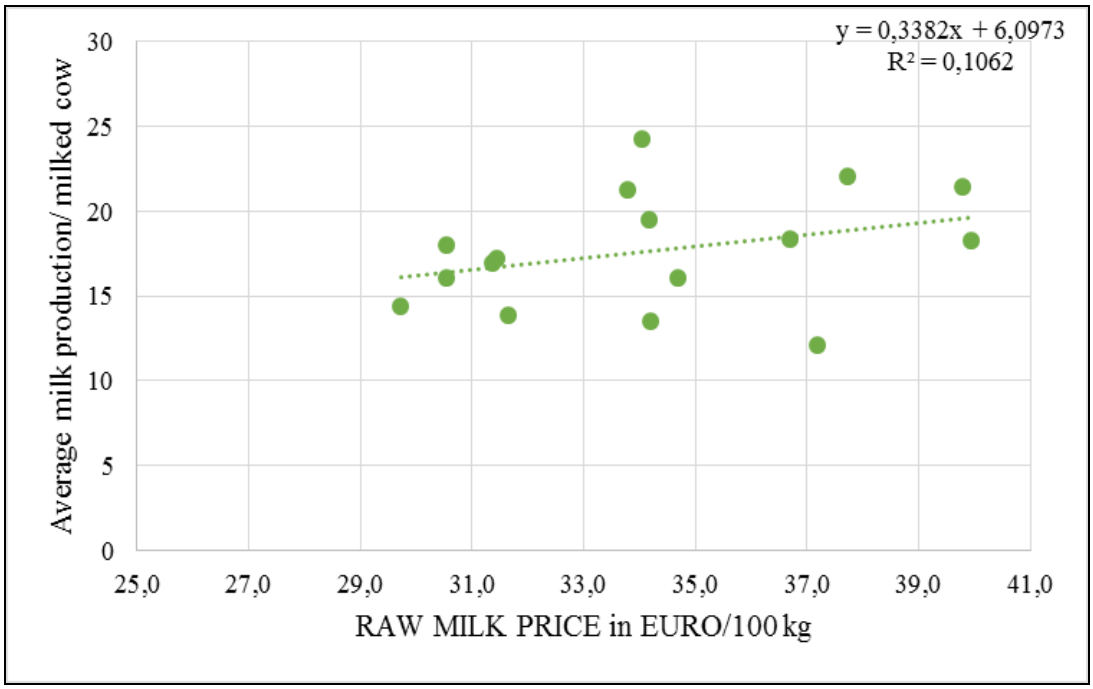

Figure 5 Correlation between the average milk production and the raw milk price

As it is seen in figure 3 and figure 6 the change of milk producer price and corn producer price which is one of the most important feed of dairy cattle were not moving together. The cost of feed is the most significant among all kinds of elements of production cost. Milk price and corresponding production costs are used to determine the profitability level of production. When increase the volatility in prices the farmer is adjusting his farm system to mitigate this risk. When the milk price increases relative to input prices, it makes sense to increase production by using more inputs.

The multilevel logistic regression model shows a moderate correlation between the milk price and corn producer price (R^2=0.19).

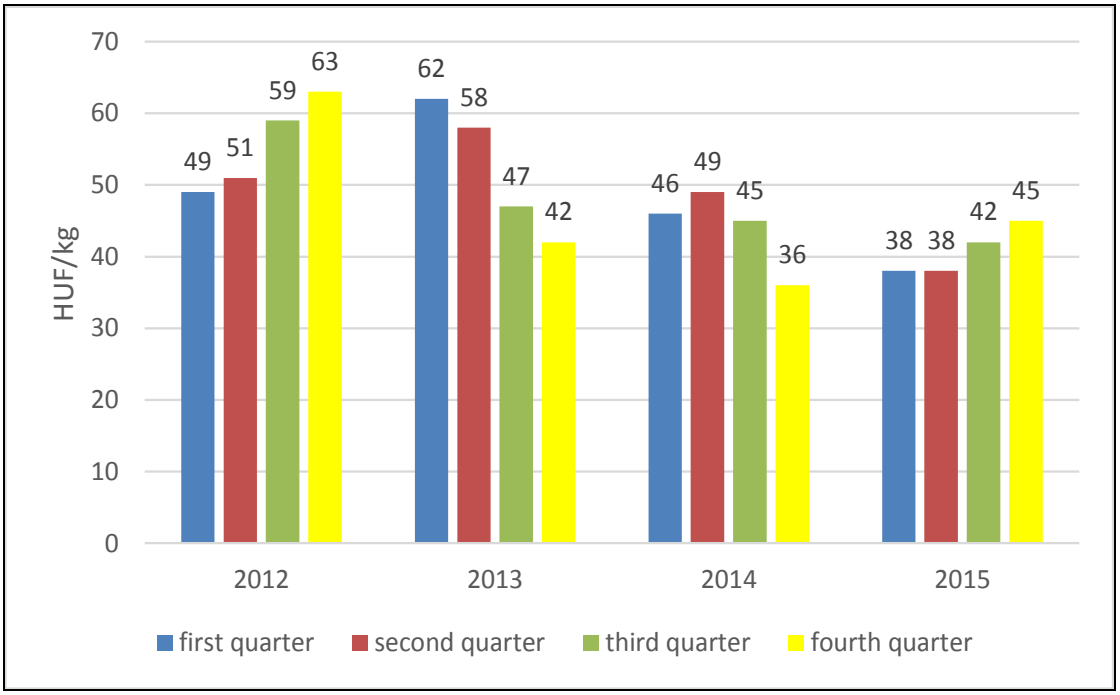

Figure 6 Change of the corn producer price

CONCLUSIONS

It is understandable that with changing product prices (the raw milk price) and input prices (dominantly the feed costs) farmers who all have different objectives will respond to these changes and elect a farm system that maximises their profit and utility. Most of dairy farmers generally are under considerable financial pressure because their capital structure imposes high fixed costs on their business. Dairy research needs to find ways to improve the effectiveness of additional inputs and in reducing their unit cost, as these are vital to sustain farm productivity. Next years, improving farmers' knowledge and skills in dairy cow nutrition and in business management (particularly marginal analysis) of benefits from extra inputs will be a critical factor in ensuring farm viability.

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