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AN ANALYSIS OF THE HUNGARIAN DAIRY INDUSTRY IN THE LIGHT OF SUSTAINABILITY

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ABSTRACT

The two most important expressions in the title are "dairy industry" and "sustainability." In a few words, sustainability is the capacity to endure. This concept has three dimensions: environmental, economic, and social. In ecology, this word describes how biological systems remain diverse and productive over time. "Economic sustainability" is the term used to identify strategies that make it possible to utilize available resources to the best advantage. In the case of business operation, economic sustainability calls for using resources so that the business continues to function over a number of years, while consistently returning a profit. "Social sustainability" encompasses human rights, labor rights, and corporate governance. The present study tries to analyze the dairy sector in the light of sustainability. The general objective of this paper is to answer the following question: How can the dairy industry achieve competitive growth while attempting to comply with the criteria of sustainability? To answer this question we should be aware of the present situation of the Hungarian dairy industry. This study will try to give a complex overview of domestic milk production, consumption and trade and to illustrate the above-mentioned three dimensions of sustainability in dairy sector with examples. The expected general result of this study can be summarized in one sentence: in many cases – as in the case of the dairy industry – sustainability can hardly be achieved while following the spirit of competitiveness.
Keywords: Hungary, dairy industry, sustainability, competitiveness

INTRODUCTION

Present study focuses on the Hungarian dairy sector in the light of sustainability. The general objective of this paper is to answer the following question: How can dairy industry achieve competitive growth, meanwhile it attempts to comply with the criteria of sustainability? To reach this objective the first task is to give a brief overview about the Hungarian dairy sector – production, consumption and trade. The second task of this paper is to illustrate the three dimensions – environmental, social and economic – of sustainability in the dairy industry through examples.

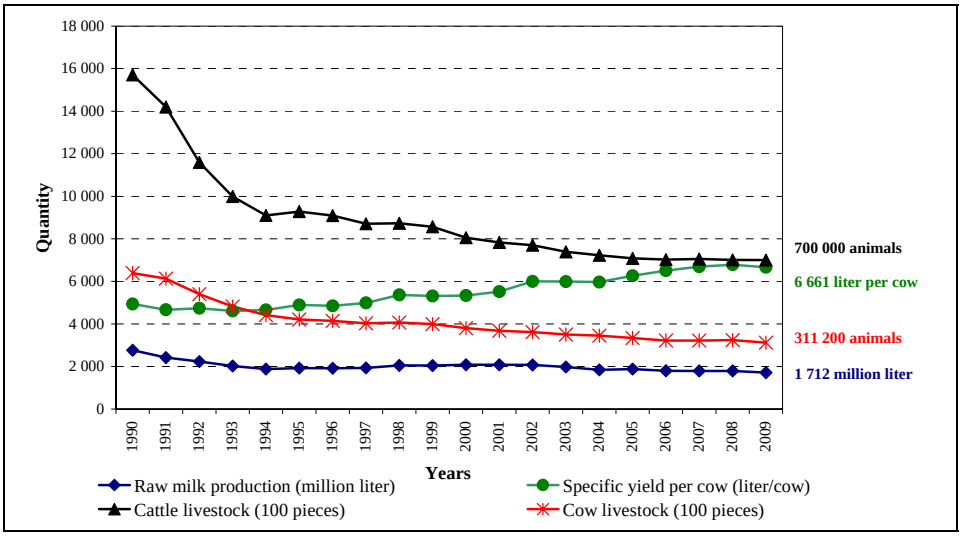
Brief overview of the Hungarian dairy sector

In the last two decades the number of the Hungarian dairy cows declined from 630 thousand to 311 thousand animals. In the beginning the decreasing number of cow livestock was not perceptible in the amount raw cow milk production, which was around 1.9-2.1 million tonnes. Later the increasing specific cow yield was not able

to compensate the national milk production descent. Since then the Hungarian raw milk production has been continuously falling down. Currently the national milk production is around 1.7 million tonnes (*Figure 1*).

Figure 1

The evaluation of the Hungarian dairy sector



Source: *HCSO*[1], 2011

As *Figure 1* illustrates the number of dairy cows significantly declined in the past twenty years. In accordance with the aforementioned statement the specific yield per cow was able to compensate this decline in cow number, so the volume of raw milk production remained stable. This correlation is down to the fact that with our EU accession most of the rural dairies ceased to exist and small producers with only a few dairy cows and low yields were forced to stop production. In this way the average Hungarian yield per cow started to increase.

Figure 2 demonstrates the level of milk and milk product consumption from 1987 to 2009 in Hungary. 1987 was an outstanding year in per capita consumption, because in this year Hungary managed to approach the consumption level of Western-European countries. Currently the average level of milk and milk product consumption is about 145-165 kg/capita/year, which is only the half of the average of the most developed European countries. In all probability cheese consumption will increase in the next few years in Hungary.

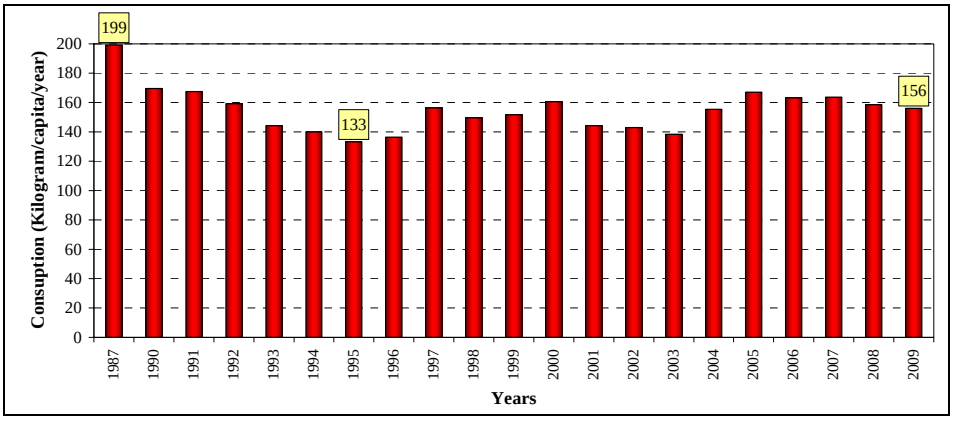
The EU accession was defining in all aspects; it had significant impact on our foreign trade position (*Figure 3).* After 2004 Hungary become a net importer in the field of milk and milk products. Currently we primarily import liquid milk to Italy,

[1] Hungarian Central Statistical Office

Romania and Slovenia. While milk products with higher added value arrive from Germany, Poland, Slovakia and the Czech Republic. Our foreign trade balance is unanimously negative.

Figure 2

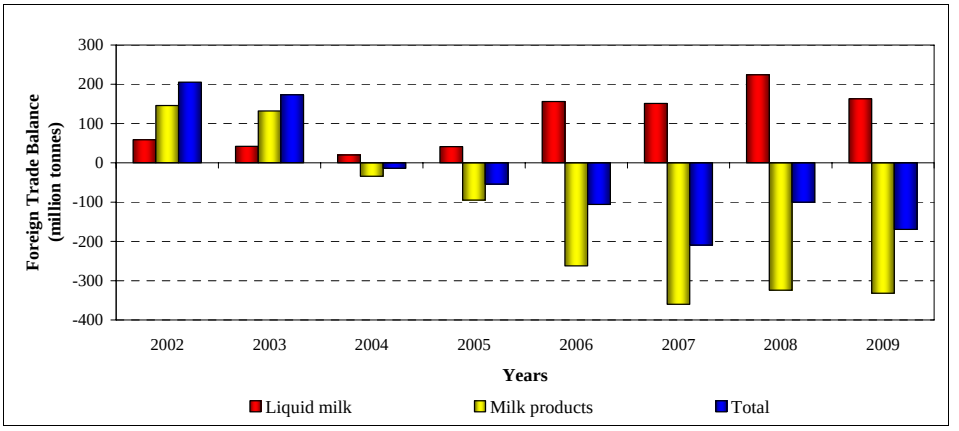
The evaluation of the Hungarian milk and milk product consumption



Source: *HCSO*, 2011

Figure 3

Foreign trade position of Hungary in the field of milk and milk products



Source: *HCSO*, 2011

The general concept of sustainability

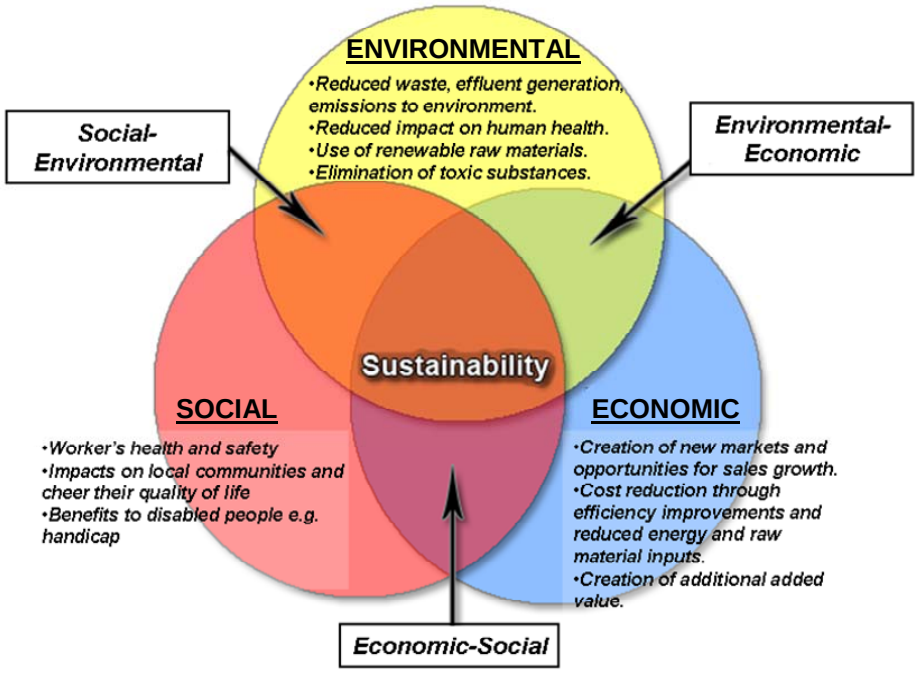
Perhaps the most quoted definition of sustainability was published in Bruntland Report of the World Council on Environment and Development in 1987: "Sustainable development meets the needs of the present without compromising

the ability of future generations to meet their own needs". This broad definition effectively summarizes much of the philosophy of sustainability (*Cox and Ziv*, 2005).

Figure 4 demonstrates the three main dimensions of sustainability and illustrates the overlaps among these major areas. Present study only concentrates on the three major dimensions.

Figure 4

Dimensions of sustainability



In ecology, the word sustainability describes how biological systems remain diverse and productive over time. An ecologically sustainable system maintains a solid base of natural resources and avoids excessive use of such resources. This involves the conservation of biodiversity, attaining atmospheric balance, productivity of soil as well as other systems of natural environment which are usually classified as noneconomic resources. Therefore, from an environmental point of view, sustainability means setting limits for consumption, population growth and pollution, as well as the faulty ways of production; including wasting waters, cutting the forests or the soil erosion.

Development is considered to be socially sustainable when it achieves social justice via equitable resource allocation, eradicates poverty, and provides social services, such as education, health and others to all members of the society, especially the most needy ones. The social dimension of sustainable development is,

thus, based on the notion that man constitutes an important means of development and its prime target who should strive to achieve this notion for both present and future generations.

Economically, sustainability means providing economic welfare at present and in the future, while paying more attention to the "natural capital", which means the natural resources of economic value, considered as the bases for the economic system, such as plants, soil, animals, fish, and bio-environmental system such as air and water purification (I1).

MATERIALS AND METHODS

Present study introduces the Hungarian dairy sector in the light of sustainability and it is primarily founded on previous researches and product chain information. Mainly based on secondary data collection I collected those factors which were examined in detail in this paper. In case of every single factor I tried to support my statements with figures.

RESULTS AND DISCUSSION

Environmental dimensions of sustainability in dairy farms

One of the most significant aspects of the environmental dimension in dairy farms is the methane emission. Methane (CH4) is a very aggressive gas; it has twenty times greater warming effect than carbon-dioxide. Methane contributes to the further warming of our planet and it represents 10% in the GHG inventory. Methane is generated mainly in waste disposal sites and animal farms. Enteric fermentation in animals is considered as significant source of CH_4 all over the world. The most important process of generation is the anaerobic cellulose degradation in the rumen of ruminants. In Hungary the leading CH_4 emitters are cattle and sheep, with the most important category is dairy cattle. In addition to the number of animals, the level of production and feeding practices are the factors primarily influencing the amount of CH_4 from enteric fermentation (*Kiss-Kovács*, 2008).

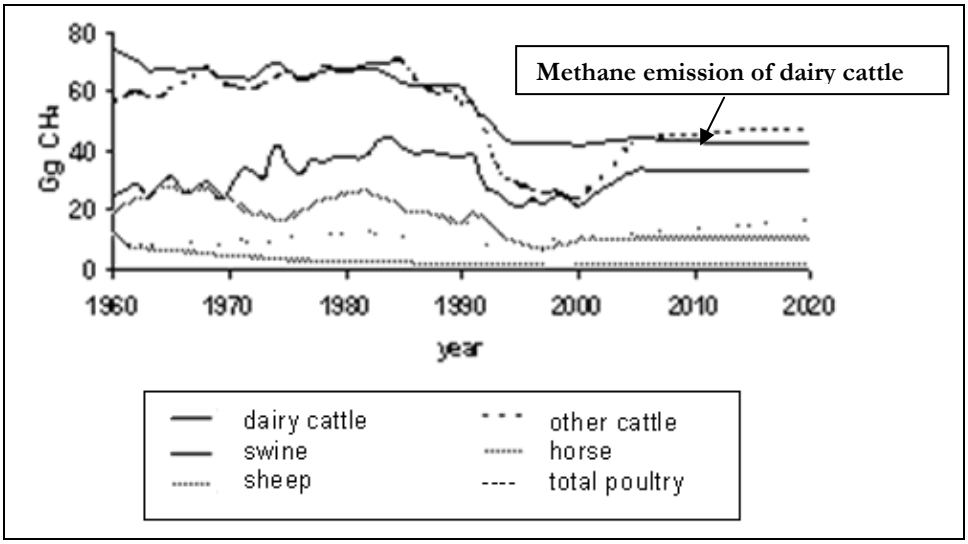
Why do dairy cows contribute to methane emission in the highest rate among other animals? The answer is not too complicated. The digestion of a dairy cow is really active, since it has to consume more feed to produce milk, in this way a dairy cow will emit much more methane than other animals. *Figure 5* demonstrates the methane emissions from Hungarian livestock production between 1960 and 2020 by animal category. Methane emission of dairy cattle and other cattle has dominated for the year of 1960 and it will also represents – in accordance with the estimated values – the highest rate among the other animals in the future.

The average annual methane emission of a dairy cow is about 90-110 kg/year/cow (*Munk*, 2007). To measure this emitted quantity is simple: the cow is in an airtight, so-called respiratory chamber, where she can eat, sleep and live under conditions close to the natural way of life. The researcher measures the composition of the air in the chamber and the air leaves that. In this way the

researcher can get the data which shows the contribution of the animal to the greenhouse gas content of the atmosphere. To calculate with the aforementioned value the current (2010) total methane emission of dairy cows can be determined easily. In 2010 the number of dairy cows in Hungary was 192 thousand animals, so they emitted about 17-21 thousand tonnes methane. The methane emission originates from dairy cows represents 4-5% of the total Hungarian methane emission.

Figure 5

Methane emissions from Hungarian livestock production between 1960 and 2020 by animal categories



Source: *Borka*, 2002

Figure 6 illustrates the total methane emission and the number of dairy cows in Hungary between 1990 and 2008. Considering the data of *Figure 6* it can be seen that the number of dairy cows has continuously decreased since the political transformation and parallel to it the amount of methane emission has also declined in the same period. The calculated correlation coefficient shows a very strong relationship between the two time series. Its value is 0.709 beside 0.014 level of statistical significant in the examined period.

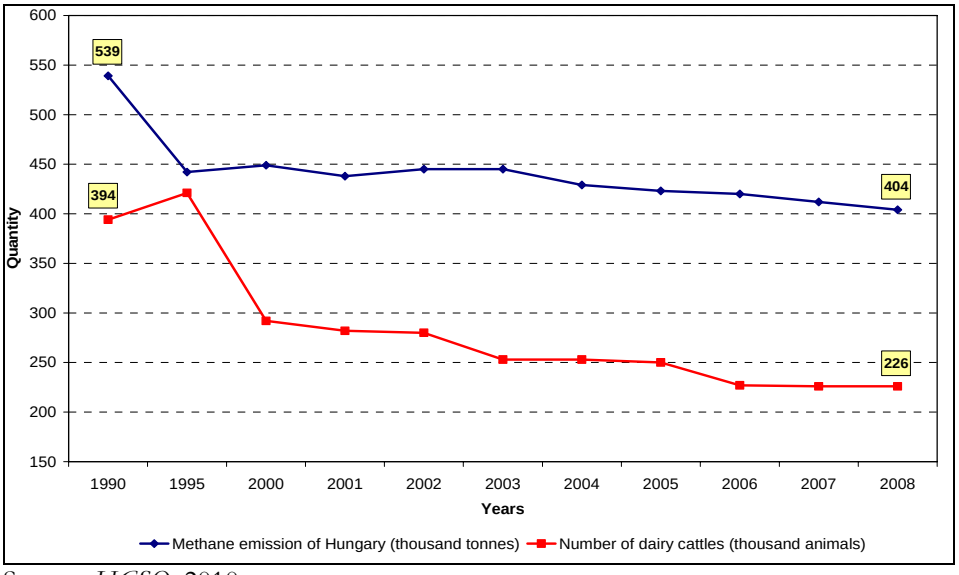
Of course there are methods to mitigate methane emission from dairy cows. Approximately 4-7% of cows' feed became energy loss in the form of methane gas. If this could be eliminated, it would have favourable effect on greenhouse gas content of the atmosphere and it would also increase milk production (I2).

One of the approaches to reduce methane emission is the appropriate selection of the applied forage. In case of high-fibre forage such as grass, hay and silage the methane production will also be higher. Change can be achieved with the increase

in the ratio of fodder, i.e. concentrated feed such as barley and corn (*Borka*, 2002). A second approach is to better balance the diet protein and carbohydrate fractions to improve the efficiency of both rumen fermentation and feed nutrient use. Methane emissions will be reduced as a result. There are also opportunities to provide specific feed additives to decrease methane emissions from the cow. Their use is currently limited due to lack of data to demonstrate their efficacy in lactating dairy cows. Ionophores are one feed additive that does have data indicating improved feed efficiency and decreased methane emissions (*Chase*, 2010).

Figure 6

Methane emission and the number of dairy cows in Hungary between 1990 and 2008



Source: *HCSO*, 2010

However there are several limiting factors which influence the implementation of the above-mentioned mitigating approaches. Many options will require some financial investments and management changes may also be needed. Furthermore feed additives that could be helpful in reducing methane emissions have not been tested in animal trials and cost to benefit ratio cannot be defined for many practices that could be use (*Chase*, 2010).

I selected manure production as the second element of the environmental dimension of sustainability in dairy farms. One of the major problems of concentrated livestock production is the storage and utilization of manure generated in large quantity. The average manure production of a cow is about 9-10 tonnes/year. This manure is used in crop production and it has really versatile effects, which are collected in *Table 1*.

Table 1

Effects of livestock manure

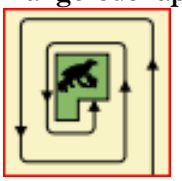
Positive effects	Negative effects
+ improves the water- and air-management of the soil + promotes the formation of good soil structure + enriches the humus content of the soil + insures nutrients + provides favourable living conditions for microorganisms + long impact on the physical condition of the soil + yield-stabilizing effect	- slow effect - the agricultural land becomes overgrown with weeds due to grazing

In compliance with *Table 1,* livestock manure has much more positive than negative effects on soil. Grazing and raping have essentially favourable effects on biodiversity, as they lag behind in a land it will become bushy and wooded and then it results the reduction of birds' and other animals' natural habitat. A negative effect of grazing, that the manure of dairy cows will contain weed seeds and it results that the agricultural land, where the manure is utilized, becomes overgrown with weeds. Besides raping carried out in the incubation and breeding period (June-July) destroys the old ground-nesting birds and brood. To prevent the aforementioned negative effect of raping it can be carried out in a nature protective way. *Figure 7* demonstrates the different raping methods.

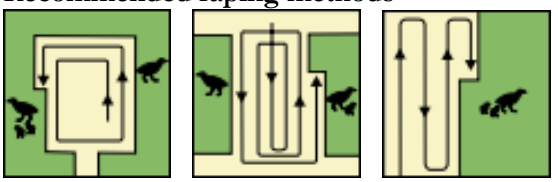
Figure 7

Illustration of different raping methods

Dangerous raping method



Recommended raping methods



The picture illustrates the dangerous way of raping, when it occurs from the outside in. In this case animals have no chance to escape. But if we choose one of the recommended raping techniques we can provide opportunity for animals to escape. In dairy farms groundwater is used as drinking water and technological water. Drinking water gets to the manure, while technological water can be considered a hazardous waste. In case of technological water its purification is necessary.

Social dimensions of sustainability in dairy farms

Cow milk production is primarily the activity of the rural areas. So it plays important role in rural employment. However our EU accession brought changes in this area. Most of the rural dairies were compelled to suspend their activities and in this way several small-scaled farms were forced to stop their production. On the one hand it resulted that alternative income earning opportunities became limited in rural areas, on the other hand getting locally produced fresh milk also became hard.

While the goal would be just to reach the increase in milk and milk product consumption. Milk has several positive effects on human health. The economic impact of the current 150-160 kg/capita annual milk and milk product consumption level is the gradual decline in domestic milk production resulting in a reducing volume of domestic sales and import growth. The public health aspect of the low consumption level is the so-called "Hungarian silent epidemic", the osteoporosis, which affects more than 1 million people in Hungary (*Szakály*, 2006). Dairy products represent the only category of food which contains more calcium than phosphorus. Former examinations of National Institute for Food and Nutrition Science related to the adult population prove that 80% of the women and 70% of the men do not reach the level of the daily 800 mg calcium need. Hungary as regards calcium consumption is on one of the last places in the ranking of the European Union member states. If we wanted to reach the average consumption level of the EU member states we should increase our consumption to 230 kg/capita/year, but it is very difficult to achieve in the light of the special Hungarian eating habits and the current purchasing power. Therefore for the foreseeable future to achieve the 180-200 kg/capita/year consumption level of milk and milk products can be a more realistic goal for Hungary (*Szakály*, 2007).

One of the most significant economic impacts of low milk and milk products consumption level is the decline in domestic milk production, which is accompanied by the reduction in number of dairy cows. And it has further social consequences. The capacity of rural areas to support their population with additional source of income also reduces and it means the loss of knowledge capital as well. The elder generation is forced to discontinue this activity and the young ones do not see appropriate opportunity in this sector to start this activity. That is a vicious circle which results in the loss of knowledge capital and the reduction in number of dairy cows. However the rural landscape is unimaginable without grazing cattle.

Economic dimensions of sustainability in dairy farms

In economic terms, dairy industry can be considered sustainable; while the members of it acquire fair and reasonable income from their activity and parallel to it consumers can purchase milk and milk products also at a fair and reasonable

price. These two things do not exclude each other. However the income-generating capacity of the sector members is unequal due primarily to the different bargaining position of the members. Dairy sector can be divided into four basic stages: production of raw material, processing, trade and consumption. As we move forward on dairy product chain it can be concluded that the bargaining position becomes increasingly stronger. So the dairy farmers are in the most defencelessness situation against the other members of the chain.

Economically speaking by what kind of factors is the sustainability of the sector threatened?

1. Due to the low level of cooperation in production stage of dairy product chain negotiation power of dairy farmers is poor and they can be described by increased defencelessness against the rest of the product chain. The result of the increased defencelessness of dairy farmers is the weaker bargaining power against the dairies, which leads to low purchase prices. However purchase prices are depressed not only by the more concentrated processing sector, but the increasing presence of import products and the "unfavourable" product choice of price-sensitive consumers. Milk price became stable in 2007 and 2008 at a high level, internationally. Growing production and the economic crisis, however, led to a dramatic relapse in the price, leaving a number of producers in uncertainty (*Borbély et al.*, 2010). On the basis of RIAE[2] (2011) database price of raw milk was 0.25 EUR/kg[3] in January 2010, however it was already 0.30 EUR/kg in December. In reference to the datum of January 2011 price of raw milk was 0.31 EUR/kg, which was approximately higher by 24% compared to data of previous year.

2. The above-mentioned consumer price-sensitivity and the growing demand for cheaper import products contribute to another main problem, to the decreasing demand for domestic milk and milk products. Disposable income essentially determines the level of milk and milk product consumption of the Hungarian population. Hungarian consumers are not loyal for domestic products. In many cases they choose the cheaper import products of retail chains. They are usually not aware of the features and components of products, do not know the origin of them and they are not interested in the method of production, i.e. they are not conscious and in the first place price influences their buying decisions. Lack of community marketing is typical in Hungary. However the successfulness of this sector exactly depends on the creation of consumer awareness and strengthening of health consciousness, to which community marketing tools should be invoked (*Popp et al.,* 2008). A survey carried out by *Szakály et al.* (2005) also proved that in relation to milk and milk products significant misconceptions prevail among consumers. Essential interest of dairy industry is to clarify these existing misconceptions, since the lack of awareness building may have adverse effects on all categories of dairy products. Primary task is to strengthen consumer mentality among domestic products. *Szakály et al.* (2005) and *Major* (2007) also emphasise the importance of community marketing, which is beneficial to the participants, because they can preserve the independence of their core activity, but apportion the costs of advertising, market research, exhibitions and

[2] Research Institute of Agricultural Economics

[3] 265.36 HUF/EUR (Hungarian National Bank, April 2011.)

product policy among each other. However sector and national community marketing activity can not function effectively without the establishment of producer organizations and marketing cooperatives. The most important finding of *Szakály et al.* (2005) is that "the domestic community marketing can only be fully effective if a grassroots, marketing oriented system is managed to establish taking maximum into account the market needs and demands."

3. Based on the experience of previous years it can be stated, that although the average milk yield of the Hungarian dairy herd – 6 661 litre/cow/year based on HCSO (2010) – is nearly 5% above the EU average, nevertheless not the volume of yields is the most important in terms of the profitability of milk production, but the cost of production. Hungarian milk production is relatively expensive in comparison with the competitors (*Popp et al.,* 2008). Feeding costs represent the highest rate in cost structure of production, based on the statement of *Vágó* (2008) 43% of the costs are feeding costs. One reason for the high feeding costs is that dairy farms often do not have their own land to produce feed. If they can do they produce the necessary feed in leased land, however in worse case they base their production on purchased feed placing them even more vulnerable position. Moreover there is decreasing supply of the relatively cheap sugar-beet processing and cannery by-products, which further complicates the situation of producers. Losses from animal health problems can not be disregarded in the cost structure of production. In Hungary annual loss caused by reproductive disorders is roughly 150-300 EUR/cow, which can even be 9-11% of the farm's revenue. Another significant problem also causing serious losses is mastitis (*Ózsvári,* 2007). However further problem beside high feeding costs is our worse natural indicators, which are often caused by poor feed conversion and in many cases inefficient use of labour. If we take the economic dimension of sustainability into consideration the sector becomes more sustainable if energy-, water- and labour use are minimized. Minimizing labour use are in a huge contradiction with the social dimension of sustainability, which contains the important of increase in employment. All the above-mentioned factors contribute to the high net costs of dairy farmers. In 2008 centre of net costs was 0.28 EUR in case of defining commodity producers. The so-called better farms could produce milk 27% cheaper, for 0.21 EUR, while the less cot-effective farms produced milk for 0.32 EUR. The differences mainly arise from the costs of feeding (*Béládi and Kertész*, 2009).

On the one hand the above-mentioned threatening factors of dairy sector result in the lack of technological improvements, so production can be characterised by increasingly obsolete technology; while on the other hand several producers are ousted from the market choosing sales from house or entirely giving up production. All these factors could further deepen our already existing competitive disadvantage against the Western-European competitors.

CONCLUSIONS

After the brief overview of the Hungarian dairy sector and the collection of the examples for the dimensions of sustainability I can try to answer the question has been raised as the general objective of this paper. It was the following: How can

dairy industry achieve competitive growth, meanwhile it attempts to comply with the criteria of sustainability?

Competitiveness can not be always achieved in a sustainable way. It is confirmed by the many contradictions that arise during the consideration of this paper's examples. I selected only a few, most characteristics contradictions to prove my aforementioned statement:

1. Competitive large-scale farms with developed technological background (for example with milking robots) will use less human resources. It means that while the social dimension of sustainability expects the increase in employment in rural areas, until then in economic terms the goal is to minimize the labour use.
2. In order to provide job for the rural population in this sector it is necessary to achieve increase in the number of dairy cows. But the growth of the dairy herds' size will cause the increase in the methane emission as well.
3. As it has already mentioned dairy cow breeding is essentially a rural activity and it can provide additional income source for the rural population. But competitive milk production can not be completed in all regions of Hungary.

These are so-called vicious circles which make impossible to fulfil all dimensions of sustainability, meanwhile competitiveness is also be realized.

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