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**MACRO AND MICRO LEVEL ANALYSIS OF FACTORS
DETERMINING COMPETITIVENESS IN HUNGARIAN AND DANISH
DAIRY PRODUCTION**

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1 INTRODUCTION, THE AIMS AND HYPOTHESES OF THE DISSERTATION

In Hungary over the past decades, the share of agriculture in the national economy has steadily declined, the previous balance of crop and livestock production has been disrupted. The social and economic development corollary is observed in all developed and developing countries, globally however – as a result of increasing demand – a more intensive agriculture and an increasing animal production are characteristic. Unfortunately, as a result of opposite processes, our country has experienced a significant drop in livestock production, and animal production is in decline even today.

Cattle-keeping is not an exception, neither is dairy production, the Hungarian dairy sector has been struggling with serious problems connected to competitiveness for years. Mostly due to low purchase prices, stricter quality, animal health, hygienic requirements, numerous dairy farms were forced to close their farms.

One of the goals of a newer reform of Common Agricultural Policy (CAP) is driving forward the employment and economic growth, supporting those enterprises, enterprise communities and improving their competitiveness that provide the European citizens with quality food produced in a sustainable way (George Lyone report).

Accordingly, the primary aim of the dissertation is to analyse whether the traditionally animal farming area, farms of West Transdanubian Region suit the requirements, fit into the mentioned farming communities, have the necessary resources and how efficient they use them for remaining competitive.

The basic point was the fact that Hungary became a member of a market of millions in 2004, and its competitiveness is relative, exists just compared to the competitors, the development of competitiveness of Hungarian dairy production was compared to that of Danish which has been providing significant dairy product export in Europe.

The aims of the dissertation

Literature

- Mapping and analysis of agriculture in general, characteristic tendencies of dairy sector in the world, Europe and and Hungary;
- Presentation of the concept of competitiveness and measuring method;
- Review the competitiveness of dairy production and its efficiency factors;
- Outline of dairy market organisation and regulation.

Own analysis

Comparison of Hungary and Denmark

- Short presentation of the history of dairy farms (Hungary, Denmark, Europe) using secondary data for defining relevant historical, developing and development differences, tracing the present relations, analysis of role of agriculture, dairy production in national farming of the two countries.
- Analysis of factors influencing competitiveness of dairy production by comparing Hungarian and Danish dairy sectors. Using natural and economic efficiency indicators, presentation of eventual conformity and difference, outlining areas for strengthening, developing, and eventual transformation, improving, determining guidelines, emphasizing the role of other important factors – as professional standards, necessity of coalition, infrastructure.

Professional business analysis

- Evaluation of questionnaire survey (primary data collection);
- Presentation of production-technological factors, efficiency analysis (natural and economic), cost and income calculation;
- Determining the system of subsistence and sustenance capability of the farms (necessary farm size, production standards, etc.).

Hypothesis in connection with the aims

- Considering the Hungarian dairy sector as a whole, the development of natural efficiency and (as a result of this) competitiveness indicators (in international comparison) is unfavorable.
- In Denmark, milk is – based on the favorable climate for dairy production and efficiency superiority – produced in a more favorable cost level compared to ours.
- Significant proportion of Hungarian dairy farms, qualified by the Farm Accountancy Data Network of size categories applied in the European Union as being sustainable, are having subsistence problems.
- Due to unfavorable income conditions lasting for a longer period of time, a significant proportion of the animal-keeping farmers have given up their animal-product preparing and dairy product producing activity, making the crop farming of arable land almost exclusive in the production structure.
- The content of the dairy production sector is very heterogeneous. Accordingly, in spite of the unfavorable development of the indicators characterising the whole, or more precisely its average performance, it can not be stated that the conditions of the really competitive (rated with international standards) and development-capable farms would be excluded.

Beside the economic organisations producing the dominant proportion of milk, in Hungary (and in West Transdanubian Region as well) internationally competitive individual (family) farms do exist which are exemplary and can serve as appropriate model.

2 MATERIAL AND METHOD

The part RESULTS OF OWN ANALYSIS AND EVALUATION actually consist of two units. Comparison of factors influencing dairy production efficiency of Hungary and Denmark is done using secondary data, while the analysis of dairy farms of West Transdanubian Region - participating in the survey – is done using primary data. Considering the structure, first were always the national, and then the Hungarian professional business evaluations presented in the sub-section. During the research work, I did not manage to collect (primary) samples characteristic of Danish farms similar to the Hungarian one, or make a database. At the personal interviews (in Denmark, the problems were partly of language, secondly of technical nature with the questionnaire survey) only one farmer provided the cost data for 2008 and 2009 of his farm.

The necessary information for comparing the histories and historical development of the dairy farming of the two countries comes from books, studies, articles published in different journals in Hungarian, English and Danish languages. General data characterising Hungary and Denmark (area, land, population, livestock – Attachment 7), and concrete information concerning Hungarian and Danish dairy farms were collected mostly from the database of EUROSTAT in English language. For a more precise evaluation, database of other organisations, institutions (FAO – Food and Agricultural Organization; UNSD – United Nations Statistics Division – Commodity Trade Statistics Database; ICAR – International Committee for Animal Recording; IFCN – International Farm Comparison Network; FADN – Farm Accounting Data Network, HCSO – Hungarian Central Statistical Office, Danmarks Statistik, Statbank Denmark) were used as well in the dissertation.

For setting up the primary database characterising dairy farms of West Transdanubian Region, the survey was conducted by a questionnaire and personal interviews twice, at plants of different size and ownership relations (individual farms, economic organisations). The farmers got the same questionnaire first in 2007, then in 2012, referring to years of 2002-2006 and 2007-2011. While in the first case, almost 200 questionnaires were sent to those participating in the database on hand, the second time only those got the questionnaire who answered in the first round. In 2007, 30 (20 individual farms, 10 economic organisations), in 2012 12 (8 individual farms, 4 economic organisations) questionnaires for evaluation were received. The sample is thus composed of 32 dairy farms (20 individual farms, 12 economic organisations), and there are two „new” farms taking part in the second survey.

The analysis concentrated mainly on the development of livestock and its output, land at disposal, purchase prices and income conditions. Beside these, the

questions were referring to farms, general characteristics of the farmers, technical and technological conditions and some quality parameters.

Answers could be categorised according to the following categories: management and personal conditions (human factors); natural indicators (biological factors); technical, technological characteristics (physical factors); land ownership, land usage (nature factors); prices, cost and income conditions; support, investment, development (economic factors).

In order to find the answer to the question raised in the introduction – „whether the farms meet the requirements of CAP” – the individual farms were categorised according to more aspects:

- FADN typology
I calculated the plant size taking into consideration the actual (cattle section related but also connected to dairy production)¹ Standard Gross Margin (SMG) values and Euro-Forint exchange rate (European Central Bank, 31.12 of the given year) for the years of the examined period.²
- applied technology
- intensity of production
- sustainability of farms
The basis was the income need of a four-member family, which calculation was done on the basis of yearly expenditure per capita (CHSO) (Szűcs, after 2005) for the years of the examined period.

I used Microsoft Office Excel program for the statistic analysis of the dissertation, for the necessary calculations (average, standard deviation, ration, index, analytical trend, and multiple linear regression and correlation calculation) needed for evaluation and for demonstrative illustrations.

¹ Dairy cows and their progeny (e.g. two-year old and older cattle, dairy cows /J07/, cattle less than one year old, female /J02B/, forage areas for their provision (e.g. extensive grassland, meadow and pasture /F02/)

² Standard Output replaced Standard Gross Margin (SMG) in 2010 and since then it is the basis of the plant classification system. In the dissertation, the Standard Gross Margin (SMG) for each year, in order to achieve comparability is used.

3 OWN ANALYSIS AND RESULTS

3.1 Macro economic survey

For a sufficiently grounded and real presentation of the competitiveness of domestic dairy sector and its judgement, the analysis of the determining factors and their development were done by comparison with those of Denmark (as a reference country) and as a result of which the following were determined.

Trade factors

Milk and dairy products form a particularly rich product group, their consumption can therefore reflect well the eating habits of a population of a country and their standard, and indirectly the purchasing power of the consumers. **In Denmark, one and a half times more milk and dairy products are consumed than in Hungary**, which is on one hand due to cultural (The Danish use butter for both roasting and cooking), on the other hand due to economic reasons (above all Danish real income). Denmark is – beside much higher consumer prices than the European average - characterised by large domestic consumption, with contrast to Hungary where the consumers find the milk and dairy products expensive, and the standard of consumption is unfavourable from nutrition-biological aspects.

The balance of trade of milk and dairy products in Hungary is negative at the moment. While the proportion of more expensive and those of added value products is higher in the import, the share of cheaper, less processed products increased in export. The foreign products on the domestic market have not been serving the choice expansion for a long time, as they are competitors to Hungarian products exactly in the product group which could realize the biggest profit.

In Denmark, the huge milk surplus represents an excellent export base, export trade proportion of milk and dairy products is specially advantageous. In the past period, the milk and dairy products' import has increased in the country, it is far behind the export in terms of both quantity and value.

There are 50 milk processing plants in Hungary while in Denmark nearly 30. In our country, none of them own not even the 25% of the market share, in Denmark, the Arla Foods owns 90% of the market. **In Hungary** therefore, despite the fact that some of the leading companies in the global dairy market have their representations here, **there is no such milk processing company that would be capable to realize strategy applying the most up-to-date technology, producing high added value, cost-effectively which characterises big companies; and act as a really determining market participant on the international stage with united advertisement and sales promotion.** Beside all this, the Hungarian companies lag behind their competitors in product

development. The smaller companies are poor in capital, more serious product development is almost out of question due to high costs, and the present multinational companies develop and produce the real innovative new products in their country and not in subsidiaries. The biggest processing companies could reach a more favourable position by cooperation (work share), mutual product development and marketing activity, and for smaller companies – similarly to 30 smaller cooperatives in Denmark, covering 10% of the market – a solution for future could be production of special products.

Nature and climate factors – land

The share of agricultural and arable land from the whole land is outstanding in both countries, as for the arable, it is the highest in Denmark and Hungary within the EU-27. In 2011, the agricultural land in Hungary was 19%, in Denmark it was 34% fodder area, two-thirds of which are constant grass lands in Hungary, while in Denmark they were the arable fodder areas. Consequently it is logical that grass lands expanded in Hungary and **the fodder crops grown at the arable land in Denmark represent primarily the fodder base for the bovine livestock** (despite the fact that the territories of the northern, northern-western seaside countries are covered by characteristically thick, high yield pasture). At the same time, it is well known that a big part of grass land is not utilized in Hungary, however in Denmark – where grazing is a normal practice – the arable land, the so called temporary grassing actually functions as lawn.

By comparing the milking cow livestock and the fodder area, it turned out that **in Denmark much bigger livestock** (the difference is one and a half times more at the farms specialised for livestock dairy production) **is supplied on a unit land than in Hungary, and unambiguously the background for this is the difference in numerous average yield, higher land efficiency.** However the high average yield can not be attributed exclusively to the favourable climate of the northern countries.

Biological and physical factors

Despite the significant decrease in the number of cow livestock **in Hungary**, the decrease of the whole **dairy production** was milder, and the **decreasing tendency could not have been turned back by the increase of yield either.** Contrary to this, **in Denmark in parallel to decrease of cow livestock number, due to the continuous increase of yields, the whole dairy production increased.** Nowadays, in dairy production of both countries the type of Holstein-Friesian becomes dominant (with 90% share within the milking cow livestock), in spite of it, **the Danish average production standard far exceeds the Hungarian.** In 2011 an average Hungarian cow gave on average 6800 kg milk with 3,67% fat

content, the average milk output of a Danish cow was 8400 kg with 4,27 fat content.

The technology of building **stables in Denmark** is variable, but they **are light structured buildings made of pre-built units**. When designing, a very important criteria is that one person should be able to do all activities if necessary, and an eventual later expansion would not meet any difficulties. **In Hungary**, there are no up-to-date information as the building conditions are concerned, but some 10 years ago, the **age of the bovine livestock stables was on average 31 years old, and only 17% of these were younger than 10 years old**. The walls of the buildings were in 72% made of a some durable material (stone, concrete, brick), drainage was done only by third of them.

Owners, leaders of farms in Hungary nowadays do not undertake to establish stables provided by contemporary, modern equipment and farm buildings. The present situation of animal farming has caused insecurity, kind of distrust among farmers who abstain from long term investments and development which may go with some restrictions (for example maintenance obligation).

One of the most important functions of infrastructure is providing fast flow of products and information. In Denmark, the farms, agricultural operations are connected by main roads of excellent quality road network so the manufactured goods arrive without any disturbances on time to the processing and selling places. Opposite this, in Hungary there are still farms which ship milk every second day due to difficulties to be approached. Telephone, internet availability are nowadays indispensable tools for farms to join local, regional, national, or European circulation, the farmers can get up-to-date information about the economy or section concerned, facilitating in this way the agricultural production as business recovery.

Human factors

In 2007, including the owner, family member or possible employees, **in Hungary there were on average 2,96 people, in Denmark 2,52 people working (specialised on dairy production) on a farm, and the number on milking cows per worker was 7,14, and 45,05**.

The calculations show that **in northern countries on farms keeping more than 100 cows the work expenditure is four times more efficient than in our country**. In Denmark, the owner and the family members, and in some cases the employees (altogether 2-4 people) serve much more cows (in this category) than in Hungary on average 41 workers.

In Hungary yearly dairy production per worker (owner, family members and employees) in 2007 was 105 thousand kg, in Denmark it was 414 thousand kg, extracting 100 kg milk took 1,2 hours in Hungary, whereas in Denmark it took 0,37 hours.

The role of professional preparation is of outstanding importance for quality dairy production and operation. The lack of skilled workforce is a problem not only for dairy sector but for the whole agriculture. **In 2011, the level of qualification of agricultural employees in both countries fell beyond those working in the national economy.** The most outstanding is the difference in lower qualified workforce, in Denmark almost half of the employees had only primary school certificate. Significant proportion of the latter – based on the Danish education system – were students completing their practice period. The number of employees is very small compared to the number of farmers, therefore a real picture about competence can be achieved by considering the qualification of the owners and family members. In 2007, **only 8% of Hungarian farmers have finished secondary school or college/universities**, opposite to this, a leader of a farm **in Denmark** can only be a person who got agricultural qualification. If the territory is bigger than 30 hectares, the **user of it should have wide-scale agricultural qualification, which means at least 3 years of trainee work (in at least two operations), and a 9 months long farmer course.** And in many cases, studies abroad are necessary as well.

Economic factors – prices, cost and income situation

The purchase price index of milk in Hungary and Denmark lagged behind not only the agricultural production but the input and consumer price index in 2011. In case of Hungary the difference is particularly outstanding concerning consumer price index. **The reasons for this are the unfavourable price structure, the disproportion characteristic of Hungarian milk verticum.** The chance for increase in the production prices is slight for now, just as it would result further consumer price increase, which consequence would be consumption decrease. The increase of production prices would damage the international competitiveness.

The comparison of unit cost of dairy production shows that **the Hungarian farmers produce their own fodder much more expensively than the Danish farmers.** Marginal contributions for 1 tonne of milk were in vain double in Denmark compared to Hungary, we can not speak about advantageous income situation in either countries, as between **2004 and 2009 the specific income of the farms in Hungary and Denmark was in negative range.** While **in Hungary, the biggest costs were the labour costs, in Denmark they were the interest costs.** In Hungary the high labor costs refer to disadvantages in organization, work productivity, in the Scandinavian country the investments of the past decade led to indeptedness of farms.

Denmark has been member of the European Union since 1973. The Danish farmers could come to big income due to the price support, the intervention, a high consumer prices particularly in the beginning. Opposite this, Hungary joined the European Union in 2004 and similarly to the other new members, it received

just a determined percentage of the EU-10 support level. As the Danish example shows there the income from the farms and **significant support from the union provides the re-production, in Hungary the support rather conserves the established situation**, the Hungarian farmers do not dare and can not start a more serious, innovative development due to lack of capital.

Danish dairy production is thus without doubts **more efficient than the Hungarian**. This is beside others due to more favourable capital supply, more modern technology, more qualified workforce, thicker infrastructure, but above all owing to the **unity, uniformity that characterises the whole Danish dairy verticum**.

The Danish dairy production would not have been able to achieve the present development level without the cooperative network which has been in control of and operating the production of some farms and operations for more than a decade. **In Hungary just – with the mediation of the cooperative network - the lack of unity is one of the biggest problems**, both horizontally and vertically. In order to be competitive with leading countries in dairy production, the requirements of Western Europe, and Denmark – products of excellent quality, continuously high standard, as cheap as possible, precise shipment are inevitable. The realization of this is unimaginable without establishing the already mentioned organization, rational work share, tight cooperation with processing and sales unities. **The possibility of establishing sales cooperatives in Hungary like the one spread in Denmark (see Arla Foods) is really low**. However, different **farmer cooperation**, mostly on input side, but also in the phase after production (establishing creameries) **would play an important role** in improving the vulnerable situation of the farmers. The latter could by concentrating the farmers, on one hand, provide lower shipping costs, and on the other hand – by complying certain requirements concerning the dairy production – provide more uniform raw material to the processors.

3.2 Professional business analysis

Due to the low number of samples, the survey can not be considered representative, it can not be used for making consequences on national level. The presented results are thus of informative nature, but provide answers to the question whether competitive farms exist on international level on the given territory, thus in Hungary as well.

As out of the 32 farms participating in the survey, 20 were individual farms and 12 economic organisations, and in case of the individual ones, „only” 8 were primary producers and the rest family farms – we can conclude that the dairy production of West Transdanubian Region in terms of business/enterprise (primary and secondary) form, show a variable picture. This is particularly true if we consider that 7 were cooperatives, 4 shareholders and 1 limited liability

company out of the analysed economic organisations. However, for 18 of them farming was full time job and 2 perform the activity as second job out of the 20 individual farms and without exception only the farmer and family members work on the farm.

As for the qualifications, it is by all means favourable that – in case of individuals – although older generation is characterised by 8 grades of primary education (but they are primarily pensioners, they perform dairy production as a supplementary activity), the 90% of younger generation has secondary education. At the same time, in total **the skilled qualification is present at only 50% of the farmers participating in the survey.** Although the person providing the leading role of the plant usually has tertiary education **in the economic organisation, the lack of skilled workforce** performing the everyday activity and having the direct contact with the animals **is one of the most significant barriers of the efficiency increase.**

In the tendency of the analysed period (2002-2011), at both the individual farms and economic organisations, the average number of cows increased, and the production standard improved. Although **milk yields (average, specific) of the economic organisations surpassed the individual farms', the reasons for this are mainly the type combination characterised of the latter, as at the farms keeping exclusively Holstein-Friesian type of cows, the differences have disappeared between the two farming forms.**

The **lack of consulting organisations** similar to the ones present in Denmark is mostly felt at solving breeding and reproductive biological problems. On the basis of experience, the individual farmers are not aware of the extent early culling and prolonged time between two calving can damage the income of dairy production.

The indicators of work productivity have improved at both farming forms in the analysed period, but lagging behind the West European competitors is still significant. The applied technology at the individual farms actually sets limits, the basic problems at the economic organisations are primarily in work organisation, and work share.

The purchase prices in case of the individual farms have **increased** by 18% and by 20% in case of economic organisations **in the presented 10 years period of time,** but there is a significant fluctuation in certain years. **The price of raw milk was quite different at the individual processors,** at the beginning the difference from average exceeded 30 HUF.

The specific income at the individual farms exceeded 10HUF/L every year, whereas in the economic organisations in 2004, 2005 and 2009, the costs were not cleared with the added support to milk prices. It should not be forgotten however that the unit production costs of the individual farms do not contain the labor cost, the amortization costs, which would be a significant cost increasing part in case of a complete calculation. At the economic organisations, the

overhead of dairy production increased by 12% in the analysed period, which is mostly result of increase of fodder cost that makes 40-50% of costs.

According to the size categories of ESU, **all the analysed individual farms were sustainable, however there was a farmer who gave up the production as it was loss making.** At the same time, there are farms participating in the sample which can be considered competitive, that maintained or increased their product output level, their operation resulted in profit for the family business providing subsistence for their family.

Emphasizing that the results can only be considered as guiding, it can be stated on the basis of the sample that **farms with at least 20 cows** (performing yield level of 5000 liter/cow), **30 hectare of fodder area provided subsistence for a four member family in each analysed year.** At the same time, farms keeping less than **10 cows did not in either case meet this requirement.** All these confirm the hypothesis according to which **farms in West Transdanubian Region keeping less than 10 cows gave up dairy production, while those with more than 10 cows increased their stock, developed their farm** to maintain and increase their competitiveness.

4 NEW AND NOVEL SCIENTIFIC RESULTS

- **The development of Hungarian dairy production compared primarily to Danish, and the EU-27 member countries on the basis of performed natural efficiency, cost and income analyses is unfavourable. The disadvantage is due to unfavourable development of relevant production technological indicators as well, but much rather to low standard of labour efficiency.**
- **In Denmark, the costs of own grown fodder (in the analysed period) were lower than in Hungary, whereas production cost of milk in Denmark in certain years exceeded the domestic.**
- **A significant proportion of the Hungarian dairy production farms qualified by the Farm Accountancy Data Network of size categories applied in the European Union as being sustainable, are having subsistence problems, some of them were forced to close due to their loss making.**

Farms keeping at least 20 cows (performing yield level of 5000 liter/cow), with 30 hectare of fodder area provided subsistence for a four member family in each analysed year. At the same time farms keeping less than 10 cows did not in either case meet this requirement.

In case of farms not completing the sustenance level (on the basis of own developed criteria system), concerning the expected development of profitability, it was more favourable for them to give up dairy production and deal with crop farming on the land at their disposal.

The results of the analysis show that **beside the economic organisations producing the dominant proportion of milk, in Hungary (and in West Transdanubian Region as well) internationally competitive individual (family) farms do exist which are exemplary and can serve as appropriate model.**

5 LIST OF PUBLICATIONS IN THE TOPIC OF THE DISSERTATION

Scientific study published in Hungarian language in supervised periodical:

Salamon I. – Mészáros J. – Németh A. – Tell I. (2007): Miért nem legeltetik a tejelő teheneket? *Gazdálkodás*, 51. évf., 5. sz.

Kacz K. – Koltai J. – **Salamon I.** (2008): A földbirtok- és üzemszerkezetet befolyásoló tényezők hatásvizsgálata Nyugat-Dunántúl gazdaságainak körében. *Acta Agronomica Óváriensis*, 50. évf., 2. sz.

Scientific study published in foreign language in supervised periodical:

Salamon I. – Hegyi J. – Tell I. – Kacz K. (2013): Development of profitability and the sustenance capability of the West Transdanubian Region family dairy farm. *Acta Agronomica Óváriensis*. Megjelenés alatt.

Lecture and poster in Hungarian language:

Salamon I. – Mészáros J. – Hegyi J. (2005): A tej minőségének alakulása a felvásárlói árak tükrében (1984-2004). *Gazdálkodás Konferencia*, Mosonmagyaróvár, 2005-10-14, Konferencia kiadvány

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- Németh A. – Mihályfi S. – Salamon I. – Gergátz E. – Gulyás L. (2007): A Lacaune juh fajta szerepe a magyar juhágazat versenyképességének javításában. AVA-3 Konferencia, Debrecen, 2007-03-20, Konferencia kiadvány
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- Németh A. – Mihályfi S. – Salamon I. – Gergátz E. – Gulyás L. (2007): A Lacaune juh fajta szerepe juhtenyésztésünkben. XIII. Ifjúsági Tudományos Fórum, Keszthely, 2007-03-22, Konferencia kiadvány
- Salamon I. – Mészáros J. – Németh A. – Mihályfi S. – Kettinger A. – Tell I. (2007): Miért nem gyep? - A szarvasmarhatartás és gyephasználat összefüggései. Gazdálkodás Konferencia, Mosonmagyaróvár, 2007-04-25, Konferencia kiadvány
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