ECONOMICS OF MILK PRODUCTION IN 2010-2016 – A HUNGARIAN CASE STUDY

SZÁNTÓ László, SZŰCS István, SZŐLLŐSI László
University of Debrecen Faculty of Economics and Business Institute of Applied Economics, Debrecen, Hungary
szantoo.laszlo@gmail.com
szucs.istvan@econ.unideb.hu
szollosi.laszlo@econ.unideb.hu

Abstract: *The Hungarian dairy sector had to face quite a few challenges due to the main global and European events over the past years. Among other things, the Russian's embargo and the abolition of the milk quota system were the key reasons why the milk sales prices drastically reduced both in the EU and in Hungary in 2015. As a result, many Hungarian dairy farmers – mainly smaller ones – have gone bankrupt and ceased farming. The aim of the study is to present – as a case study – how the economic situation of the Hungarian milk production has changed in the period 2010-2016 based on a dairy farm operating in Eastern Hungary. Data collection was based on data from 2010-2016 and primarily focused on the change in the animal stock, production and technological parameters, input and output prices, as well as average cost items. Based on the collected data, the cost and income situation of milk production in the analysed farm were determined using a deterministic model calculation. The main indicators of the farm were also compared to the Hungarian and international figures. During the analysed period, modernisation investments were implemented which improved production and financial parameters. The obtained results show that the specific milk yield increased by 7% and the efficiency of human resource use improved by more than 100% between 2010-2016. Production costs increased by 50% between 2010-2014, then declined by 15% by 2016. Sales price in the farm increased by nearly 40% between 2010-2014, followed by a 21% decrease. Net income was fluctuating during the given period but the production was profitable in the analysed farm. However, the milk production was unprofitable without subsidies in 5 years.*

Keywords: *Hungarian milk production; dairy farm; economic analysis; profitability; efficiency.*

JEL Classification: *M11; Q12.*

1. Introduction

The global milk production was 829 million tonnes in 2017 (OECD-FAO, 2019). The production quantity has been constantly increasing, which became more intense in the last decade due to the increasing demand for milk and dairy products and favorable weather conditions for milk production (Vőneki – Mándi-Nagy, 2014). World milk production and the closely related milk processing are concentrated in Europe and the North American continent. In 2017, the EU-28 countries accounted

for more than 25% (170.1 million tonnes) of global milk production, which has been growing intensively since 2013 (Eurostat, 2018). The Hungarian dairy sector produced 1.92 million tonnes of milk in 2017, representing only 1.1% of EU production (HCSO, 2019). Thus, the importance of the Hungarian dairy sector within the EU is small, and significant changes affected the dairy sector in recent years, which made the Hungarian dairy industry more exposed than other Western European Member States.

Russia has been banning imports of EU products since the summer of 2014. As a consequence, Russia stopped importing milk and dairy products from the Member States, including Hungary (Boulanger et al., 2016). As a result, the EU-28 countries were looking for other outlets where they could sell their products, thus delivering more products to markets where Hungarian dairy products were more prevalent, thereby making it more difficult to sell Hungarian products in these markets due to the strengthening competitors.

In 2015, the EU milk quota system to regulate the EU dairy market was also abolished. As a result, Member States are no longer bound in terms of milk production, and more advanced, primarily Western European countries are able to produce more milk, creating further difficulties for less developed countries, including Hungary, which could never even reach their quota (Xiaodong, 2017). Hungary only used 72-76% of the quota framework during the years leading up to the abolition of the milk quota, i.e., the milk quota did not limit milk production in Hungary both before and after the accession (Szűcs – Szőllősi, 2015). Most dairy farms in countries with increasing milk production are able to produce milk in a more cost-effective way, making Hungarian producers even less competitive, not to mention that the abolition of quotas has led to a drastic reduction in European milk prices.

As a result of these two major events, as well as other trends in supply and demand on the dairy market, a "milk crisis" emerged in 2015-2016.

The profitability of milk production in Hungary is relatively low compared to other agricultural sectors, which is due to low purchase prices and high average cost. This finding is supported by Blaskó et al. (2012), adding that the demand for dairy products with higher added value tends to decrease. Low purchase prices are basically due to the fact that producers are exposed to processors. Although the Milk Package, introduced in 2012, has slightly improved the position of producers vis-à-vis processors, they are still in a difficult position to negotiate prices. Moreover, there is still not a strong enough horizontal unification of interests at the level of milk producers to strengthen their bargaining power against processors.

The importance of small-scale milk production in Hungary has declined in recent decades. Large-scale and industrial technology dominates Hungarian milk production. Contrary to the global and European structure, more than 80% of the milk produced in Hungary comes from farms with large cow population (only 5% of farms can be called large farms) and the number of cows is the highest on these farms (over 350). For this reason, Hungary has a comparative advantage from the aspect of economies of scale on an international scale, which is expected to continue in the future. In Hungarian dairy production, housing methods and feeding technology (as well as its quality), farm size, and feed production and preservation issues are cardinal factors, as most Hungarian farms are lagging behind in this area.

Feed costs make up the largest part of milk production cost. In Hungary, extensive grassland management is dominant, with yields far below those of Western European countries. Therefore, on the one hand, the cost of hay is relatively high and, on the other hand, grazing is almost completely excluded from feed technology. In addition, mono-diets are dominated by maize-based fodder, which makes the sector vulnerable through volatile feedstock prices. Moreover, the dominance of maize (a feed system based on grain and silage maize) degrades breeding performance, resulting in a high cull rate and a short useful life (1.8-2.2 years/cow), which also increases average cost through the use of "unused" breeding stock (Szűcs – Szőllősi, 2015).

At the same time, the useful life of producing cows is extremely low, not only in Hungary, but in all producing countries with high specific yields. Therefore, no significant improvement is expected in the lactation number of 2.2. The age at first calving of cows can be an important indicator for breeding and economic efficiency. Dairy breeds, such as the Holstein Friesian, are suitable for early rearing, and calving can take place by 24 months with appropriate heifer rearing technology. Internationally, Hungary has a 1-2 month lag, which is clearly due to inadequate heifer rearing technology and the professional excellence behind it. However, Hungary has a significant reserve (10-20 days) between the two calvings, which is currently over 440 days. Furthermore, this figure is over 400 days in most high-income countries. The solution is to raise the standard of housing and feeding technologies, quality expertise and adequate reproductive biological management (Szűcs et al., 2015).

Currently, about 92% of the Hungarian dairy cattle population is Holstein Friesian and crossbred, which is of similar importance internationally. Hungarian dairy cattle breeding has become internationally significant in recent decades as a result of specialisation and specialised production. Hungary ranks high in Europe and globally in terms of milk per cow and milk hygiene parameters. No significant improvement in these parameters is expected in the future. At the same time, the content of the milk produced (3.6% fat, 3.3% protein) is below the EU average, and, currently, quantitative parameters are preferred over quality. In this field, partial change of breeds, the greater spread of crossing and the modifying of feeding technologies can bring progress (Szűcs et al., 2015).

Over the past 15 years, Hungarian dairy farmers have been facing serious problems. Milk production was unfavourable at the time of EU accession (2004), and the economic situation of the sector was more or less stabilised by 2006. The Russian embargo starting in 2014 and the abolition of the milk quota in 2015 again had a negative impact on the sector. Between 2010 and 2016, the cost of producing milk increased steadily from 1 711 to 2 581 EUR per cow (Table 1). Despite the improving average yields, this tendency is also evident in the average cost, which has increased from 22 to more than 30 Eurocents per litre. At the same time, due to favorable international market conditions, the purchase price of raw milk increased until 2014, and it decreased significantly by 2016, even below the 2011 level. As a result, the profitability of milk production was favourable until 2014, but in 2015 and 2016, producers were able to realise income only with subsidies.

Table 1: The cost and income situation of dairy sector, averaged over the determinant producer farms (2010-2016)

Item	2010	2011	2012	2013	2014	2015	2016
Sales price (Eurocent/litre)	23.4	28.0	29.2	32.0	34.2	26.7	24.1
Production value (EUR/cow)	2 239	2 593	2 745	2 886	3 238	2 855	2 923
Production cost (EUR/cow)	1 711	1 819	2 055	1 991	2 177	2 312	2 581
Average cost (Eurocent/litre)	22.2	23.5	25.4	26.2	27.3	28.8	30.1
Income (without subsidies) (Eurocent/litre)	1.2	4.5	3.8	5.7	6.9	-2.0	-1.8
Income (EUR/cow)	528	774	690	897	1 060	544	295
Cost profitability (%)	30.8	42.6	33.6	45.1	48.7	23.5	11.5

Source: Hungarian Farm Accountancy Data Network (FADN) averaged over the determinant producer farms, In: Béládi – Kertész, 2012; 2014; Béládi et al., 2017 and Szili – Szlovák, 2018

The Hungarian dairy sector has received considerable government assistance in recent years. In addition to an EU aid of 68 million EUR in 2018, farmers received nearly 50 million EUR of national funding in 2018 under a temporary national aid. In 2018, Hungarian farmers produced more than 1.9 million tonnes of milk. The sector is stable regarding production, but the number of cows is stagnating. The average cost of milk increased significantly, with the average price of milk being 30.5 Eurocents per kilogram and the average cost of milk fluctuating between 29 and 32 Eurocents. Some dairy farmers would be unprofitable without subsidies. The balance between milk imports and milk exports is still negative, with about 20% more value entering the country. The sector's export earnings were close to 203 million EUR in 2018 (HCA, 2019).
The aim of the study is to present – as a case study – how the economic situation of Hungarian milk production has changed in the period of 2010-2016 based on a given dairy farm operating in Eastern Hungary.

2. Material and methods

During data collection primary and secondary data is also applied. The latter one is used by different kinds of database. Primary data was collected from a Hungarian farm. Primary data collection was based on data from 2010-2016 and primarily focused on the change in the animal stock, production and technological parameters, input and output prices, and average cost items. Based on the collected data the cost and income situation of milk production in the analysed farm were determined using a deterministic model calculation. Financial results were converted to EUR using a base year exchange rate of the Central Bank of Hungary in 2016 (311.46 HUF/EUR). The main indicators of the farm were also compared to the Hungarian and international figures. For the comparison we used the average data of the Hungarian Farm Accountancy Data Network (FADN) on the determinant producer

farms (Béládi – Kertész, 2012; 2014; Béládi et al., 2017; Szili – Szlovak, 2018) and the EC (2016) database.

3. Results and discussion

During the examined period, the farm had 1 500 to 2 000 cows, and their offsprings, which were kept on two farms. On one of the farms, a complex milking parlor and two sheds were built in 2011, both of which having a capacity of 528 cows, while in 2014, two sheds with the same capacity were built. Until the end of 2011, all age groups of cattle were kept on both farms. However, the population was divided after the investment to provide efficient production. The site where the investment was made was the "main farm" (Farm A) while the site where no development was done is the secondary site, a rearing farm (Farn B). Cows and their offsprings are kept in Farm A until they reach 90 kg. The bulls are then sold and the heifers are moved to Farm B, where they are first inseminated after rearing and maturation, and are returned to Farm A two weeks before calving to get into production immediately after calving. The cows remain on Farm A until they are culled. At the end of the production process, the raw milk produced and already chilled, which is sold for further processing, is purchased 100% by a local dairy.
The mortality, culling rates and the number of lactations on the farm showed continuous improvement during the examined period (Table 2). The lactation average was much better than the Hungarian average of 2.2. The number of days between calvings was also favorable, with an average of 397 days.

Table 2: Mortality and culling rates and number of lactations in cow group

Year	Mortality	Culling	Total removed	Number of
2010	7	26	33	3.3
2011	5	31	36	2.7
2012	6	29	36	2.7
2013	5	29	33	3.3
2014	6	26	32	3.1
2015	5	28	33	3.3
2016	5	25	30	3.3

Source: own data collection, 2017

Milk is the main product of the farm's dairy sector, while the by-products are sold animals of different age groups and manure. Subsidies received also increase production value. The farm's production value per cow ranged between 3 200-4 400 EUR during the examined period (Figure 1). 55-75% of the production value came from milk sales, 5-15% from the sales of by-products and 15-40% from subsidies received. From 2010 to 2014, milk sales revenue increased steadily from 2 025 to 2 807 EUR per cow. In the last examined year, this figure was 2 395 EUR per cow. There is no trend in the value of the subsidies received. The received subsidies were the highest in 2016 (1 656 EUR/cow).

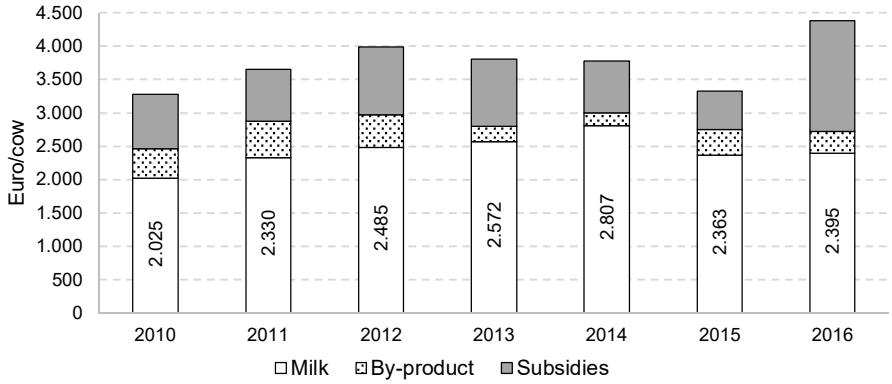

Figure 1: Production value per cow (2010-2016)
Source: own data collection

Table 3 compares the average prices of the examined farm between 2010 and 2016 with the average sales prices in Hungary and in the EU-28 countries. The average prices of the farm were above average national sales prices each year, while EU-28 average prices were generally 3-15% higher. Between 2010 and 2014, sales prices increased steadily in all years. However, it declined in 2015 and 2016.

Table 3: Average sales price of raw milk (2010-2016)

Year	Average sales price (Eurocent/kg)			Difference (%)	
	Examined farm	Hungary	EU-28	Farm / Hungary	Farm / EU-28
2010	23.79	22.89	27.03	3.93	-12.00
2011	27.71	27.61	30.47	0,35	-9.06
2012	29.44	27.71	30.34	6.26	-2.96
2013	31.53	30.82	35.45	2.29	-11,05
2014	33.26	33.12	36.83	0.39	-9.68
2015	27.80	25.81	31.21	7.71	-10.91
2016	26.26	23.79	29.51	10.39	-10.99

Source: own data collection; RIAE MPIS, 2017; EC, 2016

Table 4 shows the average annual milk yield per cow between 2010-2016 for the farm, Hungary, the EU-15 and EU-13 countries. The milk yield of the examined farm was 10-20% higher than the Hungarian average value. Moreover, it was 13-19% more favorable than the specific yields of the EU-15 Member States. The Hungarian dairy sector performs 40-50% better than the EU-13 average, which includes less developed Eastern European countries. In Hungary, as well as the EU-15 and EU-13 countries, milk yields continued to increase on a yearly basis, while the milk yield per cow of the examined farm showed a different tendency. The milk yield of 8 500 kg/cow/year in 2010 decreased to 8 160 by 2013. From 2014, after the investments, specific yield started to increase and it reached 9 120 kg per cow by 2016. In our opinion, this tendency is due to good nutrition and advanced technology, which has

an outstanding performance compared to the farms of developed European Member States.

Table 4: Specific milk yields (2010-2016) Unit: kg/cow/year

Year	Examined farm	Hungary	EU-15	EU-13	Difference (%)		
					Farm / Hungary	Farm / EU-15	Farm / EU-13
2010	8 508	6 890	6 961	4 288	23.48	22.22	98.41
2011	8 409	6 863	7 137	4 388	22.53	17.82	91.64
2012	8 439	7 122	7 082	4 621	18.49	19.16	82.62
2013	8 160	7 133	7 040	4 684	14.40	15.91	74.21
2014	8 444	7 457	7 275	4 951	13.24	16.07	70.55
2015	8 499	7 718	7 356	5 130	10.12	15.54	65.67
2016	9 120	7 781	7 442	5 341	17.21	22.55	70.75

Source: own data collection; HCSO, 2016; EC, 2016

Table 5 summarises the production cost per cow over the examined period. In terms of direct costs, material costs account for the largest proportion. Material costs generally ranged from 1 500 to 2 100 EUR/cow. More specifically, the largest item is feed costs, which account for 70-80% of material costs.
In terms of labour costs, there was an increase from 2010 to 2013, but as a result of the investments, the value decreased. Labour costs accounted for 16% of production costs in 2010 and only 13% in 2016. In 2010, the headcount was 93, which decreased by 11% to 83 by 2016, while the average number of cows increased by 150. The number of hours worked decreased by 40.2% from 191 000 in 2010 to 136 000.

Table 5: Production cost per cow (2010-2016) Unit: EUR/cow

Item	2010	2011	2012	2013	2014	2015	2016	2016 / 2010
Material cost	1 507	1 727	1 748	1 802	1 919	2 000	2 081	138%
from this: feeding cost	*1 047*	*1 175*	*1 406*	*1 435*	*1 416*	*1 599*	*1 580*	*151%*
Labour cost	390	422	416	439	420	378	380	97%
Depreciation	163	335	308	296	301	122	168	102%
Machinery cost	98	121	104	105	100	81	5	7%
Other direct cost	166	161	110	125	154	161	224	135%
Total direct cost	2 325	2 765	2 686	2 763	2 894	2 742	2 859	123%
Overheads	126	127	127	120	130	100	114	92%
Production cost	2 451	2 892	2 813	2 888	3 024	2 842	2 973	121%
Production cost of Hungarian average*	1 711	1 820	2 055	1 981	2 177	2 312	2 488	135%
Cost of farm/Hungarian average cost (%)	143	159	137	146	139	123	120	-

*Average of determinant producer farms of the Hungarian FADN
Source: own data collection; Béládi – Kertész, 2012; 2014; Béládi et al., 2017 and Szili – Szlovák, 2018

Machinery costs were between 95 and 125 EUR/cow between 2010 and 2014, but subsequently followed a downward trend, with only 5 EUR/head/year in 2016. This is because the company has sold its own machines and started hiring machines from other contractors.
We also examined the depreciation and obsolescence of the tangible assets of the dairy farm. Depreciation was between 120-340 EUR/cow. There was an increase in 2011 and 2014, which could be attributed to investments (newly built milking sheds and stables). The obsolescence rate decreased from 51% in 2010 to 13% after the first investment and then to 3% after the second investment in 2015.
Overheads ranged between 100 and 130 EUR/cow during the examined period, representing 4-5% of the production cost.
The total cost of production during the examined period was between 2 400 and 3 100 EUR per cow. Compared to the average production costs of the determinant producer farms of the Hungarian FADN, it can be seen that the examined farm had around 30-60% higher production costs.
The farm's average cost was 23-26 Eurocent/kg in the examined period and it increased by almost 40% between 2010 and 2014, while the average cost of milk in the determinant producer farms of the Hungarian FADN increased by 45% over the same period. Subsequently, a decrease was observed, similarly to the national trend. In 2016, the average cost of milk at the farm was 26.3 Eurocent/kg, which was 21% lower than the average cost of 2014, but 10% higher than the 2010 value. Compared to the Hungarian average, it can be found that the farm usually produces 1 kg milk at a 10-25% higher cost. However, as it was shown above, the specific yield indicators of the farm are significantly better than the Hungarian average.

Table 6: Changes in income (2010-2016) Unit: EUR/cow

Item	2010	2011	2012	2013	2014	2015	2016	2016 / 2010
Production value								
- Analysed farm	3 278	3 656	3 995	3 828	3 780	3 322	4 377	133%
- Hungarian average*	2 237	2 594	2 745	2 886	3 236	2 854	2 922	131%
Production cost								
- Analysed farm	2 451	2 892	2 813	2 888	3 024	2 842	2 973	121%
- Hungarian average*	1 711	1 820	2 055	1 991	2 177	2 312	2 488	145%
Gross income (production value – direct cost)								
- Analysed farm	954	891	1 179	1 060	885	580	1 518	145%
- Hungarian average*	710	941	896	1 108	947	793	1 503	212%
Net income								
- Analysed farm	828	764	1 182	940	755	480	1 404	170%
- Hungarian average*	527	774	690	895	1 060	543	433	82%
Net income without subsidies								
- Analysed farm	80	-24	169	-75	-25	-91	-257	-
- Hungarian average*	No available data							

*Average of the determinant producer farms of the Hungarian FADN
Source: own data collection; Béládi – Kertész, 2012; 2014; Béládi et al., 2017 and Szili – Szlovák, 2018

Net income in the 2010-2016 period was between 480 and 1 500 EUR per cow (Table 6). The best year was 2016, when the farm realised a profit of EUR 1 404 per cow, which was mainly due to subsidies, with the highest proportions being 'Transitional national milk aid', 'Special milk aid for the structure of the milk sector' and 'Dairy cattle management support'. The former two were introduced to milk producers in 2015 in view of the crisis in the sector, replacing "Milk quota aid" and the "Special milk aid". The farm received the "Fattened Bull Support" for the existing bull stock. Compared to the Hungarian average, the company's net income was less favorable only in the years when the company made modernisation investments. However, net income without subsidies was positive only twice out of the seven examined years. The farm was able to make 80 EUR per cow in 2010 and 169 EUR per cow in 2012. It can also be seen that subsidies are of great importance in this sector.

Table 7: Efficiency indicators (2010-2016)

Denomination	2010	2011	2012	2013	2014	2015	2016	2016/2010
Profitability *(%; ROS; net income/turnover)*	34.2	27.4	40.5	33.1	25.7	17.4	52.2	153%
Direct cost profitability *(%; gross income/direct cost)*	41.0	32.2	43.9	38.4	30.6	21.2	53.1	130%
Cost profitability *(%; net income/production cost)*	34.1	26.9	42.0	33.5	25.6	17.3	47.9	138%
Net income per product unit *(Eurocent/kg)*	9.7	9.1	14.0	11.5	9.0	5.7	15.4	150%
Turnover per one working hour *(Eurocent/working hour)*	2.4	2.9	3.6	3.5	4.1	4.0	4.0	186%
Production value per one working hour *(Eurocent/working hour)*	3.2	3.6	4.8	4.7	5.1	4.9	6.5	203%
Net income per one working hour *(Eurocent/working hour)*	0.8	0.8	1.4	1.2	1.0	0.7	2.1	239%

Source: own data collection; Béládi – Kertész, 2012; 2014; Béládi et al., 2017 and Szili – Szlovák, 2018

Table 7 summarises the main efficiency indicators of the dairy farm for the examined period. Profitability (ROS) was between 17-52% and cost-profitability ranged between 17-48% during the examined period, of which 2015 was the least favourable year. Improvements have also resulted in improved labour efficiency. This finding is also supported by the continuous improvement in the production value per workhour from 3.2 Eurocent/workhour in 2010 to 6.5 Eurocent/workhour in 2016.

4. Conclusion

Due to events in recent years, Hungarian dairy farmers have been through a difficult period. The backlogs of most farms are due to the housing and feeding technology,

economies of scale and the problems of feed production and preservation. Most of the available milk production capacities are obsolete and their renovation is timely. In the analysed farm, modernisation investments were implemented between 2010-2016 which improved production and financial parameters. The obtained results show that the specific milk yield increased by 7% and the efficiency of human resource use improved by more than 100% between 2010-2016. The farm's specific yield indicators are outstanding both in Hungary and internationally. At the same time, the greatest weakness is seen in feed costs. In this area, it is recommended to develop and modernise the crop production activities, i.e., the average cost of self-produced feedstuff would be reduced, so that feeds could be involved to the milk production at lower costs. Continuous monitoring of the effectiveness of the formulas and minimising unnecessary waste would also help. On the other hand the sales price in the farm increased by nearly 40% between 2010-2014, then decreased by 21%. The average sales prices of the farm were also above the average at the Hungarian level. Net income was fluctuating during the given period but the production was profitable in the analysed farm. However, the milk production was unprofitable without subsidies in 5 years.

5. Acknowledgements

This work was supported by EFOP3.6.3-VEKOP-16-2017-00007 – "Young researchers for talent" – Supporting careers in research activities in higher education program.

References

1. Béládi, K. and Kertész, R. (2012) *A főbb mezőgazdasági ágazatok költség- és jövedelemhelyzete 2010,* Budapest: Research Institute of Agricultural Economics, p. 125.
2. Béládi, K. and Kertész, R. (2014): *A főbb mezőgazdasági ágazatok költség- és jövedelemhelyzete 2012*, Budapest: Research Institute of Agricultural Economics, pp. 32-38.
3. Béládi, K., Kertész, R. and Szili V. (2017) *A főbb mezőgazdasági ágazatok költség- és jövedelemhelyzete 2013-2015*, Budapest: Research Institute of Agricultural Economics, pp. 38-41. DOI: 10.7896/ai1704
4. Blaskó, B., Kovács, K., Szőllősi, L. and Szűcs I. (2012) Complex problem analysis of the Hungarian dairy farms, *Apstract*, Vol. 6, No. 1-2. pp. 93-100.
5. Boulanger, P., Dudu, H., Ferrari, E. and Philippidis, G. (2016) Russian Roulette at the Trade Table: A Specific Factors CGE Analysis of an Agri-food Import Ban, *Journal of Agricultural Economics*, Vol. 67, No. 2. pp. 272-291. DOI: 10.1111/1477-9552.12156
6. EC (2016) *EU Agricultural Outlook – Prospect for the EU agricultural markets and income 2016-2026*, Brussels: European Commission, DG Agriculture and Rural Development, Available: https://ec.europa.eu/agriculture/sites/agriculture/files/markets-and-prices/medium-term-outlook/2016/2016-tables.pdf [28.09.2017]

7. Eurostat (2018) *Milk and milk product statistic*, Eurostat, Available: https://ec.europa.eu/eurostat/statistics-explained/index.php/Milk_and_milk_product_statistics [12.09.2019]
8. HCA (2019) A *tejágazat a termelői oldalról stabil*, The Hungarian Chamber of Agriculture, Available: http://nak.hu/en/agazati-hirek/mezogazdasag/147-allattenyesztes/99613-a-tejagazat-a-termeloi-oldalrol-stabil [15.09.2019]
9. HCSO (2016) *Élő állatok és állati termékek termelése, felhasználása (2013-)*, Budapest: Hungarian Central Statistical Office, Available: https://www.ksh.hu/docs/hun/xstadat/xstadat_eves/i_oma001a.html [24.09.2017]
10. HCSO (2019) *A legfontosabb állati termékek termelése (1990-),* Budapest: Hungarian Central Statistical Office, Available: https://www.ksh.hu/docs/hun/xstadat/xstadat_eves/i_oma002.html [12.09.2019]
11. OECD-FAO (2019) *OECD-FAO Agricultural Outlook 2017-2026*, Available: https://stats.oecd.org/index.aspx?queryid=76852 [15.09.2019]
12. RIAE MPIS (2017) *Research Institute of Agricultural Economics Market Price Information System*, Budapest, Available: https://pair.aki.gov.hu/web_public/general/showresults.do?id=5025898137&lang=hu [15.09.2017]
13. Szili, V. and Szlovák, S. (2018) *A főbb mezőgazdasági ágazatok költség- és jövedelemhelyzete 2016*, Budapest: Research Institute of Agricultural Economics, p. 109. DOI: 10.7896/ai1803
14. Szűcs, I., Béri, B., Szőllősi, L., Kovács, K., Molnár, Sz. and Ladányi, K. (2015) *A hazai tejágazat fejlesztési koncepciójának komplex megvalósíthatósági elemzése és továbbfejlesztése*, Szakértői tanulmány, Budapest: OTP Bank Nyrt. Agrár Kollégium, 111 p.
15. Szűcs, I. and Szőllősi, L. (2015) Problems of the Hungarian dairy sector in connection with the abolition of the milk quota system, *Annals of the Polish Association of Agricultural and Agribusiness Economists*, Vol. 17, No. 3. pp. 379-385.
16. Vőneki, É. and Mándi-Nagy, D. (2014) *A tejágazat kilátásai a kvótarendszer megszüntetése után*. Budapest: Research Institute of Agricultural Economics, p. 25.
17. Xiaodong, W. (2017) Report: Dairy imports will continue to rise, *China Daily* [Online], Available: http://www.chinadaily.com.cn/china/2017-04/21/content_29023297.htm [21.04.2017]