Viability issues of small-scale dairy production

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Abstract: The economic difficulties of the dairy cattle sector and their solutions are not the same at the large-scale and small-scale levels. In this study, a small family farm dealing with dairy cattle was planned. During the calculation, the characteristics of small farms were considered, and their entire economic plan was set up, considering all expenses and income. From the authors' calculations, it has been shown how the various economic indicators were developed in a three-person family farm. The Hungarian Simmental breed herd consists of 15 cows and their offspring. The main source of income is the sale of raw milk. The low profitability of the sector is a reason for further research, see how the sector income can be increased with the given production parameters. The solution for the future is the increase of added value and the search for new types of sales channels, for the sake of long-term sustainability.

Keywords: small-scale farm, animal husbandry, milk production, Hungarian Simmental

Introduction

Milk production has a long tradition in human history. Its development is closely related to the domestication of breeds still used for milk production today. The distribution of species varies in different areas of the Earth (Merényi and Schneider, 1999).

The most widespread form of utilization of cattle bred in all countries of the world is milk production. Cattle account for 83% of the world's total milk production. Another 17% is produced by buffaloes (13%), goats (2.3%), sheep (1.3%) and camels (0.4%). Between 1961 and 2014, the total number of cattle in the world increased by one and a half times, nowadays it is close to one and a half billion animals. Between 1961 and 2013, world cow milk production doubled. In 2013, it showed a value of 636 million tons (Horváth and Komarek, 2016). After the fall of the socialist political and economic system and the beginning of the transition period, a restructuring process in the Hungarian economy – and with it, the dairy sector, set in. And indeed, the Hungarian dairy industry as part of this economy had to undergo severe changes leading to an exceptional decrease in both the milk production and milk processing sector (Perekhozhuk et al., 2013). According to WTO (1991) Hungarian production of milk decreased in 1990 by almost 10 per cent to reach a level of 2.52 million tons. Based on Hungarian Telegraph Office, quoting Hungarian Minister of Agriculture domestic milk production reached the forefront of Europe by renewing the technological background; based on sales and employment, the dairy industry is one of the largest and increasingly important sectors of Hungarian food production, also in terms of exports (Schweiczer, 2024). However, according to USDA (2023) in January 2023, Hungary's cattle inventory stood at 0.9 million head. This is a decrease of 1.8 percent from 2022 on a year-on-year basis. Dairy cow beginning stocks were down slightly as well. Volkov et al. (2025) point out that under the current regulatory regime the most susceptible dairy sectors in the European Union are in Hungary and the Baltic States.

Szűcs et al. (2007) emphasize that the most important economic advantage of the sector is the continuous sales revenue and thereby ensuring a stable liquidity situation, as well as its outstanding margin (overhead capacity), which is of particular importance in complex agricultural enterprises with a mixed structure.

Small-sized dairy farms are integral to the agricultural landscape, providing economic, social, and environmental benefits to rural communities (Jafri et al., 2024). In the 1990s, a significant proportion of small dairy farms were established in an unclear market situation, based on inaccurate information. In some cases, for example, a group of producers imagined that building their own dairy could mean an escape from the strict requirements of raw material certification, and others may be disappointed because they only expected competition from the state dairy industry (Hingyi, 2002).

The annual food inflation exceeded 40%, while dairy inflation approached 80% at the end of 2022. This level of inflation is almost unprecedented; hence, it is an interesting question how these crises impacted competition across the supply chain and how different levels of the supply chain behaved and formulated their respective prices (Berezvai and Kónya, 2025). They also found that stimulated consumer demand was one of the reasons for the exceptionally high inflation in Hungary, as government subsidies were still high in 2022, which was connected to the parliamentary election. As a result, processors could pass on cost increases to consumers as demand was also high during the period of energy price increases.

The 2011 Eurobarometer survey highlights that there is a growing demand for closer producer-consumer relations. During the investigation, the majority of respondents believed that the strengthening of short supply chains should be supported. However, in the domestic context, traditional forms, such as markets, are primarily understood under short supply chain, as more innovative, modern forms are less widespread, such as community-supported agriculture or home delivery (Szabó, 2014). Over the last few decades, short food supply chains and local food markets, where farmers either sell their products directly to consumers or use a limited number of intermediaries, have developed worldwide in rural and urban areas. They complement conventional, often globalized, long food chains where small farmers have little bargaining power, and consumers cannot link the food they buy to a known agricultural producer or geographical area where the food is produced. The advantage of direct sales is that producers can obtain a higher price while consumers have easier access to fresh food products (Drejerska and Sobczak-Malitka, 2023).

The conditions for food production and sale by small-scale producers are laid down in the 52/2010. (IV. 30.) FVM (Ministry of Agriculture and Rural Development) decree. In addition, the entrepreneur receives the regulation of the activity from the Food Safety and Animal Health Department of the competent Government Office, in the form of a decision. The production of food and its subsequent sale are also strictly controlled.

A small-scale producer can only sell raw milk produced on his own farm and dairy products produced from it, such as cottage cheese or cheese. In terms of territorial regulation, the sale is possible to the final consumer in the territory of the own farm or in all markets, fairs, events and authorized temporary sales places operating in the territory of Hungary, as well as retail or catering facilities within the territory of Hungary, including home delivery at the customer's request.

Taking into account the quantity limitation, the production and sale of dairy products may not exceed 40 kg per day. The amount of raw milk sold was maximized at 200 litres per day. Raw milk may be sold without refrigeration within 2 hours of the end of milking, after which it can be sold within 24 hours if stored between +6°C and +8°C.

"By the concept of efficiency we mean the economic use of resources" (Siklósi, 2009). The concept of efficiency can be found in many fields of science – both in the field of economics and engineering sciences. According to Engle (1941), technical efficiency is part of economic efficiency. The difference is that technical efficiency can be interpreted by itself, absolute, while economic efficiency needs to be compared to something, relative.

The added value produced in the farms is compared to the gross production value when comparing the value creation capacity of the agricultural sectors (Fogarasi and Zubor-Nemes, 2017).

According to Kapronczai (2011), regarding the role of efficiency, Hungarian agrarian society is characterized by division. One half emphasize efficiency orientation and competitiveness, while the other half treat challenges related to economic efficiency as a secondary issue, focusing on rural occupation. In their research, Kőműves and Lukács (2015) examined the situation of small-scale domestic dairy farms. Several farms were involved and the conditions for economical milk production were presented. Based on their previous experiences, however, they were aware that it is still difficult for small-scale and family farms to make a living and earn a decent income.

According to Benedek's (2014) study, the term short supply chain, includes a variety of sales channels. They are mostly characterized by the small geographical, social and cultural distance between the producer and the consumer. In addition, the demand for

healthy food grown in an environmentally friendly manner is also a common feature. Consumers interested in short supply chain are characterized by a higher-than-average level of education. Habits are also divided based on the age group, according to which older people prefer traditional forms, while young people prefer to use the new, more modern possibilities of short supply chains.

Materials and Methods

We collected data in the Southern Great Plain region by interviewing the managers of small dairy farms. Our primary goal was the complete mapping of economies in order to be able to plan with the most accurate parameters possible when creating the economic model. The information received was recorded in a Microsoft Word document and then grouped by creating different Microsoft Excel worksheets.

Then, a complete calculation series were set up, using the production value and production cost of the annual operation, as well as economic indicators, with the help of which a small-scale dairy farm was modelled. Accounting was recorded in a Microsoft Excel spreadsheet consisting of several worksheets.

The total yield of the herd has been designed in such a way that it complies with the regulations for small-scale producers, according to which a maximum of 200 litres of milk can be sold per day. The labour requirement was planned for a family of three. When planning our small-scale farm, the Hungarian Simmental breed was decided on, so according to the survey of the Hungarian Simmental Association, a specific milk yield of 7,000 kg per cow was calculated, similar to the value shown for 2020. Authors' calculation thus indicated that 15 cows is the ideal number in accordance with their criteria for the plan, which means an average of 13 milking and 2 dry cows.

Results and discussion

The selling price of the milk was set at 350,000 HUF/t in line with the selling prices of small-scale producers in the Southern Great Plain region. The sale of milk accounts for 87.8% of the total production value, HUF 31,411,000, which is the sector's main source of income (Figure 1). Milk represents significantly the largest proportion of income, so its price change has a significant impact on the profitability of the farm. If the selling price of milk reduced to the price of HUF 176 per litre announced by Central Statistical Office for the year 2023, the production value from the sale of milk is only HUF 15,795,000, which is only 50.3% of the previous one.

According to the model calculation, regarding reproduction, farmer thought that she would only raise a heifer for the purpose of replacement, the rest of the calves would be sold at the age of 7–14 days, from which farmer could realize a production value of HUF 1,320,000, which is 3.7% of the total.

According to the idea, one cow will be culled every year. Its weight is determined at 584 kg, and its unit price at HUF 600/kg. The sales revenue from its sale results in HUF 350,000, which is 1% of the total production value.

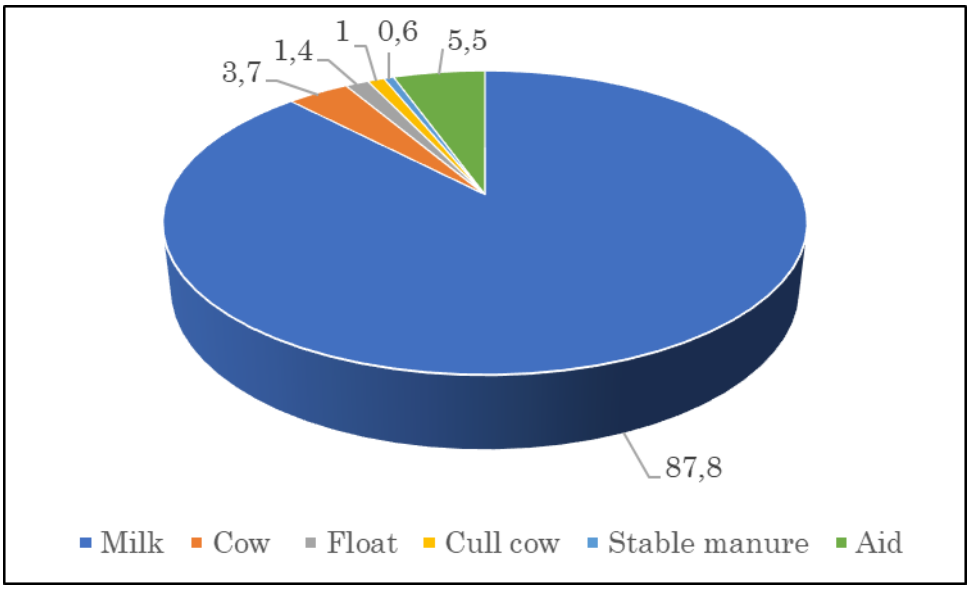

Figure 1. Distribution of the production value in the model farm (%)

Source: own editing

The income from the sale of manure from the activity as a by-product was also counted, which, calculated with the planned livestock, at a price of HUF 1,200/t, results in a production value of HUF 214,000.

Among the production-related subsidies, the direct payment for dairy cows can be applied for, which, if eligible, means an income of HUF 1,960,833, which is 5.5% of the production value.

One of the reared heifers is sold at the age of 1–2 years at a price of HUF 1,050/kg, which results in a production value of HUF 504 thousand for the farm.

The total production value of the small-scale farm was calculated by summing up the previous ones, so we got a total production value of HUF 35.76 million as a result. The enterprise's costs were collected in detail and then summarized them by cost type. Material costs account for the significantly largest share of farm costs (73.2%), which corresponds to HUF 19,026,000, or HUF 1,261,000 per cow (Table 1).

Feed costs were taken into account, which were recorded as purchased, energy costs, and the cost of inseminator and veterinary services in this cost group. In the following, we have summarized the personal costs. Since a family farm were modelled, a specific hourly wage thus a wage for the family members were not calculated. The farm has a gross income interest. Therefore, personal costs were not counted at all, they were taken as zero in the calculations.

The special fixed assets were also listed in detail, their cost is HUF 1,608,000, which is HUF 107,000 per cow. 6.4% of the costs are the costs of special fixed assets meaning depreciation and maintenance costs. Summing up the costs listed above, we determined the amount of direct costs, which is 18.653 million HUF, 1.237 million HUF for one cow.

Direct costs account for less than 3/4 of all costs. The direct costs were supplemented with the distributed costs (1.815 million HUF), so we got the production cost, which is 20.468 million HUF – 1.357 million HUF per cow – 81% of the total costs. The indirect costs are HUF 4,795,000, which means HUF 318,000 per cow. The total costs of the farm are the sum of direct and indirect costs, i.e. HUF 25,262,000, which is HUF 1,675,000 per cow.

Table 1. Model calculation for the production cost

Denomination	Total (1000 HUF)	Per Cow Costs (1000 HUF)	Distribution (%)
I. Material costs	17 045	1 130	67,5
II. Labour costs	0	0	0
III. Depriciation and Maintainance costs	1 608	107	6,4
IV. Other Direct costs	0	0	0
Total Direct costs	18 653	1 237	73,9
V. Machinery costs (allocated costs)	1 815	120	7,1
Total Direct Production costs	20 468	1 357	81,0
Indirect costs	4 795	318	19,0
Total Production costs	25 262	1 675	100,0

Source: own calculation

The total sales revenue calculated for the sector is HUF 32,228,000, which corresponds to HUF 2,137,000 per cow, as shown in Table 2. The unit price of milk was changed from HUF 350,000/t to the price according to the Central Statistical Office – which is HUF 176,000 per litre – however, sales revenue resulted only HUF 17,394,000, which means HUF 1,153,000 per cow.

Table 2. The most important economic indicators of the sector, calculated with a milk price of HUF 350,000/t

Denomination	Total	Measure unit	Per cow value	Measure unit
Sales revenue	32.228	million HUF	2.137	million HUF
Production value	35.760	million HUF	2.371	million HUF
Production cost	25.262	million HUF	1.675	million HUF
Net income	10.498	million HUF	0.696	million HUF
Gross income	10.498	million HUF	0.696	million HUF
Value of fixed assets	7.421	million HUF	0.492	million HUF
Value of current assets	7.579	million HUF	0.502	million HUF
Total value of assets	15.000	million HUF	0.994	million HUF
Working time usage	6,336	hours	420	hours

Source: own calculation

Table 3 summarizes the most important economic indicators of the farm based on one calculation, the production value of the farm is HUF 35,760,000, which is HUF 2,371,000 per cow, calculated at the small-scale producer milk price, while this value is significantly

different with the lower price level, 20.144 million HUF in total, and 1.336 million HUF is the production value per cow. Production costs were also calculated for both options, which are the same, i.e. 25,262,000 HUF and 1,675,000 HUF per cow in both cases, since the costs did not change, only the purchase price of the milk. Net income was calculated from the difference between production value and production cost. In the case of the HUF 350,000/t milk price, there was a net income of HUF 10,498,000, which means HUF 696,000 per cow. However, calculating the milk price of Central Statistical Office, a negative value resulted, -5.118 million HUF in total for the farm. The calculated value of the gross income is the same as the value of the net income, since it is a family farm, so – as it was mentioned before – any separate labour expenses were not calculated.

In both cases, the fixed asset value is HUF 7,421,000, or HUF 492,000 per cow. While the current asset value is HUF 7,579,000 for the farm in total, HUF 502,000 per cow. The total asset value – which is the sum of the fixed asset value and the current asset value – is 15,000 HUF for the farm, of which 994,000 HUF goes to one cow. The farm uses a total of 6,336 hours of working time per year, which is 420 hours for a cow.

Table 3. The most important economic indicators of the sector, calculated with a milk price of HUF 176,000/t

Denomination	Total	Measure unit	Per cow value	Measure unit
Sales revenue	17.394	million HUF	1.153	million HUF
Production value	20.144	million HUF	1.336	million HUF
Production cost	25.262	million HUF	1.675	million HUF
Net income	-5.118	million HUF	-0.339	million HUF
Gross income	-5.118	million HUF	-0.339	million HUF
Value of fixed assets	7.421	million HUF	0.492	million HUF
Value of current assets	7.579	million HUF	0.502	million HUF
Total value of assets	15.000	million HUF	0.994	million HUF
Working time usage	6 336	hours	420	hours

Source: own calculation

In terms of profitability as a percentage of sales, calculated at the small-scale producer price, it is 32.6%, while at the lower price -29.4%. The cost-effective profitability developed similarly, 41.6% and -20.3%. The main economic indicators of the model farms are summarized in Tables 4 and 5.

As a result of these calculation very different values were achieved for the return on assets, 70.0% and -34.1%. The cost level was set at 70.6% for the selling price of HUF 350,000/t, while in the second case at 125.4%.

Table 4. The main economic indicators of the model farm, calculated at a milk price of HUF 350,000/t

Denomination	Indicators	Measure unit
Revenue-based income	32,6	%
Cost-effective income	41,6	%
Return on assets	70,0	%
Cost level	70,6	%
Revenue per 1 working hour	5,087	HUF
Production value per 1 working hour	5,644	HUF
Net income per 1 working hour	1,657	HUF
Obsolescence of assets	50	%
Unit cost of milk (according to production value)	245	HUF/litre

Source: own calculation

Calculating the sales revenue per 1 working hour, in the first case we got HUF 5,087 as a result, while calculating with the sales price by Central Statistical Office, it is only 53% of this, i.e. HUF 2,745. The production value per 1 working hour is HUF 5,644 in the case of the higher milk price, while with the lower price it is only 56.33%, or 3179 HUF. The net income per 1 working hour is 1657 HUF and -808 HUF. The obsolescence of the assets is 50% in both cases. According to the production value, the cost of milk is 245 HUF/litre at the selling price of small-scale producers, while it is 219 HUF/litre at the lower purchase price.

Table 5. The main economic indicators of the model farm, calculated at a milk price of HUF 176,000/t

Denomination	Indicators	Measure unit
Revenue-based income	-29,4	%
Cost-effective income	-20,3	%
Return on assets	-34,1	%
Cost level	125,4	%
Revenue per 1 working hour	2 745	HUF
Production value per 1 working hour	3 179	HUF
Net income per 1 working hour	-808	HUF
Obsolescence of assets	50	%
Unit cost of milk (according to production value)	219	HUF/litre

Source: own calculation

Conclusions

The long-term sustainability of the dairy cattle farm modelled is questionable. The three-person family farm can sustain itself with a selling price of HUF 350,000/ton of milk, but its long-term development requires an increase in income. Within the family, any labour costs was not counted at all, since family members do not explicitly receive a salary. The net and gross income therefore show the same values.

However, according to practical experience, homemade milk seems to be relegated to the background. Both because of the lower price level in stores and because homemade cow's milk can be kept for a shorter time than that available in stores. By processing milk, the raw milk produced by the farm more saleable, and by increasing the added value, the farm can also get additional income.

The second line of calculations shows very carefully that raw milk is sold at the price also announced by Central Statistical Office – which is paid by the dairy industry – in which case the farm is in deficit. In this case, it is even more appropriate to process the milk and increase the added value. If the income from milk and the products produced from it are increased, the family farm will be sustainable in the long term. It is not necessary to increase the quantity of produced products, but their quality and thus the selling price.

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