Acta oeconomica et informatica 2
Nitra, Slovaca Universitas Agriculturae Nitriae, 2002, s. 44-47

ECONOMICS AND MANAGEMENT OF MILK PRODUCTION IN THE SLOVAK REPUBLIC

EKONOMIKA A MANAŽMENT VÝROBY MLIEKA V SLOVENSKEJ REPUBLIKE

Igor REPKA[1], Pavol HÁJIK[2]

Slovenská poľnohospodárska univerzita v Nitre[1]

Farma Fresh, a.s Majcichov[2]

A significant decrease in a number and performance of dairy cows in Slovakia after 1989 has been reflected in the market milk production, its purchase by milk-processing plants, and production and consumption of dairy products. Cow milk yield started increasing only in 1996, but the yield of 4,337 litres per cow on average in 2000 is behind the EU countries. Costs of milk production per litre (9.16 SKK) are still high and substantially different in various regions of Slovakia (8.44 – 10.28 SKK). The work analyses causes of this unfavourable situation and discusses the possibilities of reducing milk production cost. Labour-consumption in milk production is also examined and time consumption per dairy cow required in traditional tie housing system and free housing is compared.

Key words: development trends, cost of milk production, labour organization, labour-consumption in milk production

Cattle breeding belongs to the most important branches in agricultural production. It produces milk, a raw material for the Slovak dairy industry, and is of high significance from the viewpoint of regular cash flow.

Milk and milk products play a very important role take place in human nutrition. Since 1989 there have been downward trends in the production and consumption of dairy products due to a reduction in customer demand. The consumption of milk and milk products per capita (calculated on milk value basis without butter) decreased in the Slovak Republic from 253 kg (1989) to 161.4 kg in 1999, which is less in comparison to the EU countries with a 200 to 300 kg consumption.

The task following from this situation is to promote milk and milk products.

Material and Methods

The aim of the present study is to analyse the development trends in cattle keeping, milk yield, milk production and purchase, as well as in evaluation of milk efficiency. The data from the Slovak Statistical Office (SO), the Economic Research Institute of Agriculture and Food (VUEPP) and the information on the agrarian and nutritive policy of the Slovak Republic were used in the study.

The time consumption was monitored for either technology used to take care of dairy cows.

Table 1 Development of selected indicators in milk production

Year (1)	Average number of milking cows (2)		Average milk yield per year (4)		Milk production (6)		Purchase of milk by processors (7)	
	Heads (in ths.) (3)	Index	Litres (5)	Index	Litres (in millions)(5)	Index	Litres (in millions) (5)	Index
1989	559	100.0	3 654	100.0	1 995	100.0	1 733	100.0
1990	549	98.2	3 537	96.8	1 920	96.2	1 680	96.9
1991	501	89.6	2 887	79.0	1 526	76.5	1 340	77.3
1992	434	77.6	2 888	79.0	1 331	66.7	1 053	60.8
1993	386	69.1	2 953	80.8	1 214	60.9	922	53.2
1994	364	65.1	3 175	86.9	1 155	57.9	894	51.6
1995	355	63.5	3 292	90.1	1 151	57.7	875	50.5
1996	335	59.9	3 317	90.8	1 125	56.4	877	50.6
1997	310	55.5	3 604	98.6	1 116	55.9	898	51.8
1998	288	51.5	3 970	108.6	1 142	57.2	914	52.7
1999	262	46.9	4 101	112.2	1 073	53.8	902	52.0
2000	246	44.0	4 337	118.7	1 067	53.5	903	52.1
2001	237	42,4	4 515	123,6	1 070	53,6	930	53,7
2002	230	41,1	4 700	128,6	1 081	54,2	942	54,4

Source: SO SR and particular calculation, estimation for 2001, prognosis for 2002
Prameň: ŠÚ SR a vlastný prepočet, rok 2001 odhad, rok 2002 prognóza

Tabuľka 1 Vývoj vybraných ukazovateľov pri výrobe mlieka
(1) rok, (2) priemerný počet dojníc, (3) tisíc kusov, (4) priemerná ročná dojivosť, (5) litre, (6) výroba mlieka, (7) nákup mlieka spracovateľmi

Results and discussion

1. Development trends in natural production

An introduction of economic restoration has had the most unfavourable impact on cattle keeping, which was reflected in the decline in cow number and milk yield (Table 1).

A substantial decline in cow population was observed during the whole period covering 1989-2000, this trend being supposed to continue in 2001 as well (index 42.4).

In terms of milk yield the development was unfavourable after 1989, with a rapid fall especially in the first years of economic restoration, over 1991 - 1993. The milk production increase was slow but despite this situation, the average milk yield of 4,337 litres per cow per year was recorded in 2000. However, the level of average annual milk yield in the EU countries is higher.

Average milk yield per year by production regions in the Slovak Republic is very different. The deviation was 2,117 litres (48.8%) vs. 4,337 litres per cow milk yield in 2000.

2. Level of milk production costs

The crucial indicator of economically efficient milk production is prime cost per production unit.

We can say that one of the main reasons for the said unfavourable status in milk production is a high level of milk production costs in the agricultural enterprises with lower milk yield.

A decrease in cost per unit of production is one way how to obtain better economic results in milk production and improve milk yield and milk quality.

The analysis of prime cost per litre of milk by cost items in the selected set of Slovak agricultural enterprises in 2000 is presented in Table 2. This set includes 136 agricultural enterprises (agricultural cooperatives and business entities) from the point of view of all production regions with the mean annual milk yield of 4.767 litres per cow.

The prime costs per litre milk amounted to 9.16 SKK in 2000, i.e. 0.65 SKK (7.64 %) more than in 1999.

The costs per feeding day were 11.83 SKK (10.98 %) higher, which is an increase from 107.74 SKK to 119.57 SKK.

Labour costs were 1.16 SKK per litre of milk and their proportion in prime costs made 11.61 %. A change to organization of milk production is the way of reducing this cost item.

Table 2 Structure of prime costs per 100 feeding days and per litre of milk in Slovakia in 2000

Indicator (1)	Prime costs per (21)		
	100 feeding days (22)	litre of milk (23)	
	SKK	SKK	%
Labour costs (2)	1 515	1.16	11.61
Produced fodder (3)	3 054	2.34	23.42
Purchased fodder (4)	1 466	1.12	11.21
Other immediate material (5)	510	0.39	3.90
Social costs (6)	507	0.39	3.90
Repairs and maintenance (7)	174	0.13	1.30
Fixed assets depreciation (8)	582	0.45	4.51
Breeding herd depreciation (9)	1 613	1.23	12.31
Other immediate costs (10)	892	0.68	6.81
Costs of complementary activities (11)	979	0.75	7.51
Items regulated immediate costs (12)	-252	-0.19	-1.90
Total immediate costs (13)	**11 040**	**8.45**	**84.58**
Production overhead costs (14)	1 014	0.78	7.81
Management overhead costs (15)	998	0.76	7.61
Total prime costs (16)	**13 052**	**9.99**	**100.00**
Prime costs of milk (17)	11 957	9.16	91.69
Prime costs per calf (18)	446	0.34	3.40
Prime costs of manure (19)	600	0.45	4.51
Prime costs of liquid manure (20)	49	0.04	0.40

Source: VÚEPP Bratislava, particular calculation
Prameň: VÚEPP Bratislava, vlastný prepočet

Tabuľka 2 Štruktúra vlastných nákladov na 100 kŕmnych dní a 1 liter mlieka v SR

(1) ukazovateľ, (2) mzdové náklady, (3) vyrobené krmivá, (4) nakúpené krmivá, (5) ostatný priamy materiál, (6) sociálne náklady, (7) opravy a udržiavanie, (8) odpisy investičného majetku, (9) odpisy zvierat, (10) ostatné priame náklady, (11) náklady pomocných činností, (12) položky upravujúce priame náklady, (13) priame náklady spolu, (14) výrobná réžia, (15) správna réžia, (16) vlastné náklady spolu, (17) vlastné náklady na mlieko, (18) vlastné náklady na 1 teľa, (19) vlastné náklady na maštaľný hnoj, (20) vlastné náklady na močovku, (21) vlastné náklady na, (22) 100 kŕmnych dní, (23) liter mlieka

The fodder costs of 3.46 SKK (34.63%) per litre of milk was the highest cost item; produced fodder made 67.63% (2.34 SKK) and purchased fodder 32.37% (1.12 SKK) of total cost. The goal of agricultural primary milk producers is to use cheap bulk fodder of good quality for dairy cattle.

The breeding herd depreciation of 1.23 SK per litre of milk was the second highest cost item (12.31% of total costs). Cow keepers are looking for the possibilities of reducing this cost,

Table 3 Economics of milk production by production regions in 2000 (in SKK)

Production region (1)	Costs per litre of milk (8)	Revenues per litre of milk (9)	Of which subsidies per litre of milk (10)	Economic result per litre of milk (11)	Average milk yield per year (in litres) (12)
Maize growing (2)	8.73	9.96	1.28	1.23	5 179
Beet growing (3)	8.44	9.82	1.45	1.38	5 453
Potato growing (4)	9.96	11.35	2.58	1.39	4 208
Potato-oat growing (5)	10.01	11.11	2.53	1.10	4 595
Mountain (6)	10.27	12.46	3.98	2.19	3 635
Total Slovakia (7)	9.16	10.57	2.00	1.41	4 767

Source: VÚEPP Bratislava, particular calculation
Prameň: VÚEPP Bratislava, vlastný prepočet

Tabuľka 3 Ekonomika výroby mlieka podľa výrobných oblastí v roku 2000 (Sk)

(1) výrobná oblasť, (2) kukuričná, (3) repárska, (4) zemiakárska, (5) zemiakársko-ovsená, (6) horská, (7) Slovensko spolu, (8) náklady na 1 liter, (9) výnosy na 1 liter, (10) z toho dotácie na 1 liter, (11) hospodársky výsledok na 1 liter, (12) ročná dojivosť v litroch

one of them being prolonging the production age of cows from 3 to 4 lactation periods and more. Other ways are the rearing of first - calf heifers as well as higher purchase prices of slaughter cows.

Overhead cost can affect the level of milk production costs and for the managers there are big possibilities of declining them. Production overhead costs were 0.78 SKK (7.81 % of total cost) and management overhead costs 0.76 SKK (7.61 % of total cost). The fall in overhead costs plays an important role in the rationalization of managerial work both in animal production and the enterprise as a whole.

From the aspects of production regions there were differences in the level of milk production conditions. It points to a different level of organizational and managerial work and to the possibilities of reducing cost as well.

The economy of milk production by production regions in 2000 is given in Table 3. The production costs of 9.16 SKK and purchase prices of 10.57 SKK per litre of milk including subsidies in 2000 made it possible to achieve a profit of 1.41 SKK and the 15.39 % profitability in the selected set of enterprises with the mean annual milk yield of 4,767 litres per dairy cow.

3. Labour-consumption in milk production.

A necessity of milk production rationalization follows from the fact that cow breeding is among the branches with high labour-consumption and low direct labour productivity (Table 4). The traditional technology of rearing is used in stables with tie housing system. The time consumption per cow per day ranges from 22 to 26 minutes, which enables a tender to look after 14 - 16 cows. With the average service norm of 15 cows and the average milk yield, total production per worker is 65,000 L milk and labour-consumption is 1.9 – 2.2 minutes. In the stable having four row corridors, the daily time consumption reduced to 18 - 20 minutes and service norm was increased to a number of 18 - 20 cows. Increasing direct labour productivity is achieved in the stable with free housing system and milking by milkers. The time consumption per cow per day is between 10 and 12 minutes and one tender services 30 to 36 cows. The annual milk production per worker is 142,000 L at a milk yield of 4,300 litres per cow, but on the best farms with a milk yield of 6,000 litres per cow it is 243,000 L.

Low level of the organization of working processes and low efficiency of direct labour is influenced by more factors, particularly by use of the traditional technology of cow rearing, insufficient level of mechanisation, low level of labour organization (pragmatic working methods), and insufficient qualification.

The increase of labour productivity can be obtained by changes in technique and technology, increasing labour discipline, as well by improving labour organization as well in physical and social conditions of work environment.

Animal production managers do not pay sufficient attention to improving forms and methods of the organization of labour processes. This situation is caused by insufficient application of the basic principles of scientific labour organization and motivation of managers and workers in production at the decline in direct labour -consumption.

Based on our knowledge of the introduction of labour process rationalization it is possible to reduce the time consumption by 25 - 30% excluding other investments.

Súhrn

Výrazný pokles stavov a úžitkovosti kráv po roku 1989 sa následne prejavil v trhovej produkcii mlieka, v nákupe do spracovateľských podnikov a vo výrobe a spotrebe mliekarenských výrobkov. Dojivosť kráv sa začala zvyšovať až v roku 1996, pričom úžitkovosťou 4337 l v roku 2000 stále zaostáva za vyspelými krajinami EÚ. Nákladovosť výroby 1 l mlieka (9,16 Sk) je veľmi vysoká a v rámci regiónov Slovenska značne diferencovaná (8,44 - 10,27 Sk). Analyzujú sa príčiny uvedeného nepriaznivého stavu a poukazuje sa na možnosti znižovania nákladovosti výroby mlieka. Pozornosť sa venuje prácnosti výroby mlieka a porovnáva sa spotreba času v tradičných ustajňovacích priestoroch a vo voľnom ustajnení.

Kľúčové slová: vývojové trendy, nákladovosť výroby mlieka, organizácia práce, prácnosť výroby mlieka

References

JEŠKO, J. 2001. Mlieko : Situačná a výhľadová správa. Bratislava : MP SR-VÚEPP, 2001. 27 s. ISBN 80-8058-200-9

KRETTER, A. 2000. Kvantifikácia marketingovej vertikály bravčového mäsa. In: Transfery projektov hlavných úloh. Zborník vedeckých prác. Nitra : FEM, SPU, 2000, s. 154-159. ISBN 80 - 7137 - 684 –1

KUBANKOVÁ, M. - BURIANOVÁ, V. - IZAKOVIČOVÁ, B. 2001. Vlastné náklady a výsledky hospodárenia poľnohospodárskych

Table 4 Labour-consumption in milk production

Technology of dairy cow keeping (1)	Time consumption (8)		Service norm (heads) (11)	Milk yield per year (in litres) (12)	Labour–consumption per litre of milk (in min.) (13)	Production per worker per year (in litres) (14)
	Minutes per day per head (9)	Hours per year per head (10)				
Stable with tie housing system (2)						
a) with two row corridors (3)	22-26	134-158	14-16	4 300	1.9-2.2	65 000
b) with four row corridors (4)	18-20	110-122	18-20	4 300	1.5-1.7	82 000
Stable with free housing system (5)						
current state (6)	10-12	60-70	30-36	4 300	0.8-1.0	142 000
the best farms (7)	8-10	48-60	35-46	6 000	0.5-0.6	243 000

Tabuľka 4 Prácnosť výroby mlieka

(1) technológia chovu, (2) väzné ustajnenie, (3) dvojradové neprejazdné, (4) štvorradové prejazdné, (5) voľné ustajnenie, (6) súčasný stav, (7) najlepšie farmy, (8) spotreba času, (9) denne v min.ks^{-1}, (10) ročne v h .ks^{-1}, (11) norma obsluhy v ks, (12) ročná dojivosť v litroch, (13) prácnosť výroby mlieka v min.l^{-1}, (14) ročná výroba na 1 pracovníka v litroch

podnikov v SR za rok 2000. Bratislava: VÚEPP, 2001. 58 s. ISBN 80-88992-30-3
REPKA, I. 1999. Organizácia práce. Nitra : VES SPU, 1999. 98 s. ISBN 80 - 7137 - 564 – 2
ŠIMO, D. 2000. Agrárny marketing. Nitra : SPU, 2000. 301 s. ISBN 80 - 7137 - 709 – 0
UBREŽIOVÁ, I. - MIHINA, Š. 1998. Ekonomická efektívnosť výroby mlieka u rozdielnych typov úžitkových dojníc vo vybraných farmách na Slovensku. In: Zěmědelská ekonomika, roč. 44, 1998, č. 7, s. 305-309.
VICEN, M. 2000. Diferenciácia produktivity práce v chove hydiny a v živočíšnej výrobe podľa regiónov SR. In: Zborník vedeckých prác. MVD 2000. Nitra : FEM SPU, 2000, s. 151-155. ISBN 80 - 7137 - 715 - 5

Contact address:
prof. Ing. Igor Repka, PhD., Katedra manažmentu a marketingu, Fakulta ekonomiky a manažmentu, Slovenská poľnohospodárska univerzita, Tr.A.Hlinku 2, 979 76 Nitra, tel. 037/650 81 68, e-mail: igor.repka@fem.uniag.sk; Ing. Pavol Hájik, Farma Fresh, a.s., 916 22 Majcichov

Acta oeconomica et informatica 2
Nitra, Slovaca Universitas Agriculturae Nitriae, 2002, s. 47-50

GLOBÁLNE MIERY EFEKTÍVNOSTI

GLOBAL EFFICIENCY MEASURES

Peter FANDEL

Slovenská poľnohospodárska univerzita v Nitre

The last 10 years in the area of efficiency analysis have been characteristic of development of new models and methods as well as a big number of empirical applications in various sectors of economy. Empirical applications, which is also applicable to the sector of agriculture, are based either on radial or additive models. Due to their nature, radial models usually overstate efficiency when nonzero slacks are present because they do not consider non-radial inefficiency of the **slacks.** Unlike radial models, additive models take into account all sources of inefficiency, i.e. radial and non-radial, however, they do not directly provide efficiency measure. The work compares the above-mentioned models with the so called *global efficiency measures,* which are capable of taking into consideration all sources of inefficiency, thus enabling to calculate directly efficiency measure. The global efficiency measure derived from Russell Graph Measure of Technical Efficiency and Enhanced Russell Graph Measure of Technical Efficiency is presented and applied.

Key words: global measures of technical efficiency, Data Envelopment Analysis, Russell measures of technical Efficiency

Teoretické základy analýzy technickej efektívnosti položil Koopmans (1951), ktorý definoval technickú efektívnosť ako prípustný input/output vektor, v ktorom nie je technologicky možné zväčšiť žiaden output (alebo žiaden input redukovať) bez súčasnej redukcie iného outputu (alebo zvýšenia iného inputu). Debreau (1951) a neskôr Farrell (1957) odvodili inputovo orientované indexy technickej efektívnosti vyjadrené formou ekviproporcionálnej (radiálnej) redukcie všetkých vstupov pri danej úrovni výstupov. Tieto indexy boli neskôr inšpiráciou pre Charnesa et al. (1978), Bankera et al. (1984) a Färea et al. (1985, 1994), ktorí odvodili a neskôr rozvinuli Analýzu dátových obalov (DEA), metodológiu založenú na aplikácii matematického programovania. Analýza dátových obalov je technika, ktorá na základe výpočtu konvexného obalu dát všetkých hodnotených producentov (hranice produkčných možností) umožňuje vypočítať ich relatívnu efektívnosť. Táto technika sa stala veľmi populárnou pri výpočte technickej efektívnosti, pretože pomerne jednoduchým spôsobom umožňuje zohľadniť transformáciu viacerých vstupov na viacero výstupov, je neparametrická, nevyžaduje ceny vstupov a nie je potrebné vopred definovať typ správania sa producenta (maximalizácia zisku, resp. minimalizácia nákladov).

Potenciálnym problémom pôvodných modelov DEA je, že nie sú v súlade s definíciou navrhnutou Koopmansom. Z toho dôvodu Farrellovské radiálne miery efektívnosti môžu nadhodnocovať efektívnosť, pretože nie sú schopné zohľadniť neradiálne odchýlky od hranice efektívnosti. Färe a Lowell (1978) na tento problém reagovali tým, že navrhli potrebné vlastnosti, ktoré musí ideálna technická efektívnosť spĺňať a neskôr i miery technickej efektívnosti vyhovujúce týmto vlastnostiam. Tieto miery nazvali *Russellova inputová miera technickej efektívnosti* (Färe et al., 1983) a *Russellova outputová miera technickej efektívnosti* (Färe et al., 1985). Navrhli taktiež *Russelovu grafickú mieru technickej efektívnosti,* ktorá na rozdiel od predchádzajúcich dvoch simultánne zohľadňuje neefektívnosť vstupov aj výstupov.

Problém súladu DEA modelov s Koopmansovou definíciou sa neskoršie riešil aj v samotných DEA modeloch. Aditívne DEA modely (Charnes et al., 1985) sú toho príkladom. Tieto sú schopné zohľadniť všetky zdroje neefektívnosti (radiálne aj neradiálne), avšak priamo neposkytujú mieru efektívnosti. Neskoršie boli publikované radiálne modely DEA, ktoré sú schopné riešiť neradiálne zdroje neefektívnosti. Väčšinou ide o viacfázové postupy, keď po výpočte Farrellovských mier efek-