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Forage Production and Feeding Management in Hungarian Large-Scale Dairy Farms

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Abstract

In this paper, 4 typical dairy farms were surveyed and the characteristics of the Hungarian dairy farming system and feed problems were analyzed. Due to the large-scale production system of dairy farming in Hungary, individual operations are performed by specialists, resulting in a very high efficiency, as seen in milking work. However, in terms of coordination among the individual operations, the method is not efficient and lacks consistency as a technical system of milk production. As a result, there has been a decline in technical standards, such as prolonged calving intervals. Close coordination among individual work processes could be achieved through labor management. The major problem is that because of the large scale, feed production and feeding management in dairy production are entrusted to different departments, which is inevitable in the management of large-scale farms. Also, because of the diversification of farming among departments, manure treatment has not been a problem in spite of the large size of the farms. However, the lack of coordination in the activities of the feeding department and the feed production department hinders the development of feeding management and feed production technologies. This aspect appears to be the major constraint in the production system of Hungary's dairy industry, as exemplified by the feed ratio problems, including the insufficient improvement of the quality of roughage and the increase in the use of concentrate rations.

Discipline: Agricultural economics
Additional key words: farming system, cost structure, competitiveness, EU

Introduction — objectives and methods —

Hungary is a major agricultural country. A distinct characteristic of Hungarian agriculture is that a large part of its agricultural production is derived from large-scale farms based on the collective farm system implemented during the socialist rule(1). The same applies to Hungary's dairy production. Although raw milk production once experienced a 32% decline in 1994, compared to the largest increase in 1988, the structure by which large-scale farming (private corporations or agricultural cooperatives feeding an average number of 387 cows) accounting for most of the raw milk production (72% in 1996) has remained unchanged.

In Japan, dairy farming has continued to expand. In particular, Hokkaido dairy farms are considered to have surpassed EU standards in terms of herd size, achieving a rapid increase in production capacity. On the other hand, shortcomings of large-scale farming are beginning to emerge such as unstable profit structure due to strong dependency on purchased feed, and difficulties in the production system for manure treatment. In this paper, the author focused on dairy farming in Hungary, since Hungary implemented what Japan considers to be its own objective — expansion of the farm scale as well as aggregation of dairy farms. The purpose of the paper is to analyze the characteristics of large-scale production and provide information for determining the strategy to be adopted to improve Japan's dairy agriculture. Also, the implications could be useful for other countries with the same objective.

To do so, the author will first analyze the statistics, research materials and literature based on related agencies, including the agriculture ministry and dairy farm organizations, interviews of researchers, and case study results of representative farms. The farms were as follows: Dalmandi mezogazdasagi RT. (diversified upland-

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livestock farming with a farmland area of 6,200 ha, and a former government-run farm; hereafter designated as 'A Corporation'), Kapostaj Mg. Szovetkezet (diversified upland-livestock farming with a farmland area of 2,500 ha and a former agricultural producers' co-operative; hereafter designated as 'B Co-operative'). As a contrast, 2 family-run farms were also surveyed (hereafter designated as 'C and D Farms')[2]. First, the author will provide an overview of Hungarian dairy farming based on the literature, followed by an analysis of the characteristics of dairy production systems mainly at the surveyed farms. Feeding system, forage structure and cost structure will be discussed, and finally a conclusion will be given.

Overview of Hungarian dairy farming[3]

In Hungary, the reform introduced by the government in 1989 has led to a rapid decline in raw milk production since 1990, mainly due to the economic difficulties associated with the transition from a socialist to a market economy. Even in 1996, milk production was about 70% of the value in 1990 (approximately 1.9 billion L). There was a 36% decrease in the number of milking cows in 1997 from the number in 1990 (414,000 cows) and milk consumption per capita decreased to 69% of the 1989 level (170 L/year). Hungary's milk trade is small and the projected self-sufficiency rate of milk production for 1998 was 105%.

The percentages of milking cow herds managed in a corporate form[4] in 1997 were 27.6% for the corporations, 39.4% for the co-operatives and 33.0% for individual farms. Likewise, rates by raw milk production were 32.2, 39.8, and 28.0%, respectively. The numbers of registered farms were 25,000 for the individual farms and 750,000 for the corporations and co-operatives. The dairy production system varies considerably depending on traditional small-scale farming (30% of the milking cow herd size) or modern large-scale farming (70%). The former produces milk mainly for self-consumption, one to five cows are crossed with native animals or Holsteins, milking is done by hand, and the yield per cow is 3,000 to 4,000 L. The hygienic conditions of milk do not meet EU standards for quality[5]. Meanwhile, in modern large-scale farming (corporations and co-operatives), 200 Holsteins or more (303 head on the average) are fed and tended using TMR (Total Mixed Ration), loose barns, and milking parlors, the yield per cow is 5,000 L, and 90% of the cows satisfy hygienic EU standards for milk quality.

In both cases, deterioration of the facilities is a major problem. Furthermore, standards of reproduction management are all below the EU average for the delivery rate, calving interval and mortality. Since 1990, yield per cow has also declined, falling below the EU average.

There is a low probability that family farms (herd size of 30 to 100) will emerge in the interim and this aspect depends entirely on the government's support policy. It is predicted that if small-scale farms cannot meet EU hygienic standards for milk quality, they will have to discontinue their operations.

Until 1990, subsidies were used for milk producers, consumers (purchase) and export, thus prices were controlled. Since then, free competition has been introduced and government subsidies have been abolished. However, subsidies for milk production were re-introduced in June 1993, though only for milk with a high hygienic standard. Then, the milk quota system was introduced in 1996, but milk production has not increased enough to meet the quota of 1.8 billion L (excluding self-consumption). Currently, Hungarian milk prices are 1/2 to 2/3 of the range in the EU nations.

Feeding systems of dairy cattle

Most of the milk production in Hungary is conducted in large-scale farms. At the same time, a large number of small-scale dairy farms, which were developed in private plots during the period of former collective farms, can also be observed. In short, the 2 forms of farming are considerably different (Table 1). The main production systems for large-scale dairy farming were consolidated in the 1970s. Large-scale highly efficient production can be achieved through the utilization of a large labor force. Since feeding management operations are further subdivided and allocated to specialized workers, in general, individual operations are highly efficient. However, due to the stagnant trend in investment, outdated facilities and machinery are still being used.

At the surveyed farm which belongs to the 'A Corporation' and which is involved in feeding management only (Alsoleperd farm, hereafter designated as 'A Farm'), a work force of 16 people feed 840 cows (including 720 milking cows) and 649 heifers, along with fattening cows (644), fattening pigs (3,000) and reproducing pigs (1,800). Likewise, at the 'B Co-operative', 19 workers feed 385 cows (including 290 milking cows), 290 heifers, fattening pigs (1,700), and reproducing pigs (130)[6]. The milking cowshed is divided into loose barns (for 640 cows) and tie stools (for 80 cows). Cows in the former are milked at milking parlors (40 units; automatic milker removing unit, computer-controlled identification unit). But, there are only 2 workers in charge and the working hours are 4 h and 30 min (5:00~9:30) in the morning and 3 h and 45 min (15:00~18:45) in the afternoon. In addi-

Table 1. Milk production structure by head of dairy cattle (1997)

No. of dairy cows (head)	No. of farms	Total head no.	Average head no.	Milk production (1,000L)	Milk yield (L/head)
Smallholder · Family farm					
1–5	22,092	52,529	2.4	160,214	3,050
6–10	2,180	15,978	7.3	54,973	3,441
11–20	469	6,778	14.5	22,907	3,380
21–50	152	4,847	31.9	18,308	3,777
51–100	55	3,764	68.4	9,056	2,406
101–200	12	1,915	159.6	8,533	4,456
201–	2	626	313.0	2,585	4,129
Total	24,962	86,437	3.5	276,576	3,200
Co-operatives · Corporation					
1–10	3	25	8.3	112	4,480
11–20	3	44	14.7	200	4,545
21–50	31	1,158	37.4	4,223	3,647
51–100	52	4,104	78.9	15,996	3,898
101–200	133	20,720	155.8	84,930	4,099
201–500	358	119,854	334.8	564,078	4,706
501–1,000	136	90,854	668.0	505,260	5,561
1,001–	33	53,229	1,613.0	323,960	6,086
Total	749	289,988	387.2	1,498,759	5,168

Source: Dairy Produce Council.

tion to the milking shed, the cowshed is operated by individual feeding specialists in the sheds of nursing (first and second terms), rearing (first and second terms), calving, first pregnancy, and dry up. Their work is further subdivided and allocated to special staff.

On the negative side, in this excessively subdivided working method, in spite of the efficiency, the lack of coordination among individual operations hinders the development of a consistent technical system of milk production from nursing, rearing, insemination, to milking. The average Hungarian calving interval has continued to rise since the mid-1980s – from 403 days in 1985 to 422 days in 1996 ('A Farm': 430; B Co-operative: 380~400 days). Since the mortality is also high, 28% (Holstein and Friesian, or crossbreed), the average number of calvings is only 2.6 ('A Farm'). In contrast, in the 2 family farms (feeding 9 cows or 18 cows at traditional stall barns), the calving interval was 360 days. Thus, the low technological standards in large-scale farms can be attributed to the work system though problems in the supply of feed may also be important.

The sequence of feeding processes lacks continuity as a work system in spite of the efficiency of individual operations. In fact, the feeding size per worker is not particularly large nor very high in work efficiency. In other words, although large-scale production can be achieved, a technical system that makes optimal use of capacities has not been developed.

Meanwhile, in spite of the large herd size, Hungary does not have environmental problems associated with manure treatment, due to the low underground water level and the low feeding density of cattle. There were no environmental problems associated with the manure treatment at any of surveyed farms in Hungary. Large quantities of straw are used as bedding in cowsheds. For example, at 'A Farm', bedding is replaced every day or every other day, transferred from the cowshed to the compost yard. After 4 months of accumulation, the bedding will be reused as compost in upland farms. In spite of their large scale, farms in Hungary do not experience the problem of manure treatment, because in many farms, crop cultivation and livestock farming are combined, compost is in great demand, and a large amount of wheat straw can be used in dairy farming.

Feed structure of milking cows

Feed in dairy farming, consisting of roughage or concentrate, is often produced on the premises of the farm. At the surveyed farms, barley and maize were also produced (Table 2). In most of the large-scale farms, the production department is divided into several sections, and feed production is normally included in the crop section due to the similarity of the work. The organization is different from that of the department of dairy farming (feeding). In addition, since each department has its own

Table 2. Cultivation area of surveyed farms (1998)

Kind of crop	A Corporation		B Co-operative		C Farm*		D Farm	
	Area (ha)	Yield (t/ha)	Area (ha)	Yield (t/ha)	Area (ha)	Yield (t/ha)	Area (ha)	Yield (t/ha)
Wheat	2,040	5.3	662	4.7	5	4	5	4
Winter barley	779	4.9	93	4.2			2	4
Spring barley	150	4.1						
Maize	1,018		868		15		6.5	
for cereal			705	9.2	10	7	3.5	7
for silage			163	25.6	5	25	3	
for breeding	1,018	37.0						
Brassica for oil	156	0.5						
Brassica for mustard	307	0.3						
Sunflower	730	1.8	236	1.7				
Sorghum for silage	50							
Lentil	777	0.6						
Triticale			135	3.3				
Lucerne	200		173	4.7	5		5	
Grass for cutting			42				2	
Grass for grazing					5		3.5	
Others	20		265					
Total	6,227		2,474		30		24	

* C farm's figures correspond to the year 1997.

accounting system, the same feed produced inside the corporation is purchased in the dairy department. As a result, feed prices are regulated by market prices, failing to guarantee conditions for obtaining inexpensive feed.

'A Corporation' also has a similar structure of departments. Since crop production is centered on seed production, the feed cropping area is not large enough to allow for self-sufficiency, thereby requiring the purchase of feed rations from outside dealers. Table 3 shows feed materials and unit prices supplied at the formula feed department of the A Corporation plant.

The raw materials of formula feed are mostly produced in the corporation. The price of these raw materials corresponds to the market price. At 'A Farm', produced formula feed is supplied by the TMR method based on the feed composition given in Table 4, leading to a milk yield of 6,400 L/year per milking cow (milk fat rate: 3.6~4.0%; protein rate: 3.2~3.4%). To reduce the consumption of concentrates, by-products are used for TMR. Milk yield per cow at 'B Co-operative' is likewise 6,800~7,000 L/year (milk fat rate: 3.7~3.8%; protein rate: 3.3~3.4%). The amount of feed supplied in family farms is shown in the same Table. Because of summer grazing, the milk yield per cow is low, 6,000 L/ year (C Farm) and 5,500 L/year (D Farm). In this regard, the yield is very different from that of large-scale farms.

Table 3. Feed supply at 'A Corporation' (1998)

Item	Kind of feed	Volume (t/year)	Price (HUF/t)
Purchased	Pre-mixed	700	9,500
Purchased	Soybean	2,600	6,000
Purchased	Sunflower cereal	1,500	3,200
Self-supplied	Cereal	22,000	15,000

JPY (Japanese yen) 100 = HUF (Hungary Forint) 151 (Oct. 1998).

The milk yield per cow in Hungary exceeded 3,000 L in the 1970s, then it rose to over 4,000 L in the 1980s. Although it declined and remained stagnant in the 1990s due to the structural reform (Table 5)[7], it has been increasing over the long term. Two major factors for this trend are related to breed improvement and the increase in the amount of concentrates used. On the other hand, the roughage quality did not improve. Indeed, if the quality of roughage had increased, the amount of concentrates used would have not increased so much when milk yield per cow increased.

Nutritional value of supplied feed at 'A Farm' is shown in Table 6. The author could not obtain data on various kinds of grasses. However, since the amount of CP (crude protein) of maize silage was very low, the quality of haylage or hay was low. These findings indicate that if the cattle feeding department and feed production department are separated, the lack of coordination between the 2 departments prevents the improvement of quality of roughage. This is because procedures in dairy production are closely related: in the case of feeding, the

Table 4. Feed composition for milking cows at surveyed farms (1998)
(kg/day/head)

	A Farm[a)]	B Co-operative	C Farm	D Farm
Grazing	–	–	Intake	Intake
Corn silage	18	25	Intake	13
Grass hay	1.5	–	Free intake	–
Lucerne hay	1.5	–	–	5–6
Haylage	3	8	Free intake	–
Beer by-products	6	–	–	–
Alcoholic by-products	4	–	–	–
Concentrates	6[b)]	0–8[c)]	8–10 [d)]	5[d)]
By-pass protein	1.5	–	–	–
Fresh beet pulp	Intake in particular season			–

a): Example for 20 L of milk per day < Energy 6.5 MJ >.
b): 50% of corn, 20% of wheat, 20% of sunflower, 5% of soybean, 5% of pre-mixed feed.
c): 70% of formula feed, 30% of pre-mixed feed.
d): Furthermore, pre-mixed feed lime.

Table 5. Changes in milk yield for registered cows (kg/cow)

Year	Milk yield	Year	Milk yield
1970	3,458	1984	4,817
1971	3,369	1985	4,875
1972	3,281	1986	5,037
1973	3,277	1987	5,244
1974	3,132	1988	5,363
1975	3,135	1989	5,435
1976	3,158	1990	5,534
1977	3,480	1991	5,519
1978	3,831	1992	5,510
1979	3,988	1993	5,498
1980	4,138	1994	5,696
1981	4,314	1995	5,856
1982	4,515	1996	5,909
1983	4,682		

Source: Livestock Performance Testing Ltd.

quality of supplied feed should be improved, while in the case of feed production, feeding management should be adapted to the quality of roughage, which is easily affected by the weather conditions. Here there is a lack of consistency in the technical system of dairy production extending from feed production to cattle feeding.

Because the quality of roughage does not improve, the increase in milk yield per cow is associated with the use of concentrate rations. As a result, compared to Western European countries, the amount of concentrate rations per 1 L milk is large and the feed effect[(8)] is low, 2.0. Furthermore, this is another factor for cost increase, and the feed price is also higher than in Germany (Germany: DM 0.3/kg; Hungary: DM 0.4/kg).

Table 6. Feed value of forage at 'A Farm' (1998)

Feed	Feed value
Corn silage	DM 31.7%, CP 2.4%, DCP 1.2%, SV 19.1 kg/100 kg
Alcohol by-products	DM 43.2%, CP 5.6%
Formula feed	DM 88%, CP 15.1%, DCP 13.2%

DM: Dry matter, CP: Crude protein, DCP: Digestive crude protein, SV: Scandinavia feed value unit.

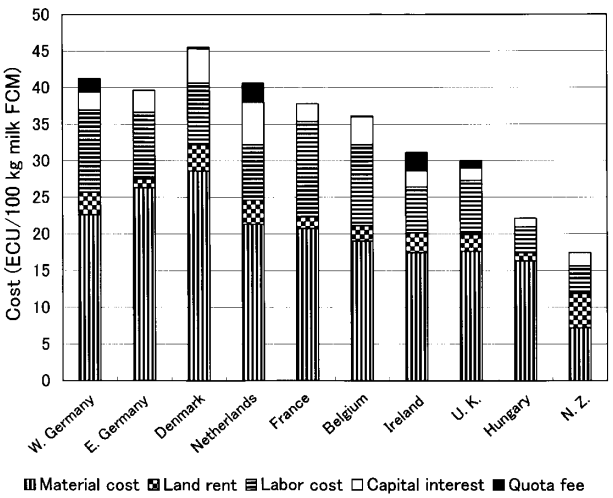

Fig. 1. Cost structure of milk production (1997)
Source: Questionnaires of the Club of European Dairy Farmers (EDF), 1997.

Table 7. Changes in milk production cost in Hungary

Year	1993	1994	1995	1996	1997	1998
Total cost (HUF/L)	19.4	25.8	29.3	37.3	45.2	51.9
Feed cost (HUF/L)	7.4	9.8	12.9	17.4	21.0	24.5
Rate of feed cost (%)	38.7	38.0	44.0	46.7	46.6	47.1
Milk price (HUF/L)[a)]	21.56	25.57	30.45	36.86	46.46	55.00
Rate of cost (%)[b)]	111.1	99.1	103.9	98.8	102.8	106.0

a): Extra grade, b): Milk price/total cost, Source: Dairy Produce Council.

Table 8. Cost of milk production at surveyed farms (1998)

	A Corporation*			B Co-operative		
	(1,000HUF)	Per 1 L (HUF/L)	Percentage (%)	(1,000HUF)	Per 1 L (HUF/L)	Percentage (%)
Feed cost	134,102	19.52	44.6	50,351	27.84	53.7
self-supplied	106,552	15.51	35.4	23,071	12.76	24.6
purchased	27,550	4.01	9.2	27,280	15.08	29.1
Other materials	24,766	3.60	8.2	12,513	6.92	13.3
Wage	26,340	3.83	8.8	5,219	2.89	5.6
Wage taxes	10,272	1.50	3.4	2,563	1.42	2.7
Depreciation	14,636	2.13	4.9	2,165	1.20	2.3
Other costs	24,785	3.61	8.2	6,949	3.84	7.4
Repair, maintenance	5,341	0.78	1.8	1,848	1.02	2.0
Machines	26,958	3.92	9.0	–	–	–
Other fixed costs	34,210	4.98	11.4	13,480	7.45	14.4
By-products	431	0.06	–	1,256	0.69	–
Total cost	300,979	43.81	100.0	93,832	51.88	100.0
Milk production (L)		6,870,457			1,808,719	
Sales price (HUF/L)		58.5			58.1	

* First half year of 1998.

Cost structure of milk production

Cost of Hungary's raw milk production is lower than in the EU countries (Fig. 1). If Hungary joins the EU, its dairy farm industry will become more competitive[9] due to the low labor cost and land price. Feed cost or material cost is not appreciably different. Although the cost of milk production (Table 7) continues to increase every year due to inflation, milk prices also increase and their ratio has been fluctuating near 100%. Since the price of milk has continued to increase, especially in 1998 when it skyrocketed, milk production should increase.

The breakdown of milk production costs shows that the feed cost rate (produced in the farm or purchased) has been consistently on the increase — a major factor in the rise in the production cost, which may be associated with privatization following the reform of the regime, and the increase in purchased feed[10].

Milk production cost at 'A Corporation' is low (HUF 43.81/L) while the milk price is high (HUF 58.5/L), with a ratio of 134% (Table 8). Among the costs, the rate of feed cost is predominant at 45%, while the labor cost, depreciation cost, and repair cost are conspicuously low. Production cost at 'B Co-operative' is high (HUF 51.88/L) due to the high cost of purchased feed. The same characteristics can be observed in the cost composition.

Conclusion

Due to the large-scale production system of dairy farming in Hungary, individual operations are conducted by specialists, leading to a very high efficiency, as seen in milking work. However, in terms of coordination among the individual operations, the method is not efficient and lacks consistency as a technical system of milk production. As a result, there has been a decline in technical standards, such as prolonged calving intervals. Close

coordination among individual work processes could be achieved through labor management.

The major problem is that because of the large scale, feed production and feeding management in dairy production are entrusted to different departments, which is inevitable in the management of large-scale farms. Also, because of the diversification of farming among departments, manure treatment has not been a problem in spite of the large size of the farms. However, the lack of coordination in the activities of the feeding department and the feed production department hinders the development of feeding management and feed production technologies(11). This aspect is the major constraint in the production system of Hungary's dairy industry, as exemplified by the feed ratio problems, including the insufficient improvement of the quality of roughage and the increase in the use of concentrate rations.

In Japanese dairy farming as well, feeding management and feed production technologies have not made progress simultaneously. In the modern dairy farm industry in Hokkaido, feed rations cannot keep up with the speed of breed improvement of milking cows (especially in terms of high-quality roughage), causing diseases during the birth period. In Japan, there is an expansion of the scale of operation, aggregation of dairy farms, and outsourcing for feed production (on contract). Feeding issues in Hungarian dairy farming indicate the importance of a production method in which feeding management and feed production are linked.

In Hungary, negotiations are being promoted for joining the EU in 2005 or 2006. People are optimistic about the competitive power of Hungary's dairy industry in the EU, except for the lack of a revenue source for subsidizing farms, which will be required after joining the EU. In fact, milk production costs in Hungary are lower than in Western Europe. However, the low labor cost is based upon the advantage of the production system. Although high efficiency is achieved in individual operations, the production of final dairy products is not very efficient, in taking account of the large number of labor hours in the agricultural industry. The comparative advantage of Hungarian dairy farming depends on the low wages rather than on the production system. In this respect, the problem for Hungary is how to reduce material costs.

Notes

(1) Regarding the trend of Hungarian agriculture associated with the reform introduced by the government, refer to Shibasaki, Y.[5] and Morita, K.[4].

(2) For details on the large-scale farms surveyed, refer to Tsuboi, N.[6]. The coordination of the visits of farms by the author was taken care of by Nobuhiro Tsuboi, Tohoku National Agricultural Experiment Station (now at Tsukuba University) and Yukihito Konno (at the Japanese Embassy in Budapest). For the study and interviews, cooperation was extended by Dr. Márta Stauder and Dr. Márton Szabó of AKII, Mr. Attila Máthé of Pannon Agricultural University.

(3) Information was provided mainly by Udovecz, G. Meszaros, S. & Spitálszky, M.[1], Lingard, J. & Szabó, M.[2] and Orbán, N. M., Stauder, M. & Szabó, M.[3].

(4) For the corporate form of Hungarian agriculture, refer to Morita, K.[4]. The "corporation" category includes privatized former government-run farms, former collective farms and developing individual farms, involving limited companies and stock corporations. The former predominates (95% of the farms) (1997). "Co-operative" is a collective farm. "Individual" comprises family farms (full-time farmers) and traditional small-scale farms, which were derived from the individually run farms within the former collective farms.

(5) Raw milk quality requirement in the EU is as follows: less than 400,000 somatic cells and 100,000 total germs per cm^3. Approximately 20% (1996) of Hungary's raw milk production is consumed through direct sale to homes or nearby localities. The milk in such sales is not subjected to hygienic standards.

(6) On a labor per capita basis, the scale is not particularly large. However, since over-employment in farms is common, evaluation from a socio-economic perspective is necessary. For example, in a co-operative farm, there is an obligation to secure employment for the members.

(7) Factors responsible for the decrease in yield per cow include the disposal of high-quality cows due to privatization, the lack of breed improvement, and the decline in roughage quality due to the 1992-1993 drought when slaughtering of milking cows was not implemented in spite of the decrease in milk consumption.

(8) Feed effect = quantity of milk produced / amount of concentrate feed ratio. Incidentally, the Hokkaido average is 2.9 (1997).

(9) However, competitiveness within the EU is ultimately affected by the standard of direct payment (subsidy) (Mr. Becsy Laszlo, Ministry of Agriculture). Although Hungary can be competitive under the present price conditions, the increase in wages and investment in hygienic facilities may reduce Hungary's competitiveness in the short run (Lingard, J. & Szabó, M.).

(10) As privatization of land progresses, large-scale farms need to lease all their farmland. This is the major factor for the instability in dairy farming. Land lease contract is not considered to be stable due to the continuous competition in the utilization of farmland. For Hungary's land privatization, refer to Morita, K.[4]. Owner-operated farming based on land leasing and privatization has facilitated changes in farmland cropping and has led to a reduction in feed production.

(11) However, we cannot evaluate the suitability of corporate forms only in terms of production system. Refer to Tsuboi, N.[7].

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