USE OF LOCALLY PRODUCED ROUGHAGE BY DAIRY FARMS IN KOREA

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ABSTRACT

Dairy production in Korea has a history of only 50 years, but it is expanding rapidly with the rising consumption of milk and milk products. Since farms are small, it is difficult for dairy farmers to produce enough roughage feed. The proportion of feed concentrates in the diet of dairy cattle is very high, and what roughage feed is given is often of poor quality, particularly rice straw. This causes physiological disorders and low fertility. The problem is discussed, and a case study given of a dairy farm in a rice-growing area. The farmer rents fallow rice land over the winter in order to grow a winter forage crop. His costs are relatively low compared to most dairy farms, and the productivity of his herd is higher.

INTRODUCTION

Although dairy production in Korea has a very short history, it has developed rapidly with the increase in milk consumption since the 1970s. Over 28 years, per capita milk consumption in Korea has increased by 150 times, from 0.3 kg/year in 1965 to 45.0 kg/year in 1993.

During this period of rapid growth, the dairy industry has depended on concentrated feeds, because of the high cost of land and labor and lack of suitable farm machinery. In the rations of dairy cattle, feed concentrates make up 60% while roughage contributes only 40%. Most concentrated feeds are made in mixed feed factories from imported materials such as corn, sorghum, wheat, tapioca and soybean.

The main roughage feed used on dairy farms is rice straw (66% of the total). Forage cut while green contributes 25%, and silage 9% (on a dry weight basis). Land used to produce roughage feeds for dairy cows was only 0.1 ha per head, including forage crops and grassland. The low intake of roughage feed causes low productivity as a result of disease from physiological disorders, sterility, shortening of economic life etc.

In order to solve this problem, many dairy farms are making every effort to obtain more roughage feed. This paper discusses the general status of dairy management in Korea, and a case study of a dairy farm which produces its own roughage feed.

DAIRY FARMING AND FORAGE PRODUCTION IN KOREA

Milk Production

Although dairy cattle raising in Korea is only about 50 years old, the Korean government has carried out a policy of promoting dairy farming, by introducing high-yield milk cows from abroad and maintaining milk prices at a level higher than production costs. By 1993, 553,300 head of dairy cattle were being raised on 28,200 farms, producing a total of 1,859 thousand mt of milk.

Annual milk production per head that same year was 5,946 kg, which represents a 20% increase compared with production levels ten years earlier. The fat content of milk produced in 1993 was 3.7%, while the breeding rate was comparatively low, at 72.6% with a 16.5-month calving interval. This poor fertility was largely the result of physiological disorders due to a shortage of roughage feed in the diet.

The average gross income for each milk

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cow was US$4,046 (US$3,227 from the sale of milk, and US$819 from the sale of the calf and the manure), while production costs in 1993 were $3,653 per head. This gives an average net income per head of US$393.

The production cost of milk (deducted by-product value) was $0.50 per kilogram, while the price of milk was $0.53 per kilo. This gave a profit of $0.03 per kilo of milk. In Korea, the price of milk is not decided by market demand, but is set by the government according to farmers' production costs and their need for a reasonable profit.

Forage Crop Production

The forage crops grown in Korea are mainly corn for silage, and sorghum, rye, oats and rape which are cut green or used for silage. Corn and sorghum are grown during the summer, and rye, oats and rape over the winter following crops of corn, sorghum or rice. Of the total area (164 thousand ha) planted in forage crops for beef and dairy cattle in 1993-'94, 15% was in lowland paddy fields after the rice crop, and 85% was in the uplands. In upland areas over the summer, corn grown for silage was the most important forage crop, while oats, cut green or used for silage, were the most important winter crop (see Fig. 1).

The average cultivation area of forage crops per farm was 1.48 ha in 1993. The area per farm is increasing compared with that of the past, but the area per head is decreasing (only 0.09 ha in 1993). The reason is that both farm machinery for forage production and farmland are becoming more expensive. Most dairy farms are using rice straw, and are purchasing alfalfa imported from abroad rather than cultivating their own forage crops.

Feeds Used for Dairy Cattle in Korea

On dairy farms in Korea, the ratio of roughage feeds given milk cows in 1993 was only about 37% (on a dry weight basis), compared to 50% only 10 years ago. This diminishing trend has been caused by an increase in the scale of dairy production.

Of the concentrated feeds used on dairy farms, mixed feeds produced in feed factories contribute about 90%, with the remainder made up of bran and other food by-products. Of the roughage feeds used on dairy farms, 66% was rice straw while 25% was green-cut forage. The remaining 9% was made up of other roughage feeds such as silage and hay (Table 1). Even ten years ago, relatively little rice straw was used as feed compared to green-cut forage and silage. Despite the increase in the number of dairy cows, the production of roughage feeds has not improved, leading to an increase in the use of rice straw and also imported alfalfa.

PRODUCTION OF ROUGHAGE FEEDS ON DAIRY FARMS – A CASE STUDY

Farm Size and Forage Crops

A dairy farm located in Kimpo District near Seoul was selected as a case study. The Kimpo area

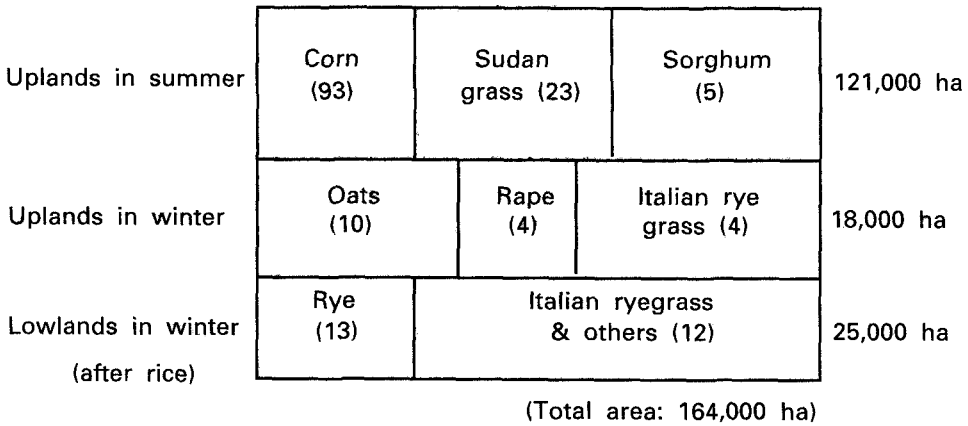

Fig. 1. Area of forage crops grown in uplands, and in lowlands following rice.
Note: Numbers in parenthesis indicate the cultivated area x 1000 ha.

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Table 1. Feeds used for dairy cattle in Korea

Classification		1980	1985	1990	1993	1993/1985(%)
Concentrated feed (kg DM)	Mixed feeds	2,797	2,689	3,203	3,545	131.8
	Bran & others	270	458	415	449	98.0
	(Subtotal)	3,067	3,147	3,618	3,994	126.9
Roughage feed (kg DM)	Rice straw	1,019	1,408	1,365	1,578	112.1
	Green-cut forage	961	978	686	591	60.4
	Silage	908	783	495	191	24.4
	Hay & others	59	45	110	40	88.9
	(Subtotal)	2,947	3,214	2,656	2,400	74.7
Ratio roughage: concentrates (%)		49.0	50.5	42.3	37.5	-

* DM: Dry Matter

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* Source: Report of Livestock Production Cost Survey, National Livestock Cooperative Federation, 1981 - 1994

is in the plains, and is mainly used for wet rice. Around 6,700 head of dairy cattle are being raised on 370 farms, with most farmers feeding the rice straw as roughage. Mr. Ik-Hwan Kim, the owner of the case farm, is 35 years old. Since graduating from an agricultural high school 15 years ago, he has been engaged in full-time dairy farming. His wife also works on the farm helping her husband. The farm is managed as a form of diversified farming which combines dairy and rice production.

At present, the farmer is raising 26 milk cows and 24 heifers. He plans to increase his herd to about 40 milk cows and 40 heifers, and hopes to produce 1,000 kg of milk per day in the near future. He is now managing a cropping area of 3.3 ha, used for paddy rice over the summer and for rye during the winter to provide roughage feed. He also has 2.5 ha of upland fields, growing corn during summer and rye over the winter.

Each year, his lowland fields produce a total of 14.9 mt of rice and 16.5 of rice straw, plus about 33.8 mt of silage from the winter rye. His upland fields produce 112.5 mt of corn silage during summer season and 65.3 mt of rye silage during the winter. However, he buys an additional 33 mt of rice straw each year, because he cannot produce enough roughage feed on his own farm.

The average annual milk production of his dairy herd, 7,320 kg/head is 23% higher than the national average production of 5,946 kg/head. The fat content of the milk is 4.0% and the breeding rate is 85.7%, both also higher than the national average figures of 3.7% fat content and breeding rate of 72.6%.

Production of Roughage Feeds

The farmer would like to increase the productivity of his herd by feeding silage all year round, cultivating more forage crops. However, land is too expensive to buy just for forage, so he intends to rent fallow lowland over the winter.

In the production of forage crops, a considerable investment of labor and agricultural machinery is needed for seeding, harvesting and silage making. To achieve economies of scale, five years ago ten farms formed a group, working together to produce silage. More than 20 farms are now participating in this cooperative effort. The number of members is increasing year by year, in order to make joint use of machinery and to solve the labor problem when it is time to harvest the forage crops and make silage.

With regard to the quantity of roughage feed, it was found that the case farm uses 30% less rice straw than the national average, and more than twice the average amount of silage. Further-more, the silage is of very good quality.

The high productivity of the farm's dairy herd is considered to be a direct result of the high quality of the forage feed.

Profits from Dairy Farming

The farm under study produced an average of 190 thousand kilos of milk and 22.3 calves every year, giving a gross income of US$126,018. Operating costs were $60,515, including US$40,463 for feed. Production costs were US$94,803, which included the cost of family labor and the interest on

capital.

The net income of the farm was thus US$31,215 a year. When converted to income per milk cow, the yearly income per head was $2,651, considerably higher than the national average.

The production cost per kilogram of milk (deducted by-product value) was $0.37, which is lower than the national average cost. There are two reasons for this. Firstly, the yield of milk and calf production increased as a result of using plenty of good-quality roughage feed. Secondly, the farm was larger than the average dairy farm, making possible more efficient use of family labor.

CONCLUSION

Success or failure in dairy farming in Korea depends largely on a sufficient supply of good-quality roughage feed. In countries like Korea which have a high population density compared to the cultivated area, it is not easy to cultivate forage crops rather than food crops on arable land. Therefore, dairy farms in Korea depend more on concentrated feeds than roughage feeds. Even the roughage feeds they do use consist largely of rice straw as a crop by-product, rather than forage crops.

The farm on which the case study was based showed that increasing forage production could be profitable, because the improved diet of the cows led to an improvement in productivity, in terms of milk yield, milk fat content and breeding rate.

An improved forage supply is crucial to improving the productivity of dairy farms. On farms where there is not enough land to produce enough roughage feed, renting fallow land over the winter, combined with joint use of the expensive implements used for seeding, harvesting and silage making, can be highly efficient. In addition, the application of livestock manure to fields of forage crops can be expected to have a beneficial effect, by reducing the need for chemical fertilizer, improving soil qualities, and reducing the environmental pollution which the manure might otherwise cause.

DISCUSSION

Dr. Aglibut of the Food and Fertilizer Technology Center (FFTC) said that several methods of treating rice straw had been used in the Philippines, including urea and sodium hydroxide. Although treatment improves the feeding value of the straw, the methods are difficult for farmers to use, and easier methods must be found. He referred to forthcoming FFTC programs which would look at the extent to which such methods are being adopted on farms.

Dr. Kim agreed, and pointed out that although ammonium treatment is effective, it must also be economical from the farmer's point of view. He pointed out that many factors have to be considered, including the price of straw, the price and availability of ammonia gas, the price of concentrates, and the market price of livestock products. Milk prices in Korea are high in relation to the price of rice straw. A dairy cow giving 20 kg milk/day can be fed mainly on rice straw, but when a cow is producing milk at a rate of 25-30 kg/day, untreated straw cannot meet her nutritional requirements and ammonia treatment is needed.

Dr. Kim also pointed out that whereas untreated straw had an energy value of around 37% (on a dry matter basis), straw treated with ammonia gas had an energy value of 46-50%. Ammonia treatment had two advantages: it increased the feed intake of livestock, and increased the energy value of straw.