Grasslands for Animal Production in Japan and their Future Prospects

Tsuyoshi Okajima

(Received December 28, 2005)

Abstract

In the middle of 19th century, a lot of pasture species were introduced from foreign countries and artificial pastures were developed, and utilization of artificial pastures were accelerated by a lot of subsidies financed by the government in the 1960's. However, the grazing management of pastures failed to be a main current in Japan. One of the reasons can be undergrazing of pastures, or rank growth of broadleaf dock (*Rumex obtusifolius*), or tall sward height utilization of tall grass type species such as *Dactylis*, *Phleum* and *Lolium*. So, I would like to propose "short sward height utilization" of tall grass type species such as *Dactylis*, *Lolium* and *Festuca*. The experiment of short sward height management of *Dactylis* pasture showed that the short sward height utilization resulted in a high carrying capacity (ca. 570 cow day) of the pasture. And also, short and stoloniferous species such as *Agrostis*, *Poa* and *Zoysia* are necessary for the grazing management of pastures.

Bull.Facul.Agric.Niigata Univ., 58(2):137-139, 2006

Key words : grazing, short sward height, stoloniferous species, tall grass type species

Situation and role of semi-natural grassland in Japan

In Japan, the climax vegetation is forest, and in Hokkaido that is evergreen coniferous forest. In Tohoku and north Chubu areas, the climax vegetation is deciduous broadleaved forest, and to the South and East areas in Japan the climax vegetation is evergreen broadleaved forest (Fig.1). In each corresponding area, semi-natural grasslands for the meadow types are (A) *Sasa* spp., (B) *Miscanthus* and (C) *Miscanthus-Pleioblastus* types. On the other hand, those for the grazing pastures are (A) *Poa-Festuca*, which are mainly dominated by naturalized pasture species from Europe and US, (B) *Zoysia*, and (C) *Zoysia-Pleioblastus* types (Fig.1). Several decades ago, the area of semi-natural grasslands in Japan was 16,000 km^2 and this figure is slightly less than the area of Shikoku Island. These semi-natural grasslands were established and

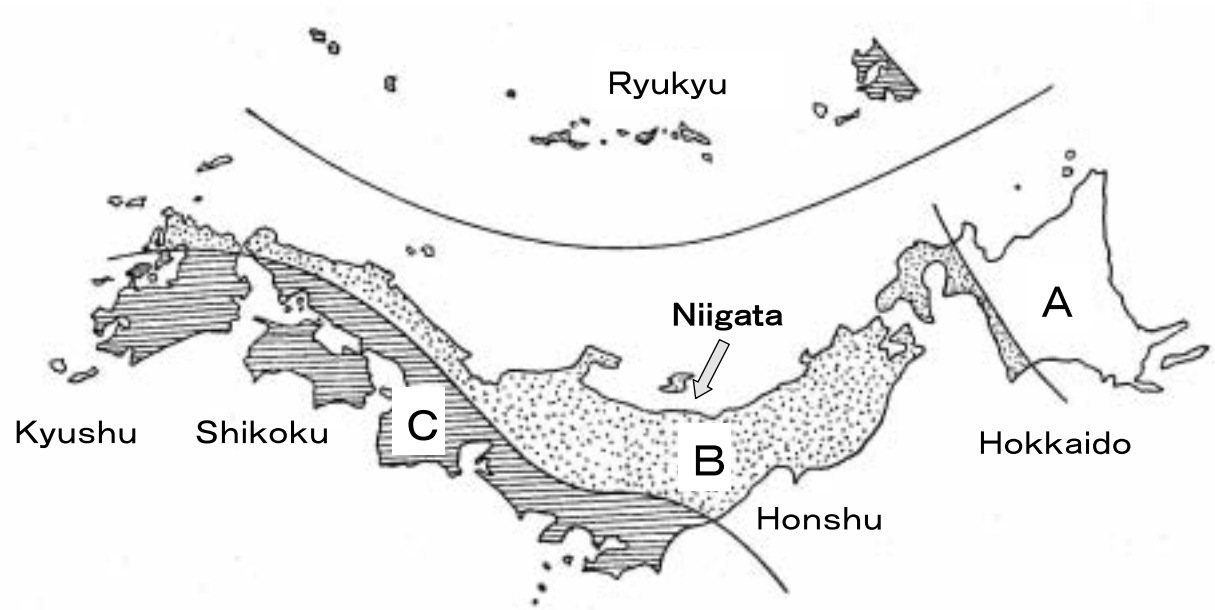

Figure 1. Climax vegetations for forest in Japan are (A) evergreen coniferous forest, (B) deciduous broadleaved forest and (C) evergreen broadleaved forest. Those for semi-natural grassland, meadow types are (A) *Sasa* spp., (B) *Miscanthus* and (C) *Miscanthus - Pleioblastus*, and pasture types are (A) *Poa - Festuca*, (B) *Zoysia* and (C) *Zoysia - Pleioblastus*. (partly altered from Numata, 1969)

Department of Agrobiology, Faculty of Agriculture, Niigata University, Japan
okajima@agr.niigata-u.ac.jp

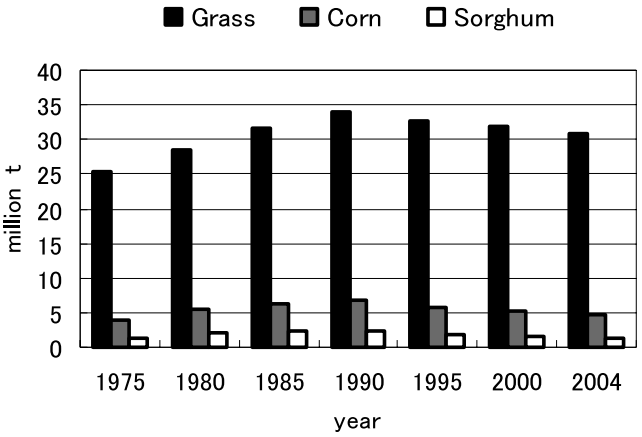

Figure 2. Production (in fresh weight) of grass, corn and sorghum in Japan.

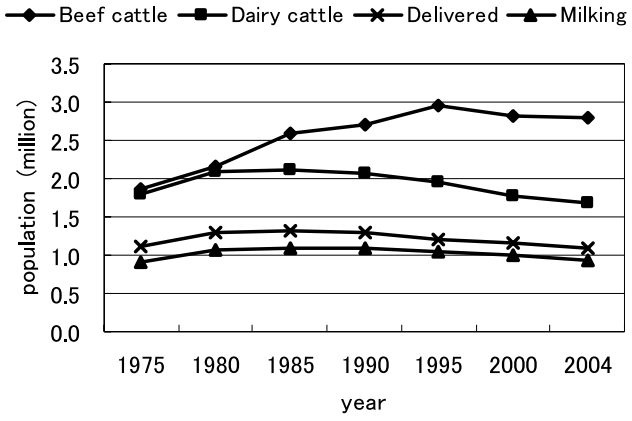

Figure 3. Population of beef cattle and dairy cattle in Japan.

kept by burning, grazing and harvesting for agricultural use. And, together with rice straw and some agricultural by-products, all of the semi-natural grassland had contributed and sustained animal production in Japan until mid 1950's.

In the middle of 19th century, milk was consumed only by foreigners and small part of urban citizens, and milk was supplied by milking manufacturers on the suburbs, not dairy farmers. The only heifers and dry cows were reared by farmers. Milking cows reared by manufacturers were fed with rice straw, some agricultural by-products and concentrates. Milking cows were not on the grasslands. The tendency of feeding much concentrate on dairy cow continues now, and too much concentrate feeding causes one of the factors of its reproductive difficulty. Both the reproductive difficulty and the higher feeding cost derived from concentrates bear severely upon the affairs of dairy farmers.

Utilization of artificial pastures and forage production in Japan

In the middle of 19th century, Meiji Government introduced a lot of pasture species from foreign countries and tried to develop artificial pastures. But the attempt to develop and use the artificial pastures failed to extend to farmers practically. Actual transition from the use of semi-natural grasslands to the use of the artificial pastures became apparent after the World War II, and actual transition was accompanied by both the rearing shift from horse to cattle and from cattle for draft to cattle for production. In addition, development and utilization of artificial pastures were accelerated by a lot of subsidies financed by the government in the 1960's.

Forage production in Japan is showed in Fig.2. Artificial grassland area in Japan is only 0.6 million ha in 2004 (788,000 ha of harvested area), and this area is only 1.7 % of total land area of Japan. In 1975, grass production in fresh matter was 25 million tons, and then increased to 34 million tons during 15 years. Recently, grass production is decreasing a little, and the amount is about 31 million tons, now. Significant amount of grass is preserved as silage and hay, but only a few part of grass is grazed directly on the pastures. Corn, almost all the amount is preserved as silage, is harvested about 4 million tons in 1975, and then increased about 7 million tons in 1990. After that, the amount of corn decreased steadily from the peak of 1990. The decrease of corn production was caused by the wide extension of roll bale silage in Japan. Although about 40 million tons of forages (grass, corn and sorghum) are made in Japan, grass is imported as hay, and the amount is 7.4 million tons in fresh matter base. Also, rice straw of 1.2 million tons is fed to livestock, and the imported amount is about 20 % of rice straw consumed by livestock in Japan.

Fig.3 shows populations of beef and dairy cattle. Dairy cattle increased to the peak of 2 million, and then decreased to 1.7 million in 2004. The numbers of delivered and milking cow showed the same trend, and the population of milking cow is about 1 million. Also, the number of beef cattle increased to the peak of 3 million in 1995, and this increase in beef cattle was mainly due to the Holstein steers as beef cattle, not increase in the Japanese black. The total number of beef cattle is 2.8 million.

In Japan, because it was difficult for individual farmers to secure enough area of grazing pastures, a lot of "public-run grasslands" were established in 1960's, and the number of the public-run grassland increased through the political supports. However, because of the shortage of both skill and knowledge for grazing management, the number of the public-run grassland decreased and decreased from the peak of about 1,300 in late 1970's. Why did the grazing management of pastures fail to succeed in Japan? One of the reasons can be undergrazing of pastures, or rank growth of broadleaf dock (*Rumex obtusifolius*), or tall sward height utilization of tall grass type species as *Dactylis*, *Phleum* and *Lolium*.

Recently, the Japanese Ministry of Agriculture and Fishery (MAF) have advanced the following four styles of grazing originally carried out in Japan - first, intensive

Table 1. Effects of sward height and herbage mass on intake of grazing cows under rotational grazing on the *Dactylis* pasture

Rotation	1	2	3	4	5	6	7	8	9	10	11
	(May)		(June)		(July)		(August)			(September)	
Sward Height (cm)											
before grazing	21.3	14.8	14.0	12.0	14.7	17.0	14.2	13.9	14.6	14.0	14.7
after grazing	7.6	5.8	5.4	5.8	7.3	6.4	6.3	7.6	7.3	7.8	8.2
Herbage mass (gDM/ ㎡) *											
before grazing	154.7	104.3	90.3	48.3	41.9	59.0	65.7	47.3	54.3	51.1	57.8
after grazing	26.6	12.9	8.3	5.6	11.1	10.0	11.2	11.0	10.6	15.7	19.9
Utilization (%)	82.8	87.6	90.8	88.4	73.5	83.1	83.0	76.7	80.5	69.2	65.6
Intake (gDM/head/day)	18.3	14.9	11.4	10.6	6.1	8.4	10.2	7.2	9.3	10.7	10.0
DM Intake/BW (%)	3.07	2.53	1.95	1.82	1.04	1.43	1.73	1.24	1.58	1.82	1.70

* cut at 5 cm above the ground level

Experiment was carried out at Field Center (Muramatsu ST), Faculty of Agriculture, Niigata University, in 2005 (G. Sato and T. Okajima, unpublished)

grazing for dairy farmers, called "super grazing"; second, grazing on the paddy field for the reproductive management of beef cattle farmer; third, grazing on the *Zoysia* type pasture established on the terraced paddy field abandoned; and the last, Silvipastoral grazing, coordinated with the silviculture. But, except for *Zoysia*, MAF makes no mention what kind of grasses should be used for Japanese style of grazing.

Generally, tall grass type species, e.g. *Dactylis*, *Phleum* and *Lolium*, are palatable and high nutritional quality, but they are not so suitable for grazing use in the pastures. On the other hand, short grass type species such as *Agrostis*, *Poa*, and so on, were not actively used in the grazing pastures, because these species are considered to be generally low in palatability and nutritional quality. So, from a different perspective, I would like to propose "short sward height utilization" of tall grass type species such as *Dactylis*, *Lolium* and *Festuca*. Table 1 shows the result of the grazing experiment we made on the *Dactylis* pasture at the Field Center (Muramatsu Station), Faculty of Agriculture, Niigata University, in 2005. In the experiment, short sward height before grazing was achieved and that was from 12.0 to 21.3 cm, and sward height after grazing was from 5.4 to 8.2 cm. But, because the decrease in tiller density, due to the hot temperature during the season, was quite different from our expectation, herbage mass (cut at 5 cm above the ground level) also decreased in late June and low herbage mass continued until late September. Therefore, the herbage intake by the grazing cows decreased at the same time, and the ratio of herbage dry matter intake to body weight of cows was very low from June to September (1.04 to 1.95 %), though the ratio was 2.53 to 3.07 % at the rotations in May. Nevertheless, the utilization (%, ratio of intake to herbage mass before grazing) was very high (74 to 91%) through the experimental period (except the rotations in September) and carrying capacity was 570 cow day from May to September.

Also, I would like to propose the use of short and stoloniferous species such as *Agrostis*, *Poa* and *Zoysia* for the grazing pastures, because these grasses are highly adaptable to various soil conditions in Japan under cattle grazing. Using both tall and short grass type species, also stoloniferous ones, for the grazing pasture, what we must pay attention to is to maintain short sward height, and also to maintain higher tiller density of the sward.