

THE RELATIONSHIP OF GRAZING CONDITIONS TO ANNUAL CHANGES OF SWARD CHARACTERISTICS AND HERBAGE UTILIZATION BY LACTATING DAIRY COWS IN THE SNOWY, COLD REGION IN JAPAN

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ABSTRACT

In order to determine the relationship of grazing conditions to annual changes of sward characteristics and herbage utilization in the snowy, cold region in Japan, the data for pasture utilization of dairy cows under a time-restricted grazing on Experimental Farm, Hokkaido University, from 1984 to 1992 were used for analyses. An annual herbage utilization did not always decrease though legume crown coverage declined gradually with advancing years after sward-establishment. The annual herbage utilization (tDM/ha, Y) increased with increasing the stocking rate (cow-hr/ha, X) ($Y=0.00136X-0.685$, $r=0.752^{**}$).

KEYWORDS

Grazing conditions, sward characteristics, herbage utilization, annual changes, lactating dairy cows

INTRODUCTION

Hokkaido is located in the northernmost, and snowy, cold region of Japan ($N42K^{\circ}$ - $45K^{\circ}$), and has large areas of grassland as an important agricultural resource and the most dairy cattle in our country. Grazing conditions have a direct influence on changes of sward characteristics and herbage utilization of pasture. There is, however, little information on annual changes of sward characteristics and herbage utilization of pasture in snowy, cold region (Hokkaido) as compared with humid and temperate region (Honshu) (Simamura et al., 1981; Takahashi et al., 1984).

In this paper, the data for pasture utilization of dairy cows under a time-restricted grazing on Experimental Farm, Hokkaido University, were used for analyses to determine the relationship of grazing conditions to annual changes of sward characteristics and herbage utilization in the snowy, cold region in Japan.

MATERIALS AND METHODS

The data used for analyses were those from 9 paddocks (0.26-0.55ha/paddock) of orchardgrass (*Dactylis glomerata* L.) and white clover (*Trifolium repens* L.) pasture in Experimental Farm, Hokkaido University, during 1984-1992. The 9 paddocks (total area = 4ha) were established between 1980 and 1984, and were used for rotational grazing of lactating dairy cows. Annual fertilization rates for the 9 paddocks during 1984-1992 were 30-72kg N, 60-100kg P₂O₅ and 60-138kg K₂O/ha (equally split in middle of April and July).

13-30 heads of Holstein lactating cows were rotated in the 9 paddocks under time-restricted grazing (2.5-7.5hr/d) so as to ingest 3-10kgDM/d/cow of herbage. In addition, cows were fed grass silage, hay and concentrate in the barn. The daily roughage allowance was equivalent to total digestible nutrients (TDN) for maintenance+13kg of milk based on Japanese Feeding Standard for Dairy Cattle (National Research Council of MAFF of Japan, 1974). Concentrates were supplemented roughages at rate of 0-28% of milk yield.

As sward characteristics, proportion of legume crown coverage and bare ground area were measured before grazing. Herbage intake was estimated from the difference of herbage mass before and after

grazing. Accumulated herbage intakes were regarded as annual herbage utilization. Stocking rate was expressed as cow-hr/ha since grazing time per day was restricted.

RESULTS AND DISCUSSION

The relationships between years after sward-establishment and sward characteristics, and herbage utilization are shown in Figure 1. Legume crown coverage declined gradually with advancing years after sward-establishment. There were great differences of bare ground area among paddocks in the same year after sward-establishment, so that changes with advancing years were not clear. Annual herbage utilization varied widely among paddocks in the same year after sward-establishment, and annual herbage utilization did not necessarily tend to decrease with advancing years after sward-establishment.

Figure 2 shows the relationship between stocking rate and annual herbage utilization. The annual herbage utilization (tDM/ha, Y) regressed positively on the stocking rate (cow-hr/ha, X), and the following equation was obtained: $Y=0.00136X-0.685$, $r=0.752^{**}$. The annual herbage utilization tended to increase until the stocking rate reached nearly 5000cow-hr/ha (Figure 2), and it is supposed that the annual herbage utilization may increase moreover when the stocking rate is over 5000cow-hr/ha.

In conclusion, it was suggested that the annual herbage utilization did not necessarily decrease with advancing years after sward-establishment, but increased with increasing the stocking rate.

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Figure 1

Relationships between years after sward-establishment and sward characteristics, and herbage utilization

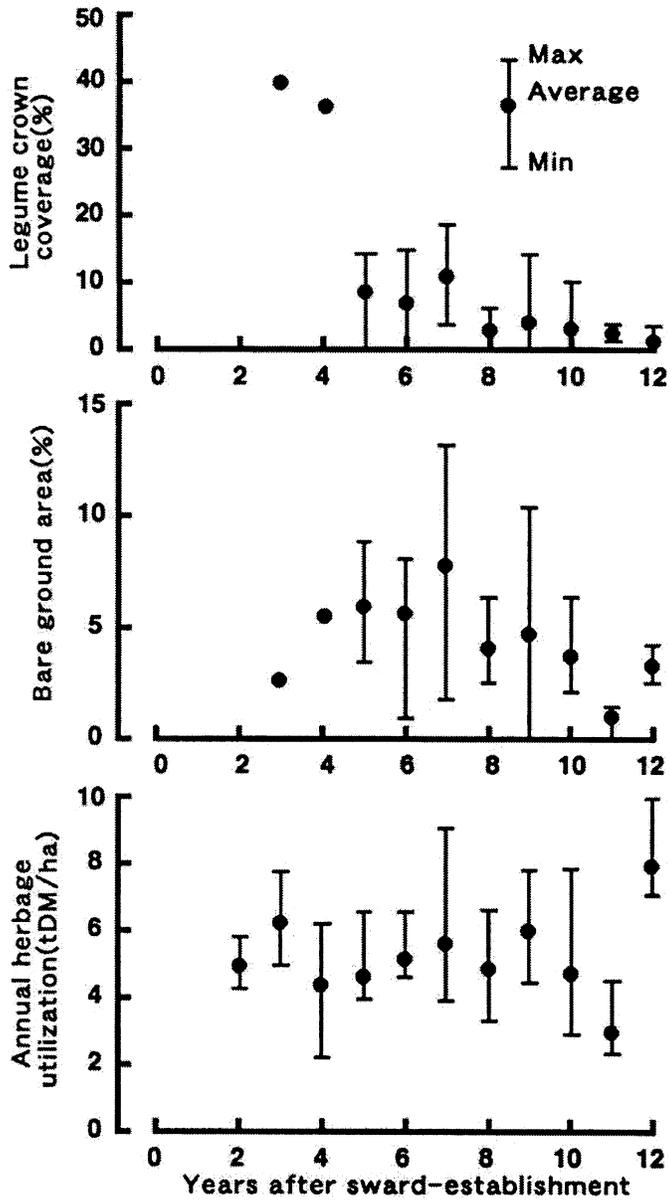


Figure 2

Relationship between stocking rate and annual herbage utilization

