ESTIMATION OF HERBAGE INTAKE OF HIGH PRODUCING MILKING COWS UNDER INTENSIVE GRAZING WITH A SUPPLEMENTARY FEEDING METHOD IN NORTHERN JAPAN

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ABSTRACT
The objective of this study was to estimate the herbage intake and to assess a supplementary feeding method for high producing milk cows under intensive grazing. Eight high producing milking cows were grazed rotationally on perennial ryegrass (*Lolium perenne L*) dominant mixed pasture and on meadow fescue (*Festuca elatior L*) dominant mixed pasture, changing rotation period and grazing area ccording to seasonal pasture growth rate. Pasture intakes were estimated to be about 2% of body weight by TDN requirements estimation of animals. A supplementary feeding method is examined to be proper for high producing milking cows under intensive grazing.

KEYWORDS
milking cows, intensive grazing, pasture intake, supplementary feeding

INTRODUCTION
Recently, grazing has been re-evaluated in Japan, because of its low cost and labour saving character. Dairy farmers who raise high producing milking cows have much interest in intensive grazing, but they have many problems with grazing high producing milking cows, for example, the decrease of milk fat contents or other solid contents, reproductive disorders caused by nutritional deficiency especially at early lactation.

These problems are mainly derived from the difficulties of estimating herbage intake of grazing cows, so that they cannot determine proper kinds and amounts of supplements.

Konsen dairy cattle research group in northern Japan suggested two regulations for determining supplement quantity and quality. One is to adjust total digestible nutrients (TDN)/crude protein (CP) ratio of total ration to more than 40%. Thus, the purpose of this study was to estimate the herbage intake and to assess a supplementary feeding method for high producing milking cows under intensive grazing.

METHODS
In 1996, eight Holstein cows were grazed on pasture (4.0 ha) containing perennial ryegrass (cv. Friend), or meadow fescue (cv. Tomosakae) both with white clover (cv. Sonia) from 8th May to 6th November (183 days). A 1.6 ha ryegrass pasture which was divided into 23 paddocks was allocated to four cows, and 1.6 ha fescue pasture also divided into 23 paddocks was allocated to another four cows. After morning milking, each herd was grazed on a new 7a paddock until evening supplementary feeding at 5:30 pm. After evening milking, at 7:30 pm, two herds were mixed and grazed on a 0.8 ha set grazing pasture containing ryegrass, meadow fescue, bluegrass (*Poa praten L*). In the morning, at 7:30 am, cows were called together for the morning supplementary feeding. The paddock number for rotational grazing was changed according to the seasonal change of growth rate. The pasture area and numbers are shown in Table 1.

Average calving date of the cows was 12th March 1996 (13th Jan. - 11th Apr. 1996). Average calving number was 3.25 (2-5). Average 305 days corrected milk yield was 9,074 kg (7,180-10,571 kg).

Pasture intake was roughly determined by estimating pre and post grazing herbage mass using rising plate meter for daily rotational paddocks and by estimating seasonal growth rate by using protect cages for set grazed pasture. The kinds of supplements were grass silage, beet pulp and mixed grains. The amount of these supplements was determined weekly by the following methods: (1) TDN amounts of supplements were determined to meet total TDN requirements of each cow which were calculated according to Japanese Feeding Standard for dairy cattle including 10% increase of maintenance energy for grazing; (2) Add or subtract some amounts for regulating each cow's body condition score (BCS); (3) The TDN amounts of supplements should not be changed radically compared to previous week (approximately within 20% change); (4) Decrease the amount if the refusal exceeds 10% of feed; (5) Adjust TDN/CP ratio of total ration (including pasture) to be not lower than 4.09; (6) Adjust NDF contents of total ration more than 40%.

Pasture intake was estimated again by the following method: Pasture TDN intake of each animal was estimated by subtracting the TDN amount of supplements that each animal had eaten from the total TDN requirements of each cow. Pasture dry matter intake was estimated by dividing the predicted pasture TDN intake by pasture TDN contents.

RESULTS AND DISCUSSION
Average daily milk yield and BCS change of cows is shown in Figure 1. Milk yield declined smoothly and BCS was maintained properly. The cows showed no feature of nutritional deficiency. They seemed to be kept in proper nutritional conditions.

Pasture intake estimated by TDN requirements seemed to be independent from daily milk yields. The cows ate about 2% of body weight of pasture dry matter (Figure 2).

As the pasture NDF contents was relatively low in spring, and as the animals did not eat all the fed silage, the NDF contents of total rations were below 40% in spring. Therefore, the milk fat contents were low in spring. It might be another reason for low milk fat content in spring that most of the cows calved in early spring, and they produced more milk in spring.

As the CP contents of pasture remained high, the TDN/CP ratio did not reach four except spring and late autumn. When TDN/CP ratio was low, blood urinary nitrogen rose.

Assuming the dry matter pasture intake and 2% of body weight, a method for determining the quality and quantity of supplementary feeds as to the procedure mentioned above seemed to be proper for high producing milking cows under intensive grazing. An example of supplementary feeding for lactating cows is shown in Table 2.

REFERENCES
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Figure 1
Milk yield and body condition score of cows during grazing

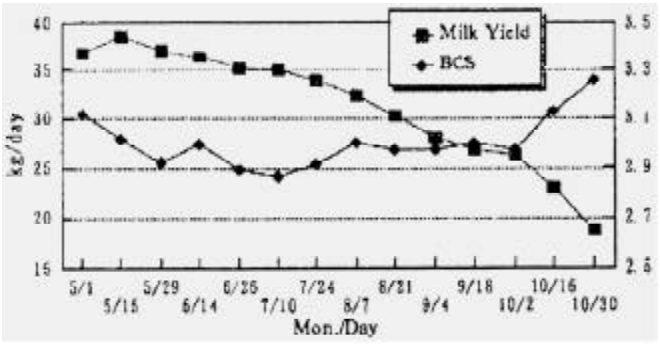

Figure 2
Estimated pasture dry matter intake and daily milk yield

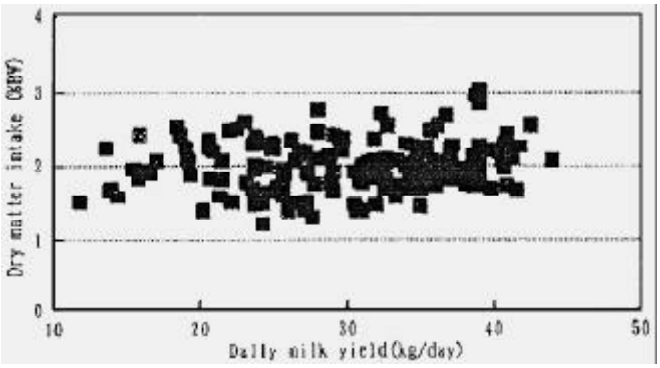

Table 1
Pasture area and rotation periods during grazing

Periods	Pasture area per cow	Rotation periods (= paddock number)
15th May - 29th June	24a	8 days
30th June - 24th July	33	13
25th July - 6th November	50	23

Table 2
An example of supplementary feeding for milking cows under intensive grazing in spring

Milk yield kg/day	Grass silage kg	Concentrates kg	Beet pulp kg	Pasture intake DMkg	NDF cont. %	TDN/CP ratio
35	6	6	2	12.4	41	4.6
28	4	4	2	13.7	42	4.5
20	0	0	2	14.3	46	4.5