Vertical Distribution of Plant Parts and the Selectivity of Harvesting Heights by Cattle in *Miscanthus sinensis*

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Key words : availability , cattle , foraging heights , *Miscanthus sinensis* , vertical distribution

Introduction The previous study showed that survival and regrowth of *Miscanthus sinensis* tillers were sensitive to defoliation of shoot apex and the trampling by grazing cattle (Takahashi *et al* . , 2008) . It is generally recognized that grazing herbivores select plant species and plant parts to maximize their intake rate (Gross *et al* . , 1993) . However , there is little information on foraging response of herbivores to sward structure in the long grass , *M . sinsnsis* . The aim of this study is to understand the relationships between harvesting height of cattle and vertical distribution of plant parts in a *Miscanthus sinensis* grassland .

Materials and methods The study was conducted on June-July (summer) and September (autumn) in 2003 , at a *Miscanthus* grassland (1 .2 ha) in Kawatabi Field Science Center , Graduate School of Agricultural Science , Tohoku University . In the two seasons , eight steers were grazed in the grassland for 5-7 days at 29 .7-37 .8 animal unit (AU) · days/ha . Before grazing in each season , leaf density was estimated as frequency of occurrence measured for every layer at a 20 cm height interval from the ground in the canopy of *M . sinensis* , within 9 plots (50 cm×50 cm each) . Standing crop (the mass of leaves and stems) was also measured by cutting within the plots . During each grazing period , the number of bites taken by steers was counted (3-14 hours , 3 days) by visual observation , and proportion of the bites in individual layers to the total bites was calculated .

Results and discussion Leaf mass was high in layers of 20-80 cm in summer (42-78 g DM/m^2) , and nearly equal in individual layers of 0 80 cm in autumn (33-51 g DM/m^2) (Figure 1) . Vertical distribution of leaf density was similar to that of leaf mass . Proportion of bites taken by steers was highest in layer of 20 80 cm (in which , leaf density was more than 84%) in both seasons . Leaf mass in individual layers was significantly related to leaf density of the layers (Figure 2 ; P<0 .001) , meaning that leaf density well revealed vertical distribution of leaf mass in *M . sinensis* . Proportion of bites taken by steers increased curvilinearly with increasing leaf density in individual layers (Figure 3 ; P<0 .001) . The result indicates that cattle strongly take bites from layers having more available leaf mass .

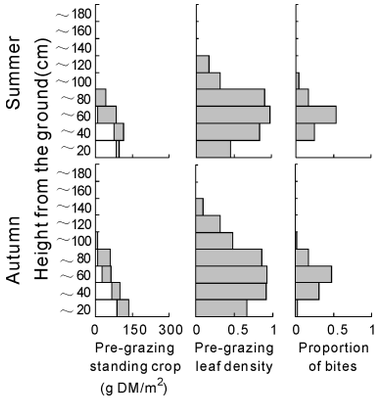

Figure 1 *Vertical distribution of leaf and stem in* M . sinensis *and proportion of bites taken by grazing steers .*

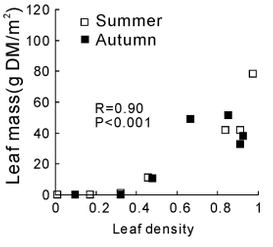

Figure 2 *The relationship of leaf mass to leaf density in the* M . sinensis *grassland .*

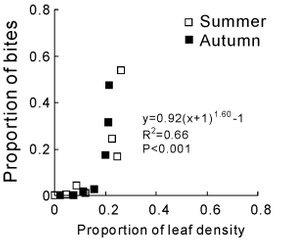

Figure 3 *The relationship of proportion of bites taken by grazing steers to proportion of leaf density in the* M . sinensis *grassland .*

Conclusions Grazing cattle selected the layers with high leaf mass in both seasons . This selectivity in harvesting heights probably gives severe impacts on *M . sinensis* (Takahashi *et al* . , 2008) , which cause deterioration of *Miscanthus* grasslands .

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