

# Methods of ryegrass establishment (*Lolium multiflorum* Lam.) affecting optimal sward height to maximize the intake rate

Delma Fabíola Ferreira da Silva<sup>A</sup>, Lidiane Fonseca<sup>B</sup>, Carolina Bremm<sup>C</sup>, Anibal de Moraes<sup>A</sup>, Alda Monteiro<sup>A</sup>, Hélio Mayer<sup>A</sup>, Thiago Marzarotto<sup>A</sup> and Paulo César de Faccio Carvalho<sup>B</sup>

<sup>A</sup> Federal University of Paraná, Brazil

<sup>B</sup> Federal University of Rio Grande do Sul, Brazil

<sup>C</sup> Agricultural and Livestock Research Foundation, Brazil

Contact email: [delmafsilva@gmail.com](mailto:delmafsilva@gmail.com)

**Keywords:** Integrated systems, no-tillage, management recommendation.

## Introduction

In integrated systems it is common to use the no-tillage method. The adoption of this method improves the system's sustainability (Laurent *et al.* 2011). It is necessary to understand the effects of the integrated systems on sward structure and its consequences in the grazing process and in animal production. The intake rate of grazing animals is primarily responsible for the animal performance (Coleman 2006), which short-term depends mainly on sward structure (Laca and Demment 2006). The sward height has great influence on the animal decision on where to take the next bite (Mcgilloway *et al.* 1999). The hypothesis of this work was: is there an optimum sward height for ryegrass (*Lolium multiflorum* Lam.) to maximize the intake rate by grazing animals and does this height vary depending on the existence of the base layer of straw canopy?

## Method

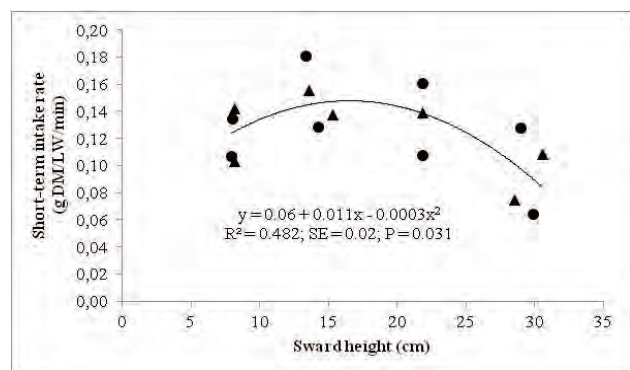
The experiment was conducted at the Canguiri Experimental Farm of the Federal University of Paraná, 22° 30'58" and 26°43'00" latitude south and 48° 05'37" and 54° 37'08" longitude west, Southern Brazil, between July and August 2012. Treatments consisted in defining two methods of ryegrass establishment, with no-tillage and with conventional tillage, with four sward heights (8, 16, 24 and 32 cm). A randomized complete block design was used in a factorial arrangement with two replications. Three adult sheep of Suffolk breed, aged 31 months and with mean live weight (LW) of 73.2 ± 3.9 kg were used. The animals were equipped with IGER Behaviour recorders (Institute of Grassland and Environmental Research, London, UK). To determine intake rate, the double weighing method described by Penning and Hooper (1985) was used. The experiment was conducted once pasture reached the pre-set sward height for each treatment. The sward height was measured from 200 random points pre- and post-grazing per experimental unit. To determine forage mass and botanical composition in each experimental unit, three pre-grazing samples (0.1089 m<sup>2</sup> each) were cut at ground level. JMP software version 10 (SAS Institute Inc., Cary, NC, USA) was used for statistical analyses. Analysis of variance was performed at 5 % significance level and when

differences in treatment means were detected, a Tukey's test was used. Regression analyses were also performed for sward and animal data.

## Results

Sward heights were close to the desired treatment levels ( $P < 0.001$ ). Herbage mass was higher (1278.4 kg/DM/ha;  $P < 0.05$ ) in conventional tillage than in no-tillage (784.6 kg/DM/ha). Differences in herbage mass between the two methods were especially evident at 8 and 16 cm sward heights. This can be attributed to the effect on botanical composition, the no-tillage method having a greater amount of invasive plants ( $P < 0.05$ ) than in the tillage method of ryegrass establishment. The ryegrass establishment methods did not affect the intake rate ( $P = 0.458$ ).

Therefore, based on this functional response, the management recommendation is for using intermediate sward heights. The highest intake rate was observed in 18.3 cm sward height, with a maximum value of 0.18 g DM/LW/min, independent of the methods of establishment of ryegrass. Considering that animals remove proportionally 50% of sward height (Laca *et al.* 1992), results suggest that the presence of straw in the no-tillage method of ryegrass establishment did not affect the bite depth, because straw and invasive plants in this study were concentrated in the lower stratum (*i.e.* 50% of sward height,  $P < 0.05$ ). The management target for ryegrass pastures to



**Figure 1.** Short-term intake rate by sheep (g DM/LW/min) under different sward heights and two methods of ryegrass establishment (▲ no-tillage, ● conventional tillage).

maximize intake rate is an 18.5 cm sward height and this target is not altered by the method of ryegrass establishment. In the case of continuous grazing the average sward height should be from 10 to 15 cm (Pontes *et al.* 2004). In rotational grazing this height should be present when animals enter the sward, and not be reduced by more than 40 % through grazing (Fonseca *et al.* 2012).

### Conclusions

The optimum sward height targets for intake of ryegrass pasture were not altered with conventional or no-tillage establishment methods. There were differences in sward structure, but they had no influence on the intake rate, which was maximized at 18.3 cm sward height.

### Acknowledgments

Federal University of Paraná (UFPR), Federal University of Rio Grande do Sul (UFRGS) and Coordination of Improvement of Higher Education (CAPES).

### References

- Bremm C, Laca EA, Fonseca L, Mezzalira JC, Elejalde DAG, Gonda HL, Carvalho PCF (2012) Foraging behaviour of beef heifers and ewes in natural grasslands with distinct proportions of tussocks. *Applied Animal Behaviour Science* **141**, 108-116.
- Coleman SW (2006). Challenges to assessing forage intake by grazing ruminants. *Proceedings of the 8th World Congress on Genetics Applied to Livestock Production*, Minas Gerais, Brazil, 13-18 August, 2006, 14-16.
- Fonseca L, Mezzalira JC, Bremm C, Filho RSA, Gonda HL, Carvalho PCF (2012) Management targets for maximising the short-term herbage intake rate of cattle grazing in *Sorghum bicolor*. *Livestock Science* **145**, 205–211.
- Laurent F, Leturcq G, Mello I, Corbonnois J, Verdum R. (2011) Magazine French Brazilian geography - on line <<http://confins.revues.org/7143>>, Accessed 20 Jan 2013.
- Laca EA, Ungar ED, Demment, MW (1992) Effects of sward height and bulk density on bite dimensions of cattle grazing homogenous swards. *Grass and Forage Science* **47**, 91-102.
- Laca EA, Demment MW (2006) Modelling intake of a grazing ruminant in a heterogeneous environment. *Proceedings of the International Symposium on Vegetation-Herbivore Relationships*, New York, Academic Press pp. 57-76.
- Mcgilloway A, Cushnahn A, Laidlaw AS, Mayne CS, Kilpatrick DJ (1999) The relationship between level of sward height reduction in a rotationally grazed sward and short-term intake rates of dairy cows. *Grass and Forage Science* **54**, 116-126.
- Penning PD, Hooper GEN (1985) An evaluation of the use of short-term weight changes in grazing sheep for estimating herbage intake. *Grass and Forage Science* **40**, 79–84.
- Pontes LS, Carvalho PCF, Nabinger C, Soares A, Brugnara A (2004) Biomass flow in annual ryegrass (*Lolium multiflorum* Lam.) managed at different heights. *Brazilian Journal of Animal Science* **33**, 529-537.