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# **Improving the use of perennial ryegrass swards for dairying in Ireland**

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*Dedicated to my wife Berenice and my son Felipe*



## Abstract

The main objectives of this thesis were to investigate the effects of grazing severity, treading damage, re-growth interval and pre-grazing herbage mass (HM) on sward and animal performance in four experiments during 2009 and 2010 in Ireland. Experiment 1 investigated three post-grazing sward heights ranging from 3.6 to 4.9 cm during the main grazing season. Herbage accumulated and harvested (11.3 and 11.2 t dry matter (DM)/hectare (ha), respectively) were not significantly affected by grazing severity but there were sward morphological and structural differences. Experiment 2 quantified the effects of treading damage during two seasons, ranging from light to severe damage (3.3 to 13.3-cm hoof-print depths, respectively). Treading damage in a perennial ryegrass (PRG) sward on a well-drained soil did not reduce annual grass DM production. Treading in a creeping bent-dominated sward on a poorly-drained soil resulted in 14 to 51% reductions in cumulative yields depending on frequency and season. Experiment 3 examined the effects of 2-, 3- or 4-week re-growth intervals on herbage production, characteristics and tissue turnover of a PRG sward using marked tillers ( $n = 240$ ) under a cutting regime. Cumulative HMs were 6.7, 9.1 and 10.4 t DM/ha for the 2-, 3- and 4-week re-growth treatments, respectively. The number of leaves appearing per tiller during the re-growth period was only optimum for the 4-week treatment. Experiment 4 also used marked tillers ( $n = 360$ ) in a grazing dairy cow experiment during the main grazing season under three target pre-grazing HMs (945, 1,623 and 2,360 kg DM/ha  $>4$  cm). The number of leaves appearing per tiller during the re-growth period was 1.0, 1.9 and 2.4 for low (L), medium (M) or high (H) pre-grazing HM treatments, respectively. Cows grazing L, M or H pre-grazing HM produced 343, 342 and 330 kg milksolids, respectively. Low pre-grazing-HM cows grazed for 90 min/day more than M and H pre-grazing-HM cows but there was no difference in individual intake (16.0 and 15.8 kg DM/cow/day in June and August, respectively). Post-grazing sward height, treading damage, re-growth interval and pre-grazing HM can have a significant impact on the sward and on animal performance. The imposition of best management practice leads to a more effective conversion of grass into milk.



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## Foreword

There is a need to design a grass-based system of production for Irish dairy farmers that is sustainable for animals, people and for the environment, and profitable. It also needs to be socially acceptable, easily replicated with clear guidelines, and sufficiently appealing to attract people to work in the industry. This thesis, however, focuses on grazing management practices.

This thesis is presented in a series of papers which have been published, submitted for publication or are being prepared for submission. Therefore, some repetition, especially in the materials and methods sections, was unavoidable. The references from each chapter are at the end of the thesis. It must be pointed out that this work is only focused on grazing management without taking account of irrigation, sward renewal or nitrogen fertilisation. Ultimately, this thesis aims to provide answers for grassland farmers around the world as a result of work carried out in Ireland.



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## Definitions

The following terms may be used in a different way in Ireland and the rest of the world (New Zealand), taken from Allen *et al.* (2011) and Drewry *et al.* (2008):

**Herbage:** The above-ground biomass of herbaceous plants, other than separated grain. Grasses, grass-like species, herbaceous legumes and other forbs collectively; the foliage and edible stems of herbs.

**Sward:** A population or a community of herbaceous plants characterised by a relatively short habit of growth and relatively continuous ground cover, including both above- and below-ground parts.

**Canopy:** The above-ground parts of a population or community of forage plants. It may include both herbaceous and woody vegetation.

**Herbage mass:** The total dry weight of herbage per unit of land above a defined reference level.

**Pasture:** A type of grazing management unit enclosed and separated from other areas by fencing or other barriers and devoted to the production of herbage for harvest primarily by grazing.

**Paddock:** A grazing area, part of a grazing management unit, that is enclosed and separated from other areas by a fence or barrier.

**Grazing system:** A defined, integrated combination of soil, plant, animal, social and economic features, stocking (grazing) method(s) and management objectives designed to achieve specific results or goals.

**Defoliation:** Removal of plant tissue by grazing animals or machinery.

**Poaching:** Slurry-induced soil conditions on very wet soil when trampled with stock.

**Pugging:** Deep hoof imprints in wet, soft soil, associated with pasture damage.



## Glossary of terms

ADF	Acid-detergent fibre
CAP	Common Agricultural Policy
CP	Crude protein
DHA	Daily herbage allowance
DIM	Days in milk
DM	Dry matter
ESH	Extended sheath height
ETH	Extended tiller height
FLL	Free leaf lamina
GLC	Ground level cut
HM	Herbage mass
LAI	Leaf area index
LAR	Leaf appearance rate
LER	Leaf extension rate
LSD	Leaf, stem and dead components in the sward
LWT	Live weight
ME	Metabolisable energy
MS	Milksolids (fat + protein)
N	Nitrogen
NDF	Neutral-detergent fibre
OMD	Organic-matter digestibility
PRG	Perennial ryegrass
SR	Stocking rate
WSC	Water-soluble carbohydrates

