QUANTITATIVE ANALYSIS OF BEHAVIOUR OF GRAZING DAIRY COWS

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A thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy

February 2007

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DECLARATION

The studies presented in this dissertation were completed by the author while a part-time postgraduate student in the Department of Animal Science, University of New England and employed with NSW Department of Primary Industries. Assistance given by other persons is indicated in the text or in the list of acknowledgements. All references cited are included in the bibliography. The work is original otherwise.

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I certify that the substance of this thesis has not already been submitted for any degree and is not being currently submitted for any other degree. I certify that any help received in preparing this thesis, and all sources used, have been acknowledged in this thesis.

Signed: ________________________________ Date: __________

ACKNOWLEDGEMENTS

This thesis could not have been without the help of some key people. In particular I wish to acknowledge the friendship and leadership of Professor Bill Fulkerson, whom I have had the privilege of working with for over 20yrs. He has been a great inspiration and friend throughout this time. Also, I would like to acknowledge the friendship of Dr Kuldip Nandra. His charming nature and drive for me to complete this thesis has been extremely helpful.

To my supervisors, Associate professor Geoff Hinch and Professor John Nolan, I say thank you for your patience and perseverance. Your guidance has been inspirational. To Bill as an associate supervisor thank you for your great patience.

I also acknowledge my employer, NSW Department of Primary Industries for allowing me to conduct this research and to submit it as a PhD dissertation. Funding from Dairy Australia for some of this work is also gratefully acknowledged.

Finally, I am extremely grateful for the patience of my family, my wife Kathy and 5 children, Aaron, Caleb, Joshua, Zachary and Emily. Without their understanding and support I may never have finished.

DEDICATION

This thesis is dedicated to my mother Elva Eileen Dawn Dobos (1934 – 2005), who guided, nurtured and encouraged me to pursue science. Unfortunately she died before this thesis was completed.

LIST OF ABBREVIATIONS

ADF	acid detergent fibre
BW	body weight (kg)
d	day
DM	dry matter (kg)
DMI	dry matter intake (kg DM/d)
DN	double normal distribution
g	grams
G	gamma distribution
GD	grazing duration (h)
GT	grazing time (min/24h)
h	hours
IR	intake rate (g/min)
kg	kilograms
LN	log-normal distribution
LW	liveweight (kg)
min	minutes
MVT	Marginal Value Theorem
N	nitrogen
NDF	neutral detergent fibre
NH_3	ammonia
OFT	optimal foraging theory
OM	organic matter
RDC	rumen degradable carbohydrate
RDP	rumen degradable protein
RPM	rising plate meter
SH	sward height (cm)
SSH	sward surface height (cm)
SN	normal distribution
UDP	rumen undegradable protein
VFA	volatile fatty acids
W	Weibull distribution
WSC	water soluble carbohydrate

ABSTRACT

This research thesis describes the quantitative analysis of behaviour of grazing dairy cows in terms of sward height (SH) in combination with the length of the grazing session (grazing duration, GD), the time of allocation of fresh pasture and the type of carbohydrate supplement offered. A review of the literature (Chapter 2) identified that there was limited information on the combined affects of SH and GD on behaviour, herbage dry matter intake (DMI) and intake rate (IR) of dairy cows grazing sub-tropical pastures and how these interact to influence sward structure. Also, there was limited information on how SH x GD, time of allocation of fresh pasture and type of carbohydrate supplement offered affects the temporal patterns of behaviour and the subsequent time-dependent probabilities.

In this current study, 2 levels of SH (10 and 13cm) and 5 levels of GD (1, 2, 4, 8 and 15h) were used to quantify the effects of SH and GD on dairy cow grazing behaviour, IR and herbage DMI. Sward height significantly ($P<0.05$) influenced total GT such that cows grazing SH13 swards spent an extra 45min grazing than SH10 cows over the 15h grazing period. There was a significant ($P<0.05$) asymptotic relationship between GT and GD such that GT increased by 0.45 h/h GD to a maximum at 4h GD, irrelevant of SH treatment. Intake rate declined more rapidly for SH13 cows than SH10 cows but had stabilised for both SH treatments by 4h GD. Irrespective of SH treatment, cows had consumed >70% of their total herbage DMI within the first 4h GD. Quantification of the sward profiles after each SH x GD combination showed that dairy cows grazing kikuyu using the management described in this current study did not graze at random.

Spectral decomposition of dairy cows grazing behaviour at two different SH (10 and 13cm) did not find any differences in temporal patterns of behaviour. However, dairy cows offered their fresh pasture after the afternoon milking (PM) grazed longer at this

time and exhibited different temporal patterns of grazing behaviour than those cows offered their fresh pasture after the morning milking (AM). There were no differences in temporal patterns of grazing behaviour for grazing dairy cows offered different types of carbohydrate supplements to test rumen synchrony of N and energy (Synch *v.* ASynch).

Dairy cows offered the shorter swards (10cm) had a higher likelihood of being found in the grazing state (21%) than those offered taller swards (13cm; 16%) during the 15h period under the strip-grazing management described in this current study. Cows offered their fresh pasture at either AM or PM were equally likely to be in either the grazing or non-grazing states as were cows offered different types of carbohydrate supplements to either synchronise energy and N in the rumen or otherwise (synchronous *v.* asynchronous).

The results from this current thesis highlight the factors that either encourage or discourage grazing by dairy cows and should also help to improve decision tools used for pasture rotation, supplementary feeding and stocking density.

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