Lincoln University
Te Whare Wānaka o Aoraki
CHRISTCHURCH•NEW ZEALAND

Nutrient returns from pasture litterfall during grazing

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Outline

- Introduction
  - *New Zealand pastures*
  - *Litterfall*
  - *Carbon cycling*
- Objective of the survey
- Procedure
- Results and conclusion

Introduction

New Zealand Pastures:

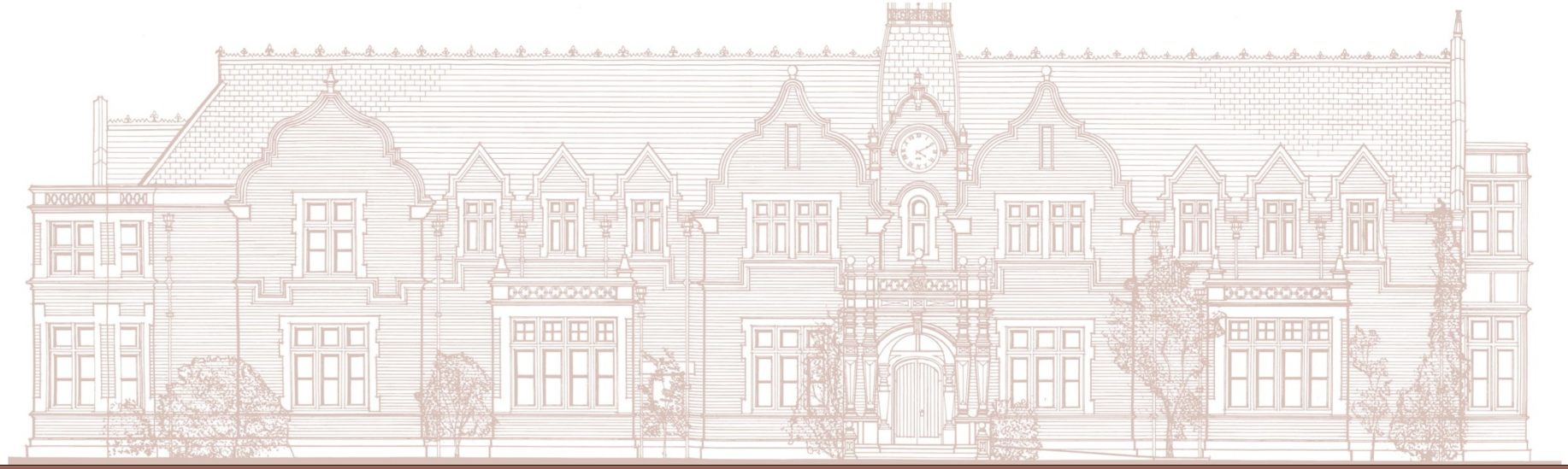
- 90% of the total farm area is under pastoral system
- Dominated by perennial clover-ryegrass systems
- There are about 13,860 dairy farms in New Zealand
- 6 M cows managed on 1.3 M ha, producing about 11,000 M litres milk,
- After consuming 12 M tonnes of pasture dry matter (Holmes et al. 2007).
- Follow **Rotational grazing -** animals are offered a fresh area of pasture at regular intervals (after 20-30 days)
- Animals graze for 24 h in each paddock
- Variations with management factors.

Introduction (contd.)

Litterfall occurs???

Close observation of dairy animals during grazing showed that herbage

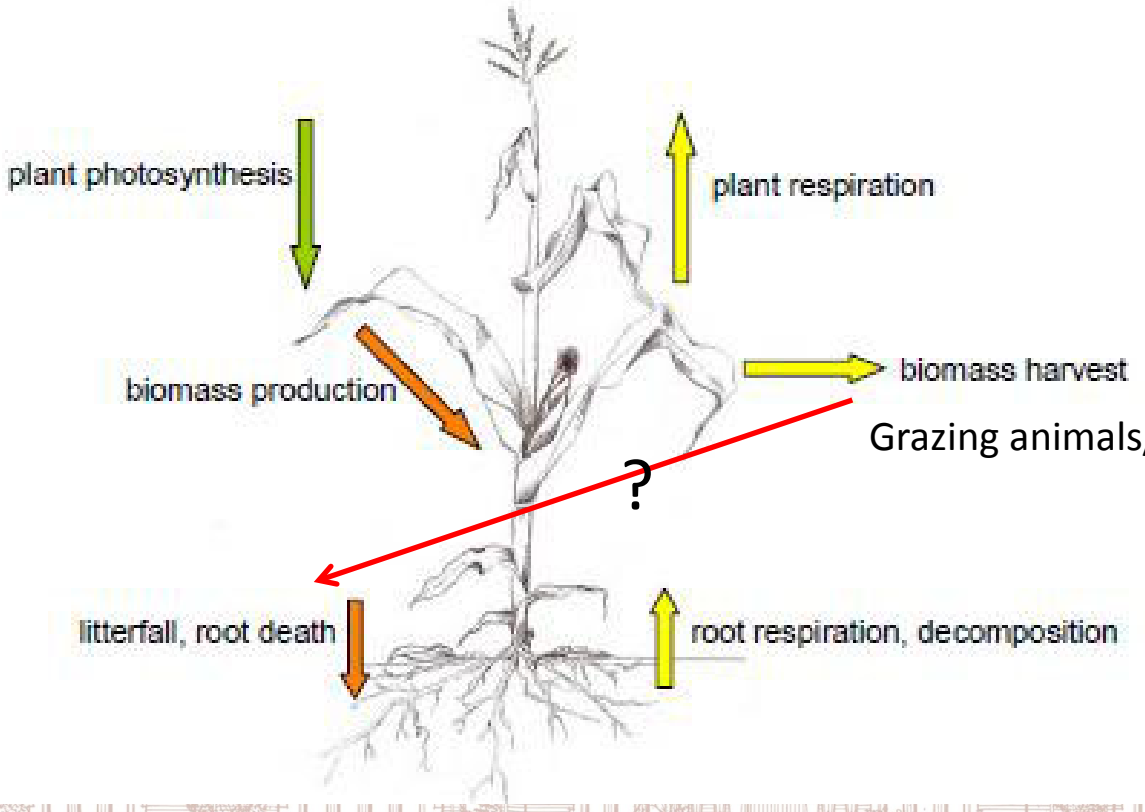
- ❑ although harvested, could fall from their mouth onto the soil,
- ❑ could be sheared due to hoof movement and fall onto the soil.
- ❑ these processes are termed '***litterfall***' which creates pasture '***litter***'.



Introduction (contd.)

Introduction (contd.)

The carbon cycle



Introduction (contd.)

- Under 'ideal' conditions, the C lost and gained in the system remains same, i.e. The system is '*neutral*'.

- However, research indicates that understanding C cycling is crucial.

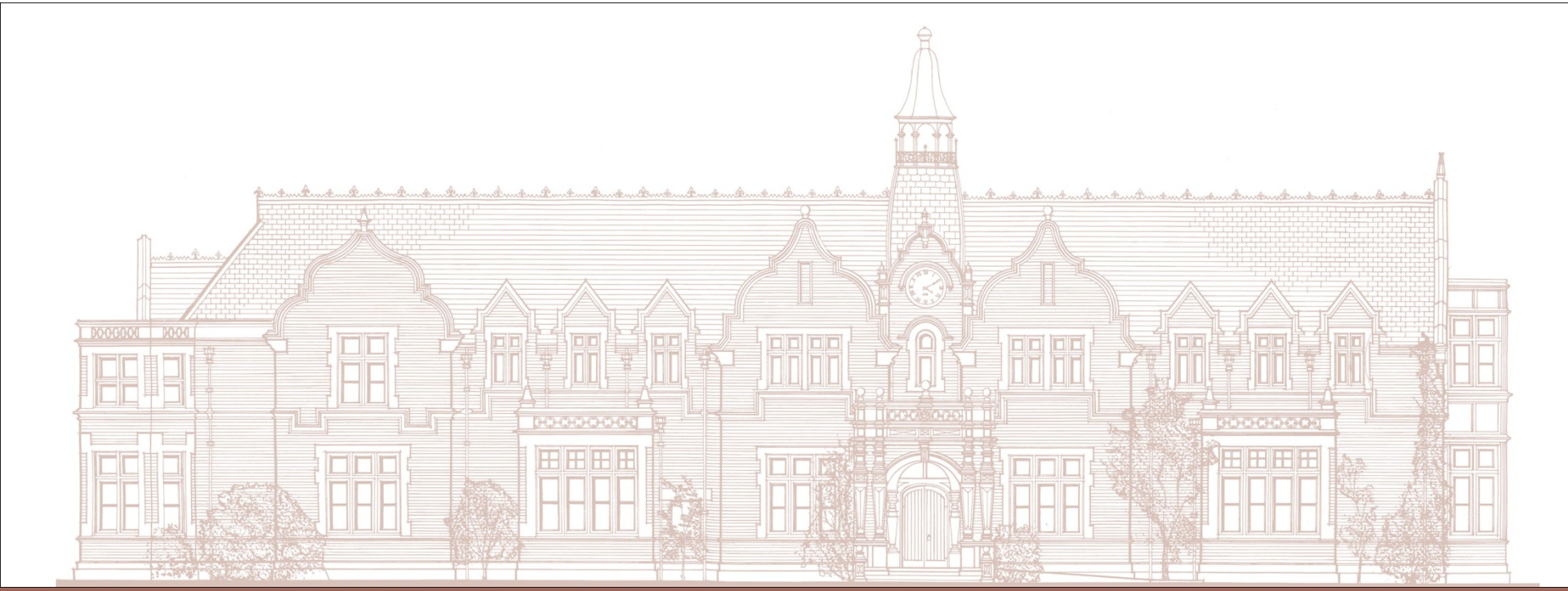
- The cycle has been disturbed in the recent past due to human activities and hence, need for Carbon sequestration – to put the C back into the soil.

- This again emphasises that C sources need to be understood further.

- Litterfall has **NOT** been quantified in **Pastures** which can be a probable source of C.

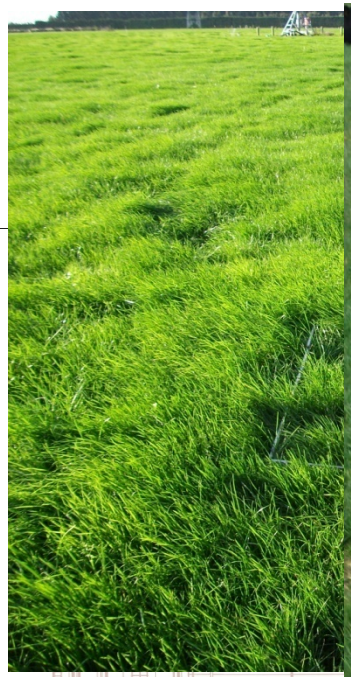
Rationale

- To quantify litterfall during grazing and,
- To find its relation to other factors such as herbage on-offer, post-grazing residual.



Procedure

Pre-grazing herbage = 'herbage on-offer'



Procedure (contd.)

Post-grazing herbage

Procedure (contd.)

Separation of fresh and senesced litter after vacuuming

All herbage was dried at 65^{o}C for 48 h and converted to kg DM/ha

Procedure (contd.)

- Combination of each of pre- and post-grazing measurements was termed as an 'observation'.

- Total 150 observations were made over the 2010-2011 period at the Lincoln University Dairy Farm (LUDF).

- Each paddock was grazed 12 times per year (excluding dry period)

- The pre- and post-grazing herbage and the vacuumed litter – analysed for C and N contents

- Expected utilisation = (on-offer) – (post-grazing residuals)

- Actual utilisation = (on-offer) – (post-grazing residuals + ***litterfall***)

Results

51% DMI

54% DMI

Table 1. Details of the litter fractions ***per grazing event***

	Quantity (kg DM/ha)	**Total C** (mg/g)	**Total N** (mg/g)
Pre-grazing on-offer	2516 ± 636[a]	396	28*
Post-grazing residuals	1167± 265	320	20
Intake per cow	12.3 ± 4.8 kg DM		
Litter fractions			
Post-grazing-Fresh	53 ± 24	398	25*
Post-grazing-Dead	19 ± 18	397	15
Litterfall per cow	0.8 ± 0.5 kg DM (0.6 kg as fresh litter)		

[a]Mean of 150 observations

* Significant differences

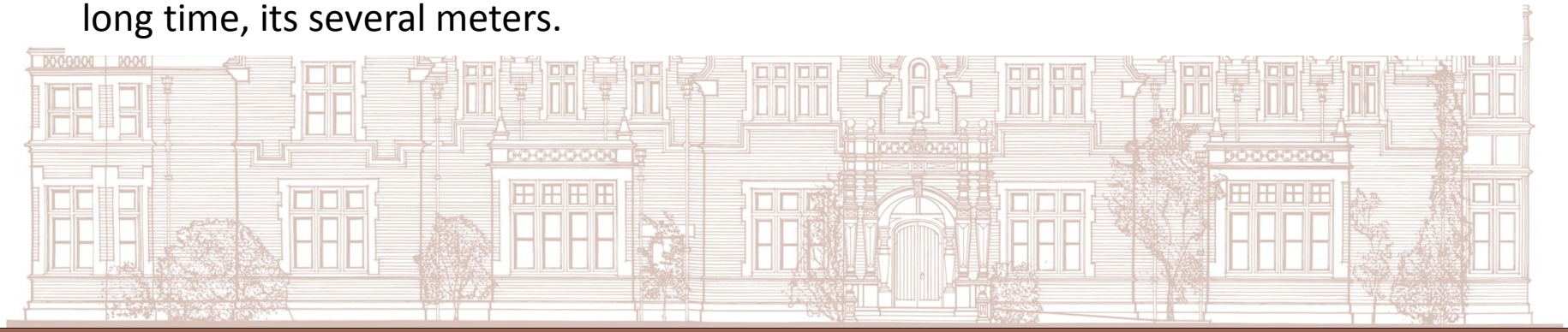
Results (contd.)

- Total litterfall was 72 kg DM/ha per grazing event i.e. 3% of the expected intake.
- Litterfall per year = 864 kg DM/ha/yr (= 345 kg C/ha/yr)
- Litterfall was NOT affected by herbage on-offer or the post-grazing residuals

- Emissions of N_2O contributed 32-76% to the total greenhouse gas budget.
- The N budget was compiled in a Manuscript submitted to ***Journal of Environmental Quality*** in Aug, 2011.

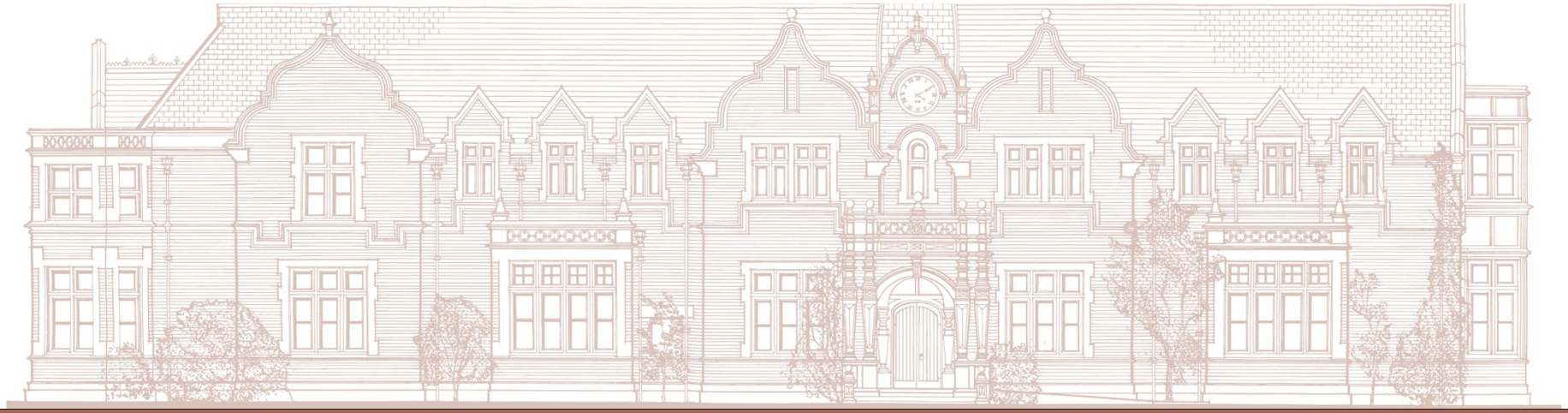
Conclusions

- Total litterfall was 72 kg DM/ha per grazing event i.e. 3% of the expected intake.
- Litterfall per year = 864 kg DM/ha/yr
- Litterfall was NOT affected by herbage on-offer or the post-grazing residuals
- The study shows that a small but important fraction of pasture litter can contribute to C and N returns in pastures.
- Litter is like pangea separating to islands, over a yr it might be a few mm but over long time, its several meters.



Future research

- ***Can grazing time influence litterfall quantities?***
- ***Any effect of climate on litterfall?***
- ***More number of animals = more litterfall?***



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Thank you!!!

Questions please