



# **Measuring machines & practical feed estimation:**

Cory Matthew  
Institute of Agriculture and Environment,  
Massey University

To cover:

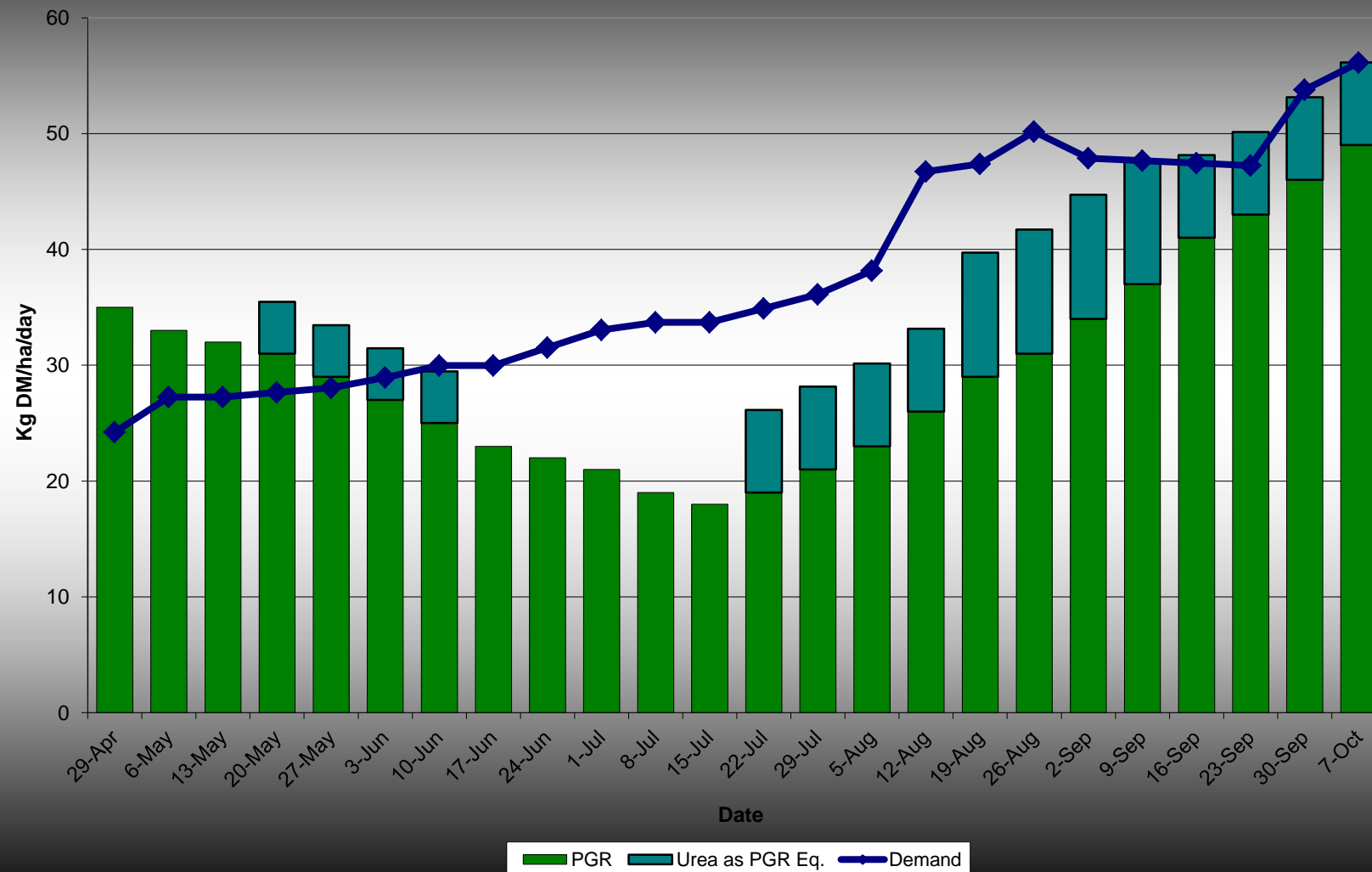
## Measuring machines

- Why farmers measure cover;
- Ways to measure cover (Plate / Probe / Visual / CDAX);
- Controlling variability.

## Practical feed estimation

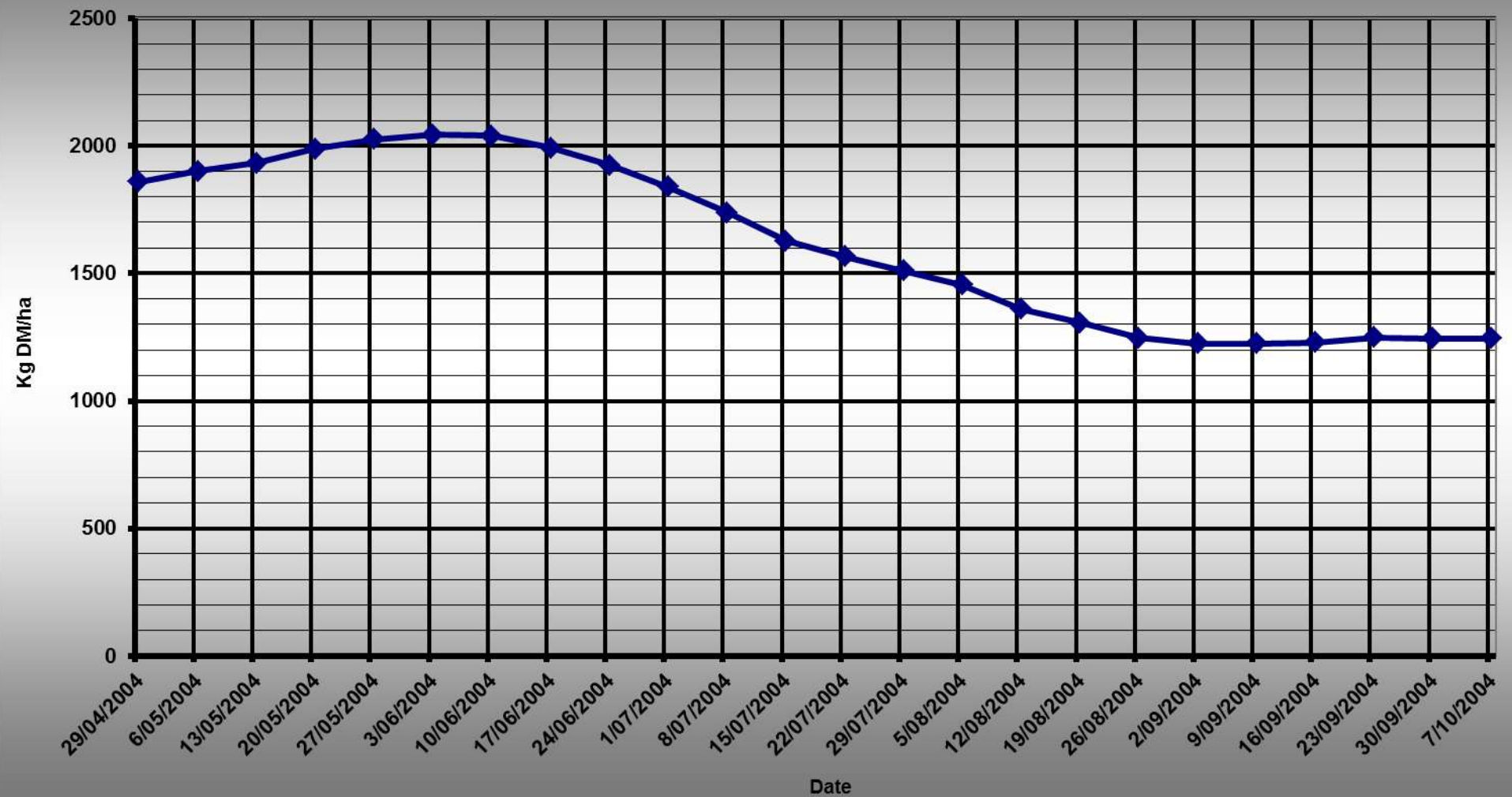
- Intake estimation from pre- and post grazing mass;
- Supplementary matters: rotation length vs animal intake, pasture growth, & pasture quality.

## Farmlet Y- Pasture Supply & Demand



At this site, 1 May to 1 October; c. 4.8 t DM/ha grown (range 2004 – 2014 = 3.5 to 6.2tonnes; c.5.3 t DM/ha eaten. Rotational grazing “rations” intake to get a couple more sheep per ha through the winter, compared to rotational grazing.

Farmlet Y- Average Pasture Cover



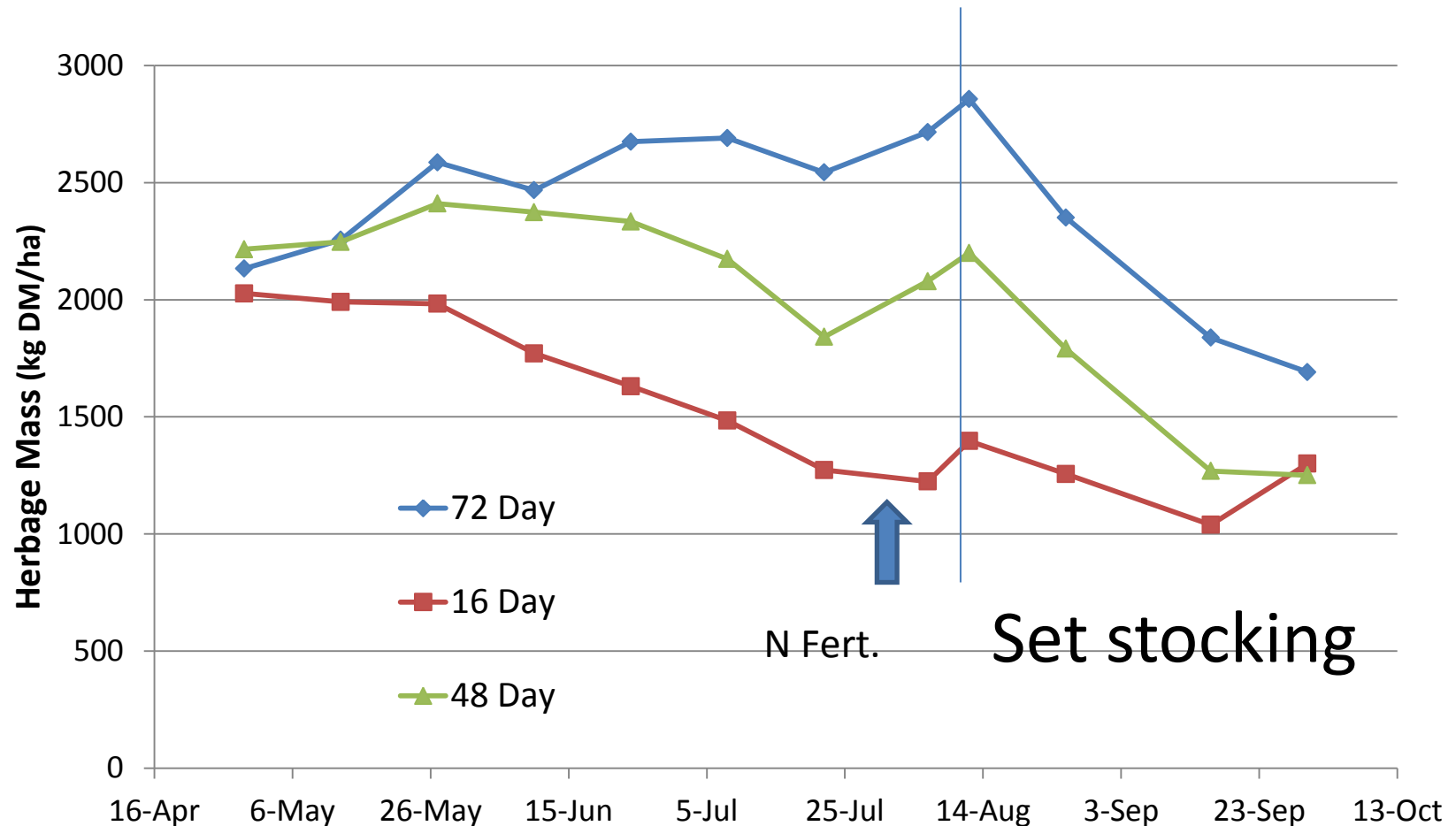


LITTLE PIPITEA ST

## Two key reasons why farmers measure cover

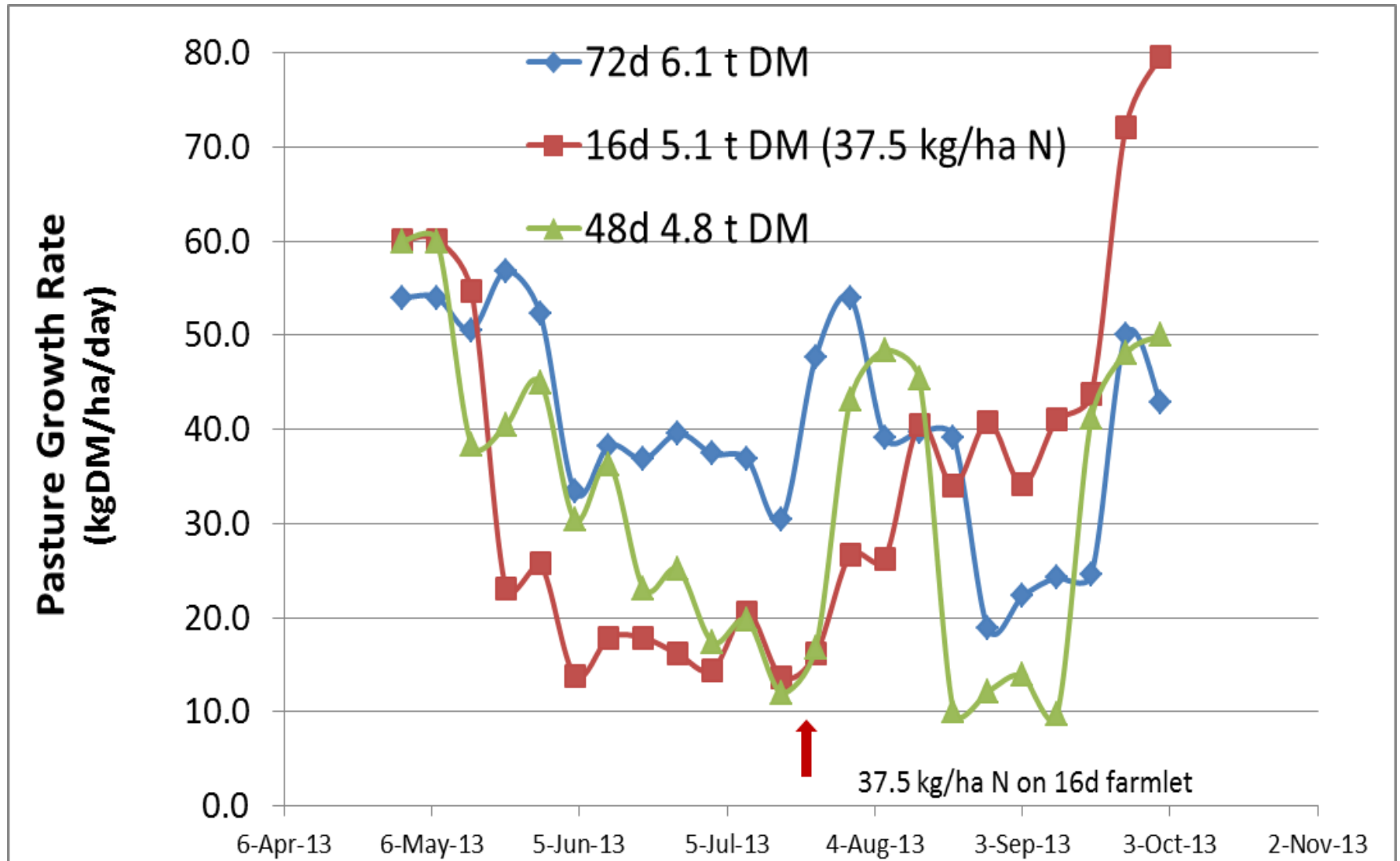
- Average farm cover measures feed reserve in storage (like silage or hay in a pit/barn) – on nearby plots 5000 kg DM/ha needed for 20 sheep / ha 1 May – 1 October; 4500 from growth & 500 from stored cover released through rotation.
- Pre- and post-grazing herbage mass used to monitor intake to see if (i) animals getting enough; (ii) feed is being rationed as per the budget.

# Cover trajectories for each rotation (2013)



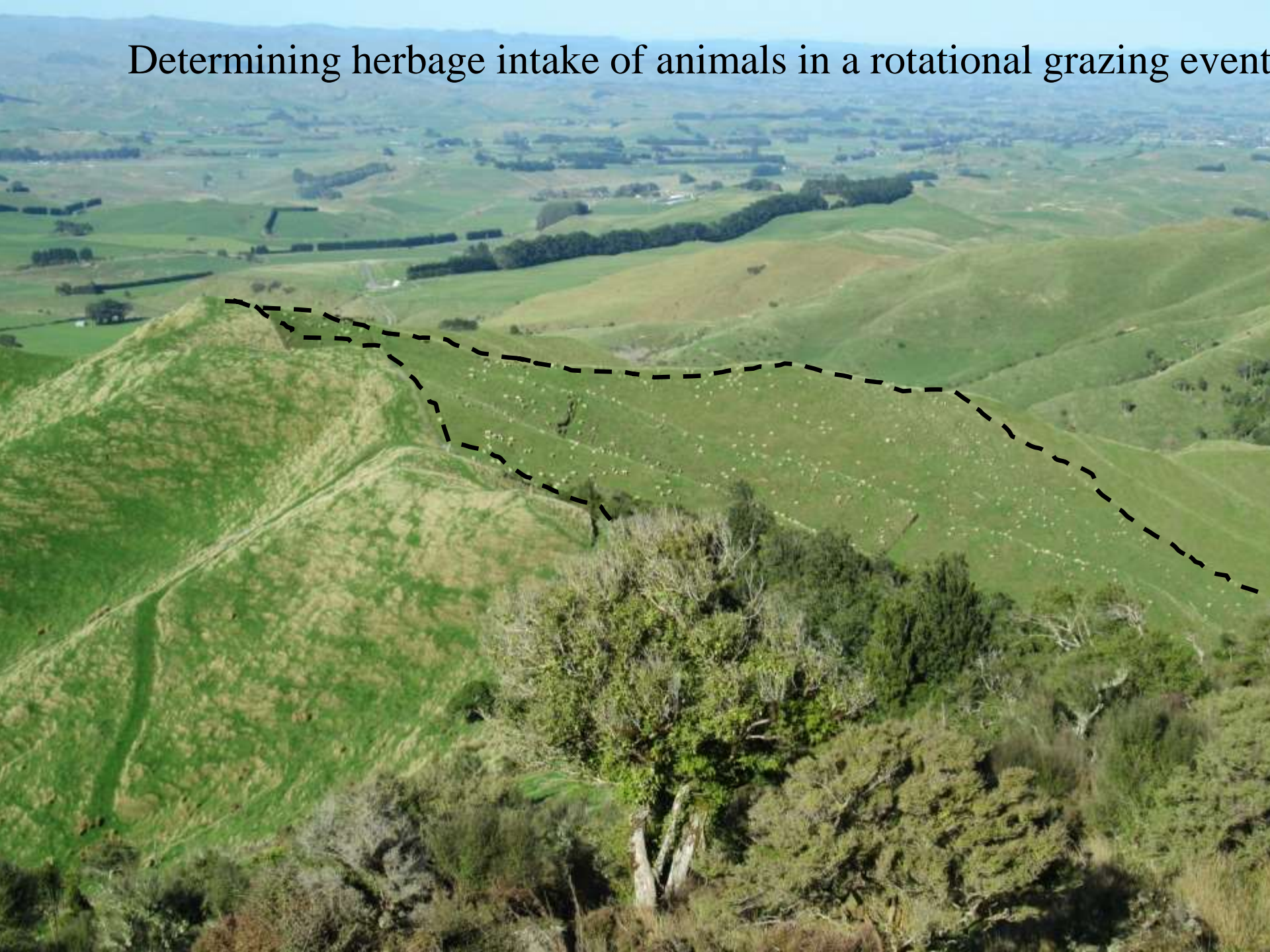
# Pasture growth back-calculated

(from pasture cover and animal bodyweight data)





Determining herbage intake of animals in a rotational grazing event



# Calculations for intake of animals

Intake (kg DM/animal/day) given by:

$$\frac{\text{Herbage removed}}{\text{Grazing intensity}}$$

Where:

Herbage removed = pre-grazing minus post-grazing herbage mass (kg DM/ha);

Grazing intensity = animal . days/ha in the grazing event.

No. Sheep	1600		
No Cattle	20	Pre-grazing cover (kg DM/ha)	1800
SU per cattle beast	<u>4</u>	Post-grazing cover (kg DM/ha)	900
Total Sheep SU	1680		
		Herbage removed	
Days per paddock	4		
Ha paddock area	8	Intake of stock (kg DM/sheep/day)	
Grazing intensity (Sheep.days/ha)			

# Visual Assessment of Pasture Cover

(B – Ra – S – T)

- Benchmark (A mental picture that lets us tie our scoring to a kg DM/ha value, ranked compared to benchmark)
- Rank (Is this paddock longer or shorter than something else – a history student with no previous experience can do this!)
- Score (Allocate kg DM/ha value)
- Truth test (one way to do this is by judging over first week if animals appear over/under fed cf. calculations.)

**Visual assessment is usually of similar accuracy to the rising plate or capacitance meter.**

# Rising plate & Capacitance probe meters

- Rising plate measures height in 5 mm units (“clicks”);
  - Average of (say) 20 drops = meter reading (MR);
  - $Y = aX + b$  conversion MR to kg DM/ha most used (also sq. root) ~ 140 kg DM/ha per 5 mm; intercept 200 – 1000 kg DM/ha;
  - Common errors: “rolling”, hoof marks, sward stubble, hill slope, sward variability, washer size;
  - Accuracy: meter  $\pm 3$  mm; operator  $\pm 25$  mm; other (??)
  - Price c. \$500
- Capacitance probe has an aluminium cylinder to sense surface area of grass;
  - Internal cylinder height 30 cm;
  - Sensitivity radius 50 mm;
  - Small signal – measured in picofarads of capacitance and varies with atmospheric conditions, morning dew, herbage moisture %;
  - Use wax or oil to stop water film build up on probe;
  - Single reading error  $\pm 400$  kg DM/ha; any calibration error extra
  - Grassmeter \$1650

Always “truth test” when setting up measurement protocol!



# Resulting in different herbage mass estimates



**Readings on the same transect on wet ground  
(30 meter drops)**

<b>1</b>	<b>14.13</b>	<b>10.33</b>
<b>2</b>	<b>13.37</b>	<b>9.47</b>
<b>3</b>	<b>12.90</b>	<b>9.87</b>
<b>4</b>	<b>12.80</b>	<b>9.07</b>
<b>Average</b>	<b>13.30</b>	<b>9.68</b>

**Difference in predicted cover  
(kg DM/ha) 506**

**$F(1,8df) = 79; P < 0.001$**



#### WHAT IS THE FEED READER?

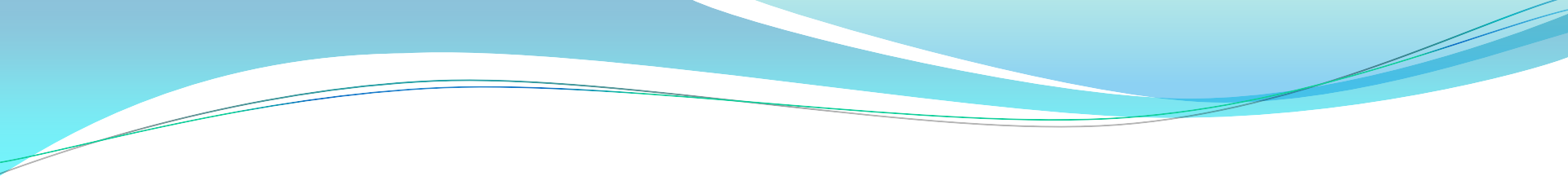
An Ultrasonic Reading Head that calculates the height of pasture in millimetres (mm) working with a display console, giving a product capable of generating pasture yield maps and automating your pasture recording and monitoring system. Combine this with the ultra powerful software kit (which is mainly automatic and easy to operate - for those worried about hard to use software programs) and you have a revolutionary system for monitoring and improving your pasture use.



DISPLAY CONSOLE WORKING IN GOLD MODE



CDax pasture meter – measures by interruption of light beams at approx. 1 cm height intervals, GPS/computer connected, can produce spatial maps colour coded to kg DM/ha.



	16 d.	48 d.	72 d.
Pre-grazing (kg DM/ha)			
Post-grazing (kg DM/ha)			
Removed (kg DM/ha)			
Sheep number			
Days			
Grazed area (ha)			
Graz. intensity (shp . D /ha)			
Intake (Removed / Intensity)			





**1 Leaf**

**2 Leaf (lamina above and base below)**

**4 Leaf**

# NIRS analysis of pictured samples

Component	Leaf 1		Leaf 2 (Lamina)	Leaf 2 (base)		Leaf 4
Crude protein %	25.7		28.5	20.9		22.8
Neutral detergent fibre %	40.1		37.0	50.7		50.0
Soluble sugars/starches %	19.7		19.7	15.4		15.2
Protein:CHO	1.3		1.4	1.4		1.5
Organic matter dig. %	93.3		94.9	81.3		83.7
Metabolisable energy (MJ/kg DM)	13.0		13.2	11.4		11.8

Samples collected mid afternoon on a sunny day and taken to the drying oven within 60 minutes = high soluble sugars and OMD/ME, but relatively valid.



# 1. Our reference sward



Pasture		
Test	Units	Result
Dry Matter	%DM	95.1
CP	%DM	29.7
Lipid	%DM	4.6
Ash	%DM	10.2
ADF	%DM	21.1
NDF	%DM	42.0
SSS	%DM	9.2
OMD	%DM	84.3
ME	MJ/kg DM	11.7
K	%DM	3.74
Mg	%DM	0.21
P	%DM	0.46
Ca	%DM	0.44
S	%DM	0.41
DCAD	mEq/kg DM	454
Lignin	%DM	2.4

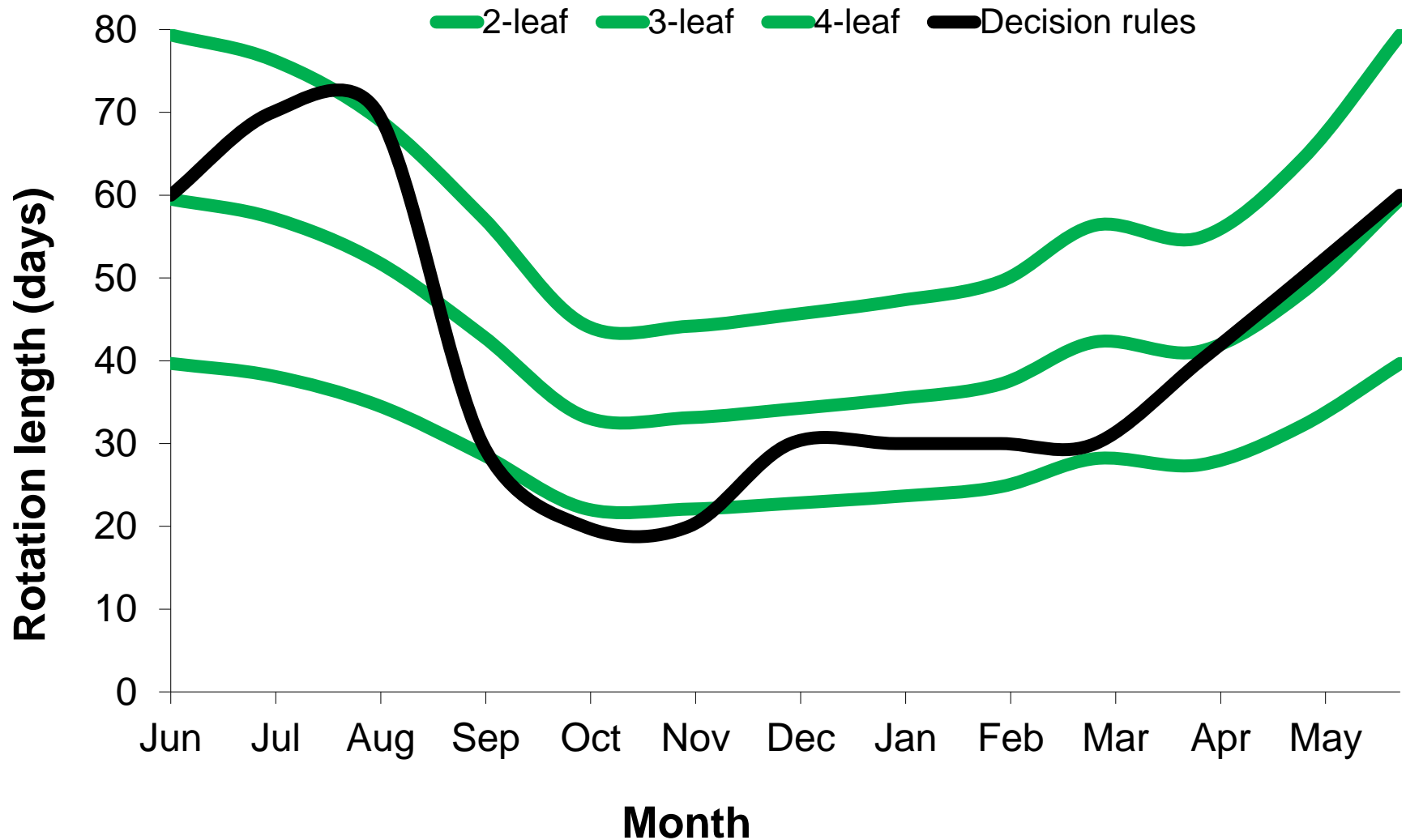
Result
94.4
13.0
2.8
11.2
36.8
60.3
5.7
59.6
8.4
2.73
0.16
0.26
0.34
0.20
418
6.4



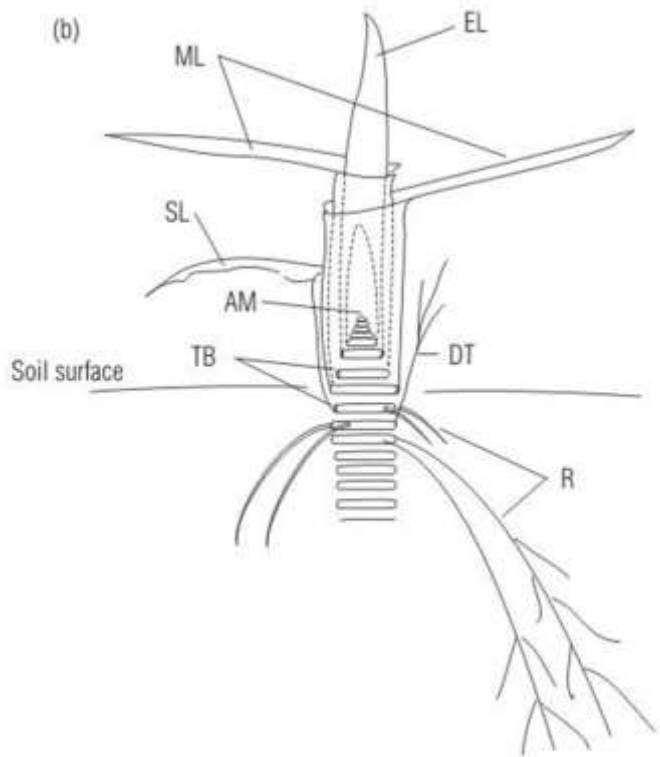


Overnight 4 lambs got through a hole in the fence into this ryegrass variety trial and before they were found the next morning they cleaned out all 4 replicates of the cultivar Bealey!! A complex topic, but energy value / palatability of feed matters!

# 3-leaf grazing time versus farm recommended (considers animal needs)



# Grass: Unique properties



- Leaf growth from base (below grazing height);
- Flexible (pseudo)stem OK for treading;
- Leaf turnover and programmed senescence;
- Root growth from tip for soil penetration;
- Root turnover cycle  $\sim 3\times$  longer than leaf cycle;
- Vegetatively self replacing;
- Mobility over time;

# Difference in measuring machines & practical feed estimation

Matthew C

---

*14/03/2024 - Downloaded from MASSEY RESEARCH ONLINE*