

40 Years of Forage Research in NZ

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AgResearch
Lincoln



NZGA 1970

Lincoln

- Ray Brougham President

Ray Brougham

- “Low Cost Agriculture Production”
 - Farmers net income has dropped significantly
 - Wool prices dropped 33% over past 15 years
 - Butterfat has stayed the same at 30cents/ lb
 - Lamb increased by 15%
 - CPI increased by 68% over same period
 - Farmers questioning all forms of advice
 - Consultants, researchers, universities

Ray Brougham

- Plough up and re-sow policy
 - Value of sowing new forages frequently questioned by farmers
 - To take advantage farmers must incorporate these improved species into **farm systems**
 - 4% sown to brassicas and less than 5% sown to new pasture
 - 3 ewe equivalents per acre
 - Concluded 3000lbs /acre to feed these
 - Potential pasture production 10 000lbs/acre

- Legumes vs fertilizer nitrogen
 - Up to 600 lbs/acre fixed
 - So difficult to envisage NZ following overseas practices in use of artificial N
 - Current research shows there is no economic benefit to applying N fertilizers on dairy farms

1970

Opening address

- W M Hamilton
 - Director General DSIR
- Last 60 years agriculture contributed 90% of value of exports
- Need to provide 55% of all increases in export value in next decade
- Need to find new markets

1970

Opening address

- Will Britain join the EEC?
- High tariffs in other markets
- Increasing substitutes for natural products
 - Margarine first made during Franco-Prussian war
 - New synthetic fibres
- Area in farming has only increased by 1% in past 70 years

1970

Opening address

- Quality and management of pastures have improved
 - Fourfold increase in carrying capacity
 - 0.8 to 3.25 ewes/acre
 - 140 lbs to 300 lbs/ butterfat per cow

NZGA papers 1970

- Lucerne
 - 4 papers covering grazing management, defoliation intervals etc
 - Potential of cocksfoot and tall fescue
 - Intensive use of light land

Jim Stewart

- Intensification of light land
- Lucerne Farm System
- Lincoln College
 - These were the days of
 - Coop
 - Langer
 - Walker
 - Stewart
 - etc

NZGA 1980

Greymouth

- John Lancashire President
- 50 year Jubilee

1980

Opening address

- Duncan MacIntyre Minister of Agriculture
- Pleased to see private enterprise in plant breeding
- Insufficient just to breed new plants
 - How do they respond to other components
- How to integrate knowledge and convey to the farmers?
- Need for grasses and clovers for hill country
 - 80% of NZ grasslands





NZGA papers 1980

- Pasture management
 - Brougham
- Maximising animal performance
 - Rattray 26 ewes/ha 130% lambing
 - 16 120 DM kgs utilized
 - Bryant 23 kgs DM/kg milksolids
 - 15 000 DM kgs utilized

Corkill

Species and cultivars for the regions

None of the species sown are native

- Huia and Ruanui 1949
- A white clover to grow under low fertility
- Evolution of ecotypes Nui/Ellett
- Cocksfoot and tall fescue for grass grub tolerance
- Lack of regional cultivars

Agriculture information

- MAF
 - Still dealing with information in ways appropriate to turn of century
- Set up a new system that will revolutionise ways of transferring technology
- Aglink
 - 7000 topics covered by 1985 (14000 in total)

NZGA 1990

Ashburton

- R Duffy President
- Manufacture of superphosphate in 1881
- Increased levels of nitrates in ground water near Christchurch
- Soil fertility declining

NZGA papers 1990

- Lucerne
- New species in action
 - Drought species
 - Tall fescue, cocksfoot, phalaris, prairie grass
- Fertilisers
- Seed production

NZGA 2000

Invercargill

- Tom Fraser President
- Seeing results of move away from 'skinny sheep' policy
- Farmers 'benchmarking' production
- Time lag between research and uptake by end users
- Lack of Systems Research

NZGA papers 2000

- 'Dags to mastitis'
- Trace elements
- Pasture quality
- Lamb growth
 - Post weaning

Southland animal numbers

1000s

	–Dairy	Sheep	Deer
• 1975	31	2542	
• 1980	24	6959	19
• 1985	31	8837	44
• 1990	38	8932	124
• 1995	126	7688	186
• 2000	233	6738	393
• 2010	600	4600	246

NZGA 2012

Gore

- Jacqueline Rowarth President
- Resilience in the face of need to increase production
- Climate Change ETS
- Food security
- Sustainability
- Farm systems

papers 2012

- Environment
- Lucerne
- Dairy pastures
- Herbs



What's different in 40 years

- Forage improvement
- Stock classes
- Environmental issues

What's different

- Forages
 - More species
 - More cultivars
 - Commercialism
 - Confusion

Named cultivars

		Ryegrass	white clover
• 1970	11	3	1
• 1980	18		
• 1990	42		
• 2000	81		
• 2010	117	25	20

Endophyte

- 1980s message was very clear
- Then came novel endophytes
- Cultivar endophyte interaction
- AR1 in northern North Island
- Lack of trust

Perennial Ryegrass

- Quality has improved less disease
- Late flowering
- Tetraploids
- Persistence ???
 - More pressure
 - No hay reseeding
 - Less tillers

Perennial Ryegrass

- Insect and pest tolerance
 - Not much difference (endophytes)
 - Grass grub still main NZ problem
- Quantity
 - Maybe 10% in 50 years (endophytes)
 - Spread of production

legumes

- White clover still king
 - Leaf size grazing management
 - Disease tolerance
- Other legumes
 - Red clover
 - Caucasian
 - Lotus
 - hybrids





herbs

- Plantain
- Chicory
 - Were weeds
 - Rapid establishment
 - farmer perception
 - Visual
 - Feel good factor



New pasture sowings

- Has there been any change

	1970	2010
total	4%	4.7%
Area	10 m ha	8 m ha

– Difficult to get good information

New pastures

- 4% annually would take 25 years to replace all pastures?
 - However
- Most new sowings are on areas that have recently been renewed
 - Short term pastures
 - High input areas

New pastures

- South Island
 - Most new pasture sowings are due to a bare paddock after winter crop. Brassicas are the driver
- North Island
 - Some after summer crop/maize
 - Some to correct endophyte status

Failure to capitalise on genetic improvement

- Perceived cost
- Poor persistence
- Too confusing
- Bad experience
- Don't understand how to fit into a “farm system”



Failure to capitalise on genetic improvement

- Lack of good independent data
 - FVI
- Lack of independent advice
- Need for simple systems
 - Dairy farming
 - Alternative species
 - Lucerne the exception

Some reasons for lack of progress

- Farmers are not convinced of improvement
- Too many conflicting messages
 - Glossy pamphlets
 - AR1 endophyte in Northern NZ

Nitrogen supply to pastures

- Probably the biggest gap in forage research
- Nothing done for more than 20 years
- Hill country extremely nitrogen deficient
 - Lack of legumes
 - Are they fixing N?





Adoption

- Lack of progress has been a recurring theme
- Many scientist don't understand farm systems
- Most research is 'component'
- Lack of trust
- Commercialism

Farm Systems

- Dairy system simple
- Sheep and beef complicated
 - Many stock classes
 - Many land classes
 - Simple sheep systems do work
 - Set targets
 - Goals

Farm Systems

- We have very good species/cultivars
- We (forage scientists) mainly do component research
- Other science disciplines have also made significant gains in component research
 - Soils pests animal etc
- **Farmers manage a 'system'**

lucerne

- 40 year cycle
 - Jim Stewart Derrick Moot
 - Disease and pests
- Has been successful
 - Not driven by seed industry
 - Passionate researchers (farmers)
 - Acceptance by 'end users' to change management

lucerne

- Need to fit into farm system
- Jim Stewart 1970
 - Whole farm in lucerne
 - More feed
 - Higher quality
 - Less seasonal variability
 - Resistant to grass grub and porina
 - **BUT**

Lucerne farm system

- At high animal performance
 - Lack of late winter early spring quantity
 - Rotational grazing required
 - Potential problems with ewe fertility
- Solution
 - 20% of farm area in winter turnips
 - 15% of farm direct drilled with annual rye

Te Anau basin hill country

- High weaning % >165
- Good weaning weights >30kgs
- Late lambing
 - Feed supply/demand
- All lambs gone at weaning
 - Feeding ewes for next year
 - Setting up pasture supply for next lambing





Fitting component research into the ‘Farm System’

- Farm history:
 - High country South Island
 - Merino flock
 - 95% lambing
 - Weaning 22 kg lambs end January
 - Finishing lambs in October November



2009 10 29

Changes in 15 years to 2008

- Land tenure review
 - High country retired
 - Freehold easier country flat to rolling
 - Irrigation
 - Lucerne made to silage
 - Tall fescue
- Same management system

Production 2008/09

- Lambing 95% (ewes mated at 55kgs)
- Lambs weaned at day 110 at 24gs
- Lambs mid sale date July (18kgs)

Using forage supply for best return

- 2008/09 policy for forage use:
 - Lucerne taken for silage in spring
 - Ewes and lambs grazing low to average quality pastures
 - Highest quality forages fed to works lambs in autumn and winter. Increase carcass weight by 2kgs



2008 10 17

Change in farm system 2009

- Lucerne mixtures to ewes and lambs
- Silage from medium quality pastures
- Ewes fed forages in autumn (lambs gone)
 - Lambing 128%. Ewes mated at 63kgs
 - Lambs weaned at day 75 at 27.5 kgs
 - Lambs weaned onto lucerne/grass (200 gms/day)
 - 98% of lambs sold by end Feb

Change in system

- Main reasons
 - Allocation of Forage quality
 - Animals vs silage
 - Allocation of forage quantity
 - Rotational grazing
 - Understanding the system



2009 10 17

Opportunities on sheep farms

- Most sheep farmers have not learnt from dairy farmers
- Most critical time to feed ewes
 - Prior to lambing
 - Early lactation



Twin ewe system

- The average ewe flock BCS is **0.5 lower** than optimum at the start of lambing.
- **0.5 BCS** is worth an increase in lamb weaning weight of **3kg** per lamb for twins

- 15% loss in body weight by mid pregnancy equals **10% less lambs** at tailing.
- 12% loss in bodyweight during late pregnancy equals **10% lower** lamb birth weight.

- 1 BCS is about 10% of live weight
- For a live weight loss of 5kg the feed required to prevent this loss is **16kg DM**.
- Conversely it takes **30kg DM** to regain 5kg live weight.

BCS 3 at lambing optimises:

- Colostrum production & quality
- Immune response
- Potential milking ability
- Lamb birth weight especially for multiples
- Daughter lifetime production

Financial analysis

- Twin ewe scenario:
 - BCS maintained at 3.0 compared to loss of 0.5
- Benefits.
 - Increase lamb survival 5%
 - Increase lamb growth rate 30 gms/day
 - Increase lamb birth weight
 - Increase ewe survival

Financial analysis

- Per 100 ewes

Increased lamb growth (30gms/day)

from 27 kgs to 30kgs

3kgs

170 lambs X 3

510 kgs

Increased lambs (5% of 170)

8.5

8.5 X 30

255

Total gain

765 kgs LW

Financial analysis

- Extra feed required to maintain BCS (65kg ewe)
 - Ewe maintenance through pregnancy 10.3 MJME
 - To feed twins in late pregnancy 6.0 MJME
 - 100 ewes @ 6MJME for 30 days 18 000
 - @11ME 1636 kgs

Financial analysis

- Lamb LW gain 765
– @\$2-50/kg \$1912.5
- Extra feed 1636kgs
- Cents per kg/DM \$1-17

Financial analysis

- Dairy cow grazing (500kg cow)
 - Maintenance 60 MJ
 - 0.5 BCS 36 MJ
 - Pregnancy 30 MJ
 - Total 126 MJ/day
 - Total kgs DM/week 80 (11 MJME/kgDM)
 - @\$25/week 31 cents/kg DM

Other benefits

- Lower ewe death rate
- Lambs finish earlier
 - Require less summer/autumn feed
- Ewes heavier at weaning
 - 30 kgs less feed per 0.5 BCS



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