Report to SFF

Grant No. 06/067

Pasture and forage options for store lamb and beef production from South Island hill and high country.

2007 Field Day booklet

Prepared by

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New Zealand

November 2007

Lees Valley Farmer's Group

FIELD DAY

Pasture and forage options for SI hill and high country

8 NOVEMBER 2007

LandCo Farming, Wharfedale Station

Photo: LU FSC

LINCOLN UNIVERSITY
Te Whare Wānaka O Aoraki

Sustainable Farming Fund

PROGRAMME

1.00 pm An introduction to Lees Valley – Mr Oliver Dickson (LandCo Farming)
1.30 pm Comparison of ± cultivation, two drill types and three rates of lime when sowing permanent pasture into herbicide, undeveloped, depleted grassland – Dick Lucas and Ed Tapp
2.00 pm Perennial grass growth ± nitrogen – Dr Anna Mills
2.30 pm Legumes and Herbs – Professor Derrick Moot and Mr Dick Lucas
3.00 pm Annuals and Forages – Dr Warwick Scott
3.30 pm Pasture Mixtures – Professor Derrick Moot
4.00 pm Lucerne sowing date and rate – Professor Derrick Moot

N.B. Times may be subject to change depending on the number of visitors.

BBQ to follow at the LandCo Farming office, Wharfedale Station

Lees Valley Farmer's Group

Background:

The Lees Valley Farmer's Group includes 20 farmers, managers and farm staff in and around the Lees Valley area of North Canterbury. We include farmers from LandCo Farming Ltd, who co-ordinate some management of the trial plot and provided financial assistance to the wider applicant group. The core applicant group was formed in January 2005 to discuss agronomic issues related to the intensification of Lees Valley. At this point scientists from Lincoln University were invited to discuss potential ideas for development. Together the group successfully sourced funding from the MAF Sustainable Farming Fund to establish a demonstration site in the Lees Valley. The aim of the group is to provide a research and extension site for public discussion and debate on pasture options for intensifying hill and high country areas lead by agronomists from Lincoln University.

Farmers within the group were surveyed about the issues relevant to them and ranked topics for demonstration on site and at their own properties. Issues most commonly identified were:

- Pasture species combinations
- Nitrogen on pasture
- Fertilizers and brassicas
- Caucasian clover establishment
- Annual clover establishment and management
- Sowing rates of pastures
- Lucerne grazing management
- Oversowing on steeper hill country

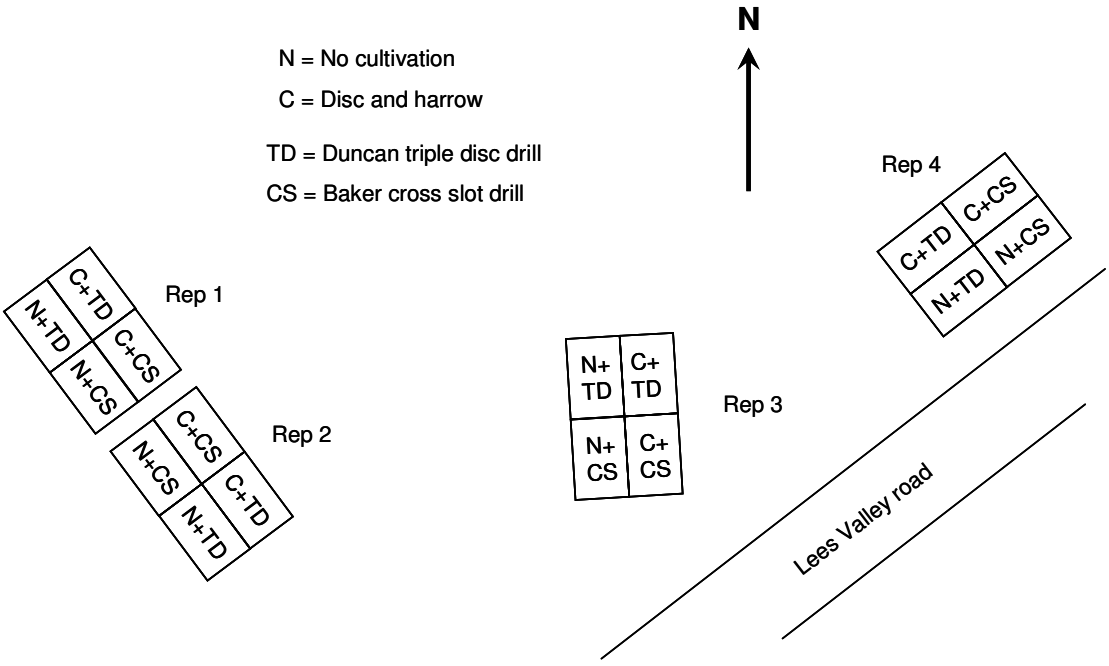
Based on this feedback a series of demonstrations and experiments has been established on a 10 ha site. The aim of the field day is to enable a wider audience to see the range of issues being tackled and provide some preliminary data for discussion. The opportunity is for attendees to take messages from this environment to apply to their own on-farm situation. Farmers wishing to be placed on the mailing list to receive updates are invited to complete the attendance sheet record accordingly.

A full time technician is employed to monitor pasture growth and plot management. Senior students from Lincoln University are involved in research projects based around the plots and an army of overseas visitors has been enlisted as volunteer workers to assist with harvests and data collection. A weather station has been installed to allow site specific rainfall, temperature, wind run and radiation data to be collected and this is used to assist in interpreting pasture growth.

The Group has funding to maintain the site until June 2009. At that point MAF will reassess the situation and may provide additional funding if the applicant group and wider audience (you) see benefit in continuing some or all of the monitoring. Given that persistence and production are important attributes of dryland pasture species we are hopeful that the opportunity will present itself to maintain the site beyond the first commitment period.

Comparison of ± cultivation, two drill types and three rates of lime when sowing permanent pasture into undeveloped, depleted grassland

Dick Lucas and Ed Tapp



Background:

The Lees Valley farmer's group is interested in the relative cost benefits of various inputs when establishing permanent pasture directly into depleted tussock grassland.

Basal treatments

- Round up (3 l/ha) sprayed mid December 2006 to kill resident grasses prior to autumn sowing, for successful establishment.
- Superphosphate broadcast on all plots at 400 kg/ha on 22 February 2007
- DAP spread at 350 kg/ha on triple disc plots on 22 February 2007 prior to sowing on 28 February.
- Cultivated plots disced twice on 22 February, harrowed on 26 February.
- DAP applied at 350 kg/ha in cross slot drill plots 7 March 2007 beside seed.

Seed	Sowing rate (kg/ha)
'AR1' perennial ryegrass	10
'Ella' cocksfoot	1
'Nomad' white clover	2
'Leura' subterranean clover	4
'Woogenellup' subterranean clover	4
'Kaituna' lucerne (pelleted)	1

(All legumes inoculated with appropriate Rhizobium strains the day before sowing).

Treatments

Main plots

1. No cultivation plus triple disc drill
2. No cultivation plus cross slot drill
3. Disc and harrow plus triple disc drill
4. Disc and harrow plus cross slot drill

Initial Soil Quick Test pH 5.3, Olsen P 9, Ca 2, Mg 15, K 8, Na 4, S 5

The cross slot drill has

i Improved ability to sow at a consistent depth due to presence of gauge wheels.

ii Seedlings are not as susceptible to desiccation because embryonic root exploration in the inverted T-shaped slot is not hindered by compacted slot walls.

iii Placement of fertiliser in a concentrated band beside, but not with, the seed. This reduces the occurance of fertiliser toxicity or 'seed burn'.

The triple disc drill has

- One cutting disc and two opening discs, placing the seed in a V shaped slot. Fertilizer is drilled with seed or else broadcast.

Results to 2nd October 2007

- Cultivated treatment had 656 kg DM ha^{-1} vs the non cultivated 292 kg DM ha^{-1}($p<0.05$).
- Cross Slot drill had 542 kg DM ha^{-1} vs triple disc drill of 406 kg DM ha^{1} ($p = 0.09$).
- 6 t ha^{-1} of lime produced 555 kg DM ha^{-1} vs 430 kg DM ha^{-1} from 0 and 2 t ha^{-1} of lime ($p<0.05$).

Total green dry matter production (kg ha^{-1}) and botanical composition (%) of pasture grown with and without cultivation and two drill types on the 2nd October, after establishment in a depleted tussock grassland at Lees Valley, Canterbury 2007 (From Tapp 2007).

Treatment	Total green dry matter (kg ha^{-1})	% Ryegrass	% Subterranean clover	% Cocksfoot	% White clover	% Weed
Cultivated	656	66.8	26.4	0.68	3.01	2.7
Non cultivated	292	39.6	33.7	1.27	6.32	19.0
Significance	*0.011*	*0.031*	*0.052*	*NS*	*NS*	*0.087*
Cross Slot	542	59.2	21.4	1.22	4.98	12.9
Triple disc	406	47.2	38.6	0.73	4.34	8.8
Significance	0.081	0.061	0.008	NS	NS	NS

Cost benefit analysis of establishment methods

Total cost of pasture establishment includes cost of basal treatments; spraying, seed, fertiliser including transport and spreading, plus cost of treatment.

Total cost of pasture establishment, with and without cultivation, with two drill types and with 0, 2 or 6 t ha^{-1} of lime in a depleted tussock grassland at Lees Valley, Canterbury 2007 (From Tapp 2007).

	Rate of lime (t ha^{-1})		
	0	2	6
Cultivated			
Cross Slot	$1,022	$1,123	$1,325
Triple disc	$925	$1,026	$1,228
Non cultivated			
Cross Slot	$822	$923	$1,125
Triple disc	$725	$826	$1,028

- The cost of the cultivated treatment was 1.22 times greater than non cultivated treatment.
- The cost of the Cross Slot drill treatment was 1.1 times greater than triple disc drill treatment.
- The cost of lime including transport and spreading was $50 tonne^{-1}. The average cost was $873 ha^{-1} for 0 t of lime ha^{-1}, $974 ha^{-1} for 2 t of lime ha^{-1} and $1176 ha^{-1} for 6 t of lime ha^{-1}.
- The total cost of 6 t of lime ha^{-1} was 1.35 times greater compared with 0 t of lime ha^{-1}. Applying 6 t of lime ha^{-1} was not cost effective at this time but the lime response is likely to be ongoing.

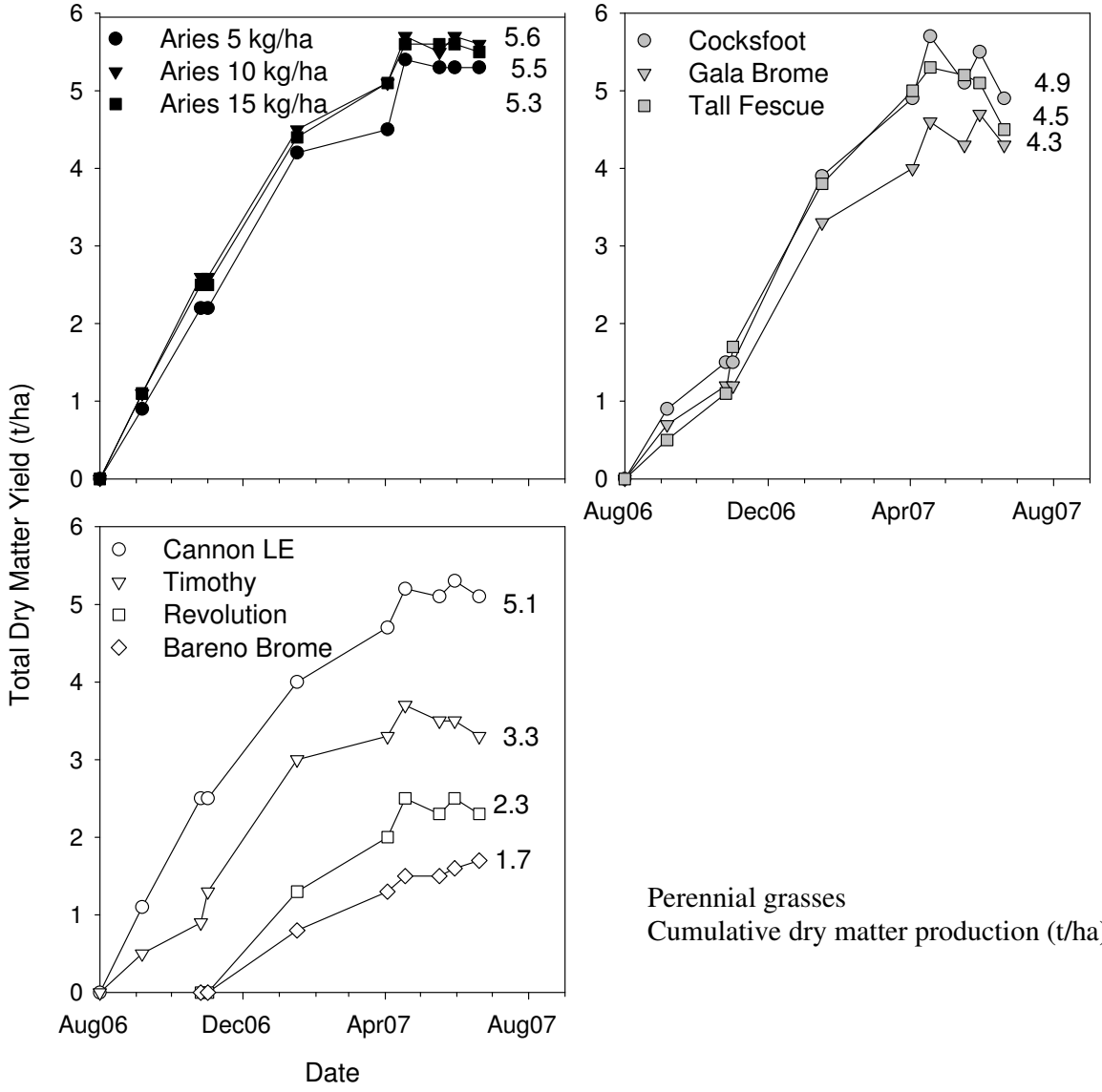
Note: only sprayed once pre-sowing because of the dry autumn meant there was no regrowth to spray.

Initial disc cultivation of resident tussock / browntop after herbicide application

Perennial grass species

- The site was initially sprayed with round up (4*l*/ha) in April 2005 and again in October. Lime applied at 5 t/ha. Browntop mat broken down by hoof and tooth from April to August 2005. 400 kg/ha superphosphate and 300 kg/ha DAP applied in January 2006 then disced, harrowed and heavy rolled.
- Eight species were sown 13 February 2006. Revolution ryegrass and Bareno brome were sown 1 November 2006
- Plots were grazed April, September, November 2006, January and June 2007. They were topped in December 2006.
- The dry matter production range from 1 August 2006 to 20 June 2007 is between 5.6 and 3.3 t DM/ha for Aries HD 10 kg/ha and Timothy respectively. The later sown Bareno brome and Revolution ryegrass produced 2 t DM/ha. There was no difference in dry matter production ($p>0.05$) for the Aries HD 5, 10 and 15 kg/ha from April 2006 – July 2007 (5.3, 5.6 and 5.5 t DM/ha accumulated respectively).
- Under drought conditions Kara cocksfoot and Advance tall fescue produced higher dry matter (1750 and 1460 kg DM/ha respectively in April)($p<0.05$) compared to other species (Aries HD 15 kg seeds/ha; 1240 kg DM/ha).

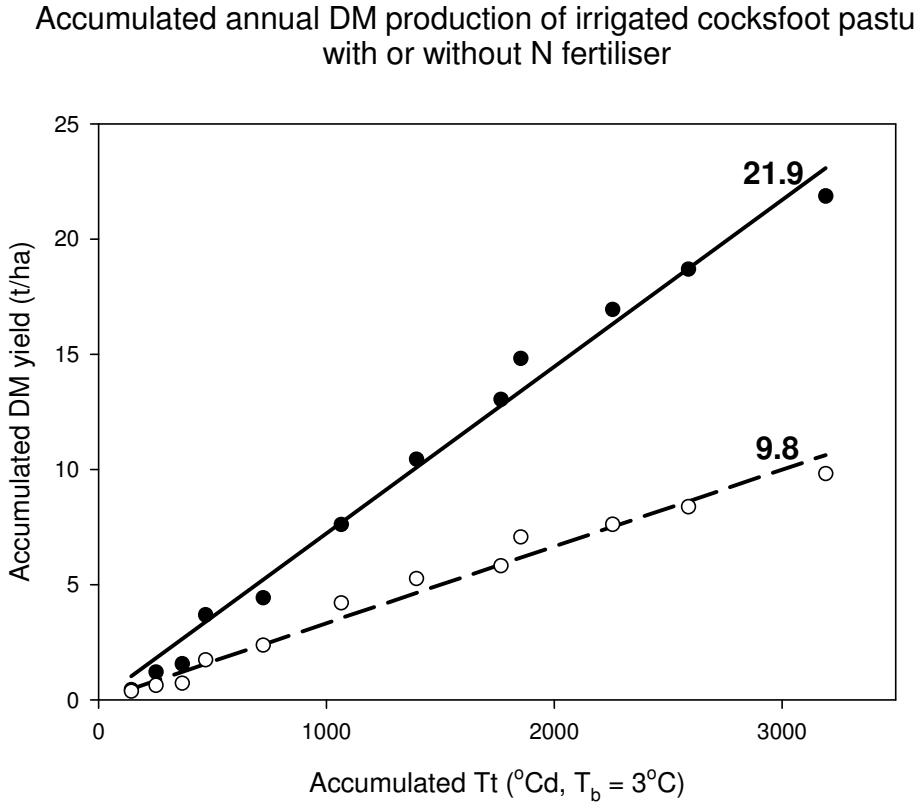
Soil Quick Test pH 6.1, Olsen P 16, Ca 9, Mg 8, K 9, Na 2, S 9 at 8 August 2007



Perennial grasses
Cumulative dry matter production (t/ha)

Accumulated annual dry matter production of irrigated cocksfoot pastures with or without N fertiliser

Dr Anna Mills



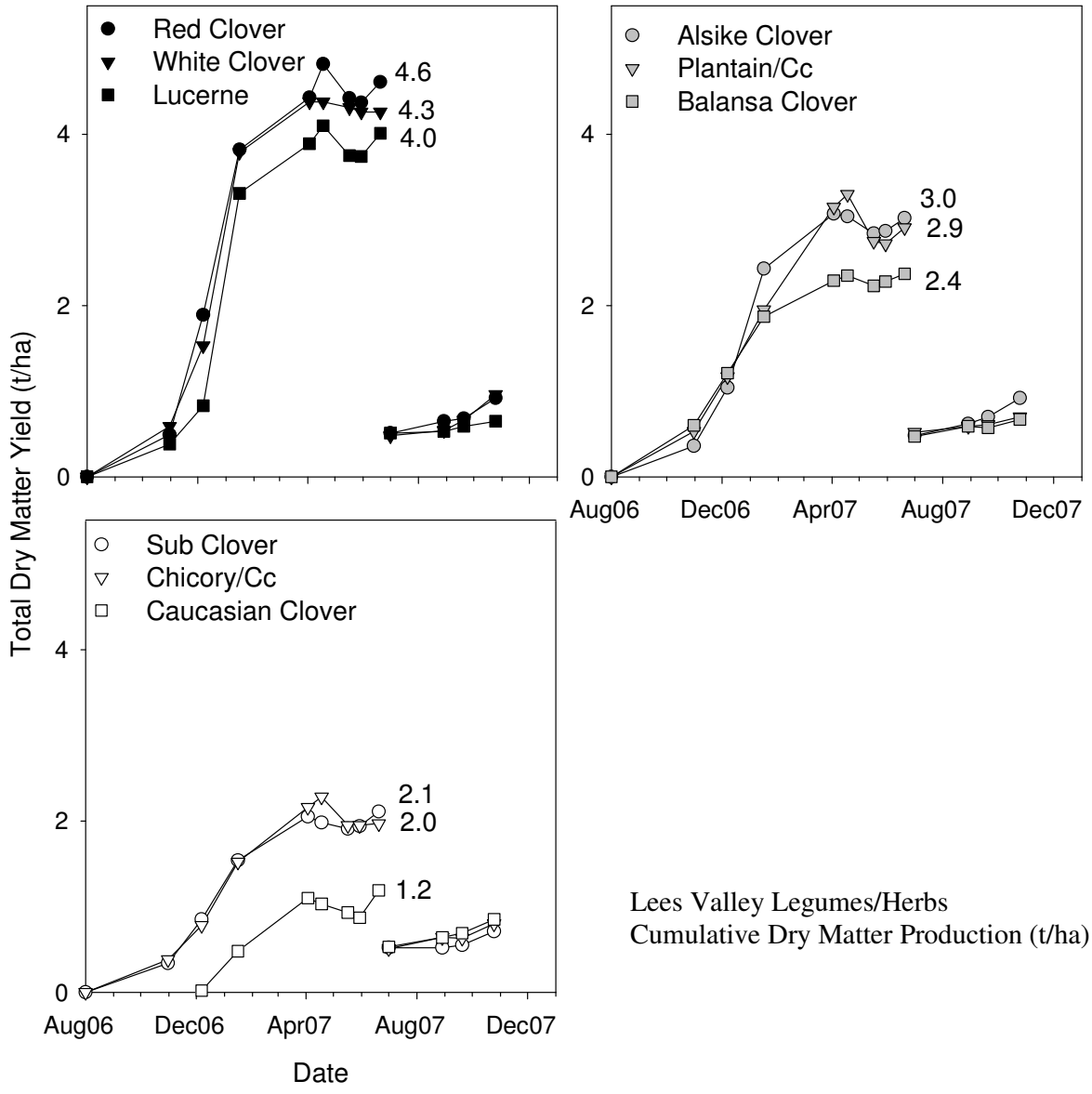
- At Lincoln, fully irrigated cocksfoot pastures supplied with non-limiting N fertiliser had more than double the yield of pastures with irrigation alone.
- Both pastures used about 700 mm of water annually to produce these yields.
- Cocksfoot is highly competitive for moisture and out-competes most legumes.
- For dryland properties – spring N (50 kg N/ha) will increase cocksfoot growth, water use efficiency and grazing preference.
- At Lees Valley pasture plots have been split in half. One half received no N fertiliser and the other 150 kg N/ha as calcium ammonium nitrate on 15 Aug 2007.

- The high rate of N fertiliser applied here is experimental. Data will be used to develop a nitrogen nutrition index which will allow N fertiliser recommendations to be made regardless of location, season or previous site history.

Legumes and herbs

- Alsike (3.5 kg/ha), white (4 kg/ha), red (5kg/ha), subterranean (10 kg/ha), balansa (3 kg/ha) clovers, chicory (0.6 kg/ha), plantain (1 kg/ha) and lucerne (10 kg/ha) were sown 8 – 13 February 2006. Site preparation same as for perennial grasses.
- Caucasian clover (Cc) was over drilled in chicory and plantain treatments and sown with rape on November 1 2006.
- Production was between 4.6 for red clover and 1.2 t/ha for caucasian clover alone, from August 2006 to June 2007.
- White clover is expected to loose its taproot after 12 – 18 months.
- Subterranean and balansa plots now heavily infested with weeds. Lack of subterranean seedlings in autumn was due to high percentage of hard seed.
- Plots were grazed September and November 2006, January and June 2007.

Soil Quick Test pH 6, Olsen P 17, Ca 7, Mg 10, K 11, Na 2, S 8 at 8 August 2007



Lees Valley Legumes/Herbs
Cumulative Dry Matter Production (t/ha)

Sub clover; winter chill

Caucasian clover establishment

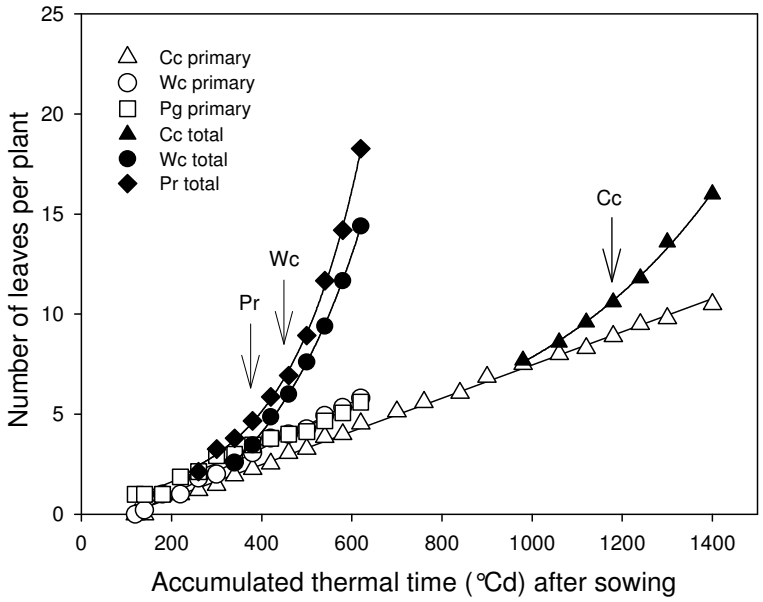
Caucasian clover (Cc) requires a specific rhizobium strain to form effective N fixing root nodules

Cc rhizobia are not present in NZ soils. Therefore, all Cc seed must be freshly inoculated shortly before sowing with the correct strain of Cc specific rhizobia.

Rhizobium bacteria are sensitive to ultra violet light, dessication and high temperatures. If sowing is delayed, the inoculated, pelleted seed should be kept in a dark, cold, dry place.

Takes longer to form a canopy of leaves

Cc has the same rapid rate of germination, emergence and primary shoot development seen in most clover species. However, the thermal time required to start production of the secondary growing points, which are required to rapidly produce a canopy of leaves, is much longer for Cc than perennial ryegrass or white clover (see graph below). For example, ryegrass begins tillering after 400°Cd, Wc initiates stolons after 430°Cd but Cc takes 1200°Cd for its first crown shoots and ~1600°Cd (most of a growing season) for secondary leaf production.



Number of total and primary stem leaves for seedlings grown at 25/15 ºC against accumulated thermal time above a base temperature of 0 ºC. Arrows indicate the time of initiation of secondary growing points, either tillers (pr), stolons (wc) or crown shoots (Cc).

Spring sowing best

The aim should be to sow early enough to accumulate 1600°Cd (degree days) before April.

Best practice Cc establishment

a) Cultivated seed-beds

i. Incorporate lime and fertilizer (no N) into the soil based on recent soil test results.

ii. Create a weed free, firm, fine seed-bed for sowing in spring when soil temperatures exceed 10°C.

iii. Use appropriate herbicides before cultivation and pre and/or post emergence as needed.

iv. Drill in spring 5 kg/ha of freshly inoculated Cc seed (at time of sowing). A roller drill may be best to replace seed at 10 mm depth, in rows no wider than 15 cm.

v. A pure stand of Cc sown in spring and overdrilled in autumn with permanent pasture species or winter feed will give the fastest Cc establishment.

<u>Seed mix options</u>

- Sow rape (e.g. Winfred) with Cc at 1 kg/ha (less if N fertility is high, more if N is low). An early grazing may be needed to avoid the rape canopy shading out the clover. Other pasture species, including annual clovers in summer dry areas, can then be overdrilled in autumn.
- Half normal rates of plantain or chicory have also been used as nurse crops for Cc but rape provides the most rapid bulk of feed with a leaf canopy which is compatible with the clover.
- Slower establishing grasses (sown at half commercial rates) such as timothy (1 kg/ha) or tall fescue (10 kg/ha) have also been used with Cc in spring sowings.
- Grasses sown with Cc will slow the clovers development depending on soil N levels; perennial ryegrass in particular is highly competitive with its rapid seedling establishment and at conventional (15-20 kg/ha) rates. On moderate fertility sites 5 kg/ha of perennial ryegrass is sufficient when sown with Cc in spring.

b) Direct drilling

i. Follow advice as for cultivated seed-beds.

ii. Double spray to ensure complete kill of resident vegetation and weeds.

iii. Soil N levels will tend to be lower than after cultivation. Companion species are therefore likely to be less competitive than if the same paddock had been cultivated.

iv. Ideally use a cross-slot drill to place fertiliser in the soil near, but not in contact with the seed and take care with monitor sowing depth.

v. Fertilizer and lime surface broadcast will not increase topsoil nutrient levels as rapidly as cultivation.

Dryland brassicas

Dr Warwick Scott

- Brassicas produce about 20 kg/ha of dry matter (DM) per mm of water used.
- Shallow-rooted crops (turnips and swedes) are more sensitive to soil moisture deficit than deeper-rooted ones (kale and rape).
- Yield is limited by the amount of water available from stored soil water and in-season rainfall.
- Most brassica crops will extend their roots to about 1.0 m depth.
- Water available in the 1.0 m root zone ranges from about 80 mm in light, shallow soils to about 140 mm in heavier, deeper soils.
- Fallow before sowing to conserve water in soils with low water holding capacity.

Typical available soil water holding capacities (mm)

Soil Depth to gravel (m)	Swedes, Turnips (0.6 m root depth)	Kale, Rape (1.0 m root depth)
0.20	65	80
0.30	80	90
0.50	100	110
0.75	130	140
1.00	130	165

- Provide an optimum rooting environment for crops.
- Sow early to allow survivial through mid and late season drought.
- Choose brassica types that grow mainly at less droughty times of the year.
- Maximise productive use of available water.
- Manage crops so they can best take advantage of rainfall when it occurs.

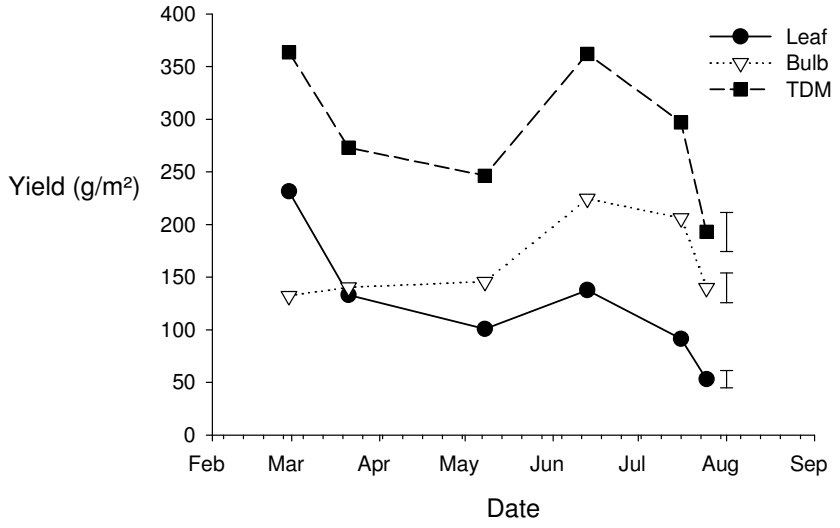
Green globe turnips with nitrogen and phosphorus

Back ground

- Site established April 2005 sprayed with round up (4 l/ha) and again in October. Browntop mat broken down by hoof and tooth from April to August 2005.
- 400 kg/ha super phosphate and 300 kg/ha DAP applied in January 2006 then disc, harrow and heavy rolled. Glyphosate (540 g/l a.i. at 2 l/ha) applied September 2006.
- Green globe turnip sown at 1.5 kg/ha and 100 kg C.A.N. broadcast over all plots (21 kg N/ha – first application) on 14 December.
- Second application of N (20 kg/ha to designated 40 kg N/ha plots) applied 28 February 2007. Final application of N (20 kg/ha to designated 60 kg N/ha plots)14 March 2007.
- Three treatments of Phosphorus (0, 30 and 60 kg P/ha) applied prior to sowing.

Results

- Maximum turnip dry matter production occurred on the 28 February at an average yield of 3640 kgDM/ha, before the drought reduced yield to 2460 kgDM/ha in early May.



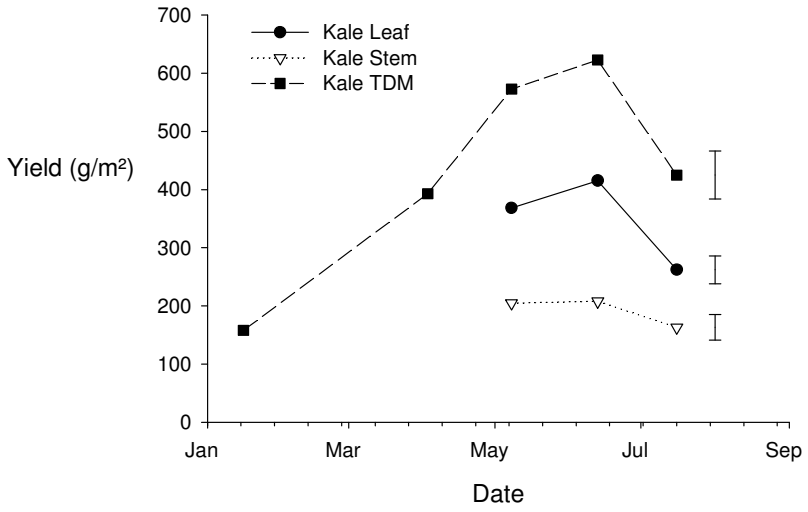
Yield of turnips (*Brassica campestris* L.) over time, showing leaf, bulb and total dry matter accumulation. Error bars are LSD at the 10% level (From Reynolds 2007).

Kale

- Sown 9 November 2006 at 3 kg/ha.
- Half of the plots had nitrogen applied (urea) at 30 kg N/ha on 8 May.

Results

- The yield rose from 1580 kg DM/ha in mid-January and reached a maximum of 6230 kg DM/ha in mid-June.



Yield of kale (*Brassica oleracea* L.) over time, showing leaf, stem and total dry matter accumulation. Error bars are LSD at the 10% level (From Reynolds 2007).

Radiation Interception

- The light interception was low in May, due to incomplete leaf canopies after the drought.
- Kale recovered quicker, responded to nitrogen and produced higher yields by mid winter than turnips.
- 30 kg N/ha produced 2180 kg DM/ha more by mid June compared to no autumn N application (70 kg DM/ha increase per unit of N).
- Light interception increased as the plants redevelop leaf canopies after the drought.
- At the start of May the proportion of radiation intercepted was 33% for turnips and 59% for kale.
- By mid July radiation interception had increased to 46% for turnips and 76% for kale.

Kale growing at Mt Pember station, 2006

Annuals
(2006 sowing)

- Annuals are used to provide quality feed over the 120 + day winter at Lees Valley.
- Initially six treatments were sown 13 February 2006.
- Cereals sprayed with glyphosate 16 January 2007.

		Herbage Available (kg DM/ha)				
		2006				2007
Species/cultivar	Sowing rate (kg/ha)	Autumn (26 April)	Winter (16 Sept)	Spring (26 Oct)	Early Summer (7 Dec)	Mid Summer (16 Jan)
Triticale	100	1663 a	834 a	432 b	1563 a	2289 b
Oats	100	1774 a	376 b	204 c	740 b	2826 a
Ryecorn	100	1074 b	1043 a	746 a	2210 a	1623 c
Significance		***	***	***	***	***
LSD (P<0.05)		384	290	160	669	509
Italian ryegrass	20	648 b	762 ab	784 b	3326 b	2265
Quartet ryegrass	23	723 b	524 b	526 c	1989 b	2502
Maverick Gold short rotational ryegrass	20	870 a	1109 a	1208 a	5673 a	2736
Significance		***	**	***	***	NS
LSD (P<0.05)		384	375	244	1563	

		2007 cont'd; Herbage Available (kgDM/ha)				
		Mid autumn (18 Apr)	Late autumn (17 May)	Mid Winter (1 July)	Late Winter (8 Aug)	Early Spring (6 Sept)
Italian ryegrass	20	1291	999	588	270	262
Quartet ryegrass	23	1781	1381	959	482	447
Maverick Gold short rotational ryegrass	20	1815	1353	965	345	317
Significance		NS	NS	NS	NS	NS

- Light graze April, September, October 2006 and August 2007
- Rapid growth in early summer followed by topping in December 2006
- High rainfall in December lead to an increase in dry matter production over January.
- Low rainfall between January and April and moderate temperatures resulted in a decrease in dry matter production.

Annuals
(2007 sowing)

- Sonik annual ryegrass sown 30th January 2007
- Cereals sown 21st March 2007 into previous cereal or fallow plots

		Herbage Available (kg DM/ha)					
	Sowing Rate (kg/ha)	**Mid autumn (18 Apr)**	**Late autumn (17 May)**	**Mid winter (1 July)**	**Late winter (8 Aug)**	**Early spring (6 Sept)**	**Mid spring (25 Oct)**
Sonik ryegrass	30	881	1055 a	768	612	227	1029
Oats	100	413	714 ab	1389	780	172	339
Ryecorn	100	549	466 bc	1006	602	229	1258
Triticale	100	353	278 c	586	345	240	1210
Significance		NS	*	NS	NS	NS	NS
LSD			414				

- Grazed in August 2007
- Sonik showed fast establishment and strong autumn growth activity. Growth was reduced after temperatures decreased in winter.
- Oats have strong winter growth activity and,compared to the other cereals, has higher frost tolerance. October results show slow re-growth after grazing.

Soil Quick Test pH 6.0, Olsen P 14, Ca 7, Mg 8, K 10, Na 2, S 8 at 8 August 2007

Pasture species mixtures

- Sprayed with glyphosate in early November 2006 and left fallow for three months
- Sown on 30 January 2007.
- All plots have a basal clover mixture of 'Leura' subterranean clover at 10 kg/ha and 'Nomad' white clover at 2 kg/ha.

Perennial Ryegrass

Grass treatment	Sowing rate (kg/ha)	Emergence (plants/m^2)	Dry matter (kg/ha)
			June
Revolution AR1	10	372	842
Cannon HE	10	504	612
Revolution + Cocksfoot *	10 2	344 44	847
Revolution AR1	20	562	857
Samson AR1	10	276	818
Significance			NS

* Agriseeds fine-leaved cocksfoot (dg25)

	June botanical composition (%)				
	Sown grass	Subterranean Clover	White Clover	Weed	Dead
Revolution AR1 (10 kg)	55	11	3	0	31
Cannon HE	44	19	2	0	35
Revolution + CF	38	10	8	3	41
Revolution AR1 (20 kg)	51	8	2	0	39
Samson AR1	40	13	3	0	44
Signficance	NS	NS	NS	NS	NS

- Dead percentage high due to no grazing in autumn

Soil Quick Test pH 5.7, Olsen P 12, Ca 5, Mg 7, K 7, Na 2, S 8 at 8 August 2007

Pasture mixtures cont'd

Dryland Mixes

Grass treatment	Sowing rate (kg/ha)	Emergence (plants/m^2)	Dry matter (kg/ha)
			June
'Advance' tall fescue	20	87	794
'Advance' tall fescue +endophyte	20	208	730
'Bareno' brome	20	360	781
Agriseeds cocksfoot (dg25)	2	58	643
'Ella' cocksfoot	2	56	653
Significance			NS

	June botanical composition (%)					
	Grass	Subterranean Clover	White Clover	Weed	Dead	Other Grass
'Advance' tall fescue	5b	55	16	0	23	1
'Advance' tall fescue +endophyte	16b	45	14	0	25	0
'Bareno' brome	61a	15	4	0	20	0
Agriseeds cocksfoot	20b	39	8	10	20	31
'Ella' cocksfoot	20b	40	14	3	23	0
Signficance	**	NS	NS	NS	NS	NS
LSD	19.8					
SEM	6.1					

- Botanical composition indicates Bareno brome had a greater ($p<0.05$) percentage of grass content than other treatments
- Bareno brome is slower to establish than ryegrass, however it is faster than cocksfoot or tall fescue.
- Clover percentage was subsequently lower in Bareno brome plots.

Soil Quick Test pH 5.7, Olsen P 16, Ca 5, Mg 9, K 11, Na <2, S 10 at 8 August 2007

Pasture mixtures cont'd

Timothy Mixtures

Timothy/herb mixture	Sowing rate (kg/ha)	Emergence (plants/m^2)	Dry matter (kg/ha)
			June
'Kahu' timothy	2	63	584
'Kahu' timothy + Chicory	2 1	66 315	339
'Kahu' timothy + red clover	2 4	55 174	550
'Kahu' timothy, Plantain + Chicory	2 1 1	66 174 208	311
'Kahu' timothy + Plantain	2 1	57 232	511
Signficance			NS

	June botanical composition (%)								
	Grass	Sub	WC	RC	Plant	Chic	Weed	Dead	Other Grass
'Kahu' timothy	3	49	16	-	-	-	1	31	0
'Kahu' timothy + Chicory	13	41	10	-	-	6a	0	30	0
'Kahu' timothy + red clover	4	68	6	4	-	-	0	18	0
'Kahu' timothy, Plantain + Chicory	7	31	8	-	14	0b	0	40	0
'Kahu' timothy + Plantain	3	41	3	-	12	-	2	39	0
Signficance	NS	NS	NS	NS	NS	***	NS	NS	NS
LSD						3			
SEM						7			

- The botanicals showed no significant differences in grass or clover content
- Clover percentage was higher in timothy plots compared to ryegrass and dryland mixtures due to slower establishing timothy

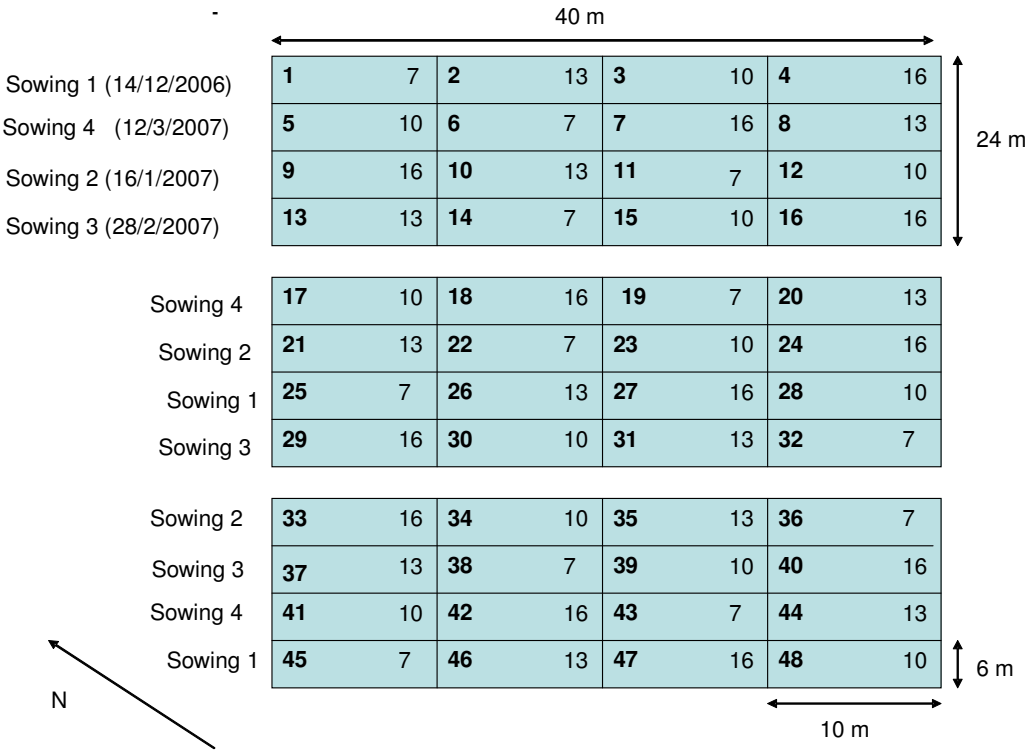
Soil Quick Test pH 5.8, Olsen P 16, Ca 5, Mg 8, K 9, Na <2, S 11 at 8 August 2007

Timothy seedling in pasture mix.

Lucerne (sowing date and rate)

- The site was initially sprayed with round up (4*l*/ha) in April 2005 and again in October. Browntop mat broken down by hoof and tooth from April to August 2005.
- 400 kg/ha superphosphate and 300 kg/ha DAP applied in January 2006 then disced, harrowed and heavy rolled.
- Sown with 20 kg/ha Feast annual ryegrass in February 2006, then grazed May and September 2006
- Glyphosate (540 g/l a.i. at 2 l/ha) applied November 2006.

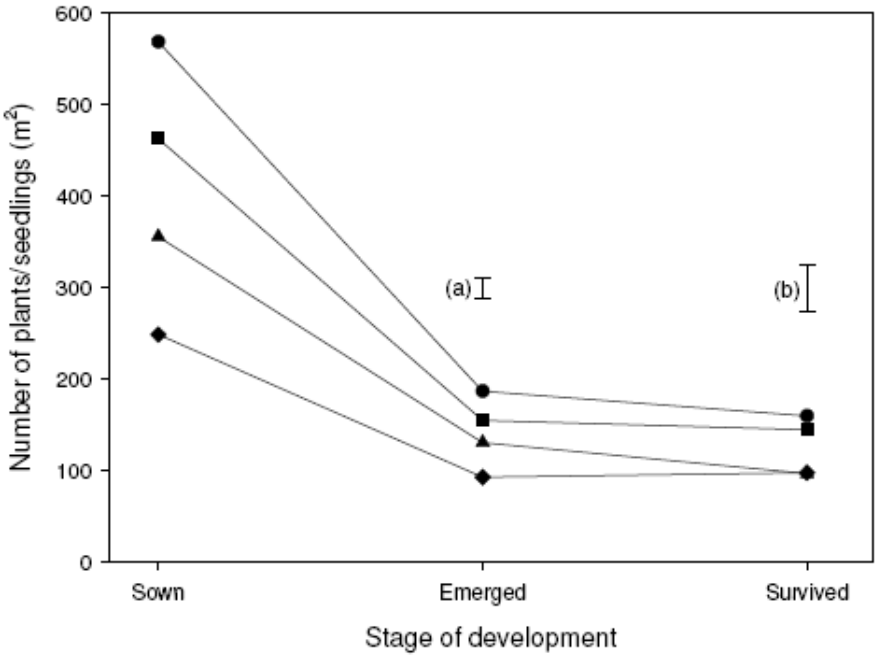
Soil Quick Test pH 5.7, Olsen P 12, Ca 4, Mg 8, K 11, Na <2, S 8 at 8 August 2007



Results

Plant populations

- Lucerene stands sown on the 14 December had the highest (201 plants/m^2) number of plants while those sown on the 16 January had the least (95 plants/m^2).
- The total number of plants that survived the first winter was highest from the December and January sowings.
- Plant numbers for 16 kg/ha sowing rate (160 plants/m^2) were higher than those from 7 and 10 kg/ha sowing rate (98 plants/m^2).
- The decline in the number of seeds sown to the number that survived to spring can be seen in in the graph on the next page.



Average number of lucerne seeds sown (seeds/m^2), emergence on various dates (plant/m^2) and survival as at 12 September 2007, from 7 (♦), 10 (▲), 13 (■) or 16(●) kg seed/ha sowing rates, at Lees Valley, Canterbury. Error bars are LSD ($p<0.05$) for (a) emergence and (b) survival (from Lewis 2007).

- The two latest sowing dates February and March have been sprayed with Round-up (2 l/ha) and will be left to see what recovers.

Lees Valley (LV) weather summary

Keith Pollock

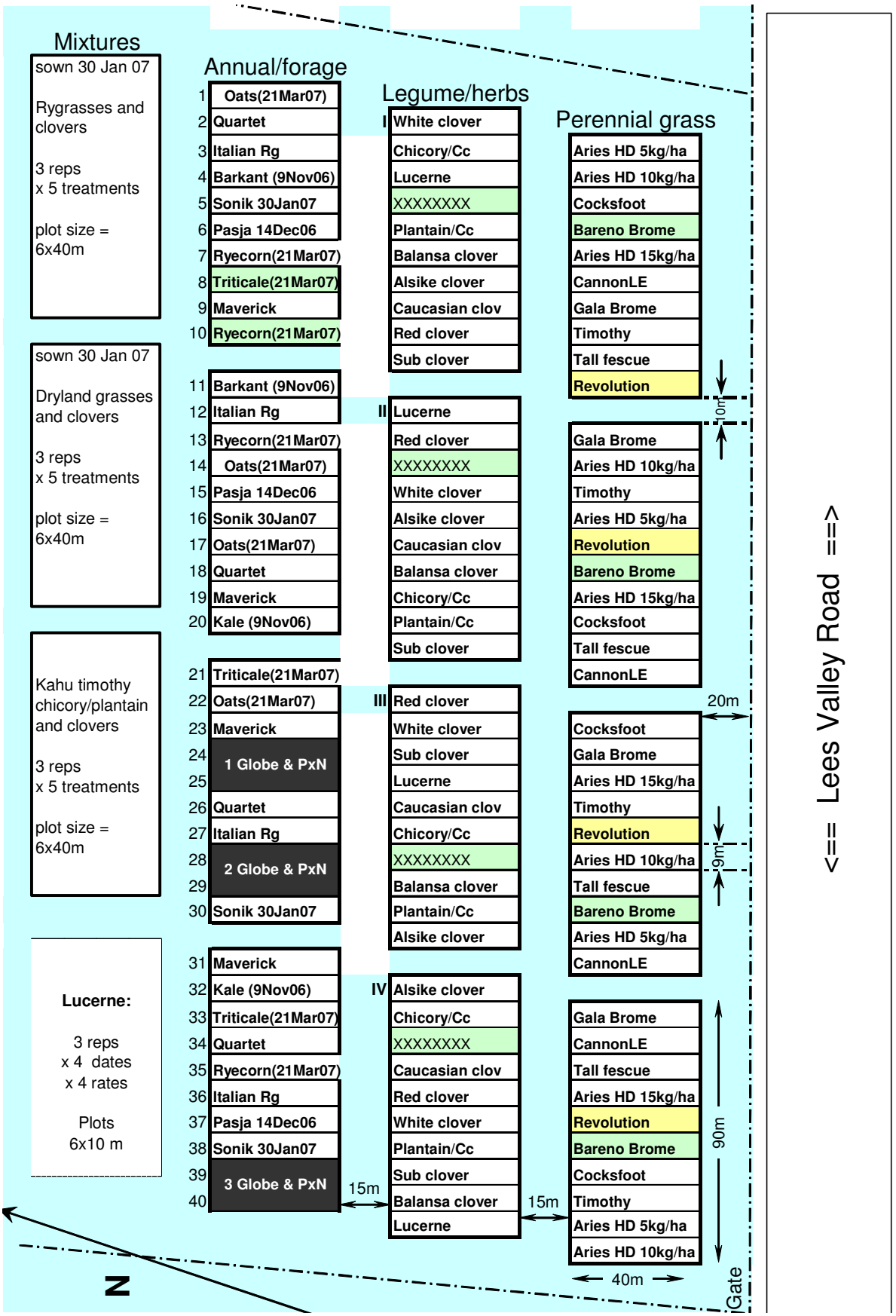
An automated weather station was erected on the flats of Wharfedale station in November 2006.

Data for the first year are summarized below and compared to data from Darfield and the ECAN rain record from near Island Hill across the valley (due North from trial site, on the Ashley River).

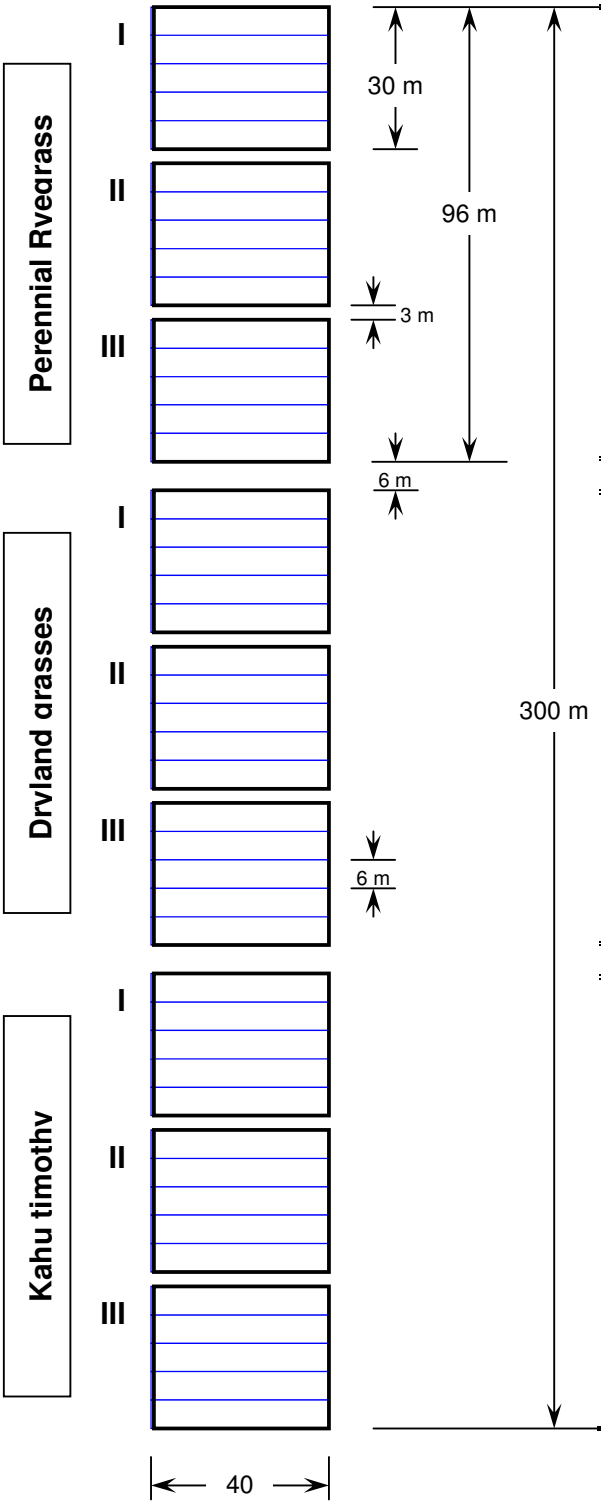
	Air temp. (°C)		Soil temp. (°C)		Rainfall (mm)			Wind(km/hr)		Solar Rad.
Month	**LV**	**Darfield**	**LV**	**Darfield**	**LV**	**LV(ECAN)**	**Darfield**	**Mean**	**Max**	**MJ/m^2/day**
Nov06	11.5	12.8	13.0	15.4	89.0	139.0	100.2	3.3	26.8	17.9
Dec06	11.1	12.3	14.2	15.7	105.8	135.5	95.2	2.4	17.9	17.4
Jan07	14.8	14.8	16.0	17.6	16.6	29.0	27.2	2.1	16.1	16.9
Feb07	14.4	15.5	15.8	19.7	30.2	49.0	18.8	1.6	13.3	16.1
Mar07	15.1	16.5	14.9	18.5	13.6	18.0	38.8	2.3	24.0	14.0
Apr07	9.1	11.1	11.2	12.8	37.2	64.5	51.2	1.3	13.2	9.3
May07	9.7	11.9	8.7	10.0	33.8	57.5	38.4	2.4	24.7	6.7
Jun07	3.3	5.7	4.2	4.8	48.8	73.5	50.6	1.9	25.5	5.1
Jul07	3.4	5.9	3.4	5.0	26.0	42.5	41.2	1.4	17.8	5.4
Aug07	5.2	7.1	5.5	6.6	26.0	41.5	28.6	2.0	63.0	8.5
Sep07	7.9	9.5	8.0	9.5	28.0	58.5	33	8.3	77.8	11.3
Oct07	9.7	10.7	9.5	11.0	109.0	187.5	81.2	15.8	105.5	16.2
Means /Totals	**9.6**	**11.2**	**10.3**	**12.2**	**56.4**	**89.7**	**50.4**	**3.8**	**105.5**	**12.0**

Darfield data are courtesy of Selwyn Plantation Board and ECAN rainfall data are courtesy Environment Canterbury. Rainfall updates from the ECAN network are available by phone or their web page @ http://www.ecan.govt.nz/Our+Environment/Water/Rainfall/

- Mean monthly LV (Wharfedale) rainfall was 65% of the ECAN site across valley, r^2 =0.95; and 95% of the Darfield rainfall, r^2 = 0.82.
- Lees Valley was 1 °C cooler than Darfield in summer; 2 °C colder in winter.

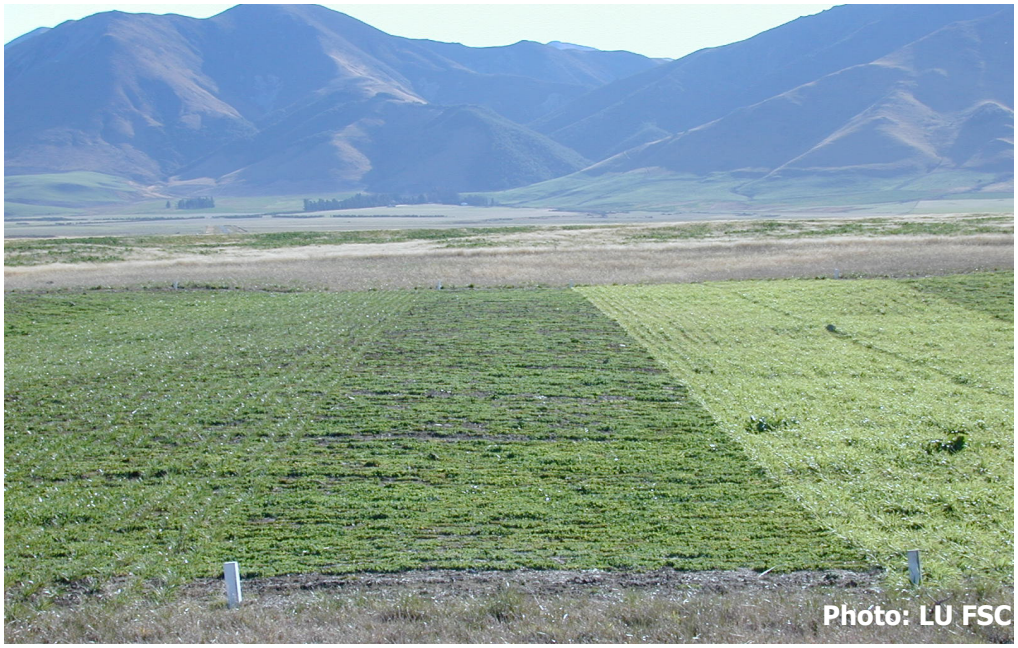

Mixtures
sown 30 Jan 07
Rygrasses and clovers
3 reps x 5 treatments
plot size = 6x40m
sown 30 Jan 07
Dryland grasses and clovers
3 reps x 5 treatments
plot size = 6x40m
Kahu timothy chicory/plantain and clovers
3 reps x 5 treatments
plot size = 6x40m
Lucerne:
3 reps x 4 dates x 4 rates
Plots 6x10 m
Annual/forage
1 Oats(21Mar07)
2 Quartet
3 Italian Rg
4 Barkant (9Nov06)
5 Sonik 30Jan07
6 Pasja 14Dec06
7 Ryecorn(21Mar07)
8 Triticale(21Mar07)
9 Maverick
10 Ryecorn(21Mar07)
11 Barkant (9Nov06)
12 Italian Rg
13 Ryecorn(21Mar07)
14 Oats(21Mar07)
15 Pasja 14Dec06
16 Sonik 30Jan07
17 Oats(21Mar07)
18 Quartet
19 Maverick
20 Kale (9Nov06)
21 Triticale(21Mar07)
22 Oats(21Mar07)
23 Maverick
24 1 Globe & PxN
25
26 Quartet
27 Italian Rg
28 2 Globe & PxN
29
30 Sonik 30Jan07
31 Maverick
32 Kale (9Nov06)
33 Triticale(21Mar07)
34 Quartet
35 Ryecorn(21Mar07)
36 Italian Rg
37 Pasja 14Dec06
38 Sonik 30Jan07
39 3 Globe & PxN
40
Legume/herbs
I White clover
Chicory/Cc
Lucerne
XXXXXXXX
Plantain/Cc
Balansa clover
Alsike clover
Caucasian clov
Red clover
Sub clover
II Lucerne
Red clover
XXXXXXXX
White clover
Alsike clover
Caucasian clov
Balansa clover
Chicory/Cc
Plantain/Cc
Sub clover
III Red clover
White clover
Sub clover
Lucerne
Caucasian clov
Chicory/Cc
XXXXXXXX
Balansa clover
Plantain/Cc
Alsike clover
IV Alsike clover
Chicory/Cc
XXXXXXXX
Caucasian clov
Red clover
White clover
Plantain/Cc
Sub clover
Balansa clover
Lucerne
15m
15m
Perennial grass
Aries HD 5kg/ha
Aries HD 10kg/ha
Cocksfoot
Bareno Brome
Aries HD 15kg/ha
CannonLE
Gala Brome
Timothy
Tall fescue
Revolution
10m
Gala Brome
Aries HD 10kg/ha
Timothy
Aries HD 5kg/ha
Revolution
Bareno Brome
Aries HD 15kg/ha
Cocksfoot
Tall fescue
CannonLE
20m
Cocksfoot
Gala Brome
Aries HD 15kg/ha
Timothy
Revolution
Aries HD 10kg/ha
Tall fescue
Bareno Brome
Aries HD 5kg/ha
CannonLE
9m
Gala Brome
CannonLE
Tall fescue
Aries HD 15kg/ha
Revolution
Bareno Brome
Cocksfoot
Timothy
Aries HD 5kg/ha
Aries HD 10kg/ha
90m
40m
Gate
<== Lees Valley Road ==>
N

Pasture mixtures: grass/clover/herbs



Experiment	Rep	Plot#	Trt#	Grass/forbs
Ryegrass	1	**1**	1	Revolution AR1 10kg
	1	**2**	3	Cannon HE 10kg
	1	**3**	5	Revolution 10 kg & Cf (dg25)
	1	**4**	4	Revolution AR1 20kg
	1	**5**	2	Samson AR1 10kg
	2	**6**	3	Cannon HE 10kg
	2	**7**	2	Samson AR1 10kg
	2	**8**	5	Revolution 10 kg & Cf (dg25)
	2	**9**	4	Revolution AR1 20kg
	2	**10**	1	Revolution AR1 10kg
	3	**11**	2	Samson AR1 10kg
	3	**12**	5	Revolution 10 kg & Cf (dg25)
	3	**13**	4	Revolution AR1 20kg
	3	**14**	1	Revolution AR1 10kg
	3	**15**	3	Cannon HE 10kg
Dryland mix	1	**1**	1	Advance Tf
	1	**2**	5	Ella Cf
	1	**3**	3	Bareno brome
	1	**4**	4	Agriseeds dg25 Cf
	1	**5**	2	Advance Tf +endophyte
	2	**6**	1	Advance Tf
	2	**7**	2	Advance Tf +endophyte
	2	**8**	5	Ella Cf
	2	**9**	4	Agriseeds dg25 Cf
	2	**10**	3	Bareno brome
	3	**11**	2	Advance Tf +endophyte
	3	**12**	5	Ella Cf
	3	**13**	1	Advance Tf
	3	**14**	4	Agriseeds dg25 Cf
	3	**15**	3	Bareno brome
Timothy	1	**1**	4	Kahu timothy & chic/pltn
	1	**2**	5	Kahu timothy & red clover
	1	**3**	3	Kahu timothy & plantain
	1	**4**	1	Kahu timothy
	1	**5**	2	Kahu timothy & chicory
	2	**6**	1	Kahu timothy
	2	**7**	3	Kahu timothy & plantain
	2	**8**	5	Kahu timothy & red clover
	2	**9**	4	Kahu timothy & chic/pltn
	2	**10**	2	Kahu timothy & chicory
	3	**11**	2	Kahu timothy & chicory
	3	**12**	1	Kahu timothy
	3	**13**	5	Kahu timothy & red clover
	3	**14**	4	Kahu timothy & chic/pltn
	3	**15**	3	Kahu timothy & plantain

Plus basal clover: Leura sub clover (10kg coated/ha) and Nomad white clover (2 kg/ha)



Newly established pasture mixes; Advance tall fescue on left, the basal clover (centre) and Bareno brome at right

Balansa clover with Triticale for silage harvesting.