

Mt Bengier

Legumes for Lambs



Field Day

1 November 2013



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Programme:

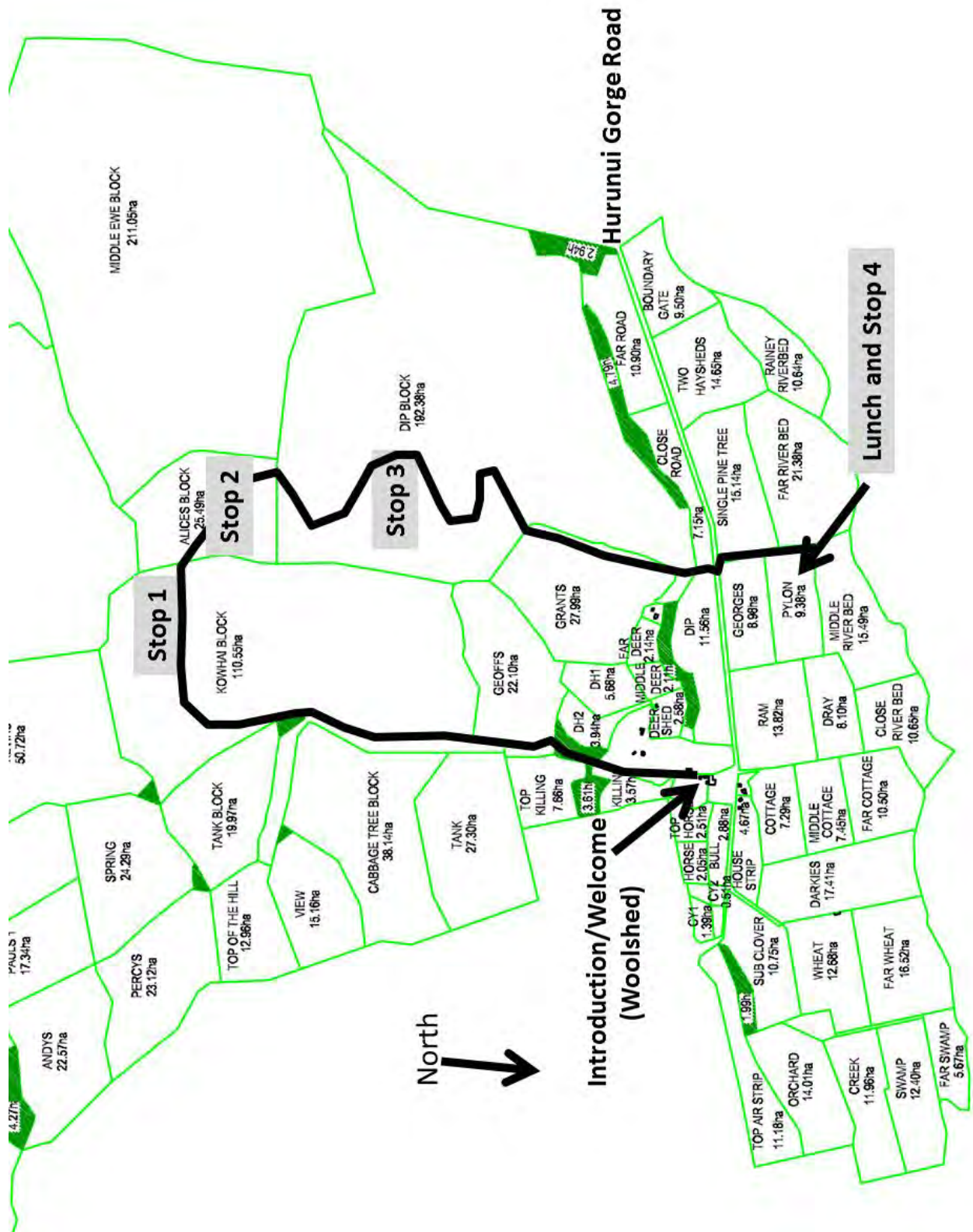
Time:	Activity
10.00 am	Meet at the Woolshed
10.15 am	Welcome and Introduction to Mt Bengier Station (Andrew Johnston & Matt Iremonger)
10.30 am	Drive up to Stop 1 (Kowhai Block). (Dick Lucas)
11.00 am	Arrive Stop 2 (Alice's Block improved pasture)
11.15 am	Attributes of 'Antas' and 'Monti' Sub clovers (Richard Prusa, Heritage Seeds, Australia)
11.30 am	Success of pasture improvement methods (Dick Lucas & Matt Iremonger)
11.45 am	Arrive Stop 3 (Dip Block). Walk over sunny face pasture
12.45 pm	Arrive Stop 4 for lunch – supplied courtesy of ANZ Bank
1.30 pm	Current use and future development of lucerne on Mt Bengier (Matt Iremonger, Derrick Moot).
2.30 pm	Final closing discussion
3.00 pm	Refreshments supplied courtesy of BASF

COVER PHOTO: Alice's Block, Mt Bengier. 2 October 2013.

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Today's Planned Stops



Introduction to Mt Benger

Basic stats:

Area 3430 ha consisting of:

430 ha river flats and terraces (13%)

800 ha easy down land (23%)

200 ha medium hill which could be developed using spray and disc (6%)

2000 ha too steep for tractor but would respond to aerial development (58%)

Improvement

Area currently improved (ha)

1345 ha pasture

85 ha lucerne

Average area to be developed / year over next 5 years

500-600 ha into improved grass/sub clover pasture

180 ha into Lucerne (in next two years)

Stock

Cattle stock units 6300

645 cows & heifers mated

Sheep stock units 17300

11000 ewes and 3000 hoggets mated

Deer

150 weaners (would normally be 300-400).

Soils & Fertiliser:

Soil tests done as needed, mostly re-tested post application to determine effect of applications.

Basic fertiliser policy:

Irrigated areas:

350 kg SS20 applied in two applications spring & mid-summer,
Urea as needed.

Cultivated Downs

currently 3 t/ha lime plus durasul sulphur at 60 kg/ha.

Hill:

30kg/ha brimstone 90 sulphur prill every third year.

In general fertility levels are:

Irrigated areas: Olsen P 25+,

Cultivated Downs: Olsen P 25-100+,

Hill: Olsen P 15-50

- Sulphur is the main deficiency.
- Soil pH is down to 5.3 (H₂O) on some hill areas even though this is limestone country

Seed Mixes:

Recent mixes used in improved areas:

Irrigated pastures: Lucerne,

Italian RG,

‘Pacer’ summer brassica (forage turnip/forage rape hybrid).

Cultivated Downs: Tall Fescue & white clover. (changing to sub clover in future)

Hill country: Cocksfoot, 'Ruanui' ryegrass & Sub clover.

'Mt Barker' sub clover was flown onto some of the hill country in the early 1960's.

Lucerne:

- Is primarily a finishing feed with a little conserved for wintering.
- Moving to substantial amount of lucerne under irrigation, because of high temperatures and long irrigation return (up to 15 days).
- High requirement of nitrogen fertiliser applications needed due to sandy soil type to support ryegrass.
- Also cold winters giving little growth in winter of perennial RG = Lucerne.

Pylon & Georges lucerne paddocks:

- Both were previously in perennial RG. They were sprayed in spring, sown into 'Pacer' brassica for summer production then into oats for winter. The following spring Lucerne was direct drilled.
- Grazing is by set-stocking at about 12/ha for lambing hoggets, then once finished lambing mobbed up and rotationally grazed until weaning at approx. 100 days when hoggets, (now 2ths) removed. Killable lambs are sold and remainder continue to rotationally graze until reach killable weights.
- Problems with nodding thistle mainly, no aphid impact in nearly 6 years, winter spray programme aim to complete by 1 July. Mostly sown 'Wairau' cultivar.

Alice's Block:

- Was part of a larger 236 ha block, but lent itself to be subdivided off as it was easily fenced, had water & helpful for tailing etc.
- Had good soil and good fertility levels although was thick with matagouri, with some grass of danthonia and browntop.
- Never had fertiliser applied and had little grazing value.
- Subdividing made no difference to main block's carrying capacity, which is normally set-stocked at under 1/ha of singles until weaning, then rotationally grazed maybe for 1 week about 4 times max. over summer/autumn/winter with 2500 ewes.

Development of subdivided improved area of Alice's Block:

- About 20 of the 25 ha bush/bog disced with bulldozer, second discing with offsets by tractor.
- In December 2011 & January 2012, 1 t/ha of lime was applied.
- A mix of 'Interval' rape at 3 kg/ha plus 3 kg/ha of 'Woogenellup' sub was flown on with 150 kg/ha of Sulphur Super 20 then harrowed first week of February 2012.
- Grazed with 100 steers over winter beginning June 2012 until mid-July.
- No stocking over spring to allow 'Woogenellup' sub clover to seed.
- Re-grazed with cattle in January to open sward. Then lightly disced to cut up stalky re-growth rape.
- On February 1st 2013 'Porto' cocksfoot 5 kg/ha, 'Ruanui' ryegrass 10 kg/ha, 'Antas' sub 5 kg/ha, 'Monti' sub 5 kg/ha, 'Huia' white clover 3 kg/ha plus plantain at 1.5 kg/ha was flown on.
- Grazed by 500 ewe lambs over mating from May 1st through to June 6th.
- Set-stocked with 100 twin bearing ewes on July 29th.

- Tailed plus added 250 single bearing ewes on September 23rd until October 6th; then shut-up.

Fencing:

- No immediate plan to subdivide hill,
- Very important to have some larger blocks from a management perspective
- Currently have 176 paddocks & blocks.
- Cattle policy important part of the grazing policy as are mob sizes,
- Lambs in mobs of 1500 - 2000 and ewes in 2500 - 4500.

Basics for Dryland Lamb Producers

Principles for fast lamb production

- Ewes bearing twins and triplets need top quality feed in late pregnancy and throughout lactation
- Legume rich pastures or lucerne will give faster twin lamb live weight gain (LWG) than grass dominant pastures
- Sheep will select a diet of about 70% legume (lucerne or clover) and 30% grass when given a free choice
- Therefore, twin lamb LWG pre-weaning is directly proportional to the % clover dry matter (DM) on offer
- With over 50% clover on offer LWG of twins pre-weaning should be well over 300 g/hd/day
- This assumes bite size (= DM intake) is not limited by forcing ewes to eat a lot of lucerne stem or grazing pasture mass down to below 1200 kg/DM/ha.

How to get legume rich pastures

- Choose an appropriate legume for your environment; lucerne if you can grow it, annual clovers such as sub if you have regular dry summers; perennial clovers such as white, red or Caucasian in summer moist or irrigated.
- Sow pastures with high legume rates (e.g. 10 kg/ha sub clover) and low grass rates (e.g. 2 kg/ha cocksfoot or 5 kg/ha ryegrass)
- Young pastures will be legume dominant, ideal for twins; as nitrogen (N) builds up with N fixation by legumes, grasses will become more vigorous and competitive
- Therefore appropriate management is vital to maintain legume content (e.g. manage sub clover for high seed production if sub drops below 20% on offer in early October)



Plate 1 East side of Alice's Block, 2/10/2013. Typical hill country pasture in foreground.

- Avoid the use of N fertilisers if legume dominance is desired as N fed grass is very competitive for light, water, phosphorus (P), sulphur (S), potassium (K) and some trace elements.
- Pasture legumes fix N in proportion to their DM production; for every 1 t/ha of legume DM grown about 25 kg N/ha will be fixed
- So if a sub clover/ryegrass pasture produces 8 t DM/ha/year with 3 t/ha/yr clover and 5 t/ha of grass we can assume at least 75 kg N/ha was fixed
- Maintain soil pH at >5.6 for most clovers and >6.0 for lucerne, 'Antas' sub clover and strawberry clover



Plate 2 Clover canopy at 25 cm high in Alice's Block on 20/5/2013.



Plate 3 Contrast of sown clover dominant pasture in Alice's Block with unimproved in background. 20 May 2013.

Nitrogen supply and water use efficiency by dryland pastures

- Nitrogen drives grass productivity once other nutrients such as P, S, and K have been brought up to moderate levels and soil pH has been amended with lime
- Soil N supply can be gauged by the colour of grass dominant pastures (yellow-green through to dark green) and the prominence of urine patches
- Yellow-green N deficient grass in October, growing at 40 kg DM/ha/d uses water at the same rate (say 4 mm/d) as dark green urine patch grass growing at more than 100 kg DM/ha/day
- Therefore, N deficient grass in spring has a water use efficiency of 10 kg DM/mm water used BUT the grass in the dark green urine patch has an efficiency of over 25 kg DM/mm water used
- Healthy legumes can fix all their own N from the nitrogen gas in the air through the root nodules which contain rhizobium bacteria
- Legumes therefore have high water use efficiency of over 25 kg DM/mm water used, similar to grass in a urine patch
- Legume dominant pastures in summer dry areas will therefore use the limited soil water more efficiently than N deficient grass dominant dryland pastures

- Dryland pastoral farms, typically with N deficient grass dominant pastures and less than 10% clover use scarce water inefficiently and must do better by increasing total legume production or the farm could go broke..

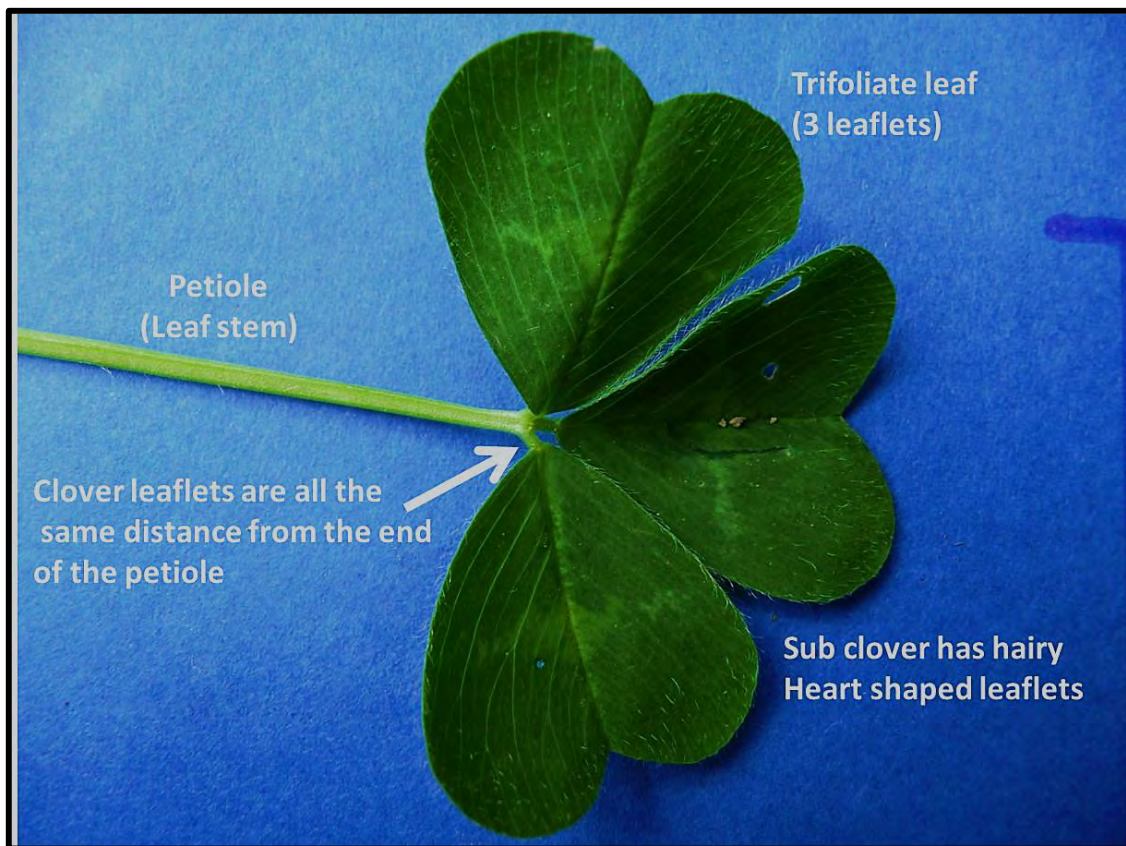


Plate 4 A 'Monti' sub clover leaf.



**Plate 5 Sub clover establishment from February broadcasting of seed on hill
(no herbicide or cultivation) on Alice's west face. Photo: 2/10/2013.**

Sub Clover Cultivars

There are large differences between sub clover cultivars so it is important to select the best for each site. Mixtures of two contrasting sub clover cultivars are often recommended so that variations in soil depth, winter wetness and hill aspect can be covered. For example a wet tolerant cultivar such as 'Monti' may be sown with 'Woogenellup' on a hill block with wet gullies.

It is important to be able to identify the cultivars which thrive on different sites.

Features which differ between cultivars are:-

- hairiness of runners (stems), petioles (leaf stems), and peduncles (flower stems);
- leaf markings,
- stipule colour(structure at base of petiole),
- flower colour,
- flowering time,
- seed colour.

Each subterranean clover cultivar belongs to one of three sub species, either

- *Trifolium subterraneum* sub spp *subterraneum* or
- *T. subterraneum* sub spp *yanninicum* or
- *T.subterraneum* sub spp *brachycalycinum*.

Most cultivars belong to the subspecies *subterraneum* (e.g. 'Woogenellup', 'Denmark', 'Mount Barker'). These have black seeds and are adapted to well drained soils with pH (H₂O) down to about 5.4.

Identifying Sub Cultivars

‘Monti’ has hairless runners and petioles; a green stipule with red stripes; leaves may have some brown flecks in late autumn/winter; green calyx hairs extend to the full length of the flower petals; seeds are cream/white. ‘Monti’ is a newly released cultivar which flowers earlier than ‘Woogenellup’ so is adapted to lower rainfall areas with its shorter active growth season. This cultivar has a hardseededness rating of 1. ‘Monti’ belongs to the *yanninicum* sub-species of sub clover and cultivars derived from this sub species can tolerate periodic wet soil conditions better than other sub species.

‘Antas’ sub clover runners are weakly hairy or hairless; green stipules at petiole bases have red stripes. This cultivar has a strong leaf mark, very large leaves and long petioles. Its’ seeds are black. Currently, there is limited experience with highly productive ‘Antas’ in NZ. It has a similar later flowering time to ‘Denmark’.’Antas’ belongs to the *brachycalycinum* sub-species of sub clover and is best adapted to well limed soils and soils with a natural pH (H₂O) of >5.8. hardseedness rating is 2.

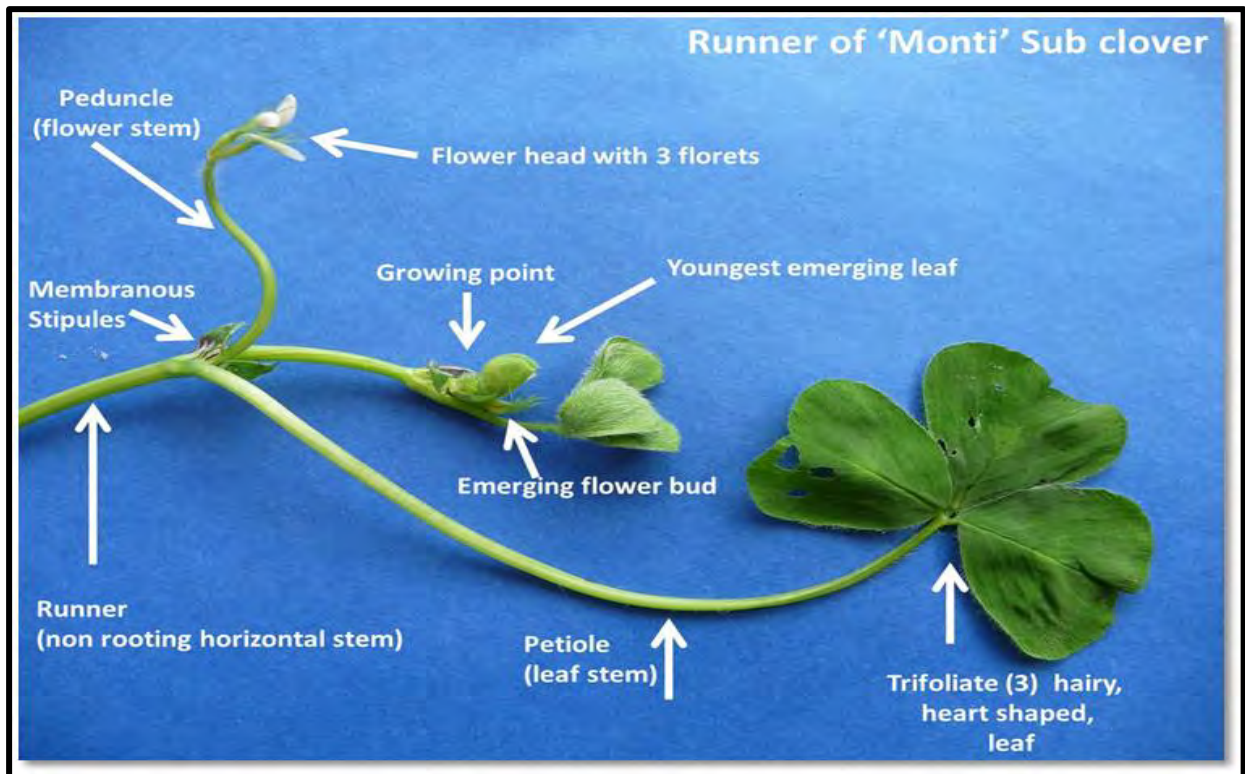


Plate 6 A 'Monti' sub clover runner.

'Woogenellup' which has hairless runners but may be have hairy petioles and peduncles; stipule has red stripes; light leaf markings, large light green leaves with long petioles. It is very productive but has a reputation in Australia for false strikes because of its very low hardseededness rating of <1.

'Denmark' has hairless runners, petioles and peduncles; light leaf mark, small leaves. It persists well under intensive grazing and has a hardseededness rating of 1. This cultivar is later flowering than mid/late season flowering 'Woogenellup' and mid-season flowering cultivar 'Monti'.



Plate 7 A 'mixture of sub clover cultivars on the uncultivated west face of Alice's Block with danthonia and striated clover.

'Mt Barker' has very hairy runners and red stipules, brown flecks on leaves in winter and a red band on its flower tubes. 'Mt Barker' is very soft seeded and susceptible to false breaks with a hardseededness rating of <1. It has a similar late flowering time to 'Denmark'.

'Mt Barker' is the oldest sub cultivar in NZ, it will be surviving on many hill farms where it was oversown 50 to 60 years ago. By adopting grazing management aimed at encouraging sub clover, it may become more productive in some paddocks where its seed is present in sufficient quantities in the

seedbank. However, the introduction of new, improved cultivars should lift dryland pasture productivity considerably.



Plate 8 A close up of 'Mt Barker' Sub clover with a 10cm x 10 cm scale. The brown flecks on the leaves disappear in spring but are characteristic of young 'Mt Barker' plants in late autumn and winter.

Managing sub clover after sowing to rapidly get a high producing, persistent clover dominant pasture

The best way to rapidly build up a sub clover seed bank is through early spelling in the first spring after autumn drilling or broadcasting seed at 10 kg/ha. Newly sown sub clover/grass pasture should be grazed no lower than about 1200 DM/ha through late autumn and winter. It's OK to lamb on it but at a lower stocking rate than normal. The new paddock should be closed to reseed about a week after flowers become obvious. For mid/late flowering cultivars this will be in the first week of October in lower altitude Canterbury. Do not take a last few days grazing to 'clean up the green leaf' before spelling the paddock as that may result in runners being eaten and seed yield greatly reduced. There needs to be 6-8 weeks of soil moisture available to the sub clover plants after closing to get maximum seed set. Check the seed burrs for fat ripe seeds.

During the spring spell from grazing, sub clover runners can grow a further 20 to 30 cm in length. This means that individual plants will have the potential to get to about 60 cm in diameter. These runners can colonize vacant space by pegging down seed burrs. Each burr will contain 3 or 4 large seeds each. Seeds are about ten times the weight of a white clover seed. Each sub clover plant will have about five runners each with six burrs containing mature seeds. So each spelled plant can produce over 100 seeds.

It is suggested that cattle will be best to clean up the standing hay sub clover/mature grass in December/early January. Once the paddock has been grazed hard by cattle keep on top of summer grass growth with sheep. Aim to

create some bare ground during February so that the fluctuating soil surface temperatures will more rapidly soften hard seed to give a good strike of sub clover with the first significant autumn rains. If all goes well the pasture should then provide excellent ewe lactation feed in the second spring season.

On some hill country it may not be necessary to reseed the sub clover if there is sufficient sub present in the old pasture. Grazing management alone, perhaps helped by some judicious chemical topping, may achieve a sward which can regularly produce over 40 % clover in spring. Assess the suitability for this approach by measuring the frequency of sub clover presence in the pasture. Do this by **walking over it, do not ride**. If sub clover is under your boot more often than two thirds of your steps there may be enough present to bring it back to full potential through management only. This will require hard summer grazing, briefly spell the paddock after autumn sub clover germination until seedlings have four or five leaves, control grass competition by keeping pasture mass to under 2 t DM/ha through winter, lamb on paddock but get off it a week after flowers are visible. Spell the paddock for at least 8 weeks and then graze standing hay with cattle. Time the spelling of the pasture to a prediction of when there is 6-8 weeks of soil moisture remaining before the summer dry sets in.



Plate 9 Sub clover runners spreading through the danthonia dominant pasture on an uncultivated west face at Mt Benger (2/10/2013).



Plate 10 Runner damage caused by overgrazing prior to close-up in early October. Flower from this recovery on 22 October 2013 may be too late to form seed burrs.



Practical Lucerne Grazing Management
Professor Derrick Moot and Malcolm Smith

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1. Getting started: (Paddock 1)

One of the most difficult things to understand when grazing lucerne is what stocking rate to use and when to start grazing. At Lincoln University we have been faced with this dilemma over many years and we don't always get it right. This guide summarises our experiences to date;

- Start spring grazing of lucerne when it is about 15-20 cm tall – the first paddock grazed and sprayed in the autumn clean-up round is likely to be the first one ready for grazing in spring.
- Put ewes with lambs at foot onto lucerne as early as your management allows i.e. lamb onto older stands with some fibre available or start drifting stock on when lambs are no more than 2 weeks of age. The younger the lambs are on lucerne the better!
- Stock at 10-14 ewes plus lambs (180%+) per hectare in one mob to commence grazing in the first paddock (Paddock 1) of a six paddock rotation. e.g. if you have 30 hectares of lucerne that is 300-420 ewes and lambs all being put on the first 5 ha when it is 15-20 cm tall in spring

or about 1500 kg DM/ha. (And then you can wonder where all your stock have gone as they come off lambing blocks letting those areas recover).

- The exact number of animals to put on is location and spring dependent and will take a year or two to work out for yourself. For us it is 12-14 ewes plus twins per hectare for 10-12 weeks.
- Paddock 1 needs to be consumed in 3-4 days. There will be little post grazing pasture mass (PGPM) because all of the herbage on offer is leafy rocket fuel (all herbage ME=12+ and protein 26%+).
- Animals grazing lush lucerne are most prone to health issues as guts adjust – but it is really important to start grazing lambs on lucerne as young as possible. Ensure fibre and salt are available. Ewes that have previously been on lucerne are likely to take to it with little adjustment.
- If you find you are losing lambs or ewes (usually the best ones) check your vaccination programme is up to date and consider 10 in 1 vaccine. Fast growing animals are more prone to clostridia disease from rapid bacterial growth in the rumen that causes sudden death. This is often mis-reported as bloat because they blow quickly after death.



Plate 11 Hoggets grazing lucerne in spring 2007 at the MaxClover Grazing Experiment at Lincoln University, Canterbury, New Zealand

2. First rotation (Paddocks 2-5).

Having started ewes and lambs on lucerne the next issue is when to move them onto Paddocks 2-6. This is a combination of observation and experience and not always easy to get right the first year you start grazing. Some tips;

- The lucerne continues to grow in front of you as you are grazing a paddock- so you are building a wedge or bank of feed ahead of you – managing this is the key to maintaining lucerne quality to maximize animal growth in this vital spring period.
- As you open the gate to Paddock 2 the ewes will usually walk (not run) because they know they are getting good quality feed and won't have to

hunt for the tasty legume amongst grass. But make sure there is fibre and salt on offer.

- Paddock 2 will be taller and contain more dry matter than when you started in Paddock 1.
- Figure 1 is an example of one years grazing management from our six paddock rotation for the 'MaxClover' experiment at Lincoln. Grazing of hoggets started in Paddock 1 in early September 2005. The dry matter increased from 1500 kg DM/ha to 2200 kg DM/ha before entry to Paddock 2.
- Paddock 3 was about 2600 kg DM/ha upon entry. The PGPM is shown as less than 500 kg DM/ha for these first three paddocks.
- Paddocks 4-6 were all around 3300 kg DM/ha upon entry and the PGPMs were closer to 1000 kg DM/ha.
- To get an idea of how much to leave behind after grazing test the herbage as animals go in. Either squeeze or bend a stem until you can find where the woody part begins - this is low quality (ME=8, Protein = 12%) that is maintenance feed at best so not recommended for fast growing stock!

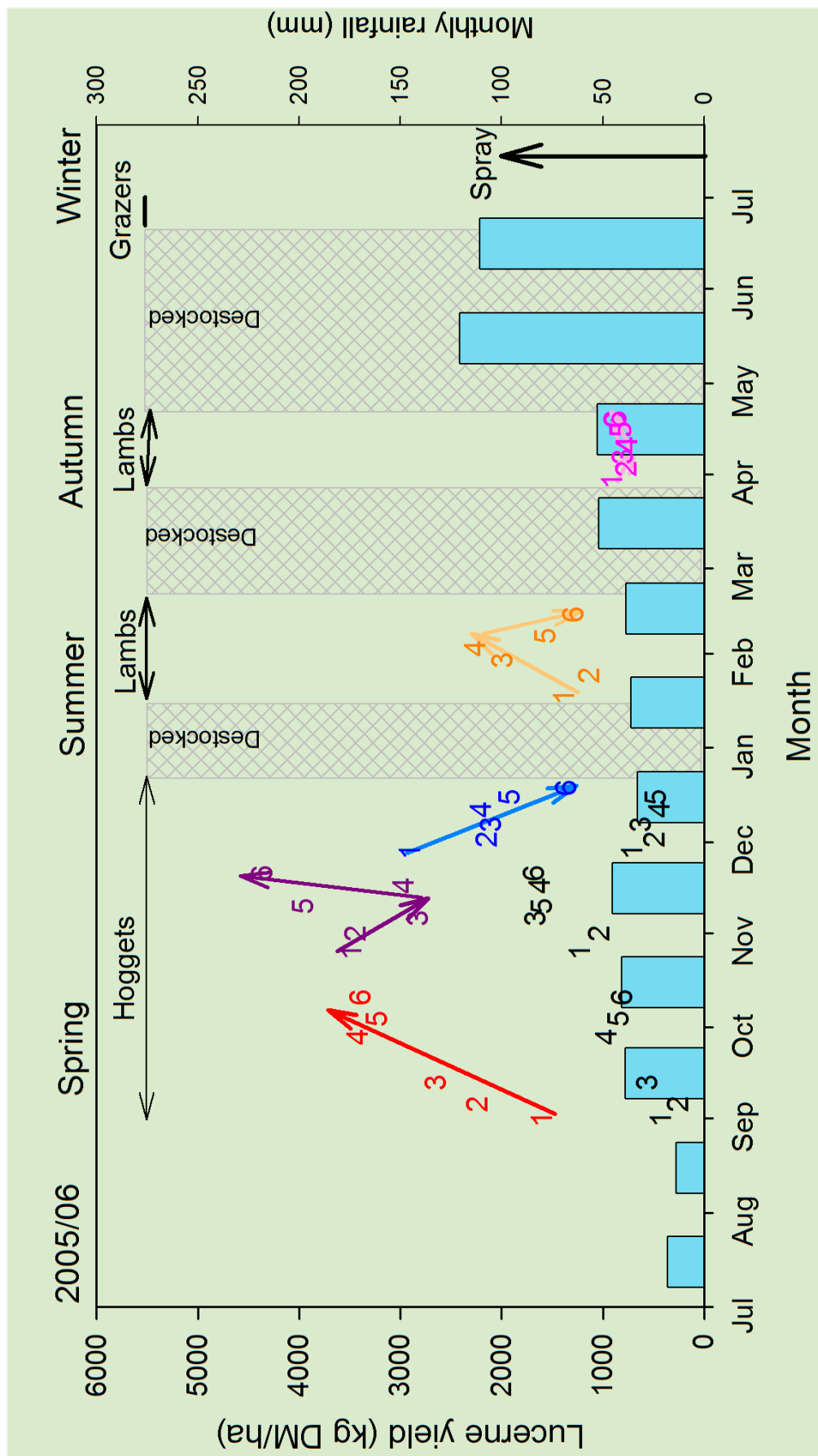


Figure 1 Yields in paddocks 1-6 as stock begin grazing the MaxClover experiment at Lincoln University in 2005. Values at the bottom of the 1st, 2nd, and 3rd grazing cycles are post grazing pasture (stem) mass (PGPM) when stock were moved to a new paddock.

3. When to go back to Paddock 1?

When you enter Paddock 4 you should look to see if recovery in Paddock 1 is 10-15 cm tall. How this grows over the next two weeks dictates paddock rotation. If regrowth is rapid you may not want to graze Paddock 6 but drop it out of the rotation for hay or silage or increase the mob size to cope. As a guide, the time of return to Paddock 1 after leaving should be between 30 and 42 days (or you will have grown too much stem).

- Ideally Paddock 1 will have about 3300 kg DM/ha upon entry the second time (Figure 1 shows this was similar to Rotation 1 in Paddocks 4, 5 and 6). In our example, Paddocks 1 – 5 were all grazed at reasonable yields for the second rotation but Paddock 6 was starting to become too heavy/stemmy.
- The PGPM for Paddocks 1-6 shows about 2000 kg DM/ha was grazed or about 70% utilization. Herbage analyses indicate this level of DM utilization will see over 80% of the total ME and CP consumed. There is no point in making growing animals eat the lower quality residual.
- The amount of regrowth in the second cycle will depend on in season rainfall. In our 2005/06 example the monthly average rainfall was around the long term mean of 50 mm. This was sufficient to keep lucerne growing in Paddock 1 for a third rotation with another 3000 kg DM upon entry.
- For Paddocks 2-6 this level of in season rainfall is inadequate and meant growth was reduced. Paddock 6 only 1200 kg DM/ha was available for grazing in late December.

- Conveniently our experimental plots were destocked from late December until mid January – beach time for dryland farmers!
- The average summer rainfall until May was inadequate for much regrowth so only a single summer rotation was possible with lambs before a clean-up graze in April followed by destocking and a winter weed spray in mid July.

4. Annual Production Summary

- Figure 1 shows the timing of production from each paddock varied across the season. However, when the total dry matter yields were accumulated each grew 10-11 t DM/ha.
- For spring, Paddock 1 produced 7.8 t DM/ha (1.5+ 3.4+2.9) across the first three rotations compared with 8.8 t DM/ha (3.4+4.2+1.2) for Paddock 6. If we converted these to herbage quality the difference would be smaller with the higher yield from Paddock 6 resulting from more stem production, particularly in the second rotation.
- The annual rainfall for this season was 600 mm which is similar to our long term average. Of note, the 230 mm of rainfall in May and June did not result in any significant autumn lucerne growth. At this time the moisture would be accumulated in the soil for use the following spring.
- Ideally the stock on these experimental plots would have been ewes and lambs. However, the small size meant hoggets and weaned lambs are more appropriate.

5. Estimating Dry Matter Yields

One of the key questions when determining stocking rate is assessing current herbage yields. Over the life of the 'MaxClover' experiment and other Lincoln University experiments we have examined the relationship between yield and height and can show a distinct seasonal relationship.

- Figure 2 shows that in spring the lucerne yield can be estimated by multiplying the height (cm) by 90 to get an estimate of yield (kg DM/ha). For example, when a paddock is ready for grazing at about 35 cm height it contains about 3200 kg DM/ha.
- Figure 2 also shows that for summer and autumn the relationship is lower with the multiplier being 60. Thus, that same 35 cm height equates to 2100 kg DM/ha.
- Figure 3 gives a picture of the multiplier on a calendar basis. The overall pattern of a higher multiplier in spring than summer held for stands of many different ages. At Lincoln the highest multiplier of 100 is appropriate in the main growth period of September and October but it then declines to be about 60 from December on.

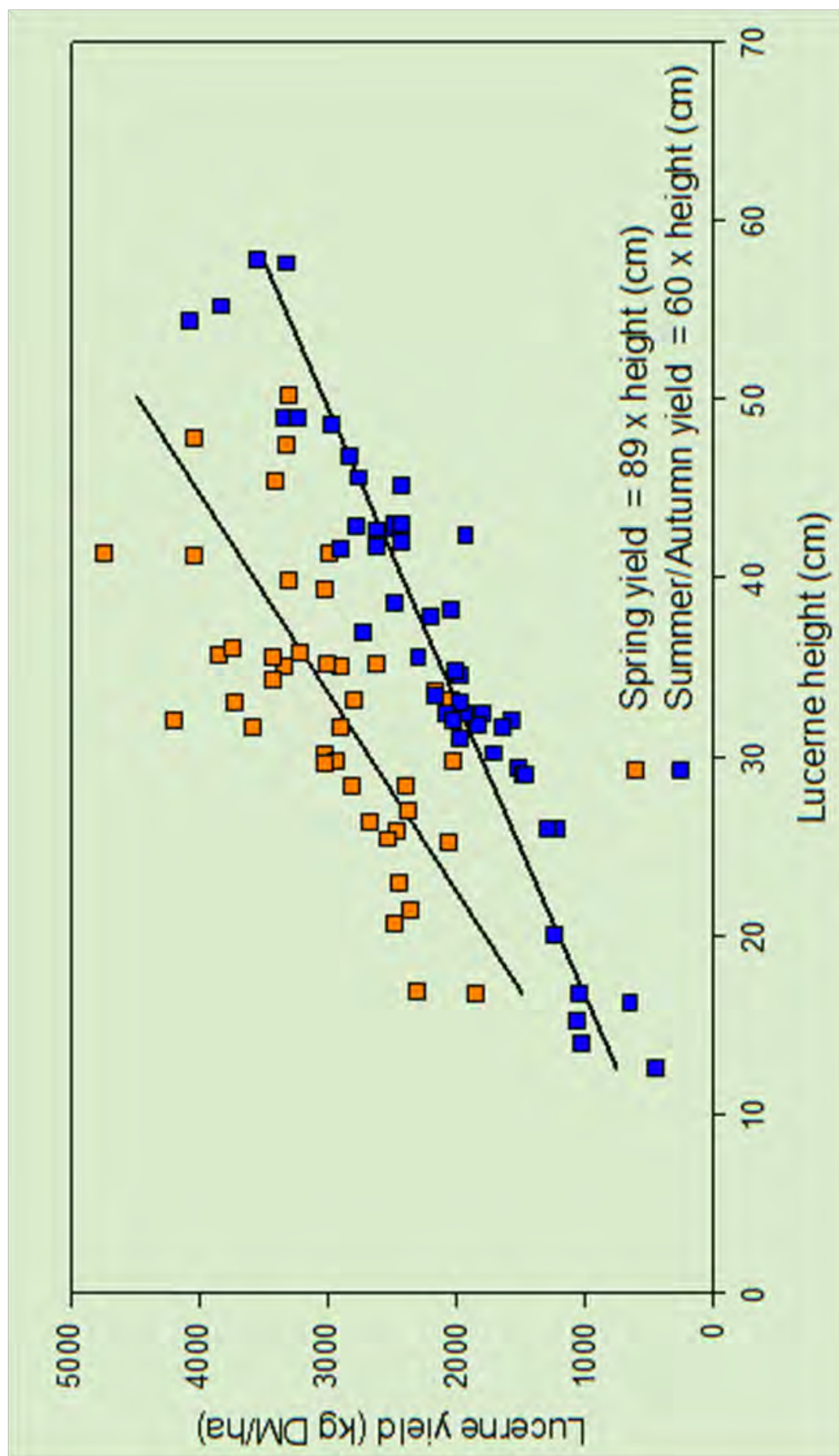


Figure 2 Lucerne dry matter yield estimated from height measurements in Spring (orange squares) and Summer/Autumn (blue squares) Changes in the multiplier used to predict dry matter from lucerne height over a year.

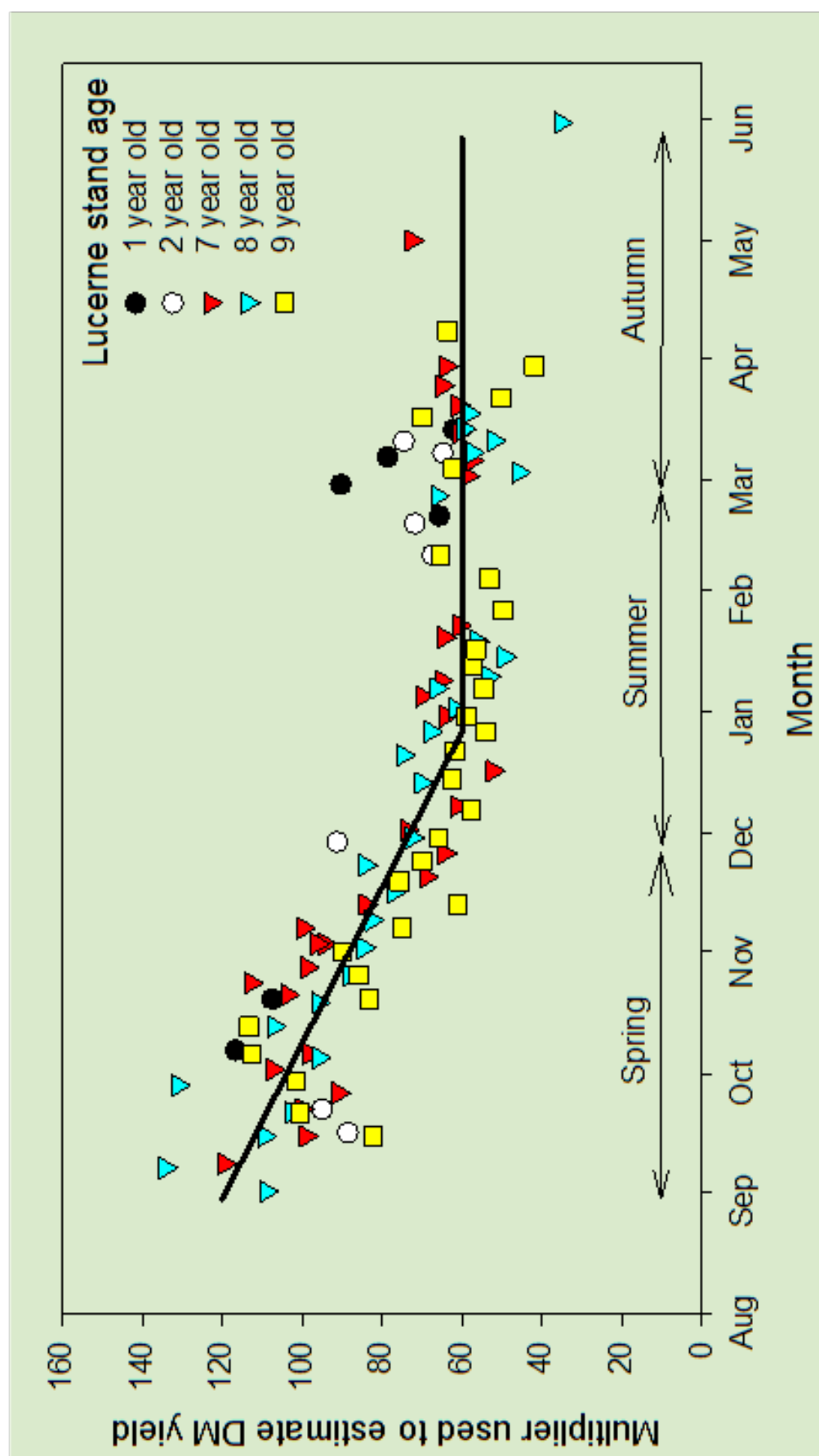


Figure 3 Changes in the multiplier used to predict dry matter from lucerne height over a year.

NOTES



'Antas' sub clover leaf. Alice's Block, Mt Bengier on 20/5/2013