

Spotlight on legumes



Mt Benger Field Day
2nd November 2021

Booklet produced by the
Dryland Pastures Research Group



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Mt Benger Field Day

2nd November 2021

Programme

Time	Activity
11.00 am	Meet at the Woolshed
11.15 am	Welcome and Introduction to Mt Benger (Andrew Johnston & Stuart Fraser)
11.30 am	Drive up to Stop 1 (Kowhai Block) (Dick Lucas & Stuart Fraser)
Noon	Arrive Stop 2 (Alice's Block improved pasture)
12.15 pm	Alice's Block revisited - success of pasture improvement methods (Dick Lucas & Stuart Fraser)
12.30 pm	Soils, fertiliser and molybdenum (Jeff Morton)
12.45 pm	Arrive Stop 3 (Dip Block). Walk over sunny face pasture
1.15 pm	Arrive Stop 4 for lunch – supplied courtesy of Luisetti Seeds
1.45 pm	Current use and future development of lucerne on Mt Benger (Stuart Fraser, Derrick Moot).
2.15 pm	Sheep performance (Peter Anderson)
3.00 pm	General discussion

Cover photo: Clover canopy at 25 cm high in Alice's Block (20 May 2013).

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Introduction to Mt Benger

Basic stats

Area 2810 ha consisting of 2450 ha owned and 360 ha leased

430 ha river flats and terraces (15%) (350 ha irrigated)

800 ha easy down land (28%),

57% steep hill

130 ha established lucerne plus 50 ha more to be sown in 2021

80 ha 'Pacer' leafy turnip summer brassica – lamb fattening

Improvement

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

Area currently improved (ha)

1345 ha pasture

Average area to be developed / year over next 5 years

500-600 ha into improved grass/sub clover pasture – about 100 ha/year to sub clover.

Stock

Total about 12,000 stock units

Cattle stock units

380 MA cows in calf

72 in calf heifers

140 R2 sale steers

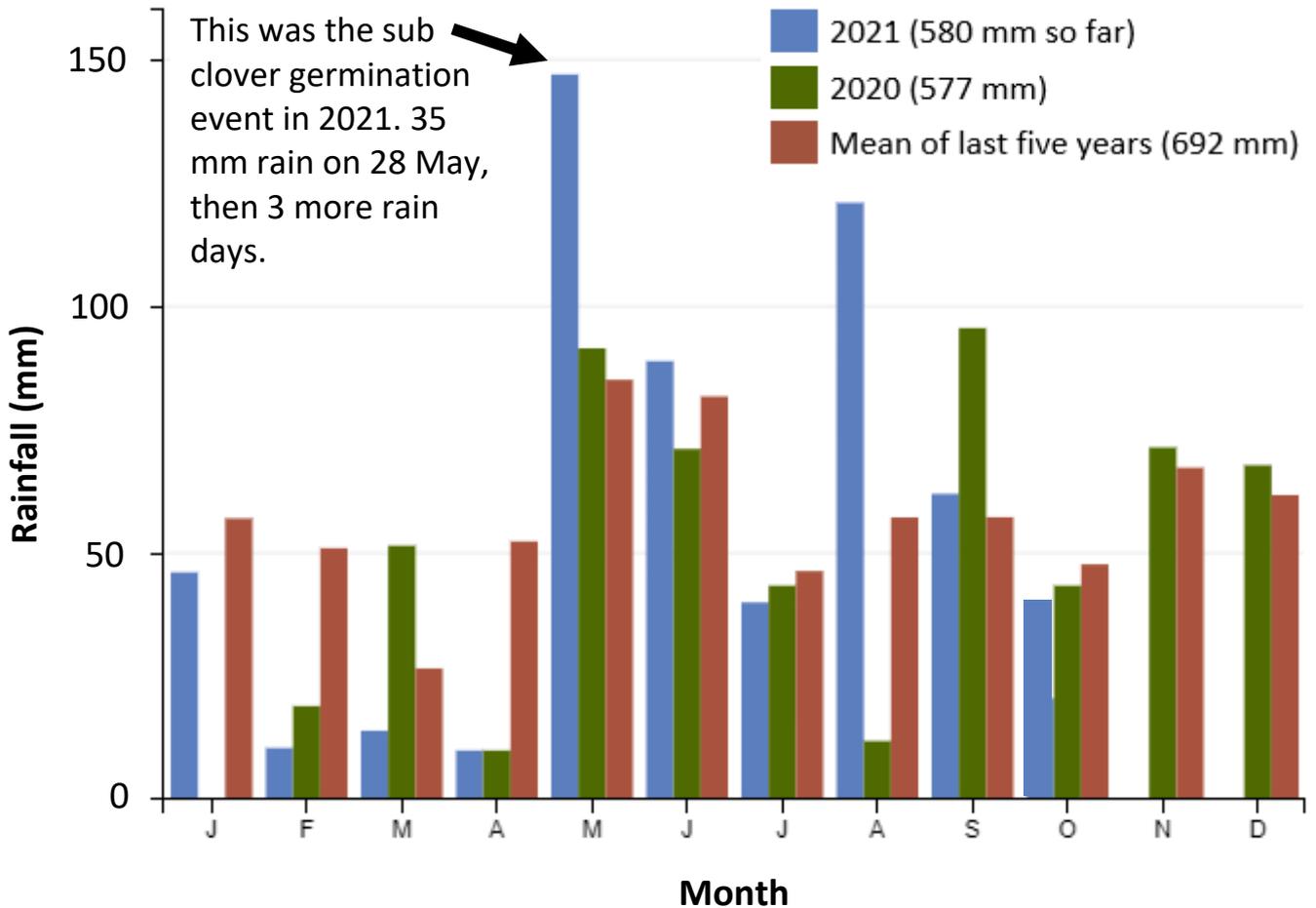
378 R1 steers/heifers

Sheep stock units

5461 in lamb ewes

1689 in lamb hoggets

Rainfall at Mt Benger



Mt Benger rainfall in 2021 to 21st October, 2020 and long term mean monthly rainfall for 5 years from 2016. Note high rainfall in late May 2021 initiated sub clover germination. (Rain gauge is located at the house).



Contrast of sown clover dominant pasture in Alice's Block with unimproved in background (20 May 2013). It was a good autumn in 2013!

Soils and fertiliser

Basic fertiliser policy

Irrigated areas - 350 kg sulphur super 20/ha 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 - 30 kg/ha brimstone 90 sulphur prill every second year.

In general fertility levels are:

Irrigated areas: Olsen P 25+

Cultivated Downs: Olsen P 25-100+

Hill: Olsen P 10-20

- Sulphur is the main deficiency but P and Mo responses possible once S deficiency is corrected.
- Soil pH is down to 5.3 (H₂O) on some hill areas even though this is limestone country

Molybdenum

- Jeff Morton

Some soils especially those in the lower rainfall, rolling downs and hills lack molybdenum (Mo) for legumes to fix nitrogen.

Lime can be used to increase soil Mo supply but pH has to be increased to near 6.0, which is uneconomic in hill country.

The standard method of detecting a lack of Mo is to sample clover and send it to a lab to measure Mo and N content.

But in spring, which is when clover is more likely to grow with dry summers, it can be difficult to sample enough herbage when animals are normally set-stocked and on top of the feed.

Therefore we are testing the use of test strips where Mo is applied to a small area and any increase in clover vigour compared with outside the strip observed.

If it can be shown to be a practical method we would envisage a farmer getting liquid Mo in a small container, mixing it with water and spraying it on to a GPS'd area with a watering can.

What you will see at the field day is one of 21 test sites.

Alice's Block

- In 2011 was part of a larger 236 ha block, but lent itself for 25 ha 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 Danthonia and browntop. Small amounts of suckling and striated clovers.
- Never had fertiliser applied and had little grazing value.
- Subdividing made no difference to main block's carrying capacity, which was 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 summer 2011/12.
- In 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 1st February 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 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.

During the last eight years:

- the block has been grazed following tailing, rotationally grazed throughout spring and shut up in a normal autumn to allow it to establish for spring.
- being in the better hill class it receives biannual fertiliser additions of 200 kg/ha sulphur super 30.

Fencing

Plans to subdivide to allow better grazing management and pressure to allow smaller blocks to be improved with sub clover without reducing ewe + lamb rotation areas too much.



Alices Block, Mt Benger, 2 October 2013. Cultivated area in distance. Foreground and shrub area:– seed + fertiliser only.

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).

- 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 25 to 30 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



East side of Alice's Block (dark green pasture). Typical hill country pasture in foreground in 110 ha Kowhai Block (2 October 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
- Pure stands of legumes (e.g. red clover, lucerne) will produce more in spring than the N deficient grass which is typical of most dryland pastures.
- 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.



Sub clover establishment from February broadcasting of seed on hill (no herbicide or cultivation) on Alice's west face (2 October 2013). Note that sub clover has now spread over the yellow-green grass areas (October 2021) and into matagouri shrub areas.



Alice's Block September 2017 six years after Woogenellup oversown. Sub clover pasture on cultivated area in foreground and middle distance on right and sub clover thriving on uncultivated steeper slopes with matagouri and 'native' grasses on the left.



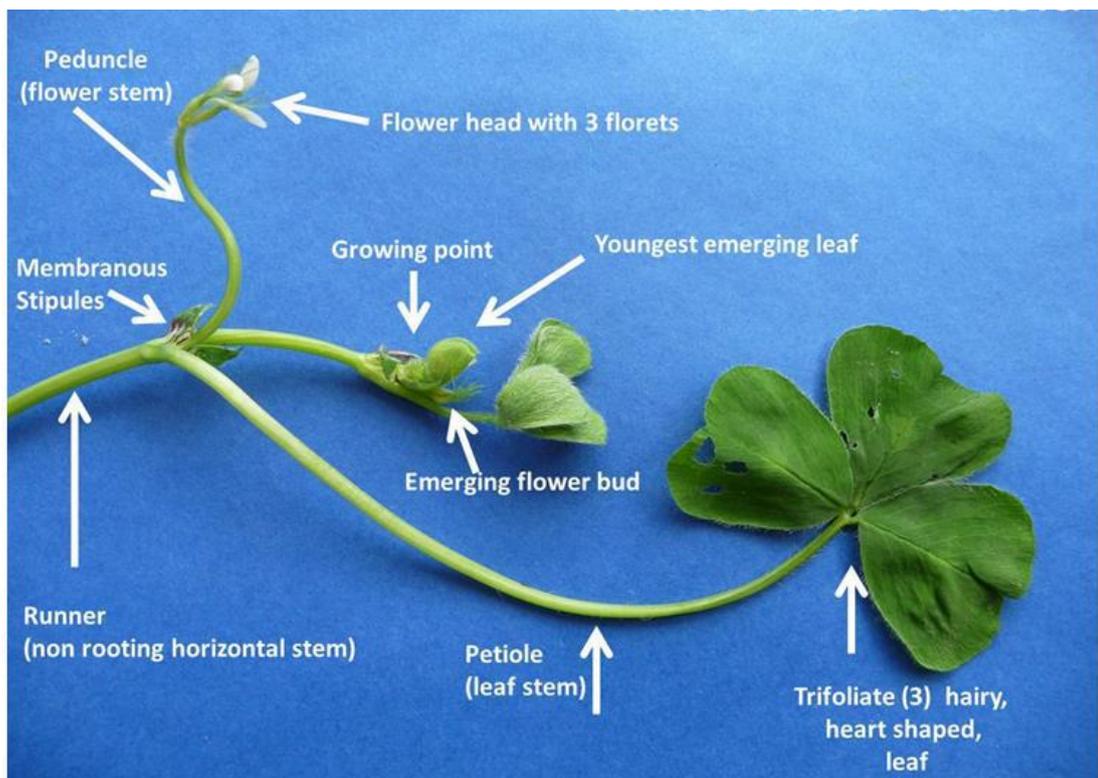
Alice's Block 28 September 2021, 10 years after sub clover sown – dark green in the distance. Note light brown grass 'tag' on south faces, could not be controlled during summer and autumn.

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 the late flowering cultivar 'Denmark' may be sown with mid-season flowering 'Woogenellup' on a hill block with a range of aspects.

It is useful 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.



A sub clover runner showing plant parts.

'Woogenellup' which has hairless runners but may 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. However it is the dominant cultivar on 'Tempello' where sub clover supports an efficient lamb production system.

'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'.

'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 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 60 or more 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.



A close up of 'Mt Barker' sub clover with a 10 cm 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 resident sub clover and introducing new sub clover

Dick Lucas and Derrick Moot

Aim: rapidly achieve a high producing and persistent sub clover dominant pasture

Is resident sub clover present?

- ♣ The best time to assess sub clover presence is by walking across your paddocks in September/October.
- ♣ If you step on a sub clover patch every second step, about every 2 metres, then that may be acceptable for improvement through grazing without reseeding.
- ♣ Given the opportunity, the sub clover runners will extend the patch up to 60 cm in diameter in a season with late spring spelling.

There are a number of ways to manage and improve the sub clover content of existing pastures. Calendars for the following are described:

1. Acceptable resident sub clover - manage to increase sub content
2. Low or no resident sub clover - plan to oversow the following autumn
3. Drilling sub clover into existing pasture



Sub clover flowers are small - about 10 mm long and 3-4 mm wide. Mt Barker (left), Narrikup and Rosabook have red-banded flowers which helps with cultivar identification in the spring. Antas (right), Coolamon, Denmark, Karridale, Tallarook and Woogenellup flowers have no bands. Photos: David Hollander.

1. Acceptable resident sub clover - manage to increase sub content

Use the following timeline to manage grazing to increase sub clover content:

When	Task/Comment
September	Paddock walk to identify sub clover populations Greater than 1 sub clover patch every 2 m Normal stocking rates, keep grazing above 1200 kg DM/ha
Mid-September onwards	Identify when sub clover flowers are obvious This will depend on the sub clover cultivar NB: sub clover flowers are small (see photo next page). Spell the paddock for four to five weeks and longer if possible (e.g. up to 8 weeks)
After spelling	Graze with cattle after spelling This will limit amount of grass seed produced. Sheep target sub clover runners and eat the seeds.
Summer grazing	Graze as required depending on rainfall Reduce pasture mass to 700 kg DM/ha by the end of February
End of February until significant autumn rain (over 20 mm)	Remove any tag Keep grazing pasture down to 700 kg DM/ha. Opening up the pasture will aid sub clover seed germination.
Autumn	Monitor rainfall and watch for sub clover germination Sub clover germination is triggered by a rainfall > 20 mm. Spell to allow sub clover establishment Spell the paddock to allow sub clover seedlings to reach 3-4 trifoliate leaf stage. Then graze, preferably with cattle, to control grass competition.
Winter	Graze as required Keep pasture above 1200 kg DM/ha. If possible spell lambing paddocks to build clover rich pasture for lambing. Pasture with >40% clover is great feed for lactating ewes

♣ Manage at least one paddock/block each year in a sub clover friendly manner.



Earlier growth stages of the Mt Barker sub clover cultivar: cotyledons (top left), unifoliate or spade leaf (bottom left), five trifoliate leaves (right). Photos: David Hollander.

- ♣ The ultimate aim of long-term grazing management is to have 80% ground cover of sub clover in the spring pasture. This means there is 40% clover DM on offer.
- ♣ Spelling pastures to ‘rejuvenate’ sub clover populations is not necessary every year but is recommended that each paddock is managed to favour sub clover about once every five years – do paddock walks to monitor sub clover contents from year to year and keep records of clover% per paddock.

2. Low or no resident sub clover – plan to oversow the next autumn

Use the following timeline to improve sub clover content on uncultivable hills by oversowing seed in autumn:

When	Task/Comment
September	<p>Paddock walk to identify sub clover populations</p> <p>Less than 1 sub clover patch every 2 m</p> <p>Plan to oversow with sub clover next autumn:</p> <ul style="list-style-type: none"> ♣ Investigate sub clover cultivar options¹. Ideally soft seeded and late flowering for most areas. ♣ Soil test – check recent results or get soils tested Check pH is > 5.6, Olsen P is 15-19, and Sulphate-S > 8. ♣ Order sub clover seed – need 10 kg/ha
September to January	<p>Graze as normal</p> <p>If some resident sub clover is present aim to keep pasture above 1200 kg DM/ha</p>

¹ Look at sub clover cultivar options in the Dryland Pastures Research (DPR) blog posts. A link to the website is on the inside back cover.

February to mid-March	<p>Remove any tag</p> <p>Chew the pasture down hard to 700 kg DM/ha. Opening up the pasture will aid resident and oversown sub clover seed germination</p>
Mid-March	<p>Oversow with sub clover seed & apply fertiliser if required</p> <p>Monitor rainfall and watch for sub clover germination</p> <p>Sub clover germination is triggered by a rainfall > 20 mm.</p> <p>Spell to allow sub clover establishment</p> <p>Spell the paddock to allow sub clover seedlings to reach 3-4 trifoliolate leaf stage</p>
Winter/spring	<p>Graze lightly in the first year preferably with cattle</p> <p>Keep pasture at about 2000 kg DM/ha to control grass so clover is not shaded</p> <p>Lamb on pasture</p>
Mid-September onwards	<p>Identify when sub clover flowers are obvious – usually early October</p> <p>Spell the paddock for at least six weeks then graze with cattle to get on top of the tall pasture.</p> <p>Ongoing management as previously outlined for acceptable sub clover content</p>

Oversowing costs at Koromiko, North Canterbury

Hugh Dampier-Crossley

The following are the costs to oversow the uncultivable hill country at Koromiko:

Item	Cost per hectare
Fertiliser: Sulphur Super 20 (incl. Transport)	\$90
Sub clover seed (10 kg)	\$125
Helicopter to apply fertiliser and seed	\$25
Total:	\$240

“This is very cheap development considering the cost of the tractor and drill alone to direct drill our cultivatable country is around \$130-\$145/ha, with the cost of spray, helicopter, fertiliser and seed on top of that”.

3. Drilling sub clover into existing pasture

At a Koromiko Field Day in May 2015, at the end of a very dry autumn, it was suggested that the North Canterbury farmers present should consider direct drilling sub clover into bare, dead and dying pastures as soon as possible. The aim being to grab the opportunity to inject some superior sub clover cultivars into depleted pasture where competition from resident grasses was likely to be minimal.

The photo shows the excellent result achieved by Chris Crossley who put the over-drilling suggestion into action on his farm 'Cranford' in Rotherham. The mix of sub clovers including Antas re-established naturally in autumn 2016 and again in 2017.



The dark green patches on these Koromiko hill slopes (N. Canterbury) were established sub clover. A good growing season and careful grazing management have allowed this annual legume to thrive. (Photo taken on 13/10/17 by Sonya Olykan).



Chris Crossley *et al* standing in the strip at 'Cranford', Rotherham. (Photo taken on 13/9/17 by Dick Lucas).

Drilling sub clover into existing pasture (contd.)

Use the following timeline to improve resident sub clover content by drilling sub clover into rolling hill country:

When	Task/Comment
September	Plan to drill selected paddock(s) with sub clover next autumn: <ul style="list-style-type: none">♣ Soil test – check recent results or get soils tested Check that pH is > 5.6, Olsen P is 15-19, and Sulphate-S > 8.♣ Investigate sub clover cultivar options². Ideally soft seeded and late flowering for most areas.♣ Order sub clover seed – need 10 kg/ha
September to January	Graze as normal or Herbicide if green in Oct-Nov Graze or consider herbicide pre-drilling if green
End of February to mid-March	Remove any tag Chew the pasture down hard to 700 kg DM/ha Opening up the pasture will aid sub clover seed germination and establishment
February (if soil is moist) to mid-March	Drill sub clover seed and apply fertiliser and lime if required Monitor rainfall and watch for sub clover germination Sub clover germination is triggered by a rainfall > 20 mm. Spell to allow sub clover establishment Spell the paddock to allow established sub clover plants to reach 3-4 trifoliolate leaf stage
Winter/spring	Graze lightly in the first year Can lamb on the new paddock. Keep pasture above 2000 kg DM/ha and consider using lower stocking rates than normal
Mid-September onwards	Identify when sub clover flowers are obvious – usually early October Spell the paddock for at least six weeks to maximise seed set Ongoing management as previously outlined for acceptable sub clover content
December	After spelling for seed set, graze with cattle

² Look at sub clover cultivar options in the DPR blog posts.

Some take-home messages for clover enthusiasts

1. Regular applications of superphosphate will not magically increase clover content of summer dry pastures without specific grazing management to favour annual clover species.
2. Ensure clovers have optimum nutrient supplies by getting soil and leaf analyses done so the right type and amount of fertiliser is spread.
3. A well fertilised sub clover paddock will produce over 500 kg/ha seed if it is spelled for about six to eight weeks after sub clover has been flowering for two weeks.
4. Twin lambs will grow at over 300 g/head/day if 40% of pasture dry matter on offer in Sept/Oct is clover.
5. Note that if you can see clover foliage covering about 80% of the visible leaf canopy it probably amounts to only 40 % of the actual dry matter on offer.
6. Spring is the money making time, exploit the lactation potential of ewes and cows by optimal feeding with high legume pastures.
7. Aim to manage for increased clover on **at least** 10% of permanent pasture each year. Record paddock clover contents each spring to guide decisions on which paddocks need improvement.
8. It is difficult to optimally manage more than one clover species in a pasture. It may therefore be best in higher rainfall areas to manage for white clover on south faces and sub clover on sunny faces.
9. Allow annual clovers to fulfil their growth potential by rotationally grazing after a lamb tailing.
10. Select sub clover cultivars with flowering times to match the time when the soil usually dries out and pasture ceases to grow.
11. Annual legumes are more productive in early spring than perennials.

**Future proof your dryland farm against climate warming
with annual clovers.**

Lucerne

Mt Benger: Pylon & Two Haysheds lucerne paddocks

Pylon – old lucerne (9 ha)

Pylon was previously in perennial RG. It was 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. When lambing is finished, they are mobbed up and rotationally grazed until weaning at approx. 100 days when hoggets, (now 2 ths) are removed. Killable lambs are sold and the remainder continue to rotationally graze until they reach killable weights.

Problems with nodding thistle mainly. No aphid impact in nearly 6 years. Aim to complete winter spray programme by 1 July. Mostly sown 'Wairau' cultivar.

All lucerne is winter sprayed with some paddocks summer sprayed with Hexazinone for thistles.

The Pylon paddock will be taken out next due to weeds and plant population reducing.

Two Haysheds – new lucerne (15 ha)

Two Haysheds was previously an old lucerne stand, sprayed due to weeds (horehound and thistles), drilled in 'Pacer' leafy turnip for summer, drilled in 'Upright' ryegrass for winter and then redrilled with 'Raptor' lucerne in January 2021.

How the lucerne and Leafy turnip is used for summer lambs

The 28-34 kg lambs are weaned on to leafy turnip and the 28 kg below on to lucerne. At monthly weighs anything in the 28 kg and below mob that weighs over 28 kg will move on to leafy turnip. As the season goes on the weight bracket may change but tend to find fewer deaths to red gut this way. All lambs have adhoc access to mineral salt.

Fodder beet is used to winter R2 cattle to be sold in the spring.

Practical Lucerne Grazing Management

Professor Derrick Moot and Malcolm Smith

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 with 600 mm rainfall, 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. Alternatively, the first paddock could be an older, weedy stand that will be replaced next.
- 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.
- 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 with 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 will have an ME of 12+ and protein of 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 misreported as bloat because they blow quickly after death.



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

1. 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 year's 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.

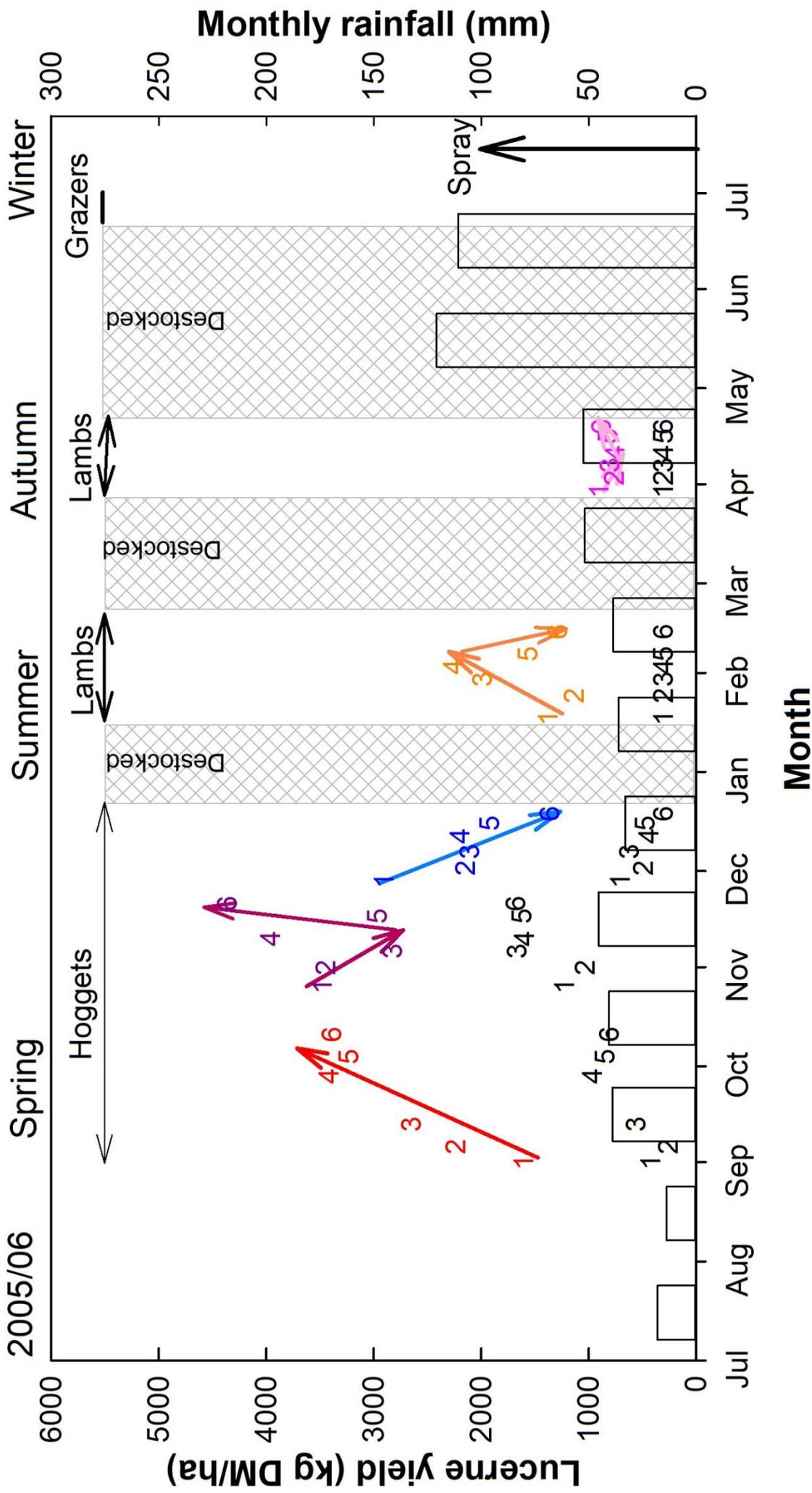


Figure 1: Yields in paddocks 1-6 (red) as stock begin grazing the MaxClover experiment at Lincoln University in 2005. Black values at the bottom of the 1st, 2nd, and 3rd grazing cycles are post grazing pasture (stem) mass (PGPM) when stock were moved to a new paddock. Second rotation lucerne mass at start of grazing (purple) and third rotation (blue). Late summer grazing (orange) and late autumn pregraze (pink). Columns – monthly rainfalls.

- 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%) and is maintenance feed at best, so not recommended for fast growing stock!

2. 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.

3. 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 plot size meant hoggets and weaned lambs are more appropriate.
- 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.



Bulls with ewes and lambs on lucerne at Bonaveree October 2016. Mown strips to provide wilted lucerne.

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.



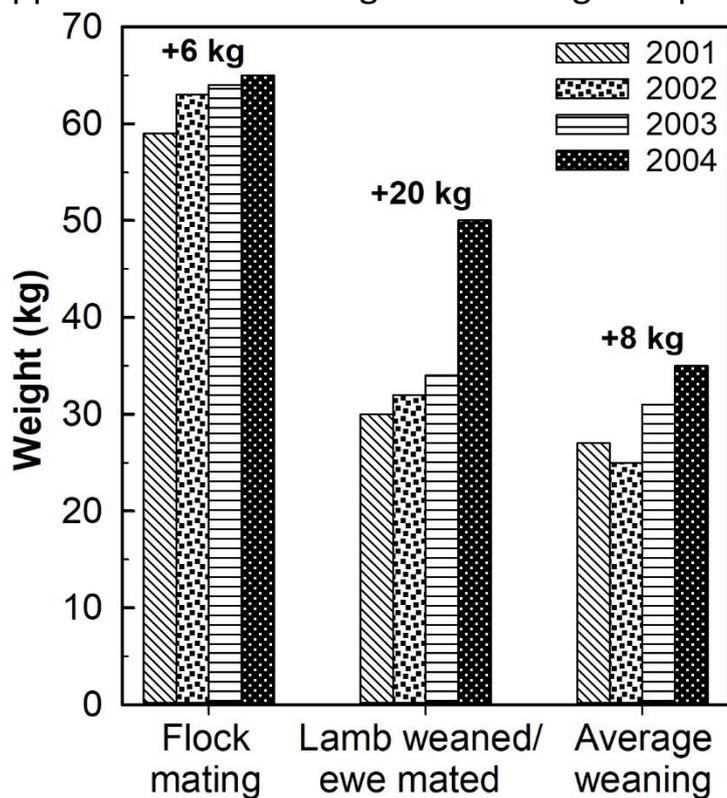
Ewe with triplets on lucerne at Ashley Dene (March 2015)

How legume understanding and management improves flock performance

Peter Anderson

Tempello

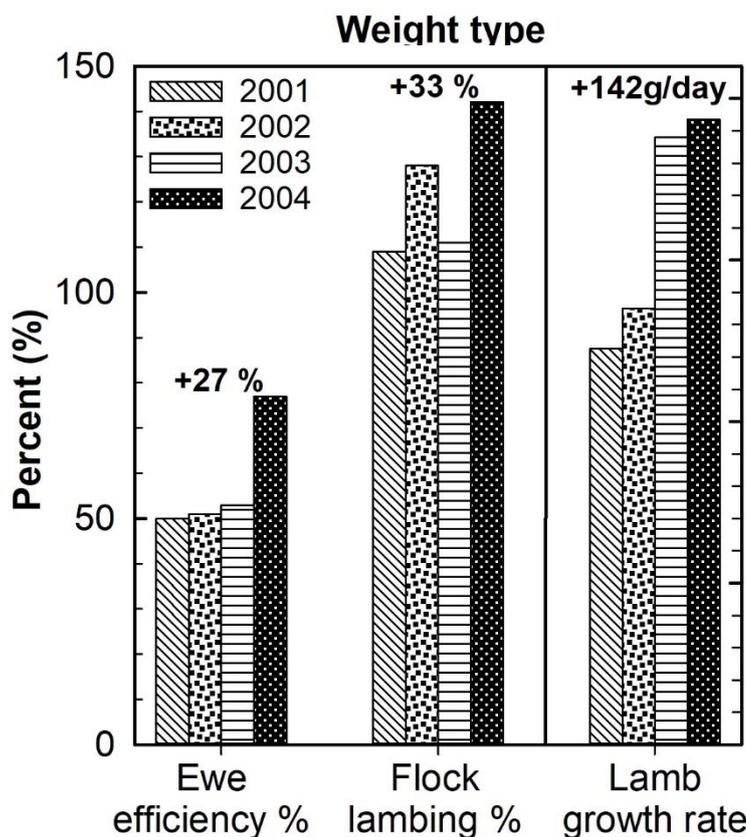
Ewe Flock Performance on Tempello Station over 4 years when the benefits of understanding and managing sub-clover on Marlborough hill country was first appreciated and management changes implemented.



Flock mating = Average weight of all ewes (MA + 2T) at mating time.

Lamb weaned/ewe mated = Average lamb weaning weight x lambing %.

Average weaning = average weight of all weaned lambs



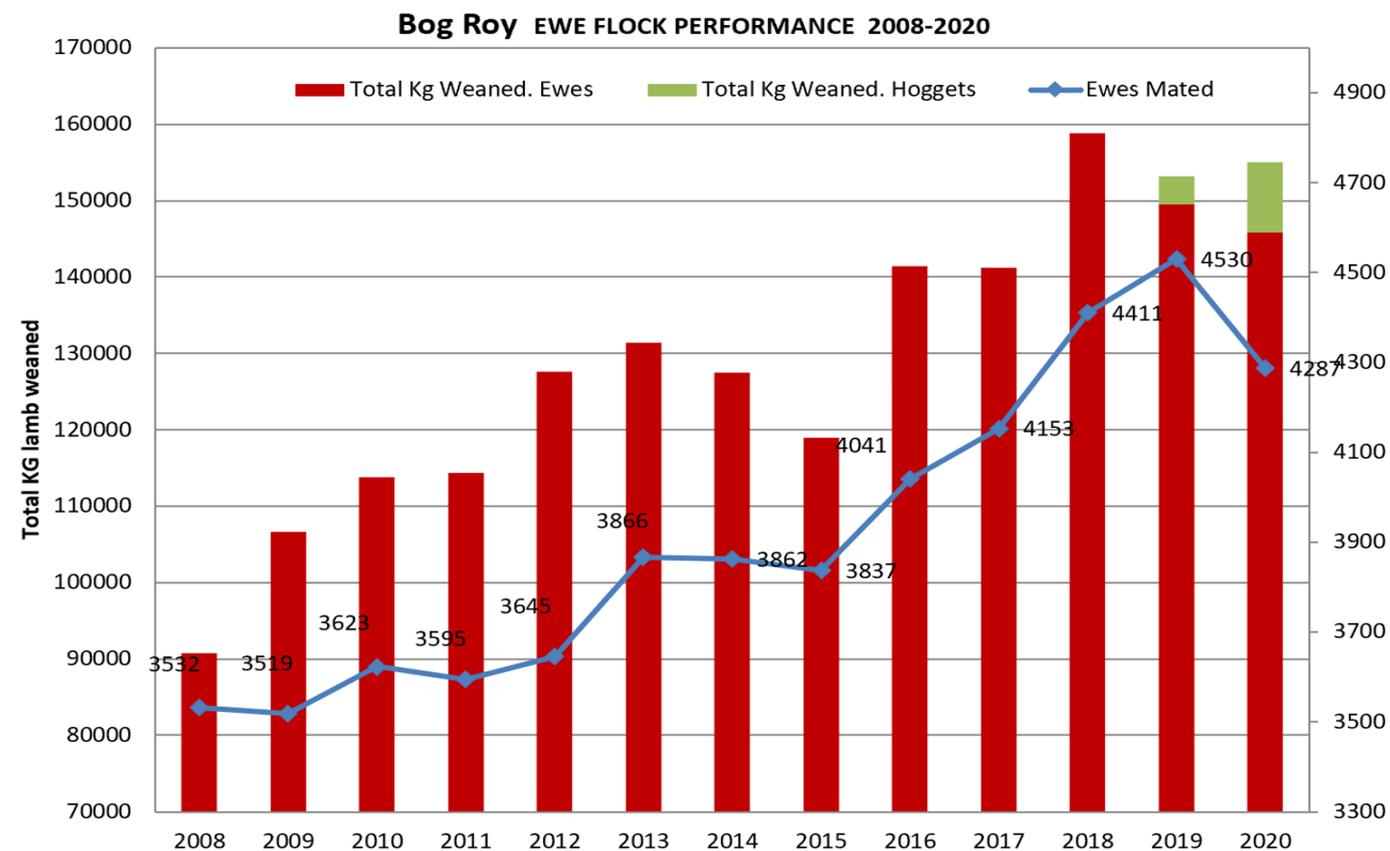
% Ewe weight weaned = kg lamb weaned/ewe as a % of ewe mating weight

Flock lambing % = lambs tailed to ewes at scanning

Growth rate = growth rate of lambs from birth to weaning

Bog Roy – Omarama

Improvement in ewe flock performance with the shift from a typical set stocked high country Merino property to one where legume establishment and management drove a 70,000 kg improvement in ewe flock performance (kg lamb weaned).

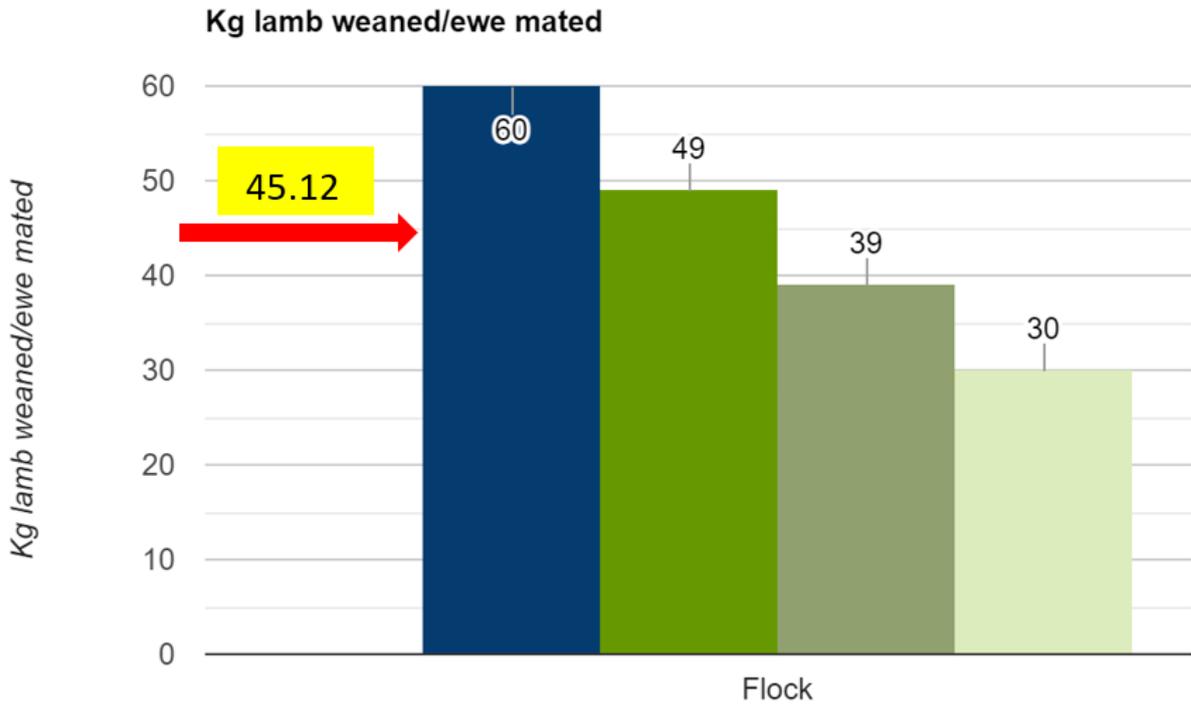


There were 3 phases to Bog Roy's development:

1. 2008-2011: lucerne initially grown for hay increased to 90 ha and lucerne understanding and management improved and direct feeding to stock commenced.
2. 2012-2015: Flock management changes as a result of measuring and monitoring implemented. Further dryland and irrigated lucerne establishment along with hill/high country subdivision and management saw the beginning of a significant improvement in hill country pastures (2014-15 = drought years).
3. In 2016 a change from flood to pivot irrigation under which red clover and lucerne were established. 900 more ewes were now being carried and hogget mating began. Improved ewe performance with over 140% lambing and increased lamb growth rates meant early weaning (80 days) could take place. All lambs were then grown out on the legumes under the pivots and ewes returned to rotationally grazing the hill country maintaining their condition there.

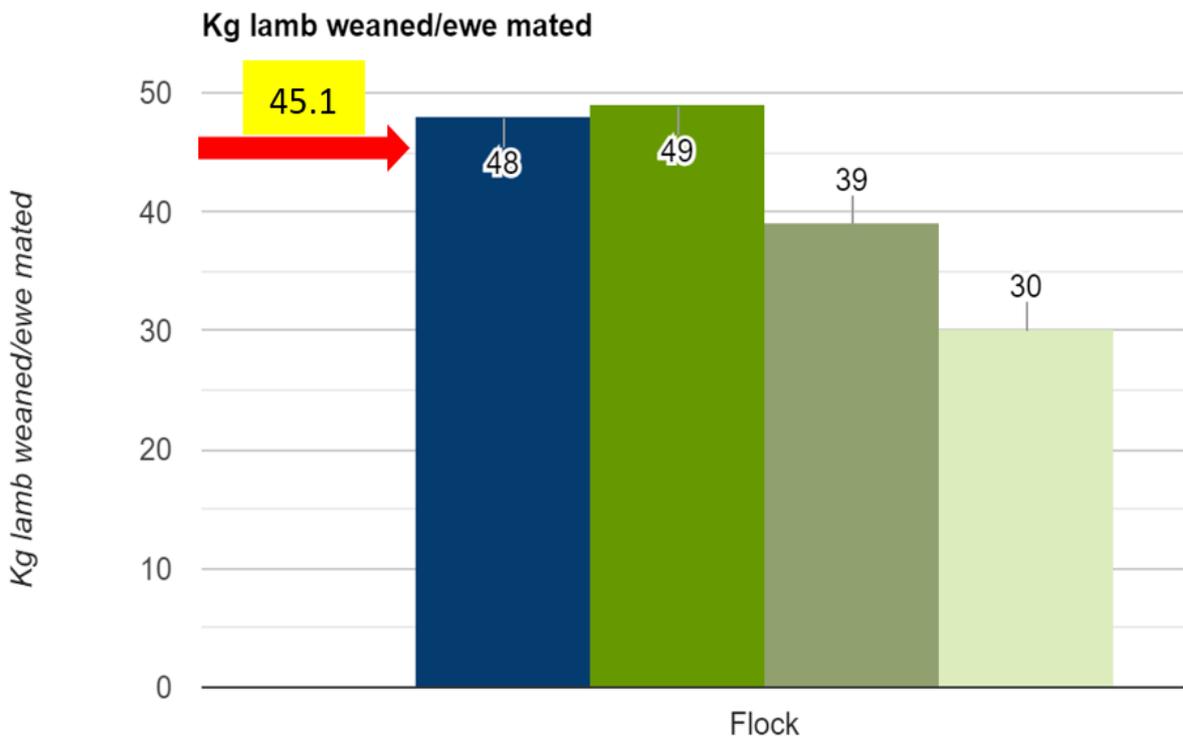
Bonavaree Farm

Bonavaree has a very high performing lucerne based system with an exceptional weight of lamb weaned/ewe. Similar breed to Mt Benger.



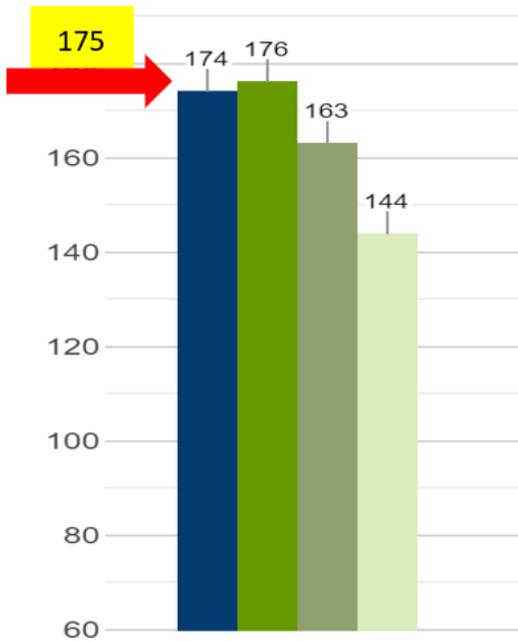
Mt Benger flock performance (red arrow) compared to Bonavaree lucerne based (■) and values for all properties in the StockCare database: ■ top 25%, ■ average, ■ bottom 25%.

Dumgree

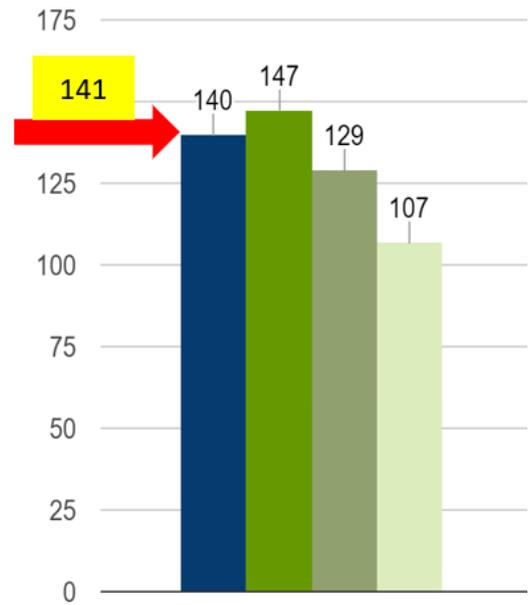


Mt Benger flock performance (red arrow) compared to Dumgree (■) and values for all properties in the StockCare database: ■ top 25%, ■ average, ■ bottom 25%.

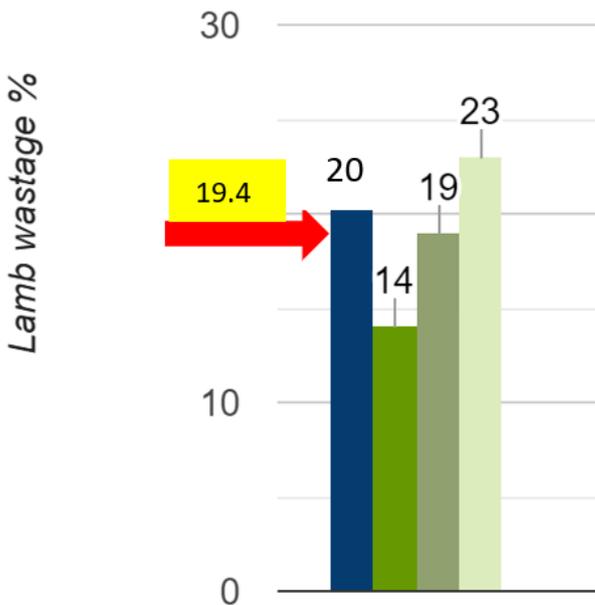
Scanning percentage



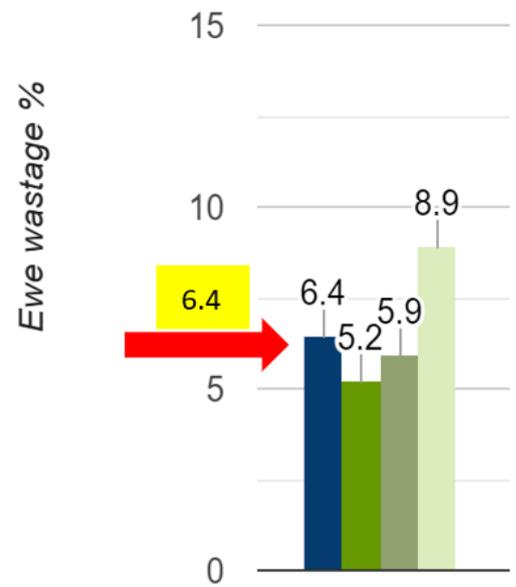
Lambing percentage



Lamb wastage %



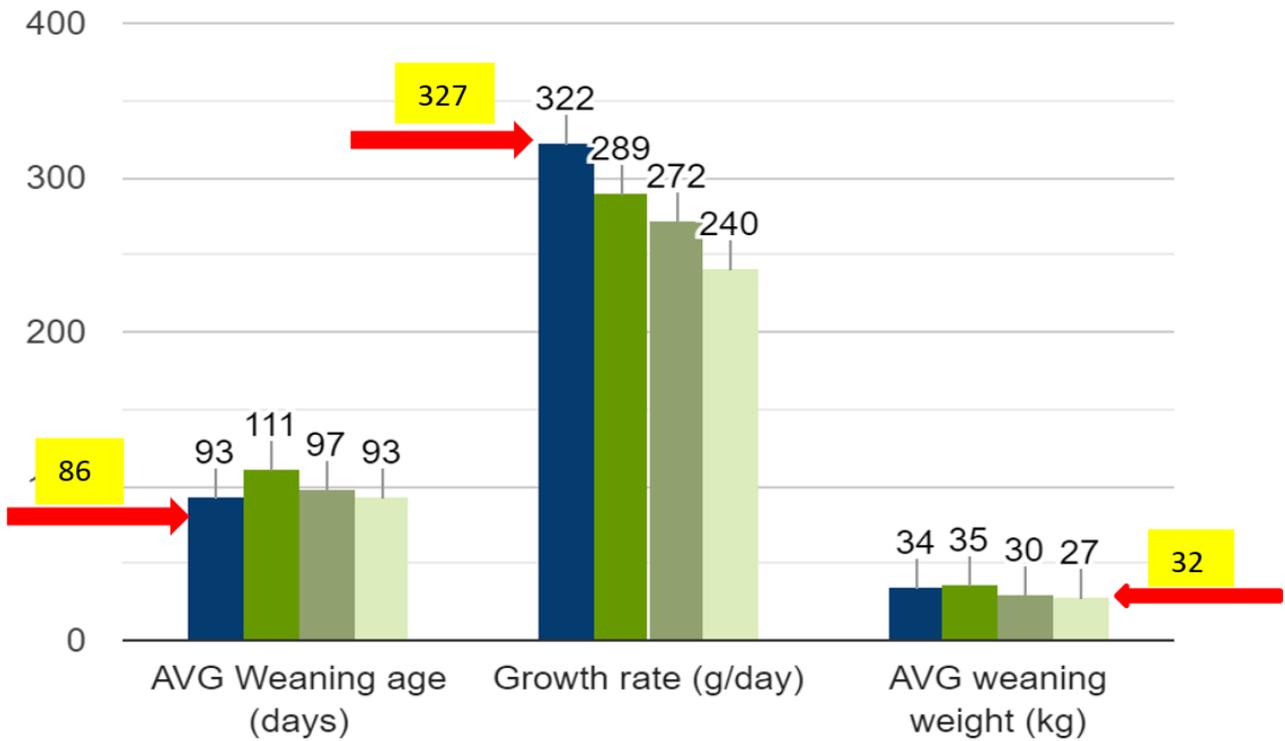
Ewe wastage %



Lamb wastage = (Scanning % - Lambing%)/Scanning%
 = (175-141)/175
 = 19.4%

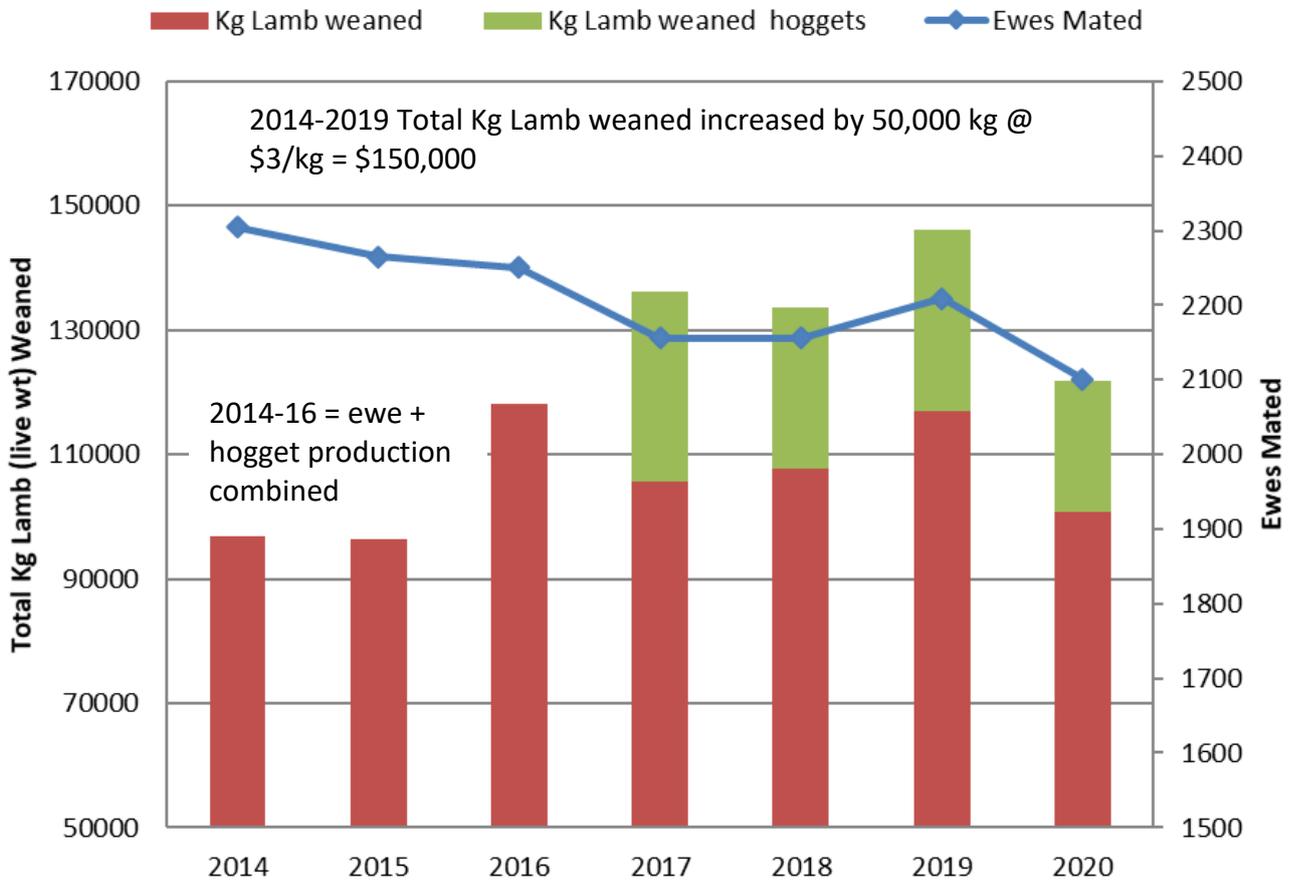
Ewe wastage = Ewes loss between scanning and tailing.

Mt Benger scanning, lambing, and lamb and ewe wastage percentage results (red arrow) compared to Dumgree (■) and values for all properties in the StockCare database: ■ top 25%, ■ average, ■ bottom 25%.



Mt Benger Lamb Performance – birth to weaning

Dumgree shows the result of improved sub-clover management which included subdivision, resting of lambing blocks between scanning and lambing, and rotational grazing of ewes and lambs as soon as possible after lambing.



Dumgree ewe flock production

This greater production occurred despite a gradual decline in ewe numbers and no change in the lucerne component of the property, which is on 120 ha of the 800 ha property. The drop in ewe flock production in 2020 at the end of the drought is only because weaning took place 2 weeks earlier. Average lamb growth rate despite the drought was the best he had achieved.



Sheep and cattle grazing on lucerne at Bonavaree (September 2009).

Dryland Pastures Research Group

Mission statement

“To provide research results that assist dryland pastoral farmers to develop resilient farm systems that are financially, economically, environmentally and socially sustainable.”

DPR solutions for dryland pastures: Which legume drives your system?

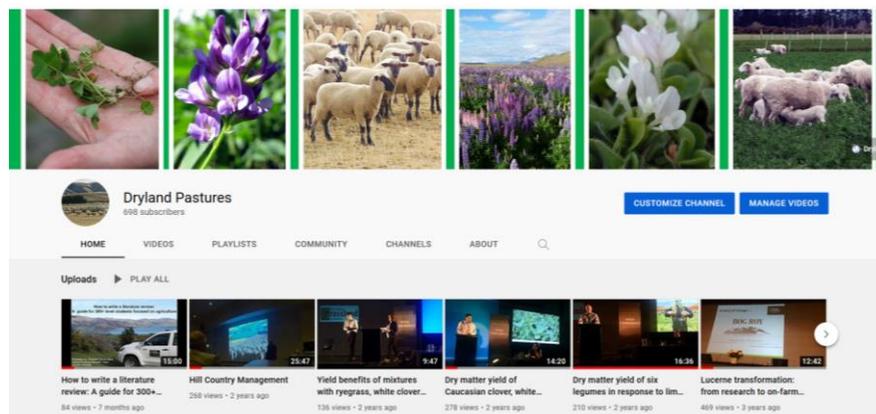
- High quality forages that maximize water use efficiency (kg DM/mm/ha) and water extraction (Lucerne).
- Pasture species that fix nitrogen and grow early in spring when soil moisture is available (Annual clovers).
- Grazing management systems that maximize spring live-weight gain (LWG/ha) but enable the high quality forages to survive and thrive.
- Persistent grass species that respond to moisture during summer dry periods (Cocksfoot).
- Appropriate research information to allow farmers to develop management systems that maximize the benefits of dryland pasture species (Field days!).

Website & Blog: <https://drylandpastures.com/> (currently in development)

Facebook: [@DrylandPasturesResearch](#)



YouTube: www.youtube.com/DrylandPastures



Dryland Pastures Research supporters

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Current research supporters:



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This field day was sponsored by Luisetti Seeds

