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Integrating lucerne into the system at Mooney's Gap

Farm info.

- **Producer:** Rod and Bernadette Vearing (*EverGraze* Supporting Site)
- **Location:** Ararat, Victoria
- **Property size:** 1200 ha
- **Mean annual rainfall:** 608 mm
- **Soils:** Ordovician foothills rising to steep hill country
- **Enterprise:** Wool and prime lambs.

At Ararat in southwest Victoria, the members of the local Perennial Pasture Systems (PPS) group had widely used phalaris as a pasture base, and wanted to demonstrate how to best manage it for persistence.

Those producers with Ordovician foothill country also wanted to see if lucerne could be grown successfully to extend the growing season on their properties. Others in the group had already been growing lucerne successfully in alluvial soils.

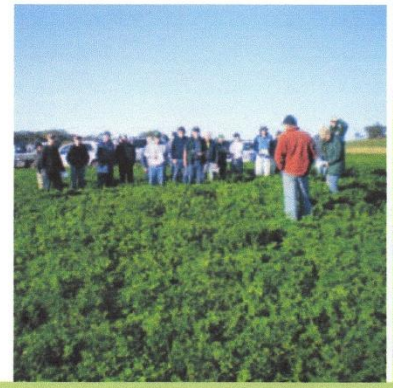
In 2009, Rod and Bernadette Vearing volunteered their property 'Mooney's Gap' to host a PPS/*EverGraze* Supporting Site, with the help of site coordinator Rob Shea, PPS committee member Paul Harrington and agronomist Cam Conboy.

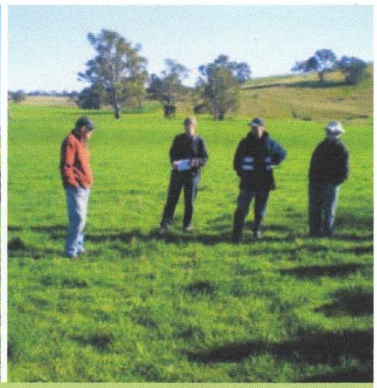
The farm had a history of low fertiliser inputs and no significant pasture improvement due to the earlier run of drought years.

BELOW: At a field day held at the Mooneys Gap Supporting Site during October 2010, Rod Vearing (red jumper) discusses the excellent establishment and production of both the lucerne pasture (left) and phalaris pasture (right).

Key points

- **Establishing lucerne and phalaris in the Ararat region has increased production and provided more enterprise options**
- **Consider the trade-off in winter production and persistence when selecting lucerne cultivars**
- **Changes of enterprise or marketing strategies may be required to take full advantage of improved perennial pastures.**





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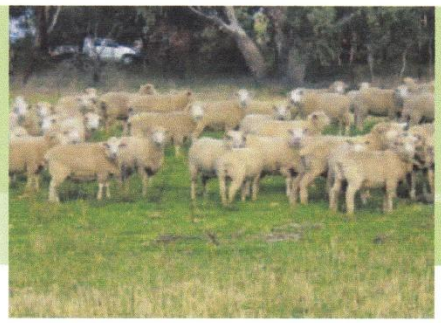

The phalaris pasture, shown here in autumn 2011, carried an average of over 19 DSE/ha during 2010, 2011 and 2012. Rod used it in conjunction with the lucerne to carry the crossbred lambs to heavier weights.

Farm background

The Vearings run approximately 2000 self-replacing, 19 micron Merino ewes, 1000 wethers and 1500 weaners for wool production and 1000 first cross ewes for prime lamb production.

"We lamb in June each year, with the crossbred lambs sold in late spring. They go to processors or into store sales depending on their weight, which typically averaged 20 kg carcase weight on the rundown pastures," Rod said.

"With an initial carrying capacity of about 7 DSE/ha when we bought it, the property did not have the capacity to carry lambs into summer.

"But we hoped pasture improvement could lift the carrying capacity to the district potential of about 12 DSE/ha, and maybe giving us the option of finishing lambs later at higher weights."

Site setup

According to site coordinator Rob Shea, a 12 ha Supporting Site paddock was sown to Holdfast GT and Advance AT phalaris, together with a sub clover mix, during the autumn of 2009.

"Lime at a rate of 2.5 t/ha, gypsum at 0.5 t/ha and MAP at 100 kg/ha were also applied during sowing, following three spray applications," Rob said.

"Establishment costs for the phalaris paddock amounted to $447/ha, with ongoing annual maintenance costs for weed control and fertiliser of $72/ha.

"A second paddock of 14.5 ha was sown to Genesis 7 lucerne during autumn 2009. This is a winter active lucerne, with a dormancy rating of seven. It was sown at a cost of $493/ha, which included a post-sowing weed control spray costing $64/ha.

In addition to the same pre-sowing sprays and fertiliser at sowing as the phalaris paddock, the lucerne received phosphorus and potash to counteract nutrients removed in hay. Therefore, for those years when hay is cut, the total ongoing annual maintenance costs for the lucerne paddock was $123/ha."

Rod Vearing (dark blue shirt) discusses the findings of the Mooney's Gap Supporting Site with Project Leader Kate Sargeant and the *EverGraze* regional coordinators.

Fodder production

The seasons during 2010 and 2011 were exceptionally wet, and the amount of grazing or fodder produced by the two Site paddocks was higher than expected.

"We rotationally grazed the phalaris paddock, on a simple time-based system of one week on and three weeks off, with the focus on looking after the plant," Rod Vearing said.

"We calculated that the phalaris pasture carried over 19 DSE/ha during 2010 and 2011.

"We sold about two-thirds of the drop of lambs as they reached sale weights in late spring. The remainder were put on the two Site paddocks until they were sold at about 25 kg carcase weight in late June the following year.

Unfortunately we still did not have the animal numbers to fully take advantage of the extra feed the lucerne produced, so we cut the paddock for hay in both 2010 and 2011. It yielded on average 3.1 t/ha each year.

Converting this to grazing equivalent, the lucerne carried 13.4 DSE/ha and 17.3 DSE/ha for 2010 and 2011 respectively, through grazings and hay cuts.

The initial production increase from the base stocking rate has therefore been dramatic, but we realise we have had two exceptional seasons.

"I have since sown another paddock to phalaris in 2011, and another to lucerne in 2013. Further pasture establishments are planned for coming years."

Experience of others

While the Vearings have only included lucerne in their pasture base since 2010, other local PPS group members have been using lucerne for some time over a number of different seasons.

These producers' experiences with lucerne in the Ararat region are told in the boxed section next page. ■

Contact

Rob Shea
e: yadin@netconnect.com.au

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At the Hamilton *EverGraze* Proof Site, the Triple System (lucerne, tall fescue and perennial ryegrass) had similar profits to a perennial ryegrass for production of store lambs. However, the variability in gross margins was lower in the Triple system with lower feeding costs in dry years. Modelling also showed that lucerne provided opportunities for higher profits by taking lambs to higher weights.

Producer views on growing lucerne in this area

Simon Brady, Jallukar Park, Jallukar
(20 km north-west of Ararat)

"We have a self-replacing merino enterprise and use lucerne as a risk management or opportunity tool to finish merino wethers or crossbred lambs, or to increase the conception rates of ewes.

In 2011, we finished May/June drop Merino wethers to 20.8 kg carcase weight and second-cross lambs to 21.4 kg carcase weight on the lucerne.

We generally tend to wean onto lucerne and then move onto clover stubbles and back to lucerne if there is new growth, as there was in 2011.

If you had asked me ten years ago whether lucerne was of value in this environment I would have said no as we don't traditionally get much summer rain and the autumn-winter growth of lucerne is so poor it would have reduced stocking rates. But I feel that we are getting shorter seasons and more summer rain so having about 8–10% of our pastures as lucerne does give us more flexibility and less risk. In 2012 we still had lucerne when the rest of the pastures had cut out."

Ben Green, Millbanks, Elmhurst

"We run a self-replacing merino flock and use lucerne to manage difficult Merino weaners over summer. We cut silage for the first cut and this is fed back to Merino weaners with grain. The silage provides a well-balanced feed — 11 ME and 24% CP and we get good production and survival of our lambs.

Lambs are weaned onto the lucerne and we also draft off the tail end weaners into a separate mob on lucerne. We find having about 8% lucerne in the system is optimal for us.

The downside of lucerne is the very poor winter production and some losses from redgut, but the extra value overall makes it worthwhile.

Good management of less winter active lucerne varieties (with a dormancy rating of five or less) will give us 10–15 years before they need re-sowing, whereas the winter actives (dormancy rating six or higher) only last about five years. This year (2012) we are having a terrible season which cut out in October, so any late rains now will be of value to us with lucerne growth."

Paul and Dennis Harrington, Tirranna, Mt Cole Creek (15 km north east of Ararat)

"We run a prime lamb enterprise, buying in Merino ewes and joining them to terminal sires to lamb in May/June. The lambs are sold over the hooks to Woolworths at a 23 kg carcase weight, which may take 4–10 months to reach.

We grow a range of winter active lucernes, from GT 6 to SARDI 10, which make up 25–30% of our pastures. Our other pastures are Holdfast phalaris and sub clover, as well as two plantain pastures. We feel that we can keep winter active lucerne for 5–7 years and are looking at drilling in plantain to all our lucerne pastures to fill in the gaps and assist with redgut problems."

Ken Hall, South Glengowan, Joel Joel
(20 km west of Stawell)

"Lucerne and lambs go hand in hand in this environment, and it also fits well with our cropping enterprise as we have found the most successful way to establish lucerne is under a crop sown in May. Lucerne now makes up about 25% of our pasture area.

We breed first-cross lambs (from Merino ewes and White Suffolk rams) and we also buy in store lambs at the end of the season to grow out on our Stamina 5 lucerne. We always put hay in paddocks to reduce redgut problems."

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Science behind the story

Jane Court and Kate Sargeant DEPI Victoria

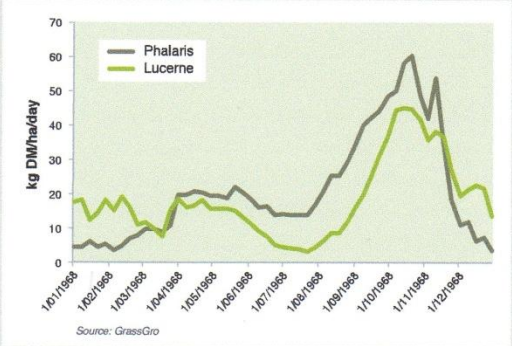
Fitting lucerne into the system — what the models show

The lucerne sown at Mooney's Gap was very productive in the years of the Supporting Site, but its long term value and best management system in this environment is yet to be established.

To predict how well lucerne will produce in the long term, including in drier seasons, Rod's paddocks were modelled in the grazing decision support tool GrassGro, using the Ararat weather data from the past 40 years (1970-2011).

Figure 1 shows the estimated long-term average growth rates of lucerne, and phalaris as modelled by GrassGro.

FIGURE 1. Long-term (1970–2011) average monthly growth rates for phalaris and lucerne at Ararat



Source: GrassGro

Seasonal impact

This figure shows the long term (40 year) average and not the year to year variation of the phalaris and lucerne pastures. In some years with late spring and summer rains, the lucerne added to the total pasture supply. In other years, total pasture production was reduced due to the lower winter production.

The modelling also indicated that if lucerne was included in the pasture system, the better feed quality in the late spring and summer months made it necessary to carry lambs to heavier weights to maximise the returns.

Other sites

Lucerne was included as part of the perennial pasture systems at both the Hamilton and Wagga Wagga Proof Sites.

The aim at both sites was to increase livestock production from perennials while reducing groundwater recharge, thereby preventing salinity.

Compared to Ararat, Hamilton has the same long term summer rainfall (107mm) but overall higher annual average rainfall (683mm) and cooler summer temperatures, making the growing season longer.

At the Wagga Wagga site (located between Wagga Wagga and Tarcutta), annual average rainfall is similar to Ararat, but with slightly higher summer rainfall (around 130mm).

Site results

Both sites achieved significant reductions in ground water recharge by including lucerne in the system, compared to perennial ryegrass (Hamilton) or phalaris (Wagga Wagga). Lucerne also persisted for more than eight years at both sites.

At Wagga Wagga, two systems were compared, including lucerne at a rate of 20% and 40% of farmlets with the remainder of the area sown to phalaris and tall fescue. The results showed that including a higher proportion of lucerne in the system reduced supplementary feeding costs in drought years and increased lamb production (by 168 kg) and gross margins (by $264/ha) in years with a wet spring/summer. In wet springs, phalaris and tall fescue were utilised early while lucerne was saved for finishing lambs later in the season. There was no disadvantage to winter production and stocking rates from including more lucerne in the system. The results also showed that the greatest advantage of having lucerne was realised in systems where more ewes per hectare could be run by lambing later (September) and joining half of the Merinos to terminal sires, rather than running a traditional self-replacing Merino system lambing in July. Maximising profits from lucerne in these systems required a flexible marketing strategy, where in good seasons lambs could be retained

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Science behind the story

(Continued from page 4)

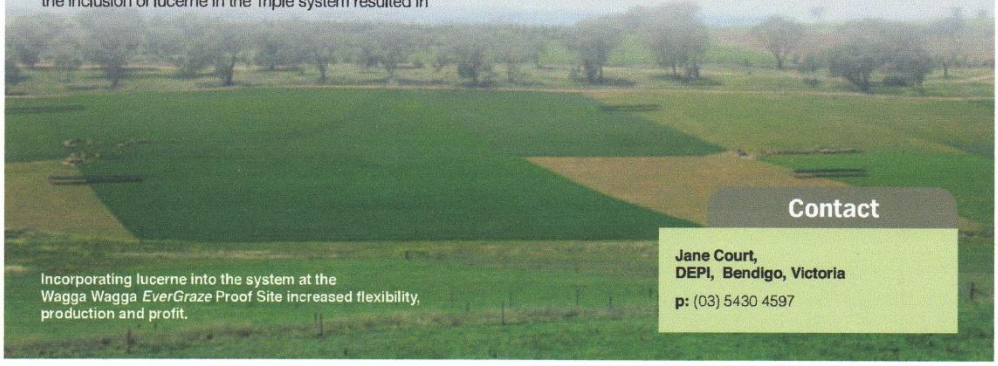
and finished while in drier years they were sold as stores. Wagga Wagga site results also showed that a "flushing" effect could be achieved by grazing ewes on lucerne for two weeks before and two weeks during joining, resulting in approximately 10% additional lambs marked and returning an additional
$48/ha compared to joining on dry pasture or stubble. Note a flushing effect can also be achieved on grass-based pastures when they are green.

At Hamilton, lucerne was planted on the well-drained crests as part of the 'Triple' system, with perennial ryegrass on the slopes and summer active tall fescue on the valley floor. This was compared to a Best Practice Perennial Ryegrass system where early flowering ryegrass was planted on the crests, mid-season flowering ryegrass on the slopes and late-season flowering ryegrass on the valley floors. While both systems had similar profitability, for an August lambing Merino-cross terminal enterprise selling store lambs in December, the inclusion of lucerne in the Triple system resulted in less variability in gross margins and, in particular, reduced supplementary feeding costs in dry years. The benefits of lucerne for finishing lambs and flushing ewes were not included in this analysis. However, modelling showed that lambs could be kept on lucerne to January in 60% of years and February in 30% of years while still having enough lucerne to flush ewes, and that this would provide further opportunities to improve profits in those years with wet summers. Like the Wagga Wagga site, at Hamilton, there was no disadvantage to winter production and stocking rates by having lucerne in the system. This was in part due to the contribution of annual grass weeds to winter production.

Consider costs

A perennial pasture can provide options for increased profitability of the farm with the right enterprise choice. The higher establishment and re-sowing costs of lucerne must also be considered.

With an estimated payback period of 5–7 years, lucerne varieties that require re-sowing every 7–10 years need to add value to production to be a worthwhile investment. ■



Incorporating lucerne into the system at the Wagga Wagga *EverGraze* Proof Site increased flexibility, production and profit.

Contact

Jane Court,
DEPI, Bendigo, Victoria
p: (03) 5430 4597

For further information:

More information from *EverGraze* research and fact sheets on the place, purpose and management of perennial pastures can be found on the *EverGraze* website:
http://www.evergraze.com.au/fact-sheets.htm

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Appendix 1:

Doing the sums — Investing in pasture improvements at Mooney's Gap

Jane Court, DEPI, Victoria

Establishing lucerne and phalaris pastures at Mooney's Gap has been very productive, growing more feed for longer over the growing season.

But establishment is expensive, in this case $493 and $447 per ha (for lucerne and phalaris respectively). It may take some time to recover costs and to reap the full benefits while stock numbers are increased or enterprise changed.

Cumulative net cash flows can provide a guide as to the affordability and payback times of the pasture improvement options. An estimate of return on capital (as Internal Rate of Return) gives a guide as to whether the investment is worthwhile.

Is it affordable?

TA cumulative net cash flow is estimated as a means of showing the annual cash flow associated with each improved pasture option. A cash flow includes the capital and maintenance costs associated with improving the pasture, purchase of extra stock and the net income from those stock, plus interest costs to allow for the borrowing of capital and the opportunity cost of investing. In this analysis, the extra costs and income of the pasture investment are presented on a per hectare basis. The whole farm implications of sowing down a portion of the farm also need to be estimated and considered, to show the total effects on farm cash flow and implications for total debt.

Costs and prices

Ewe replacements were costed at $154 ($64/DSE) for this analysis, while the lamb prices were based on the average, over-the-hooks prices from MLA for 2007–2011. These equated to 435 c/kg carcase weight for carcases less than 18 kg, 444 c/kg carcase weight for carcases 18–26 kg and 428 c/kg carcase weight for carcases over 26 kg. Skins were priced at $10 each.

Actual costs (at contractor rates) have been included for the pasture improvements, at $447/ha for phalaris and $493/ha for lucerne. The lucerne has a higher maintenance fertiliser cost primarily due to the pasture being cut for hay in 2010 and 2011, requiring replacement potash and phosphorus to be applied.

Ongoing costs for the pastures were estimated the same at $40/ha. Interest rate has been set at 8 per cent and inflation at 3%.

Income used

For this analysis, an average return of $30/DSE was used. This was taken from the 41-year long-term average (inflation adjusted) for prime lamb enterprises in the southwest region of Victoria, from the DEPI Livestock Monitor Farm Project 2010–11 report.

The unimproved annual pastures were run at a lower stocking rate (7 DSE/ha) than the improved pastures, probably at a lower per head production and profitability per DSE than the improved pastures. As there is no measure of the difference in lamb performance or profitability between the two pastures using grazing days, we can either use the same return or make an educated guess on what the difference might be.

A modelling exercise of the pastures at the Supporting Site estimated a long-term gross margin per DSE of $30/DSE for the improved pastures but only $14/DSE for the annual pastures at the stocking rates achieved, so both scenarios were tested.

Calculating flow

Figure 2 (see page 7) shows the cumulative net cash flows per hectare for investing in establishing phalaris only (Phalaris) and for a phalaris/lucerne system (Mix system). This is the cumulative cash flow ($/ha) generated from the improvement (above that generated from the annual pastures or 'business as usual'), with an enterprise return of $14/DSE. The Mix system had approximately 80% phalaris and 20% lucerne.

If a business as usual gross margin was also $30/DSE, the payback period is extended by two years and peak debt is around $900/ha.

What it means

The cumulative net cash flow analysis (Figure 2), which is based on the costs, returns and assumptions outlined above, shows that the phalaris pasture will have repaid the investment by the fifth year while the lucerne pasture (due to slightly higher

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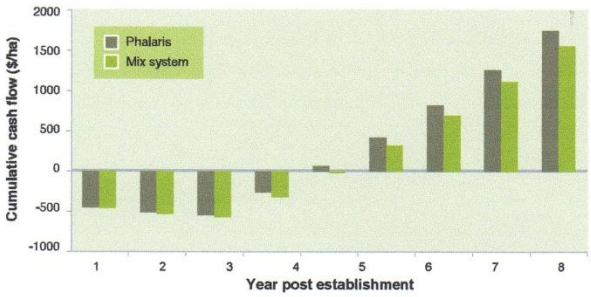
establishment costs) will return the investment by the sixth year. Peak debt occurs for both systems in the second year after establishment (due to the purchase of extra stock).

The return from lucerne may be under-valued as extra animal performance that may result from having lucerne such as higher lamb finishing weights or higher marking percentages from flushing ewes is not included.

The other consideration is that lucerne is thought to last between 7–10 years in this environment and hence may start to lose production after the first few years which will add to the longer-term cost and cash flow. For a mixed system to be more profitable than phalaris only, the lucerne needs to add value to the enterprise profitability.

FIGURE 2. Cumulative Net Cash Flow for Phalaris and the phalaris/lucerne Mix system assuming $30/ha gross margin (business as usual at $14/DSE)



In doing your own sums, the key costs that are often left out are the costs to increase stock numbers and the financial costs to borrow the capital to make the improvement.

Over the years of the *EverGraze* demonstrations, both lamb prices and seasons were good (especially compared to the previous eight years) and returns (if pastures were utilised profitably) would have been better than often estimated in these kinds of analyses. One very good or bad year within the early years after establishment could make 12 months difference or more, to the time before the pastures start to make a return.

What is the return?

Cash flows alone do not tell us whether either of these options are a good investment. The common measure that is used to help decide whether an investment is worthwhile, is return to the marginal capital invested, called the Internal Rate of Return (IRR).

The IRR is a measure of the economic efficiency of the investment over a set period of time. It can be compared with returns from alternative investments of the same capital, with a similar life and that are similarly risky.

The IRR accounts for all the income generated over the period, less the costs of the improvements. It also includes a salvage or depreciated value of the capital investments (such as livestock, fencing and pasture improvement) at the end of the time period. Ten years is common for pasture improvement programs.

Table 1 shows the gross margins per hectare (when pastures achieve their potential), return on capital (IRR) for both pasture options with a 10% discount rate, compared to business as usual. Enterprise gross margin is compared for $30/DSE for the improved pastures and business as usual (annuals) at $14/DSE.

A worthwhile investment?

Looking at Table 1, both pasture improvements are a good investment. Return on capital is over 18% if the improvement is in stocking rates only (same gross margins/DSE at $30) or more than 35% if the enterprise gross margin/DSE is doubled due to the improvement (increase from $14/DSE to $30/DSE) as well as increased stocking rates.

Including lucerne in the system would need to improve the profitability of the enterprise by more than $6/DSE, on average, to be a better investment than phalaris on its own. This may be due to heavier sale weights, less supplementary feeding or higher lamb marking percentages from flushed ewes.

The profitability of the enterprise (at $30/DSE) in our calculations as well as the large increase in stocking rate has led to very good investment returns for both options. Increasing stocking rates significantly across the farm may increase labour and overhead or infrastructure costs as well as potentially increased exposure to

TABLE 1. Gross margins, and return on capital (as IRR) estimated for phalaris or a phalaris/lucerne system at Mooney's Gap, compared to business as usual

Analysis	'Business as usual'	Phalaris	Phalaris/ lucerne (80%/20%)
Potential stocking rate	7 DSE/ha	14 DSE/ha	13.6 DSE/ha
GM/ha at potential stocking rate:			
$30/DSE	$210/ha	$420/ha	$408/ha
$14/DSE	$98/ha		
Value of investment (compared to business as usual)			
Return on capital (IRR):			
Business as usual at $30/DSE		22%	19%
Business as usual at $14/DSE		40%	37%

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TABLE 2. Gross margins, and return on capital (as IRR) estimated for phalaris or a phalaris/lucerne system at Mooney's Gap, compared to business as usual

	Annual pastures	Phalaris	Phalaris	Phalaris and lucerne (80/20%)	Phalaris and lucerne (80/20%)
	Store lambs	Store lambs	Finished lambs	Store lambs	Finished lambs
Ewes/ha	3.5/ha 7.4DSE/ha	6/ha 13.2 DSE/ha	5.5/ha 14 DSE/ha	6/ha	5.5/ha 14 DSE/ha
Average gross margin	$104/ha $14/DSE	$323/ha	$397/ha $28/DSE	$271/ha	$403/ha $29/DSE

tough seasons, and these should be considered before making large scale improvements.

For a simple cost-benefit analysis of pasture improvements, use the *EverGraze Pasture Improvement Calculator*, available at **www.evergraze.com.au/tools**

Changing the enterprise?

To make the best of improved pastures, it may be worthwhile to consider a change in the system or enterprise to take advantage of better feed quality and a longer growing season.

The computer-based modelling program *GrassGro* can be used to compare the production and financial returns from different systems. In this case, the program was used to compare Rod's original crossbred store lamb enterprise (based on annual pastures), a move to a phalaris pasture base to produce store or finished lambs, or adopting a mixed pasture system with 80% phalaris pastures and 20% lucerne, to produce store or finished lambs.

Standard prices and costs were used, as outlined previously, so the impact of seasonal conditions could be analysed, particularly the long-term occurrence of late spring and summer rains.

Stocking rates and margins

Table 2 shows the 40 year average (1970–011) stocking rates and gross margins for the three pasture systems (annual, phalaris and phalaris/lucerne) for producing store lambs (sold at weaning) or lambs finished to a 22 kg carcase weight. A 'lucerne only' pasture option was not included as it is unlikely to be used as a sole pasture system.

Whilst average gross margins over the years tested (1970–2011) indicate that there isn't much extra value from including lucerne in the system, there is large variation between years depending on the rainfall pattern.

For example, in the 2002 drought, production for both species was reasonable over the main growing season. The spring and summer rains during this year were too late for phalaris, but were optimal for lucerne, so having 20% lucerne pastures in the system increased returns by nearly $70/ha.

Conversely, during the 2006 drought the summer rain was too late to be useful because even though the lucerne grew, the lambs were already gone. This, combined with the low winter growth of the lucerne, meant a phalaris-only system would have been better than a combination system. The lucerne provided feed for ewes over the summer, but the saving wasn't enough to outweigh the winter deficit.

The results also indicated that in changing to an improved pasture system, finishing lambs to heavier weights would be a more profitable option than store lamb production, particularly for a system that includes lucerne.

Better varieties of lucerne (and phalaris) and better lamb growth rates would give different results. But analysis of average gross margins over a 40 year period shows the effect of variable rainfall on both phalaris and lucerne in this district.

Key considerations

The enterprise (and ability to maximise the use of the summer feed quality) and winter activity of the lucerne are key considerations in deciding to incorporate lucerne. The producers who have been using lucerne for some time in the area get their main value from growing young stock (merino wethers, merino weaners, finishing prime lambs) late in the season when the phalaris quality has dropped. The other consideration is the cost of establishment and higher maintenance costs of lucerne, which is not considered in these gross margins. ■