



future farm

PERSONAL STORIES FROM AUSTRALIAN FARMERS

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FUTURE FARM
INDUSTRIES CRC



Lucerne finds its place in the system

Producers with an open mindset can make the most of what lucerne has to offer

Welcome to Future Farm

Future Farm – What does it mean?

For years now I have struggled with a dilemma – how to bring together the frequent call for radical changes in our farming practices with a profitable, practical path to achieve such goals.

In *Future Farm* I see answers – a magazine that profiles the personal stories of farmers who have been highly innovative and successful in bringing perennial plants into their enterprise and have increased sustainability, productivity and improved profit.

Our challenge is to build on Australian agriculture's proud track record of being at the forefront of technological change, problem solving and sustained productivity growth. This ability has made it a leading sector in innovation - much to the credit of the farmers and scientists that work in it.

The perplexing question for me now is whether this proven ability to deal with change is enough to allow dryland farming to adapt to more variable seasons and the onset of climate change, while offsetting declining terms of trade and sustaining natural resources.

This first edition of *Future Farm*, as practiced and talked about by farmers on these pages, will make readers far more optimistic about meeting the challenges that lie ahead. Here are six success stories that range from the more familiar and immediately available lucerne and chicory to the less familiar summer active perennial grasses and kikuyu, and brand new fodder shrubs with unfamiliar names today. It is these farmers' experimentation in partnership with scientists and their growing experience

with perennial cultivars, particularly the incorporation in new farming systems that speak to a more secure future – profitably, sustainably and in readiness for climate change.

I invite you to share the success and passion of Nick and Jane Trethowan, David Robertson, Trevor and Lyn Bolto, Don Nairn, David and Robyn Holder, and Don Price.

Kevin Goss

FFI CRC Chief Executive Officer



FROM LEFT TO RIGHT: Inside this issue of *Future Farm* Don Nairn, David Robertson and Nick Trethowan share with readers their successes.

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For further information about FFI CRC visit www.futurefarmcrc.com.au

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our cover

Nick Trethowan gets up close and personal with his lucerne pastures.

- See full story 4.

Photo: Ben White



Finding your way with the new look

The new-look, new-name for *Future Farm* magazine retains the best elements of the *SALT Magazine* with a fresh look and a broader focus.

FFI CRC has worked hard to maintain what readers like from *SALT Magazine*, especially the case studies that engage readers with the successful farming systems of producers who face and manage common issues across the country – climate variability, hostile soil conditions, summer and winter feed gaps, rising water tables and salinity.

Where has all the SALT gone?

Even though salt has disappeared from the name, it hasn't left the minds of readers or researchers.

Each issue of *Future Farm* will continue to bring success stories about farmers who successfully manage saline conditions with a range of innovative approaches.

These salt stories can be found in the central pages of each magazine and have their own unique identity.



Profitable perennials

Perennials in farming systems are a viable strategy for salinity management and can do much for farm businesses and natural resource management.

We hope you enjoy the farmer stories in the new look of *Future Farm* and welcome your feedback. 🌱

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Successful format stays

Future Farm will continue to bring case studies from across Australia that describe how producers are successfully incorporated perennial plants into their farming systems.

The first-person style of the stories allows farmers to share their own experiences with readers, almost like going on a farm walk.

Science behind the story

To support the farmers' experiences we ask experts in the field to explain the science behind the on-farm results from each case study.





Lucerne proves a perfect fit

After a visit to Kojonup earlier in the year, Catriona Nicholls recently caught up with fourth generation farmers, Nick and Jane Trethowan, to see how the season was progressing and get the latest lowdown on their lucerne.

"I remember during the summer of 2001, when the pasture paddocks were all dry feed, looking at the side of the road seeing green perennial weeds like phalaris, paspalum and veldt grass," Nick said.

"This inspired me to look at perennials as a potential source of green feed over summer.

We first tried sorghum after a heavy rainfall event during December 2002. We dived in with a knockdown herbicide and seeded the crop, grazing it twice before winter.

The following year we were ready to try our luck again, but our farm adviser suggested we look at lucerne as an option because of its perenniality. He also felt it would be a better fit with our farming system, which already involved rotational grazing. So we grabbed it from there and ran with it.

Our adviser was right. Lucerne does fit in well with our system, mainly because we don't see rotational grazing as a barrier, like many more traditional livestock producers in our area. We have been rotationally grazing sheep for about 20 years.

Also, we were already growing canola and so were equipped with most of the tools to manage small seeds, including the direct drill technology and the knowledge that bug and weed control is critical – if you can grow canola you can grow lucerne.

Exceeding expectations

Originally we didn't expect the lucerne to do much over summer unless we got out-of-season rainfall. We did expect it to extend the season – a few weeks before summer hit and then a few weeks after it finished, but we didn't think it would do much without a rain event. However, it has never gone

key points

- Lucerne is ideal for graziers who are prepared to rotationally graze their stock
- Weed and insect control is vital for successful lucerne establishment
- Lucerne can fit well with a companion cropping system, having little impact on yield.

farm info.

Case study: Nick and Jane Trethowan

Location: Kojonup, Western Australia

Property size: 777 ha plus a further 700 ha leased

Mean annual rainfall: 510 mm (50-year average)

Soils: Heavy sandy loams

Enterprises: Merino sheep, canola, barley and oats

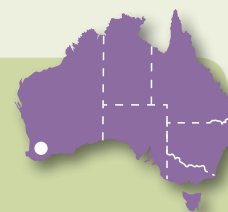


Photo: Ben White

Lucerne has proved a perfect fit in Nick and Jane Trethowan's farming system, providing a vital source of green feed during summer for ewes and lambs, controlling rising water tables while fitting in nicely with their cropping rotation.

dormant – we keep rotationally grazing it and it keeps growing back. We have tried some other perennials including an evergreen subtropical perennial mix and found it didn't work in our area – it was too wet and cold during winter.

I think we have learnt a lot through our failures. Even with the lucerne we've made every mistake you can make – from sowing on acid soil, to overgrazing and not controlling insects.

But as a result we know a fair bit about what it can and can't take.

The key management tools are to ensure the soil pH is right (5 or above), get insect control and grazing management in the first and subsequent years. It is critical to allow the pasture to regrow between grazings to allow the stand to persist.

We often have graziers interested in how we manage our lucerne, but most are using set stocking and the rotational grazing is seen as a huge barrier to adoption.

Companion cropping

The other big thing for us now, is companion cropping on top of the lucerne.

We did it for the first time, probably during 2004, putting some oats over lucerne as a fodder crop after hearing of others doing a similar thing.

At that stage, we had a heap of lucerne in and I felt it wouldn't be a drama if we stuffed it. But, it worked beautifully.

We grazed the oats that season, but it would have equalled at least an average crop if we had harvested.

Two years ago we direct-drilled canola into a lucerne stand and that equalled our average yield of 1.3 t/ha.

This year gone, we achieved a 5t/ha oat crop off the same paddock that was under canola last year and we are now seeding barley into the same paddock.



Photos: Nick Trethowan INSET: Ben White

Lucerne and chicory planted September 2003, companion cropped with canola in 2006 (1.3 t/ha), oats in 2007 (5.1 t/ha) and planted to Baudin Barley May 2008.
INSET: Clover self seeds and regenerates after cropping.

Multiple benefits

The benefits of lucerne are greater than just the increased pasture production and green feed during summer.

Paddocks we used to get bogged in every year, we haven't been bogged in since putting them under lucerne.

We currently have about 130 ha under lucerne but will hopefully increase that this year along with other perennials such as tall wheatgrass and strawberry clover for our waterlogged saline country where lucerne is not an option.

In terms of lamb production lucerne gives the lambs a huge boost compared with the lambs without access to lucerne. I think the first year we ran lambs on lucerne they cut half a kilogram more wool per head.

We start lambing in early July through to the second week of August and the lucerne gives the lambs a great start after weaning.

We don't try to keep pure stands and I've noticed this year especially, the lucerne paddocks are full of clover, so we'll get a good winter pasture. We use winter active varieties, but they remain fairly dormant, so we want the clover and grass to be there.

When we decide to crop the lucerne we spray top during the previous spring using gramoxone and then rotational crop for two years. We then leave the lucerne out of crop for three years and the clovers regenerate.

The first paddock we put in during 2001 is still going strong except for a sandy seam with a low pH and it is mainly PL90 (winter active). We'll keep it going until it is too thin to use, but it is generally poor management that results in thinning.

We'll still have 10 plants per square metre and I consider that a good pasture. Some research suggests five plants per square metre will maintain a stable water balance." 🌱

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science behind the story

By Dr Perry Dolling, DAFWA

- In the Kojonup environment there is a risk of waterlogging due to the amount of rainfall during winter. This reduces the productivity of pastures and crops and contributes to rising water tables. Nick and Jane have hit on an efficient way to use the excess water by incorporation of lucerne in their farming system. Lucerne can create a much drier soil leading into winter, ready to absorb large rainfall events. The soil deficit in autumn under lucerne is on average 60-90 mm more than the soil deficit under annual crops and pasture for the range of soils in this area.

Lucerne is sensitive to waterlogging especially in the establishment year. However, Nick and Jane establish their lucerne in spring, after any waterlogging events, and by the next winter the soil is sufficiently dried to prevent any or limited waterlogging.

The Kojonup climate, like most of the agricultural areas in Western Australia, is Mediterranean so most rainfall falls between late autumn and early spring. However, summer and early autumn

events do occur and you get a flush of growth from the lucerne. Nick and Jane have also found lucerne extends the growing season. This grazing is valuable during late autumn when there is not much pasture or stubble available and early summer when the annual pasture has died and stubbles are unavailable.

Lucerne requires some rest to maintain stand density and maximise production. It is particularly vulnerable to overgrazing by sheep because its crown can become exposed. This is especially so for the highly winter-active cultivars, as the crown is closer to the soil surface and is more exposed on sandy soils. It also has a limited ability to recruit.

Nick and Jane had been rotationally grazing before trying lucerne and this is one of the reasons it has done so well in their system. This is not to say you have to be a strict rotational grazer to grow lucerne – it needs some rest especially when it is not growing and for a short time in spring to replenish its reserves leading into summer but you can graze for longer periods.

Companion cropping, where a crop is grown over an established stand of lucerne, is relatively new for WA. Research in the low to medium rainfall areas has shown lucerne can reduce crop yield due to the competition for water during spring. We have not done any research in the higher rainfall areas, such as Kojonup, so it is encouraging that Nick and Jane have been successful, with limited or no reduction in crop yield. Their success is probably due to the lucerne reducing crop waterlogging. A Kojonup winter is quite cold and lucerne has limited growth. This area also receives good spring rainfall to further support the growing crop.

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Summer-active trials look set to change farming forever

An *EverGraze*™ trial in Hamilton, western Victoria has revealed results with the potential to change the way the region is farmed forever. A switch from winter-active perennials such as ryegrass to deep-rooted, summer-active perennials such as lucerne and chicory has dramatically improved productivity and profitability and made significant inroads into the challenge of containing salinity. Laureta Wallace caught up with David Robertson to find out how sowing summer-active perennials on his property are paying off.

"I'm the chairman of the *EverGraze*™ Regional Group that oversees the Hamilton trials, started about four years ago," David said.

"The Hamilton trial is about looking at how we can take better advantage of summer rainfall in terms of pasture production, matching the pasture system to the animal system and how to reduce water recharge.

The prediction was that 40 per cent of the region would have salt problems by 2020. However we've had quite a few dry seasons and the water tables have gone down.

I was heavily involved in the *Lifetime Wool* project and saw *EverGraze*™ as a natural progression. *Lifetime Wool* looked at an animal's pasture needs and identified the green feed gap during summer and autumn as a critical period in ewe production. I have been a reasonably high stocker and was interested in *EverGraze*™'s combined focus on production, profitability and environmental sustainability – all important to me.

EverGraze™ looks at how pasture systems can be managed to complement animal systems.

The Hamilton trial looks at using summer-active perennials – the only pastures that respond to summer rain.

key points

- Summer-active perennials prove profitable, even during drought conditions
- Profitability can be boosted by more than 50 per cent
- Year-round pasture production provides greater marketing flexibility for prime lamb producers.

farm info.

Case study: David Robertson

Location: Coleraine, Victoria

Property size: 1200 ha

Mean annual rainfall: 600 mm

Soils: Duplex and clay loams

Enterprises: Wool, prime lambs and cropping



Hamilton *EverGraze*™ Trial Site Leader, Ralph Behrendt (left) and Regional *EverGraze*™ Chairman, David Robertson (right) inspect a lucerne pasture on the trial site.

At the start, the aim of the trial was to increase profitability by 50% and reduce water recharge by the same amount. On the trial sites profitability has been increased by more than 50% with stocking rates increased significantly. However, the 50% reduction of water recharge has been revised somewhat. It is now really all about soil health.

Last season was probably our toughest season ever here. However, the two pasture system plots that maintained their profitability with little need for supplementary feeding were the lucerne/fescue and kikuyu/chicory systems. The comparison plot, which is indicative of traditional pasture systems in this region with 100% ryegrass, cost \$20 more

per head for supplementary feeding than the two pasture systems. Plus the paddock had to be destocked.

Adoption of the pasture systems

I started sowing lucerne about two years ago and it has certainly been beneficial for growing out weaners. The green feed is wonderful for getting them up to weight and for fattening prime lambs.

It has been staggering to see the production from lucerne not only during summer but also during winter. Our belief that lucerne would have little grazing value during winter was incorrect. The trial has shown it is equal to



or better than banquet rye and fescue in its production. A small amount of green feed is very valuable over summer when everything else is dry.

I estimate that during last season, with weaners, I saved about \$6 per head on supplementary feed costs and made an extra \$10/head with store lambs.

In this region the traditional pasture system of sub-clover and rye grass starts to dry off during mid-November. As such, farmers have adapted their animal systems so as to ensure they have their animals finished before this date.

This has meant lambing has been brought back to the start or middle of winter – which is certainly not ideal. When people go to market with their lambs just before Christmas there tends to be a market glut. In the past, farmers have got stuck and have had to feed their lambs during summer when they have had no green pasture.

With deep-rooted summer-active perennials, I'm able to set my prime lamb lambing later (August) and still finish them off on green feed.



Photos: Currie Communications

Summer-active perennials such as lucerne are providing protection against seasonal variability for producers such as David Robertson (left).

They do wonderfully well and grow out into, what we say with Merinos, pretty good animals.

It's about being flexible with your pasture system to fit in with your animal system rather than the other way around.

Using summer-active perennials can also provide protection against increased seasonal variability because of the flexibility it provides. In this region we seem to be getting less rain and the timing of that rainfall is also becoming more uncertain. As such we need pastures that can take advantage of rainfall at any time. Ryegrass simply does not respond to summer rain.

I started sowing summer-active pasture systems three years ago and I am certainly still learning.

I have trialled various mixes of tall fescue/lucerne, phalaris/lucerne, chicory/lucerne. The lucerne/chicory and pure lucerne seem to be the best.

By the end of next year I plan to have 20% of the property sown to summer-active perennials." 🌱

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By Dr Ralph Behrendt, EverGraze™

science behind the story

- Stocking rates and productivity from the Hamilton trial site are 50-100 per cent higher than some of the region's benchmarked farms, while soil moisture levels have decreased under the higher water use of summer-active perennial pastures.

Areas sown to improved varieties of lucerne and chicory have been substantially drier at the start of winter than the region's traditional perennial ryegrass winter-active pastures.

Started in 2004 the trial has shown farmers can grow more pasture, run more stock and produce more wool and meat per hectare while reducing soil moisture at depth.

The production systems being trialled offer alternatives for other high rainfall areas (annual average rainfall 600-800 mm) that traditionally rely on winter-active pastures such as sub-clover and perennial ryegrass.

The Hamilton trial site covers 70 hectares, divided into one-hectare plots. It matches deep-rooted, summer-active, improved perennial pastures to varying soil types on valleys, slopes and crests on the site. It uses top sheep and cattle bloodlines and measures livestock performance (lamb production, wool production and beef liveweight gain) from the different pasture systems. The pasture systems with increased summer activity are compared against a 'best practice' perennial ryegrass system. The 'best practice' perennial ryegrass system was designed and modelled to be 50% more profitable than 'current practice'.

The current practice benchmarks were drawn from the top 20% of farms in the *Hamilton Monitor Farms* project, which has recorded the performance of 50 farms in the region over 30 years. These farms traditionally graze sheep and cattle on perennial ryegrass/sub-clover pastures that are dormant in summer. Both the best practice perennial ryegrass systems

and the summer-active pasture systems are increasing productivity, but each one responds differently to the seasonal conditions at hand.

The key is having a diversity of perennial pastures, some that are summer active and some winter active – that are matched to soil type and landscape and respond to rain when it falls – and then adding high-quality stock and managing them so they can convert as much pasture as possible to lambs, liveweight gain or wool production.

- *Dr Ralph Behrendt is the Hamilton EverGraze™ Trial Site Leader.*

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Kikuyu rises to the challenge with green feed over summer

Despite low rainfall, long, hot, dry summers, sandy soils and salinity, livestock producers on Kangaroo Island, such as Trevor and Lyn Bolto, are experiencing successful results with kikuyu. Catriona Nicholls spoke recently with Trevor about their experiences and expectations of the hardy perennial pasture.

"We've been here on the island for 50 years now and given the increasingly tough economic conditions, variable climate and land degradation challenges, we have been searching for some pasture options that can help us increase our profitability and sustainability," Trevor said.

"The crux of the challenge has been to find species that will provide year-round green feed to support our livestock and allow us to manage the watertable and erosion at the same time.

Traditionally, the island pastures contained silvergrass, capeweed and some clover, which failed to sustain livestock and did little to prevent land degradation.

During the summer months, a lack of green feed with these pastures meant we often faced Vitamin E deficiencies in our younger stock, preventing them from thriving.

We have a six-month growing season during the colder months, although this can reduce down to five months some years and expand to 10 months during other years in what is a variable climate.

Any growth we achieve during these months needs to supply feed for the rest of the year and the logical approach seemed to be that perennials would help us achieve this.

key points

- Kikuyu provides green summer feed, which maintains livestock and reduces the risk of Vitamin E deficiency in young stock
- Year-round growth means kikuyu can use water from the soil profile at all times
- Heavy grazing has little impact on the ability of kikuyu to persist, even during dry seasons.

farm info.

Case study: Trevor and Lyn Bolto

Location: Kangaroo Island, South Australia

Property size: 1000 ha

Mean annual rainfall: 500 mm

Soils: Sandy loam over ironstone gravel (duplex) with impervious clay

Enterprises: Sheep and wool production

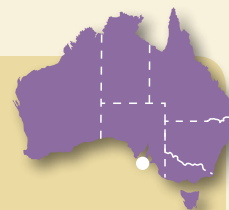


Photo: Lyn Bolto

Kikuyu may have ended Trevor (pictured) and Lyn Bolto's search for a pasture species that can provide year-round green feed for their livestock and allow them to manage a rising water table.

We also wanted to incorporate perennials into the system to use more water out of the profile and guard against salinity, which is a problem in our area. Although recent dry seasons have seen the water table stabilise, a few wet years might change this.

Painting the picture

We operate in a landlocked catchment and a significant rainfall event will see water run into a lagoon covering about 2000 hectares.

During 1992, a very wet year, the lagoon spread across twice the normal area and a visiting consultant advised us to revegetate 35 per cent of the catchment with trees.

While this appeared to be a logical solution from a sustainability perspective, trees are

expensive, require significant rainfall to establish and don't provide a fodder source.

This is really where the perennial pastures seemed to offer a better solution for us.

During the past 10-12 years, we have tried a range of perennial species including phalaris, cocksfoot and tall wheatgrass.

Although the phalaris establishes and persists successfully under our conditions, it can be toxic to stock in some years and requires careful grazing. As such it has a place in our system, but not on a whole-farm scale.

Cocksfoot and tall wheatgrass have failed to produce the feed supply we were chasing.



Unexpected success

It was during 2004 that we first trialled kikuyu on 20 ha with a low seeding rate (250 gm/ha) as a part of a shotgun mixture - including tall fescue, cocksfoot, tall wheatgrass and a few clover species.

The kikuyu has thrived and spread to cover at least 80% of the paddock – almost every seed must have grown!

During this time, the kikuyu has out-competed almost all other species.

The advice we have received since this first sowing was that we used an extremely low seeding rate, so I am keen to discover what we could achieve with a standard rate of 1 kg/ha, although this will be an expensive option.

I'm certainly look forward to seeing the results in a wetter year.

While improvements in productivity are hard to gauge at this stage, the pasture has certainly achieved the aim of providing green feed during summer.

In addition to pure dry matter the fresh growth provides a good source of protein.

I believe if you let it grow too high then the rank growth is poor quality but we haven't had that problem at this stage.

On the other hand, the kikuyu has withstood heavy grazing during this time.

The other side benefits include a reduction in wind erosion during summer and autumn.

Although I can't really judge the affect on salinity, I have found roots down to 30 cm which is fairly impressive.

Most of our soils are sandy loams over ironstone gravel and 30 cm down is clay. They tend to get waterlogged in wet years because the clay is nearly impervious to water.

Our soil is fairly acid, which can discourage many species, but the kikuyu seems resistant to aluminium toxicity, which occurs due to low pH.

So far we have had no problems with kikuyu at all really, it's very easy to look after. You can stack your sheep on it and they don't seem to be able to get rid of it. It may be more tricky if you are cropping in rotation with a kikuyu pasture, but that isn't a concern for us.



Photo: Lyn Bolto

Kikuyu rhizomes penetrate the soil surface, protecting them from heavy grazing by sheep.

We also tried Rhodes grass and setaria which are subtropicals, but they spread by runners on top of the soil whereas kikuyu spreads by rhizomes under the surface so is not as affected by close grazing. 🌱

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By Paul Sanford, EverGraze™

science behind the story

- The observations of Trevor and Lyn Bolto fit with the research experience with kikuyu on the south coast of Western Australia.

This region is characterised by sandy soils, mild summer temperatures and out-of-season rainfall. Trials show that in areas receiving more than 400 mm kikuyu can provide out-of-season green feed, consistently resulting in increased stocking rates and reduced supplementary feeding.

Kikuyu has been particularly impressive in the autumn feed gap when moisture availability is low and most temperate perennials cease to provide feed.

It has a deep root system that can go as far as 3 m in some soils and is a high water user, which can substantially reduce groundwater recharge and the impact of salinity.

The grass also protects the sandy surfaced soils of the region against erosion, particularly in autumn.

In all the research conducted to date kikuyu has resulted in increased stocking rates, compared with annual pastures, of between 40 to 100 per cent depending on rainfall. These increases have been achieved with continuous grazing highlighting the fact that kikuyu is a very grazing-tolerant and persistent species.

Forage analysis and livestock measurements suggest kikuyu is typically a maintenance diet, though it is possible to grow livestock at modest rates on a sward made up of mostly young leaf.

Broadleaf weeds such as capeweed are common in kikuyu swards, as the perennial most likely out-competes these species for moisture and nutrients at the break of season.

Given that the south coast of WA and Kangaroo Island in South Australia have similar soils and climate it is likely that the success of kikuyu in WA could be repeated on Kangaroo Island. Certainly Trevor and Lyn Bolto's experience suggests that will be the case.

- Paul Sanford is the EverGraze™ Trial Site Leader in South West Western Australia where kikuyu is being included as part of a range of on-farm trials.

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Fodder shrubs fill the summer gap and keep soils under wraps

A passion for running sheep, improving land sustainability and boosting biodiversity has seen Western Australian mixed farmer Don Nairn trial fodder crops. While the fodder shrub challenge is in its infancy, Don has been able to increase stocking rates and reduce or negate any soil erosion problems. Laureta Wallace talked to Don about the results so far and what more is needed to be known about fodder shrubs.

"I believe in running a mixed farming operation. In our situation that means cereals, lupins and Merino sheep," Don said.

There are different ways farmers can improve profitability in livestock and cropping and at the same time address sustainability issues.

To improve our livestock profitability we had to increase the stocking rate without causing soil erosion. Because we needed to double our Dry Sheep Equivalent (DSE) we had to come up with a different approach to running sheep. Running sheep the traditional way, that is, in small mobs in big paddocks, was financially unrewarding.

We decided to change the practice instead of changing the breed of sheep – enter strip or intensive grazing.

When we introduced the new grazing practices during 2004, an automatic electric fencing system enabled us to erect and dismantle temporary poly-wire fences.

The system fits onto our ATV and carries up to four reels of wire. Each reel holds up to 800 m of wire. The ATV mechanism is powered directly from the back tyre, with no mechanical adjustment needed. We carry plastic stakes or tread-ins on the ATV's carrier. The system is simple and quick.

key points

- Increased stocking rates required a change in grazing management from set stocking to strip (intensive) grazing
- High stocking rates have increased livestock profitability
- Fodder shrubs provide a grazing solution during summer.

farm info.

Case study: Don Nairn

Location: East Binna, Western Australia

Property size: 2476 ha

Mean annual rainfall: 320 mm

Soils: Red loam and yellow sandplain

Enterprises: Cereals and legumes, Merino sheep, fodder plantations



Photos: Greg Lawrence

The introduction of fodder shrubs has provided a summer grazing option for Don Nairn (above) that allows high stocking rates while still protecting fragile soils from wind erosion.

With the fencing system up and running we now have the new grazing system in place and the tools to manage it.

Strip grazing

Sowing fodder and cereal crops, then intensively grazing them at high stocking rates, has enabled us to maintain the Merino flock and increase profitability, even through the two driest years of the farm's history.

Now we can run higher numbers of stock during winter. But the question was what about summer? Where was the feed going to come from and what was going to happen to the country with such high stocking rates?

It is not practical to run a lot of stock during winter and then have to sell them in summer to a poor market.

Fodder shrubs

Our solution was to introduce fodder shrubs into our farming system, which has resulted in the following benefits:

- High stocking rates during summer without creating soil erosion
- Reduced costs and time spent supplementary feeding during summer and autumn
- A better environment for livestock such as shade and shelter



Shrubs such as *Rhagodia* help drought-proof Don's farm. INSET: A 54 hectare *Tagasaste* plantation planted during 2004 on high, wind-blown country. The paddock has been heavily stocked but there is no evidence of erosion.

- The ability to capture out-of-season rainfall
- A means of drought-proofing the farm.

We planted the shrubs on our marginal soil types that are prone to wind erosion. Shrubs are planted in cells of 2000 trees in six rows. Enough room is left between each cell for fodder establishment.

Using guidance navigation allows us to leave one, two or three passes of the seeder, depending on the soil type. This way the sheep can be run on marginal soil and the better soils can be cropped.

Lessons learnt so far

Fodder shrubs work if you like sheep and still want to protect your land.

There is somewhere to put the sheep and fill the feed gap during summer and autumn.

Tagasaste, *Rhagodia* and saltbush are suitable but we still need more varieties.

We also need to investigate the planting of fodder shrubs by seed, because of the high cost of seedlings across a large area.

Where fodder shrubs are incorporated with other pastures and crops, it helps restore marginal land and make farming more profitable.

There needs to be biodiversity on farms. Combining plant diversity with sound grazing management and embracing the animal's capacity to seek and deal with a diverse diet, offers good scope for moving forward." 🌱

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By Dean Revell, *Enrich*

science behind the story

- Don Nairn's management and visions make sense. He is demonstrating that modified systems incorporating perennial forage shrubs can be more profitable and sustainable. A key to Don's successful approach is the way he considers the whole farming system, rather than trying to manage a block of shrubs in the back corner of his property.

Forage shrubs effectively add a layer (physically and metaphorically) to on-farm forage production helping to build resilience to farming enterprises. The extra layer adds to the feed base during the critical out-of-season period (summer/autumn), which typically limits the livestock profitability.

Farming system analysts Felicity Byrne and Marta Monjardino have shown that a modest area (for example, about 10 per cent, depending on particular circumstances) of a 'typical' mixed crop-livestock farm used for forage shrubs can boost whole-farm profit by 15-20%, principally by reducing the expense of supplementary feed during summer/autumn. It also allows deferment of annual pastures at the

break of season, increasing carrying capacity. It is important to recognise that sufficient quantities of forage shrubs are required for them to be able to 'earn their keep', while bearing in mind the opportunity costs of planting and managing too many. The wide spacing between Don's shrub rows allows the establishment of grazing pasture or grain cropping is an example of how shrubs should be managed – that is, as part of the mix of farming enterprises.

There are sound economic reasons for Don's interest in the biodiversity benefits of shrubs, such as an improved capacity to deal with prolonged dry periods or out-of-season rainfall. We need to consider the way a mixed palette of plants can sustain farming enterprises and healthy landscapes rather than assessing individual plant species in their own right.

Don also indicates his interest in finding and using other shrub options to complement the tagasaste, old man saltbush and *Rhagodia* already established.

The *Enrich* project is screening about 60 species of Australian native shrubs

for a range of traits, including biomass production, nutritive value for livestock, and bioactive effects on rumen microorganisms and gastrointestinal parasites. We have put forward 20 species as being of particular interest at this stage. Some possess favourable traits in one or more areas, but rarely does a species meet all criteria.

Nine regional groups across southern Australia are participating in further evaluation of this short list, with each group planting 15 species to assess shrub performance in their own locality. Don Nairn will be hosting one such site.

This is a fantastic opportunity for researchers and land managers to learn together about new shrub options and how to best manage them.

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Perennials provide balance

With a non-farming background, David Holder and Robyn McClintock embarked on a steep learning curve when they returned to Robyn's family farm in 1994. Perennial pastures, crossbred ewes and a system that embraces an all critical balanced approach to life have become the basis of their farming system. David discussed with Catriona Nicholls the path they have taken since becoming involved in farming.

"Robyn and myself both spent some time in Sydney studying before doing some overseas travel. We were living and working in Canberra but found ourselves spending most of our weekends travelling back to the farm before taking up an offer to become actively involved in 1994 in the *Mannamite Pastoral* partnership with Robyn's parents Bob and Noeleen McClintock," David said.

"Robyn has established her own aquatic physiotherapy practice from home, allowing her to work alongside me during winter and early spring when we are sowing and lamb marking. During her busiest period, from September till May, Robyn works school hours so she can be there for our three children.

Balance is important to us as we have other interests outside the farm, and spending time away allows you to remain focused and enthusiastic about what you are doing. We are always trying to think of ways to make what we do more efficient and a lot of energy is devoted to working smarter, not harder.

Perennial pastures play a definite role in achieving that balance - firstly, they reduce the amount of feeding we do during summer, even with the recent dry seasons.

A new approach

When we first came back to the farm Bob was running a flock of Corriedales. We decided to focus on one sheep enterprise and put all

key points

- Perennial pastures reduce supplementary feeding and support a better life balance
- Soil pH and weed control is critical to successful lucerne establishment
- A lucerne/sub-clover approach provides year-round pasture growth and feed for livestock.

farm info.

Case study: David and Robyn Holder

Location: Cootamundra, New South Wales

Property size: 970 ha plus a further 364 ha leased

Mean annual rainfall: 550 mm

Soils: Clay loams

Enterprises: Balance composite crossbred ewes and mixed cropping (wheat, canola, triticale and oats)



Photo: Pamela Lawson

Robyn and David Holder (above) have found perennial pastures such as lucerne allow them to work smarter, not harder within their livestock enterprises.

our efforts into it. After an analysis of our soil types, topography, climate and general farm structure we decided that prime lamb production was most suited.

After 50 years of breeding his Corriedale flock, my father-in-law had a sound understanding of how to run a self-replacing sheep operation and we capitalised on his experience. Initially, we bought first cross ewes and crossed a portion of them with Coopworths to provide our ewe replacements. We joined the balance to Dorsets bought through a local ram buying group. More recently we have introduced Gromark rams to gain even more control of the maternal genetics of our sheep.

To support the enterprise change we needed to revamp the pastures. Back in 1994 there were a few old Australian phalaris paddocks and a couple of tired lucerne stands. No lime had been applied and the challenge was to establish some productive pastures.

With an urban planning background, the first year I spent on the farm I think I wasted a lot of time on a fergie tractor slashing thistles, making the farm look nice. I soon realised that tidy paddocks don't drive profitability or production.

While I didn't know agriculture, I knew how to research and assimilate information and got my hands on as much material as I could. I checked out what the neighbours were doing and sought out systems that were productive, but efficient at the same time.

Pretty much the things that work for us are fairly uniform across our area. We have a mix of lucerne/sub-clover pastures on the better soil types and phalaris/clover pastures on the lighter, sandier soils.

The phalaris pastures are important to our system for maintaining our composite ewes with a minimum of supplementary feeding, while the lucerne/sub-clover paddocks are critical for achieving maximum weight gains in our lambs.



We started by sowing pure lucerne stands during spring but found that in following winters we had too much bare ground between lucerne plants. Our advisor, Greg Condon, recommended sowing a mix of sub-clover and lucerne in winter to give us more groundcover.

Our confidence in pasture establishment has improved as we have acquired better technology. Five years ago we bought an Agrodriill and since then we have not had a failure in establishing a pasture – even in the most trying of seasons.

Ongoing improvement

Other things we have done to improve our system include looking at paddock boundaries in relation to topography, soil types and natural features. At opportune times we have changed fence lines to create more homogenous paddocks, that although still retain some diversity, enable us to crop and run sheep more efficiently.

Weed control is critical to successful pasture establishment. We clean our paddocks with a 3-4 year cropping rotation before establishing pastures under a final cover crop – usually with a hard wheat variety at a sowing rate of 10-15kg/ha. Pastures are retained until they decline in productivity – usually indicated by a drop in desired species plant density.

One thing I have observed anecdotally is the production of newly sown perennial pastures in their first year of grazing far outstrips pastures sown in previous years. This is particularly the case with lucerne/sub-clover paddocks and I'm unsure of the exact reasons, but think it must be linked to higher nutrient levels following the cropping phase and a lack of weed competition. Last season, undersown lucerne was growing out of the top of the wheat cover crop and our contract header driver couldn't believe his eyes.

It's tempting to graze paddocks like these straight after the header has gone out the gate, but you have to leave them alone during that first summer and autumn. When you get to the autumn break you can start grazing, preferably with lambs. In our district when you get to the third week in August in a normal season, you can be guaranteed that you won't be able to eat the feed off.

Keys to success

I'm fastidious about weed control – it is really important, especially with summer fallows, as keeping them clean conserves moisture and nutrients. Sowing technique is also critical, making sure you don't get too greedy with the cover crop.

Nutrient levels and lime are also important. Our soils are quite acidic and so regular testing is required to gauge whether a top up of lime is required to avoid aluminium toxicity before sowing perennial pastures.

Grazing management is just absolutely critical to the long-term sustainability of perennial pastures. We have cereal stubbles and phalaris paddocks that allow us to set stock our ewes over summer and avoid time-consuming hand feeding. Lucerne stands are managed a little differently.

Come late winter and through spring, we can bring ewes off grazing cereals and phalaris pastures to lamb on lucerne/sub-clover paddocks. After weaning in early November lambs are given preferential grazing treatment, while ewes are boxed together.

We are pretty happy with our system and aim to upgrade the last of our older paddocks in the next 12 months to get them back in shape for our lambing ewes in spring.”

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By Greg Condon

- **The team at Mannamite Pastoral (David, Robyn and Bob) work efficiently on key goals in their farm business. To achieve these goals they stick to a limited number of enterprises and manage them well. This includes prime lambs, wheat and canola, which are rotated with a pasture base of lucerne/sub-clover or phalaris/sub-clover.**

The management associated with each enterprise is carried out using modern practices, such as no-till seeding and tramline farming for crops or fodder budgeting and rotational grazing for pastures. A switch to late winter/spring lambing in recent years has brought added benefits in lower autumn feed costs along with increased lamb weight gain and pasture utilisation in spring.

Feed planning is a key feature of the grazing system at Mannamite. David and the team always plan ahead to determine what feed will be available for each class of sheep. This includes

locking ewes up in droughtlots during late summer/autumn to reduce soil erosion and to allow lucerne pastures a spell before lambing.

With a mid-winter stocking rate of 14 DSE/ha, grazing cereals such as wheat and triticale are used to minimise supplementary feeding costs during this time, when pasture growth rates are low.

When lambing starts during mid August the ewes are turned onto the lucerne/sub-clover or phalaris/sub-clover pasture for five weeks before being boxed and rotated in larger mobs during spring/summer. This is when the perennial pastures, such as lucerne, come into their own. With thorough weed control and fertility they can carry lactating ewes and lambs through to November and run the weaned lambs during summer with minimal supplementary feeding.

The Mannamite team manage their pastures with similar systems to those used for the winter crops. Weeds such

as Patersons curse and Shepherds purse are controlled and regular soil testing is carried out to gauge soil phosphorus, sulphur and pH levels.

Grazing management is a major driver of production with perennials at Mannamite especially during late summer/autumn. At this time the ewes are removed from the perennial pastures onto stubbles or into droughtlots to maintain groundcover and preserve plant carbohydrates for maximum production in late winter/spring.

- **Greg Condon, Grassroots Agronomy, works with producers to achieve practical and profitable outcomes for their business.**

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Lucerne and chicory – when opposites attract

To Don Price, lucerne and chicory seemed like the perfect match. A nitrogen-soaking non-legume, chicory had all traits of being the right mate for nitrogen-producing perennial legume, lucerne. But even with the science behind him Don Price was amazed at how well the pair hit it off. Today, on his southern Victorian property, Don is reaping the rewards of the couple's fruitful relationship enjoying more productive pastures, less weeds and better soil structure.

"We first started to sow lucerne and chicory together about 8-9 years ago," Don said.

"Today, the paddocks boasting the combination are as profitable as our cropping paddocks. During 2007-08 our best lucerne and chicory paddock yielded \$2000 per hectare as a result of the profit derived from silage and the lambs turned off it.

A lucerne paddock that was unable to maintain pasture production was the catalyst for the trialing of the combination. We decided to combine the lucerne and chicory as a possible remedy.

Now that paddock is probably one of our best pasture paddocks.

It is also of benefit that both species have a similar growth pattern.

Some paddocks have had sub-surface pipes installed in areas normally too wet to grow lucerne. However, we are finding the lucerne is drying the soil out so much that the pipes have almost nothing in them. Adjoining paddocks without lucerne and chicory still run.

All up about 21 per cent of the property's grazing land is sown to lucerne and chicory and we intend to expand that amount.

key points

- Lucerne and chicory work well as a mixture with complementary growth habits
- While lucerne puts nitrogen into the soil, chicory is a non-legume, which is a can use the extra nitrogen
- A lucerne/chicory mixture supports lamb growth rates.

farm info.

Case study: Don Price

Location: Cavendish, Victoria

Property size: 1000 ha

Mean annual rainfall: 650 mm

Soils: Sand over clay, heavy cracking clay, redgum podzol

Enterprises: Cereals, sheep (meat and wool)



Photo: Don Price

The combination of lucerne with chicory has proven to be a success for Don Price's lamb enterprise. Don sells heavier lambs early, leaving the following 60-70% to graze the lucerne, chicory pastures until they reach a target carcass weight of 20 kg.

During the past, in all paddocks, lucerne had tended to do better than the chicory. However, in 2007 the chicory did just as well, even six years after sowing.

The process

There was a degree of trial and error when we first started but to me it was also a common sense thing. Lucerne is a legume that puts nitrogen in the soil. Chicory is a non-legume that likes to take nitrogen from the soil. It just seemed sensible.

I also went on a study tour of New Zealand where producers were raving about chicory. The farmers there were reporting on how it was a great tool for balancing a sheep's diet.

Lambs tend to do poorly on lucerne alone due to the excess ammonia it puts in the rumen. It has a bit of a reputation for causing 'red gut'. However by mixing

lucerne with chicory this problem seems to be solved. Lambs do fantastically on the combination.

We lamb during July and wean early, running weaners on a combination of clover, ryegrass and phalaris. During that time we cut the lucerne for silage. When the initial weaning paddock has dried off, the lucerne paddock already shows signs of regrowth.

A portion of the heavier lambs are sold early. The remaining weaners, about 60-70% of the original number, are grazed on the lucerne and chicory combination. They are weighed regularly and when they make the weight are sold. We like to sell lambs at about 20 kilograms.

All lambs are sold over the hooks. They are weighed and fat scored by our agent before they leave the property.



We tailor our lambs to suit the market they are destined for. For example lambs of fat score 1-2 scores are sold to Castricum Bros and the better-rounded lambs are sold to Coles.

Marketing is very important – you can't just send a semi-trailer load of lamb to saleyards and hope for the best. That's just like taking a bundle of money to the casino and hoping you will come out on top.

Weed problems solved

The combination of lucerne and chicory is also a great weed control tool. It tends to fill in the gaps in and provides a handy groundcover.

We used to spray a lot but found it was resulting in too much bare area around the plants and as a result there was too much soil movement, which left soil mounds on the lucerne.

Another option is to combine oats, lucerne and chicory. This will increase winter feed and increase summer groundcover.



Photo: Malcolm McCaskill

Local interest in Don's lucerne and chicory combination is high with a strong turnout at a recent EverGraze™ field day.

Cutting the lucerne for silage also helps with weed control. All-in-all, weeds just aren't a problem anymore.

Thinking laterally

As members of the Southern Farming System Group we recently hosted an EverGraze™ field day focusing specifically on the combination of lucerne and chicory. I think

most of the participants were suitably impressed with the success of the pairing.

It gave people food for thought and demonstrated the benefits of looking outside the square. It was a pretty dry autumn here but the lucerne and chicory held up well.

We really need a wet winter now to refill the soil profile – otherwise, I believe, the lucerne might be drying the soil out too much.” 🌱

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By Dr Malcolm McCaskill

science behind the story

• Don Price is a producer who is often ahead of researchers in trying innovations. Our most recent experience with lucerne and chicory started four years ago. We sowed these species onto the well-drained crest areas of the EverGraze™ Proof Site at Hamilton. We didn't mix lucerne and chicory together, as we wanted to measure their production and water use separately. Instead, we sowed sub-clover into both the lucerne and chicory, to provide a legume for the chicory.

The initial stands were not as dense as we would like. We thickened the lucerne with a second sowing the following autumn. The chicory was thickened by allowing it to set seed during summer. Since then, new chicory plants have appeared each year through hard seed from the initial summer self seeding. This ability to self-thicken is an advantage chicory has over lucerne, whereas mature lucerne plants exude chemicals that restrict the establishment of new lucerne seedlings.

Our measurements of pasture growth and soil moisture started two years ago.

Growth of the lucerne-based pastures has averaged 12 tonnes/ha each year, of which 18 per cent grew between January and April when perennial ryegrass-based pastures lack quality and respond poorly to out-of-season rainfall. We were particularly pleased with the winter production of our SARDI7 lucerne, which averaged 53 kg/ha/day, compared with 44 kg/ha/day from perennial ryegrass. Previous varieties grew well during summer, but were poor during winter.

Chicory growth averaged 9 t/ha per year, of which 16% was between January and April. Its winter growth rate was relatively low at 28 kg/ha/day. Chicory is not a direct replacement for perennial ryegrass or phalaris, but a specialist high-quality forage to continue lamb weight gains into December and January, when the traditional pasture species have insufficient quality for animal growth.

Soil moisture measurements showed that both lucerne and chicory dried the soil out to a similar extent. Both species developed a dry soil buffer down to at least 3 metres, which can absorb excess soil moisture that penetrates the top

metre of soil explored by the root systems of annual plants. The dry soil buffer protects the soil from recharge to groundwater, reducing the threat of dryland salinity.

Lucerne grows poorly below a pH in calcium chloride of 4.8. While topsoil acidity is correctable by liming, subsoil acidity is too expensive to correct for agricultural purposes. Chicory has a greater tolerance of acid soils and is better able to cope with short-term waterlogging than lucerne. This means a pasture based on both lucerne and chicory is more resilient than one based on lucerne alone.

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future farm

PERSONAL STORIES FROM AUSTRALIAN FARMERS

🌱 *"Lucerne does fit in well with our system, mainly because we don't see rotational grazing as a barrier."*

Nick Trethowan, farmer, WA (see story, page 4)

🌱 *"Last season was probably our toughest ever but the two pasture system plots maintained their profitability with little need for supplementary feeding."*

David Robertson, farmer, Victoria (see story page 6)

🌱 *"The combination of lucerne and chicory is allowing our lambs to thrive."*

Don Price, farmer, Victoria (see story, page 14)

Future Farm brings you success stories from people adopting farming systems based on perennial plants that are making their farms, local landscapes and catchments more profitable and sustainable. Dryland salinity, climatic variability and other natural resource constraints threaten the long-term viability of regional areas. However, backed by innovation and good science, farmers are successfully managing these constraints and often turning them to their advantage.

FFI CRC was formed in July 2007 to build on the former Cooperative Research Centre for Plant-based Management of Dryland Salinity's work in making dryland agriculture in southern Australia more adaptable through innovative research, education and training, and commercialisation. The CRC promotes innovation in dryland farming appropriate to Australia's unique environment, and which will prosper in the long term.

For further information about FFI CRC visit www.futurefarmcrc.com.au



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