



future farm

PERSONAL STORIES FROM AUSTRALIAN FARMERS

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FUTURE FARM
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look to us

Phalaris beats the climate challenge

Providing flexible options in an increasingly variable climate

Future Farm hits the spot

After 18 months of the Future Farm Industries CRC (FFI CRC) establishment and the second edition of *Future Farm*, I can say with great satisfaction that momentum is gathering and significant progress is already being made.

Looking back now I must admit it was with some initial trepidation about 10 months ago we embarked on a redesign and content broadening of the highly-regarded *SALT*. Back then we recognised a new look was needed to create fresh and new approaches to stories and research in ways that were distinctive and memorable.

The positive feedback received from the first edition of *Future Farm*, reassures the right decision was made. To me it's clear that Kondinin Information Services has created a magazine that reflects the CRC and its intensions through stories, and a look and feel, that has struck a chord with our readers. Their efforts in delivering

high-quality publications on our behalf were recently recognised by the WA Rural Media Association, who presented Kondinin with the 2008 Award for Excellence in Rural Communications – in my mind a well-deserved accolade.

Another positive opportunity that has arisen from the first edition of *Future Farm* is the interest and support that FFI CRC participant Landmark has shown – support that has now taken the form of sponsorship and contribution (see pages 14-15). Landmark's involvement is further confirmation we are moving in the right direction, by creating a publication of high relevance to producers across southern Australia.

A relevance that continues in this edition as we go south to Tasmania to look at the success Simon and Penny Foster are having with Phalaris pastures on their property. West Australian farmers Trudi and Norm

Quicke share the benefits they have gained from having oil mallees for more than a decade and Cowell-Flats based farmer Scott Williams explains how he uses shrubs as supplementary feed in South Australia.

Among other stories we highlight the forthcoming *Prospects for profitable perennials in mixed farming systems* publication due out in early 2009. This publication captures seven years of CRC Salinity research and presents it as a regionally-based, easy-to-use landholder and advisor guide.

I hope you enjoy this second edition of *Future Farm* and I look forward to sharing the future successes of farmers who have embraced the use of perennials in their enterprises.

Kevin Goss

FFI CRC Chief Executive Officer



FROM LEFT TO RIGHT: Inside this issue of *Future Farm* Matthew Doyle, Bob Wilson and Scott Williams share their personal stories.

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

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For further information, contact FFI CRC on:

T: (08) 6488 8559

E: enquiry@futurefarmcrc.com.au

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our cover

Simon Foster is thrilled with the flexibility offered by phalaris.

- See full story page 12.

Photo: Catriona Nicholls





Perennials earn their place in mixed farming systems

Photo: Maree Doyle

Rising water tables, increasing soil salinity and predictions for less rainfall and higher temperatures have seen perennial forage plants dubbed a likely saviour for southern Australian farming systems.

A new publication put together by FFI CRC Researcher (UWA) Sarita Bennett, aims to inform farmers of their perennial plant options and how they can best incorporate the non-traditional forage into their cropping and grazing enterprise.

The *Prospects for profitable perennials in mixed farming* publication brings together seven years of research carried out by the former CRC for Plant-based Management of Dryland Salinity and provides perennial pasture options for farming regions across southern Australia.

“It takes a region-by-region approach based on temperature, rainfall and soil type,” Dr Bennett said.

key points

- A new *Prospects Statement* opens the door to information on incorporating perennials into mixed farming systems
- Perennials require more strategic management than annual pastures
- The latest *Prospects Statement* provides clear guidelines for species selection and management and is supported by practical on-farm case studies.

“During the past lucerne has been the most popular perennial, but this research also looks at other legumes, grasses and herbs.”

Benefits year after year

The right perennial forage plant can offer farmers out-of-season feed and a tool in the fight against salinity. But a decision to incorporate perennials needs to be carefully considered.

“In many cases farmers will be required to change their cropping and grazing strategies,” Dr Bennett said.

“For example, they will need to make a switch from one-year-on-one cropping to rotations of three or four years.

“Perennials also require more strategic grazing, so rotational grazing not set stocking is often a preferred option.”

The ultimate guide

For farmers, the *Prospects for profitable perennials in mixed farming* will act as the ultimate guide to perennial forages allowing them to quickly and easily find out what plants are suited to their area, the cultivars available and how they will add value to their operation.

“Farmers may narrow their options down to three plants and then take their information to an extension officer for more guidance.”

Dr Bennett said some farmers may have been deterred from perennials during the past, particularly lucerne, due to difficulties getting the forage established.

“Perennials can be hard to establish – some prefer to be sown during spring rather than autumn, which leaves farmers dependent on spring and early summer rain.

“By using the comprehensive guide farmers can become informed about what other perennials are likely to work in their area.”

Farmer case studies also provide practical examples of, where and how various perennials have worked.

“And while the case studies will be specific to certain farming areas, in many cases the same principles can be applied in other regions.”

A cost-benefit analysis of perennial plants compared with annual forage and supplementary feed is also included as well as details on the weed risk assessment employed by the FFI CRC.

The *Prospects for profitable perennials in mixed farming* publication is set to be released early during 2009.

“Finding new forage plants for Australia’s low-rainfall areas is a priority research area at the moment and there are some exciting things in the pipeline,” Dr Bennett said.

Extending the mix

Prospects for profitable perennials is the fourth title in the FFI CRC’s *Prospects Statements* series. The series aims to synthesise existing knowledge across a range of key farming technologies. The Statements address the case for current investment in the technologies, the limits and risks of applications, and future development opportunities. Other titles in the series include: *Lucerne prospects*, *Integrated forestry on farmland* and *Saltland Prospects*. 🌱

contact

- Greg Lawrence
T: (08) 6488 7353
E: greg.lawrence@futurefarmcrc.com.au



Keeping things moving

Four years after buying his grazing property near Yass, New South Wales, Matt Doyle is reaping the rewards of a rotational grazing system. Increased feed availability, improved groundcover, reduced land degradation and better biodiversity are just some of the benefits he shared with Catriona Nicholls during a recent chat.

“When we bought Glenryan at the start of 2004 it had been managed in a traditional manner, with continuous grazing on predominantly native pastures,” Matt said.

I saw the property as a blank canvas for me to make my own system.

I’d been exposed to holistic management previously, probably first during my time at Marcus Oldham during the early 1990s.

I see holistic management as a low-cost way to address land degradation issues such as bare ground, weeds, erosion and salinity.

The basic principles of such a system include allowing adequate rest after grazing and maintaining groundcover at all times.

This leads to increased soil organic matter, less run-off and healthy grassland with better water-use efficiency, which leads to more pasture and lower costs because we’re not having to use as much fertiliser.

Because we maintain groundcover we also have less weed problems and don’t have to spend time and money spraying.

Breaking up the boundaries

I manage the property in three parts; hilly granite country, pipeclay creek flats and strong clay loam country.

A third of our country is hilly granite with gravel ridges. I use this country for winter grazing, when the lower-lying areas can become waterlogged.

key points

- A focus on maintaining groundcover reduces weed burden and improves soil fertility and biodiversity
- Timing of grazing is critical to manipulate pasture species
- Perennial pastures combined with rotational grazing maintains feed year-round.

farm info.

Case study: Matt and Maree Doyle

Location: Yass, NSW

Property size: 1300 ha

Mean annual rainfall: 650 mm

Soils: Granite, clay loam and pipeclay

Enterprises: Beef cattle (440 breeding cows producing feeder steers)

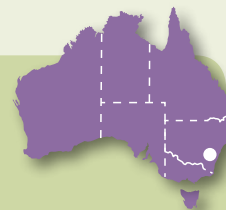


Photo: Maree Doyle

Matthew Doyle in a 30 ha paddock of tall fescue being grazed by cows and calves in his rotational grazing system.

This hilly country is original native pasture country, never farmed and not heavily fertilised. We set stock the cows here during August-September for calving.

We rest the hills during spring so they can grass up a bit before the summer storms. This area may be given a short grazing during summer but it is then rested through autumn to provide winter feed.

A lot of the native pasture on the hilly country is made up of perennial grasses that maintain feed quality through to winter and fill a winter feed gap. Instead of having a shed full of hay for winter feed, I use a paddock full of grass.

The timing of grazing these areas seems to be working. I have noticed greater water infiltration and less run-off on the slopes during summer.

In addition, a couple of spring and autumn rest periods on this country have led to more than 40 different plant species being found by CSIRO researchers working in the FFI CRC in developing its *Biodiversity in the paddock, a land managers guide*.

This added benefit has come out of a management strategy that aims to reduce run-off and erosion and improve grazing efficiency.

The breeding country

Then we have our pipeclay creek flats, where the cows and calves are run after calving through spring, summer and into autumn. This is where I am really focussing my improved pasture management. There are eight paddocks that we rotationally graze with all 440 cows and calves in one mob.

These paddocks are predominantly cocksfoot, phalaris, annual and perennial ryegrass and summer-active fescues with some areas of Yorkshire fog.

During 2004, we started sowing a more diverse pasture mix into this country. It includes lucerne, chicory, cocksfoot, phalaris and fescues and, so far, we’ve sown 50 ha and try to average 40 ha per year of this mix.

I also plan to further subdivide these eight paddocks. In the whole-farm plan, I’d like there to be about 40 paddocks, 10 ha each,



which can be grazed for two to four days on a rotation. This would allow for 80-160 days rest, depending on pasture growth rates.

Our old pasture paddocks are recovering with better management. Even aged stands of perennial ryegrass and cocksfoot are thickening up. The average stocking rate I'd like to get to on this breeding country (800 ha) is a cow to about 1.5 ha (about 10DSE / ha). We currently run a cow to 1.8 ha or about 8DSE / ha.

Keeping the best till last

The final third, about 400 ha, of strong clay-loam country is where the young stock are grown out. It is a mix of introduced and native annual and perennial pastures.

Steers and heifers are grazed in same-sex mobs across an area of about 400 ha, broken into 12 paddocks.

We are not sowing any pastures here. It's our best country and has pretty good biodiversity anyway. It's clean, doesn't have land degradation problems and seems stronger country with areas of shade and shelter. At the moment our pasture improvement dollar is better spent on our degraded country.

I recently went round one of these paddocks and there were patches of phalaris in one corner and microlena in another. This biodiversity is the result of the rotational grazing; one week on, five weeks off. I basically don't do anything on this country except manage the groundcover.

It is all in the timing

The steers are weaned during April and gone by the following January; the paddocks are rested until April. I think that is the time of year your land can get degraded in this area and with no stock pressure we are insuring ourselves against the autumn feed gap.

The same with the country the heifers are on. They are weaned in April and run through till October. We run them in and draft off the better-grown, well-structured replacement heifers and try to cull about a third into the spring restocker market.

Replacement heifers are joined for five weeks and then we pregnancy test and get rid of any that are not in calf.

By the time the feed starts to cut out during late summer, the mob of heifers rotating through the area is getting smaller with less grazing pressure. And then by the following April, after weaning, we bring on the new heifers, taking older heifers to join the cows on the pipeclay country after weaning.

I concentrate on keeping the cow mob on the breeding country to about 440 by culling aged and poor performing animals.

We are just starting to see the results of the change in management in terms of the volume of feed and biodiversity.

I'm really sold on rotational grazing. I haven't experienced a feed gap. It is like climbing a staircase that never ends: I



Photos: Maree Doyle

Cows and calves enjoying a productive spring with the cows score 3.5 or better for joining. INSET: A diverse sward of species on unimproved country during spring.

haven't had a moment where I've gone to move them and the next paddock isn't ready.

I also think perennials hold the key to ongoing feed availability. They make use of rainfall at any time of the year. During the past few years we've had a dry spring and rain during November. Annual systems don't benefit from this out-of-season rainfall like those with perennials." 🌱

contact

- Matt Doyle
T: (02) 6227 32280
E: glenryan@activ8.net.au

science behind the story

By Jacqui Stol, CSIRO

- As Matt has highlighted, there are many significant benefits of adopting a planned grazing system that provides long pasture rest which include increased groundcover, better control and flexibility of stock numbers and an ability to predict feed requirements. Such a system also provides opportunities for less grazing-tolerant plants and animals to prosper.

However, levels of fertiliser use and stocking rates, rather than a paddock being rotationally or continually grazed, were found to be the main influences on biodiversity with lower stocking rates and fertiliser use linked to higher biodiversity.

At this stage what Matt is probably noticing is an increase in abundance of those more grazing-sensitive species.

His observations of increased groundcover under rotational grazing

reflects that continuous grazing, particularly during drought, can lead to soil surface degradation, loss of perennial plants and breakdown of litter cover. A thick cover of native perennial plants and plant diversity are critical for managing climate variability. This biodiversity supports the potential of different plants to respond to rainfall at different times of year, and widespread perennial cover reduces wind and water erosion on hills in particular.

Exotic annual grasses and weeds often result from sustained high grazing pressure and fertiliser use – our research found exotic dominated pastures quickly collapsed under drying conditions whereas native perennial grass cover was resilient with little loss of overall live plant cover during periods of severe soil moisture deficit.

By reducing his inputs Matt is reducing his overall costs reflecting that rotational

grazing and native pastures are typically low input systems.

Native pastures with strong biodiversity and reduced or minimal fertiliser or other inputs play a vital part in overall farm management. Matt has clearly identified the areas of land more likely to provide a high return for his input – sowing pasture grasses and fertiliser on pipeclay creek flats – and realised his native pastures can provide an important role by filling seasonal feed gaps (along with protecting soils from erosion).

- Jacqui is a researcher with the Agricultural Landscapes Group within the CSIRO Sustainable Ecosystems Division.

contact

- Jacqui Stol
T: (02) 6242 1625
E: jacqui.stol@csiro.au

A decade of oil mallees gets results

The Quicke family from Kulin, Western Australia, started planting oil mallees during 1995 in a bid to curtail salinity and protect stock. Today, with more than 175,000 established mallees, Norm and Trudi are reaping the rewards not only of reduced salinity but a successful integrated tree cropping program. The hardy native trees have demonstrated a survival rate better than 85 per cent. Norm has had the most success in terms of survival and grazing preference, with oil mallee species *E. loxophleba lissophloia* and *E. polybractea*.

“We sourced local mallee species from the Kulin Tree Nursery and started planting along fence lines,” Norm explained.

“We have continued planting mallees – coupled with saltbush – on our lower country, since 2002.

We make our planting decisions with help of David McFall from the Upper Great Southern Oil Mallee Association. For the past three years the Avon Catchment Council’s Integrated Water Management – salinity/ integrated tree cropping program has also given their support.

This project provides seedlings and other support services and we contribute to the establishment costs and receive additional benefits based on the survival and performance of the trees.

Survival rates have been excellent and as a result the reward incentives have largely covered the establishment costs. We would have continued planting oil mallees regardless but the extra support has allowed us to carry out larger scale plantings.

key points

- Oil mallees have proven to be a handy weapon in the fight against salinity
- Strategic plantings can be combined with an integrated cropping and grazing program
- The development of a carbon trading scheme is set to offer more opportunities for farmers who have invested in oil mallees.

farm info.

Case study: Norm and Trudi Quicke

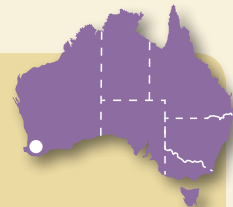
Location: Kulin, Western Australia

Property size: 1740 ha

Mean annual rainfall: 300 mm

Soils: Mostly clay with some loam

Enterprises: Sheep and cropping



Photos: Monica Durcan

Norm and Trudi, with daughter Macushla, have integrated oil mallees into their farming system and continue to plant up to 30,000 new seedlings each year. INSET: Norm and family have high hopes that carbon trading will provide further incentives for oil mallee plantings.

The benefits of mallees

The paddock we first planted to mallees had no trees and was becoming saline. We decided mallee would be best for both soil protection and salinity control.

If we had not put in the trees we would have lost more land to salt than the land we lost to the trees.

During the first six years the trees reduced the scalds – they decreased until there was only one left in the paddock.

But after the 2006 flood the scald problem started to return. The site was under water three times over 15 years, which killed a few trees and, as a result, some salty patches still remain in the ‘crab hole’ country.

Bringing it all together

We have integrated the mallees into our farming system. During 1998 we bought a 400 ha farm that had 13 square paddocks running across the creek line. We dismantled the fences and realigned and redesigned the land into four paddocks. We now farm these to suit the landscape, which has meant planting 10% of the area to mallees. We have also fenced and revegetated the creek line.

During autumn 2008, we planted 52,000 oil mallees over three days. We would continue to plant that many trees but it is a lot to handle.

We now plant 20,000-30,000 seedlings per year using two tree planters, a single and



a double row planter. This results in three rows, which seem to work well.

Mallee establishment

I crop twice before planting to reduce the weed burden and help the trees establish. I then run young sheep – less than 18 months old – and wethers in the trees when they are about one metre high and after a second crop.

Mostly it is unnecessary to overspray as the sheep clean up any weeds, as long as a knockdown is applied and a successful weed kill results before the trees go in. This year I did have to overspray quite a few trees because rain resulted in weed resurgence.

We now use a GPS to line up the rows – a much simpler option than the drums we used to use.

The location of the rows is marked with a ripper and in most years I rip again to a depth of 400 mm or deeper if possible – but it was not necessary during 2008.

Nowadays, I enlist the help of a local contractor to help with planting. The machines plant deeper and the trees seem to do better than when we hand plant.

Planting design

We have eight paddocks which operate under various configurations of belt layouts, some

trials and plantings along contours and creek lines (four rows below contours and four rows either side of the creek lines).

We have found that triple rows fit best with our system giving us a 10 m canopy width over 6 m of trees allowing six runs with the seeding machinery in between. We use a 21 m boomspray and 10.7 m seeder bar and machinery width played a role in determining the distance between our mallee belts.

I have set up the rows across the hill as much on the contour as possible so water will run into the crop and trees.

Lessons learnt

I believe there are three secrets to the successful oil mallee establishment: pre-ripping, weed control before planting and grazing younger stock during the first year.

Ripping – in most years I pre-rip to shatter the soil further out and then drive over the rips to break-up any clumps. I may go over the site again if the rips have not gone deep enough. Ripping when the soil is drier gives the best results – you can actually see the soil lift.

Weeds – trees will not grow when there is a weed burden during the first year so first season weed control is essential.

Grazing – the best results are with weaners but definitely graze sheep less than 18-months of age.

Access – I leave an access gap for machinery and to see the paddock easily. I've put in machinery access from corner to corner and paddock to paddock.

Plans for the future

We plan to plant another two paddocks of mallees during 2009, which effectively gives us about 45 ha under the trees. But as to how many more we will plant after that, it will depend on the carbon credit situation.

I believe we will be way in front when the time comes that every farmer is responsible for their own greenhouse gas emissions. If the Government or industry provide incentives to increase plantings to 15% of the farm we might well do the work having learnt from how effective integrated tree cropping can be.”

Acknowledgements: Avon Catchment Council

contact

- Norm and Trudi Quicke
E: merindah@westnet.com.au

By John Bartle, RSU

science behind the story

- There are several mallee species that have been selected for development in Western Australia. Mallees are eucalypts that have a characteristic multi-stemmed form and a lignotuber (the 'mallee root') just below the ground surface. The lignotuber carries numerous embryonic shoots that rapidly sprout or coppice if the tops are lost to fire or harvested as a crop. The mallee species now in widespread use were selected to suit the range of soil types and land conditions on wheatbelt farms. They include ones tolerant of salinity, acidity and waterlogging. All selected species are high in leaf oil, which is a potential product, as well as conferring a high degree of grazing tolerance. Mallee belts do not need to be fenced.

The attraction of growing mallee in belts is that they are high water users. In deep soils (without shallow groundwater) mallees quickly develop extensive deep (greater than 10 metres) and lateral (up to 20 m)

root systems. A couple of deep drilling investigations have shown that this enables mallee belts to form a wide, deep zone of dried-out soil. With good design of belt layouts, this dry zone can be used as a 'sink' or reservoir to intercept and store surface and shallow sub-surface water flows. Especially from lower slopes, surface run-off is a major source of waterlogging, recharge of groundwater and salinity on valley floors. If this water is captured by the mallee belt then water that would otherwise be a problem can be converted into mallee growth.

The development of mallee industries has been slower than hoped. Even with 15 years of research and development, farmer planting and experience, and assuming an efficient harvester is available, mallees probably still fall short of being commercially competitive with the annual crops and pastures of the wheatbelt. But, recent economic analysis undertaken by the FFI CRC shows that with the likely value of sequestered carbon under the new National Carbon Pollution Reduction Scheme

(\$20 per tonne carbon dioxide), mallee crops could become competitive with annual crops. Note that in this analysis, the effect of mallee belts in suppressing adjacent crops was fully accounted for.

The extensive planting of mallee undertaken by farmers like Norm Quicke and many others has generated invaluable experience and confidence in potential commercial mallee production. The resource they have built also provides confidence and potential early supply of mallee biomass to processing entrepreneurs.

- John Bartle is from the Revegetation Systems Unit (RSU) in the Department of Environment and Conservation (DEC) and also leads the FFI CRC 'Biomass Supply Assessment' project.

contact

- John Bartle
T: (08) 9334 0321
E: john.bartle@dec.wa.gov.au

Weathering the summer feed gap

Sand, deep sand, is what Lancelin farmer and *Evergreen* farming Group vice president, Bob Wilson runs his 1000 head beef cattle enterprise on. *Focus on Salt* magazine last caught up with Bob during 2006, a drought year, when he spoke of his success in sustaining summer feed and, as result, a hefty herd. Two years later *Future Farm* magazine can reveal that Bob's system of tagasaste and subtropical perennial grasses, continues to provide sustenance throughout summer.

"You should see our perennials after the out-of-season spring rain during November – they're growing like crazy," Bob said.

"Admittedly they may have been limited this year because they were not fertilised as a result of low cattle prices and skyrocketing fertiliser costs. But I've tried to be as creative as I can.

I started with the perennial fodder shrub tagasaste as a means to drought-proofing our property about 22 years ago.

Although we receive, supposedly, 650mm of rain annually our soil doesn't have the water holding capacity of other soils and so we need more rain, more often.

I have found it difficult to rely on annuals, such as subclover, alone. For example, this year we had a false break during April, which triggered germination, but with no more rain for three weeks we lost most of our annuals. It is the same problem with an early finish. Without our perennials in the system – this would have been a recipe for disaster.

key points

- Perennial grasses such as Panic, Rhodes Grass and Signal Grass as well as fodder shrubs such as Tagasaste can provide valuable summer feed for livestock
- A combination of perennial grasses, fodder shrubs, legumes and annual grasses has seen a Lancelin-based, beef farmer maintain heavy stock numbers while improving his soil biology.

farm info.

Case study: Bob Wilson

Location: Lancelin, Western Australia

Property size: 2000 ha

Mean annual rainfall: 650 mm

Soils: Sand

Enterprises: Beef cattle

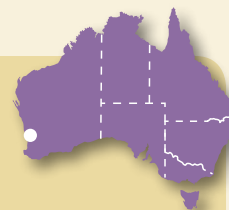


Photo: Tim Wiley

Bob Wilson manages the long Lancelin summer and the resulting feed gap with perennial pastures and fodder shrub, tagasaste. INSET: Bob regularly shares the results of his farming systems with other farmers and researchers.

We have about 1000 hectares of tagasaste and since 2003 have planted about 240 hectares of subtropical perennial grasses, mainly panic, Rhodes and Signal grass.

We still have some annuals in with the perennials, although these are mostly Brome grass, capeweed and of course blue lupins.

During spring all stock are run on the tagasaste, to prevent it from flowering.

This year, during mid-August the blue lupins really took off and I am hoping they will provide the perennials with nitrogen rather than me having to provide it out of a bag.

So far it looks like my wish might be granted – if the perennials is anything to go on – they look pretty healthy.

I really think understanding soil biology is the future frontier for farming. Something, that we don't completely understand yet, happens in the soil underneath perennials.

For example, during a recent drought Tim Wiley, (DAFWA) dug up two panic plants; the soil between the plants was bone dry but underneath the plants the soil was wet.

Underneath our perennials and among the tagasaste I believe we are building up mycorrhiza fungi. This could explain the moisture and also why we are getting a build-up of organic carbon under the perennials. The fungi also produce enzymes that convert immobile carbon to humus, which lasts for much longer in the soil.

Soil tests on our farm comparing annual pastures with perennial grasses show that the perennials are sequestering carbon in the soil at a rate of 7 tonnes of carbon dioxide equivalents per year. Tagasaste is sequestering carbon at a similar rate, but with about half the increase being in the soil and half in the woody stems and roots. At this rate of storage our perennials are actually a net sink of green house gasses.



Stocking up

We currently run 750 breeders and 300 yearling cattle and increased our carrying numbers during spring 2006 when we bought 500 breeders. We also took part in a *Grain & Graze* trial that saw us continue to carry big numbers throughout the drought – equivalent to those we would typically carry.

We ran the stock on a mixture of tagasaste and perennials and the whole experience emphasised the benefits of such a system. Some out-of-season summer rain fired up the perennials and we sustained the numbers.

I was a bit nervous carrying such high numbers. I knew the tagasaste would stand up because of its deep root system. But perennials have to be grazed and rested and I didn't know how long they need to rest.

With tagasaste and perennials we aim to graze up to 9DSE/ha. During last summer we carried more than 10DSE/ha on the tagasaste. Obviously, without the summer rain this high rate may not have been possible.

Nutritional value

I am still pleased with the nutritional value of the perennials although I think the younger stock might need supplements – probably partly as a result of not fertilising.

The system relies on rotational grazing. We lock up the perennial grass paddocks around August ready for the young bulls during

summer. Last year the young stock did not gain as much weight as I anticipated. Mature plants tend to be lower quality due to an increase in the fibre in the leaf. But, this is not to say the plants are not thriving and with recent late rains this year there is strong growth coming through.

I intend to consult an animal nutritionist to see, if supplements are needed and will get a plant leaf analysis carried out.

Fertiliser options

While I didn't fertilise this year, I'm not sure this is a sustainable practice. I'm thinking of trialling a non-traditional approach using biological fertilisers – compost tea, it's not biodynamics but biological.

At a recent conference in NSW I met and visited a Victorian farmer who is using it on crops. The cost comparison was about one third less using a biological approach, and yields last season were comparable to a more conventional neighbour.

It is quite labour intensive. This farmer applies the compost tea spray once during sowing and twice during the growing season – so that isn't a lot different to traditional chemical applications. He has volcanic soils, which after years of phosphorus application have locked up large amounts of fertiliser. He believes compost tea increases soil microbes that release the phosphorus.

Perennials – a growing trend

There is a lot of local interest in sub-tropical perennials. But due to a number of poor seasons and poor returns from stock, there probably hasn't been significant uptake. Up until this season, there is probably more than 100,000 ha of tagasaste and 30,000 ha of subtropical grasses planted in WA. About 7000-10,000 ha are subtropicals in the region this year. The most popular combination was Rhodes grass, Panic and Signal grass.

Panic performed slightly better than Rhodes grass under drought conditions around Geraldton, which could have been due to grazing management. I suggest sowing a mix that includes Rhodes grass. DAFWA trials suggest the more intensive the rotational grazing, the more vigorous the green panic. Having more paddocks results in higher stocking pressure when each paddock is grazed – but a longer rest between grazings. High stocking pressures stop cattle selectively grazing the panic plants. At low stocking pressures the panic gets hammered till it is weakened and outcompeted by the less vigorous Rhodes grass."

contact

- Bob Wilson

T: (08) 9655 1055

M: 0417 185 592

E: bobwilson@bordnet.com.au

By Tim Wiley, DAFWA

science behind the story

- Bob Wilson's farm has deep sands with very low water and nutrient holding capacity. These sands typically hold about 40 mm of water per metre of soil. So a subclover plant with its roots down 750 mm only has access to a maximum of 30 mm of water and would require rain about every 10 days during spring to survive. Consequently, annual crops and pastures do poorly on these coarse sands.

Tagasaste and perennial pastures have much deeper roots and therefore have access to more stored soil water. Tagasaste is known to root down to at least 10 metres. This depth of sand could store about 400 mm of rain, or about two thirds of the average annual rainfall at Lancelin. While the rainfall at Lancelin is strongly winter dominant, tagasaste can grow through summer by accessing winter rainfall that has drained to great depth.

The subtropical grasses are also deep rooted but not to the extent of

tagasaste. The maximum rooting depth of these perennial grasses is not known but live roots have been found at 4.5 m on deep sands. The subtropical grasses have a different photosynthesis pathway (C4) to other plants (C3). This C4 pathway allows them to use water more efficiently than other plants. The down side of the C4 plants is that they need more sunlight energy and higher temperatures than C3 plants for growth. So the combination of deep roots and a lower water requirement allows these C4 perennial grasses to persist through very dry summers and droughts. While these species and other subtropical grasses have been grown north of Perth for more than a decade without any problems, there is a low risk of toxicity. To manage this risk, its encouraged to plant a mixture of species to reduce intake of any one kind by livestock. Temperate (C3) perennial grasses such as phalaris, fescue and cocksfoot have not persisted north of Perth.

Underneath his perennials and among the tagasaste Bob is building up mycorrhiza

fungi. These are fungi that live in symbiosis with their host plant. The host plant allows these fungi to grow right inside the cells in the roots. The mycorrhiza then grows out into the soil and can exploit much more of the soil than the plants roots can. The plant provides the fungi with sugars for energy. In exchange, the fungi provide nutrients and water to the plant. These fungi produce enzymes that release phosphorus chemically in the soil, which is not normally available to plants. Trials by DAFWA in the region are showing more available phosphorus under the perennial pastures than under a

- Tim Wiley is a pasture agronomist and researcher with DAFWA.

contact

- Tim Wiley

M: 0427 779 430

E: twiley@agric.wa.gov.au

Enriching Cowell Flats

Eyre Peninsula, South Australia has a tradition of innovative dryland farmers – perhaps it has something to do with the presence for almost a century of the renowned research centre at Minnipa. Scott Williams is an enthusiastic follower of research and one of the extensive band of farmers across southern Australia participating in trials of forage shrubs. He recently shared his story with Bruce Munday, research manager for the Joint Venture Agroforestry Program, which is a partner in the *Enrich* project along with the FFI CRC, MLA and AWI.

“Traditionally we have cropped about 1200 hectares of country on a year-in year-out rotation. But the past few years have been exceptionally dry, averaging about 150 mm of rainfall per year and restricting the area we are game to crop,” Scott said.

“This has forced us to look at other options, and particularly how we might better integrate our livestock into the overall farming system where cropping seems to be increasingly problematic.

There is an area through here that we call the Cowell Flats, which has always been marginal for cropping. It is a fairly light grey-ash soil with some magnesia patches. In a good year it can be productive but realistically it has some pretty harsh soils which over the past few years has forced us to look at alternatives to cropping. The question then becomes: how do you make best use of it for grazing?

Over the years there has been quite a bit of interest in saltbush on Eyre Peninsula. Grazing shrubs certainly seem to make a lot of sense, but there probably hasn't really been enough attention paid to how to manage it, how to best fit grazing saltbush into the rest of the farming operation, and just what are the real productivity benefits.

key points

- Dry seasons have forced Scott Williams to investigate alternatives to cropping in problematic and marginal areas
- *Enrich* trials are helping Scott investigate the potential of woody perennials for fodder
- To date Oldman saltbush has been the star performer of the trials.

farm info.

Case study: Scott Williams
Location: Cowell, Eyre Peninsula, SA
Property size: 2200 ha
Mean annual rainfall: 300 mm
Soils: (on trial site) fine particle clay loam
Enterprises: Grains; wool



Scott Williams (left) and Neil Ackland (right) monitoring woody perennial trials at four months.

Photo: Tony Zwar

A couple of years ago we read about the CRC's *Enrich* project. The concept sounded really interesting, particularly as it seemed to broaden out the options beyond just saltbush and was looking at the sorts of questions that we were interested in.

Neil Ackland, who works with the Eyre Peninsula Natural Resources Management Board (EPNRM) in Port Lincoln, alerted us to the fact that the FFI CRC was looking for groups to set up regional trials and so encouraged us to apply. Seven farmers in the district saw this as a real opportunity for their area and Neil, with funding support from EPNRM, implemented one of these trials on our property.

Putting shrubs to the test

We have a one hectare trial site on our property measuring 200 m by 50 m where 15 varieties of woody perennials have been planted following deep ripping. We will be watching these shrubs with interest so that

we can evaluate their nutritional benefits and see how they withstand long-term grazing.

Magnesia and salinity is an increasing issue in this area, and as some of this site takes in those magnesia patches we can compare the shrubs growing under all soil types.

The shrubs are all varieties selected for our conditions and several are native to this area. The seedlings were raised by Dr Jason Emms from South Australian Research and Development Institute (SARDI) and planted by hand last July by the local farmers with help from GreenCorp volunteers. To be on the safe side we gave the seedlings a drink on the day of planting.

We are also trialling a new low rainfall vetch, Safeguard ryegrass and clover that may have future potential as an understorey in these shrub-based grazing systems.

So far the best performer has generally been Oldman saltbush, which includes the Eyre's Green, a saltbush selected and



propagated from a variety on Eyre Peninsula. But like everything else this year, most of these trial species are struggling. We had reasonable winter rain to get things going, but the season effectively stopped early in September. On top of that we had unusually strong winds, burying lots of the seedlings under the sand in their furrows that then crusted over following rain.

Where to from here

When you look at the trial site it would be easy to be disappointed. But then you have to remember it is just a trial with plants, many of which are unfamiliar to agriculture. Furthermore, we are planting into difficult soils in a season that has tested every plant on every farm – and it is not just the lack of rain, it has also been the wind.

We are still optimistic that we are on the right track with *Enrich*. As a group we have visited the main trial site at Monarto and seen some pretty impressive work with about 70 different prospective species. The amount of background knowledge accumulated there will be a huge asset.

We also visited Martin Wilkinson's property (see *SALT Magazine* Issue 13) at Snowtown where they have about 200 ha of excellent saltbush with understorey growing on some

pretty ordinary soil. One of the interesting things there is the way they manage their saltbush and integrate the grazing into their whole farm system.

It has been great to work with the research team. Not only do we have the benefit of all their accumulated knowledge, they also really value the local knowledge that we can provide. Together we make a pretty good team.

On the one hand we always knew this was not going to be a 'quick fix'. But on the other hand, the way our climate seems to be changing a 'quick fix' is exactly what we need.

Next year we will extend the trial site and start looking at grasses, particularly natives, between the rows. This is part of exploring opportunities for taking advantage of summer rains that traditionally are wasted on nothing but summer weeds." 🌱



Photo: Tony Zwar

Daniel Schuppan and Mary Crawford (both RSSA) at planting in July.

contact

- Scott Williams
M: 0429 949 471

By Neil Ackland,
Eyre Peninsula, NRM Board

science behind the story

- Until recently the trend on Eyre Peninsula was away from livestock towards more intensive cropping, all supported by improved plant nutrition, better disease and weed management, along with the well recognised benefits of reduced tillage.

However, the past few years have caused many farmers to think again. A string of not just dry years, but dry growing seasons, has seen many farmers reconsider their attitude to livestock. Climate change conditions which look as if they could be here to stay have increased the risk to single enterprise farming systems.

The appeal of livestock has been helped by quite healthy and stable livestock prices along with improved management practices including containment during extended dry periods. Along with this is the realisation that there are gains to be made from new forage systems which can be integrated into the whole farm structure.

The farmers in the Cowell Flats group are very keen to explore the possibilities with new forage options. They see this as an opportunity reduce the economic and environmental risks in cropping marginal land in a low rainfall environment.

The great thing is that they are a very assertive group – they don't just stand back and let the researchers use a patch of land – they actually influence the research agenda by the questions they ask, the propositions they put and the local knowledge that they inject into our planning.

The added advantage for them is that they are now 'in the loop'. They are part of a national research project that has interviewed producers who have been using shrubs as part of their forage system, and catalogued some of their experiences, ideas and production systems. This has been coupled with whole-farm economic modelling to test a range of scenarios that impact on the optimal scale and the profitability of using forage shrubs.

Enrich has now identified more than 100 species of shrub with potential for use as part of a forage system; 50 species are well established at the evaluation site at Monarto and now replicated in Condobolin, NSW and Merredin, WA.

This Cowell Flats group is now one of nine regional groups across WA, SA, Victoria and NSW with up to 20 species planted across a range of environments.

- Neil Ackland is senior consultant with Rural Solutions SA operating as a Landcare Officer under the Sustainable Farming Systems program for the Eyre Peninsula NRM Board.

contact

- Neil Ackland
T: (08) 8688 3401
E: ackland.neil@saugov.sa.gov.au



Persistence proves profitable

As distinct seasonal patterns become a thing of the past, Simon and Penny Foster, Ross, Tasmania are striving for pasture options that provide ultimate management flexibility. They recently shared the benefits of phalaris in their system with Catriona Nicholls.

“Coming out of three years of dry seasons, phalaris is proving its worth, particularly during the past month,” Simon said.

“Three years ago (2005) we had an incredibly good spring, the rain started during September and just kept coming. After a dry autumn we’d been aggressive in offloading stock before winter. Then it started raining and didn’t stop and we had feed coming out of our ears.

We had water in places that hadn’t seen water since the 1970s. All the grass took off and by the end of summer the phalaris was higher than the bonnet of the Landcruiser.

But since then we’ve been sitting on a rolling 12-month average between 300 and 350 mm of rain with no seasonal pattern.

My father would talk about seasonal patterns. But during his early days (60s and 70s) the rainfall anomalies were positive about the long-term mean and the landscape was wetted up. And even if rainfall during autumn was low, subsoil moisture was there.

They talked about autumn breaks and conserving fodder in spring and designed their systems around this.

I’d say from the early 80s we’ve moved into a period where the rainfall anomalies are negative and if you miss out on rainfall in key months it has a big impact.

We now tend to think that rain could come at any time and so we need a farming system that can flex a lot more – roll with nature more, as we can no longer plan on distinct seasonal rainfall patterns.

Nowadays, we probably have to plan on not receiving an autumn break, however we still plan for a spring and organise our feed

key points

- Phalaris provides the ability to be flexible in terms of an unpredictable climate
- The ability to survive extended dry periods outperforms many other traditional species
- Establishment of perennial species such as phalaris is a valuable long-term investment.

farm info.

Case study: Simon and Penny Foster

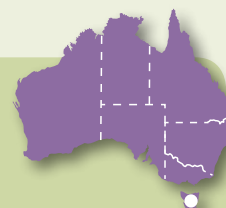
Location: Ross, Tasmania

Property size: 7780 ha

Mean annual rainfall: 450 mm

Soils: Highly variable ranging from black cracking clay through to sands

Enterprises: Fine wool Merinos, prime lambs, beef cattle, irrigated lucerne, cereals



Photos: Catriona Nicholls

Phalaris is providing Simon Foster with a pasture option that supports flexibility in an unpredictable climate. INSET: The superior ability of phalaris (background) to take advantage of opportunistic rainfall when compared with annual species (foreground) is obvious.

demand to match the feed supply during this period.

Our farm advisor has a strong focus on planning but we haven’t entirely got our heads around that because it requires a real shift in our thinking. We’re happy to design a system that doesn’t rely on an autumn break, we just haven’t done it yet.

There’s always a positive to what can appear as a negative situation. Recently, high grain prices seemed negative, but they have forced us to destock earlier and more aggressively than we would have done had prices been lower. During the past we may have kept those sheep, which would have had a negative impact on the pasture base and our mental health from the monotony of dragging grain bins around.

So high grain prices meant we have faced decisions differently and it has been positive for all sorts of reasons.

Phalaris – the survivor

My father was somewhat ahead of his time and started sowing phalaris in the mid 60s, when it wasn’t a common practice in the

district. He saw phalaris as making sense because it was perennial, deep rooted and by all accounts it would survive dry seasons and grubs. He sowed a mix including phalaris, cocksfoot, perennial ryegrass, white and subclovers because he had a view that across a paddock plants would find a niche within it.

During the past year, I have objectively assessed the species diversity in our paddocks and groundcover. What we’re left with after 40 years is phalaris and subclover – the ryegrass has gone, cocksfoot has survived in places, but disappeared in others.

Phalaris is persisting in our environment and with our grazing regime – which I describe as ‘flexible’. We set stock when appropriate and rotate when appropriate.

We’ve just come out of one of the driest Octobers on record and wettest November for 24 years – you’ve got to be so flexible with your grazing in those circumstances.

During October it looked like February after a poor spring and now after approximately 70 mm of rain it looks like early September – over just four weeks.



Photos: MAIN: Carriana Nicholls, INSET: Penny Foster

The difference four weeks and rain makes: MAIN: December 3, 2008 INSET: November 5, 2008.

Acting accordingly

When it started to rain, we moved the sheep off the perennials to allow the pasture to take advantage of the rain. The annuals were already setting seed and drying off, so we stocked those and used some of our irrigated lucerne to hold the stock until the phalaris pastures recovered sufficiently to graze.

The other key thing about phalaris in this environment is that it survives. Yes, it has an establishment cost but you can spread that across 40 years. You might have to re-sow a species such as ryegrass every eight years.

We've got paddocks identified that currently contain annuals that we will sow down to perennials. And I think we will sow phalaris

and we won't sow ryegrass because it doesn't persist. Although, I am always open to new species and keen to run trials for complementary pasture species.

Phalaris toxicity

People talk about phalaris toxicity and poisoning and to be honest, I've never really considered it. I would go as far as saying we haven't lost a single animal to it – but on the other hand, we've lost sheep to ryegrass staggers.

Our veterinary consultant recently said 'there has been more sheep lost in the Midlands of Tasmania due to a lack of phalaris rather than phalaris toxicity'.

One thing about phalaris is that it doesn't fit croppers' programs because they want a short-term grass solution to include in their rotations.

Long-term investment

The thing about phalaris is that in establishing it you need to take a long-term view and do everything right in terms of paddock preparation. It needs to be sown into adequate moisture and you can't be too quick to graze it – as farmers we can often be impatient, we see the green pick and it's very tempting to graze it immediately.

We sow the pasture, allow it to set seed and then it is two to two and a half years before we really consider the paddock to be in the system – you can bring it all undone if you rush the system.

You've got to take that long-term view. We've seen phalaris pastures that have been here for 40 years and if you look at it like that it's not a long time – it is a sound investment that offers flexibility in an unpredictable climate." 🌱

contact

- Simon Foster
M: 0419 536 662
E: sifoster@bigpond.com

science behind the story

By Sandy McEachern, Holmes Sackett

- **Highly profitable grazing systems are continually compromising between what is best for the pasture, what is best for the livestock and what is best for the wallet. For Simon Foster, phalaris has proven to be a species that can handle these compromises.**

Many producers get caught up with using species that do well at particular times of the year. Other species do respond better at various times throughout the year and phalaris can only be considered a second runner in most instances. But better responses are worthless if the species dies under tough commercial and climatic conditions.

Phalaris will never be the top performer at any one time of the year but because of its sheer persistence in the longer term it is the most profitable option.

I think Simon's observations on his pasture species diversity is also

important. Why sow a mix of perennial species when only one is going to survive? If producers identify that other species don't persist, sowing a mix only aims to leave gaps in the pasture for annual weeds to fill down the track.

While all care must be taken in its establishment, Australian phalaris is notorious for its persistence when established and can present a weed risk in certain locations. As persistence is the number one profit driver for perennial pasture establishment, Australian phalaris has proven to be the best value for money. You can kill it, but you have to try hard.

I would argue there is still a seasonal pasture production pattern in Simon's local area, in as much as spring generally offers better reliability than autumn. Strategically, their system is designed around a better spring, for example lambing and calving times are chosen to match seasonal peak pasture production.

But in terms of variability within in each season Simon has the flexibility to make tactical decisions as the season plays out because of his perennial pastures.

As Simon points out, the common perception that phalaris toxicity is a significant barrier to adoption doesn't really match with reality. The stock losses associated with toxicity pale into insignificance when compared with the potential production benefits gained from having a persistent perennial pasture option.

- **Sandy is a Director of farm consultancy business Holmes Sackett and provides strategic reviews of farm performance, farm business plans and management systems.**

contact

- Sandy McEachern, Director
T: (02) 6931 7110
E: sandy@hs-a.com.au



Perennial pastures extend the growing season

Kevin and Elly Moir from Wilga, south-west Western Australia are progressing their aim of boosting autumn and summer feed for their sheep with the help of perennial pastures. Kevin explained to Rob Kelly how their farm has undergone a series of evolutions in farming practice.

“We went from the old butter fat dairy days through to beef and sheep and a little bit of cropping to now where we have exclusively a sheep enterprise,” Kevin said.

“Even our sheep enterprise has evolved.

We used to run a self-replacing Merino flock with a focus on wool, but with the return from lambs I wanted our sheep to put on more body size and get the lambs to grow out more quickly.

So we decided to mate our Merino ewes with Dohne and White Suffolk rams for prime lamb production. And that’s what we’ve done the past couple of years.

Lambing used to happen during July and August but we’ve been moving that forward to June and July to reduce problems with flystrike and grass seeds.

We’re hoping to overcome some of the grass seed problems with the introduction of perennial pastures.

Bridging the gap

What I was aiming to do with the perennial pastures, especially with a late break scenario, was bridge the feed gap by having plants already in the ground and established to produce more early feed.

The previous annual pasture base was almost exclusively clover, which is slow to establish, especially in cold conditions.

key points

- **Timing of sowing can impact dry matter production significantly for perennial species**
- **A carefully selected species mix will outperform a single species perennial pasture base**
- **Red-legged mite control can be critical, particularly in pastures containing plantain.**

farm info.

Case study: Kevin and Elly Moir

Location: Wilga (20 km north of Boyup Brook), Western Australia

Property size: 600 ha

Mean annual rainfall: 700 to 800 mm

Soils: Highly variable, from sandy gravel to heavy

Enterprises: Wool and prime lambs

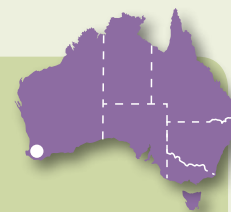


Photo: Courtesy of Landmark

Perennial pasture species are helping Kevin and Elly Moir of Wilga boost pasture production, extend the growing season and control the water table.

To boost the clover, we planted a number of annual ryegrass varieties to try and put a bit of balance into it.

But annual ryegrass is very competitive and in some places choked the clover out completely.

It was then we decided to go for perennials and of course, annual ryegrass can snuff the perennial plants out too.

We started planting of perennial pastures during 2002 and in that year we sowed during May and June and they did extremely well.

I put nearly half my farm into perennials last year. On the dryer areas I planted a mix of tall fescue, phalaris, cocksfoot, chicory, plantain and clover.

We also sowed a mix of lucerne, chicory and plantain in another three paddocks intended for high-quality silage.

Timeliness proves critical

Delays caused by the unavailability of seed and difficult weather conditions taught us that sowing date is critical for the perennial species.

The difference between sowing earlier than later was probably 1000 tonnes of silage and probably 300 rolls of hay during the first year – it was substantial.

You’ve also got to get rid of the ryegrass before seeding so we used a double knockdown herbicide spray.

We direct seeded the perennials like a crop and they were sown with a pasture renovator fitted with presswheels.

Reduced herbicide options

The grass and broadleaf mix limits your herbicide options, so the pre-sowing weed control needs to be effective.



With the lucerne, plantain and chicory mix we could spray out the ryegrass and corkscrew (*erodium*) with Verdict.

Lucerne establishment challenging

Another thing we've learnt is that establishing lucerne can be a challenge.

I read an article from the eastern states that said you can get a lot better feed value from lucerne if you mix chicory with it.

It seems to complement the diet of our sheep and we've found where the lucerne hasn't established well, the plantain and chicory has done really well. Plantain does particularly well in our region.

However, a key thing to watch with plantain is Red-Legged Earth Mite (RLEM). See



of the plantain I put in earlier has been devastated by mite attack. They seem to prefer it to anything else.

We now use the Timerite risk calculator and Lemat to keep on top of the mites.

Suitable species for the wetter areas will be an another ongoing evolution and I'll have to consult my Landmark agronomist, Sam Taylor as to how to handle that one." 🌱

contact

- Kevin Moir
T: (08) 9766 1046



Photo: Courtesy of Landmark

Caption/ / / / /

Supported by



an increased rate compared with annual species, lengthening the season to a degree and reducing the reliance on supplementary feeding. I have seen large surpluses of conserved fodder available on Kevin's farm during August the following season, indicating this system allows him to have at least 12 months feed supply up his sleeve.

The process of replanning his farm fencing and increasing the number of paddocks is another major key in the success of this system for Kevin. Smaller paddocks mean that short term stocking rates can be increased in perennial paddocks, and this then allows longer periods of recovery between grazings, a critical success factor for perennial pastures.

- *Sam Taylor has ten years experience in commercial agronomy with the last six years in the South West of WA. Sam is contracted to Landmark and specialises in pasture production and in particular establishment of perennial species.*

contact

- Sam Taylor, Landmark
M: 0429 332 593
E: sam@agvivo.com.au

science behind the story

By Sam Taylor, Landmark

- **Wilga, located in south-west WA between Donnybrook and Boyup Brook, is an area that is susceptible to many frosts each season. With cooling conditions at the end of autumn when the traditional season break arrives, annual pastures are often slow to establish and a feed shortage generally occurs prior to the onset of lambing. Using perennial pastures has allowed Kevin and Elly to increase the available feed supply at this critical time of the year.**

Having the plants already established at the break of the season, means the perennial pasture is ready for grazing earlier than comparative annual pastures, with an increased amount of high-quality dry matter.

Perennials make better use of the favourable growing conditions at the end of autumn that helps build a feed wedge (surplus) going into winter, which is critical for lambing and helps manage the risk of a false autumn break.

The use of several species in the mix has allowed pasture production to be increased across the variable soil types of the property. As an example, lucerne will not do well in the lower parts of the landscape where waterlogging can be intermittent. However, it does extremely well on the gravel hills where

it can put its roots down to depth and utilise excess soil moisture.

Five-year old lucerne stands that Kevin had established previously have persisted extremely well. The broadleaf herbs (chicory and plantain), maintain growth rates during winter as they can catch more sunlight and are better adapted to areas not suited to lucerne.

The perennial grasses are newer to the system, however we are confident of increasing production with them as Kevin employs a system of rotational grazing, critical to the survival of perennial species. They are suited to the environment and hardy enough to survive, so after the critical establishment phase they should add value to the system.

Late spring feed production is generally good in the south-west, however the use of perennial species allows high-quality fodder to be conserved as the vegetative phase of the perennials lasts longer than annual species and the fodder is conserved later than annual pasture paddocks when weather conditions are generally more favourable. Utilisation of annual pastures is then increased as the perennials become the focus of fodder conservation and annual pastures are rotationally grazed at this time. Perennials also recover post cutting at

future farm

PERSONAL STORIES FROM AUSTRALIAN FARMERS

“If we had not put in the trees we would have lost more land to salt than the land we lost to the trees.”

Norm Quicke, farmer, WA (see story, page 6)

“You’ve got to take that long-term view. We’ve seen phalaris pastures that have been here for 40 years and if you look at it like that it’s a sound investment.”

Simon Foster, farmer, Tasmania (see story page 12)

“I put nearly half my farm into perennials last year.”

Kevin Moir, farmer, WA (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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