Evergreen FARMING

incorporating

Western Australian Lucerne Growers

Newsletter of Evergreen Farming September 2009

Sheep hiding in a Tall Wheat Grass stand at Tambellup on a misty winter morning. This stand was sown in September 2007 by Justin and Kim Taylor. It was harvested for seed in February this year and produced 200 kg/ha of clean seed. These wether hoggets have grazed the paddock since May and have clearly enjoyed it - gaining an average of 6 kg each. Not bad considering 300 of them are running on the 8 ha paddock! Only a small amount of supplement has been fed during this time. Imagine how useful a paddock like this could be for giving lambing ewes extra shelter. Photo Sam Taylor 10 Aug 09.

Inaugural GAI Award

Reported by Bob Wilson, Evergreen Farming / Tagasaste Farm, Ph: (08) 9655 1055.

On May 28th and 29th this year the National Business Leaders Forum (NBLF) was held in the Great Hall at Parliament House in Canberra. The theme was *Redesigning the Global Economy: turning risks into sustainable business opportunities.*

Using the lobbying prowess for which she is noted, Dr Christine Jones managed to convince the organisers to include a session devoted to the topic of 'Carbon Solutions: Australia's Soil Carbon Leadership'. The panel included a number of leaders in the push for the acceptance that Australian soils could build up soil carbon, and therefore farmers adopting these processes should be rewarded for this action.

Dr Stephen Joseph (CEO Anthroterra Pty and Visiting Professor UNSW) gave a very interesting background on the reasons why Biochar should become a mainstream soil additive that also should be able to attract carbon credits.

Adrian Lawrie (LawrieCo Biological Fertilisers) gave us an insight into how he has built a sound business based on helping farmers adopt biological farming practices. His company now employs over 20 people, many of these agronomists who have a scientific background.

Dr Christine Jones (Australian Soil Carbon Accreditation Scheme) gave a concise appraisal of the benefits to agriculture and the world in general, of farmers adopting land management strategies that build soil carbon. She listed some of these as - enhance biodiversity, increase biological activity, sequester carbon, activate soil nutrient cycles, restore water balance, improve productivity and create new topsoil.

Michael Costello (CEO of the ACT power company actewAGL - among many other hats he wears) spoke about his company's keenness to utilise offsets from soil carbon, when and if it was accepted by government that soil carbon increases could be measured and verified as being long term.

The Chair of the panel was Dr John White, executive director of Ignite Energy Resources. This company has developed technology to treat low value brown coal, and produce a high value black coal plus oil. Part of the system produces biochar which can be used in agriculture. They believe the whole process will attract carbon credits.

And finally, as the token farmer, who was at the forum to receive the inaugural GAI Award, I managed to present an overview of what the Evergreen Farmers of WA already 'know'… That by changing from an annual based farming system to a perennial based one we are able to increase our build up of soil carbon.

Bob Wilson receiving his award from Tony Burke, Christine Jones and Alan Hill.

The GAI Award came about following the ABC Landline program which featured the work of Dr Christine Jones, and her fight for farmers to be recognised and rewarded for sequestering CO_2 from the atmosphere and turning it into soil carbon.

A retired businessman from Sydney was so impressed with what Christine was doing that he contacted her and offered to help. Her response was to suggest that he put money up for an annual award that recognises a farmer who had been carrying out innovative practices that built soil carbon, as well as being prominent in promoting their benefits.

And so the A & K Hill Green Agriculture Innovation Award was instigated, with myself as the inaugural winner. The recipient receives $25,000 along with the plaque. The donor Mr Alan Hill has promised to support the award for another four years.

The inscription on the plaque reads:
The A & K Hill Green Agriculture Innovation Award recognises outstanding leadership and innovation with respect to the adoption of yearlong green farming practices that build carbon-rich topsoils, foster secure, resilient agricultural production, restore ecological balance and enhance landscape function.

The presentation of the award was made at the NBLF dinner, and although the time was limited I still managed to promote agriculture as a potential answer to the climate change issue, not part of the problem! Unknown to me at the time Tony Burke was in the audience and I was very pleased when he leapt up after the presentation and introduced himself. During a quick conversation he agreed to host a meeting with myself and Christine Jones in his office the following Monday to discuss the challenges of the agricultural industry.

But that story is for another day…

Committee Column

Erin Gorter (President), Kojonup

Finally it seems like we have had a 'proper' traditional winter where the wellington boots have been put to good use, along with ropes, chains and snatch straps! I think many districts have their own stories to match their conditions, but there has certainly been no shortage of bogging stories in our area. On our own property it has been interesting to note in the paddocks where we have perennials growing we have no concerns about getting bogged. The paddocks have been driven over all winter with no worries about long walks home to get the tractor. Unfortunately, I can't say that for all our paddocks! Let's hope everyone gets those all important finishing rains.

In July, the committee travelled to Geraldton for a meeting and field day. What an amazing day we spent driving from Geraldton to Binnu to Nabawa then back to Geraldton. Quite an eye opener for the 'southerners' among us. Inspiring stuff to say the least! It never ceases to amaze me the innovation happening throughout our state by farmers. Fancy being able to grow a productive pasture in a paddock where four wheel drives get sand bogged down to the axles! Not sure if we managed to get a photo of our friendly life member and perennials guru, Tim, as we pushed him out!

The Evergreen Farming AGM is coming up and I urge all interested members to attend if possible. Our AGM is a great opportunity to have input into your group and meet the committee members that work on your behalf. This year we have linked it with a field day in Gingin to add to the value of the day. There will be a number of properties visited to give an insight into some of the work happening in the region. Attendees will see a wide selection of paddock scale perennial plantings of different species, hear more about latest establishment techniques, rotational grazing and much more. I look forward to meeting many of you on the day.

Committee Exposé

Jim Wedge, Binnu

Jim Wedge's farm "Wileri" is located in the very north west of the agricultural area at West Binnu. Kalbarri is but a short drive away. 1,200 of the 2,000 hectares is arable, and the average annual rainfall is 400 mm. Soil types vary from heavy loams, where cropping predominates, to deep sands where perennial pastures are the only option. Approx. 50% of the farm is cropped each year to a mix of wheat, lupins, canola and oats. A herd of Angus breeding cows runs on the other half of the farm that is in pasture, occasionally sharing it with ex-pastoral cattle taken on as agistment. Jim grows out the progeny from his Angus cows on perennials to produce grassfed steers and heifers which he markets under his own "Wileri Beef" brand.

The deep sands have been gradually sown to both tagasaste and subtropical perennial grasses over the last 6 years, with only 100 ha of annual pasture left. Perennials are grown to improve productivity but also to maintain ground cover and to build some life in the soil. All pastures are rotationally grazed. Pasture cropping and no-kill cropping have been trialled in 2009 with the main aim being to improve winter feed for livestock, and possibly grain production, but also to build soil organic matter (through greater biomass). A new paddock of perennial grasses has been sown this Spring using tramlining with 2 cm accuracy so that future pasture cropping efforts can be more precise (with crops planted just to one side of the perennial plant crowns). Jim's aim is to have all his sands and some of his loam planted to perennials, with much of this cropped over to improve productivity and soil health, and to gain an income from carbon credits!

2009 COMMITTEE

President

Erin Gorter - Kojonup
Ph: (08) 9833 7524

Vice President

Bob Wilson - Lancelin
Ph: (08) 9655 1055

Secretary/Treasurer

David Monks - Badgingarra
Ph: (08) 9652 9277

Committee

Bob Leeson - Lancelin
Ph: (08) 9655 1785

Charlie Hick - Narrikup
Ph: (08) 9845 3076

Phil Chalmer - Esperance
Ph: (08) 9076 6092

Marcus Sounness- Borden
Ph: (08) 9827 9277

Luke Caelli - Ravensthorpe
Ph: (08) 9835 7050

Stuart Bee - Jerramungup
Ph: (08) 9835 5030

Jim Wedge - Binnu
Ph: (08) 9936 6366

Rob Rex - Wagin
Ph: (08) 9862 6067

Executive Officer

John Duff
Ph: (08) 6272 4545

Agronomy

Philip Barrett-Lennard
Ph: (08) 6272 4545

Administration

agVivo Pty Ltd
PO Box 645
BELMONT WA 6984
Ph: (08) 6272 4545
Fax: (08) 6272 4555
admin@agvivo.com.au

Mycorrhizal fungi - powerhouse of the soil

Christine Jones, Amazing Carbon, Ph: (02) 6772 5605.

The soil foodweb of microflora and microfauna constitutes an underground engine of fundamental significance to plant productivity. Mycorrhizal fungi play a key role in the functioning of this foodweb, drawing down atmospheric CO_2 as dissolved organic carbon (DOC) and providing much-needed energy for the soil ecosystem. Mycorrhizal fungi also improve aggregate stability, enhance soil structure, build stable soil carbon, improve plant water use efficiency and increase the efficiency of utilisation of important nutrients like phosphorus, sulphur and nitrogen.

Agricultural research tends to focus on conventionally managed crop and pasture lands where loss of diverse perennial groundcover and/or intensive use of agrochemicals, have dramatically reduced the number and diversity of soil flora and fauna, including beneficial microbes such as mycorrhizal fungi. As a result, the potential contribution of microbial symbionts to agricultural productivity has been greatly underestimated.

What are mycorrhizae and how do they work?

Vesicular arbuscular mycorrhizae (VAM) are 'obligate fungal symbionts', meaning they must form an association with living plants. They acquire their energy in a liquid form, as dissolved organic carbon, siphoned directly from actively growing roots. Mycorrhizal fungi cannot obtain energy in any other way. They have mechanisms enabling them to survive while host plants are dormant but cannot survive if host plants are removed.

Mycorrhizal fungi produce thin, hair-like threads of cytoplasm (hyphae) with a hyphal tip at each end. One tip enters a plant root and the other tip explores the soil matrix. Although the hyphae are small in diameter (usually less than 10 µm), the mycelial network can extend across many hectares.

Mycorrhizal fungi have a fan-shaped architecture (Fig.1), with long runner hyphae branching into networks of narrower and narrower absorbing hyphae. There can be over 100 hyphal tips at the end of each runner. These networks extend from the root system into the bulk soil, well beyond the zone occupied by the roots and root hairs. The absorptive area of mycorrhizal hyphae is approximately 10 times more efficient that that of root hairs and about 100 times more efficient than that of roots.

An amazing symbiotic relationship

Plants colonised by mycorrhizal fungi can grow 10-20% faster than non-colonised plants, even though they are 'giving away' up to 40-50% of their photosynthate to support mycorrhizal networks (photosynthate is the soluble carbon the plant fixed from CO_2 and sunlight). One of the reasons for this apparent paradox is that plants colonised by mycorrhizae exhibit higher leaf chlorophyll contents and higher rates of photosynthesis than non-colonised plants. This enables them to fix greater quantities of carbon for transfer to fungal hyphae in the soil.

In exchange for soluble carbon from their host, mycorrhizal fungi supply nutrients such as phosphorus, zinc, calcium, boron, copper and organic nitrogen. It's an amazing symbiotic relationship. Mycorrhizal hyphae have a tubular vacuole system that allows bidirectional flow. That is, dissolved organic carbon from the host plant and nutrients from the soil, can move rapidly and simultaneously in opposite directions.

All groups of mycorrhizal fungi require a living host, but there's more to it than just plants and fungi. A wide range of associative microflora are also involved. For example, colonisation of plant roots by mycorrhizae is enhanced by the presence of certain 'helper' bacteria. There are also active colonies of bacteria on the hyphal tips, producing enzymes which solubilise otherwise unavailable plant nutrients.

Mycorrhizae and soil carbon

Glomalin, a long-lived glycoprotein (protein containing plant sugar) is a highly stable form of soil carbon that provides a protective coating for the hyphae of mycorrhizal fungi. Networks of fungal hyphae also provide an important first step for the polymerisation of dissolved organic carbon, ultimately leading to the formation of humus, a high molecular weight gel-like substance that holds four to twenty times its own weight in water. Humic substances significantly improve soil structure, porosity, cation exchange capacity and plant growth.

Both glomalin and humus are of significance to the current debate on soil carbon transience, as these stable soil carbon fractions cannot be lost from soil during droughts or fires.

Marie Spohn from the Universität Oldenburg has identified mycorrhizae (and the glomalin they produce) as the primary soil carbon stabilisation mechanism in sandy soils. Previously, soil scientists have considered carbon sequestration potential to be constrained by the soil's clay content. The new findings are good news for WA farmers, opening the way for much greater levels of carbon increase in agricultural soils than previously thought possible.

Land management impacts

Increasing the amount of stable carbon stored in agricultural soils via mycorrhizal fungi will require a redesign of many current land management techniques. Factors negatively impacting on mycorrhizae include lack of continuous groundcover, single species crops and pastures (monocultures)

Continued

and application of herbicides, pesticides or fungicides.

Mycorrhizal fungi are also inhibited by the application of large quantities of water-soluble phosphorus and by the presence of non-mycorrhizal crops (such as canola). Tillage has a less detrimental effect than previously assumed. Recent studies have shown that the use of chemicals is more harmful than moderate soil disturbance. Biology friendly farming practices based on living plant cover throughout the year (eg cover cropping or pasture cropping) and the use of biofertilisers, enhance mycorrhizal abundance and diversity and are more beneficial for soil health than chemical farming systems based on intermittently bare soils and minimal soil disturbance.

Due to their low abundance in annual-based or conventionally managed agricultural landscapes, the important role of mycorrhizal fungi in nutrient acquisition, plant-water dynamics and soil building processes has been largely overlooked.

The types of fungi that tend to survive in conventionally managed soils are non-mycorrhizal, that is, they use decaying organic matter such as crop stubbles, dead leaves or dead roots as their energy source rather than being directly connected to living plants. These non-mycorrhizal fungi have relatively small hyphal networks.

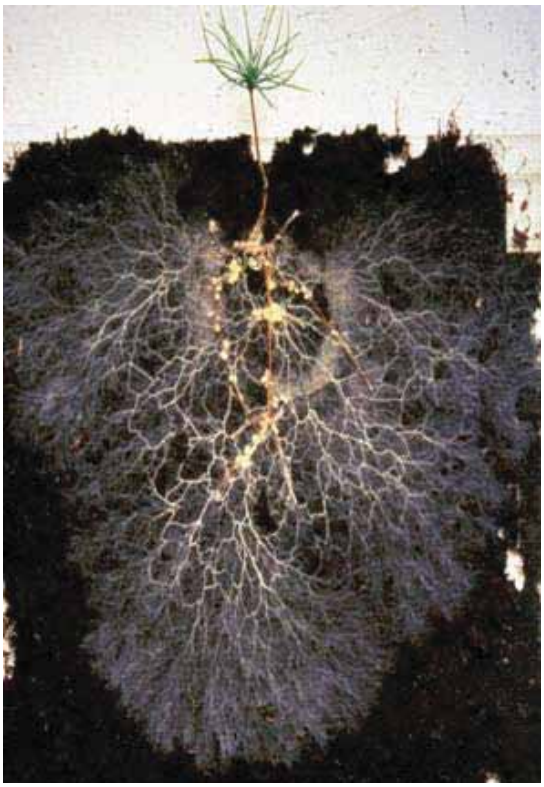

Fig.1. Mycorrhizal hyphae (white) colonising the roots (yellow) of a pine seedling. Photo courtesy Aberdeen Mycorrhiza Research Group

Mycorrhizae and water

It is well known that mycorrhizal fungi access and transport nutrients in exchange for the carbon from the host plant. What is less well known is that in seasonally dry, variable, or unpredictable environments (ie most of Australia), mycorrhizal fungi play an extremely important role in plant-water dynamics. The hyphal tips are hydrophilic (both the end in the plant and the end in the soil) enabling both water and nutrients to diffuse from one end to the other along a moisture gradient.

Mycorrhizal fungi can supply moisture to plants in dry environments by exploring micropores not accessible to plant roots. They can also improve hydraulic conductivity by bridging macropores in dry soils of low water-holding capacity (such as sands).

Further, mycorrhizal fungi can increase drought resistance by increasing the number and depth of plant roots.

Perennial grasses and mycorrhizae

Higher densities of mycorrhizal hyphae are found in healthy perennial grasslands than in any other plant community. It has been estimated that the hyphae in the top 10 cm of four square metres ($4m^2$) of perennial grassland, if joined end to end, would stretch all the way around the equator of the earth.

Broadacre cropping could benefit enormously from widely spaced rows or clumps of long-lived perennial grasses and/or mycorrhizal fodder shrubs. As yet we do not know the required critical mass to improve soil ecosystem function, but it might only need to be 5-10% perennial cover. In diverse plant communities, mycorrhiza compatible plants join common mycelial networks called guilds. These networks connect plants with each other, enabling exchange of nutrients and water. This may help explain why mixed plant communities often perform better than monocultures.

In addition to the resilience conferred by mycorrhizal guilds, the benefit of permanent mycelial networks in terms of aggregate stability, porosity, improved soil water holding capacity, reduced erosivity and enhanced nutrient availability in soils are immense.

Soil benefits in many ways from the presence of living plants year-round, due to reduced erosion, buffered temperatures, enhanced infiltration and markedly improved habitat for soil biota. Significantly, it is the photosynthetic capacity of living plants (rather than the amount of dead biomass added to soil) that is the main driver for soil carbon accumulation.

Management techniques that improve the vigour of groundcover, foster mycorrhizal colonisation, increase glomalin production and enhance the humification process, will contribute to long-term carbon storage, improved soil function and markedly increased resilience to climatic variability.

Case Study - John Mottram, "Rockbridge", Manjimup

Paul Omodei, agVivo, Manjimup, Ph: (08) 9777 2980.

Summary

Name: John & Danielle Mottram

Location: 30 km South East of Manjimup

Arable Area: 300 ha

Farm System: Cattle and Poll Dorset stud sheep. Target baby beef market selling calves straight off cow. Using rotational grazing.

Species Sown: Quantum Summer Active Tall Fescue (12 kg/ha), Palastine Strawberry clover (2 kg/ha), Paradana Balansa clover (2 kg/ha)

Sowing Time: June, 2007

Soil Type: Karri loan over clay; Deep River loam

John's paddock sown to a mixture of Quantum Tall Fescue, Strawberry and Balansa clover in early June 2007, shows the summer activity of Quantum Tall Fescue given favourable late spring / early summer rain. Photo taken 13 December 2007 courtesy Greg O'Reilly, Department of Water.

Reason for species selection:

The summer active Tall Fescue variety was chosen to extend the growing season in autumn and spring so that stock remain on good quality green feed for longer. It was also to take advantage of summer rain and reduce hand-feeding. We nearly always get at least one good shower of summer rain so the theory was to have this type of pasture system in place to use up the rainfall and turn it into feed.

Pre-sowing preparation:

Lime was applied at 3 t/ha in autumn prior to sowing. Fertiliser (SuperPhos at 180 kg/ha) was broadcast also.

Following the break of the season, the volunteer pasture was allowed to germinate. This first germination was then cultivated in. The paddock was levelled and rolled. We rolled it because we didn't want the soil to be loose. The seed would germinate better after rolling.

The first germination of weeds following cultivation was knocked down with a high rate of herbicide (Glyphosate 450 @ 2 L/ha, Liaise @ 2%, Goal @ 60 ml/ha, Uptake @ 0.5%, Li700 @ 0.2%). This also included insecticide (Dimethoate and alphacypermethrin at 100 ml/ha each) to get rid of any insect pests that would attack emerging seedlings. Sowing at this time of the year the most prevalent pest is red legged earth mite but as these paddocks have always been pasture there was likely to be a few grubs and beetles that would go for the seedlings as well.

Sowing:

A Bettinson double disc seed drill was used to broadcast seed, with discs removed, onto the prepared seed bed. It was then rolled with a heavy paddock roller to ensure seed to soil contact.

Post-sowing:

Emerging seedlings in this environment can easily be damaged by insects and other pests. We used Talstar bare earth treatment at 200 ml/ha as insurance against anything eating the new growth.

Capeweed also germinated in abundance because of the soil disturbance from the cultivation. It competed with the new seedlings for space and nutrients and set the growth of some back a bit. The plant density and evenness of the stand was affected. When it came to grazing it was hard to get the timing right. Some parts of the paddock where there had been less capeweed had been growing more strongly and were ready to graze and the other areas where there was a lot of capeweed were not ready to graze. The capeweed was eventually sprayed in July once clover seedlings were big enough to withstand MCPA at 1.2 L/ha.

We used Timerite to apply Le-Mat in the first year to reduce numbers of RLEM the following autumn.

Grazing management:

In the first year of establishment the pasture was grazed 6 times. Rotational grazing has been the key to good pasture growth rates, allowing long rest periods for the plants. Pasture was left to reach at least 2,500 kg/ha dry matter per hectare and not grazed too heavily, down to 1,000 kg/ha DM.

Because establishment was uneven, the grazing in the first year was also a bit uneven. Stock would over-graze the poorer

Continued

areas of the paddock and under graze the better areas. To even things up we mowed the paddock at the start of winter in 2008 and this had a good result in evening up the growth and the subsequent grazing.

Spring grazing: Spring is an important time for grazing perennial grasses such as fescue and ryegrass. They require frequent (21 day intervals generally), heavy grazing to keep the plants actively growing and delay them from entering the reproductive stage. Good spring grazing will also improve the plants ability to withstand periods of hot, dry weather during summer and, therefore, survival rates. The other option is to cut silage. I found that topping in winter and then silage in spring created a much more even stand. The cuts also had the benefit of knocking the broadleaf weeds back.

Nutritional Management:

In March, prior to sowing, the tall fescue paddock received a base fertiliser of SuperPhos at 180 kg/ha which was according to soil tests. We top this up every year in autumn to keep the base levels in check.

During the growing season we applied 70 kg/ha of urea to keep nitrogen levels sufficient. In spring we applied a basic NPKS fertiliser (Hayburst at about 150 kg/ha). This keeps the pasture going for a bit longer.

In November, the pasture was still growing well as it hadn't started to dry off yet so we gave it another top dressing of urea to keep it going.

If we know we are going to get a good lot of rain in summer, we would also give it another top dressing of nitrogen, probably Sulphate of Ammonia, to get a boost of summer growth.

Establishment Year Review:

Initial production estimates from this paddock have been very encouraging. In its first twelve months of establishment it was grazed 6 times. Rotational grazing has been the key to achieving high pasture growth rates.

Table 1. Mottram Unimproved Annual pasture comparison with Improved Annual pasture and Perennial pasture, 2008.

Paddock	Area	Description	Pasture Grazed (kg/ha)	Fodder Production (kg/ha)	Total Utilisation (kg/ha)
10 Acre	16	Unimproved annual	3,831	0	3,831
Blue Hill	11	Improved annual	2,476	4,614	7,090
Middle	3.5	Perennial	12,560	2,000	14,560

Mottram's fescue foreground, annual paddock with stock being supplimentary fed in background. Photo taken at break of season, May, 2009.

It has received a lot of inputs but a highly productive stand such as this requires inputs to remain productive. Table 1 is a comparison of production from grazing, fodder and pasture utilisation between the perennial fescue paddock (Middle), an improved annual paddock (Blue Hill) and an unimproved annual paddock (10 Acre). The improved annual paddock would have received as many inputs as the perennial paddock so costs would be about the same for the first year. The Table clearly shows the perennial paddock is far more productive in terms of grazing and utilisation than the annual paddocks.

Key Benefits: How do the species used help your system?

* It really does extend the growing season by a minimum of 2 months.
* Utilisation is close to 80%.
* Doubles Dry Matter production using best practise techniques.
* Creates a feed wedge instead of feed gap in winter.
* Gives you more options for fattening stock.
* Reduces supplementary feeding at start of year.
* Better matches autumn calving.

Will you plant more perennial pastures?

Yes for sure. Production gained far out weighs establishment costs, and good preparation reduces establishment failure. If small or non-producing areas are attempted first the time between sowing and grazing is manageable. There is always somewhere, big or small, on every farm that would suit a perennial pasture. It's just a matter of knowing which species to plant where to be of the greatest benefit.

Drought Case Study - Grant Bain, Geraldton

Sarah Knight, Mingenew-Irwin Group, Mingenew, Ph: (08) 9928 1646.

At the beginning of 2006, the Bain's had 900 head of cattle. Nothing out of the ordinary with the aim of selling 600 at the end of the year.

With 40 mm of rainfall in January it looked as if it was going to be a bumper of a year. The perennials sown in September 2005 shot away liked they were a seasoned crop. They were grazed for the first time 8 weeks after this rain event. However, this was the last of the rain for quite some time. In fact the whole year then only got 176 mm, a total of 216 mm for the year.

Grant and Elyssa Bain have owned Mt Michael, a property located approx 35 km south east of Geraldton for 7 years. This property has an annual rainfall of 400 mm. The drought years of 2006 and 2007 hit hard for them like it did for most farmers in the northern agricultural region. Their perennial grasses helped them get through these years and come out at the other end with ground cover, top soil and enough food for cattle.

At the end of 2005, the Bain's had approximately 500 ha of their property under sub tropical perennial grasses. By June 2006 these paddocks had as much growth to them as bowling lawns, and with 900 head feeding on them and no rain decisions needed to be made.

First step was to move 600 cows and their calves to the station country. Grant's sister Wendy and her husband Tim Pens, own a station, 'Mt Gould' in the Upper Murchison so they went there. 'Had it not been for this we would have been slaughtered' said Grant. However, this still left them with 300 head of sale cattle which they had to get through the year (and in good condition) before they could be sold. A strategy was needed to ensure cattle and paddock survival.

In a nutshell the 300 head of cattle were all boxed together and constantly moved. At this stage the farm had approximately 20

Grant Bain examining a Rhodes grass plant

Bulls grazing a sub tropical perennial grass paddock

paddocks which were in the vicinity of 80 to 100 ha in size. With constant rotations the paddocks had approximately 90 rest days between grazings. 'This was enough' said Grant. 'The moisture in the ground and the little rain that did fall allowed the perennials to grow between grazings' and provide enough food for the cattle when they were grazed again.

Towards the end of the season the annual paddocks were harder grazed. With less grazing during the year Grant was able to take full advantage of what little spring flush there was. This enabled the perennials to have a greater break.

These 300 head of cattle were sold at the end of 2006. The place was not cattle free though as 400 weaners and approximately 200 station sales came down from Mt Gould station. Still with no rain and the thought of getting 600 head through the summer it was going to be difficult.

Like with the previous 300 head, these cattle were boxed together and on a very tight rotation over summer and autumn. The perennials had some bulk to them as grazing had eased towards the end of 2006. When what little rain did come (a total of 300 mm for the year) the paddock resting days were stretched out once more to 90 days as the annual paddocks started growing again and could handle more grazing pressure.

At the end of 2007 the 600 weaners and Mt Gould sales were sold and the cows all came back from the station. 2008 was the break of the drought years with the property receiving 430 mm of rain with 57 mm in February which the perennials truly appreciated.

With 300 head of cattle one year and 600 the next, one would expect that the eating of the perennials to bare minimum

Continued

Sub tropical perennial grasses showing the lines which need to be filled in

over the drought year would have had a negative impact on the perennials. There were no negative impacts, only good performers and the not so good.

Green and Gatton panic were the best performing and persistent grasses over the drought years. They survived the heavy grazing and the light rainfall. Patches of lucerne were also quite productive. 'Having trialled lucerne in the grass mix prior to the drought I found that the patches that did establish remained productive during the drought' said Grant.

Rhodes grass was not particularly persistent in the drought years. 'The Pioneer Rhodes which has always been a part of my mix has all but disappeared' Grant said. 'It could be because it can not handle the grazing pressure and lack of moisture over the dry years. And it may be because this cultivar has a short lifespan. The new cultivars like Finecut Rhodes grass may have a longer lifespan' explained Grant.

So where to now for Mt Michael? Grant plans on putting 80 to 100 ha in each year until the whole farm is under perennial grasses. 'Once that has been accomplished I will go back and fill in the gaps left by trials, machinery blockage during seeding and germination problems' said Grant.

'I have a sowing rate of 4-5 kg/ha with 4 kg/ha of panic and less than 1 kg mixture of Rhodes, Giant Bermuda couch and kikuyu. Rhodes is maybe between 100 and 200 g. 'Signal grass has been dropped out of the mix as I don't believe that it gives the production like panics and can't take the pounding' said Grant. 'I like kikuyu as it is a creeper. It spreads out especially in the not so good sands unlike Rhodes grass which has a habit of retreating. However its grazing potential is still debatable, but I believe it is still worth pursuing at the moment'. Another grass Grant is trialling presently is Giant Bermuda couch grass.

Grant also plans to break his paddocks down to below 30 ha, preferably between 20 and 25 ha. The fences will be very simple - 2 wires. The bottom wire electrified at 26 inches and the top wire the earth at 36 inches. This is enough to keep the cattle in.

Grant has also taken to spraying out the broadleaves in some of his perennial paddocks. 'Annual grasses are much better than the annual broadleaves' said Grant. By taking the broadleaves out including radish and blue lupins, Grant believes that over dry summers (like the one we have just experienced) that there is enough moisture left in the ground so the perennials perform much better.

'We are now also trialling oversowing lucerne into the earlier established less dense perennials paddocks. Getting the establishment of lucerne right is critical, but when it does establish, experience has shown that it provides good productivity and is drought tolerant' explained Grant.

Looking back on the years again Grant can surely say that there is no such thing as an early break or a nuisance rain. The perennials benefit from any rain at any time. 5 mm of rain will produce some growth. 14 mm will result in good green feed. Cyclone Claire on the 12th and 13th of January 2006 was a perfect example. It allowed Grant to get through till June with 900 head of cattle, not feeding any hay, when in fact he should have had 1/3 the number of cattle over that period.

This case study is part of the Perennial Pasture Companions Project supported by Caring for Our Country

Lucerne seedlings germinating in the crown of a panic grass

Pasture cropping R&D in the northern wheatbelt

Tim Wiley, DAFWA, Geraldton, Ph: (08) 9956 8555.

The Evercrop team is working with 14 farmers from Kalbarri to Perenjori to Gingin to assist the farmers with their own on-farm pasture cropping trials. Recently measurements have been taken from many of these farmer trial paddocks. Random quadrants were sampled in the farmer's paddocks to measure a) the crop seedling density, b) the crop seedling height and c) the density of live perennial pastures. It was found that in some paddocks as the density of live perennials increased there was a small decline in crop seedling density. In all of the paddocks measured it was found that as the density of perennials increased there was an increase in the height of the cereal crop seedlings. In other words, live perennials make crops grow better!

The beneficial affects of perennial plants on growing crops mostly occurred within 10 cm of the crown of the perennial plant. Crop seedlings this close to the perennial plant were often twice the size of the rest of the crop seedlings. It appeared that the crop seedling had to have their roots growing in the root zone of the perennial to get the big boost.

The results raise the question as to why perennial plants might boost the growth of annuals. The CSIRO researchers are examining the impact of the perennials on soil moisture for the crop. Early results suggest that on non wetting sands the perennials may result in more moisture being available to crop seedlings in the early winter. This could at least in part be due to physical affect of creating a furrow when sowing the perennial pastures. But there may also be a biological process occurring as well.

Soil samples have been taken in the pasture cropping paddocks to determine the base line fertility for cropping. At Rowan Ford's farm east of Binnu soil samples were collected from within Gatton panic crowns and from between the crowns. This paddock was good yellow sand plain and had been sown to perennials for 5 years. It had a low density of old panic plants with 2-3 m spacing between plants. Samples (10 cores per composite sample) were taken in May 2009 from 0 to 30 cm depth and analysed by CSBP.

The soil test results indicate a remarkable increase in fertility within the root zone of the panic plants compared to where there were no perennials (table 1). The results from between the panic plants were not unusual for this type of sand in this region. The results from the panic root zone would indicate that phosphorous or potassium fertiliser would not be needed to grow a crop. Nitrate and ammonium levels were low, and similar between samples. However the organic carbon was much higher under the perennials so the supply of nitrogen to the crop would likely be better during the growing season. Plant tests will be taken soon to show nutrient uptake by the crops.

These results suggest that the boost in crop growth from perennial plants is largely due to improved soil fertility.

Nitrogen, sulphur and potassium can leach on sandy soils. So it is possible that the perennials are recycling these nutrients from depth. However phosphorous does not leach on these yellow sands. It seems that the perennials must be making at least phosphorus more available in the soil.

These findings fit with the theories of Dr Christine Jones and Dr Elaine Ingham. They believe that the live perennial plants change the soil biology in favour of fungi that are know to produce enzymes that release chemically fixed phosphorous. Of particular importance are the mycorrhizal fungi that that grow in symbiosis with perennial grass roots. In this symbiosis the plants provide carbohydrates to the mycorrhiza in exchange for nutrients and water.

While we have consistently seen that a range of perennial plants (C4 grasses, native grasses, perennial legumes, Blue bush) boost the early growth of cereals, we must wait to see if this translates into higher crop yields.

Table 1. Soil nutrient levels (0 – 30 cm) from a) within Gatton panic crowns and b) between panic crowns on yellow sand east of Binnu in May 2009.

	Between panic crowns	Within panic crowns
Available P (Colwell P ppm)	21	71
Nitrate N (ppm)	4	2
Ammonium N (ppm)	2	3
Organic Carbon (Walkley Black %)	0.24	1.04
Potassium (Colwell K ppm)	44	150
Sulphur (ppm)	2.7	7.9
pH CaCl	5.8	7.1
pH water	6.4	7.8

EverCrop - Evaluating the Viability of Pasture Cropping in WA

David Ferris, EverCrop-WA leader (DAFWA), Ph: (08) 9690 2117.

Advocates of pasture cropping claim that the benefits include year round ground cover, reduced wind erosion, green summer feed, reduced weed numbers, improved soil structure, and increased levels of soil organic carbon.

But does pasture cropping have a role to play in WA?

Based on the level of enthusiasm among a growing number of farmers the answer may well be 'yes' which is clearly contrary to conventional cropping wisdom.

Over the next three years, the Future Farm Industries CRC through its EverCrop project will evaluate the role and benefits of pasture cropping in WA.

Background

In Central West NSW, pasture cropping (sowing of an annual winter crop across a 'live' summer active perennial pasture) has proved profitable in some situations based on native C4 grasses that exhibit a high degree of winter dormancy.

Clearly, the climate, soils and perennial pasture species in WA differ significantly from central NSW, where Colin Seis and Daryl Cluff initiated this concept some 16 years ago.

While the principles of pasture cropping appear sound, the viability of such a radical change in cropping practice in WA is still uncertain because of the lack of local research, on-farm experience and case studies which detail the economics and logistics of integrating pasture cropping into existing systems.

Many different components need to come together to develop a new farming system for WA!

The EverCrop team will work closely with growers and agronomists in the Northern Agricultural Region to evaluate and refine this technology in WA. The team comprises researchers and advisers from DAFWA, CSIRO and Evergreen.

Murray Carson and Tim Wiley inspect Pasture Cropped lupins at West Binnu

Buloke barley growing amongst Gatton Panic at the EverCrop trial site at Moora. Photo courtesy Peter Gwynne.

Grower perceptions

Last year, we established two Local Adaptation Groups of growers near Moora and Mingenew/Binnu to identify research needs and opportunities for on-farm trialling of pasture cropping in 2009.

Participating growers believe that the main advantages of pasture cropping were improved soil fertility and increased carrying capacity or feed over summer. They thought pasture cropping would improve soil fertility through increased organic matter, microbial activity, recycling of nutrient from depth, and improved soil structure. Having two income streams was also seen as an advantage.

Participating growers indicated that the disadvantages of pasture cropping would probably be reduced water availability and the opportunity cost to establish a perennial pasture. Growers were concerned about the potential yield penalty and/or grain quality decline due to less stored moisture from summer, less moisture available at seeding and less moisture in spring, particularly in seasons with a tight finish.

Overall the growers were very optimistic about pasture cropping but wanted more information on the type of perennial and crop to grow; the best rotation (continuous, or opportunistic), and the nutrient, equipment, grazing and herbicide requirements.

continued overleaf

Continued

EverCrop - What are we doing?

We have established a large research site at Chris Vanzetti's farm south west of Moora. This includes permanent pasture, pasture cropped and continuous crop plots. It will assess the impacts that different perennial species, nitrogen rates and perennial row spacings have on crop performance. Detailed soil measurements are being collected by CSIRO and will provide important information on the competition between the annual crop and the perennial pasture for moisture throughout the season.

We are also working with 14 farmers from Binnu to Perenjori who have established their own on-farm pasture cropping trials this year. See Tim Wiley's article for some initial results.

A number of other activities are also underway including some knockdown herbicide tolerance trials with Tony Rosser, some economic modelling by CSIRO, and some Case Studies of our pasture cropping pioneers by Muresk student Peter Gwynne.

Early observations

So far we have observed that:

* Disc seeders have been successful even on the most dense perennial pastures
* Knife points have been effective at seeding into perennial pastures that are well grazed down, but some panic plants have been pulled up by the points
* Perennial pastures have improved crop germination and seedling vigour at some sites
* Soil fertility can be higher close to perennial grass crowns than between them
* Both glyphosate and sprayseed have had only a short term effect on slowing the growth of panic this season
* Crops sown across perennial pastures still require adequate nutrition to perform
* Weed control in perennial pastures the year before pasture cropping greatly improves crop performance.

Our observations to date indicate that "crops can be sown successfully into perennial pastures, without compromising seedling establishment or early crop vigour" (Tim Wiley). Harvest data will enable us to determine if pasture cropping has any significant impact on crop yield.

Pushing boundaries with Demonstration Sites

Sarah Knight (Mingenew-Irwin Group), Sally Thomson (Wagin Woodanilling Landcare) and Maree Heenan (Facey Group).

There have been a number of demonstration sites set up by the Mingenew-Irwin, Facey & Wagin Woodanilling Groups as part of the 'Perennial Pasture Companions' project. This project is funded through Caring for Our Country involving Evergreen Farming and Saltland Pastures Association. The aim of the demonstrations is to show ways in which profit and sustainability can be increased by using perennial pastures.

Yandanooka

The Bagley family is host to this saltland pastures establishment demonstration. After consideration with the farmers it was agreed that saltbush inter rows was something that was needed in this area. Saltbush has been planted in the heavy soils in the Mingenew district to help protect the fragile river systems, prevent land that has a high potential to go salty from not going salty and make land more productive.

Saltbush is a fantastic fodder shrub but for maximum stock productivity it needs to be grazed with a stubble paddock. This ensures a balanced diet. With a stubble paddock not always available, enhancing the inter rows can provide a balanced diet.

Five different annual species were sown into the inter rows to see which would be most suitable in terms of production value and the cost of establishment. The 5 species are Yagan barley (50 kg/ha), Safeguard ryegrass (15 kg/ha), Black and White Sorghum (10 kg/ha), Enduro Balansa clover (5 kg/ha) and Santiago Burr medic (10 kg/ha). Volunteer annual pasture is being used as a control. The pastures were sown with 50 kg/ha MAP. At this stage barley and ryegrass are doing the best in terms of productivity.

Safeguard ryegrass sown in saltbush inter row. Taken 3 August 09.

Heifers grazing stubble/bluebush paddock. Taken 6 March 09.

East Mingenew

Rob and Sally McTaggart are hosting this saltland pastures grazing trial. Research has showed that grazing bluebush in conjunction with stubble will provide the stock with a much more balanced diet than just feeding them stubble.

One mob of weaner heifers were put into a pure stubble paddock and another mob of weaner heifers put into a stubble/bluebush paddock. They were on their respective pastures for a month. The heifers in the bluebush/stubble paddock put on substantially more weight than those in the pure stubble paddock. The heifers were then moved into a feedlot on the property. Research has suggested that stock from a bluebush/stubble diet will do better than those from a pure stubble diet. This is ongoing.

South Mingenew

Donald Heitman is hosting one of the 5 pasture cropping demonstration sites in this area. Using one of his subtropical perennial grass paddocks we have sown oats and barley into a small section. The oats were sown dry whilst the barley was sown wet with a knockdown of 1 L/ha of SpraySeed. The demonstration is to show that an annual crop can be sown into subtropical perennial grasses successfully and profitably. Also being demonstrated is that perennial grasses have a beneficial influence on the crop.

Machinery used to sow these crops is typical farm machinery for this area (ie DBS bar with 7" blades at 12" row spacings). The crop was sown into the perennial paddock in an east to west direction. In 2005 when the perennials were sown they were sown round and round. With the machinery used and

continued overleaf

Continued

Oats sown into perennials before the break. Photo 23 June 09.

both seeding techniques there were a number of perennials ripped out of the ground. The impact of this will not be known for a while. The deep ripping action of the DBS bar may in fact have a positive influence on the perennials.

DAFWA and CRT are also trialling different herbicides at different rates to see what impact they have on the perennial grasses.

Irwin

Mark Watson is hosting another of the pasture cropping demonstrations. Oats were sown into one of his paddocks wet after a single knockdown of 1 L/ha of SpraySeed. The machinery used for sowing the crop was twin discs at 9" spacings. There was very little disturbance to the soil let alone the perennial grasses. Again the aim of the demonstration is to show that a crop can be grown successfully and profitably in a perennial grass paddock and that perennial grasses have a beneficial influence on the crop. DAFWA and CRT also have their herbicide trial in Mark's paddock.

Others

Other demonstration sites in the area include:

* Craig Forsyth - sowing oats and wheat into a perennial grass paddock
* Keith Tunney - sowing barley and oats into perennial grass paddock under a number of herbicide treatments. He also has a fertiliser treatment.
* Jon Holmes - was late to come onto the scene but looking at a bluebush paddock which he sowed to wheat this year.

Nomans Lake

Greg, Heidi and Nathan Astbury with the support of the Facey Group holds one of the six Saltland Pastures demonstrations across WA, with the aim of increasing the adoption of saltland solutions within the region focussing on saltbush and its ability to help reduce the watertable. This season will see the plantings of the old man saltbush and barley within the alleys and in coming years implementation of perennial pastures species within the alleys, which will follow on from findings of the Sustainable Grazing on Saline Land work which has also been completed on the property in the past. The site previously had acacias planted in alleys but in the recent year these reached the end of their lifespan therefore a new action plan was needed to help alleviate the watertable. Next door to this site Phil Nichols from DAFWA will be looking at establishment of saltbush through direct seeding.

Wagin

Wet season or dry season, the low-lying flats typical of the Wagin area are reliably wet in winter. Turning this situation into a good thing is Chris English's aim, and his saltland pasture demonstration is taking on a number of fronts to protect this country and get some feed value back from it. His aim is to transform a 40 ha barley grass and scalded area into something his stock can utilise.

DAFWA staff surveyed the seemingly dead-flat paddock and broad W drains have taken care of the majority of water ponding. The area has been divided up into three groups of 'qualities' – the sandier stuff, the better stuff and the….well… harder stuff. Neil Ballard was called on site to help with species selections, and all three paddocks have a different mix of annual and perennial treatments. Wide alleys of saltbush seedlings with an inter-row of medic have been planted in the 20 ha of 'better paddock', a mix including cadiz, margarita and oats were planted in the 11 ha of 'sandier paddock' to build up organic matter before coming back in 2010 with temperate perennials, and the 'harder paddock' has dense saltbush alleys with puccinellia hay spread in some of the narrow inter-rows.

"It's all pretty wet in there now and it's a bit new figuring out how to manage establishment of species I haven't planted before in these trying conditions, but we're giving it our best shot," Chris said. The Department of Agriculture is also running a strip of directly-seeded saltbush species down one side of the trial, under the guidance of Dr Phil Nichols.

Continued

Beaufort Flats

Over the years, a range of saltland pasture plots have been established by group members, and this demonstration will put some figures on the grazing value of three different plot compositions to the farm enterprise. Graydn Wilcox has established 20 ha of direct seeded shrubs and pastures and 20 ha of Eyres Green saltbush alleys with unimproved barley grass / puccinellia interrow. The rest of the barley grass dominated paddock serves as the control.

Work by Alan Herbert from DAFWA recently concluded that the direct seeded plot was 2.5 times more productive than the Eyres Green alleys, basically due to perennial plant density. It was also concluded that it would take Graydn twice as long to cover establishment costs of the direct seeded mix compared to the Eyres Green mix. Through this demonstration Graydn will be looking at what composition fits best with his farm enterprise in terms of economic and environmental benefits. Paddock composition over time, watertable drawdown and of course production value will be looked into.

For the Pickford family, having perennial pasture is the key to having good annual pastures, as all their sheep spend at least the first month after the season break on perennial paddocks. Their demonstration is focused on the value of deferment in terms of the impact it has on annual pasture growth rates throughout the growing season.

Along with sheep movement records and grazing days of their various perennials paddocks, weekly FOO measurements of grazed and deferred annual pastures have been recorded. The 6 week break and subsequent 7 weeks of grazing still sets the deferred paddock apart from the annuals, which managed 5 weeks of grazing from the break of season as well as a heap of oats and lupins. With both paddocks looking about even now, Pickfords are running both paddocks the same, and are interested to see whether there will be any variations in growth through the season. Piezometers near perennial sites continue to be monitored, with the groundwater continuing to drop!!

Whole of Farm Perennials – Wagin

Rob and Caroline Rex are driven by the belief that perennial grasses have a role in improving soil health, soil water holding capacity and long-term farm viability. Providing a conducive environment for soil biology to flourish and drive production is another element in the trial mix. Figuring out how to measure all this is the challenge they have taken on with this project!

Root density comparison between Tall Wheat Grass (left) and Afghan Melon

After much deliberation trying to find suitable and comparable land plots, four paddocks have been set aside to be poked and prodded, each around 10 ha, two with established temperate grasses, and the other two paddocks sown to temperate grasses this winter. One of the established paddocks and one of the sown paddocks has been treated with biological inputs and the other two paddocks treated with conventional inputs. Transects have been set up across each paddock with a range of measurements including physical and chemical soil properties, and plant characteristics.

Dr Maarten Stapper provided guidance as to how the demonstration can use a balance of measurement and observation to provide useful information. The second round of measurements will take place soon, which will be done in dramatically different conditions to those we faced in April when everything was as dry as a chip!

Other Demo Sites

In addition to these sites, the Evergreen June Newsletter outlined the 7 Evergreen sites for the project.

Project supported by Caring for Our Country

EverGraze - Perennial Persistence and species mixtures

Paul Sanford & Eric Dobbe, DAFWA, Albany, Ph (08) 9892 8475.

In the spring of 2005 as part of the EverGraze project we established a trial on Adrian Anderson's property in Wellstead looking at increasing the winter production of summer-active perennials by partnering them with annuals or winter-active perennials. Species trialled included kikuyu, setaria, summer-active tall fescue, tall wheat grass, lucerne, chicory or plantain mixed with either subterranean clover, serradella, oats, annual ryegrass or winter active tall fescue.

Grazing by sheep comprised of short periods of very high stocking rates typically over the space of a few days followed by a long rest during which pasture growth was measured as accumulated biomass. The results suggested the most effective way to increase winter production is to sow either annual ryegrass or oats into perennial stands.

While pasture growth measurements ceased last year we have continued to assess perennial plant persistence: the findings of which are proving interesting, particularly given the dry years the trial experienced in 2006 and 2007.

The persistence of the respective perennial species is presented in Figure 1 assessed as either percentage basal cover which is the proportion of the ground covered by the base of the perennial (5% represents good plant density) or in the case of kikuyu the percentage of the ground covered by kikuyu.

Fraydo Tall Fescue mixed with Kikuyu

In the year following establishment (2006) the perennials fell into two groups: those with good basal cover and high plant density comprising kikuyu, tall wheat grass, Fraydo tall fescue and Quantum tall fescue and a second group with low basal cover comprising chicory, plantain, lucerne and setaria. This second group with the exception of Setaria declined in subsequent seasons. This decline in the case of chicory was most likely in part due to selective grazing as it persisted well at the nearby main EverGraze site as a broadacre sward under rotational grazing.

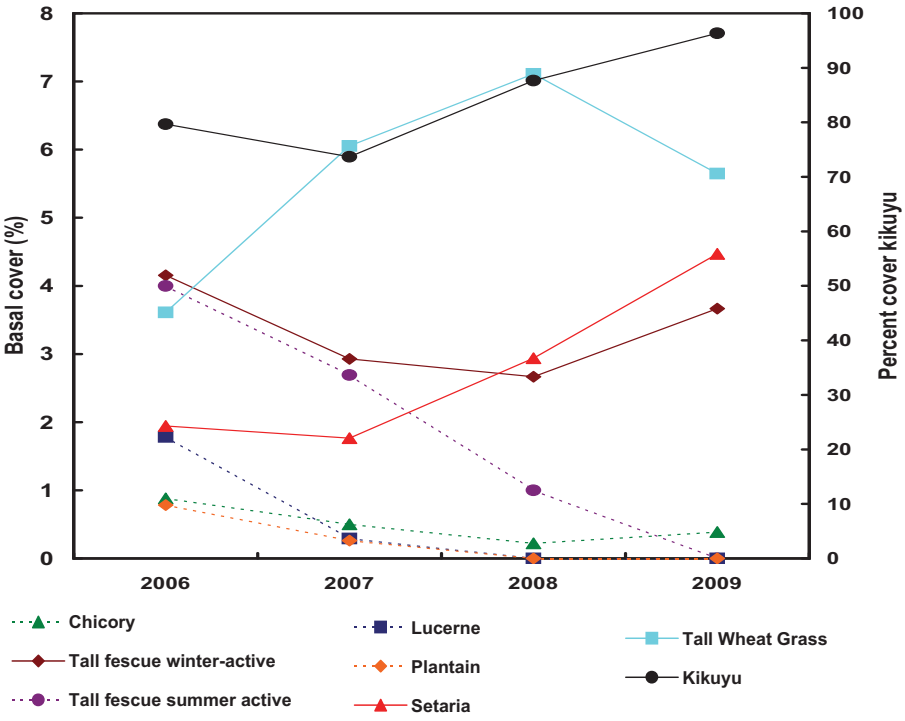

Figure 1. Change in basal cover of perennial species at Wellstead from 2006 to 2009. Annual rainfall for 2006, 2007, 2008 was 316 mm, 308 mm and 525 mm respectively.

As expected in this environment even in drought conditions kikuyu cover increased with time. Tall wheat grass also demonstrated its documented tolerance to moisture stress and showed good persistence. The increase in setaria basal cover was the result of the fewer plants steadily increasing in size each year. This species is proving to be quite persistent on the south coast.

However of most interest was the difference in persistence between summer and winter active tall fescues. At our main EverGraze site which received slightly less rainfall we experienced an almost total loss of summer-active Quantum Max P tall fescue in the summer of 2006/2007 as a consequence of heat and moisture stress. While the loss of Quantum Max P at this site during this period was not as dramatic it has steadily declined to zero in the longer term. By contrast the winter-active

Continued

Fraydo tall fescue has increased. This finding clearly demonstrates the superior persistence of winter-active tall fescue during drought. Fraydo avoids heat and moisture stress in summer by being dormant. Given that Wellstead experiences dry seasons reasonably often the winter-active types of tall fescue are better suited to this region than the summer-active types.

Fraydo tall fescue also proved to be reasonably competitive with the other perennials. Table 1 compares the performance of Fraydo and its companion when Fraydo is mixed with setaria, tall wheat grass and kikuyu. Serradella as a companion is presented for comparison. In all cases competition from Fraydo tended to result in a lower basal cover or percent cover for setaria, tall wheat grass and kikuyu compared to their performance companioned with serradella. It's quite remarkable that it can co-exist with kikuyu albeit under rotational grazing. These results support the viability of a winter-active tall fescue/lucerne mix and pose the question of how this type of fescue would perform as a companion for panic or chicory.

Table 1. Basal cover of setaria and TWG and kikuyu when mixed with Fraydo Tall Fescue compared to the same species mixed with serradella from 2006 to 2009 at Wellstead.

Treatment	Species assessed	2006	2007	2008	2009
Setaria & serradella	Setaria	1.7	3.0	4.5	5.5
Setaria & Fraydo	Setaria	3.0	0.3	0.3	1.3
	Fraydo	3.0	0.5	1.3	2.7
TWG & serradella	TWG	1.7	4.7	6.7	6.7
TWG & Fraydo	TWG	4.7	2.3	2.7	2.3
	Fraydo	2.5	3.5	0.7	2.7
Kikuyu & serradella	Kikuyu	90.0	97.0	97.0	100.0
Kikuyu & Fraydo	Kikuyu	65.3	26.3	54.3	86.3
	Fraydo	9.0	2.0	4.7	3.3

Sub-tropical grass seed - Understand what you are paying for!

Christopher Loo (UWA/Kings Park BGPA, Ph: 08 9480 3648) & Bradley Wintle (DAFWA).

Establishment of sub-tropical grasses has dramatically improved over the last few years and leading growers are consistently achieving excellent results. However the x-factor can be seed quality.

(a) Buyer beware - Seed quality of sub-tropical grass is highly variable!

- The quality of commercial sub-tropical grass seed varies from as low as 10% to more than 60%. This compares with annual pasture legumes and grasses where the germination is usually above 80% (an exception is kikuyu which normally has high germination >80%).
- Seed batches can contain empty florets, immature seed, dormant seed and dead seed in addition to viable seed (note: Seed purity refers to the % of seed you are purchasing).

(b) Viable seed may not germinate due to seed dormancy

After harvesting, many sub-tropical grass seeds display a period of post-harvest dormancy sometimes referred to as after-ripening dormancy. In this state seeds are viable but have low germination. After a period of storage germination improves. The time required to reach acceptable germination levels varies between species and storage conditions (Fig 1).

- Panic grass and setaria are affected by post-harvest dormancy. Setaria requires 4-5 months storage to reach acceptable levels of germination, while 'Green' and 'Gatton' panic require 8-10 months storage to achieve maximum germination. Signal grass also has a long after-ripening dormancy.
- Rhodes grass exhibits little or no seed dormancy.

(c) Read the seed label – request a seed analysis statement

- Check the seed label on the bag, 'fresh seed' equals dormant seed. If no or low 'fresh seed' then low germination equals poor quality seed.
- If there is a large amount of 'fresh seed' then request a copy of the seed analysis statement. A commercial seller is usually happy to provide a copy of a seed analysis statement so please don't hesitate to ask.

All pasture seed sold in Australia (except native species) must have a seed quality analysis statement or label summarising the statement details from an International Seed Testing Association (ISTA) accredited laboratory. The statement includes: test date, seed lot, seed additives (e.g. fungicides, insecticides), names of all crop seed present if 2% or more, % germination, % fresh seed, pure seed content (w/w), other seed component – name, % weight, no. weed seeds per unit weight and names of weed seeds (Fig 2). This statement is also a WAQIS requirement for the import of pasture seed into WA.

* The seed analysis 'test date' is usually undertaken within 2-4 weeks of harvest, so you can estimate the harvest date.

(d) Panic and signal grass with a moderate to high % of 'fresh seed'

If the time from the estimated harvest date to seeding is less than 6-8 months then post-harvest seed dormancy is likely to still be high. Source a seed batch from the previous year or store until the following season.

If the time from the estimated harvest date to seeding is more than 8-10 months then post-harvest seed dormancy should be low (storage conditions can affect seed quality, so it is preferable to re-test germination if seed analysis >12 months old).

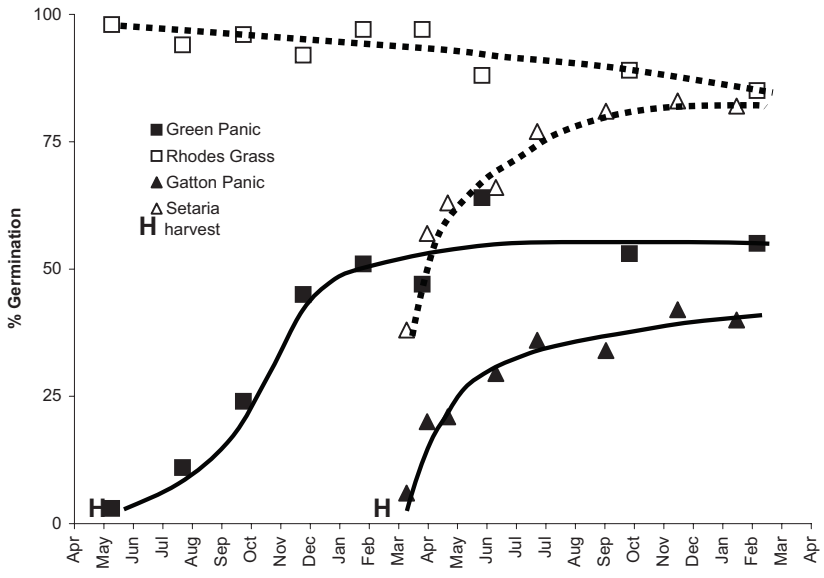

Figure 1. *Post-harvest dormancy patterns in Rhodes grass, Green panic, Gatton panic and Setaria seed stored under shed conditions. Rhodes grass seed exhibits minimal dormancy after harvest (H) whilst Setaria requires 4-5 months storage to reach acceptable levels of germination, while Green and Gatton panic require 8-10 months storage.*

Continued

Certificate of Analysis

Client:

Job Number:

Page 1/1

Report Date: 24-04-09
Received: 27-03-2009
Sample Weight: 193 grams

Kind of Seed: PANIC
Botanical Name: Megathyrsus maximus
Markings: Gatton

RITY TEST (% by Weight)

Pure Seed	Inert Matter	Other Seeds
79.9	20.1	Trace

ISTA PSD: 36#
Sample Weight Examined: 22 grams
Inert Matter: Dead insect material, empty florets

GERMINATION TEST (% by Count)

Normal Seedlings	Hard Seeds	Fresh Seeds	Abnormal Seedlings	Dead Seeds
41	0	39	3	17

First Count at 10days... 16%. Final Count at 28 days... 41%.
Method: ISTA TP 15-35°C

OTHER SEEDS:

Botanical Name	Common Name	%	VIC	NSW	SA	QLD	NT
Chloris gayana	RHODES GRASS						

N = Listed on the Noxious Weed List for Australian States + Territories (www.weeds.org.au).

The Germination test was carried out on pure seed only. (PSD 36#)

Figure 2. *Seed analysis statement for Gatton panic. Note 'fresh seed' is dormant seed.*

- Time (i.e. storage) is the most effective way of overcoming seed dormancy.
- For panic and signal grass seed with low germination but high levels of seed purity, the best course of action is to store the seed in a dry place and sow the seed the following season.
- Plan ahead - consider purchasing panic and signal grass 12 months ahead of time (i.e. 2009 harvested seed to sow in 2010).

(e) What about mixes and coated seed?

Sub-tropical grass seed is often sold in mixes with 3 or 4 species, with some coated seed and some uncoated seed. Read the seed label carefully and understand the proportions of each species/variety (% weight) and the germination %.

It may be more difficult to obtain Seed analysis statements for all of the components in the mix.

Value of seed coating:

- Coating of fluffy seed like Rhodes grass greatly improves the ease of handling and flow in the seeder.
- Seed coating reduces the number of viable seeds per unit weight.
- Some commercial seed coats contain a chemical (primer) to reduce seed dormancy. Independent testing to validate claims that chemicals in coating technology alleviate dormancy is required to give confidence to growers that such products work.

If in doubt as to the expected germination of a seed batch then obtain a current 'germ' test, by either sending a sample to an accredited laboratory (e.g. AgWest Plant Laboratories) or use a 'simple' home test.

"Show us your grass"

Perennial herbs and lucerne

Kevin Moir of Boyup Brook sowed this paddock to a mixture of Lucerne, Chicory and Plantain in 2007 to improve out of season production. The subclover content in winter is excellent but the annual grass content is low, limiting winter productivity. In an attempt to improve winter feed this year, Kevin disced in 60 kg/ha Dalyup Oats using a no-till drill. These ewes and lambs are rotationally grazed through this paddock. Photo 13 Aug 09.

Clay + Lucerne

John Wallace from Esperance clayed this deep sand paddock in 2005 before cropping it for 2 years. Due to low organic matter, the crops yielded poorly so he changed tack and sowed it to SARDI 10 lucerne in 2007. He says the productivity of the lucerne has been excellent. Ewes and lambs and grazed on it during winter and spring and prime lambs fattened on it over summer. Photo 21 Aug 09 courtesy Matt Ryan DAFWA.

Pasture Cropped Lupins

Murray Carson of West Binnu is trialling pasture cropping this year and has sown a number of test strips across existing subtropical perennial grass stands. This lupin crop was dry sown in early May using knife points on 14" spacings. The pasture received SpraySeed and Simazine pre-sowing and Simazine and Brodal post-sowing for weed control. Photo 13 Aug 09 courtesy Peter Gwynne.

Annual legumes improving

Annual legumes are an essential companion to subtropical perennial grasses. They fix valuable nitrogen and supply quality winter feed. The subclover in this 2007 sown trial site south of Moora has just exploded this year. It begs the question why? Are the perennials making the conditions more favourable for legume growth? This increase in legume content and vigour has been widely observed and usually occurs a few years after the perennials have been sown. Photo 27 Aug 09.