Evergreen FARMING

Sustainable "Green Farms All Year Round"

www.evergreen.asn.au

Newsletter of Evergreen Farming **June 2007**

The Evergreen Difference

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This is the substantial Evergreen difference! The choice is yours. No feed or plenty of feed. No ground cover or plenty of ground cover. The drought conditions of 06/07 have further highlighted the advantages of having some perennial pastures in your farming system. The 2 top photos are from Binnu (north of Geraldton) where the drought has hit hardest. The Wilson family are mighty happy they have some Rhodes grass! Both photos March 2007. The 2 bottom photos are from Albany where Wayne Smith is running almost 4 cows and calves per hectare with his high input kikuyu system. The neighbour is battling to run anything! Both Photos April 2007.

Tim Wiley: A Catalyst for Change

At the recent Evergreen inaugural Sponsors and Supporters Dinner, one of the catalysts for the formation of the group, Mr Tim Wiley from the Dept of Agriculture and Food in Geraldton, was awarded a Life Membership for "services rendered" to Evergreen.

Tim's influence on the formation of the Evergreen Farming Group, and the many farmers that are involved with our group, was acknowledged by a range of speakers on the evening. These included, David Monks, Bob Leeson and Bob Wilson, who expanded on the achievements of Tim and his beloved Perennials, over the last 20 years in the Mid-West of WA.

Tim started working in the West Midlands in 1984 with CSBP. He soon became an enthusiast for tagasaste as it was growing on poor sands where nothing else would. In 1990 he joined the Department of Agriculture in Moora on a research project aimed at finding 'alternative pastures' for the poor sands. He was asked to participate in the "Martindale Project", which was an ambitious undertaking by Sir James McCusker to develop Tagasaste for the poor sandy areas on his farm at New Norcia and later north of Dandaragan.

Evergreen President Erin Gorter and past President David Monks present Tim Wiley with Life Membership.

Photo courtesy Farm Weekly.

Tim has championed the cause of the Tagasaste Industry ever since. He was a catalyst, along with John Cook and Bob Wilson with the formation of the West Midlands Fodder Systems Development Group. This group later amalgamated with the newly formed Evergreen Farming Group (because it was easier to remember the name)!!

In May 1990 Tim sowed a series of trials with a wide range of pasture species. These trials included one sub tropical perennial, Rhodes grass. Tim managed to get a hand full of Rhodes grass plants established and to his surprise they survived a very dry summer. All the temperate perennials died in summer. At the same time private agronomist Jesse Skoss was planting trials with a wide range of sub tropical perennials on nearby farms. Tim and Jesse soon got together to share their knowledge, and research in the West Midlands began to make progress. Jesse's efforts lead to him being awarded Evergreen Farming Group's first life membership.

Neither Tim or Jesse were able to get funds to continue their research. But through Tim's local contacts he was able to find farmers who were willing to 'have a go'.

One of the first farmers to try perennial grasses was Bob Leeson who managed Joanna Plains at Cataby. Bob and Tim hand sowed some new sub-tropical pastures on a wet area in October. By the following February they had grown 12 t/ha of feed! A series of field walks became the catalyst for some strong farmer interest in the West Midlands. Eventually this led to the Bibby Springs LCDC becoming the Evergreen Farming Group.

Tim again was the catalyst for the first interstate information gathering trip to Queensland by the Evergreen Group in 2000. Knowing the character of the participants on that trip, I have no doubt Tim did not need to be the catalyst for some of their many late nights!!

Tim's ability to grasp the potential of new innovations in agriculture has seen him promoting the next big paradigm shift in farming, and that is the Carbon in Soils Revolution. The potential for carbon trading could see farmers rewarded financially for an increase in the soil organic carbon levels, which means that they have sequestered CO_2 from the atmosphere. Evergreen believes that the best way for this to occur is through the use of perennial pastures and correct grazing techniques.

Tim has encouraged the Evergreen Farming Group to take a leadership role in facilitating this potential income earner for the Evergreen Farmers of WA

From the President

Erin Gorter, Kojonup, Phone: (08) 9833 7524

Welcome to the June edition of the Evergreen newsletter. I'd like to especially welcome our many new members who have joined courtesy of CSBP. And a big congratulations to Tim Wiley on his recently awarded life membership. Tim has contributed far and beyond his 'call of duty' and has been an integral part of the acceptance and adoption of perennial pastures around WA.

The last 12 very dry months have been particularly challenging. It highlights the need for farming systems that can cope with variable seasonal conditions. Perennials certainly have a place given their ability to turn even the smallest rainfall event in to feed.

With the area sown to perennial pastures increasing each year, we are starting to face problems with seed supply. Evergreen Farming continues to work with the seed industry to ensure farmers have access to clean and viable seed.

Our extremely productive 3 year Australian Wool Innovation funded project ends this month. Through this funding we have been able to compare the feed quality and dry matter production of a range of perennial species, develop low risk establishment methods for sub-tropical grasses, demonstrate the water use ability of perennials, publish a quarterly colour Newsletter, set up a high quality website, produce farmer Case Studies, publish regular Farm Weekly pages and run a large number of field days and seminars. As you can see, we have achieved a lot! However, to continue to help farmers establish and manage perennial pastures, we need extra funding. Your committee is working hard to ensure we get some!

Phil Barrett-Lennard has been travelling far and wide in response to the growing interest in perennials, as have many members of the Evergreen committee. We have been involved with field walks in the North Stirlings, Condingup and Dandaragan areas, a bus tour at Jerramungup, field days at Esperance and Mingenew, and the launch of the Soil Carbon Accreditation Scheme at Katanning. We have also been busy giving advice to a number of catchments across the state.

I hope to see many of you at the upcoming Pastures for Profit workshops, either in Mt Barker, Dandaragan or Esperance. A high calibre group of speakers has been gathered to further broaden your knowledge of perennials. These will be extremely thought provoking days but also locally relevant as the program at each venue has been tailored to reflect the local farming systems. Please note the reduced cost for members, highlighting the value of your membership dollar.

Benefits of Evergreen Membership

And a quick reminder about the benefits of Evergreen Farming membership. You get:

(1) quarterly technical Newsletter
(2) access to the members area of the Website
(3) discounted entry to Field Days and Seminars
(4) agronomic Advice
(5) latest Research results
(6) opportunity to host Trials and Demonstrations

All for the bargain price of $110 per year.

2007 EXECUTIVE COMMITTEE

President

Erin Gorter - Kojonup
Ph: (08) 9833 7524
eringorter@bigpond.com

Vice President

Bob Wilson - Lancelin
Ph: (08) 9655 1055
bobwilson@bordernet.com.au

Secretary/Treasurer

David Monks - Badgingarra
Ph: (08) 9652 9277
Fax: (08) 9652 9278
monks.d@bigpond.com

Committee

Bob Leeson - Lancelin
Ph: (08) 9655 1785
rleeson@bigpond.com

Craig Forsyth - Dongara
Ph: (08) 9927 5035
craigfor@midwest.com.au

Paul Omodei - Manjimup
Ph: (08) 9777 2980
paul@agrom.com.au

Charlie Hick - Narrikup
Ph: (08) 9845 3076
candmhick@bordernet.com.au

Projects Manager

Philip Barrett-Lennard
Ph: (08) 9475 0753
Fax: (08) 9475 0322
pbl@consultag.com.au

Administration

John Duff & Associates
Suite 5/110 Robinson Ave
BELMONT WA 6104
Ph: (08) 9475 0753
Fax: (08) 9475 0322
adminjd@consultag.com.au

Green House Gas and Agriculture in Australia

Tim Wiley, DAFWA, Geraldton, Ph: (08) 9956 8518.

The latest edition of New Scientist says….

"Our planet's climate is anything but simple….. Yet a firm and ever-growing body of evidence points to a clear picture: the world is warming, this warming is due to human activity increasing levels of greenhouse gases in the atmosphere, and if emissions continue unabated the warming will too, with increasingly serious consequences."

There is growing interest in climate change and Green House Gas emissions both globally and in Australia. Agriculture will play a major part in Australia's emissions. Agriculture currently emits 16% of all Green House Gases from Australia. It is second only to the electricity generation industry. Agriculture also has the capacity to sequester large amounts of Carbon Dioxide and significantly reduce Australia's net emissions.

Methane from livestock accounts for 66% of the Green House Gas emissions from agriculture in Australia. Green House Gas from burning grass land (i.e. 'Savanna') in northern Australia and land clearing were other major sources from agriculture.

As yet Australia has not ratified the Kyoto protocol which sets each country's emissions targets. Our federal government has not yet implemented policies to cover agriculture emissions and sequestration, or Carbon Trading. At the time of writing, neither Liberal nor Labour have announced their policies.

Below are some of the terms you will hear more about in the future regarding global warming and Green House Gases.

Global warming

Climate change due to an increase in Green House Gases in the atmosphere that trap heat.

Green House Gas (GHG)

GHG's are a range of gases that trap heat which would otherwise radiate back into space. The most important GHG's are Carbon Dioxide (CO_2), Methane (CH_4) and Nitrous Oxide (N_2O). Methane mainly comes from the fermentation of feed in the rumen of sheep and cattle.

Carbon Dioxide Equivalents (CO_2eq)

Each GHG gas has a different Global Warming Potential (GWP), or ability to trap heat in the atmosphere. Their global warming affect is expressed in unit equivalents to Carbon Dioxide. CO_2eq are the units of accounting and trading of GHG in the atmosphere, soil, vegetation or other materials.

Conversion factors
1 ton Methane = 21 ton CO_2eq
1 ton Nitrous Oxide = 90 ton CO_2eq

Carbon vs. Carbon Dioxide

Carbon (C) is an element that is found in all living things and some non living things. Calculations of Green House Gas and emission/sequestration are in units of Carbon Dioxide (CO_2).

1 unit of Carbon (C) = 3.67 units Carbon Dioxide (CO_2)

Organic matter vs Carbon vs CO2eq

Organic matter is made up of carbon and other elements. Carbon content can be estimated from Organic Matter.

For wood
1 unit Organic Carbon = 0.50 units Carbon = 1.84 units CO_2eq

For pasture & crops
1 unit Organic Carbon = 0.47 units Carbon = 1.72 units CO_2eq

Soil Organic Carbon (SOC)

A CSBP soil test measures the concentration of Organic Carbon (OC) in the soil as a percentage. Usually the soil sample is taken from the top 10 cm. The top 10 cm has a volume of 1,000 cubic metres per hectare.

Most WA soils have a Bulk Density (t / m^3) of 1.4 - 1.6, so there is on average 1,500 t of soil in the top 10 cm. Multiplying the weight of soil by the percentage of soil Organic Carbon gives the tonnes of soil Organic Carbon. About half the organic matter under annual crops and pastures is in the top 10 cm of soil.

Total Soil Carbon (TSC)

Carbon GHG audits are based on both Inorganic Carbon and Organic Carbon. Total Soil Carbon will be slightly higher than that from Organic Carbon measured with a CSBP soil test.

Carbon Credits

Carbon Credits are the unit of trade relating to GHG. The European Union has a system for having Carbon Credits certified, audited and traded. There is Australian legislation covering Carbon Credits arising from tree plantations which gives certainty to the buyer. Carbon Credits for trees are registered as a 'Carbon Right' against the title of the land they are grown on. Currently there is no similar legislation for Carbon Credits from pastures or crops.

Despite this there are large Australia companies willing to buy Carbon Credits from soil sequestration on farm. Dr Christine Jones has launched the Australia Soil Carbon Accreditation Scheme (ACSAS) and Carbon Credits will be sold for $25 /ton from perennial pastures in WA this year.

1 Carbon Credit = 1 tonne Carbon Dioxide Equivalent (CO_2eq)

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Australian Greenhouse Office (AGO)

The Australian Greenhouse Office (AGO) is a federal government agency responsible for producing 'Australia's National Greenhouse Accounts'. These are prepared in accordance with the Revised 1996 Intergovernmental Panel on Climate Change (IPCC) *Guidelines for National Greenhouse Gas Inventories* and the principles of the IPCC 2000 *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories.*

The AGO describes the methods for measuring CO_2eq emissions and sequestration in Australia.

Intergovernmental Panel on Climate Change (IPCC)

The IPCC is an expert panel set up by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) in 1988. The IPCC sets out the procedures for measuring Carbon sinks and emissions. The IPCC defines the rules for calculating Net Emissions for an industry and country. These rules cover detailed calculations based on the best science available. A country may request changes in the calculations for themselves by submitting science based evidence. An example is that the conversion factor for calculating NO_2 emissions resulting from applying Nitrogen fertiliser are based on trials in Europe and the USA. Australian trials are starting to show lower levels of NO_2 emissions, so an adjustment could be made for Australia.

Net Emissions

Is the difference between the amount of Green House Gas (CO_2eq) being pumped into the atmosphere and the CO_2 being sequestered from the atmosphere.

Sequestration

Sequestration is the process of reducing the amount of Green House Gas in the atmosphere. This can be done by growing plants when they take up CO_2 from the air for their growth. It can also be an industrial process where CO_2 is captured and pumped below the ground for long term storage. The industrial process is called Carbon Capture and Storage (CCS).

'Cap and trade'

A 'cap and trade' is a system for limiting the net emissions from a country or an individual business. Each country or business is given a 'cap' which is the maximum amount of CO_2eq they can emit in a given period. If their emissions are below the 'cap' they can sell the difference as Carbon Credits. If there emissions are above their 'cap' they must buy Carbon Credits to off set the excess.

The European Union legislated a cap and trade system in 2005. European businesses that don't meet their cap will be fined ~ $70 (Aust) per tonne of CO_2eq above their cap. This fine will rise to ~$170 (Aust) after the 1 January 2008.

The 'cap and trade' system was first implemented in the USA for polluting gases (eg Sulphur dioxide) that cause 'acid rain'.

Kyoto protocol

The Kyoto protocol is an agreement signed by most nations to reduce the amount of GHG's in the atmosphere. It sets future emissions targets for each country. The first Kyoto accounting period is from 1 January 2008 until 31 December 2012.

Targets are set using 1990 net emissions as the base line year. Australia has a target for the 2008 - 2012 period for emission to average 108% of the 1990 level. Australia and the USA both 'signed' the Kyoto protocol, but have not committed by 'ratifying' the protocol. Once Australia ratifies the Kyoto protocol then we could trade Carbon Credits with other nations.

The Kyoto protocol also sets out the rules by which Carbon Credits can be traded between nations, and how one country can invest in another country and claim Carbon Credits using the Clean Development Mechanism (CDM).

Carbon trading

Carbon Credits can be traded between individual businesses. The price of Carbon Credits is determined by supply and demand. While no business in either Australia or the USA currently needs credits, large companies are buying Carbon Credits on the basis that they will do in the near future.

After 1 January 2008 Carbon Credits can also be traded between nations. Russia will be the largest seller of Carbon Credits. Their cap was set at their 1990 level. As their economy collapsed after the fall of communism they are now emitting well below their 1990 level. The international price of Carbon Credits will largely depend on Russia's strategy for maximising the returns on their credits.

European Carbon Exchange (ECX) & Chicago Carbon Exchange (CCX)

The ECX and CCX are financial markets that buy and sell Carbon Credits in the same way as shares are brought and sold.

Website References

http://environment.newscientist.com/channel/earth
www.greenhouse.gov.au
www.ipcc.ch/
www.fao.org/ag/agl/agll/carbonsequestration/default.stm
www.europeanclimateexchange.com

Mycorrhizas and Perennial Pastures

Dr Megan Ryan & Mark Tibbett, School of Plant Biology, UWA, Ph: (08) 6488 2208.

Introduction – what are arbuscular mycorrhizas?

Arbuscular mycorrhizas are formed by a close association between roots and arbuscular mycorrhizal fungi (AMF) which are ubiquitous in natural and agricultural ecosystems. There are currently 198 recognised species of AMF. Arbuscular mycorrhizas are formed in the majority of plant families and are commonly found in most crop and pasture plants, in particular legumes and cereals, as well as in many tree crops. A small number of plants are non-hosts for AMF including brassicas and some lupins.

AMF have long fascinated agricultural researchers with their ability to enhance host plant uptake of nutrients, especially phosphorus and zinc. AMF may also enhance uptake of nitrogen. AMF may be viewed as intermediaries between soil nutrients and host plants, and thereby as biological regulators of plant nutrient uptake. However, AMF are now known to influence host plants in other ways which include aiding with drought avoidance and providing a degree of disease control. There is now also evidence that AMF may be necessary for the long-term sustainability of agricultural systems due to their interactions with other components of the soil biological community, and role in the maintenance of soil structure and, in permanent vegetation, plant community structure and diversity.

What does an arbuscular mycorrhiza look like?

Arbuscular mycorrhizas cannot usually be distinguished without staining roots and examining them under a microscope (note – in contrast, ectomycorrhizas which are formed by a different group of fungi on many tree roots can be seen with the naked eye). A specimen prepared in this way is shown in Figure 1. We can see in Figure 1 that when AMF colonise a root they penetrate through the epidermis and hyphae then grow from cell to cell or through intercellular spaces. In some cells the hyphae form structures with fine branches known as arbuscules which allow exchange of carbon and nutrients with the host plant. AMF may also form distinctive vesicles, which act as storage structures. AMF extend hyphae out into surrounding soil and these absorb nutrients from up to 11 cm away from the root and transport them back into the root. Distinctive large spores are formed.

The hyphae of AMF which grow outside roots, if undisturbed, form a common mycorrhizal network (CMN) of interconnected hyphae and host roots. CMNs may allow movement of nutrients between linked plants. While such processes are thought to be important in mediating the outcomes of plant competition, their importance under field conditions has proved difficult to measure.

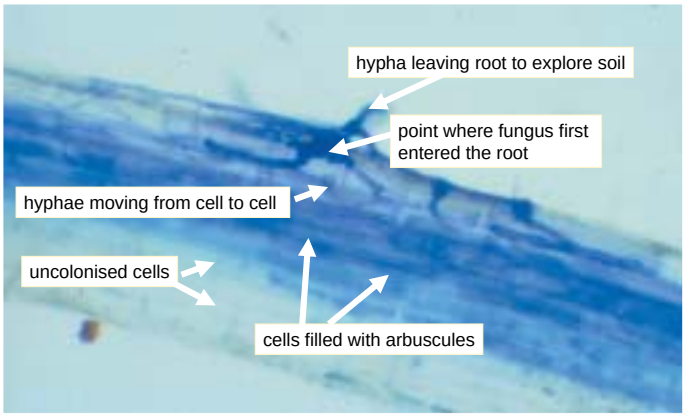

Figure 1. A wheat root colonised by AMF. The root has been treated to make the contents of cells transparent and all fungal material has been stained blue. The root has been squashed on a microscope slide and hence many layers of uncolonised cells can be seen through.

How can AMF be managed by farmers?

AMF are obligate symbionts which means they cannot grow or reproduce without association with a host root from which they acquire all their energy needs (AMF are believed to commonly use between 4 and 20% of the energy produced by the host plant - ie the sugars produced by photosynthesis). Therefore, high levels of colonisation may reduce plant growth under some circumstances (eg high soil phosphorus or low light).

The close relationship between AMF and their host plant has resulted in an inability to utilise axenic culture for large scale inoculum production (in contrast to rhizobia). Therefore the best way to deliberately manage AMF, if necessary, is via farm management practices.

Farm management practices that are favourable and unfavourable to AMF are listed in Table 1. High colonisation by AMF is particularly favoured by avoiding fertilisers that supply readily soluble P, minimal soil disturbance, avoidance of non-host plants and bare fallows, and, perhaps, a high degree of plant diversity and minimal use of biocides. Colonisation by AMF is often higher on organic farms than conventional farms and there is evidence of an increase in species diversity of AMF on organic farms. These differences appear to be primarily due to the restrictions on the use of readily soluble P fertilisers on organic farms.

The need for inoculants containing AMF is unknown, but they may prove beneficial if bare fallows or weed-free crops of non-hosts are regularly included in the rotation. Inoculation with AMF from a different location could sometimes be beneficial as some characteristics of agricultural systems, especially maintenance of monocultures, high soil fertility, and high

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rates of tillage, may stimulate development of less beneficial communities of AMF.

Can AMF substitute for fertiliser?

AMF do not substitute for fertiliser inputs as the nutrients taken up by the fungi primarily originate from the existing pool of soil plant-extractable nutrients and removal of these nutrients in farm products (ie grain, hay, livestock) must be matched by fertiliser-inputs from off-farm sources. High colonisation of roots by AMF may sometimes indicate low soil extractable P.

Role of AMF in perennial pastures?

The functioning of AMF under field conditions is very difficult to determine. Perennial pastures may provide a very favourable environment for AMF due to host plants being present all year round (ie no summer fallow) and the lack of tillage allowing formation of a CMN. Thus, in perennial pastures AMF may allow movement of nutrients between plants, including nitrogen from legumes to non-legumes, via the CMN. Maintenance of high plant diversity is therefore favoured. Nutrients from roots of plants that are dying, or roots that have reached the end of their life, may be efficiently moved via the CMN to neighbouring roots or plants, reducing the likelihood of nutrients being lost via leaching. Over summer when soil is very dry and phosphorus hard for plants to access, the activities of AMF may aid in plant phosphorus uptake due to the presence of the hyphae of AMF in moist soil pores too small for roots to enter. We have found that both lucerne and perennial grasses can be highly colonised by AMF.

Current research on AMF at UWA

UWA has a proud history of research on AMF. The current vice-chancellor Professor Alan Robson conducted a lot of influential research on AMF. One current focus of research at UWA is the role of AMF in perennial pastures. A field experiment is being established in 2007 to look at AMF and other factors associated with phosphorus nutrition for a range of exotic and native perennial legumes.

Contacts and further information

UWA research on AMF and perennial pasture plants:
Dr Megan Ryan (megan.ryan@uwa.edu.au ph: 08 6488 2208)
Dr Mark Tibbett (mark.tibbett@uwa.edu.au ph: 08 6488 2634)

Information and photos:
www.ffp.csiro.au/research/mycorrhiza/vam.html
www.cpbr.gov.au/fungi/mycorrhiza.html

Table 1. The effect of farm management on AMF.

Characteristics	Favourable	Unfavourable	Comments
Phosphorus fertility	Low soil available P (use of no, or poorly soluble, P fertiliser)	High soil P (fertilisers containing soluble P, eg superphosphate)	AMF levels are often very high on organic farms due to low P soil
Nitrogen fertility	n/a	Very high mineral N	Generally impacts of N not as large as P, high N may change the species of AMF present. Not as well understood as P
Tillage	No or miminum tillage	Frequent tillage with high degree of soil disturbance	Tillage will destroy the CMN
Bare fallow/non-host crops	n/a	Weed free long bare fallows or non-host crops	In southern Qld, poor growth of crops following long fallows corresponds with low AMF colonisation
Weeds/plant diversity	High level of plant diversity	Monocultures	Continuous monocultures may result in less beneficial populations of AMF
Herbicides, pesticides, fungicides	Mimimal use	Average to high use. Effects vary from positive to negative	Not well understood
Annuals vs perennials	-	-	Not known. Likely to favour different species of AMF

Rhagodia

Ian Pulbrook, Greenoil Tree Nursery, Mingenew, Ph: (08) 9928 1281.

Rhagodia is a native shrub, with different species occurring throughout Australia. It is found in remnant vegetation, and along road sides and fence lines through out Western Australia. It grows from the beach to the rangelands in the Mid West region.

Rhagodia is a member of the salt bush family that will grow on a wide range of soil types. It is a shrub that grows to a height of 1.5 to 2.5 metres.

Rhagodia is highly palatable to both cattle and sheep. It can provide feed during the late spring and autumn, or can be rotationally grazed all year round. In addition it can stabilise soil to prevent water run off and wind erosion. Planting Rhagodia will also add to the biodiversity in our landscape as it is a native plant

The intense interest for this plant derives from the fact that it is a native shrub that is naturally adapted to a wide range of soil types in WA. The long-term objective is to develop mixed forage systems using Rhagodia, salt-bush and perennial grasses to better withstand Australia's dry climate.

Ian Pulbrook, manager of Greenoil Tree Nursery in Mingenew, had been looking for a native shrub that might have potential for grazing. He noticed a shrub that seemed to survive all climatic conditions in the dry wheat-belt regions of WA and which the sheep and cattle were grazing on over the fence lines. He saw Rhagodia growing naturally at Kalbarri, on the eastern fringes of the Wheatbelt at Tardun and Maya, and at Cervantes.

He was given cuttings of six different species of shrubs found around the region from farmers looking for ways to drought proof their farms and increase grazing productivity on poor soil types. These cuttings were then grown at the Tree nursery. The high survival and vigour of the *Rhagodia preissii* seedlings in the nursery made this species the most favourable plant for large scale production.

Leaf samples from Rhagodia grown at Greenoil Tree Nursery were sent away for feed testing. The results re-enforced the belief that Rhagodia was the species to work with, as it had good digestibility and protein. However the real animal digestibility of Rhagodia has yet to be confirmed from animal feeding trials. These trials will commence shortly at CSIRO in Perth. Animal performance will also be measured from paddocks of Rhagodia at Binnu this year.

There is a lot of variation in growth habit within the Rhagodia collected from the Geraldton region. The most vigorous plants in the nursery were planted under irrigation at the Greenoil

Don Nairn and Ian Pulbrook, Rhagodia East Binnu. Photo 8 February 2007.

site. This has enabled Ian to increase production of seedlings and grow a first generation seed orchard for farmers across WA.

The first plantings of Rhagodia in 2002 were intermingled with saltbush plantings to see how they performed and how they were grazed at sites in Pindar, Mingenew, Eneabba and Horrocks Beach. At all of these sites Rhagodia has performed well, with vigorous growth and repeated grazing. In the eastern parts of the region 2002 was a dry year yet the Rhagodia and Saltbush shrubs survived and remained green, providing palatable feed for sheep while other food sources dried up.

The 2006 drought at Binnu showed that Rhagodia can be established in prolonged periods of low rainfall. Rhagodia was planted in winter 2006 on 30 ha at 5 sites in the Binnu region with a PIRD grant from Meat and Livestock Australia. One paddock failed due to a mice plague. The other 25 ha was successfully established despite it being by far the driest year on record.

A new national project called 'Enrich' has also been looking for native shrubs as potential forage sources. The Enrich project has incorporated Rhagodia grown at Greenoil in its field trials at the Badgingarra Research Station.

Greenoil has grown around 400,000 Rhagodia and Saltbush seedlings for planting in 2007. These will be planted on a wide range of soil types all over the Midwest region. Existing plantings include salty valley floors and hill tops in Maya, low lying salty water logged country in Eneabba, white sands at Eneabba, Dongara and Horrocks Beach, yellow sands at Binnu & Mullewa and on clay soil types at Mingenew and Three

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A mature Rhagodia plant. Photo 8 February 2007.

Springs. All these sites have grown well. The only weakness Ian Pulbrook has found is that Rhagodia doesn't like wet feet. Mounding in low lying water logged sites is essential.

Rhagodia plantations have been grazed since 2003. But there is more to learn about the habits of the plant and how to best manage it. It will probably need some form of intensive grazing system. So far, all Rhagodia plantings have been done with seedlings grown from Ian's nursery. An average planting density in the range of 600 to 800 plants per hectare appears to be best.

The benefits of Rhagodia are not limited to its grazing potential. It can also be used as an understorey in windbreaks, as part of nature conservation strips and for soil stabilisation in wind blown areas. Rhagodia may also have a role in sequestering carbon.

Ultimately the benefits to farmers will be maximised by deliberately designing plant mixtures that are drought proof, can deliver animal health, higher animal production and improved land management outcomes; which in turn will help lower input costs and increase profitability on the farm.

Please contact Ian Pulbrook (08) 9928 1281 if you would like more information.

300 kg/ha live weight gain in a dry year!

Philip Barrett-Lennard, Evergreen Farming and Shanon Dellar, DAFWA, Moora, (08) 9651 0532

An impressive 300 kg of live weight gain per hectare was produced in a trial at Badgingarra during last year's dry year. At $1.50/kg this equates to $450 income per hectare, achieved solely from pasture without the need for supplements. It is an exciting result given the adverse seasonal conditions.

The trial was run over 60 ha of an Evergreen Mix of sub-tropical perennial grasses sown in September 2005. It was designed to replicate a trading enterprise with light weight ex-pastoral steers backgrounded for the live export market.

Light ex-pastoral steers weighing 190 kg were introduced on 1 August 2006 at a stocking rate of 2.6 steers per hectare. The feed on offer (FOO) was approx. 1,000 kg/ha of dry matter at this time. They stayed in these paddocks until 29 November 2006 when the feed ran out and they began to lose weight.

Steers were either set stocked or rotational grazed (using a 12 paddock rotation) to compare the effect of grazing system on productivity.

During this 120 day period the steers gained an average of 0.97 kg/day. There was no difference in live weight gain between the set stocked and rotationally grazed paddocks.

The combination of the high stocking rate (2.6 steers per hectare) and the good live weight gain (0.97 kg/day) produced the exceptional 303 kg/ha of live weight gain.

The use of the light weight steers was critical in achieving this result. Light animals are extremely efficient at converting feed to live weight gain because their maintenance energy requirements are low. Their small body mass requires less to maintain, so a greater proportion of their pasture intake is allocated to growth. A 400 kg steer will eat nearly double that of a 200 kg steer for the same live weight gain.

The pasture in late spring showing green perennial and dry annual pasture. Photo 25 October 2006.

Steers in one of the rotational grazing cells. Photo 31 August 2006.

That only 4 months was needed to achieve this level of production is also impressive. Understandably, as August to November are reliably the 4 best months for pasture each year, but an opportunity does exist to achieve extra live weight gain during the other 8 months.

How could we integrate a trading enterprise like this onto a farm in the West Midlands region? We see 3 simple ways and then an array of variations on these.

(1) Plant perennials, purchase light weight ex-pastoral weaners each winter, and run them for 4-5 months over the best period of the year. This makes lots of money and allows you to take a holiday for the rest of the year. Market risk (ability to buy/sell when you need to) would be the biggest issue. This is where Craig Forsyth's profit-share alliance fits in on the supply side.

(2) Similar to option 1, but also plant some standing fodder crops (e.g. oats) so there is somewhere for the steers to go if the boats are late or the cattle aren't ready. The risk with the first option is that if the boats are late, the perennials could be over-grazed (reducing their persistence) and the cattle go backwards. Having another feed source for summer such as a standing oat crop could be cheap insurance.

(3) Similar to option 1, but use the trading enterprise in conjunction with an existing breeding enterprise. The breeding ewes or cows could graze the perennials during the 7 to 8 month "off-season" (December to June) when they are most in need of extra feed. The autumn growth from the perennials could replace some supplementary feeding.

The way you integrate such an enterprise and manage the risks will be crucial.

This trial at Badgingarra Research Station will run for another 2 years and utilise even greater stocking rates if the seasons allow. Stay tuned for more results.

Perennial Pasture Incentives

The Northern Agricultural Catchments Council (NACC) has developed a Targeted Investment Program (TIP), which identifies high priority natural resources such as rivers, native vegetation and agricultural land that are under threat from increasing salinity and declining water quality. The program promotes an integrated, strategic approach to the management of these resources that delivers on-ground change.

The TIP area covers approximately 1,000,000 ha between Mingenew and Gingin. It encompasses part of the catchments of the Hill, Moore and Minyulo river systems, and the Dandaragan Plateau portion of the Parmelia Aquifer.

The TIP area has been chosen through an evaluation of the natural resources in the Northern Agricultural Region (NAR), and the severity of the threats they face. Many of the natural resources within the TIP boundary are identified as being of high to medium importance, with the majority of these being under high threat of further degradation.

Low lying land in the TIP area is already showing signs of waterlogging and spreading salinity. This will be reflected on a larger scale in the next 5-10 years without immediate action.

To this end, the TIP provides financial incentives for the following on-ground works:

- Landscape revegetation with perennial pastures
- Farm forestry
- Native vegetation management
- Saline land management

$$ provided by the TIP are an incentive to enable land mangers to undertake works that they would otherwise not do.

NACC Targeted Investment Program Focus Area

TIP funding will be available from May 2007 to June 2008, with on-ground works signed up through the TIP needing to be finalised by September 2008 at the latest.

For further information please contact
Jane Bradley Tel: 9964 9774 Mob: 0428 649 775

2007 Evergreen Mixes

The Evergreen Sandplain Mixes are a blend of sub-tropical grasses trialled over several years by Evergreen members. The species are suited to deep, well-drained, sandplain soils in Northern and Southern WA. The Evergreen Sandplain Mixes consist of the following varieties in a 20 kg bag.

Northern Sandplain Mix

Variety	%
Rhodes (Finecut, Topcut & Katambora)	33
Gatton Panic	33
Signal	33

Recommended sowing rate: 3kg/ha

Southern Sandplain Mix

Variety	%
Rhodes (Finecut, Topcut & Katambora)	33
Gatton Panic	33
Setaria	33

Recommended sowing rate: 3kg/ha

The "Evergreen Mixes" are recommended for this coming spring sowing season and are now available from most major seed sellers.

For more technical information contact:

Ray Candy, Business Development Manager
Irwin Hunter & Co, Phone: (08) 9383 4708

What is the optimum seeding depth?

Ron Yates, Daniel Kidd & Geoff Moore, DAFWA, South Perth, Ph: (08) 9368 3665.

New research identifies large differences between 'sub-tropical' perennial grass species in their tolerance to different sowing depths. This may help to explain what we are seeing in the paddock and provide the science behind the recommendation for shallow seeding.

There is a recurring theme with many field walks. The paddock was sown to a mix of 3, 4 or 5 species in spring, but looking across the paddock in the subsequent autumn reveals some interesting things:

1) There are a few areas with excellent establishment but in many other areas the plant density is low and highly variable, in a word the overall establishment is patchy.

2) Apart from areas with excellent establishment the pasture composition often bears little resemblance to what was sown as most of the paddock is dominated by one or two species. What happened to the other species in the pasture mix?

A number of factors could have contributed to this result: namely poor seed quality of some of the lines in the mix and failure to have total weed control, but perhaps the big one is seeding depth? This leads to the following questions:

What is the optimum seeding depth for each species?

How much tolerance do the various species have, or how precise does the seeding operation need to be?

What about mixes, do the species have different requirements?

A new project 'Reliable establishment of non-traditional perennial pasture species', funded through the CRC Salinity (with partners including MLA, AWI and SGSL), is aiming to develop robust and reliable establishment packages for a range of perennial pastures.

One of the first things the project tackled was the influence of depth and time of sowing of six sub-tropical perennials; five perennial grasses (Gatton panic, Katambora Rhodes grass, Signal grass, Whittet kikuyu, and Splenda setaria) and the perennial legume (Miles *Lotononis*).

A small plot field trial was conducted on a sandy soil at South Perth under irrigation. The experiment comprised six different depths (surface - without pressing, 5 mm, 10 mm, 15 mm, 20 mm, and 30 mm), two times of sowing (21st August and 25th September 2006) which was replicated four times with 100 seeds sown per row (288 plots total). Depth was precisely controlled using a wooden dowel, seed was sown by hand and then the slots were filled to the surface with red sand. Seedlings were counted weekly for 4 weeks. Two seedlings were randomly selected per plot and grown through until early December.

Results

There were some very interesting results with large differences between species. The important point in Figure 1 is the relative germination at different depths for a species rather than the absolute values, as the latter reflects differences in seed quality.

The small-seeded species like Rhodes grass and the perennial legume *Lotononis* (which has a tiny seed 1/10th the size of sub clover) had excellent establishment at 5 mm but major reductions in establishment at deeper sowing depths. There was a significant reduction in Rhodes grass germination at 10 mm, with negligible germination at 15 mm and deeper. Whilst for the *Lotononis* there were major reductions in germination at a depth of 15 mm and no seedlings emerged at 30 mm.

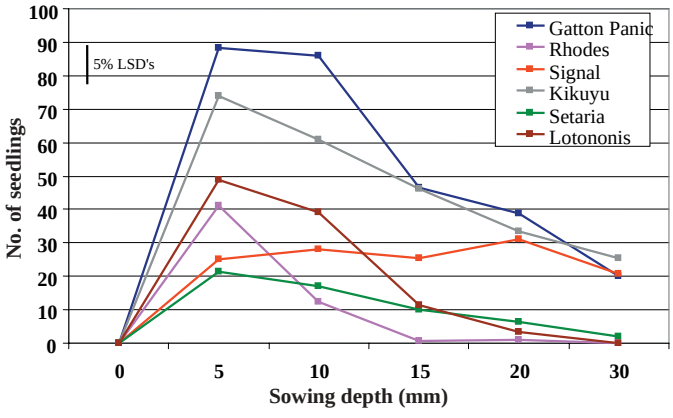

Figure 1. Number of seedlings germinating at 6 sowing depths

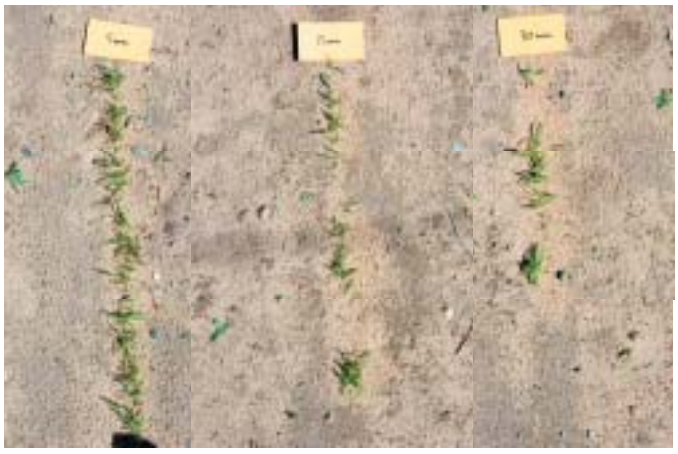

Figure 2. Plots of Gatton panic seedlings display superior germination when sown at the depth of 5 mm (left), in comparison to the depth of 15 mm (middle) and 30 mm (right)

Continued

Figure 3. Lotononis seedlings did not germinate when sown on surface (left) or at 30 mm (middle), however displayed excellent establishment when sown at a depth of 10 mm (right)

However, the larger-seeded species like signal grass were able to establish from deeper sowings, with little difference in germination for signal grass between 5 mm and 30 mm. This was similar for the relatively large seeded kikuyu, where the species optimal depth was 5 mm, but there was reasonable germination from 20-30 mm showing there is some tolerance in seeding depth.

Gatton panic and Setaria had optimal germination at 5 to 10 mm with a major reduction in germination at 15 mm or deeper (Figure 2).

Seed sown on the surface of all species failed to establish (Note: seed was not pressed or rolled to 1-2 mm which would occur if the seed was broadcast and then rolled). However, the results indicate there is enhanced establishment with seed burial (Figure 3).

Given that many paddocks are sown to a pasture mix, a key finding is that a single sowing depth of 5-10 mm appears suitable for all of the species studied.

The time of sowing (TOS) did not have a significant effect on germinating seedling numbers (Figure 4). However, the TOS had a highly significant impact on biomass production. The first TOS had greater herbage production in comparison to the second TOS (Figure 5). Further investigation will continue in the field this season on the optimal TOS and the correlation between plant maturity and persistence over summer.

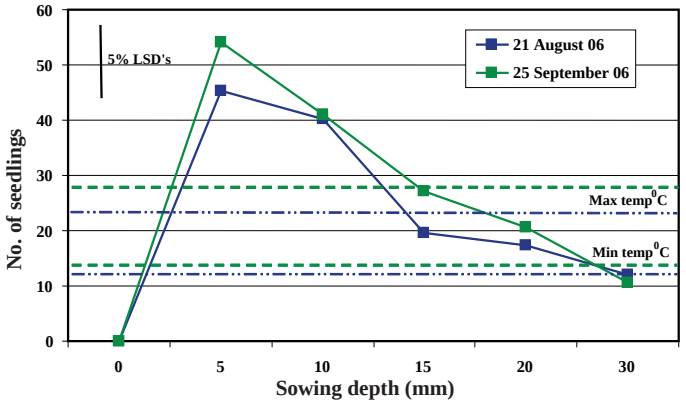

Figure 4. Number of seedlings established following two times of sowing (TOS) at six sowing depths (average of all 6 species)

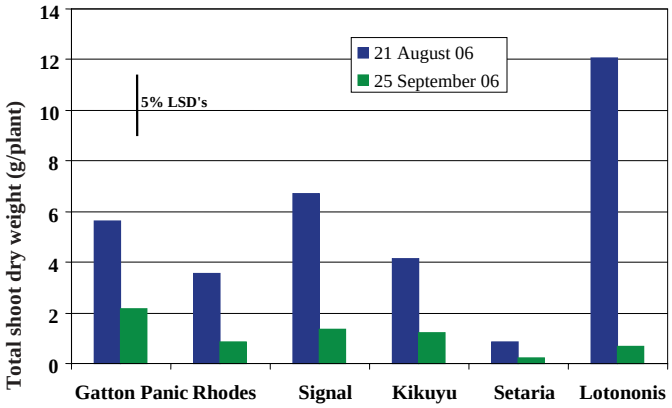

Figure 5. Dry matter production (g/plant) of six sub-tropical perennial species from two sowing dates

WANTED

The Department of Agriculture and Food, the CRC for Dryland Salinity, together with Kings Park are involved in a project to improve the establishment of non-traditional pasture species by using exciting new seed technology and developing an improved agronomy package. The project covers warm season pastures, saltland pastures and native species and is jointly funded by SGSL, MLA, AWI & CRC Salinity.

In general, the establishment of sub-tropical perennial pastures at the paddock scale is resulting in fair, but sub-optimal results. As part of our studies on perennial pasture establishment we are particularly interested in surveying seed quality before sowing. If you are establishing sub-tropical perennial pastures this spring please contact Ron Yates on 9368 3665 (office) or 0427 550 125 (Mob).

Case Study: Joe de Pledge - Badgingarra

Alison Cooke, Evergreen Grain & Graze Project Officer, Ph: (08) 9952 5030.

FLOODING on their pastoral property, Mandora Station in 1999 prompted Joe and Jane de Pledge to go in search of a farm in the Mid West to complement their Broome station.

"Huge areas on Mandora were inundated and we needed some country to retain our breeding herd and to finish our steers," Joe says.

"We were looking to spread our climatic and market risk."

Mandora covers 89,000ha and has been run by the de Pledge family for over 60 years.

Joe bought Jandawanning, a 1,510 hectare property five kilometres north of Badgingarra in 2000. An undulating property which straddles the Hill River, the soil types on Jandawanning vary from sand over gravel to rocky gravel/clay.

Fulfilling their long term expansion plans, the family bought a further two stations south of Onslow in 2006 – Yanrey (255,000ha) and Koordarrie (117,000ha). The Onslow properties are about 1,000km north of Badgingarra and 700km south of Mandora.

Annual average rainfall on Jandawanning is 600mm, with 275mm the average on Yanrey and 337mm on Mandora.

The three properties, located in three distinct geographical areas and covering more than 618,000ha afford the de Pledge family a range of opportunities, with stock moved north and south as the season unfolds.

The bulk of cattle are destined for live export out of Broome, Port Hedland and southern ports.

Because it is closer to the end market, the Badgingarra property has allowed them to hedge their bets, with cattle going to abattoirs or feed lots. "Jandawanning is used for finishing cattle, in particular steers, cull heifers and 'out of spec shippers'," Joe says. "It has the capacity for ~1,500 head of cattle (300kg animals) in spring and there is also the opportunity to trade cattle.

"We have not pushed it to its limit, grazing-wise."

The de Pledge family run 5,500 breeders on Mandora and Yanrey and calve year-round. "We run Droughtmasters at Mandora and the herd at Yanrey is Shorthorn but we are crossing over to Droughtmaster," Joe says.

"If live export goes, we will have to think about some cross-breeding."

Joe de Pledge with some of his Droughtmaster cattle at a water hub

The entire 1,400 hectares of grazing country on Jandawanning has been refenced for cell grazing. Average paddock size is 26 hectares and each of the cells centres around a central watering point. Stock are run in big mobs but moved daily, a practice that involves just opening the gate.

Pastures on Mandora and Yanrey are mainly perennial with the principal ground cover buffell grass, Mitchell grass, birdwood and woolly butt.

Year round green pastures and the ability to make use of out of season rainfall encouraged Joe towards perennial grasses on Jandawanning. He has sown nine paddocks, a total of 200ha to Rhodes glass, Splenda setaria and panic.

Despite there being little summer rainfall in recent years, the perennial grasses have remained green, suggesting the roots have tapped into soil moisture at depth.

Newly sown perennial grass paddocks are not grazed for about nine months, ensuring that plants are well anchored.

Achieving good weed control has made a vast difference to establishment of perennial grasses on Jandawanning.

Paddocks with a high proportion of couch now have very sparse plantings of the Rhodes grass mix.

A small area on the Badgingarra property has been planted to tagasaste but with disappointing results.

Joe is keen to test the potential of his paddocks sown to subtropical perennial grasses and investigate the cost – benefit of these grasses.

Joe de Pledge and Aubrey Panizza are two of 18 farms in the Northern Agricultural Region being monitored in the Grain and Graze project. Alison Cooke is a Project Officer with Evergreen Farming working on Grain and Graze. Stay tuned for more information from this project over the next 12 months

Aubrey Panizza - Badgingarra

Alison Cooke, Evergreen Grain & Graze Project Officer, Ph: (08) 9952 5030.

THE establishment of 560ha of subtropical perennial grasses has enabled the Panizza family to boost their sheep numbers by 1,600 head.

Aubrey and Lisa Panizza and Aubrey's parents, Dick and Verna run an extensive sheep enterprise on two properties, *Yerramullah Park* and *Stone End*, ~13km west of Badgingarra.

The 2,400ha on these two properties – of which 2,000ha is arable, supports 9,000 sheep. About 200ha is cropped annually to a mix of oats and lupins to meet the Panizza's own grain needs for their sheep.

Located just 40km from the coast, frost is seldom an issue and the country is undulating. Annual average rainfall is 600mm, with a varying amount of summer rainfall and soils are sandy with gravel ridges.

Aubrey runs 5,200 ewes and crosses 70 percent of ewes to AMS rams and the balance to terminal sires for the prime lamb market. Ordinarily, Merinos lambs are dropped in May and cross-bred lambs in April. Lambing rates are currently 93 percent but Aubrey is aiming to boost this figure to 100%.

"The problem relates to the period between birth and marking," Aubrey says.

"We started feeding lupins and oats at 1kg per head per day, 10 days before lambing and then for six weeks, but it only lifted our numbers by 3 percent."

He is now looking to run his ewes in smaller mobs of ~400.

Lambs are destined for the Midland saleyards, while wethers go for live export.

The Panizza family have been in the district for 25 years and are dedicated to the wool industry.

They entered the prime lamb market when the price of wool slumped but Aubrey admits he is not convinced that running some prime lambs is necessarily a good option.

"Merino wethers seem to be an easier option and they would probably fit better with our farming system," he adds.

Aubrey and his brother, Phillip were founding members of the Evergreen Group and have been planting subtropical perennials grasses for the past 16 years. Over these years, they have learnt much and assumed a great deal of risk.

These perennial grasses have been established on the least productive, sandy country on the two farms and have transformed these areas.

Some 560 ha on Yerramullah Park and Stone End has been established to sub-tropical perennial grasses

Experience has shown that subtropical perennial grasses must be sown before the first of September. These grasses are grazed during the winter months and up until November and spelled over the summer. They are only grazed over the summer months in the event of summer rains.

"We had three inches of rain this summer and if we did not feed the grasses off, they would go rank and be wasted," Aubrey says.

This grazing regime has resulted in thickening of the stands of perennial grasses, presumably with some grasses self-seeding. In addition, Aubrey has noticed regeneration of annuals such as Cadiz serradella that had been sown previously.

Grasses are fertilized annually with 80kg/ha of Coastal Super.

More then 50 percent of the Panizza's land area is established to perennials – given the area of perennial grasses and the 400ha of remnant vegetation on the two properties.

"Having transformed the sandy areas with the perennial grasses, this permanent groundcover has to go a long way toward long term sustainability," Aubrey says.

Grain & Graze

Joe de Pledge and Aubrey Panizza are two of 18 farms in the Northern Agricultural Region being monitored in the Grain and Graze project. Alison Cooke is a Project Officer with Evergreen Farming working on Grain and Graze. Stay tuned for more information from this project over the next 12 months

Statewide Snap Shots - Autumn 2006

Rhodes at Esperance

This paddock was sown to Rhodes grass in early September last year. The very dry spring produced an initially very poor establishment (<1 plant/m2). However, 200mm of rain in early January enabled those few sparse plants to take off. Each plant produced a heap of runners up to 5 metres in length, giving almost complete ground cover by mid-March. Not a bad result from what looked like a failure in December. Photo 15 March 07.

Soil Pit at Lancelin

This soil pit was dug in a 3 year old stand of rhodes, gatton panic and signal grass at Bob Wilson's farm at Lancelin. There is a mass of fibrous roots and rich organic matter in the top 30cm. The deeper roots were seen down at around 3m in the more yellow sand. Tim Wiley from DAFWA has analysed soil samples from this and adjoining tagasaste and annual pasture paddocks. There appears to be some build-up in soil carbon under perennial pastures. More details in the next Newsletter. Photo 4 April 2007.

Chicory at Wellstead

A slightly unexpected result from the EverGraze site at Wellstead has been the excellent persistence of chicory through one of the driest years on record. Last year the site only received 290 mm of rain. While the good persistence of kikuyu, lucerne, setaria and panic was expected, it is very encouraging that chicory maintained the plant density shown above. Photo Paul Sanford 2 May 2007.

Tagasaste at Binnu

This 3 year old stand of tagasaste at Don Nairn's farm east of Binnu (100km north of Geraldton) has stood up well during the drought. It is grazed exclusively by sheep and Don strip grazes it using temporary electric fencing to minimise the risk of ring barking (a common problem with sheep). Unlike many of the paddocks in that area, erosion hasn't been a problem. Photo 27 March 2007.