Northern Agriculture Catchments Council's Sustainable Land Use Program Regional Workshop

BOOKLET:
LAND PROJECTS
IN THE NORTHERN AGRICULTURAL REGION

Compiled: Stanley Yokwe, NACC

nacc
managing natural resources in WA's Mid West

Australian Government

Government of Western Australia
Department of Agriculture and Food

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THE NORTHERN AGRICULTURE CATCHMENTS COUNCIL (NACC)

The NACC is the peak Natural Resource Management (NRM) body in the Northern Agricultural Region of Western Australia. NACC's vision is to assist the development of vibrant communities with diversified economies and a healthy environment. It aims to achieve this vision through providing leadership, advice and on-ground support for NRM issues and projects.

In line with Federal, State and Regional priorities over the past few years, NACC has been investing in NRM projects that are located across the region. Under the Sustainable Land Use Program alone, NACC has funded projects dealing with issues of dryland salinity, waterlogging and rising groundwater level, erosion, climate, and farming systems. NACC has also funded projects that deliver incentives to the community groups and land managers who have NRM priorities to deal with environmental threats to our natural assets.

This workshop endeavours to provide an opportunity to review these projects and discuss key outcomes and future research needs in the region. Additionally, it will provide an opportunity to learn more about what NACC is doing in the region as well as to meet and establish effective partnerships and exchange information.

NORTHERN AGRICULTURAL CATCHMENTS COUNCIL'S (NACC) LAND PROGRAM REGIONAL WORKSHOP

Program

	DAY 1 (THURSDAY 8TH NOV 2007)	**Chairperson: Paul Findlater**	**Time (Min)**
Time	**Items**		
11:30 – 12:00	Registration		30
12:00 – 12:45	**Lunch**		**45**
12:45 – 13:00	Welcome	Paul Findlater	15
13:00 - 13:15	Background to NACC Program	Bill Currans	15
	Session 1: Salinity projects in the NAR	**Speakers /Chairperson: Paul Findlater**	
13:15 – 13:25	Salinity Rehabilitation and Extension	Mike Clarke	10
13:25 – 13:35	Assessing deep drains in the NAR of WA	Alison Beattie /Angela Stuart-Street	10
13:35 – 13:45	Brushwood industry development on saline land	Georgie Troup	10
13:45 – 13:55	Revegetation of natural drainage lines and protection of remnant vegetation in East Moore Catchment	Lana Kelly	10
13:55 – 14:05	Buntine Marchagee Natural Diversity Recovery Catchment	Rowan Dawson	10
14:05 – 14:15	Agronomic package and benchmarking for mild and periodically saline soils	Lorinda Hunt	10
14:15 – 14:45	**Questions Time**	**Above speakers**	30
14:45 – 15:05	**Afternoon Tea**		20
	Session 2: Climate	**Chairperson: Liz Easton**	
15:05 – 15:15	Biochar: prospects, potentials and myths	Paul Blackwell	10
15:15 – 15:25	Water Balance of annuals, perennials and Tagasaste on Deep sand in Mingenew area of the NAR	Ahmed Hasson	10

15:25 – 15:35	Farming to Climate: Managing climate risk and variability in the low rainfall NAR	Kari-Lee Falconer	10
15:35 – 15:45	Soil Carbon (ASCAS / NACC Soil Carbon initiative) Project	Tim Wiley	10
15:45 – 15:55	Developing potential adaptations to climate change for the low rainfall farming system using the economic analysis tool, step	Megan Abrahams	10
15:55 – 16:05	Taking advantage of climate variability in the Warradarge and Lake Indoon catchments of the west midlands, in the NAR	Jennifer Bairstow	10
16:05 – 16:35	**Question Time**	**Above speakers**	30
16:35 – 16:45	**Stretch your legs**		10
	Session 3: Incentive delivery for NRM solutions	**Chairperson: Bill Currans**	
16:45 – 16:55	TIP Project	Jane Bradley	10
16:55 – 17:05	West Koojan/Gillingarra CDI	Mark Weston	10
17:05 – 17:15	Yarra Yarra oil mallee project	Jo Ashworth	10
17:15 - 17:30	**Question Time**	**Above Speakers**	**15**
17:30 – 18:30	**Sundowner**		
End of Day 1			

	DAY 2 (FRIDAY 9TH NOV 2007	Chairperson: Andrew Blake	Time (Min)
	Session 4: Farming systems		
8:30 – 8:40	Stimulating change via the west midlands "farming systems" project "integrating innovative farming systems and catchment management"	Jill Wilson	10
8:40 – 8:50	Health farms – a pilot project	Kristy Chapman	10
8:50 – 9:00	Soil stabilisation solutions for Nangetty Valley	Kristy Chapman	10
9:00 – 9:10	Long term sustainability of profitable 'medium rainfall' farming systems.	Rob Grima	10
9:10 – 9:30	**Question time**	**Above speakers**	**20**
9:30 – 9:50	**Morning tea**		**20**
9:50 – 10:00	Reducing erosion under high stocking rate grazing systems	Rob Grima	10
10:00 – 10:10	Upper Chapman Project	Naomi Thomson	10
10:10 – 10:20	Determining optimum grazing rotations to maintain perennial pastures	Tim Wiley	10
10:20 – 10:35	**Question Time**	**Above speakers**	**15**
10:35 – 12:20	**Workshop:** **~ What have you learnt?** **~ Future Research opportunities**	**Chairperson: Rob Grima / Mike Clarke**	**1hr:45min**
12:20 – 12:40	**Closing**	**1. Findlater and** **2. Stanley Yokwe**	**20**
12:40 – 13:40	**Lunch**		**65**
Thanks……End of the workshop			

SALINITY REHABILITATION AND EXTENSION PROJECT

PROJECT TEAM: Mike Clarke, Jessica Hasleby and Andrew Blake
DAFWA, Geraldton

This project is contributing to the Resource Condition Target of *Maintaining or reducing the rate of groundwater rise and ensures that all salt affected areas are rehabilitated by 2025*. It is designed to provide a greatly improved salinity extension service to landholders throughout the Northern Agricultural Region as well as providing a fencing incentive to help rehabilitate salt affected land. It is meeting this goal by providing a three pronged approach to salinity extension.

1. An "on farm" salinity advice service
2. Regular updates of groundwater trends in the regions
3. Administration of a fencing incentive for fencing out saltland

The project is strategically focusing on the districts in the region where properties have a significant proportion affected by salinity. This includes the Yarra Yarra, eastern areas of the Moore River and the headwaters of the Irwin Catchment. There is currently market failure in provision of an "unbiased on farm" service to farmers on salinity management. Salinity is a very site specific issue to manage and farmers need to know what groundwater flow system is operating in their paddock and what range of management options are available to them.

The service is delivered by three specialists in saltland management, hydrology, revegetation and catchment planning and uses the Land Monitor products, Aerial photography, Satellite imagery, an EM 38 and other survey results to provide the farmer with a range of salinity management options. Options covered include engineering, soil amelioration techniques, cropping and grazing solutions, farm forestry and revegetation for nature conservation outcomes. Approximately 75 farming properties are visited each year.

A fencing incentive of around $1200/kilometre is assisting landholders to improve saltland management by allowing them to control their grazing management. The first step in managing salt affected areas is to protect it from grazing to allow for natural regeneration, (at the very least) to occur. It is important to ensure that salt affected areas don't remain bare and lose topsoil as a result of grazing pressure.

The project also provides information to the broader rural community on groundwater trends throughout the region by explaining how different groundwater systems are operating and publishing articles in the AgMemo.

The response from farmers has been overwhelming with over 85 farms visited in the first 14 months and over 14,000 hectares of saltland nominated to be fenced out by May 2008.

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ASSESSING DEEP DRAINS IN THE NORTHERN AGRICULTURAL REGION OF WESTERN AUSTRALIA.

PROJECT TEAM: Angela Stuart-Street, Alison Beattie,
Peter Whale, Russell Speed
DAFWA, GERALDTON

The effectiveness of deep open drains excavated to manage salinity in the Western Australian wheat-belt is subject to considerable debate. Our project aims to better understand how farmers arrive at their initial decision to dig drains and their observations and perceptions on the effectiveness of the drain they have installed. We have intentionally targeted drains which are located in a variety of landscapes ranging from sandplains to clay flats.

One on one interviews have been undertaken with the participating farmers. To complement information from the interviews, field measurements are taken of sections of the drains. These measurements include soil characterisation, EM38 transects, drain configuration and condition, and water quality. At sites where we can obtain pre-drain data we have installed transects of shallow observation bores and piezometers to accurately describe watertable response.

From the interviews, we found that the main driver for the farmers to install drains was that they wanted to restore land that was previously highly productive and is now affected by salinity or waterlogging. Most farmers obtained advice from neighbours or earthmoving contractors and in most cases preliminary assessments were not undertaken. The majority also thought that the drains were both effective and value for money. While many farmers state that they have seen improvements in productivity since the drain has been installed, soil analysis shows that the profiles are often in poor condition and still saline - often moderately to severely - even many years after a drain has been established. Drain condition and maintenance are variable between sites. Groundwater measurements taken before and after a drain is installed reveal there is great variability with watertable drawdown. Results range from negligible to measurable impacts more than 100 m from the drain.

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BRUSHWOOD INDUSTRY DEVELOPMENT ON SALINE LAND

PROJECT LEADER: Georgie Troup
Moore Catchment Council (MCC)

PROJET DESCRIPTION:
This project has a regional focus and will grow commercially valued tree crops (Melaleuca's) on land marginally affected or at a high risk of being effected by salinity. At the heart of this project will be an incentive discount offered to landholders on the purchase price of seedlings that wish to establish plantations. There will also be significant project inputs from farmers such as the costs and labour associated with fencing and other costs associated with plantation establishment.

It is envisaged that this project will establish 1500-2,000 hectares of Brushwood plantations (stocked at a rate of 2,500 trees per hectare) and will provide enough resources (raw materials) to enable a processing facility to be built within the region. The project is strategic in character; it is having positive NRM outcomes whilst supplying incentives for participants to continue the rehabilitation of salt effected land. The coppicing nature of the plants used in this project ensures that returns are provided at regular intervals over a long period of time.

It is also a goal of the project to alleviate the pressures of harvesting melaleucas from natural stands within the region. This is being accomplished by planting a 'critical mass' to reduce industries dependence on natural stands and to continue investment in ways to reduce the initial costs of plantation establishment, making the tree crop more appealing for farmers to grow.

PROJECT LOCATION DETAILS:
This is a regional project that is currently being implemented across the entire Northern Agricultural Region. The project is targeting specific areas where high water tables are causing salinity and waterlogging or at high risk of doing so.

SITE REQUIREMENTS:
Broombush grows naturally on a wide range of sites ranging from shallow rocky soils, rocky outcrops, mid slope sands down to saline margins. This allows it to be established on un-productive cropping country. Broombush grows best on cleared farmland with at least 25cm of soil to allow the roots to penetrate through to the water table to survive the summer months. They will tolerate mild waterlogging and salinity provided they are planted on mounds.

2006/07 project site locations; Calingiri, Geraldton, Northampton, Morawa, Perenjori, Coorow, Wubin, Dalwallinu, Kalannie, Miling, Moora, Bindi Bindi, Gabalong, Piawanning, Koojan and Gillingarra.

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REVEGETATION OF NATURAL DRAINAGE LINES AND PROTECTION OF REMNANT VEGETATION IN THE EAST MOORE CATCHMENT

PROJECT MANAGER: Lana Kelly
Moore Catchment Council

SUMMARY:
A NACC Investment Plan project currently being run in our region focuses on the East Moore Catchment. The main aim of the project is to implement strategic, integrated conservation works that build on existing Local Action Plans, by prioritising remnant vegetation and natural drainage areas within the catchment. The first 6 months of the project has mainly involved planning for large-scale on-ground works. The project is now reaching implementation stage, with over $250,000 allocated to fencing off remnant vegetation and creeklines that form linkages between remnants in the next 18 months. The project, titled 'Revegetation of Natural Drainage Lines and Protection of Remnant Vegetation in the East Moore Catchment' fits under the Integrated Catchment Management Category, and will run for just over 2 years. It also includes $50,000 allocated to seedling subsidies for native revegetation of degraded creeklines, and funds to conduct flora and fauna surveys in select areas. Landholders who receive incentive payments as part of this project will be required to sign some form of 'Voluntary Management Agreement' (VMA), such as DEC's 'Land for Wildlife'. For further information about the project, call the MCC Office on 9653 1355.

UPDATE 10TH SEP 07:
The East Moore Project commenced last year with planning being the focus. It was identified that… "Rising groundwater is a key factor threatening remnant vegetation and productivity of land. Much of the salt-affected land is in areas of natural drainage lines and while no longer suitable for cropping, these areas can be made productive with salt-tolerant species, and also act as wildlife corridors linking remnants".(Central Midlands Advocate, June 29th,2006)

This year the project has moved into the implementation stage. Priority areas have been determined and landholders within these areas are eligible. Funding is available for good quality remnant vegetation to be fenced off and for creeklines to be fenced off and revegetated with local, native species. Incentives include $2500 to $4000 per km for fencing to $500 per hectare for revegetation, depending on a site assessment. Since March, landholders have been visited including possible sites for inclusion in the project. Expressions of interest have been received and recorded. This is within the Priority One Area that follows the creekline and road from New Norcia to Calingiri.

During June and July the project officer approached the second (P2) and third (P3) priority areas to inform these landholders of the project and to register there interest. The second priority area extends south of New Norcia, along the Old Plains Road to the large Nature Reserve. It also includes some land North East of Mogumber. The third priority area is located at the corner of the Great Northern Highway and the Waddington- Wongan Hills Road.

On the 14th of August a successful "Rising Groundwater" Field Day was held which combined the "Koojan-Gillingarra Rising Groundwater Project" and the "East Moore Project." The latter half of August has involved re-visiting sites to GPS the fence lines for inclusion into management agreements. Flora surveys were also carried out within four project areas. September will, and has already, revolved around the creation of Management Agreements and getting them signed.

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BUNTINE MARCHAGEE NATURAL DIVERSITY RECOVERY CATCHMENT

PROJECT LEADER: Rowan Dawson
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PROJECT PURPOSE

Increase the protection of biodiversity assets within the Northern Agricultural Region (NAR) whilst promoting sustainable agriculture.

PROJECT SUMMARY

Integrated Catchment Management began in the Buntine Marchagee Natural Diversity Recovery Catchment (BMNDRC) with the planning and construction of an 870 ha Demonstration Site in 2005. Following this successful demonstration of best practice water management, DEC is now in the process of expanding Integrated Catchment Management to a much larger area of 23,000 ha. NACC funding is currently being used to produce Integrated Catchment Management (ICM) Plans for this larger project area. On ground actions in ICM include soil conservation earthworks for surface water control, revegetation and fencing activities, recommendations on grazing management and salt land agronomy, and upgrading shire road water crossings. Through these actions, ICM addresses a number of land degradation processes in the agricultural landscape that threaten both biodiversity and agricultural productivity. Such processes include salinity and rising water tables, habitat fragmentation, water logging and inundation, soil erosion, soil compaction, wind erosion and grazing management. Whilst these land management techniques are not new to the NAR, it is the integrated, holistic, large catchment scale approach to land management that separates ICM from other management regimes. Emphasis is also put on all works, particularly earthworks and road culvert / floodway modification, being implemented according to industry standards. ICM provides common ground on which DEC can engage Landholders on land degradation issues, and in most cases this results in a win win situation for both biodiversity conservation and agricultural sustainability. Integrated Catchment Management is therefore seen by DEC as the most appropriate and effective tool available to manage threatening processes in the BMNDRC.

PROJECT OUTCOMES

- Reduce the impact of land degradation processes within the Buntine Marchagee Natural Diversity Recovery Catchment (BMNDRC)
- Increase the protection and enhancement of a key habitat within the BMNDRC; namely a naturally saline braided channel ecosystem
- Increase the sustainability of agriculture in the Northern Agricultural Region (NAR)
- Increase awareness and implementation of conservation earthworks to industry standards within the NAR
- Increase awareness of and participation in the BMNDRC project

- Build partnerships between Landholders and DEC
- Increase awareness of biodiversity values within the BMNDRC
- Contribute to the development of commercial activities to combat salinity

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AGRONOMIC PACKAGE & BENCHMARKING FOR MILDLY AFFECTED SALINE LAND ALLOWING FOR VIABLE PASTURE AND CROPPING OPTIONS.

PROJECT MANAGER: Lorinda Hunt
DAFWA, THREE SPRINGS

AIMS

- Benchmarking of sites that appear to be mildly affected by salinity
- Determine which crops and pastures can grow on these mildly affected sites.
- Explore how the most appropriate cropping options can best be established & managed (ie. Sowing methods & herbicide tolerance)
- Explore existing and potential herbicide options for controlling slender iceplant (*Mesembryanthemum nodiflorum*)
- Explore existing and potential soil amelioration options for managing productive mildly affected saline sites.
- Develop a paddock based benchmarking tool to allow farmers to diagnose the salinity status of a given area.
- Collate management options in an agronomic package that would be useful for farmers to effectively manage mildly affected saline land.

PROGRESS TO DATE

- A quantitative & qualitative map of existing and at risk salt affected areas of the Morawa, Perenjori and Dalwallinu shires produced.
- A broad Australian, but mostly an international literature review has been conducted on slender iceplant and its relationship with saline and sodic soils. The biology of the iceplant has been researched and current information has been extended to landholders via an article in the Agmemo. Research papers have been collated and kept on file. A farmnote on Slender Iceplant should be published soon!
- Pre-emergent and Post-emergent herbicide trials on slender iceplant have been carried out including the only registered option, compared with various off label options. Data has been collected on the effectiveness of these options, bearing in mind that weather conditions have a great affect on herbicide activity. Trials will have to be repeated due to the dry conditions experienced during 2006 & 2007, that may influence chemical activity in the soil, iceplant vigor and possible natural defences affecting chemical uptake and transport.
- 20 demonstration sites were selected for benchmarking with crop and pasture trials established and assessed throughout the year of 2006 and 2007.
- Benchmarking mainly includes soil type, soil landscape system, soil salinity & pH, depth to water table, water salinity & pH, and overall site variation.
- Iceplant tissue samples were collected on a regular basis throughout 2006 since germination in August. Samples have been tested for oxalate content and other elemental components.

FUTURE DIRECTIONS

- Establish another 10 demonstration sites for benchmarking and determining suitable crop and pastures.

- These trials will explore the application of herbicide control options of iceplant in crops and pastures.
- Pre & Post emergent herbicide trials on slender iceplant continue, including treatments trialled from previous years and some new treatments.
- Investigate production potential of already established mature bluebush stand. Many salt affected farms already have fenced off these areas and have returned to production with bluebush stands. I would like to investigate the bluebush production benefits by simply controlling the iceplant or adding fertilizer.
- The trials will also compare different soil amelioration options, including deep-ripping and amelioration products applied in furrows.
- Saltbush & bluebush herbicide tolerance will be further investigated, in hope to find more suitable control options for slender iceplant and grasses, when sowing saltbush by seed.
- Suitable legumes, such as Santiago and Scimitar Burr medics, Mogul and Caliph Barell medics, will be trialled for benchmarking & demonstrate production while controlling slender iceplant with herbicides.
- Saltbush and pasture inter-row establishment with iceplant control will also be demonstrated.
- Iceplant tissue analysis will continue throughout the year as the composition may vary from season to season.
- A Benchmarking database is in working progress, with real benchmarking data from all trial sites, showing successful crops & pastures and further recommendations for crops & pastures.
- A Salt Land Weed Chart is being created for the establishment and management of suitable crops & pastures (including saltbush & bluebush).

ACKNOWLEDGEMENTS

- NLP for funding of project, NACC, MFIG, Liebe Group & YYCMG
- CV & WH RSU, John Borger, Mike Clarke, Andrew Blake, Jess Haselby & Dave Nicholson for technical support
- The 18 farmers (from Gutha to Pithara) who actively host trials and I work directly with.

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BIOCHAR; PROSPECTS, POTENTIALS AND MYTHS.

PROJECT MANAGER: Paul Blackwell
DAFWA, GERALDTON

WHAT IS BIOCHAR?

- **Biochar** is the remnant plant or animal material from pyrolysis. It is also known as agrichar and when made from only wood is usually called charcoal. Japan and parts of Asia are the principal regions where the soil and animal benefits of biochar/charcoal are better understood and often currently used in agriculture. Charcoal has been used for hundreds of years as a reducing agent in metal refining, as well as a cleaner fuel than wood in the 3rd world.
- **Pyrolysis** is 'dry distillation' in the absence of oxygen; it is an exothermic reaction because many chemical bonds in the original carbohydrate biomass are broken to form carbon, hydrogen and water, thus releasing the energy in the form of heat. The same reactions occur in a wood fire or when a match is struck, except the oxygen supply from the air enables the carbon from the initial pyrolysis to be oxidized into carbon dioxide.

WHAT CAN BIOCHAR OFFER AGRICULTURE AND ENVIRONMENT IN WESTERN AUSTRALIA?

(N.B. We have little information yet for WA) Biochar may:-

1. Reduce the need for applied fertilizers to grow crops, pastures and trees;
2. Improve digestibility of some animal feeds
3. Capture up to 50% of carbon from trees and other sources that may decompose or burn in wildfires;
4. Increase soil microbial biomass and thus reduce leaching risk for sandy soils;
5. Improve rates of composting and availability of nutrients from compost.
6. Provide a source of 'green' energy from the manufacture process; fuel, gas, power.
7. Assist production of biodiesel from algae.

= some evidence in WA; ***** = current experiments under way in WA

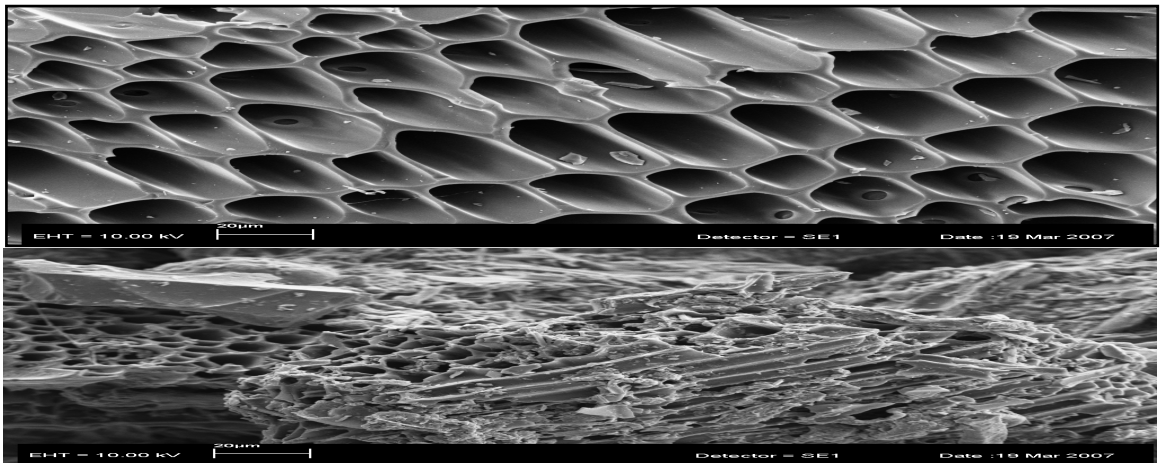

Figure 1. SEM images of plant biochar from wood (left) and plant and animal biochar from poultry manure(right). Vestigial structures of plants are visible in the remnant carbon structures, as well as amorphous organic and inorganic material.

WHAT ARE THE PROPERTIES OF BIOCHAR?

1. **Composition**; is of ash, the inorganic part of the original biomass and carbon in sheets of hexagonal carbon rings, with some oxygen and hydrogen and free positive bonds. Various amounts of other carbohydrates will be present depending on the original biomass and the duration and temperature of heating. Activated carbon/charcoal is biochar treated with steam to 'crack' and remove the remaining hydrocarbons to provide more exchange sites for adsorption and filtration.
2. **Structure**; biochar has a porosity reflecting the structures in the original biomass, e.g. phloem and xylem vessels in wood (see figure 1). There can be large variations in the amount and size of porosity, according to the nature of the original biomass, e.g. biochar from hardwood, compared to biochar from leaves and bark.
3. **Surface area and exchange characteristics**; biochar can have a large surface area, up to hundreds of m^2/gram and can have a large exchange capacity, like that of clay and with anion exchange as well as cation exchange.
4. **Microbial habitat**; the size and surfaces of the pores in biochar seem very compatible to soil microbes. This 'habiat' effect has been especially noted for beneficial soil microbes and the focus of new R&D proposals by UWA.
5. **Density, handing and combustion risk**; it is a low density substance, relatively difficult to handle and with some risk of spontaneous combustion.

Websites for more information: http://www.biochar-international.org/
http://www.bioenergyaustralia.org/

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WATER AND ENERGY BALANCES UNDER ANNNUALS, PERENNIALS AND TAGESASTE IN MINGENEW SITE

PROJECT TEAM: Ahmed Hasson, Gary Patteson,
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DAFWA

There is a strong presumption that perennial pastures will have a positive impact on catchment hydrology by reducing salinity risk associated with rising groundwater, as well as other benefits such as nutrient recycling, soil stabilisation and biodiversity improvement. Water balance and energy balance study is a part of GnG project concerns with the effect of pastures on the nitrate-N leaching and other macro nutrients behaviour in soils. To evaluate these presumptions so that future adoption of perennials can be based on factual grounds and not speculation.

The combination of outputs of the hydrological, enegy, pasture models, as well as soil condition analysis will then enable a assessment of the impacts of introducing perennial pastures at a farm and catchment level.

This information will be captured in a series of detailed case studies which portray changes in environmental and social aspects of broad-acre farming systems in response to the introduction of perennial pastures. The outcomes delivered and information generated by the project will facilitate the transition to more sustainable broad-acre agricultural systems, as well as greatly assist appropriate strategic decision making, policy development and investment in the area of perennials.

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FARMING TO THE CLIMATE: MANAGING CLIMATE VARIABILITY AND RISK IN THE LOW RAINFALL NAR

PROJECT TEAM: Kari-Lee Falconer, Daniel Gardiner, Caroline Peek
Department of Agriculture and Food WA

PROJECT AIM

- ~ Improve the knowledge of growers and agribusiness in the NAR on climate variability and risk management
- ~ Evaluate and develop farming systems and management practice performance under climate variability
- ~ Apply climate risk management to farming systems to improve water quality, reduce salinity and erosion through maintaining and improving ground cover

BACKGROUND

The low rainfall farming system functions within a highly variable seasonal climate and must be able to withstand the pressures of drought with enough flexibility to be highly productive in good seasons. This project is about providing information and tools to growers and industry to improve the management of current climate variability and develop robust farming systems.

WHAT HAVE WE DONE?

- ~ An economic analysis on the benefits of using climate predictions to make farm management decisions based on crop rotation choice and fertiliser strategy.
- ~ Monthly newsletter bulletins sent to participating farmers in Morawa and Perenjori evaluating crop yield decision support tools; Yield Prophet, PYCAL (potential yield calculator) and STINxl throughout the growing season.
- ~ Raised industry awareness of climate information through regular AgMemo newsletter articles and presentations on climate rainfall outlooks.
- ~ Developed and delivered 3 workshops on Managing Seasonal Variability; covering understanding the weather, climate and applying it to management decisions.
- ~ Established a long term demonstration site at Mullewa to examine managing climate risk in farming systems focusing on the profitability of rotation choice, nitrogen fertiliser strategy and soil moisture conservation.
- ~ Companion demonstration sites with farmers looking at aspects of climate risk management in farming systems.

WHAT WE PLAN TO DO?

- ~ Economic analysis on risk management decisions made in 2006, 2007 and their financial impact
- ~ Managing Seasonal Variability workshops

~ Case studies on farmers applying seasonal climate risk management.

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SOIL CARBON (ASCAS / NACC SOIL CARBON INITIATIVE) PROJECT

PROJECT TEAM: Tim Wiley, DAFWA and
Jane Bradley, NACC

Currently agriculture in Australia is considered to be a net Green House Gas emitter. At 16% of Australia's emissions it is second only to electricity generation. Opportunities exist to change agricultural practises so as to reduce emissions and generating income from the sale of Carbon Credits. Currently the focus for Carbon sequestration on cleared farm land has been on tree plantations. Unfortunately, even with carbon credits, commercial timber crops will be confined to the high rainfall regions of WA.

The real potential for carbon sequestration in medium and low rainfall regions will come from broad acre grazing and cropping, and new alternative farming systems. A limited amount of data from the northern Ag Regions suggests that it may be possible to sequester carbon under perennial pastures at the rate of 5 to 10 t/ha/year of Carbon Dioxide Equivalents (CO2eq). The price of CO2eq has varied internationally in the range of $5 to $35 /t. Current Carbon offset schemes in Australia based on maximum prices of $25 /t. However there is great uncertainty in the market at present and the future price of carbon in Australia will depend largely on the policies of the next federal government.

The soil data base for the Northern Ag Region indicates that there is 2.4 million hectares of poorer types sands which we know can grow perennial pastures or fodder shrubs. Based on an assumption of 5 to 10 t/ha/year CO2eq, perennials on this area could sequester 11 to 23 million tonnes of CO2eq each year. Conservation cropping with zero till, no burning and tram lining may also sequester Carbon in the soil. There is a further 2.5 million hectares of better sandy soils where a range of carbon fixing pasture, crop and agroforestry options may be possible.

However for the potential to be realised, even in part, there are many hurdles to over come. Many uncertainties exist in relation to broad acre carbon sequestration and trading.

UNCERTAINTIES

- "Cap & trade" policy of federal government
- Carbon sequestrations rate by farming method by soil type by rainfall region
- Cost effective methods for measuring and auditing carbon credits
- Price of Carbon Credits
- Economics of carbon farming systems
- Contractual arrangements and financial instruments
  e.g. length of contract, payment scheduling, marketing method, C pooling

CURRENT ACTIVITIES IN THE NAR RELATING TO CARBON SEQUESTRATION

1. Measurement of soil Carbon under commercial paddocks of perennial grass and tagasaste on poor sandy soils. Sequestration rates have

been found in the range of 6 to 13 t/ha/year CO2eq. However, the sampling intensity has been limited and not to the level of scientific rigour required.

2. A pilot project has been launched to measure, and have farmers sell, soil Carbon increases under paddocks of perennial grass. The project involves 12 paddocks (360 ha total area) spread across the NAR. This is a pilot of the Australian Soil Carbon Accreditation Scheme (ASCAS) set up by Dr Christine Jones. NACC are providing the funds for sampling and analysis ($20,000). Rio Tinto Coal has agreed to buy the Carbon Credits at $25 /t CO2eq. ASCAS will accredit the carbon stored. DAFWA is supplying technical expertise. NACC and DAFWA will not be involved directly in the sale of the credits.
3. Modelling of the economic impacts of carbon Credits on a Northern eastern wheat belt farm using the STEP model. The baseline scenario is a wheat belt farm with declining yield due to reduced rainfall as a result of climate change. New option being analysed are oil malleees and cattle grazing cereals. Analysis suggests that oil mallee is not profitable if only grown for one individual 'product' such as oil, biomass energy or carbon credits. However with income from all three streams combined they may be profitable. This work is being done under contract to AGO.
4. Assistance to the Rangelands group in measuring Carbon sequestration on 'Cheela Plains' at Paraburdoo.
5. NACC is funding the measurement soil Carbon in paddocks being planted to high water use options under their Targeted Investment Program (TIP) in the West Midlands.
6. Measurement of soil Carbon as part of a Grain&Graze research project investigating water use and Nitrate leaching under perennial pastures, tagasaste and annual pasture.
7. Preliminary trial work with Biochar as a potential soil conditioner and as a long term carbon sequester.

RESEARCH PROPOSAL

New proposals are being developed

1. A suite of projects are currently being developed on a wide range of carbon sequestering farming options such as agroforestry, perennial pastures, Biochar, fodder shrubs, conservation cropping, pasture cropping, inland algae, biofuels and oil mallee. These proposals will be put out as a 'prospectus' of investment opportunities to potential funders in government and industry.
2. Research to clarify the sampling procedures for soil Carbon (NACC, DAFWA, WANTFA and the Evergreen group).
3. Research to quantify soil sequestration rates under annual crops, annual pastures and perennials pastures on a range of soil types and rainfall zones in the NAR region. This proposal is still being developed
4. Possible farm scale monitoring of 'carbon farming' options is being considered, but not yet funded.

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DEVELOPING POTENTIAL ADAPTATIONS TO CLIMATE CHANGE FOR THE LOW RAINFALL FARMING SYSTEM USING THE ECONOMIC ANALYSIS TOOL, STEP

PROJECT TEAM: Megan Abrahams, Daniel Gardiner, Caroline Peek, Kari-Lee Falconer and Dennis van Gool; DAFWA.

PROJECT AIMS

- To examine the impacts of climate change on the financial sustainability of the current farming systems in the NAR
- To investigate potential adaptive strategies to climate change and the transitional costs of changing to a new farming system

BACKGROUND

Projections of our changing future climate vary across Australia and the impact on agricultural production is likely to vary across regions. The Northern Agricultural Region (NAR) of Western Australia is one area that faces uncertainties over the possible impacts of climate change at both a farming system and regional level. While higher average temperatures and declining rainfall could transform traditional agricultural production in the NAR, we need a clearer picture of:

- How climate change will impact?
- How we can adapt our farming systems and be sustainable?
- The costs and benefits of changing to a new system?

In this project the STEP (Simulated Transitional Economic Planning) model is used to examine the consequences of some possible projected climate change effects on productivity and profitability, and examines some potential adaptations for dealing with climate change .

WHAT WE HAVE DONE?

We have assessed some impacts of climate change on the current low rainfall farming system which is expected to be the most severely affected by climate change. Using a representative farm we have forecast a decline in farm profitability under three potential climate change scenarios.

Three alternative enterprise options were investigated for their financial sustainability under climate change projections: Oil mallees for carbon trading and Trade cattle enterprise

Combination of the above enterprises in addition to opportunistic cropping

The enterprises were tested for their sensitivity to different economic and agronomic conditions.

WHAT WE PLAN TO DO?

- Conduct similar analyses for the medium and high rainfall farming systems of the NAR.
- Continually improve and update the methodology and input data
- Set up future projects in consultation with farmer groups to more closely investigate a wider range of potential alternatives

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TAKING ADVANTAGE OF CLIMATE VARIABILITY IN THE WARRADARGE AND LAKE INDOON CATCHMENTS OF THE WEST MIDLANDS, IN THE NORTHERN AGRICULTURAL REGION

Climate variability leading to less rainfall in the typical growing season and in turn the loss of top soil caused by increase occurrences of wind erosion are leading topics in the realm of NRM today. During recent times we have seen extension messages change from having an annual based system to encouraging farmers take more of a balanced view by having a perennial system that not only takes advantage of rain falling out of the normal growing period but also recycles carbon dioxide back into the ecosystem.

In the West Midlands sub-region of the Northern Agricultural Region farmers from two catchment groups have come together to address these issues and to explore profitable ways of utilising rainfall in the autumn to spring break.

Starting in 2007, the Lake Indoon and the Warradarge Catchment Management Groups were fortunate in gaining funding from the National Landcare Program. This funding which is administered by the Northern Agricultural Catchments Council through the West Midlands Natural Resource Group, has enabled the two groups to change their farming enterprises by growing a range of perennials including; tagasaste, rhadgodia and a mix of grasses (fine cut Rhodes, Gatton Panic, Signal Grass and Splendia Seteria).

With land dominated by loose pale sands the main objective was to reduce the loss of productive land to erosion whilst providing for a stable pasture base across seasons, especially during drought conditions when feed availability is low. In addition, farmers are realizing the benefits of perennials in recycling carbon dioxide emissions and are exploring the opportunities of entering the carbon trading arena. This has been made possible through the Northern Agricultural Catchment Council's Soil Carbon Initiative three year pilot project. Therefore, providing for a more sustainable and productive farming system.

This presentation provides an overview of two local groups who have changed the negativity surrounding climate variability to their advantage through growing perennial pastures and how their efforts have expanded upon extension messages through stronger networks and partnerships between agencies and grower groups in the West Midlands.

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TARGETED INVESTMENT PROGRAM

PROJECT TEAM: Jane Bradley, Christel Schrank, Shanon Dellar, Georgie Colebrook (NACC), Kristy Chapman (MIG).

The TIP 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 is designed to assist land managers to adopt practices that will address these threats.

The TIP area covers approximately 750,000 ha between Mingenew and Gingin. The area runs from approximately 20 km south of Mingenew to 15 km south of Gingin. It encompasses part of the catchments of the Hill Moore, Minyulo River systems, and the Dandaragan Plateau/Parmelia Aquifer. The town of Dandaragan, and the Alexander Morrison, Watheroo and Tathra National Parks are located in the TIP area (see accompanying map).

To be eligible to receive incentives your property must touch or be inside the TIP boundary and you will have to meet certain criteria. Your Local Natural Resource Management Officer (NRMO) or TIP Officer has detailed maps showing the location of the TIP area and will assist you to apply

Initially incentives will be available for

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

The incentives cover a range of activities such as fencing, seed and plant stock and weed control, depending on the type of incentive. Funding permitting, other incentives for the mitigation of rising groundwater and strategic plantings will be developed (see accompany table for incentive rates).

There are minimum standards for fencing, and pasture and vegetation establishment requirements that the land owner/manager must adhere to in order to receive incentives. Your Local NRMO or TIP Officer will discuss these with you when they visit your site (see accompanying contact list for contact details).

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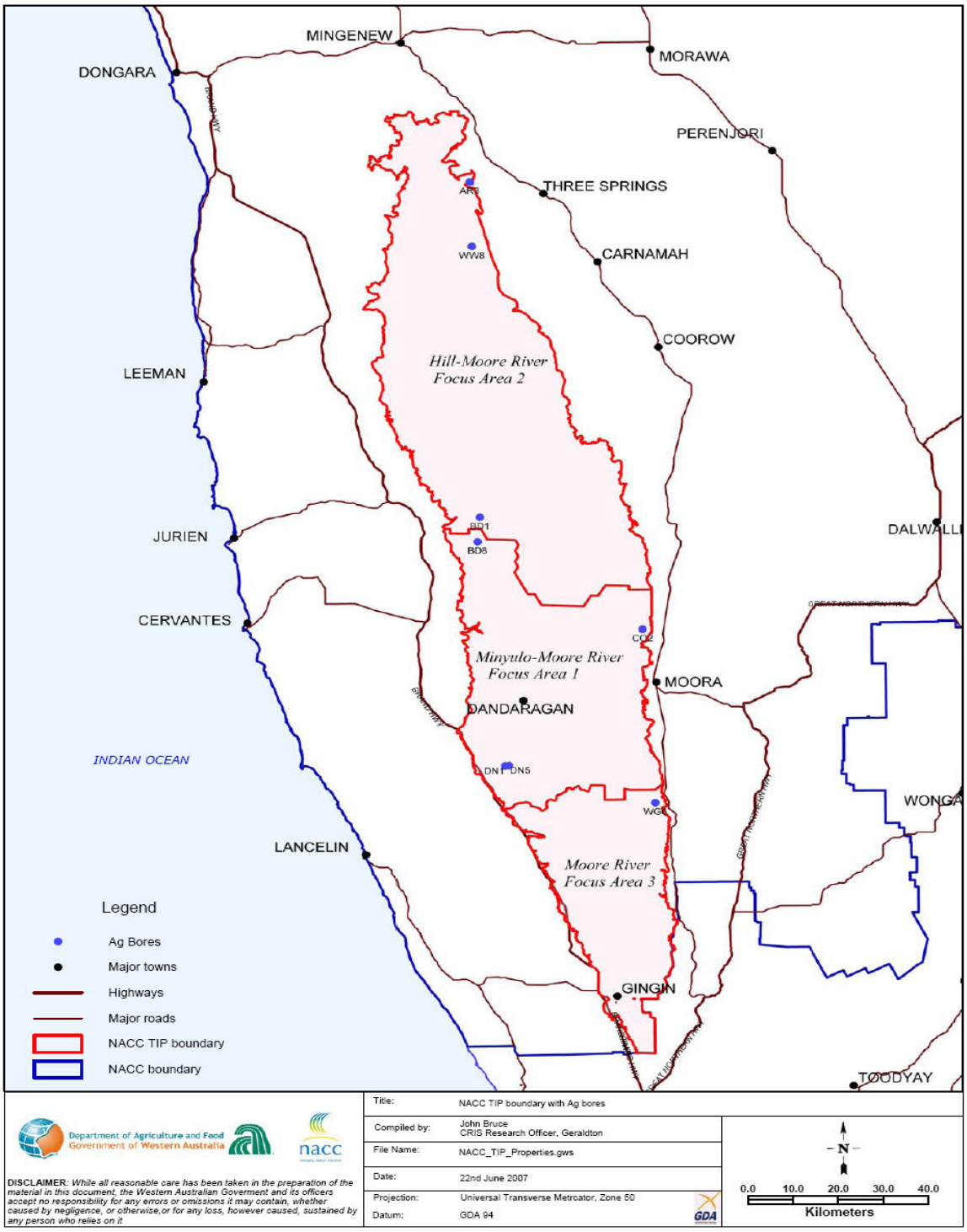
MINGENEW
MORAWA
DONGARA
PERENJORI
THREE SPRINGS
CARNAMAH
COOROW
LEEMAN
Hill-Moore River
Focus Area 2
JURIEN
DALWALLI
CERVANTES
Minyulo-Moore River
Focus Area 1
MOORA
DANDARAGAN
INDIAN OCEAN
WONGA
LANCELIN
Moore River
Focus Area 3
GINGIN
TOODYAY
Legend
Ag Bores
Major towns
Highways
Major roads
NACC TIP boundary
NACC boundary
Title: NACC TIP boundary with Ag bores
Compiled by: John Bruce
CRIS Research Officer, Geraldton
File Name: NACC_TIP_Properties.gws
Date: 22nd June 2007
Projection: Universal Transverse Metrcator, Zone 50
Datum: GDA 94
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Department of Agriculture and Food
Government of Western Australia
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WEST KOOJAN/GILLINGARRA CDI

PROJECT MANAGER: Mark Weston
NACC, GERALDTON

The West Koojan Gillingarra area south of Moora is playing a vital role in establishing management practices that make farms more sustainable and profitable through a Catchment Demonstration Initiative (CDI).

The CDI is one of four similar projects throughout the State aimed at mitigating rising groundwater and improving farming practices and has attracted $1 million of funding from the State and Australian Governments to implement the project.

The project will assist the implementation of new and more sustainable (triple bottom line) farming systems or practices, in particular those based on the use of perennials, which will reduce rising groundwater, the frequency of waterlogging and an associated incidence of primary, but more commonly secondary salinity. Reductions in groundwater and associated effects will also help preserve the quality of surface water entering the Moore River and reduce the threats to significant areas of both public and private owned remnant vegetation.

The use of perennials will be targeted primarily at areas of groundwater recharge in a series of 5 sub-catchment areas, although in some instances, and in the sub-catchment specifically, perennials will be used to take greater advantage of the freshwater available in discharge areas.

Investment will also support the construction of shallow or better aligned and engineered shallow drains so as to prevent or reduce ponding of surface water and the associated negative effects on production and the environment.

Implementing perennial based farming systems will involve supporting understanding of the methods used in establishing a range of perennials and in the changes required in livestock management practices when moving from an annual to a perennial based pasture system.

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YARRA YARRA OIL MALLEE PROJECT

Current Status:

- ~ Still and harvester currently conducting trials in Kalannie area.
- ~ Cooling water temperature too great so cooling tower has been ordered to improve efficiencies.
- ~ 360,000 seedlings currently growing due for collection/planting in July/August.
- ~ Mulching program complete with no subsidies remaining.

Future Direction:

- ~ Locate still at permanent site near Kalannie Township.
- ~ Biomass Transfer System – difficulty in locating suitable machinery so we are presently considering other options, eg cane harvesting transfer technology.
- ~ Investigate possibilities of funding for a solid fuel boiler which will increase efficiencies and therefore grower return greatly.

Obstacles:

- ~ Effect of insects on new growth of oil mallees, primarily spring beetle and leaf minor. Reduced oil content due to decimation of leaves. Leaf minor has caused deaths in mulched mallees.
- ~ Locating/sourcing of suitable machinery.

Additional outcomes from project:

- ~ Oil Mallee Association Database – Project Manager has assisted OMA by contacting all growers in the NACC region and updating details in the live online Oil Mallee Database.
- ~ Successful funding application by Oil Mallee Company for a brickette plant which uses the spent biomass from the harvesting and distilling operation. Will be located at the permanent site alongside the Kalannie Distillers still. A solid fuel boiler would complete the cycle perfectly.

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STIMULATING CHANGE VIA THE WEST MIDLANDS "FARMING SYSTEMS" PROJECT "INTEGRATING INNOVATIVE FARMING SYSTEMS AND CATCHMENT MANAGEMENT"

PROJECT MANAGER: Jill Wilson
West Midlands Natural Resource Group

The focus of the project is the adoption of high water use farming techniques in order to improve productivity and reduce recharge. Rising ground water is threatening the viability and productivity on agricultural land and is also impacting on biodiversity assets. We are using an integrated and targeted approach, using techniques that will boost farm water-use efficiency as well as productivity.

The main activities are very traditional and include:

- Implementing demonstrations and giving assistance with issues such as perennial pastures, tree plantations, waterlogging, and weed, vermin and erosion control;
- Developing knowledge and information on the local soils, hydrology, landscape and biodiversity;
- Developing best practice management for the farms in the area.

A key element of the project is the focus on communication. We have a policy of open communication and produce an electronic (or faxed) memo at least twice a month together with many other communications. We have a project "event" of some sort on the last Wednesday of every month and we are available for consultation every Wednesday in the Dandaragan office.

Our extension or change management philosophy is based on providing information and assistance and facilitating the sharing of knowledge among farmers that will trigger new on-ground-actions. We frequently have field walks and/or round-table discussion meetings to demonstrate or explore a particular idea or action. We also try to have a practical "can-do" attitude that gets on with the job with efficiently and effectively. The project is managed by Jill Wilson in collaboration with Project Officer Penny Keenan.

It is planned that a project presentation at the regional forum will focus on ways in which we can achieve change by utilising good communication and assisting farmers to share information and stimulate the adoption of new practices. This is not new, but we believe it is useful to occasionally revisit the principles of good extension methodology.

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"HEALTHY FARMS" - ENVIRONMENTAL MANAGEMENT SYSTEM

PROJECT TEAM: Kristy Chapman Mingenew Irwin Group
Dave Brindal Mingenew Farmer

WHAT DOES BEING A HEALTHY FARMER MEAN?

- Healthy farmers are adopting practices that ensure that their land and natural resources are managed in the best way for the benefit of future generations.

WHAT DOES A HEALTHY FARMER DO?

A healthy farmer – Is environmentally sustainable!

- They use EMS (Environmental Management Systems). This is a process where they plan, do, check and review management techniques used on their property to make sure there is minimal impact on the environment

PRODUCES FOOD THAT IS SAFE TO EAT!

- Healthy Farmers have a QA (Quality Assurance) system in place to ensure that all of their products are – food safety etc.

MAKES SURE CHEMICALS ARE USED SAFELY!

- They undertake training in chemical accreditation (ChemCert) to ensure safe use of chemicals on the farm

KEEPS A SAFE WORK ENVIRONMENT!

- Healthy Farmers undergo training in occupational health and safety requirements

HOW DO THEY DO THESE THINGS?

- By being trained in Environmental Management Systems, Quality Assurance, Chemical Certification and Farm Safety. Through these programs the farmer identifies what he/she does well and what he/she does not do well and then constructs management plans with actions and targets to improve the management of these problem areas. They then monitor and record their efforts in meeting these targets.

WHY DO FARMERS WANT TO DO THIS?

- To show the community they are using the best and up-to-date farming methods and technologies
- Make sure their resources are managed in the best possible way for the future
- Provide information to future generations about how the land has been managed
- Protect Australia's "clean and green" image
- Maintain and develop new markets for "Healthy Farms" products.

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SOIL STABILISATION SOLUTIONS FOR NANGETTY VALLEY
SOIL STABILISATION SOLUTIONS FOR THE NANGETTY VALLEY

PROJECT MANAGER: Kristy Chapman

The focus of this project is to demonstrate and evaluate likely rehabilitation techniques for one of the most degraded landscapes in Western Australia. The Nangetty Valley (north of Mingenew) is severely eroded and contributes the majority of the sediment load in the Irwin River system. The soils within the valley are unique and extremely erodible and therefore require special treatment to stabilise. The vegetation is predominantly made up of saltbushes and other arid landscape plants.

Apart from erosion, salinity is a major risk in the valley with DAFWA piezometers showing that large parts of the landscape are at risk. The groundwater in this Irwin Sub Basin area is of sea water quality and thus is toxic to plant growth.

Unfortunately, the valley is far from productive and economics of stabilisation / revegetation limit the ability of landholders to take them up. Thus, this project will see the implementation of large-scale demonstrations of a range of stabilisation options (the placement of which will depend on landscape position and the severity of degradation). Each option will be carefully assessed for suitability and economic viability. The options to be demonstrated and tested include:

- Gully fill / land reclamation
- Revegetation of different parts of the landscape with a focus on
    - Destocking to allow natural regeneration of saltbushes and blue bushes, etc
    - Planting of 'other' saltbush species
    - Planting via a range of methods of native species such as Acacia (to stabilise soil & minimise changes in ground water level)
    - Planting alternative tree species that may have a commercial benefit in the future
    - Planting on northern-facing, breakaway slopes which are currently denuded
- Permanent destocking
- Development of alternative, best management grazing practices (i.e. cattle only during winter, etc)

The project will allow farmers owning parts of the valley to see first hand the works and observe the impact over a period of time. Farmers will also be able to evaluate the cost effectiveness of each option, as each will be costed out in full detail (i.e. cost and return on investment).

PROJECT CONTACT: Kristy Chapman

"LONG TERM SUSTAINABILITY OF PROFITABLE 'MEDIUM RAINFALL' FARMING SYSTEMS."

PROJECT DESCRIPTION:
This project will plan, analyse, develop and deliver workshops and information packages aimed at helping farmers to decide on best bet options for the management of herbicide resistance with a specific focus on soil and other resource impacts / risks

AIMS:
- To develop an understanding of the threats posed by resistant weeds to farming businesses and their NRM
- To analyse new systems to counteract these said threats

BACKGROUND
The NAR medium rainfall zone consists of 4.5M hectares of farming land. This region is divided between sandy soils and loamy soils. The sandy soils are dominated by the lupin and wheat rotation, while loamy soils tend to have a higher concentration of cereals. Farmers do employ non cropping phases on both soil types in order to alleviate potential resistant weed problems. Despite this, weeds still pose a significant threat to the economic sustainability of farms in this region, as well as the natural resource base. It is believed that any and all methods aimed at alleviating the threat of these resistant weeds will in turn reduce the threat they pose on the natural resource base.

ACTIVITIES TO DATE:
The project started with a grower's survey pertaining to their farming business and the perceived threats to their business. Over 50 growers from the catchment took part in the survey, and the results were presented at the Agribusiness Crop Updates in Perth 2007. The survey provided an insight into the types of farms in the district, as well as their major threats.
The second stage was to use the economic model STEP to build "standard" farms that these growers could identify with. It was decided that 6 farms were required to fully cover all the soil x rainfall interactions our catchment contained. These were:
- Yellow sand high production,
- Yellow sand medium production,
- Coastal sand plain mix high production,
- Coastal sand plain mix medium production,
- Red loam, and
- Sand and red loam mix.

All sand plain farms have been analysed fully and results have been distributed to growers and industry. The final two farms have also been analysed fully and are currently being mailed out. These analyses looked at the sensitivity of each farm to enterprise mix that is the ratio of crops to pasture and the impact altering this makes on profit. In doing this we gained a clear insight into the key drivers of profit for each farm.

FUTURE DIRECTIONS:
We intend to use the information once again from our survey, and that of other surveys, to explore the potential impact alternative weed control methods may have on both the economic and environmental sustainability of our developed farms.

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REDUCING EROSION UNDER HIGH STOCKING RATE GRAZING SYSTEMS

PROJECT LEADER: Rob Grima

PROJECT DESCRIPTION:

The purpose of this project is to identify profitable stocking rates that both minimise erosion and control herbicide resistance within the whole farm. This will be achieved by identifying and demonstrating those grazing practices and crop rotations which data and anecdotal evidence indicates that high ground cover levels can be maintained under high stocking rates.

AIMS:

1. To better understand of the strategies and tactics that farmers currently use to minimise erosion under high stocking rates.
2. To determine potential grazing systems and crop rotations based on current knowledge and their ability to control seed set of weeds, optimising production.
3. To communicate the learning's principally through large scale on farm demonstrations.

BACKGROUND

The major farming system of the northern agricultural region sand plain is the very profitable wheat lupin rotation. The lack of diversity has resulted in a number of threats developing and the system is fast becoming unsustainable in its current form. The development of herbicide resistance is seen by growers as one of their greatest threats to profitability in the future. In the bid to maintain the sustainability of sand plain farming, there has been some significant interest in integrating livestock back into the system due to better livestock prices, alternative sheep breeds, availability of improved pasture legumes, as well as other pasture species. However, it is well known that high stocking rates have led significant erosion in this Region. Wind and water erosion occurs every year on some properties and significant erosion occurs every 5 to 10 years in the Region. Erosion has been identified as one of the top threatening processes in the Regional Strategy. Despite this it was demonstrated in the dry season of 2004 by a Binnu grower that stocking rates can be increased (from 0.4 DSE/ha to 7.2 DSE/ha) through the use of both alternative feed supplies as well as alternative grazing management. It was also shown in the same experiment to not increase wind erosion. This demonstration ultimately led to this project.

ACTIVITIES TO DATE:

A committee within the Northern Agri group was set up consisting of 8 growers and departmental staff. These growers became the core of the study and have each year attempted to do something different in one or more paddock that increases their stocking rate and/or reduces their erosion risk. These activities included sowing perennial species, grazing cereals, sowing legumes, and investing in permanent fencing or electric fencing. All 8 growers have participated in training through DAFWA containing information on grazing management, animal husbandry and maximising production. Grazing data was collected from these growers to gain information on the differences either feed supply or grazing management had on stocking rate, and its resulting effect on autumn ground cover. This process is ongoing.

FUTURE DIRECTIONS:

The group continues to record their stock movements and its resultant effect on potential erosion events. All growers are economically analysing their current enterprises, and also assessing potential economic impacts of changes to their enterprises.

"UPPER CHAPMAN PROJECT"

"Upper Chapman Project is a project run by the Shire of Chapman Valley and funded through Northern Agricultural Catchments Council (NACC). The project focuses on the upper section of the Chapman River catchment, roughly the area between Nabawa and Yuna. The aim of the project is to assist landholder living in the catchment to address the environmental issues that affect their properties and income. The project has produced a Draft Catchment Management Plan. This will direct where action is most needed and assist in attracting funding for on ground works. The future of the the project is focused on carrying out the actions identified in the plan including incentives for fencing to protect native vegetation, perennial pasture trials and construction contour banks."

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"DETERMINING OPTIMUM GRAZING ROTATIONS TO MAINTAIN PERENNIAL PASTURES"

PROJECT TEAM: Tim Wiley & George Woolston,
Dept of Agriculture & Food WA, Geraldton

AIM

Determine the impact of grazing intensity / number of paddocks on the persistence and production of mixed perennial grass pastures.

HYPOTHESIS

That grazing cells should have 20 paddocks in the rotation for optimum pasture persistence and production (Alan Savory 1999). Intensive rotational grazing results in better survival and production of perennial pasture species, and a more diverse mix of species.

EXPERIMENTAL DESIGN

This trial will use the 'nested cell' design where one mob of animals is rotated through paddocks of varying size. Each 'paddock' of the nested cell then represents a different grazing rotation. This trial will have paddock treatments representing 2, 4, 8, 16, 32 & 64 paddock rotations.

Treatments will be assessed on their impact on the pasture, but not the animals. The animals move through every paddock of the trial and therefore their performance is the average of all treatments.

There are two sites with one being high rainfall at Bob, Wilson's, Lancelin (650 mm) and the other medium rainfall at Craig Forsyth's, Irwin (450 mm).

DETAILED METHODS

The trial paddocks will be subdivided with electric fencing into paddocks of varying size. The paddock will be split into ½, ¼, 1/8, 1/16, 1/32, and 2 by 1/64 of the original area. The Wilson site also includes a Set Stock paddock,

During the winter spring period the mob of cattle will be rotated on a 32 day cycle, and in summer/autumn on a 64 day cycle.

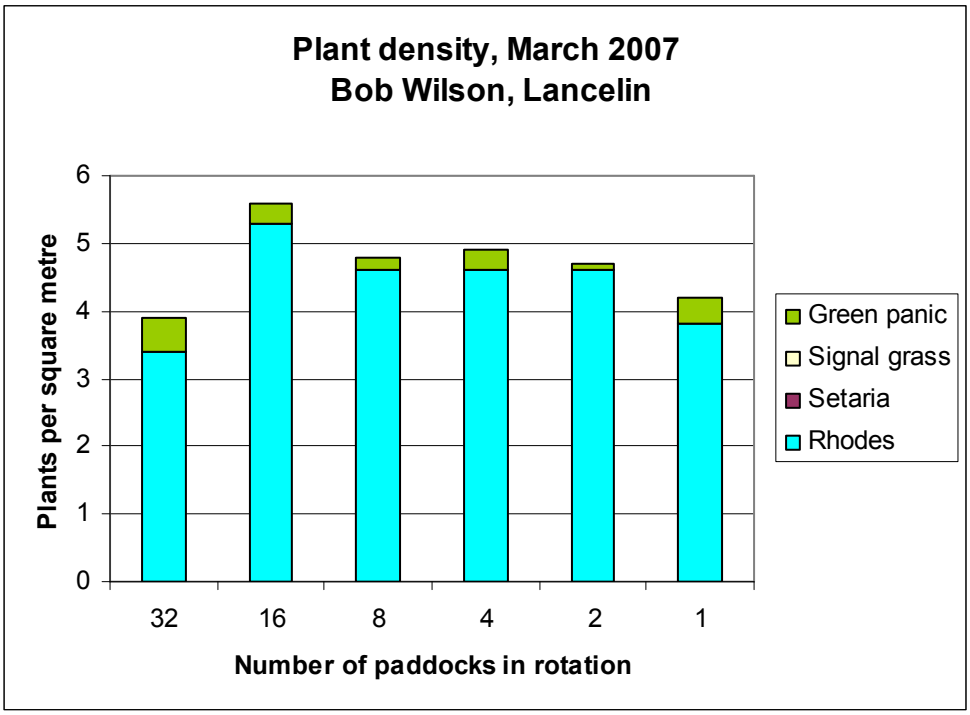
The amount of time the mob spends in a paddock is proportional to the size of that paddock, so that each paddock gets exactly the same grazing days per hectare. The small paddocks end up being grazed for short periods of time (e.g. 1 day for 1:32 paddock) but at high stocking rates (e.g. 128 steers/ha).

Paddock grazing plan

Treatments & Winter/spring steer numbers

Pdk	Tr Pdk Nos	Area ha Wilson	Area ha Forsyth	Stock rate/ha	Time in pdk	Stocking pressure/ha	Grazing days/cycle
NC2	1:2	28.5	36	4	16 days	8	128
NS4	1:4	14.25	18	4	8 days	16	128
NC8	1:8	7.1	9	4	4 days	32	128
NC16	1:16	3.6	4.5	4	2 days	64	128
NC32	1:32	1.8	2.25	4	1 days	128	128
NC64	-	-	1.12	4	½ day	256	128
NCSS	1:1	4.9	-	4	32 days	4	128

Example results



The trial is funded by Northern Ag Catchment Council & the National Landcare Program.

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