



All the dirt

February 2009

News, research, innovations, events and on-ground works to support managing for healthier soils in the Northern Rivers CMA region.

Welcome to the first edition of **All the dirt**, a newsletter about soil science and management on the north coast. **All the dirt** is produced by NSW DPI with funding from the NRCMA.

To subscribe, unsubscribe, contribute to or comment on this newsletter email allthedirt.newsletter@dpi.nsw.gov.au

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The Clarence Floodplain Project

Fiona McPherson, Clarence Valley Council

During the past century extensive drainage systems were dug and about 180 floodgated drainage structures were built on the Clarence Floodplain. Whilst bringing many benefits, some of these works have had adverse impacts. A combination of drainage and blockage of natural creek systems has resulted in poor water quality, fish kills, acid problems and the complete loss or over-drainage of extensive wetlands.

The Clarence Floodplain Project commenced 11 years ago when a group of community, industry and Government stakeholders formed a partnership to tackle environmental issues on the Clarence River floodplain and estuary. The Clarence Floodplain Project has identified a successful management approach that addresses regional priorities in a systematic way with benefits to both the environment and land managers.

Seventy floodplain watercourses and wetlands have been "revived" with assistance from floodplain landowners and many other stakeholders. Over 270 landholder volunteers have signed management plans and actively manage the watercourses adjoining their properties. This project has led to extensive on ground works and the use of innovative water control structures adapted to a wide range of watercourses and wetlands.

The major achievements of the project have been the



Edwards Creek in 2004 Source: F McPherson

high level of landowner involvement and ownership. Landowners have made a huge contribution towards this project.

Benefits to the environment have been spectacular and include better water quality, improved aquatic habitat, reduced acid discharges from acid sulfate soils, and restoration of wetlands. Monitoring results indicate improvements in water pH and dissolved oxygen along with rapid colonisation by fish, birds and other aquatic species. Wetlands that are re-inundated quickly recover, with the original vegetation species becoming predominant and large numbers of water birds returning. Research indicates that acid discharges are reduced significantly.

Returning water to over drained wetlands has increased grazing productivity by increasing the proliferation of high protein wet pasture such as water couch and soft rush pastures provided valuable fodder during drought.



Edwards Creek in 2008 after completion of on-ground works. Source: F McPherson

Project 540: Small Farm Biochar Kiln

by Geoff Moxham

Project 540 is developing a Low-cost Low-emission Biochar Kiln for small farms, and communities, with the specific intent to sequester atmospheric CO₂, in many small localities, and to make soil "good to the seventh generation." This will build on the wonderful experiment the Amazonians have already done for us, with their many hundred year old "proof-of-concept" terrapreta experiment.



A wide range of people expressed interest in small scale biochar production at the Lismore Show in 2008. Source: P Gibson

APE-UK, Artists for Planet Earth, who recognise winning ideas when they see them, and fund them from sales of world music CDs have selected our project from many applications, and awarded us £5,000, as significant funding towards our small-scale/village biochar kiln project. Dr Hugh Spencer, Director of Research at Cape Tribulation Tropical Research Station, and the Australian Tropical Research Foundation <http://www.austrop.org.au/> has offered a further A\$1000 to the project, towards process-heat and woodgas research.

The funding is awarded to the village-scale biochar work group, who are volunteers at The Rainforest Information Centre (RIC), Lismore, NSW. The project overseer is RIC founder John Seed, and the research, design and production team co-ordinator is Geoff Moxham, BSc Industrial Arts, Technology, UNSW. Other participants currently include research astro physicist, ex-Harvard and Smithsonian, Dr. Paul Taylor (UNSW), and TROPO member 'Gibbo', Peter Gibson.

The project is to run for 8 months, and we will produce Public Domain /Creative Commons working designs, and support material, while we construct, test and refine, at least one full-size~1m³ prototype best-practice kiln, including simple monitoring and control systems. The constraints will be construction at the village-tech level of skills, in light steel, firebrick and concrete.

We propose to economize by using second hand and donated materials, and voluntary labour. We have been given the enthusiastic support of one of the first intentional communities, the use of land for a kiln site, farmland adjacent to the site, and farm machinery. This way the grant money can be used to maximise the quality of kiln materials, buy test gear locally, and pay

for organic and other test and certification costs that we cannot cover from our local community.

Lukas Van Swieten at the Department of Primary Industries Wollongbar Biochar research facility has offered the use of their innovative 'pyrograms', for establishing and cataloguing char signatures. In addition Stephen Joseph has agreed to mentor the project. Local growers in TROPO, the Tweed Richmond Organic Producers Organisation, plan a farm walk to the kiln site in 2009 and will trial char samples when they achieve accredited input status.

As a secondary aim the project will look at the uses of the waste process heat. Primarily this will be for drying feed-stock for the biochar kiln. More information about the project and details of the design constraints are available online at

<http://www.bodgershovel.com/news.htm>

Carbon Farming Expo

A report from the 2nd Carbon Farming Expo and Conference held in Orange ,18-19 November 2008

by Lindy Brown NRCMA

Speakers at the expo included academics, researchers, carbon farmers and practitioners, government agency officers and private consultants. A broad range of technical topics were covered, interspersed with the practical experiences of many "carbon farmers".

First up was an introduction by **Louisa Kiely**. She explained the main points of a Communiqué developed in Oct 2008 in the USA by Conservation Agriculture Carbon Offset Consultation, United Nations FAO and Conservation Technology Information Center. This will be taken to the next Kyoto Summit, calling for soil carbon credits to be included. She emphasised that soil has a major part to play in reducing the 'Legacy Load' of CO₂ in the atmosphere. Apart from photosynthesis soil is the only other mechanism to reduce this build of CO₂ that has occurred over last 50-100 years. Tim Flannery has referred to this as atmospheric cleansing.

There is a plan to develop a regional model in the Central West of NSW, an agricultural Carbon (C) Pollution Reduction Scheme Pilot for carbon trading. This scheme will include training for farmers to account for all C, set an emissions target, do 'carbon farming', use baseline measures and engage local buyers for 'provisional credits' to further on farm research.

Jenny Hill, a councillor with Townsville City Council and Debra Burden, CEO Prime Carbon gave a presentation called *Local Communities Lead the Way*. They described a carbon trading scheme already operating around Townsville, Qld. They see the biggest benefit is that soil carbon sequestration has no lead time like forests and farmers can continue to produce food. The project links greenhouse gas emitters with landholders who then sell credits, through Prime Carbon on National Stock Exchange where 1 credit = 1 tonne CO₂. Since July 08 7 farmers have signed up 900ha. The farmers agree to certain management practices that improve soil and waterways; soil testing is done at varying intervals.

Professor Rattan Lal explained all the fractions of the soil carbon pool, its inorganic and organic components, that some last for months – years (non woody material) some for hundreds of years (woody material). Some soil

carbon fractions are soluble, some insoluble. Stable organic C is what we want to increase in the soil. We can achieve this by:

- applying bio-solids – sludge, organic by products (foodstuffs etc, manure)
- enhance activity of soil fauna
- stone, gravel, mulch
- establish/increase veg cover

In rangelands methods for increasing soil carbon are rotational grazing, managing stocking rates, controlling fire regimes and agroforestry techniques. In croplands the most useful management tools are no-till, mulching, cover crops, manuring, water conservation, integrated nutrient and pest management, agroforestry, contour hedges, and controlled grazing. Within these he sees crop residue management as the key tool.

Rates of sequestration of soil organic carbon can be:

- cool humid regions: 500–1000kg/ha/yr
- warm arid regions: 0-500kg/ha/yr
- dry environments: 5-20kg/ha/yr

Soil C can be viewed as a commodity because of its value to farmers in relation to soil fertility and its value to society through ecosystem services.

Dr Brian Murphy (DECC) addressed how we can estimate soil carbon levels. Our soil science knowledge can help allow for the relationships between soil properties and the relationships between soil and land management. Measuring Soil Carbon involves measuring the percentage of carbon in the soil, and then taking the amount of soil material in an area into account. The accepted formula for calculating carbon density is:

Carbon Density (t/ha) = C% x Bulk Density x soil depth (Kyoto standards currently allow up to 30cm soil depth)

Dr Murphy asks if we use our knowledge of soil relationships to make estimations easier and predict C levels, and what level of accuracy is acceptable? Some relationships that could be used to assist estimations of soil carbon, bulk density, soil texture, soil type, soil carbon. We can measure C to 10cm and predict to 30cm using soil C depth functions. He concluded that we have methodologies to measure soil carbon pool but the cost of doing so is high. We need to apply all our existing knowledge to bring down this cost by using known relationships to quantify the links between land management practices and soil C levels. We can then develop soil carbon potential curves for climate / soil type / land management.

Other presenters included a number of carbon farmers and an organic farmer, manufacturer of microbial products, use of bentonite as additive. The general messages I took away from listening to all the farmers were:

- drought conditions of the last few years had not really affected them too much,
- they were carbon farmers rather than graziers or croppers,
- how important it is to monitor, test and keep records and that it doesn't have to be difficult to do this,

- that farmer activities included pasture cropping, minimum/no till, increasing perennial pastures, controlled grazing management, increasing species diversity above and below the ground,
- how important they saw increasing soil microbes, insects etc and therefore biodiversity in the soil,
- that all this can be done with improved profitability.

Presentations from the conference can be viewed at:

<http://carbonfarming.blogspot.com/>

Soil erosion funding for farmers

By Peter Roberts NRCMA

The Northern Rivers Catchment Management Authority (NRCMA) currently has a number of projects running to assist northern rivers landholders to rehabilitate degraded land. This project is targeting gully erosion and mass movement. There are three projects being run on the Tablelands and are being run by SNELC, GLENRAC and Granite Borders Landcare. Another project is being run internally by the NRCMA for Coastal landholders. A further project is being run to rehabilitate erosion in the Nymboida Weir pool catchment, this project is in partnership with Northcoast water and Clarence Valley Landcare

Expressions of Interest were called for the Coastal Landscape Rehabilitation Small Grants 2008-09 project in October 2008 and 41 applications were received. Interest came from the Tweed, Richmond, Brunswick and Clarence catchments for steepland rehabilitation, gully restoration, tunnel erosion and erosion control in macadamias.

Of the 41 Expressions of interest received 18 will be funded. The works being funded include; rock flumes, gully control structures, revegetation and diversion banks. For further details contact Peter Roberts in Coffs Harbour on (02) 66530123 or Gerry Ryan in Alstonville on (02) 66270125.

Soils monitoring

By Simon Proust NRCMA

The NRCMA has embarked on a soils monitoring project which aims to obtain soil health baseline data from the volcanic plateaux to assist in measuring the success of both extension and onground soil health projects now and in the future. The project which commenced at Dorrigo and Comboyne in 2007 and will be delivered in the Tenterfield area this year. In 2007 the project focused on the Alstonville and Cudgen volcanic plateaux with Dr Peter Bacon of Woodlots & Wetlands collecting 160 soil samples across a number of different land uses.

Significantly the soils data will be used as benchmark data for measuring soil carbon and soil acidity which are key targets of the recently released Caring for Our Country Business Plan. The Northern Rivers CMA has been identified as a Land Management priority for both soils carbon and acidity. Potentially this increases our regions opportunity to access Australian Government investment for future soil health projects.

The NRCMA baseline project complements the statewide soils condition and land management project

being conducted by DECC. This project involves the establishment of 700 permanent sites of which about 70 are in the Northern Rivers. Landscapes targeted for NRCMA soil sampling sites include the coastal floodplains, Alstonville, Casino alluvials, Walcha metasediments, Wauchope low hills, Kempsey hills and Granite Borderlands.

Dr Peter Bacon presented results from the baseline project at the Soils Expo in March 2008. The 160 soil samples from 40 properties were analysed by the Environmental Analysis Laboratory at SCU for a range of biological, chemical and physical properties. The Northern Rivers Soil Health Card was also used to measure ground cover, soil penetration, macro life diversity, root development and earthworms. Other data collected included estimated soil loss (t/ha/y) and N & P loss (kg/ha/y) as well as site attributes and a survey of farmers' land management practices.

Soil samples were collected from a range of land uses with the major ones being macadamias, pastures, vegetables, avocados, woodlots, coffee, bananas and perennial horticulture. A small number of samples were collected from rainforest, bush regenerated and bare areas.

A summary of the findings from the 160 soil samples include:

- There is a large range in soil health on the Alstonville and Cudgen plateaux.
- As expected with kraznozems, soil structure was reasonable with the pasture paddocks having the best soil structure. Bulk density (compaction) was high under many vegetable crops and some macadamia orchards and approaching a threshold where root growth could be inhibited.
- Soil pH is variable with the mean pH (CaCl) of 5.5. The samples ranged from 4.3 -7.0 indicating that soil acidification is a soil health issue.
- Of other chemical tests; Potassium is abundant and available; Phosphorous is up to 10 times recommended under horticultural crops, though P is low in the pasture country. Nitrogen concentration is typically higher than 'natural' soil, especially pasture sites. Exchangeable Ca is variable and Aluminium toxicity was prevalent in some macadamia and vegetable crops, which could be alleviated with application of lime.
- Total Soil Organic Carbon mean is 6.2% over 160 samples. This ranges from 2% in a macadamia orchard to 18% in vegetable paddock. Pasture soils ranged from 4-10%.
- Overall the soils sampled had relatively low biodiversity with an average of 1.9 earthworms found in each sample both in farmed and natural soils. Interestingly the highest recorded number, was seven earthworms found in a heavily mulched macadamia orchard. Six earthworms were also found in a vegetable crop.

- Overall ground cover was pretty good and subsequently soil loss was generally low over the 160 sites. However nutrient loss via runoff is high in orchards and vegetables. Soil erosion was pronounced on bare sites and orchards with low ground cover.

For a full copy of the report on the project visit www.northern.cma.gov.au

Dave Morand in Abu Dhabi

Recently north coast soils expert David Morand has been working overseas. He was employed by WA Ag as a Senior Soil Surveyor (taking LWOP from DNR/DECC) on a project called 'Soil Survey for the Emirate of Abu Dhabi':



Salt precipitate on the surface of a sabkha (salt flat) within huge dunes of the Liwa area (near the Saudi border). This country is part of the Rub Al Khali ("the Empty Quarter"), the largest sand desert in the world. Source D Morand

The project is soil survey of the Emirate of Abu Dhabi (United Arab Emirates) to provide a foundation for the effective management of natural resources. The project is being implemented by the Environment Agency Abu Dhabi (EAD) with supervision by International Center (sic) for Biosaline Agriculture (ICBA).

The Australian company GRM International in partnership with WA Dept of Agriculture and Food has contracted to undertake the survey.

Phase 1: map entire emirate (55000km²) at 1:100 000 to provide general suitability and capability assessments for selected land uses and then to identify area of 1,000,000ha which has highest potential for these purposes.

Phase 2: select 400 000 ha of those high potential areas for intensive soil survey and determine detailed suitability for potential land uses, prioritizing irrigated agriculture.

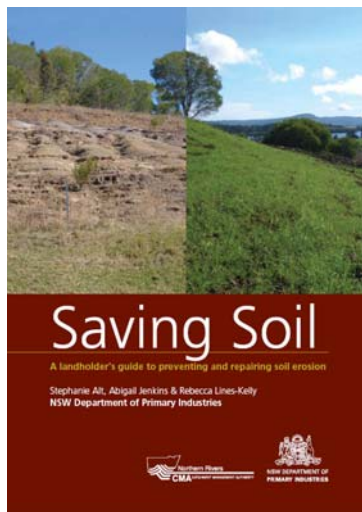
The project is due for completion mid 2009.



Hammering in the sand spear near a camel compound, near Madinat Zayed. Source: D Morand

New Publications

Saving Soil



Saving Soil – A landholder's guide to preventing and repairing soil erosion brings together current information from a variety of sources that will offer readers a useful resource to:

- manage erosion in grazing, cropping and orchard enterprises
- control water flow using drains and banks
- avoid erosion when building dams
- build and maintain

roads and tracks with minimal erosion

- fix gullies, tunnels and landslips
- calculate erosion potential.

This guide is designed for new and long time landholders, community support officers, extension officers, Landcare groups, and agricultural industry bodies. The guide will be available on the web at www.dpi.nsw.gov.au/agriculture/resources/soils/erosion and in hard copy from the NRCMA, contact Peter Roberts 6653 0123 for details.

Grazing the coastal floodplain



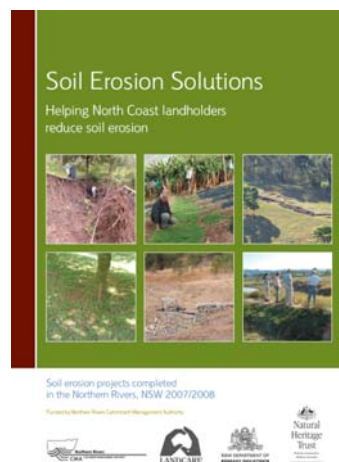
The Floodplain Grazing Project has put together a collection of case studies which highlight how floodplain graziers have tackled the issues of farming the floodplain productively and sustainably. These graziers understand the benefits of healthy soils. They know that managing their farms to promote soil health also brings benefits like healthy pastures,

better water quality, healthier stock and, often, regenerating riparian areas. Pugging and soil compaction are problems that many floodplain graziers face. The approaches these farmers use include concreting around water troughs, using rotational grazing, not grazing a wet paddock and creating raised laneways to move cattle between different areas on the farm.

The Floodplain Grazing Project is an extension program developed by the NSW Department of Primary Industries. It is specifically designed for graziers utilising low-lying floodplain areas and promotes the concept of sustainable agriculture, where impacts on the environment are reduced and productivity maintained or enhanced.

To date the program has run in the Richmond, Clarence and Macleay Valleys with funding assistance from the NRCMA through the National Landcare Program. In total 130 different landowners have participated in the Floodplain Grazing Project, between them owning 15,530ha of floodplain and 5,490ha of swamp. Copies of the booklet can be obtained by contacting Chrisy Clay at NSW DPI on 6626 1355.

Soil Erosion Solutions 2007/08



A new publication describes what 15 North Coast landholders have done to repair different types of soil erosion on their own properties. The landholders received technical advice to help them develop effective strategies for their specific sites and funding to support their on-ground works from NSW DPI's Soil Erosion Solutions project.

Following on from a previous booklet of Soil Erosion Solutions case studies published in 2006 this new booklet describes a wider range of projects. It explains how the landholders have successfully worked to:

- manage gully erosion of different severities;
- rehabilitate highly degraded land;
- reduce soil loss from macadamia orchard floors;
- establish best practice models for intensive horticulture on steep land;
- reduce the risk of mass movement.

Each site and situation is unique, and the landholders all have different goals and resources available to them, so each project uses different techniques and approaches to manage soil erosion. Soil Erosion Solutions was funded by the Northern Rivers CMA from 2005 to 2008. The publication is available online at www.dpi.nsw.gov.au/agriculture/resources/soils/erosion or contact Lyn Andersen at NSW DPI on 6626 1215 for a free hard copy.

Importance of soils

The International Union of Soil Science has produced an A4 leaflet that highlights the importance of soils. The flyer can be downloaded from the IUSS website.

www.iuss.org

CSIRO soils information

CSIRO has produced two useful information sheets on soil carbon and soil organic matter: Factors which influence soil carbon levels, and Why soil organic matter matters.

<http://www.csiro.au/resources/Soil-Carbon-Levels.html>

<http://www.csiro.au/resources/soil-organic-matter.html>

Caring for Our Country

Business Plan 2009-10

The Australian government's priorities for investment in NRM activities that deliver towards identified targets and priority areas up to the next four years.

Ring 1800 552 008 or download a copy from

www.nrm.gov.au

Events

Biological Farming

A TAFE course for all farmers and soil managers

Teacher: Dave Forrest

Course duration: 18 weeks

Mondays – 5.00 PM to 9.00 PM – starting 9 February 2009 at TAFE Wollongbar

Class members will evaluate soil health and soil management practices on their respective farms using the Northern Rivers Soil Health Card and soil lab analyses. Class members will then develop a soil management plan for their farm using biological farming principles and the NEW Soil Best Management Practice Guide.

Contact Bonnie Walker 6628 1788 or 0408 359 429 or info@soilcare.org

Macadamia Production for a Changing Climate

(incorporating biological farming principles)

A TAFE course for macadamia growers.

Teacher: Alan Coates

Course duration: 18 weeks

Mondays – 5.00 PM to 9.00 PM – starting 9 February 2009 at TAFE Wollongbar

Class members will evaluate soil health and soil management practices on their respective farms using the Northern Rivers Soil Health Card and soil laboratory analyses. Surface water management to control soil erosion will be addressed. Class members will then develop a soil management plan for their farm incorporating biological farming principles and the Soil Best Management Practice Guide.

Contact Bonnie Walker 6628 1788 or 0408 359 429 or info@soilcare.org

Biological Farming & Healthy Soil Workshops

With Maarten Stapper

From 2 March at various locations

A series of one day workshops funded through Caring For Our Country will be starting in the Hasting/Macleay region on the 2nd March. From there Dr Stapper will be travelling north up through Coffs Harbour, Clarence, Richmond and Tweed, finishing in the Granite Borders and New England area on the 10th March. Most workshops will have a morning session with Dr Maarten Stapper and then an afternoon field trip to a local biological/organic farm to discover more about the practical field based applications of biological farming.

For more information and bookings contact:

Hasting/Macleay Workshop: Ann Eggert on 6586 4465

Bellingen Workshop: Kate Goode on 6655 0588

Clarence Workshop: Julie Mousley on 6643 5006

Richmond/Upper Clarence Workshop: Anne Gibbs on 6665 1364 / 66323722

Tweed Workshop: Sally Jacka on 6670 2561

Granite Borders Workshop: Helen Smith on 6736 3500

New England Workshop: Carina Johnson on 6772 9123

Weather, Climate and Agriculture Forum

A forum for north coast farmers exploring managing climate change and variability.

Tuesday, 10/03/2009 9:00 am to 3:30 pm at Lismore Workers Club

Contact Richard Swinton 6626 1362 or richard.swinton@dpi.nsw.gov.au

Soil Carbon Mythbusters

Wednesday, March 11 in Armidale.

Contact Clare Edwards on 6738 8508 or clare.edwards@dpi.nsw.gov.au

Professor Lyn Abbot - SoilCare Workshop

Friday, 13 March at NSW DPI's Wollongbar Primary Industries Institute

Places limited, bookings essential. Contact Bonnie Walker 6628 1788 or 0408 359 429 or info@soilcare.org

Asia Pacific Biochar Conference

Gold Coast 17-20 May 2009

Guest Speakers: Prof Tim Flannery & Prof Johannes Lehmann from

Cornell University

Contact: Lee Munro 6626 1279 or leanne.munro@dpi.nsw.gov.au

Or visit www.biocharinternational.org for information.

Are you interested in joining a Tablelands soils group not unlike SNAC on the coast?

A soils network of people from across different agencies sharing information, research, extension and ideas on soils and adoption of soils BMP. Email clare.edwards@dpi.nsw.gov.au or Sally Wright at wongwibinda.stn@bigpond.com

For general soils enquiries contact:

Simon Proust at NRCMA

6653 0111 or Simon.Proust@cma.nsw.gov.au

OR

Stephanie Alt at NSW DPI

6626 1294 or stephanie.alt@dpi.nsw.gov.au



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