



All the dirt

June 2009

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

Welcome to the second 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.

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Articles

Mass Movement in the Northern Rivers.

Gerry Ryan, NRCMA

Mass movement continues to make its presence felt on the Northern Rivers landscape following some extreme rainfall events in 2006, 2008 and 2009. The Northern Rivers Catchment Management Authority (NRCMA) in a recent call for projects under the Coastal Land Rehabilitation Program 2008-09, has received several enquiries from landowners wishing to stabilise a recent 'landslip' on their property.

In the Northern Rivers region, the main areas where mass movement is likely to occur are:

- on scarps of benched basalts with slopes greater than 28 degrees (steep!)
- areas underlain by Walloon Coal Measures, on slopes greater than 12 degrees.

- geological contact zones between volcanic and underlying sedimentary rocks.
- In some drainage lines, creek edges and bottom of steep slopes.
- sometimes on 'induced' sites of dam construction near springs, and road cuttings.

A history of extensive tree clearing also usually characterises the site, however the phenomenon has been observed on fully forested slopes.



Image: Earth Slump / slide at Blue Knob (upper Tweed) Jan 2008 following 730 mm rainfall in the 3 weeks prior to the event. The site is on sedimentary material underlain by Walloon Coal measures. The affected area covers 3 ha, now intensively planted to native trees with surface runoff controls upslope.

The phenomenon creates a fractured and unstable land surface and can result in loss of productive land, safety and access hazards, potential stock losses, accelerated soil erosion and damage to roads, buildings, fencing and other property.

From a CMA perspective, any investment or assistance provided to landowners wishing to address mass movement must by necessity be limited to the lower cost 'softer' options with a proven track record, to attempt to bring the site to a more stable condition where the risk of further slip will be minimised, using relatively simple measures of :

- surface runoff control to minimise unnecessary saturation of subsurface soils (the main aggravating factor).

- intensive tree planting with deep rooting quick growing native species both above and within the slip area,
- where feasible and affordable, interception of subsurface water using 'spring-tappers'.

Three CMA funded projects are currently in progress and another is in planning on properties at Blue Knob (upper Tweed), Collins Creek (Wiangaree), Federal and Rosebank. These projects will provide demonstration of the above basic principles within a relatively small budget framework. Funding for each project ranged from \$5,000 to \$7,500, requiring in-kind contribution from landowner.

First Asia Pacific Biochar Conference: Gold Coast May 2009

Simon Proust, NRCMA

Almost 200 people from all over Australia, New Zealand, Japan, USA, Vietnam, India, Malaysia, Indonesia, Singapore, Fiji, Spain and Mongolia presented, discussed and debated Biochar for two days. Participants came from research institutions, universities, government agencies, farms, Landcare and companies involved in energy production, sequestering carbon or supplying infrastructure for pyrolysis plants.

Biochar is essentially a type of charcoal produced by burning biomass using high temperature and low oxygen. This process is called pyrolysis. This technology can turn wood, crops, weeds, manure, residual crop waste and paper into more stable forms of carbon.

Biochar has many benefits; it can be used as a soil amendment and can store carbon for a very long time. Biochar is also an energy source, and can play an important role in reducing landfill by recycling waste. It appeared that people at the conference were generally there to learn more about the carbon sequestration potential or soil improvement capacity of Biochar. The quality of biochar varies depending on the raw material and the efficiency of the pyrolysis to convert it. Essentially temperatures (500c+) applied in the pyrolysis process results in a higher carbon content and more aromatic and stable char.

Numerous scientific papers gave examples of how Biochar when applied to the soil, improved organic carbon levels, stabilised pH, improved the availability of phosphorous and potassium and increased cation exchange capacity. A poster paper by Chris Williams from South Australia explained the potential of converting a rampant weed, *Arunda donax*, that grows like sugarcane, loves salt affected areas, is an ideal biomass for production of Biochar. Chris said it would achieve two outcomes: controlling weeds and production of biochar, to be used either as soil amendment or as carbon storage in tackling global warming.

Another example of the enormous potential of Biochar was explained by Krushuun Vankat from Chennai who

said that India produces massive agricultural waste such as rice husk, crop stubble, leaf litter and weeds from its 85 million Ha of non irrigated (monsoon fed) farm production in addition to the 230million t/pa of food produced. Pyrolysis of plants at both an industrial level and local level could not only produce Biochar but would also be a great source of energy. Another interesting presentation was given by Nikolaus Foidl who explained for centuries the Bolivians have been producing charcoal as result of burning biomass from the forests resulting in a build up of soil organic carbon, which on detailed analysis is not dissimilar to Terra Preta soils. His results suggest plants grown in these soils benefit from enhanced microbial growth which facilitates nutrients uptake by plants.



R. McKelvey, R Quirk and S, Proust at the first Asia-Pacific Biochar conference, Gold Coast QLD

The most diverse example of biochar use was given by a Japanese poultry farmer from a small island of Tochigo south of Kyushu who explained to participants that he mixed charcoal with wood vinegar and fed it to his chooks whom then produced eggs for longer periods. The chicken manure was then fermented and applied to his rice crop each year without the need for chemicals. And to top it off he admitted, through an interpreter, that he gave the concoction to his ill, almost dead chooks, and that they miraculously recovered! Enough said. Biochar has huge potential.

For more information on Biochar see the publications section and <http://www.anzbiochar.org/index.html>

Soil Carbon – Armidale district results

Clare Edwards and David Waters, NSW DPI, (Armidale and Wagga Wagga)

Soil organic carbon (SOC) was at the centre of discussions during a recent NSW DPI seminar in Armidale where extensive soil test results were presented. The soil carbon test results came from a combination of 14 workshops held for landholders over the last few years and yielded over 482 samples for analysis, primarily from perennial pastures. The soils had all been sent to the same laboratory and were tested using the Walkley-Black method of analysing organic carbon.

The soil organic carbon values in the sample set from the Armidale district ranged from less than 0.6% up to

8.8%. SOC is influenced by a range of variables including climatic conditions (temperature and moisture), geology and landform, level of soil biota activity, previous land use, current management and the application of any soil amendments (such as manures) (Dalal & Chan, 2001; Young et al., 2005). A primary reason for examining this data was to determine the degree of correlation that may exist between soil type (as identified by producers), rainfall and SOC.

The 482 soil samples in this study were taken at 0–10cm depth. While the sample size was large, bias may arise through landholders selecting paddocks for testing which they viewed as problematic or in need of renovation. Further, this was not a true survey across soil types and rainfall patterns for the district. It did, however, give us an idea of some characteristics.

A correlation between soil carbon and soil type was evident, irrespective of land use or management. There were significant differences between all four major soil types, as per Figure 1.

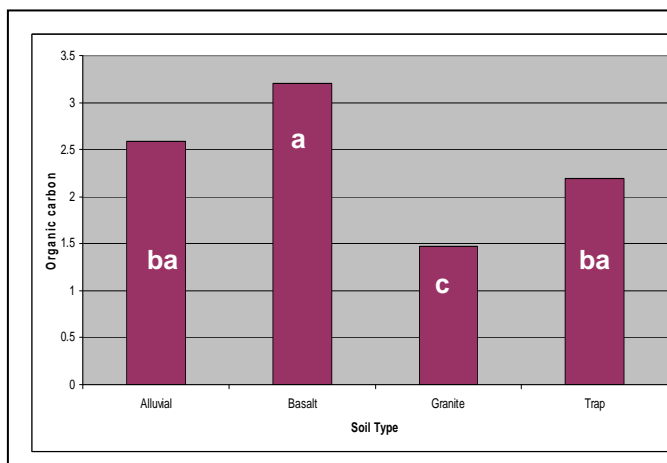


Figure 1: Organic Carbon percentage for different soil types in the Armidale district. Different letters indicate significant differences.

A 2001 study of soils in Armidale showed a difference in SOC between samples taken at 0–10cm and 10–20cm depths across all soil types (Edwards and Duncan 2002). Of those samples, 33% of soils from the 0-10cm depth recorded below 2% OC. In the 10-20cm samples 81% had less than 2% OC. This is typical of nearly all soils globally, as SOC invariably decreases with soil profile depth. This was a much smaller sample size than the 482 study.

In this current data set participants were asked to supply their annual rainfall totals, which were plotted against the SOC results (see Figure 2). The correlation between rainfall and SOC is not as strong as for soil type, but there is a clear positive linear trend. That is, as the rainfall increased so did SOC.

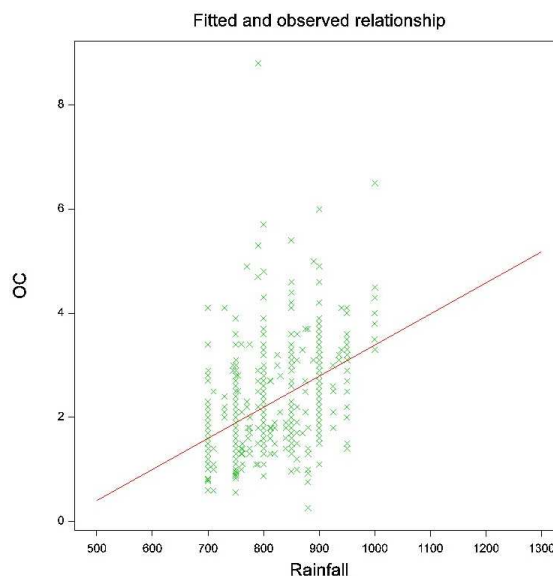


Figure 2: SOC percentage versus rainfall for the Armidale district

Future work on the SOC fractions and the impact of changing land use will be vital for land managers to understand SOC. There are several programmes doing benchmarks (such as DECC and the CMAs) across the State. Stay tuned to this interesting and important area.

For further information check out the Primefact – Increasing soil organic carbon of agricultural land. <http://www.dpi.nsw.gov.au/agriculture/resources/soils/soil-carbon/increasing-soil-organic-carbon-of-agricultural-land>

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New Soils officer at NRCMA

Gerry Ryan has been working as the newly appointed Soil Advisory Officer for the NRCMA since October 2008. Gerry has been tasked with delivering the implementation of the BMPS that have come out of the various soil health projects funded through the NRCMA, and the NRCMA's coastal land rehabilitation project in the Tweed, Richmond, Brunswick and Upper Clarence catchments.

There are limited funding opportunities available for the rehabilitation of eroded sites, for more information contact Gerry on 66270125

Biological Farming and Healthy Soils

Kate Goode, Bellinger Landcare Inc.

A series of very successful sustainable agricultural workshops were held during March, featuring Dr Maarten Stapper, a renowned farming systems agronomist with a message to share about how he sees the future of Australian farming.

Maarten has worked on various agricultural projects in the Netherlands, Canada, USA, Iraq, Syria, and, since 1982, in Australia. Maarten has said that during his time with the CSIRO he realised that most problems start with the soil, and so the search for solutions should start there too. He believes that “current soil problems are the result of gross oversimplification of fertilization and ‘plant protection’ practices that use harsh chemicals and ignore the delicate balance of microbes, trace minerals and nutrients in the soil.”

During the course of the workshops, Maarten talked about the importance of living organisms in soils and how this soil biology affects basic soil functions like productivity; nutrient storage, availability and uptake by plants; and soil carbon levels. He discussed the role of humus as a vital component of soil and how its presence is directly related to soil water holding capacity. Healthy soil biology means healthy plant life and this in turn means plants with greater natural resistance to insects and disease and higher mineral content and nutrient value – for livestock and humans. Maarten also looked at some of the reasons for soil degradation and ways of remediating these problems and he talked about what various weeds can indicate about state of the soil.



Dr Maarten Stapper

According to Maarten, improving soil biology has multiple benefits – for the soil, for the vegetation growing in it, for the animals that feed on that vegetation (including us) and for the wider environment. Just some of these benefits are improved drought tolerance, of plants and landscapes, greater resilience to changing climatic conditions, healthier plants and animals and greatly reduced need for synthetic fertilisers and pesticides. This potential reduction in farm inputs, and therefore farm costs, completes the cycle by allowing even further improvements in soil biology.

The practice of biological farming acknowledges that in farming ecosystems (as in all ecosystems) everything is connected. It looks at how farming practices affect the organisms and systems present in each landscape. As Maarten says, “The focus of biological farming is to help farmers to improve the profitability of their operations by harnessing the power of natural soil processes, improving their use of inputs, creating healthy soils and understanding those practices that negatively impact on soil health.....Biological agriculture leads to higher biodiversity on farms and greatly reduced impact of farming on catchments.”

The importance of soil carbon and soil biology was a feature of Maarten’s presentation. He states that “biological farming can improve soil carbon ten times faster and to higher levels than under current farming practices”, heavy reliance on nitrogen fertilisers and herbicides reduce the amount of humus in the soil and so limit potential carbon storage, as carbon is sequestered in soil as an element of humus. Higher soil carbon increases soil productivity and reduces atmospheric carbon. Healthy, biologically active, living soils are able to adjust to a changing climate and remain more productive.

Dr Stapper’s publication is called, *Soil Fertility Management – Towards Sustainable Farming Systems and Landscapes*. Maarten’s website and business details can be found at www.biologicagfood.com.au

ASSAY – the longest running NRM newsletter?

Chrisy Clay, NSW DPI

Could ASSAY, the national acid sulfate soils newsletter, be the longest running NRM newsletter in Australia?

First produced in March 1993, ASSAY has grown from a single A4 page news update for the North Coast to a comprehensive national newsletter.

Many changes have occurred in NRM since the early 1990’s and through it all ASSAY has continued to exist. ASSAY has survived department amalgamations, Natural Heritage Trust phase one and two and the transition to regional delivery, no small feat for what was a small regionally based newsletter.

Throughout the years ASSAY has documented the major achievements made in acid sulfate soil management in NSW including: the first national conference, production of state wide risk maps, regulation of the disturbance of acid sulfate soils, the development of a national strategy and the commencement of broad scale remediation.

As our understanding of acid sulfate soils has improved, so has our knowledge of where the soil can be found. Acid sulfate soils are now known to exist in every state and the Northern Territory and again ASSAY has documented the progress made to manage acid sulfate soils in these areas.

Now going into its sixteenth year of production, ASSAY continues to be the country’s primary source of information on acid sulfate soils. To receive copies of the newsletter contact the current editor Chrisy Clay on 02 6626 1355 or christina.clay@dpi.nsw.gov.au

Soil advisory Officer Changes at NSW DPI

As many of you may be aware Stephanie Alt has been filling in for me, Abigail Jenkins, whilst I was away overseas for the past 12 months. I am now 'back on deck' four days a week (Monday, Wednesday, Thursday and Friday). Stephanie is on maternity leave but will return sometime in the New Year. My phone number remains 66261357.

New Publications/resources

ACLEP have published a discussion paper on **Managing Australian soils** it is available at www.clw.csiro.au/aclep/documents

The NSW Department of Lands Soil Conservation Services has published the NSW Soils Framework, '**Looking forward, acting now**' to provide direction for NSW soil management into the future, see the document at www.lands.nsw.gov.au/media/lands/pdf/annual_reports

Land and soil capability mapping has been carried out in the **Namoi catchment**. Derivative maps for erosion have also been produced. For more detail see <http://www.namoi.cma.nsw.gov.au/143.html?7>

Sharing our stories: Experiences in property planning

Landholders from the Border rivers and Gwydir catchments share their stores. For a copy of the booklet and /or DVD contact Border Rivers Gwydir CMA at <http://brg.cma.nsw.gov.au>

DIG IT!

The Smithsonian Inst has a new exhibit in soils at <http://forces.si.edu/soils/>

Dirt the movie:

A new movie looks at the dire predicament the earth's soils are in especially where food production is concerned. You can view a trailer at: http://abclocal.go.com/kgo/story?section=news/assignment_7&id=6800057

Char grilled

Landline biochar story <http://www.abc.net.au/landline/content/2008/s2579264.htm>

Australian soil and land Survey field handbook 3rd Edn

Available from CSIRO at www.publish.csiro.au/nid/22/pid/5230.htm

Burn, bury and bargain with it: Biochar ticks the green boxes.

Sydney Morning Herald article from May 30 2009 at <http://business.smh.com.au/business/burn-bury-and-bargain-with-it-biochar-ticks-the-green-boxes-20090529-bq7k.html>

Carbon accumulation in soils

Australian Journal of Soil Research

There are articles on carbon accumulation in the soils of different farming systems (cotton, no tillage and perennial systems).

<http://www.publish.csiro.au/nid/84/issue/5030.htm>

Maarten Stapper, a scientist advocate of biological farming, was featured on **Australian Story** on Monday, 1 June at 8.00PM. If you missed the show see <http://www.abc.net.au/austory/default.htm>

Events

Australian Grasslands conference 2009: 'The Grass is greener'

5-6th August 2009 Taree

The conference includes tours, sessions on coastal pasture, pasture costs, soil, animal plant interactions and climate change implications.

For a brochure contact NSW DPI Taree, 65527299

Soil Carbon Myth busters workshops on soil carbon

23 rd June, at Comboyne,

24th June Dorrigo

25th June Kempsey.

For more information contact NSW DPI Kempsey Office on 65626244

Cell Grazing workshop

22 August

At Dyraaba Hall and Trevor Wilson's property.

For details contact SoilCare at

<http://www.soilcare.org.au/>

BFA Organic road show

26th August

Lismore

The Organic Roadshow is the ideal one-stop shop for information exchange, trade displays, networking and forging links with other organic producers. For info contact www.bfa.com.au

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:

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OR

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