



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

Winter 2010

All the dirt, a newsletter about soil science and management on the North Coast of New South Wales.

allthedirt.newsletter@industry.nsw.gov.au

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Mapping Armidale Soils

Dacre King of DECCW based at Armidale has spent several years studying soils on the southern part Northern Tablelands (upper Macleay Catchment). His work has recently been compiled by Humphrey Milford (also of DECCW based in Parramatta) into the Soil landscapes of the Armidale 1:100 000 Sheet as an interactive DVD, a new resource for people wanting to know a bit more about the soils and their limitations on the tablelands.

The work was undertaken through office based research and GIS interpretation, followed by extensive research, field checking and site description across the mapping area.

Hundreds of sites were officially described, tested and stored in the NSW Soil and Land Information System (SALIS), which now contains over 70,000 sites from across the State.

Soil acidity, high levels of aluminium, low levels of phosphorus and organic matter were some of the notable characteristics of the soils across the area. Physical soil issues observed and described included hardsetting and highly erodible soils in much of the grazing lands and high shrink-swell soils on some of the basalt derived urban lands, especially around Armidale. Yellow Kurosols and Chromosols, Kandosols, Tenosols and Dermosols/ Ferrosols were the most commonly encountered soil types within the region.

Local landholders were very cooperative in allowing access onto their lands in order to complete the fieldwork components of the project. Many hours were spent actually inspecting boundaries in the field when remote sensing applications did not provide sufficient detail for accurate mapping.



Dacre King testing soil on the Northern Tablelands.

Image source: Dacre King

The Armidale map will fill an important gap in the Northern Tablelands and there may be opportunities to extend the coverage across the North Coast region especially in the escarpment and tablelands areas.

Dacre's current soil monitoring projects also focus on the property or paddock level in support of its climate change objectives such as establishing benchmark organic carbon levels in soils.

For more information on the project contact Dacre King on 67735275 or dacre.king@environment.nsw.gov.au

See page 5 for more info on the new publication.

What's happening with soil in northern NSW?

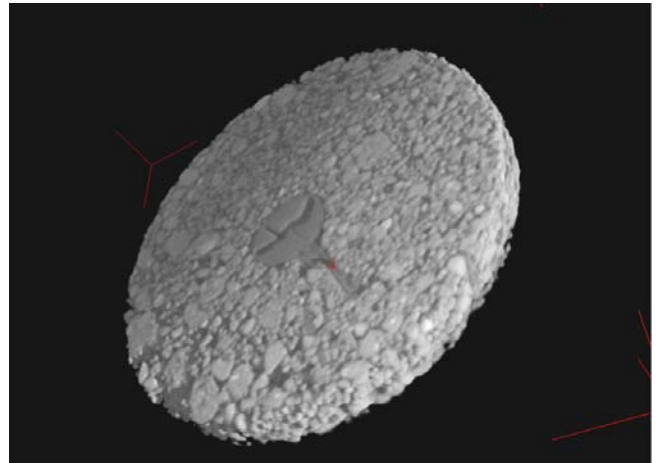
Sally Muir, I & I NSW, Inverell

The NSW branch of Australian Society of Soil Science Inc (ASSSI) held a regional forum at UNE Armidale on 19 March 2010. There were twelve presentations and plenty of opportunity to do a bit of networking with audience and presenters from all over the North West and the Hunter / Sydney region.

Prof Iain Young demonstrated the X-ray μ -CT scanning equipment used at UNE to reveal soil spaces in his *Inner Space* session, emphasising the importance of empty spaces in soil for gas exchange, water and habitat for biota. He talked about how nematodes coated in one species of bacteria contributed to the genetic transformation and recombination of a closely related species, and the concept that soil structure becomes more ordered as microbial activity increases.

In other sessions:

- Local developments in soil measurement techniques include electromagnetic imaging (EMI) being developed to measure deep drainage based on chloride predictions, and apparent electrical conductivity used to indicate topsoil depth, volumetric water content, compaction, infiltration, SOC and the presence of steel fence posts.
- Nutrient management issues included chloride deficiency in durum wheat, municipal effluent used for pasture and forage cropping, utilisation of composted cotton trash under irrigation and its benefits to microbial activity, and benefits and qualities of biochar depending on the source material.
- Some improved soil conditions were observed in soil health surveys, but also potentially damaging processes.



X-ray μ CT image of a germinating pea seed with its developing root pushing into soil.

Image source: The SIMBIOS Centre, University of Abertay, Dundee, Scotland, UK

- A follow up survey of outcomes from property management planning training in Border Rivers Gwydir CMA region showed ground cover is the most readily used measurement by landholders,.
- Soil monoliths have been useful to landholders at information days on the northern Tablelands.

More info on the presentations coming soon at <http://www.asssi.asn.au/>

Ballina bypass

Simon Proust NRCMA, Coffs Harbour

The North Coast Floodplain Network recently visited the Ballina bypass - a 12 km dual carriage way being constructed across the Richmond Floodplain. The 4 year project west of Ballina includes 17 bridges and four major interchanges including a huge roundabout on the Teven Road.



Teven Bridge, part of the Ballina bypass project.

Image source: Stuart Murphy, Clarence Valley Council

According to the soil landscapes of the Lismore - Ballina (1994) the floodplain is characterised by alluvial well-drained prairie soils and dense clays overlying poorly mixed sediments. The soils limitations are its plasticity, permanent water table, localised low wet bearing strength, salinity and localised Acid Sulphate Soils (ASS) as well as being prone to flooding.

Not surprisingly these characteristics posed engineering challenges, not the least being the need to find firm foundations for the bridge and overpass pylons. Hundreds of pylons have been driven or bored into the soil, with the Emigrant Creek south bridge pylon bored 58 m down before finding foundations. The largest bridge, over the Teven Road includes 11 spans of 33 m each with the pylons being bored approximately 50m deep.

The management of ASS on site has involved the use of lime and ensuring minimal oxidation of potential ASS. To date some 1.8 mill m³ of soil has been disturbed and used as fill, and 800,000 tonne of rock has been crushed on site to be used as road base.

The RTA has formed an alliance with Leighton contractors, AECOM, SMEC and Coffey Geotechnics to design and construct and manage the risk of the project. The project is due for completion in late 2012 with the northern section opening (bypassing Tintenbar) by the end of this year.

The tour highlighted the challenges of constructing roads on floodplain soils. The experience gained here will be invaluable to the RTA and its partners on a number of projects on the Pacific Highway including the Kempsey bypass which has a 2 km bridge over the Macleay floodplain.

Soil health workshops in Central West NSW

Sally Muir, I & I NSW, Inverell

Good soil management depends on producers understanding how soil function interacts with

environmental factors and farm practices. An increasing number of primary producers are recognising soil biology as important. More than two hundred landholders across Central and Northern NSW attended presentations of the one-day workshop 'Soil Life: an Introduction to Soil Biology' by Industry & Investment NSW during 2009-10.



Producers identifying insects in soil and litter at a 'Soil Life' workshop.

Photo Sally Muir

The workshop highlights the importance of soil biota for sustaining agricultural production and provides producers with:

- techniques to identify and monitor soil biological health,
- management options to encourage beneficial activities of soil biota and build soil organic carbon.

Participants examined their own soil for microbes and its carbon profile as well as measuring biodiversity in soil. At the end of the training participants had learnt how to identify a range of soil organisms, and understand their usefulness as indicators of biological activities and contributors to soil health.

The training was extensively praised by participants as being very useful. They felt that their understanding of soil biology had improved, their awareness of soil organisms and their role in a healthy ecosystem had increased, and that they could use the information to improve soil biological activities through their farm practices. Most intended to modify their current management practices to increase soil organic carbon on their farms and improve soil biology.

Specific training in managing soil biology can be seen as an investment in the future that promotes sustainable and economic agricultural

production. The importance of managing soil biology to improve soil health and how to achieve this on-farm is at the core of "Soil Life Management", a new on line course being developed by Industry & Investment NSW under the Australian Government's 'FarmReady' scheme.

More discussion about the extension outcomes of the 'Soil Life' workshops at http://www.asssi.asn.au/general/downloads_conf.php in the file 'Muir Soil Biology Extension Regional Forum Armidale v3.pdf'

Rethink Soil Information Delivery

The Soil Science Society of America (SSSA) reflects on their involvement in the "Dig It!: The Secrets of Soil," exhibition at the Smithsonian National Museum of Natural History in Washington, DC. in an article in the May edition of the Soil Science Society of America Journal. Out of their experience with the exhibition they suggest six unconventional goals for the future of soil science to help "embed the importance of soil in world thinking and policy".

One of these is to 'Rethink soil information delivery' suggesting that simple presentations of material, delivered in a modern style should become the norm in soil information delivery and education, especially with soil taxonomy.

"... in the last 20 years the detail of soil taxonomy, and the information one needs to classify soil, has moved beyond the knowledge of non-soil scientists and even most soil scientists working outside of pedology (let's put aside the costs of characterizing a profile). This must change or Soil Taxonomy will certainly go the way of most extinct languages."

The SSSA suggests creating a digital soil taxonomy interface. The aim would be that a user with no knowledge of soils could select a landscape anywhere in the world via Google Earth, zoom into a pedon* position on that landscape, and for each instance, see an example pedon, and an explanation of what they are seeing (using Soil Taxonomy and generic language) and how the soil and landscape influences land use.

(*According to the Oxford Dictionary of Earth Sciences a **pedon** is a three-dimensional sampling unit of soil, with depth to the parent material and lateral dimensions great enough to allow the study of all soil-horizon shapes and

intergrades below the surface. They are usually between 1 and 10 m² in size.)

The article: **The "Dig It!" Smithsonian Soils Exhibition: Lessons Learned and Goals for the Future** by Patrick J. Drohan, John L. Havlin, J. Patrick Megonigal, and H. H. Cheng in the Soil Science Society of America Journal 74: 697–705 2010 is available at <http://soil.scijournals.org/cgi/content/full/74/3/697>

ASSAY goes electronic

ASSAY – the national acid sulfate soils quarterly newsletter is now an e-newsletter for readers keen to stay abreast of emerging research findings and current best management practices for acid sulfate soils across Australia. One of Australia's longest running soils newsletters, ASSAY has evolved from the black-and-white printed version started in 1993 into today's fully electronic format with colour photos, mapping products and hyperlinks to other resources.



To subscribe contact Simon Walsh on 6626 1256 or type "SUBSCRIBE ASSAY" in the subject line and email to: simon.walsh@industry.nsw.gov.au

Free online rural business management training

RuralBiz Training is offering a limited number of fully funded (by Dept of Education and Training) places in their Diploma and Advanced Diploma of Rural Business Management & Agriculture courses. RuralBiz Training offers training online, so that anyone with an internet connection can get live training, supported by a range of other materials. Manager of RuralBiz Training, Kathy Sims, says "Our online training is flexible, allowing people to fit their study around farming activities. Our trainers are practical farmers themselves, as well as being very experienced trainers".

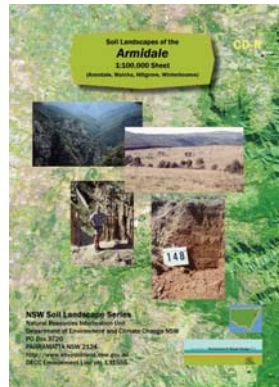
There are no prerequisites for enrolling, allowing anyone with an interest in improving their qualifications to be involved. Details of units currently offered are at www.ruralbiztraining.com.au Contact Robyn Diamond on 02 6884 8812 or admin@ruralbiztraining.com.au

New publications

Soil Landscapes of the Armidale 1:100 000 Sheet

Department of Environment,
Climate Change and Water
(DECCW)

The latest release in this popular soil landscapes series details the soil landscapes of the Armidale region. It covers 2650 square kilometres including the Tablelands component of the Macleay Catchment, extending from Armidale and Walcha in the west to Hillgrove and some of the gorge or escarpment country in the east, showing the distribution of more than 50 soil landscapes.



This publication comes in a unique, fully interactive digital format, including a SPOT5 satellite image along with 24 interactive maps, putting a suite of powerful tools and data into the hands of landholders, land managers, urban and regional planners, researchers and extension staff. The maps will help in identifying potential landscape issues, carrying out or advising on appropriate sustainable soil management practices, ensuring that land is used to its potential and enabling soil condition in the district to be maintained or improved.

The interactive Armidale DVD is available from the NSW Government online shop at <http://www.shop.nsw.gov.au/pubdetails.jsp?publication=10340>

Building high carbon - low emission farming and grazing soils: A land managers guide

Peter Crawford (ed) North East Downs Landcare Group
Contributors: Dr Christine Jones, Colin Seis, David Rowlings, Dr Maarten Stapper, Ian Moss, David Hardwick, Bart Davidson

Subtitled *Reducing emissions and improving carbon levels in southern Queensland soils*, the main sections of this guide are titled:

- Agriculture and greenhouse gas emissions,



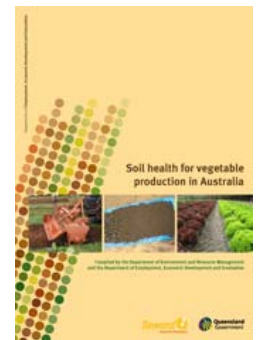
- Soil carbon – what it is, what it does, and how to build it,
- Improving soil biological activity – towards a more natural farming system and
- Nitrous oxide – how to win from not losing it.

Hardcopies of the book are available from the North East Downs Landcare Group for \$11 plus postage, contact Peter Crawford on 07 4691 1499 or peter@nedlandcare.org.au

Soil health for vegetable production in Australia

Tony Pattison (DEEDI), Phil Moody (DERM) and John Bagshaw (DEEDI)

Specifically for vegetable agronomists, consultants and growers, this manual takes a holistic view of soil health, considering the interaction of physical, chemical and biological soil properties. The balance and stability of these components are what make a healthy soil.

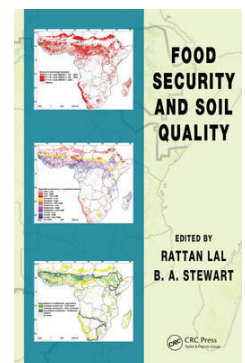


Available for free download from:
http://www.dpi.qld.gov.au/26_17025.htm

Food Security and Soil Quality

Rattan Lal, B.A. Stewart

Widespread soil degradation along with resistance to recommended agronomic practices, and little attempt to restore degraded soils have conspired with significant droughts to swell the ranks of the food insecure to over a billion people. The U.N. Millennium Development Goals' intent to halve hunger by 2015 will not be realized. This book brings together leading experts from across the world to provide a concise and factually supported exploration of the problem at hand and the critical steps needed to reverse it. It details achievable methods for improving soil quality for sustainable production and discusses the human dimension of the crisis including the influence of culture and spiritual beliefs. It also offers soil scientists working in this area



with an understanding of what is being done and what needs to be done.

<http://www.taylorandfrancis.com/books/details/9781439800577/>

Implementing Innovation: Fostering Enduring Change in Environmental and Natural Resource Governance

Toddi A. Steelman

Governments at the local, state, and federal levels have undertaken a range of innovations, often in partnership with nongovernmental organizations and communities, to try to address environmental and natural resource management tasks. Many of these efforts have failed.



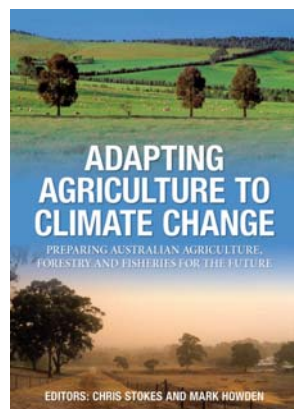
This book uses three case studies - land management in Colorado, watershed management in West Virginia, and timber management in New Mexico - to reveal specific patterns of implementation success and failure, challenge conventional wisdom about the role of individual entrepreneurs in innovative practice, and highlight the institutional obstacles that impede innovation and long term implementation.

<http://press.georgetown.edu/detail.html?id=9781589016279>

Adapting Agriculture to Climate Change: Preparing Australian Agriculture, Forestry and Fisheries for the Future.

Stokes C & Howden M. (eds).
CSIRO PUBLISHING.

More than 30 authors have contributed to this book describing the consequences of climate change. It outlines how primary industries can work towards adapting to the impacts and harnessing the opportunities of climate change. The book summarises updated climate projections for Australia and includes chapters on



socio-economic and institutional considerations for adapting to climate change, greenhouse gas emissions sources and sinks, as well as risks and priorities for the future.

<http://www.csiro.org/resources/Adapting-Agriculture-to-Climate-Change.html>

Soil and Water Conservation Advances in the United States

Ted M. Zobeck and William F. Schillinger, ed.

Have agricultural management efforts begun in the desperation of the Dust Bowl brought us to where we need to be tomorrow? Authors from each region of continental United States describe the progress of soil and water conservation to date and visualize how agricultural production practices must change in future years to address the newest challenges.

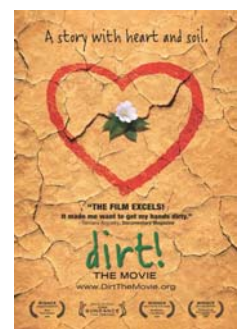


https://portal.sciencesocieties.org/Purchase/ProductDetail.aspx?Product_code=a4fb6a16-c815-df11-8644-0013210e308c

Soil films

DIRT! The Movie

This film tells the story of Earth's most valuable and underappreciated source of fertility - from its miraculous beginning to its crippling degradation.

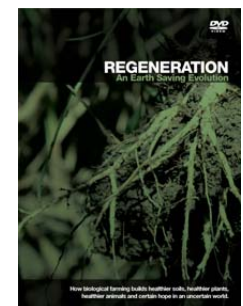


<http://www.dirtthemovie.org/>

REGENERATION - An Earth Saving Evolution

A series of six short films features Australian farmers outlining the benefits of biological farming methods.

- Regeneration - An Earth Saving Evolution
- Building Essential Carbon in the Soil
- Retaining Water in the Land
- Soil Health and Microbial Balancing
- Peak Oil - Reducing Inputs and Costs



- Keeping Communities on the Land.
You can view the first of these short films free on YouTube from a link on the website:
<http://www.lifeworksfoundation.com/projects/regeneration.php>

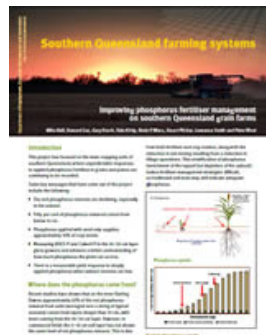
Reports

Improving phosphorus fertiliser management on southern Queensland grain farms

Mike Bell, Dale Kirby

Key messages from this research report are:

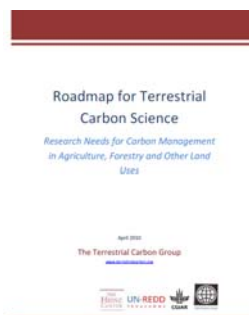
- Our soil phosphorus reserves are declining, especially in the subsoil.
- Fifty per cent of phosphorus removed comes from below 10 cm.
- Phosphorus applied with seed only supplies approximately 10% of crop needs.
- Measuring BSES-P and Colwell P in the 10-30 cm layer gives growers and advisers a better understanding of how much phosphorus the plant can access.
- There is a measurable yield response to deeply applied phosphorus when subsoil reserves are low.



http://www.dpi.qld.gov.au/4791_17124.htm

Roadmap for Terrestrial Carbon Science: Research Needs for Carbon Management in Agriculture, Forestry and Other Land Uses.

This work represents a partnership among the Terrestrial Carbon Group, the UN-REDD agencies, the World Bank, and the Consultative Group on International Agricultural Research (CGIAR) institutions to identify scientific and technical advancements needed to accelerate avoided emissions and sequestration of terrestrial carbon.



www.terrestrialcarbon.org

Research papers

Long-Term Soil Organic Carbon as Affected by Tillage and Cropping Systems

G. E. Varvel and W. W. Wilhelm

Soil Science Society of America Journal

Volume 74: 915–921 2010

<http://soil.scijsournals.org/cgi/content/full/74/3/915>

Effects of biochar from slow pyrolysis of papermill waste on agronomic performance and soil fertility.

L. Van Zwieten, S.Kimber, S.Morris, K.Y.Chan, A. Downie, J. Rust, S.Joseph, A. Cowie.

Plant and Soil 327: 235-246. (2010)

<http://www.springerlink.com/content/n645066474320872/fulltext.html>

New web resources

Pastures Australia

<http://www.pasturepicker.com.au>

An Info resource for improving pastures. You can zoom in on your region, set parameters like soil texture, drainage, soil Ph, annual, perennial, legume etc, and the site gives you a list of all the pasture plants that fit your specs, linking to fact sheets on each pasture species, including info on palatability, productivity, competitiveness and establishment.

Soils are Alive

www.soilhealth.com

An online book by Professor Lyn Abbott for anyone interested in the living aspects of soils – especially land managers, gardeners and students.

Irrigation Essentials (National Program for Sustainable Irrigation)

www.industry.nsw.gov.au/info/sustainingthebasin
(Located in the "Spotlight" and "Useful resources" sections)

- Irrigators caring for the rivers. Case studies of projects by farmers to improve their irrigation and adapt to water plans and climate variability
- Innovation in Irrigation: case studies from across Australia 2004 - 2007
- IrriSat SMS and Furrow Automation Technology Demonstrations (Video)
- Evaporation Control Technology Demonstration (Video)

- Lifting irrigated cropping profitability and water use efficiency. A publication that highlights 14 profitable and efficient irrigators
- Irrigation Farm Water Use Efficiency Assessments - the benefits

Farming for the Future: Self Assessment Tool

http://www.agric.wa.gov.au/objtwr/imported_asset/content/fm/bulletin2006_f4f_sat.pdf

This (West Australian) self assessment tool for farm sustainability has a section for natural resource and production management that emphasises on farm practices that relate to balancing the physical, chemical and biological aspects of soil fertility for improving soil health.

Bugwise simple invertebrate guide

<http://australianmuseum.net.au/document/Quick-Invertebrate-Guide>

This guide has been prepared by Australian Museum staff who work on invertebrate behaviour, taxonomy and ecology. It was designed for students undertaking invertebrate studies or volunteers that may be involved in sorting invertebrate material.

Events

Expo: Primex

17 – 19 June, 9 am – 4 pm

Casino

Primex is a primary industries trade exhibition. This year organisers expect to have over 1000 companies and organisations involved, and over 50 000 people attend. Representatives from I & I NSW (with our NSW DPI logos), the NRCMA and Landcare groups will be there too.

Workshop: Increasing soil organic carbon of agricultural land

Wednesday 16 June, 9 am - 12.30 pm

Hudson Room,

I & I NSW (formerly DPI),

Wollongbar Primary Industries Institute

1243 Bruxner Highway, Wollongbar

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

<http://www.soilcare.org.au/SoilCareYinChan%20flyer2010.pdf>

Conference: Grasslands Society of Southern Australia Inc 2010 “Our Future Farming Environment”

28 - 29 July 2010

Wangaratta Performing Arts Centre, VIC

Contact GSSA Office 03 5480 3305 or office@grasslands.org.au

Conference: 19th World Congress of Soil Science “Soil Solutions for a changing World”

1 - 6 August 2010

Brisbane Conference and Exhibition Centre, QLD

<http://www.19wcss.org.au/>

Field Day: Soil Health for Better Pastures

21 August 2010

North Codrington, on the Richmond Floodplain.

Contact Lyn Andersen 6626 1215 or lyn.andersen@industry.nsw.gov.au

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