

The CLR has been busy organising several short courses in land degradation and mining issues, during the past six months. This newsletter contains an update on research projects and forthcoming events of interest to industry professionals.

RESEARCH NEWS

“Mycorrhizal symbioses and heavy metal tolerance in plant species from native outcrops”.

This research project, started in early 1999 and is looking at the adaptation for nutrient uptake and metal tolerance of some native plant species growing in lateritic soils associated with nickel deposits, in Western Australia. This research will particularly concentrate on the role of mycorrhizal fungi. The project is funded by the Government of New Caledonia. Ravensthorpe Nickel operations is also contributing.

The focus of the study is Bandalup hill near Ravensthorpe (WA), a lateritic nickel deposit. Soil cores, seeds of selected threatened plant species, soil samples and plant leaves for metal and nutrient analysis have all been collected from the area.

The first priority was to develop seed germination protocols. It appears that most species are responding positively to smoke water. Other treatments include scarifying, heat, gibberellic acid, temperature, light or combinations of several treatments.

Seedlings of some of the selected species (*Eucalyptus flocktoniae*, *Melaleuca coroncarpa* and *Hakea verucosa*) have been grown in undisturbed soil cores, to characterize their root associations with mycorrhizas, as well as root specialized structures and architecture.

Analyses of major nutrients and certain heavy metals (in particular nickel) in soil and plant samples have also been conducted.

A current experiment with *Eucalyptus flocktoniae*, *Melaleuca coroncarpa*, *Hakea verucosa* and clover will assess the role of mycorrhizal fungi in nutrient uptake and metal tolerance. Metal and macronutrient concentration will be measured in plant shoots. Measurements of heavy metals in root and fungal tissues using electron microscopy will follow.

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Soil Sustainability – how do you know if you are getting it right?

‘Soil Sustainability’ is now a common term used in agriculture. What we mean by soil sustainability varies a little between individuals, farmers, scientists and policy makers. However, we should all agree that improving the overall biological, chemical and physical status of a soil is a good step towards increasing productivity and improving long-term sustainability. Many farmers are tackling this issue through a variety of management practices. But how do you know if you are getting it right?

One approach to determining if a particular management practice works is through the measurement of soil indicators that characterise the current status, or predict the future trend, of a soil. These indicators can be biological, chemical or physical measurements – in fact a combination of all three components of the soil is probably best. For an indicator to be of any use, it needs to be cost effective, easy to interpret and tell you something new about the status of your soil. If an indicator does not fit these criteria then it is not likely to provide you with added knowledge to assist you in your decision making.

There are numerous different methods being promoted throughout the world for use as soil indicators. Many of the methods routinely by a commercial laboratory being assessed could be done if the farmer sent in a bag of soil. Other methods are more applicable to farmer monitoring. But how do we know which ones are best for our WA soils? At present we don't. But the Centre for Land Rehabilitation has embarked on a 3-year GRDC funded project aimed at establishing soil indicators for WA. This project will draw on previous national and international experience, whilst tailoring a package of soil indicators specifically for WA soils and our often unique conditions.

(courtesy M. Braimbridge)



Replicated field trials managed by UWA, CSIRO, AgWest and farming groups are currently being used to evaluate numerous potential indicators. Management practices being assessed include: tillage systems, stubble management, lime and clay amendments, use of perennials, green manuring, phase cropping with trees and alternative fertiliser products. Results from these trials will be used to select a package of indicators most relevant to WA soils. During the 2001 field season the package of indicators will be used to assess the benefit of different agricultural practices on farms. It is also planned in the future to

determine district values for each indicator – thus tailoring the indicator even more closely to local conditions.

The overall goal of the soil indicator project is to provide the scientific basis and trial results required by farmers to enable more informed decisions to be made about the future sustainability of WA grain production and our soil resources.

During the last field season, research scientists Dr Daniel Murphy and Nui Milton have been developing close links with some of the farming groups throughout the state. They are also interested in hearing from other groups and farmers that may have suitable sites for the 2001 field season.

For more details please contact: Dr Daniel Murphy on 08 9380 7083 (dmurphy@agric.uwa.edu.au) or Nui Milton on 08 9380 1884 (nmilton@agric.uwa.edu.au)



Organic farming systems

Dr Richard Cookson from New Zealand is about to join the CLR to study nutrient cycling and soil biological fertility within organic farming systems. This is a NZ competitive fellowship funded by the Foundation for Research, Science and Technology. The principal aim of this project is to improve the management of nitrogen in sustainable farming systems.

During the next 3-years, Richard will conduct research both within Western Australia and in the United Kingdom. This international link will enable CLR researchers to benefit from

the considerable knowledge already gained in the N. hemisphere on organic farming.

Further information can be obtained in the first instance, from Dr Daniel Murphy 08 9380 7083. Email: dmurphy@agric.uwa.edu.au

Spontaneous Revegetation and Soil Development on Abandoned Sites

Dwi Setyawan (Wawan) is currently undertaking a PhD project on post-mining ecology.

Wawan is from South Sumatra and is supported by AusAID. His aim is to study the spontaneous growth of pioneer species and soil development on disturbed sites under the framework of natural rehabilitation. The project started with an intensive micro-scale mapping of landscape developed from different substrate of parent materials at Jarrahdale. In the next stage, he has introduced LFA (Landscape Function Analysis) as developed by Tongway and Hindley (CSIRO Wildlife and Ecology) as a tool to assess and monitor the progress in mine rehabilitation.

A case study was also conducted at Scotia gold mine near Norseman. This study will be extended to cover different types of mines in Western Australia as well as for the sites in Indonesia.

Email dsetyawa@agric.uwa.edu.au

PROFESSIONAL COURSES

APPLIED CONTAMINATION CHEMISTRY UWA 28th-29th November 2000

The course will be split up into four units:

- 1) introduction to clay mineralogy and other aspects of earth chemistry
- 2) applied contaminant organic chemistry
- 3) applied redox and inorganic chemistry for contaminants
- 4) chemistry and quality assurance.

Cost: \$825 (incl GST)

ABOUT NATIVE SEEDS King's Park, Perth, WA December 5th, 2000

The collection, storage and subsequent germination of native seeds are all vitally important in the preservation and revegetation of many areas within the State. Many Landcare and Bushcare groups, mining companies and local councils, have an increasing concern about the correct provenance of seed they utilise for revegetation projects. This workshop aims to present an overview of provenance, collection and storage protocols, dormancy and treatments to enhance germination. Experienced presenters have been chosen from Kings Park and the University of WA in order to provide a comprehensive understanding of an important resource.

Cost: \$150 (incl GST)

RESTORATION ECOLOGY

February 2001, King's Park and UWA

Two days of theory and practice on ecology of natural plant systems, genetics, recruitment, micropropagation and artificial seeds.

For more information about any courses, contact Sandra Maynard, Training and Extension Officer 08 9380 3827
Email sandra.maynard@uwa.edu.au or look at our web site:

<http://www.clr.uwa.edu.au>

CONFERENCES

MINERALS COUNCIL OF AUSTRALIA ENVIRONMENTAL WORKSHOP

30th October-1st November 2000
Perth WA

Details on website:
<http://www.minerals.org.au/>

REMADE LANDS

International Conference on the remediation and management of degraded lands at Murdoch University, Perth, WA.

30th November-1st December 2000.
Details available from the organiser's website:
<http://www.promaco.com.au>