

# TGGS news & views

about pasture development in the tropics and subtropics

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## Leucaena when the drought breaks

We have known for many years that cattle eating a lot of leucaena can suffer from 'mimosine' toxicity—with affected cattle becoming ill thrifty.

### Chronic but reversible

Other symptoms can include loss of hair from the tail and from patches over the body, ulcers on the tongue and excessive salivation. Cattle fail to put on weight but seldom die.

Following the famous work of Ray Jones, we know that these symptoms are the result of toxicity, less of mimosine itself, but of a product of mimosine as it is broken down by normal bacteria in the rumen. Most damage is caused by this toxic by-product, called DHP, but it can be reversed or cured by administering special rumen bacteria (*Synergistes jonesii*) that can break down the toxic DHP.

But these symptoms are chronic and cattle death, especially sudden death, is not normal.

### Sudden death

So what was happening to cattle that died suddenly in leucaena paddocks around Taroom as the drought broke?

These cattle sometimes suffered quite a violent death, frothing at the mouth.

Post mortems by Bevan Peters, the local veterinary surgeon, showed the rumens to be packed with leucaena and widespread internal haem-orrhaging of the stomachs, liver and heart. Blood tests of living animals showed that thyroxine



*The old story of mimosine (DHP) toxicity. Chronic ill-thrift fixed by drenching with a DHP-degrading bacteria. (Below) The same steer 4 weeks after inoculation.*

levels, normally around 50, were down to 4-10 meaning that the thyroid glands were severely affected. Bevan started to come to the conclusion that this was real mimosine poisoning.



*A new story. Eating only fresh young leucaena shoots and no grass when rain falls after a long drought can cause acute mimosine toxicity, and death.*

*Continued on page 4 ...*

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# Society News

## Our Internet address

[www.tropicalgrasslands.asn.au](http://www.tropicalgrasslands.asn.au)

See it for membership forms, an updated book list and pdf versions of the newsletter. Our Society e-mail address is [tgs@csiro.au](mailto:tgs@csiro.au)

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## Pasture Picker - phew at last

The Pasture Picker is at last working on our TGS Web site and has been removed from the DPI sites but with a link from there.

I have updated the information (most of it anyway) and have rescanned the images for better resolution. When the images were first scanned, Internet speed was too slow for good detail.

Putting material on the Web is not like publishing a book. When a book is printed, that's the job finished; when you put something on the Web that's the start of a treadmill that you cannot get off.

I'm sure there are some changes that still need to be made, and would be grateful for your feedback.

Ian Partridge

## \*Vice President resigns

Bruce Cook, our Vice President, has offered his resignation for personal reasons. The Vice President usually becomes the President in the next year.

We are most fortunate that Dr Max Shelton has offered to stand in as President for the year 2003/2004.

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## Your Executive for 2003

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# Annual General Meeting

The 40<sup>th</sup> Annual General Meeting will be held on Thursday, 4<sup>th</sup> December 2003 at the Department of Primary Industries Complex at 203 Tor Street, Toowoomba.

The AGM will start at 11 am and will be followed by a BBQ lunch.

The dry weather/drought over southeast Queensland has been so prolonged that there is precious little grass to be seen in

the field. As a result, after lunch, we will learn a bit about the potential for climate forecasting in assessing the future growth of natural pastures. We can then see some of the *Hedysarum* legume plants that are growing on the station. *Hedysarum* is an attractive plant that may have some potential for winter feed in the southern region.

## Tropical Grassland Society of Australia Inc.

### 40<sup>th</sup> Annual General Meeting

on

4<sup>th</sup> December 2003 at 11.00 a.m.

QCCA Building, DPI 203 Tor Street

**10.30 a.m. Arrival and Smoko**

**11.00 a.m. Annual General Meeting**

#### Agenda

1. Apologies
2. Minutes of the 39<sup>th</sup> AGM held at Redland Bay
3. Executive Committee Report
4. Treasurer's Report
5. Journal Editor's Report
6. Newsletter Editor's Report
7. Harry Stobbs Memorial Fund report
8. General Business
9. Fellowship Awards
10. Election of Office Bearers
11. Presidential Address

**12.30 p.m. BBQ lunch at QCCA Building (price to be determined around \$10-12)**

2.00 p.m. Illustrated talks on the potential for seasonal climate forecasting for drought alerts (a bit of climate science, a bit about pasture modelling and a bit about the integration of satellite imagery and climate forecasting).

Walk to see *Hedysarum* plants (in pots) with explanation by David Lloyd DPI).

#### How to get there

The DPI Complex is in Tor Street to the north of the intersection between Bridge Street and Tor Street.

From south and east, come up the main route of James Street and head out on Tor Street towards the west (towards Oakey, Dalby). Go straight ahead at the Bridge Street lights.

From the north from the New England Highway, turn up Bridge St, turn right at the Tor St. lights.

From the west, come along Bridge Street, turn left at the Tor St lights.

From the Bridge/Tor St lights, travel up the slope and across one roundabout. DPI is on the left just after Rockwell Park. Turn into the DPI complex and travel right to the back to the QCCA building (the white 'chicken shed').

*The BBQ lunch (and morning tea) will cost about \$12. Please let Ian Partridge know if you are attending (for catering). Contact details on the front page.*



*Bevan Peters explains how he ascertained the acute mimosine toxicity to members of the Leucaena Growers Network on Greg Couatts' 'Nahcub' property, Wandoan. Dr Max Shelton, Dr Athol Klieve and President, Wally Peart look on.*

*... continued from page 1*

Mimosine itself attacks all dividing cells; this causes severe lesions in the mouth and throat.

The problem was caused by the cattle eating a pure diet of young leucaena leaf without any other roughage. Normally cattle select about 70% grass and 30% leucaena, but had no choice this time because of the drought.

#### **Drought no grass**

In 2002, the paddocks received about 65 mm of rain in August but none at all for the next 3 months. Then it started raining heavily in December. A few weeks later the steers started dying.

The dry spring conditions after the long dry winter meant that there was virtually no grass plants left. But after the December rain, the leucaena responded vigorously with a flush of young shoots and leaf—full of mimosine—which the hungry cattle gorged on. Steers that had growth promotants were the most aggressive feeders, and suffered the most.

#### **Must give some roughage**

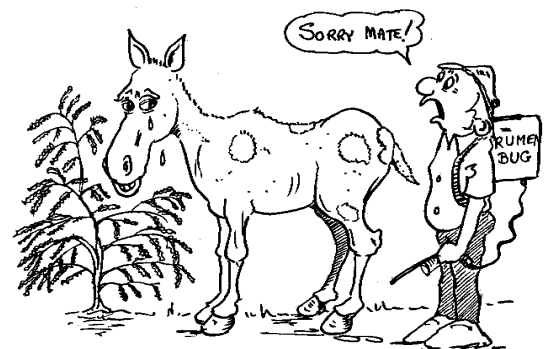
Leucaena is frequently planted in rows with the interrow being kept clean cultivated for the first years to give all the water to the establishing legume; nitrogen-loving grasses are sown later.

Cattle are periodically introduced into the young leucaena paddocks to browse on the legume to promote branching. These animals could also be at risk if they are hungry, stay too long and there is no adjacent grazing.

The lessons are that unless there is some grass available, the cattle need to be given access to adjacent sorghum stubble or provided with some hay.

#### **Not for horses**

Note. Leucaena is toxic to horses as they have no foregut in which bacteria can breakdown the mimosine or DHP. These very selective eaters nibbling leucaena shoots quickly lose the hair from their tails and manes.





## Inoculating against mimosine toxicity

Normal Australian rumen bacteria can breakdown mimosine to DHP but cannot work on the DHP. This can be degraded only by bacteria originally found in ruminants that lived in regions where leucaena is native. The presence of these bacteria (*Synergistes jonesii*) was discovered by Dr Ray Jones of CSIRO two decades ago. A way of inoculating cattle

on leucaena was worked out with the inoculum being provided by the DPI at Yeerongpilly.

### Don't become complacent

To date, enough inoculum has been sent out for 22,000 cattle but some managers can become complacent thinking that treating their stock once will last for ever.

### Some guidelines when dosing with the bug

The inoculum is provided as a rumen fluid mix in a 500 mL air-free bottle.

Rumen inoculum costs \$150 per 500 mL bottle, or about \$30 per head.

It takes about 2 weeks to prepare a flask of inoculum to go to a property.

Fluid can be kept frozen at  $-20^{\circ}\text{C}$  i.e. in a household deep freeze (but not in a frost-free model), but once thawed it must be used immediately.

At least one animal in 10 should be treated with 100 mL of rumen fluid.

Some graziers dose more than 1 in 10, even dosing all their leucaena stock. A 6 week delay for the bug to spread could mean the loss of more than 50 kg lwg. (6 weeks at 1.5 Kg/day).

It could also prevent deaths from acute mimosine toxicity after a drought.

The bacteria then spread through the herd by direct salivary contact and by grooming. The bugs produce carbon dioxide which keeps the saliva anaerobic.

Don't rely on spread by mixing some dung from treated stock in the drinking water. *S. jonesii* is anaerobic and is killed by contact with oxygen. It is unlikely to survive in dung because the hindgut microbes are different from those in the stomach, and is probably killed by contact with water in a trough.

It takes about 6 weeks for the bacteria to build up in a herd to provide safety. During this time, managers need to be sure that the animals always have access to some, but not excessive, leucaena.

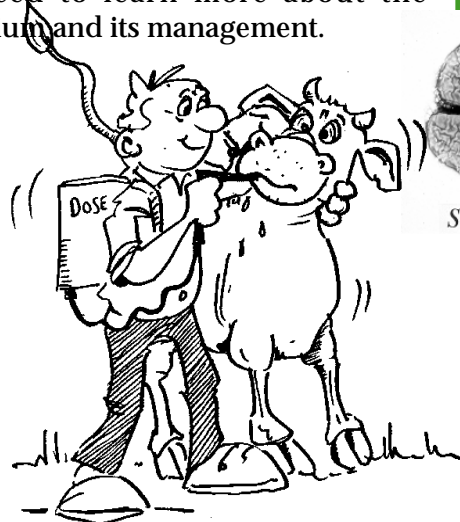
Once an animal has been inoculated, the bacteria may survive for up to 9 months, depending on it having leucaena in the diet, on the season or on drought.

It is a good practice to mix some old inoculated cattle with those newly introduced to the leucaena.

### The future

A pure culture of *S. jonesii* would be preferable to the present bacteria mix. This would be more economical and would provide a faster turn around. It would also avoid a Quality Assurance risk from the mixed culture. However, although there is a test for checking the presence of *S. jonesii*, there is currently no way of counting the strength of the culture.

We need to learn more about the bacterium and its management.



*Synergistes jonesii*

# Do you trust seasonal forecasts?

Growing beef cattle on native pastures means that you are greatly at the mercy of the elements and rainfall

Most graziers like to read the long-range seasonal forecasts in the papers or even to hear about them on ABC TV on Wednesday evening. But what does a '30% chance of exceeding the median rainfall' mean and how reliable is the information?

The answer has to be that this is the only way that a synopsis for a whole state can be presented in 15 seconds—but no one should make a hundred thousand dollar decision based on a 15-second grab on TV.

For much more detailed information

What are my chances of getting 150 mm of rain over the next 3 months?

When can the SOI give me a useful forecast?

What's normal rainfall?

Which areas have been extremely dry over the last years?

Rainman can answer these questions and lots, lots more.

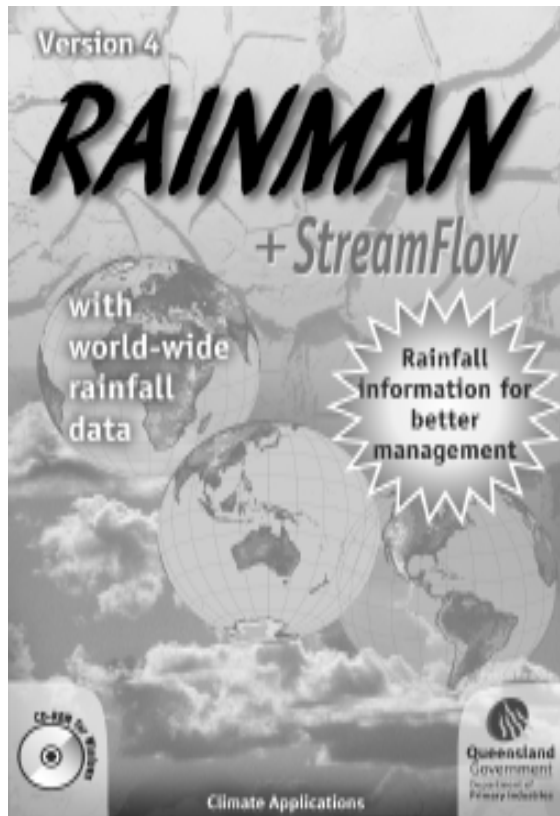
about the seasonal outlook for your location or district, you need to use the Rainman program.

The Rainman CD holds monthly and daily rainfall data, much of it for records of over 100 years, for some 3800 locations over the continent. You can look at this data or analyse it to see the chances (probability) of getting any amount of rain over any selected season. You can then do an analysis to see whether this probability distribution is altered by ENSO conditions (ENSO = El Niño – Southern Oscillation). At times of the year

and in some regions, there may be no change; in other seasons and in other regions, these changes may be dramatic.

These changes in the probability distribution form the basis of seasonal climate forecasting; knowing the state of the Southern Oscillation this month may give an indication of rainfall in a future season. It is not a categorical forecast—yes = rain, no = dry—but the chance of getting an amount of rain based on what has happened in the past—a hindcast.

Only with a good understanding of what makes our climate so variable and a powerful but easy-to-use analysis tool can you hope to make a good decision. And a good decision is one based on the best information, not necessarily that it ends up being the correct one!

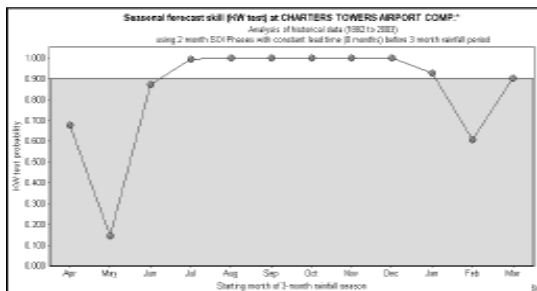


**Chance of rainfall at CHARTERS TOWERS AIRPORT COMP.\***  
 Analysis of historical data (1982 to 2003) using SOI Phases: Aug to Sep. Leadtime of 0 months  
 The SOI phases/rainfall relationship for this season is statistically significant because KW test is above 0.9, and Skill Score (20.7) is above 7.6 (p = 0.999) [Chance result or real skill?](#) [Help](#)

Rainfall period: Oct to Dec	SOI falling	SOI negative	SOI neutral	SOI rising	SOI positive	All years
% yrs with at least 395 mm	0	0	3	5	14	6
210 mm	10	12	13	26	54	26
160 mm	10	15	26	42	74	39
120 mm	20	31	46	58	86	54
100 mm	30	50	58	74	89	66
80 mm	60	54	68	89	97	76
36 mm	90	92	94	95	100	95
% yrs above median 126 mm	20	23	39	47	86	49
KS/KW probability tests	KS=0.96	KS=0.994	KS=0.91	KS=0.80	KS=0.999	KW=0.999
Significance level	*	**	#	Not significant	***	
Years in historical record	10	26	31	19	35	121
Highest recorded (mm)	242	250	369	403	562	562
Lowest recorded (mm)	20	22	7	34	64	7
Median rainfall (mm)	85	101	111	128	216	128
Average rainfall (mm)	97	107	126	163	227	154

What are my chances of getting 150 mm of rain if the SOI is neutral?

*'It's no good just having a forecast being delivered in the paper. If you are going to make a multi-million dollar decision or one that could wipe out your family farm, then you've got to have ownership of what's going on.'*



In which months can the SOI can give a significant forecast (sample for Charters Towers)

All the explanations about climate variability, the long-term rainfall data and the analyses tools are in Rainman.

The Queensland Centre for Climate Applications has just released its latest and fourth version of Rainman.

Rainman Version 3 contained rainfall data for Australia, the new version 4 adds monthly rainfall data for some 9500 locations world wide. The international data lets you see the effect of ENSO in some of our overseas markets or commodity rivals — even London’s rain in January 1697!

Other features include streamflow data for some 400 gauging stations and more rigorous testing of the statistical significance of the results of analyses to see whether there really is extra skill in the forecast.

Amongst many other uses, you can:

- check in which months you can get extra skill in forecasting using ENSO and how many months you can forecast ahead
- group any number of locations to see spatial differences- for example to see which regions have been in the driest 5% of years over the last 2 years
- sort the years to see how dry or wet a selected season is relative to other years.
- see by how many weeks an El Niño delays the onset of the monsoon in the north.

Seasonal forecasting with Rainman plus StreamFlow is not ‘black box magic’; you can see just how the forecasts are derived and how reliable they are for the answer you need.

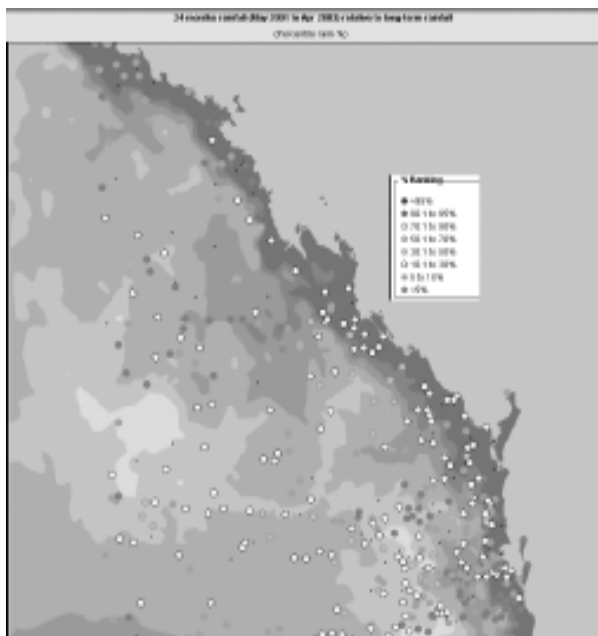


This 5-year moving average shows the 70s were wet but the 20s and 30s were dry. So what’s normal rainfall?

*The past as a guide to the future.*

*No magic or ‘black box’, Rainman’s forecasts are transparent hindcasts.*

More details of the features can be seen on [www.dpi.qld.gov.au/climate](http://www.dpi.qld.gov.au/climate).



Which parts of southeast Queensland were in the driest 5% of years (dark dots) over the last 2 years?

### What’s it worth or what does it cost?

The Standard edition of Rainman plus StreamFlow Version 4.3 costs \$125, the Professional edition (data from more locations and extra analysis tools) costs \$450. Available from DPI Toowoomba. Phone (07) 4688 1375

*Less than the cost of a tankful of fuel in a Land Cruiser.*

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# Letter to the Editor

## Stirring the giant

Don Loch's article, 'Turf - the sleeping giant', gives a timely wakeup call to T G S members, particularly in subtropical areas. While there has been the odd early morning murmur, there remains a crying need for research and technology into the general area of domestic and amenity grassland throughout much of Australia. Because such work seems to be non-agricultural (backyards, parks, roadsides etc.), for want of a better classification, it has been thrown into the horticultural basket, which might be part of the problem.

I have some thoughts on the subject, having worked in this area since retiring from CSIRO IN 1994. This work included studying the targeted application of glyphosate to problem grasses in parks etc. (Brisbane City Council and Centrogen, 96 - 99) and a project with HRDC and Parks & Leisure Australia, 98- 02, including glyphosate application, turfgrass species. testing and surveying environmental weeds on roadsides. This work has been aimed at improving the quality and manageability of vegetation in public open space.

Advancements in domestic grassland technology, particularly turfgrass, should benefit community interests, from the domestic, backyard situation, through to public open space (parks, roadsides and verges) and special, mainly recreational situations (sporting fields, racetracks, high profile sites, etc). For example, the status of domestic lawns varies considerably, with mostly quite reasonable turfgrass in some of the newer suburbs. However, in the older suburbs (and after years of questionable maintenance), good couch lawns tend to have become invaded by second-rate grasses (Bahia, elastic, narrow leafed carpet), seemingly without any enlightened comment or advice.

The lack of appropriate technology transfer to the domestic market is made obvious if you look at the type of grass seed (mostly temperate spp.) that is available in Brisbane supermarkets etc., presumably for local planting.

The status of grassland is much worse in public open space, its maintenance being costly and mostly inefficient. The slashing schedule for parks in Brisbane is restricted to c.16 cuts/yr, which explains why they are often overgrown (just try that in your backyard). Work with targeted glyphosate application has shown that through the conversion from Bahia to couch grass dominance, a reasonable standard of neatness can be achieved from half the number of cuts required for straight Bahia (Bahia's rate of vertical projection is 3-4 times that of green or blue couch).

The introduction and use of superior turfgrass (and other) species that might persist under the current maintenance regimes has been achieved at this early date (and some are commercially available). However these will be useful mostly for new plantings, perhaps using relatively low cost establishment techniques (sprigging and/or strip planting). Problems exist regarding vegetation control on the roads, with particular reference to environmental weeds, including introduced pasture spp. For example, Centrogen has been contracted by various authorities throughout Queensland. and NSW to implement a control program through targeted glyphosate application (Weedbug) to roadsides. In this regard, there could well be a need for good, low-growing ground-cover plants.

These are but a few practical issues that are currently relevant. Perhaps the day will come when Agronomy makes a big comeback. Until then, let's wakeup with the giant.

**Rollo Waite**

**ex CSIRO Div. Tropical Crops & Pastures**



# How much grass?

Graziers are becoming more and more interested in understanding their native pastures. They know they have to consider both quantity and quality of the feed, with quality representing both the nutritional value and the botanical composition.

Many graziers are monitoring their species composition using tools such as Grass Check, and estimating the amount of feed standing in the paddock using photo-standards.

This information can be used strategically to see how the pastures are changing over the years and tactically for pasture budgeting and planning dry season management.

Historically graziers had done this intuitively, look over the paddock – lots of feed—OK—and do a mental assessment. But the science of grazing management is looking for more refinement.

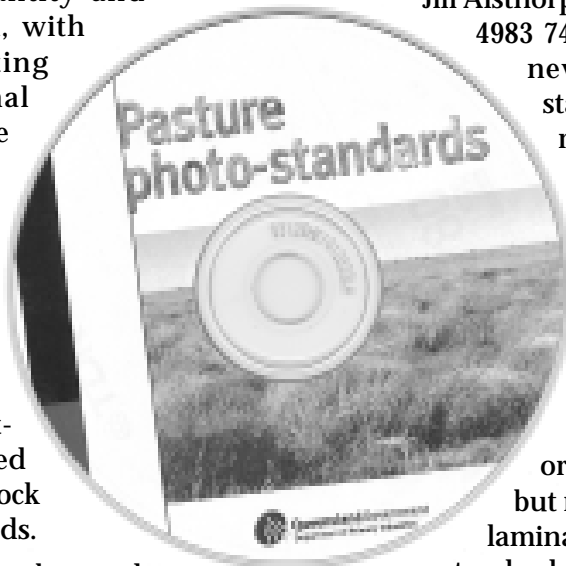
One of the valuable tools for this is to be able to recognise how much grass in terms of the weight of dry matter per hectare. An animal of a certain weight will eat so much each day, I need to leave this much feed or cover at the end of the dry season, so I can carry so many animals. In addition to being a management guide, the photostandards are useful when negotiating agistment contracts or assessing market value of a property.

Photostandards are photographs of pastures where the weight of feed has been measured. By comparing the photostandard with the feed in your paddock, you can estimate the weight present.

But each pasture type has different characteristics, so photo-standards are needed for each.

Jill Aisthorpe, DPI Emerald (07) 4983 7421, has produced a new CD with photo-standards depicting a range of pasture yields (in kg/ha) for 26 pasture communities across 12 state-wide regions. Producers without a computer or good quality colour printer can order more expensive but ready-printed laminated photo-standards for their own

pasture types.



*How much feed is in the paddock, how many cattle will it feed for how many months?*



*Sample page from the Pasture photo-standards CD*

The CD costs \$14.95. Order through the DPI Call Centre on 13 25 23 or from Rockhampton DPI on (07) 4936 0393.

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# Leucaena against dryland salinity

Salinity and water quality are big issues in Australian agriculture. It is generally agreed that tree clearing and intensive agriculture have raised groundwater levels bringing to the surface naturally occurring salt deposits that have been stable in Australian landscapes for millennia.

The key to preventing dryland salinity is to encourage farming systems that limit deep drainage below the root zone.

## Deep-rooted perennials

Professor Cox of the CRC for Plant-based Management of Dryland Salinity has said that we need farming systems based on deep-rooted perennial plants as even improved management of annual crops and pastures will not be sufficient. And these perennial plants must be able to compete with annuals economically or farmers won't adopt them.

Can large-scale plantings of the tree fodder *Leucaena leucocephala*, as proposed by the Leucaena Growers Network, do the work in Central Queensland.

High water consumption by the deep-rooting leucaena can limit excess water draining to the water table.

## Rooting depth and soil water

In December last year, a University of Queensland research team visited two properties on Downs clay soils near Rolleston and on lighter alluvial spoils near Carnarvon.

They wanted to study the hydrological properties of the soils, the depth of rooting and water use characteristics of leucaena plants, and the potential presence of a salt bulge. Both sites are in designated medium to high salinity hazard areas.

## What they found

On the Downs soil, the rows of leucaena were droughted but there were small sprouts appearing on the 2 m high stems. Cattle were eating the sprouts along with the dry buffel grass, and gaining nearly three quarters of a kilogram a day.

The rooting patterns of the leucaena were similar to those of brigalow regrowth with roots reaching 5-6 m depth compared to 2 m for buffel grass (see Figure 1). The water content of soil at 2 m was higher under the buffel grass than under leucaena or brigalow.

On the alluvial soil, there was 1-2 m of fresh leucaena growth despite the lack of rainfall, indicating that the leucaena was accessing deep water that was unavailable to the associated dry Rhodes grass.

Here leucaena roots were again measured to 5-6 m whereas roots of native trees (Moreton Bay ash and apple gums) reached only 3 m depth, and roots of rhodes grass between the leucaena rows were only 1.5 m deep. Again soil water levels at 2 m were higher under the grass than under leucaena or native trees.

Concurrent water use efficiency (WUE) on the Downs soils after rain fell was only 2.5 kg/ha/mm for leucaena when growing with vigorous buffel grass. This was much lower than the 12-16 kg/ha/mm expected suggesting that the rainfall had failed to wet soil below 2 m and that strong root competition for available water between leucaena and buffel grass restricted the regrowth of leucaena.

There was no evidence of high salt levels in either profile.

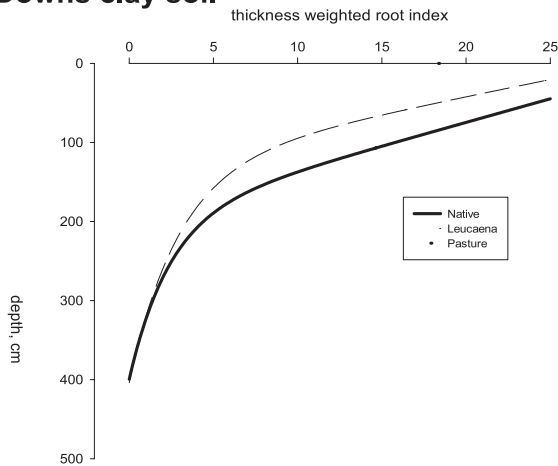
## Conclusions

In terms of rooting depth and depth of water use, leucaena appears to mimic the behaviour of native trees—important as soils at both sites were porous and therefore susceptible to deep drainage during periods of high rainfall. The alluvial soils had much greater water available at depth which leucaena was able to access and to produce green high quality fodder during dry periods.



Taking soil cores under brigalow regrowth

## Downs clay soil



## Alluvial spoil

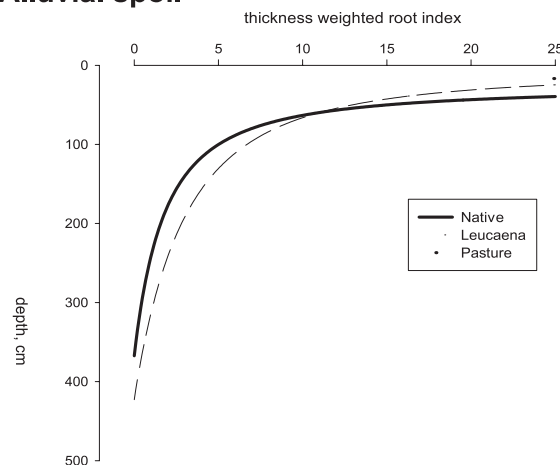


Figure 1. Depth of rooting on the clay and

There are more than over 4 million hectares of land suitable for growing leucaena in the Fitzroy catchment alone, much of it designated as high salinity hazard.

Thanks to Bruce and Lucinda Mayne of Broken Plains, Rolleston and to Stewart Ogg of Ingelara, Carnarvon for their cooperation and assistance with this project.

**Max Shelton**  
The University of Queensland St Lucia

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## Fifth International Herbage Seed Conference

The **Fifth International Herbage Seed Conference** will be held at the Gatton Campus of the University of Queensland (Australia) from 23 to 26 November 2003. The Conference theme “New Markets, New Products, New Opportunities” reflects the need to take stock of changes and recent trends in markets for forage and amenity grass and legume seeds.

The Conference will provide an excellent forum for formal and informal discussions of the many important issues associated with herbage seed production, including genetics and plant breeding, physiology, pathology and endophytes, seed crop management and harvesting, seed processing and testing, and marketing trends and environmental concerns. It will benefit all researchers, students and commercial seedsmen engaged in herbage seed research or in the extension and application of such research.

International Herbage Seed Conferences are held every four years by the International Herbage Seed Group (IHSG) with the aim of encouraging communication and cooperation between those involved in all aspects of herbage seed production research, including its extension and use. Previous Conferences were held in Tune (Denmark - 1987), Corvallis (Oregon, USA - 1991), Halle (Germany - 1995), and Perugia (Italy - 1999).

Gatton Campus is situated in the heart of the Lockyer Valley, an intensive farming region a little over an hour's drive from Brisbane International Airport. It is also strategically located close to the major subtropical seed houses in Australia.

Further Conference information and the Registration form are on the IHSG website, <http://www.css.orst.edu/ihsig/>, or contact the Organising Committee Chairman, Dr Don Loch (email: Donald.Loch@dpi.qld.gov.au).

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TGS news & views

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