Tropical Grassland Society of Australia Inc.

TGS news & views

about pasture development in the tropics and subtropics

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The Tropical Grassland Society is seeking to broaden its membership and scope of the Newsletter and Journal to embrace other uses of grasslands and grasses away from the traditional area of animal grazing and feed supply. New areas might include the use of grasslands for environmental improvement (e.g. rehabilitation of mining sites, revegetation of creek banks, erosion control), bio-remediation (e.g. sewerage/grey-water disposal), and the use of grasses for turf (golf courses, playing fields, parks, landscaping, and home lawns) and for amenity purposes (roadsides, city landscaping, urban gardens, floral displays).

John Wilson

The first of John's technical articles on shade appears on page 6.

Turf—the sleeping giant?

Don Loch, DPI Redland Bay

For too long, the turf industry in Australia has been like Cinderella before the ball.

While research on improved pastures in Queensland powered ahead with large research teams during the 1970s and 1980s, we had only one scientist working part-time on turf and amenity grasses in DPI and no one at all in CSIRO and the universities. Some pasture scientists even begrudged giving up this level of resources to something that they did not regard as a "real" agricultural pursuit.

But over the past decade or so, the funds that drove our earlier research into pastures have progressively dried up. Redundancy and retirements without replacement have eroded the key skills that kept us at the cutting edge of pasture research internationally. No one in authority seems to value any more the food and fibre that pastures generate. All of this is well known and has been of increasing concern to the Tropical Grassland Society.

What's the sodding future?

So does turf research have a place in the future of the TGS as we seek to broaden our horizons? I believe that it does have not just a role but a key role in shaping the future of tropical grassland science in Queensland and Australia. We should not forget our roots in pastures, but the TGS of the future needs to become a much more broadly based **Grassland** Society representative of the whole range of grassland-related activities.

Turf "sells" the one thing that a population with plentiful supplies of food and fibre still values—lifestyle. This comes through home lawns, roadside plantings, parks and urban open space, golf, bowls and other sports facilities, even cemeteries.

Turf and other parts of the amenity sector are large industries, both individually and collectively. Moreover, they are growing rapidly and becoming more professional

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Society News

Our Internet address

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

Not again!

Your subscriptions are due again

I have to apologise for another late newsletter but its preparation has had to fit around my other work demands. During March, I was in southern Vietnam with Bruce Cook and others helping to run a series of training courses on forage development for the local extension officers and farmers of the Quang Ngai Department of Agriculture and Rural Development. They know everything about growing rice but forages, other than elephant grass, are something new.

The enthusiasm for learning over there and the reception they provided makes we old pasture agronomists feel loved again!

Pasture Picker

We have been having a few technical problems getting the Pasture Picker onto our Web site. This has involved complications with the interactive database and the requirements of the server providers.

But we should be there soon.

Your Executive for 2003

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in response to local demand and to export opportunities for amenity-related goods and services particularly into Asia and the Middle East.

$50 M for sod and seed in Queensland

Turf is not simply a supply chain (as the current jargon would put it), but more of a supply loop. The sale of vegetative sod, sprigs or seed to establish a new area of turf only initiates a much larger and ongoing process of management (mowing, fertilising, irrigating, controlling pests) that continually adds value and creates a much larger industry overall. The $50-60 million annual sales of sod and seed in Queensland are actually part of a billion-dollar turf industry in this state.

Mega bucks for turf in the US

The US gives an inkling of where the growth of our turf industry could take us in the future. The most recent estimates (based on economic surveys now some years old) put the value of the US turf industry in 2000 at US$62 billion. It is their biggest land-based industry. Even in Texas, the turf industry is bigger than cotton and bigger than beef. And to put all of this into even better perspective, in the same year (2000) the motion picture and sound recording industry was worth US$57.8 billion to the US economy.

With all the mowing, fertilising, irrigating and the like going on, the turf industry is also a major employer among primary industries. This gives it considerable leverage on "hot" issues such as water rights as seen recently in the US and even in Western Australia.

Jobs for grass scientists

Professional TGS members will be interested in the fact that the US turf industry employs large numbers of tertiary-trained personnel. Currently, one in three members of the Crop Science Society of America work in turf—hence the need for the Australian organisers of the 2004 International Crop Science Congress in Brisbane to accommodate their interest within the Congress program. In US universities, 35-40% of undergraduates in whichever Department (Agronomy or Horticulture) offers turf courses are turf majors.

The natural progression in grass seed markets in other developed countries has been from forage to turf use. Oregon's Willamette Valley—the so-called grass seed capital of the world—started off growing seed of pasture cultivars, but now 70% or more of its production comprises turf cultivars. The main species grown are still tall fescue and ryegrass, but almost all of the breeders who used to produce improved forage varieties of these grasses have moved on to other crops or moved over to turf breeding.

Similar problems for pasture and turf

Pasture and turf research are not, and should not be, mutually exclusive areas. They share many of the same species, research topics and issues.

Diseases. Kikuyu (*Pennisetum clandestinum*), for example, is the main grass used on racetracks in southern Queensland and northern NSW; and as with kikuyu pastures one of the main problems is the disease kikuyu yellows.

In the case of blue couch (*Digitaria didactyla*), we are really only mowing a short pasture grass. There are far better types for turf and for forage use, and only recently has some of the better turf material been exploited through improved cultivars.

Winter growth. At Redlands, we are seeing the same differences in winter dormancy and activity between cultivars of the major turf grasses that were recognised in our pasture grasses (e.g. *Panicum coloratum*) decades ago. In Queensland, we need winter-active pasture grasses and winter-active turf grasses that can take advantage of our warm winter days. This is in direct contrast to the situation in much of southern USA (and eastern Asia) where a degree of winter dormancy in cultivars of the same species helps their winter survival during extreme cold snaps.

Shade. Shade affects around 25% of turfgrass sites, and so has been extensively studied by turf researchers. Much of this literature is also relevant to pasture researchers seeking to grow forage grasses under trees (see article on page 6).

Water use efficiency. Australia is the driest inhabited continent with only 1% of the world's surface water. How best to use this water, conserve it and recycle it is increasingly important for both pastures and turf use. Again, the extensive literature on water relations and use in turf grasses is relevant to pasture studies, and vice versa.

Salt-tolerance. Seashore paspalum (*Paspalum vaginatum*) was first used as pasture grass for salty seepages in Western Australia during the 1950s, but its development since has been as a turf grass highly tolerant of salt—with the best cultivars tolerant of the levels of salt in sea water.

The salinisation of previously productive land is not just a high priority issue for pastures and other agricultural crops, it is also important on an increasing number of turf grass sites. Research has shown how best to manage salt-affected turf grass sites and avoid the further accumulation of salt. We now have turf grasses that will not only tolerate high salt levels in the soil and/or irrigation water, they also look good. In many cases, however, it is not sufficient just to look good; there may also be a need to generate income through hay or grazing to make the solution economically viable. With salt as with so many other issues, we need a range of solutions from which people can choose the one that best meets their economic or aesthetic needs.

For grassland science in general, turf provides the opportunity to preserve technical skills that are also vital to the success of pasture research. At Redlands, for example, we already have a plant pathologist and a plant nutrition specialist working on turf—skills that are not readily available in pasture programs these days.

So next time you watch a State of Origin game on TV, don't just look at how good the players are. Check out how the turf they play on is holding up. This just might be **your** future.

Bruce Cook, your Vice President, describes the potential for some improved forage species in Quang Ngai Province, South Vietnam.

A Vietnamese farmer washes his pride and joy in the river in Pho An district.

Know those Aussie grasses

Grasses can be found over nearly every square kilometre of land on the continent of Australia—from the tip of Cape York to the south of Tasmania, from east to west. They can be found over natural grasslands, under woodlands and forests, in fact wherever plants can grow. And yet, they are amongst the most neglected families when it comes to botanical studies.

There are 1323 species of grass, both native and naturalised, that can be found growing wild in Australia and yet how many of us know more that a handful?

AusGrass

A new guide to identifying any of these 1323 grasses has been published as an interactive database. *AusGrass* is the largest and most comprehensive identification to a plant group ever produced. Using either interactive or dichotomous keys, you can quickly identify any of the species found in Australia. And you can use it with living or dry specimens, even if they don't have flowers or seed.

This grass database is based on the latest web-integrated Lucid Player to provide comprehensive fact sheets for each species, including a botanical description, notes on its distribution and taxonomy, as well as images including diagnostic line drawings, scanned specimens, photographs and stereomicrographs. The photographs of the inflorescences of many species are excellent and almost works of art; anyone who has tried to photograph living grasses as they wave around in the breeze to obtain close-ups with good depth of field must attest to the patience and skill involved.

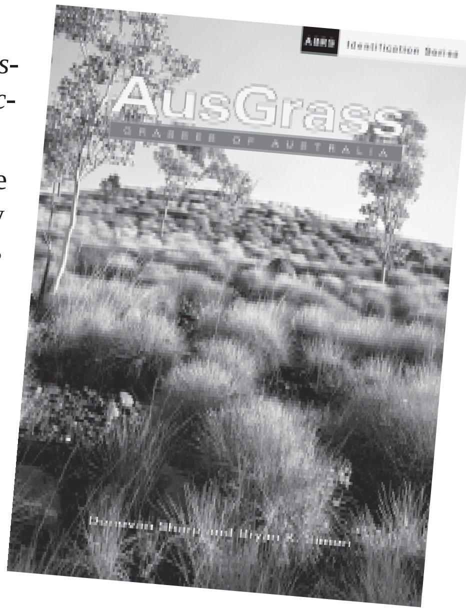
AusGrass has been developed by Donovan Sharp and Bryan Simon from the Queensland Herbarium. It is published as a joint venture between CSIRO Publishing, the Australian Biological Resources Study and the Queensland Environmental Protection Agency.

The CD-ROM and the manual cost $99.00.

Poaceae flora

Also released in a new *Flora of Australia Volume 43. Poaceae 1: Introduction and Atlas.*

This provides an overview to the grass family and to grass biology in Australia. The book contains essays that review the latest Australian research on phylogeny, classification, anatomy, physiology, ecology, palaeobotany and biogeography of the Australian grasses, with a further chapter having a detailed synopsis of the economic attributes of grasses on a genus by genus basis.



CD-ROM

Besides identification keys, the volume includes an atlas with more than 1400 maps showing the distributions of the native and naturalised species.

How to get your copies

The Flora costs $100 for a hardback edition or $85 for a paperback.

Both publications can be obtained from CSIRO Publishing, PO box 1139 Collingwood, Vic 3066.

Freecall (in Australia) 1800 645 051; e-mail: publishing.sales@csiro.au.

Check the details of this and other grassland books on their web site at www.publish.csiro.au.

Book

And don't confuse *AusGrass* with *AussieGrass,* which is the Queensland Department of Natural Resources and Mines product showing maps of present and forecast pasture growth over Australia.

Other books for identifying grasses found in Queensland's tropical and subtropical regions include *The Grasses of Southern Queensland* (with line drawing of over 400 species for $50 from TGS Book Sales) and Jenny Milson's full colour *Pasture Plants of north-west Queensland* (only $45 from DPI Book Sales)

Shady corner

'Why can't I grow good turf under shade?'

John Wilson, previously CSIRO pasture plant physiologist

In this series of articles, John Wilson, formerly plant physiologist with CSIRO Tropical Agriculture, describes the problems of trying to grow turf under shade.

The following article discusses one of the more difficult aspects of turf development.

Why can't I grow good grass under shade?

This is a question often asked by gardeners, landscapers and greens keepers and is exaberated by the trend towards sun-protective shade cloth areas at schools, public parks and pools.

Of course, the response of grass to shade is highly relevant to tropical pasture performance in tree plantations and savanna woodlands.

Shade

Light level. Incident radiation (sunlight) is traditionally measured as total short wave radiation (SW). Of more interest for plant growth is photosynthetically active radiation (PAR) of 400-700 nm wavelengths). In the past decade, integrating PAR meters have become commonly available; these can be placed in fixed positions and logged over days or months, or more usefully for tree shade areas be a hand-held type that is walked around the survey area for 5 minutes or so—integrating the light over the sunny and shady patches.

In full sunlight and under most artificial shade cloths, PAR = c. 0.5 SW, but may become PAR= 0.27SW at grass level under dense tree canopies because the tree leaves absorb PAR.

Some examples of climatic zone and seasonal variation in daily inputs of incident PAR can be seen in Table 1. Incident radiation for the wet tropics is similar throughout year, but in winter in the subtropics it is about 60% of summer levels even without shade and in the cool temperate zone as little as 20% of summer. So shade imposed in winter will have a major impact on grass growth in the latter two climatic zones.

Shade from buildings (e.g. grandstands and highrises) may decrease light input by only 30% in summer, but in winter with low sun angles and the lower incident radiation (Table 1) the decrease could be as much as 80% of normal summer light. For winter sports this shade creates great problems, especially as lower temperature restricts turf growth anyway. Under trees, the situation may be different because their canopies (and thus shade) may be heavier in the summer growing season than during winter when leaves may be lost. I have measured under trees in my own garden PAR levels as little as 2–10% of incident light in summer, but in winter the light received by the lawn may increase to 50-60% of summer levels because of leaf drop. Typically, light received by grass under tree plantations may be 40-60% of full sun for eucalypts and coconuts, but as low as 10% in dense rubber and oil palm.

Light quality. The proportion of red, blue and infra-red is little changed under shade cloths and in shade from buildings. However, under trees the red and blue wavelengths are preferentially absorbed by tree leaves for photosynthesis and the R/FR seen by the understorey grasses may change from the level of about 1.2 in full

Table 1. Daily values for incident PAR (MJ m^{-2} d^{-1})

Climatic zone	Season of year			
	Summer	Autumn	Winter	Spring
Wet tropics	8.9	9.7	8.9	8.7
Subtropics	10.8	7.8	6.8	10.3
Cool temperate	7.8	3.2	1.5	6.4

Table 2. Red/far-red ratios of light under various shade situations

Full sun	Mature rubber trees	Coconut trees	Eucalypts (8 yr-old)	Mature Rainforest	Shade cloth -green (70%)	Shade cloth -black (50%)
1.2	0.62	1.03	1.2	0.43	1.03	1.1

sun to as low as 0.43 under rainforest canopies (Table 2). The change is greater under dense tree canopies as under mature rubber plantations than under more open canopies such as eucalypts and coconut plantations.

Air and soil temperature. Generally air temperature at grass height under tree or artificial shade is only 1–2 °C lower than in full sun, and leaf temperatures may also be 1–1.5 °C lower. However, maximum surface soil temperatures under shade can be dramatically lower than in full sun by as much as 10°C, and even up to 20 °C on very hot days. Shade from trees or cloth cover may lessen the degree of radiation frosting on grass. Shade may also slow the rise of soil temperatures in spring. As a rule of thumb, tropical grasses cease growing when the minimum air temperature or surface soil temperature is less than 12°C.

Soil water status under shade. Air relative humidity under shade at grass height may increase but any influence is likely to be small (1–5% units) unless the shade canopy is very close to the grass. Because air, leaf and soil surface temperatures are decreased under shade, evaporative demand may be slightly reduced and the rate of soil drying slower than in full sun. Consequently, under artificial shade the soil may stay moister for a little longer after rainfall. However, under trees whilst the initial soil drying after good rainfall may be slowed, the extra evaporative demand of the tree canopy (unless the tree is deep-rooted) will soon dry out the soil in the grass root zone, sometimes to an even drier status than under grass in full sun, thereby causing great stress to understorey turf or grass growth. In addition, the tree canopy may prevent small falls of rain from reaching the soil, or may channel rainfall down the trunk to concentrate it in a zone near the tree base—both causing problems for grass growth.

Grass response to shade

If there are no other restrictions to growth (which is rare but may occur on intensively managed golf courses), the rate of photosynthesis and hence growth of tropical grass or turf is decreased more or less in direct proportion to the amount of light (PAR) received. Often, however, there are some restrictions, such as low temperature or lack of water or nutrients, and the photosynthetic light response curve is light-saturated at not more than about 60–70% of full light. In some of these situations, although shade may have reduced light levels to say 60% of normal, there will be little decrease in growth and sometimes none at all. The latter may occur because evaporative demand is reduced or because soil nitrogen availability is improved.

Many tropical pasture or turf grasses normally grown under full-sun situations can cope reasonably with shade down to about 50% provided they are carefully managed—albeit with reduced growth.

There are always exceptions, and within the major turf species the *Cynodon* species. and blue couch (*Digitaria* sp.) seem to cope poorly with just about any level of shade.

Below about 50% light, turf grasses need to be chosen for their special shade tolerance, and it is my judgement that only a few species will make successful turf below 20% light. A discussion of shade tolerance of different turf grass species and cultivars will be the subject of another article.

Morphological changes

Shade inevitably causes changes in the morphology of most grasses—stems elongate, leaves become thinner, broader and, in many species, more erect. Growth of the plant tops is favoured at the expense of less root growth, and the density of shoots (tillers) is much reduced. Thus it is hard to get a good dense turf under shade. A decrease in R/FR, as under dense tree canopies, adds to the extent of these morphological changes. These modifications are aimed at intercepting more light to assist success in natural ecosystems. But they are counterproductive to the sustainability and digestibility of grasses used in grazed pastures or to the maintenance of strong, high-quality, thick turf. This is because the photosynthate preferentially allocated to tops is continually being removed by mowing or grazing, causing progressive weakening of individual plants, especially in very dense shade. The lower proportion of roots makes the grasses more susceptible to soil dryness, a major problem when in competition with tree roots under tree canopies. Management is therefore a key issue for keeping good turf under shade whether on sport arenas or in the home garden.

This series by John will be continured in the next issue

Leucaena in Paraguay

Raymond J. Jones, formerly CSIRO pasture researcher

In the last Tropical Grasslands Newsletter, Ian Partridge described his experience in Paraguay. In this contribution, I will describe my impressions of what I saw of Leucaena in a brief but very intensive visit, mainly to the central Chaco region.

I was invited by the project INTTAS (Iniciativa para la Investigación y Transferencia de Tecnología Agraria Sostenible), sponsored by the AVINA foundation and operating in the Chaco. They specifically wanted me to introduce the DHP-degrading bacterium *Synergistes jonesii* to the cattle there.

My hosts in the Chaco were Dr Albrecht Glatzle and Mr Antero Cabrerra (Nikki to his friends). We were accompanied on the visits for most of the trip by an old acquaintance Ing Maria Goldfab who is an ecologist working in Argentina.

Bugs beside me

I carried the precious 'bugs', in rumen fluid from steers at Lansdown Research Station, in a stainless steel thermos flask inside an insulated container in the cabin with me—with permission from Qantas. Other documentation from quarantine authorities in both countries enabled the suspicious-looking container to pass through the numerous scanners at the various airports; it was never like this before September 11!

Young leucaena with Gatton panic in the Chaco

I arrived at 5 p.m. and had to get the 'bugs' into the prepared fistulated steers as soon as possible. It took 6 hours to travel from Asuncion to the Central Chaco Experiment Station—on a road full of potholes, in pouring rain and with spectacular lightning. We arrived after midnight and the two fistulated steers, that had been fed on leucaena, were infused with the 'bugs' by 1 a.m.

Leucaena in the Chaco

During the 'gestation period for the bug', I visited blocks of leucaena around the town of Filadelfia. This part of the Chaco is a flat flood plain originally covered with mainly Acacia and *Prosopis* scrub. Many tropical legumes are well adapted to the sandy soils but fewer on the heavier textured soils, with leucaena the most promising. One of the most noticeable features of the area was the number of small and large ant nests. Fortunately, we do not have these leaf-cutting ants in Australia. Some are specialist grass cutters and others prefer non-grasses, including leucaena. The once-popular star grass (*Cynodon* spp.) is rarely planted now because the ants favour it. Ant control is vital to the successful establishment of leucaena in many areas.

2 metres high in 6 months

I was most impressed with the healthy growth of leucaena on these farms. As in Australia, weed control is vital for rapid establishment and, where this had been achieved, some of the growth was spectacular, with 6-month old leucaena over 2 metres tall. Cunningham has been the most widely planted cultivar to date but stands of Tarramba were being kept for seed production. Many of the newly established stands over 2 m tall would have benefited from an earlier grazing or topping to stimulate basal branching.

Peter Larsen had visited Paraguay and some farmers from Paraguay had visited Australia, so they had grasped the basics of leucaena establishment and most leucaena has been sown in double rows spaced 5-8 m apart.

However, on one farm, leucaena had been established well by simply oversowing, just as we would with Seca stylo. However, I can foresee problems with management as *Acacia* and *Prosopis* seedling were re-establishing among the leucaena and are not easy to spot; also there is a potential for a thicket to form, and slashing to control height will entail slashing the whole paddock with a strong risk of puncturing the tractor's tyres. With a thick cover cattle can become very 'flighty', and are not easy to see. As this can encourage theft, farmers do not like planting leucaena near boundaries. Planting in rows so that cattle can be spotted from the homestead or existing roads would therefore be the preferred option.

Nodulation

Most stands, except some in lower lying areas that had experienced some waterlogging, had dark green leaves suggesting that they were effectively nodulated. It was claimed that they nodulate naturally, possibly from strain of *Rhizobium* from the original vegetation of leguminous shrubs and trees. However, we could find no nodules on seedlings, even those adjacent to old leucaena.

Mimosine toxicity

Animal production was being measured at only a few sites. Their experience was similar to ours in the 1970s and early '80s in tropical Australia. Steers grew rapidly at about 1 kg/day for about 2-3 months, then stopped or lost weight and animals lost hair. New animals on the same pasture, or animals that had grazed grass pastures, and were returned to the leucaena pastures, continued to gain at about 1 kg/day. No thyroid measurements had been made, but I suspect that animals from leucaena pastures would have had higher thyroid weights than the normal 20-25 g and their serum thyroxine levels would have been low. Clearly the animals do not have DHP-degrading bacteria. Freeze-dried *Synergistes jonesii* (strain 78-1), from Dr Milton Allison in USA, was introduced to fistulated cattle a few years ago and established in them. However, they were unable to transfer it to cattle on other farms, and obviously the fistulated cattle on the research station have not retained it. The rumen fluid I brought from steers at the CSIRO Lansdown Research Station took 8-9 days (compared with the usual 5 days) to completely destroy the toxin, but at least it is working in these steers. It will be interesting to follow the fate of the bacteria when transferred to cattle on the various properties. The impact on animal production should be very large and it will remove the fear about the toxicity that can hinder acceptability.

Leucaena's potential

Currently there are about 2,000 ha sown to leucaena, but there could be some 10 million ha suitable in the central Chaco region (700-900 mm MAR). It will be of great value for intensifying beef and dairy production on the relatively small farms (200-300 ha) on the Mennonite colonies and especially on the even smaller farms of the Paraguayans who receive a regular income from milk production. Milk prices are low due to competition from Argentina where the peso has been devalued, and profitability is further reduced by the high cost of concentrate feed. In the dry season, milk quality (protein level) can be so low that the local cheese factories reject it. This is disastrous result for the small farmers could be lessened or prevented with leucaena. Not only does it provide feed for the cattle but also the larger stems provide valuable fuel for cooking.

Steers in broadcast leucaena in the Chaco

No psyllids seen

I saw no evidence of any psyllid in either the western or eastern areas of Paraguay. This may well be because the critical area of leucaena plantings has not yet been reached, but leucaena has been around for a long time, particularly in the wetter eastern area of Paraguay. I did however see a caterpillar avidly feeding on the leaves and young shoots of a rapidly growing stand of cv. Cunningham, and the farmer said he had to spray to protect the new stand from heavy damage. It has been identified as a *Spodoptera* spp. Let us hope that this is just an isolated incident.

An interesting development in this area was the use, by cattlemen, of the skills of crop farmers to establish their leucaena. One excellent stand had been established by direct drilling into an old pasture of star grass. The star grass had been killed with 8 l/ha of 'Roundup' and the inter row areas sown to soybeans (see photo). Contracting such skills should reduce the risk of establishment failures on predominantly cattle properties.

Pasture enthusiasm

I thoroughly enjoyed my stay in Paraguay. It reminded me of the enthusiasm we experienced in the early days of pasture improvement using 'new' legumes and grasses in Queensland. It was good to see many of these species performing well in the different environment of the Paraguayan Chaco. For leucaena, there certainly seems to be a bright future.

Signs of salinity in the dry Chaco — dead trees around Captain's Lagoon (left) and as the white foreground and white line at the base of this roadside cutting (right).

Chaco salinity?

Dryland salinity could be a problem in parts of the Chaco as water tables rise after the trees and shrubs have been cleared.

Salt layers can be seen in places in roadside excavations and after a very wet year, the vegetation has been killed by salinity around some lagoons in the Central Chaco. These outbreaks have not recovered with return to the normal conditions.

Very good clearing guidelines have been proposed (or legislated for) in the development of new ranches. Proportions of land that can be cleared have been designated and salt-prone depressions delineated on property plans using aerial and satellite images.

But on the smaller family blocks, much land has been cleared for decades.

Could planting deep-rooted leucaena be used to prevent further rising in the water table?

This approach is being proposed by the Leucaena growers network in Central Queensland—see the article on Leucaena for control of salinity and water quality in the Fitzroy Catchment on the next page.

Salinity saviour?

Dry land salinity is caused when rising water tables bring salt from depth to the soil surface. Water tables rise because a change in vegetation reduces the water loss through transpiration.

The Fitzroy River catchment (142,600 sq. km) was once timbered with a mix of brigalow (*Acacia harpophylla*), softwood scrubs and eucalypt woodlands. In the 1960s and 1970s, the fertile clay and duplex soils associated with brigalow and softwood scrubs were extensively cleared for pasture development and for cropping. Under cropping, good topsoil has bean lost through erosion, and soil fertility has run down. An additional problem is that these soils have high salt levels at depth, and the loss of deep-rooted trees and scrubs means that dryland salinity could increase widely.

Replacing legume trees

How about replacing the lost original legume trees with other legume trees? The shallow-rooted brigalow with little productive value could be replaced with leucaena—deep-rooted, salt-tolerant and the most productive tropical cattle forage.

Leucaena's deep roots and high water-use can prevent seepage of water through salt zones into ground water in recharge areas. Vigorous leucaena-grass pastures reduce runoff and erosion thus helping to restore water quality. The grasses also improve soil organic matter through their fine root system while the legume improves soil fertility through high nitrogen-fixation.

The leucaena-grass pastures offer one of the most productive animal production systems in the world, capable of cattle liveweight gains of 250-300 kg/head a year.

Major development proposal

The Leucaena Growers Network (with the guidance of Dr Max Shelton) is promoting a leucaena project for the control of salinity and water quality in the Fitzroy catchment; it is targeting areas that are marginal for annual cropping and that have degraded grass pastures in high salinity-hazard zones. The regional target is 250,000 hectares of leucaena over 7 years and would involve some 800 growers planting an average 100 ha per year.

Large-scale leucaena planting could save salinity

Overall this proposal would:

- improve catchment hydrology by promoting large-scale revegetation with the deep-rooted tree, with associated grass ground cover, in key recharge areas.
- reduce deep drainage (affecting salinisation) and run-off (affecting water quality)
- promote a technology that is realistic, underpinned by sound scientific understanding and favourable cost-benefit analysis.
- promote an integrated approach that will simultaneously strengthen economic, social and environmental outcomes.
- add value to the principle economic activity of the region (beef production).

"Leucaena—the most highly sustainable and productive grazing system for Northern Australia."

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