Tropical Grassland Society of Australia Inc.

TGS news & views

about pasture development in the tropics and subtropics

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Looking forward from 40 years of TGS

Our symposium to celebrate 40 years of the Tropical Grassland Society of Australia Inc.

The symposium to celebrate the 40th Anniversary of the Tropical Grassland Society on September was a great success. About 75 members and visitors turned up at St Lucia to hear 4 stimulating speakers on a great range of subjects. Besides this appreciation of facets of grassland science, it was a great opportunity to rekindle old friendships and acquaintances. It was great to see such stalwarts as Don Cameron and Rob Harrison again although one younger 'thing' commented that the meeting was more suitable for getting retirement advice than a partner.

This aging population of pasture scientists reflects the decline in government interest in the management and improvement of our pastoral lands.

Thanks to David Orr and Ben Mullen for their efforts in organising the day. The only sour note arouse from those who advised us that they were coming but did not stay to eat their ordered BBQ. The Society was lumbered with a bill for over $300 for food ordered but not eaten.

The past and the future

Our speakers were Emeritus Professor Ross Humphreys of The University of Queensland, Dr Frank Smith of CSIRO Plant Industries, John Childs of the Meat and Livestock Australia with Dr Bill Burrows of the DPI to present the Harry Stobbs Memorial lecture.

Ross Humphreys started with a short history of the Society (see pages 2 and 3) before re-presenting his excellent talk from the International Grassland Congress in Brasil.

Frank told us about some techniques in genetic biology and its possible appliction to tropical pastures, while John took us outside our more blinkered views to the real world of politics and pastures.

Bill Burrows' lecture was a critique of woodland grazing ecology research in Queensland, well substantiated and with 'Brahman' being the only 'b' word!

All the talks will be presented in full in the December issue of the Tropical Grasslands Journal but are summarised here.

AGM
5th December
at Redland Res Station, Cleveland
See page 15

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Society News

Our Internet address

www.tropicalgrasslands.asn.au

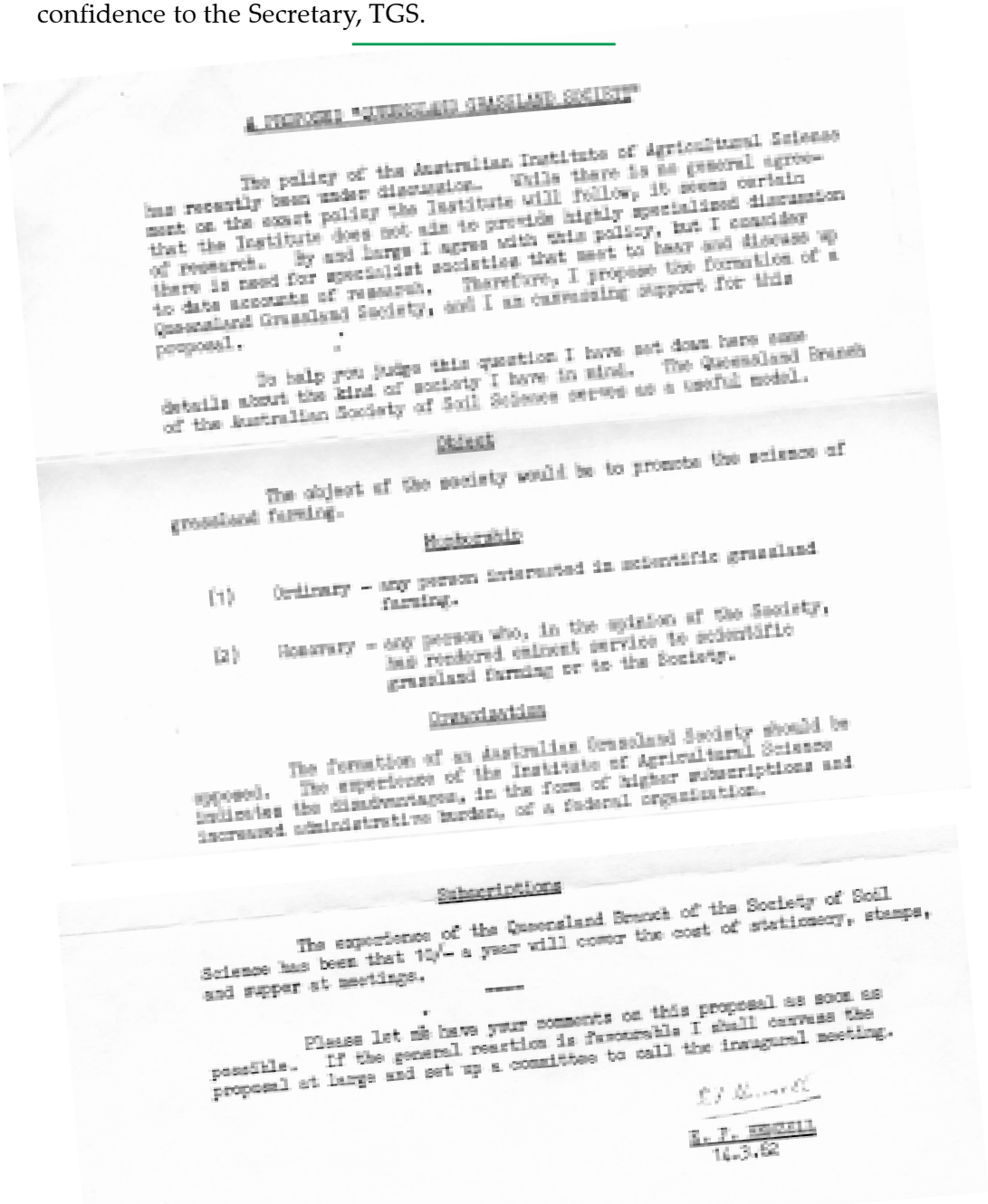
See it for membership forms, an updated book list and pdf versions of the newsletter.

Our Society e-mail address is tgs@csiro.au

Our constitution calls for 6 Executive Meetings each year. At the AGM, we will be seeking to reduce this from one meeting every 2 months to one every 3 months.

New Fellows?

Now is the time to forward any nominations for Fellows of the Tropical Grassland Society for excellent service to the Society, to grassland research, extension or commercialisation in Australia or overseas. Please send your nomination in confidence to the Secretary, TGS.



A PROPOSED "QUEENSLAND GRASSLAND SOCIETY"

The policy of the Australian Institute of Agricultural Science has recently been under discussion. While there is no general agreement on the exact policy the Institute will follow, it seems certain that the Institute does not aim to provide highly specialised discussion of research. By and large I agree with this policy, but I consider there is need for specialist societies that meet to hear and discuss up to date accounts of research. Therefore, I propose the formation of a Queensland Grassland Society, and I am canvassing support for this proposal.

To help you judge this question I have set down here some details about the kind of society I have in mind. The Queensland Branch of the Australian Society of Soil Science serves as a useful model.

Object

The object of the society would be to promote the science of grassland farming.

Membership

(1) Ordinary - any person interested in scientific grassland farming.

(2) Honorary - any person who, in the opinion of the Society, has rendered eminent service to scientific grassland farming or to the Society.

Organisation

The formation of an Australian Grassland Society should be opposed. The experience of the Institute of Agricultural Science implies the disadvantages, in the form of higher subscriptions and increased administrative burden, of a federal organisation.

Subscriptions

The experience of the Queensland Branch of the Society of Soil Science has been that 10/- a year will cover the cost of stationery, stamps, and supper at meetings.

Please let me have your comments on this proposal as soon as possible. If the general reaction is favourable I shall canvass the proposal at large and set up a committee to call the inaugural meeting.

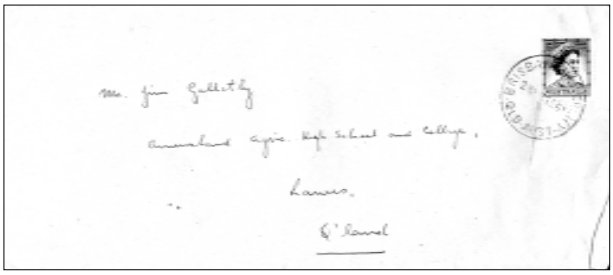
E. T. Henzell
14.3.62

The original letter from Ted Henzell dated 14.3.62 asking for expressions of interest. The suggested sub was 10 shillings. Thanks to David Lloyd for providing this bit of memorabilia.

In the beginning

E.F. (Ted) Henzell founded the Tropical Grassland Society when , on 5th September 1962, he invited Wilf Bryan, Ray Jones, Jim Pulsford and myself to form with him an inaugural committee. The object of the Society was ' to promote the science of grassland farming', but additionally it was designed to foster an inclusiveness amongst the proponents of grassland improvement.

The Queensland Pasture Liaison Committee had fallen into desuetude after 1956. CSIRO promotes *Sorghum almum* as the only tropical grass which approached perennial rye grass in its nutritive value, whilst the Queensland Department of Agriculture and Stock banned it as a prohibited plant, since it could not reliably distinguish its seed from Johnson grass (*S. hapalense*). It was also desirable to bring together people working in the service industries—seeds, fertiliser, chemicals—interested in promoting better grasslands, as well as educationalists and landholders.



The proposal on the opposite page was mailed to Jim Galletly at the Queensland Agric. High School and College, now the Gatton Campus of the University of Queensland in 1962. Postage was 5d (now = 5c).

Trevor (later Professor) Clifford spoke to the initial meeting about his experiences with pastures in West Africa, an augury of the international interest the Society always fostered. Pulsford's presidential address on 4th November 1963, 'The Dependence of Man', dealt with topics from Anthropology, demography, resource management and agricultural history. The second presidential address of Bryan reviewed 'Progress in Pasture Improvement in northern Australia and future prospects', whilst in 1965, D.E. (Doug) Poulsen, a farmer and seed producer, spoke on 'Science in farming'.

In these years, there was tremendous enthusiasm for the improvement of tropical grasslands and an excitement about the new science. The number of graduates working on pastures in the Department of Agriculture and Stock increased from 10 in 1956 to 38 in 1964, whilst in that year the CSIRO Division of Tropical Pastures had 39 scientists on its staff. The Society soon had several hundred members as landholder flocked to its meetings. Each year there were usually a 2-day filed meeting, two filed days and a sedentary lecture. Local chapters of the Society emerged in the Burnett, and in central and northern Queensland. In those years, we were less aware of the inherently low nutritive value of tropical grasses and of the problems of legume persistence related to pests, disease, grazing pressure and plant replacement.

The Society always had a strong focus on information exchange. Initially we produced proceedings of meetings and newsletters, and John Tothill started the journal 'Tropical Grasslands', now in tis 36th volume. This has become a central repository of tropical grassland science, both for Australia and for many overseas countries.

In recent years, investment by government and by industry in grassland research and extension has been wound back, but the pace of grassland improvement has continued unabated, encouraged by the Society's programmes and the knowledge base which has been developed.

L.R. Humphreys

Ross Humphreys gets together with Jim Teitzel, a leader in wet tropics pastures.

The future with biotechnology

Frank Smith, CSIRO Plant Industry

Genetic biology starts with the understanding that proteins are the major determinants of plant metabolism, growth and development and that these proteins are manufactured from the basic genetic material of DNA.

But a large suite of these proteins used for essential processes such as photosynthesis, respiration, development and reproduction are common across different plant species. Differences in adaptation arise from how these genes are regulated, and many of regulatory signals are derived from environmental stimuli.

Manipulating and marking

The two major streams of biotechnology that are relevant to the modification and improvement of tropical pasture species are directly manipulating genes and molecular markers. Direct manipulation can involve altering the expression of existing genes or inserting new ones. Molecular marking is used to assist traditional plant breeding programs by identifying useful genes.

Have the promises arrived?

Most of the wide-ranging promises to agriculture of the optimistic 1980s and 90s have not yet been delivered. Instead attention has been moved to a smaller number of very major crops such as cotton and soybeans. This is because of the large investments that have to be made in biotechnology by commercial organisations that have to recoup and turn a profit on these investments.

However, what has developed is a greater understanding of the basic biology of plant metabolic processes, growth and development and this understanding should benefit all plant scientists, including those working with tropical pastures.

Model plant systems used in this work have concentrated on a small number of plants. In the dicots, the most important species has been the small laboratory-scale *Arabidopsis*. It has been favoured by its small size and short generation interval in the same way as Drosophila fruit fly is used in animal genetics. Other dicots have included the legumes *Medicago trunculata* and *Lotus japonica*; in the monocots, rice and maize are the favourites.

An example of understanding plant processes involves the uptake of nutrients to understand how phosphate utilisation can be improved in pasture plants. When plant roots take up phosphate, it is absorbed by P transporters. These P transporters can be promoted to access forms of phosphorus that are not normally available to plants.

It is estimated that about $9 billion worth of fertiliser P remains in Australian soils, much of it under pastures. Much (20-50%) of this soil organic P is as phytate and unavailable to plants. Phytate can be broken down by the phytase enzyme found in the fungus *Aspergillus*. Adding this phytase gene from *Aspergillus* to the *Arabidopsis* means that this can make use of previously unavailable P. Although the gene is present throughout the plant, it is expressed only in the right tissue (the root epidermal cells with root hairs) and only when the plant requires more phosphorus. This effect has also been demonstrated in medics in the lab.

Mapping gene markers

Genomics and proteomics are helping us to understand the complex networks that regulate the expression of thousands of genes. Genomic sequencing makes it easier to discover new genes and libraries of plant sequences are now available; libraries of mutant genes make it possible to work out the functions of specific genes.

What future for tropical pastures?

Three levels of barrier may inhibit any direct application of biotechnology to tropical pastures.

First there are the technical problems in transforming pastures species and then regenerating them.

This is dwarfed by the social, environmental and political concerns that the general publica have about genetically modified organisms especially with the difficulty in containing species under pastoral conditions.

The immediate concern is money. Most of genetic modification is undertaken by large corporations that own much of the enabling technology. These corporations are interested only in high-value plant species that dominate international agriculture.

However, there may well be spin-offs. The similarity in basic genes means that other research can be immediately useful by marking genes.

Direct genetic manipulation is progressing so fast that there is a virtual explosion of knowledge about model species and major cropping species and this could be transferred to other (pasture) species. But this knowledge resides in the white-coated and narrowly focussed gene specialist; what is needed are broader-based grassland scientists who understand the technologies and who can spot potential applications as they arise.

Where to for tropical pasture improvement

— silver bullet, weed or …?

John Childs
Resource Management MLA Northern Beef Program

Tropical pasture improvement has an impressive record of achievement. It has been a major focus for development of the beef industry in the more productive grazing areas of northern Australia. It has been a major basis for research programs designed to increase beef production and productivity. It has provided a number of researchers with enviable reputations.

Despite the ups and downs of Townsville Lucerne, and the difficulties associated with any technology that does not achieve its claimed potential, tropical pasture improvement has by and large delivered considerable benefits and gains to the northern beef industry.

Current situation

Given its achievements, it is surprising that there has been a continuing decline in tropical improved pasture research and development. Staffing and programs have been decimated. There is even debate over the maintenance of genetic stocks and the provision of services providing genetic material. This change is typified in the ongoing renaming of the CSIRO Division of Tropical Pasture Production to Tropical Agriculture to Sustainable Ecosystems.

The tropical pasture improvement technology did not always live up to the claims made for it. And it did have unintended ecological consequences, particularly in relation to the water grasses (Para grass, Hymenachne), and those grasses significantly increasing the fire fuel load (Gamba and Buffel). The relative significance of the contribution from improved pastures was also influenced by the increasing availability of alternative cattle production technologies such as infusion of Bos indicus and provision of feed supplements.

While the relative influence and impact of improved tropical pastures has declined, the perception that it has nothing to offer and is a dying technology is probably somewhat premature. Provided it can meet environmental requirements and provide economic benefits, it may well have a role.

Issues to consider

We need to understand where cattle grazing and pasture improvement fit in the wider landscape ecology context.

There is any increasing emphasis on landscape health as a means of defining the attributes and indicators of healthy use and the basis for assessing and monitoring the health of the landscapes.

The Tropical Savannas CRC has developed a concept of landscape health, which incorporates issues of use and a range of scales.

There are three components to the definition of landscape health.

A healthy landscape:

- Maintains basic functions at all spatial scales including; nutrient cycling, water capture
- maintains viable populations of all native species of plants and animals at appropriate spatial and temporal scales
- reliably meets the long-term needs (material, aesthetic, spiritual) of people with an ongoing interest in the region.

The particular attributes of a healthy landscape differ in relation to use and scale. The attributes will be quite different between landscapes used for pastoral production and those used for traditional aboriginal purposes or for conservation. The scales will be influenced by the area and habitat required to maintain healthy populations of native plant and animal species.

Within a broader regional or bioregional context, each separate use cannot meet all the health requirements of the landscape on its own. There needs to be a differentiation of landscape health requirements within a region or bioregion based on use, provided that all environmental values can be met at the region or bioregional scale.

Within the context of a grazing land use, significant issues need to be considered. The terms of trade, or relationship between prices received and the cost of inputs, has continued to decline. As for other commodities traded on a world basis, this trend will continue. To counteract this, producers need to continually increase their economic efficiency of production. In addition the requirements for economic viability have changed over time. What was once a sufficient property size for economic viability is often now far too small. Economic profitability can only be maintained by a use of appropriate technologies, an increase in scale of operation or by mining the natural resources on which the enterprise depends.

The following sayings are well known. "You can't be green if you're in the red". "If you're not green you'll never get in the black". While both are somewhat true, they represent the dilemma that in many circumstances ecological sustainability and economic viability are not compatible. The work of McIntyre, McIvor and McLeod in SE Qld demonstrated this.

Pasture improvement in context

These pressures for economic viability when economic circumstances are declining, require a consideration of how technology can be utilised to increase productive efficiency while sustaining environmental and natural resource values. Pasture improvement may well have a role.

If pasture improvement is to have a role it needs to meet certain requirements. It must:

- be compatible with ecosystems function and health.
- maintain and enhance nutrient cycling and flows and water dynamics.
- do this within the context of maintaining the ecosystems as a whole.
- be beneficial for the habitat and food chain requirements of biodiversity such as soil biota.

Pasture improvement must impact positively on those industries dependent on it. It must meet certain economic imperatives. At the same time it must not adversely impact on other land uses and their health, including conservation, cropping and aboriginal use.

Pasture improvement must be compatible with native pasture species and ecosystems. Diversity in plant populations is crucially important in maintaining a resilient system, which will respond to adverse impacts and challenges and adapt without outside interference. Diversity is the key to adaptive survival.

There will continue to be an ongoing increase in the intensity of use of natural resources by grazing industries. In achieving this, the industry will need to meet certain requirements in maintaining landscape health and be subject to monitoring and scrutiny by the wider community. This will apply to both on property and off-site impacts and landscapes.

Pasture improvement potentially can make a major contribution. It will need to actually deliver sustainable increases in productivity while maintaining landscape health within a regional context.

Resource management priorities

The northern beef industry has defined the following major issues in natural resource management, which it believes it must address to maintain industry viability and resource sustainability at property, regional and industry scales.

- Grazing management, including increased utilization, resource protection and production efficiency
- Water quality, based on property and downstream.
- Tree-shrub management, including the use of fire.
- Monitoring of landscape health and trend conditions.
- Weeds and their management, based native and exotic.
- Greenhouse gas emissions by the grazing industry.
- Dryland salinity.
- Environmental Best Practice Management, benchmarks and adoption of appropriate packages.

The MLA Northern Beef Program through its Sustainable Northern Beef NRM Strategy is addressing these issues. Projects being conducted within this Strategy will contribute technologies and guidelines of assistance to the grazing industry in maintaining sustainability and economic viability.

New rules for improved pastures

Given the context of landscape health and what is required to achieve it, the economic and efficiency pressures to intensify natural resource use, and the context of pasture management and improved pasture development, there are a number of guidelines or rules which will apply to improving tropical pastures.

There must be no harmful off-site effects, such as sediment movement, habitat degradation or weed establishment and expansion.

Use of Genetically Modified Organisms will be very, very difficult if not impossible, because of the potential for contamination of the environment.

Pasture improvement must not be a threatening process, as defined in the Environmental Conservation & Biodiversity Protection Act.

The introduction of pasture improvement should result in minimal soil disturbance to avoid increasing soil acidity and dryland salinity.

There will be major restrictions on tree clearing, both areas cleared and the layout of clearing and remnants, which will influence pasture improvement within the landscape.

Monitoring landscape health will enhance the effective management and use of the pastures and may well be a requirement for meeting performance targets in environmental management.

The way forward

Given the situations faced by the grazing industry, there is a logical and increasing role for the use of pasture improvement technologies in northern Australia. This will be based on the best options for sustainable production while meeting certain landscape health and environmental requirements.

This will involve, first and foremost, not breaking the rules and guidelines described above. Systems will need to be put in place to ensure best management practice is implemented and performance of these systems monitored and evaluated.

Tropical pasture improvement will need to be implemented within the concept of a healthy landscape and its design. This will be of benefit to the sustainability and performance of the grazing industry.

The best management practices determined by experiential knowledge and science will need to be implemented if the production and economic efficiencies from introducing the technology are to be achieved while meeting sustainability requirements. Processes of benchmarking and monitoring will need to be readily usable by graziers and provide meaningful information for management.

The Leucaena Network provides a sound model on the process and requirements of managing pasture improvement with and introduced species. They have developed a code of practice and are addressing production efficiency and resource management requirements.

Tropical pasture improvement can not deliver a silver bullet; the technology and context are too complicated for that and sound and intelligent management will always be required.

Pasture improvement need not be the cause of environmental weed invasions, if properly and appropriately implemented, with well considered criteria and processes for monitoring, management and containment.

Tropical pasture improvement can be an important component in increasing production from natural resources, maintaining economic viability while contributing to the maintenance of healthy and responsive landscapes.

Churchill Fellowships

About 20 Churchill Overseas Travel Grants are awarded to Queenslanders every year. They provide travel funds and allowances for people in any walk of life to go overseas for up to c.8-10 weeks to obtain further expertise in their chosen field that they could not get in Australia. I stress that they are not scholarships just for tertiary graduates, you can be in business, artistic or creative field of any type, education, health, science, tourism, agriculture or whatever. You must have some track record in what you do and show in your application how you yourself will benefit, how your community or Australia might benefit, and have the capacity to disseminate your newly gained information.

Why put this in our Tropical Grassland newsletter? Well the Churchill Committee also allocates several linked scholarships of special interest to agriculturists & TGS members. The scholarships are Gluyas (tropical pastoral industry- Qld applicants only!), Swire Group (1 for woody weed management, 1 for cotton industry), Jack Green (dairy industry), Sheeran (an aspect of bread manufacture), and Rotary (development of rural community-based employment opportunities). There were no applicants for the woody weed scholarship from Queensland in the past 2 years.

TGS members might come across other people in their community who could benefit from a Churchill scholarship, e.g graziers or their spouses (new technologies, management tools, ecotourism, etc), people in agri-business, artists or entrepreneurs creating new agriculture products, uses or artefacts that benefit the economic and social wellbeing of rural areas, and of course scientist professionals and technicians. Bring the fellowships to their attention.

For more information and application timing (I think 1 January 2003) check the website:- www.churchilltrust.org.au and check Links for information on the additional scholarships.

John Wilson

Practical Abstracts. Continued from page 11

Effects of herbage mass and herbage quality on spatially heterogeneous grazing by cattle in a bahia grass (*Paspalum notatum*) pasture—by Shin-ichiro Ogura, Hitomi Hasegawa and Masahiko Hirata, on pages 172-179.

Herbage quality (protein and digestibility) was high in late spring-early summer when cattle ate more herbage from patches with more growth. But as quality decreased in taller patches later in the year, cattle ate herbage regardless of the growth or ate more from shorter patches. Cattle selected more from patches with taller grass when the pasture was low and became less selective when it was tall. Selecting for patches was modified by their quantity-quality as well as by the average growth over the pasture.

Dynamics in lamina size in a bahia grass (*Paspalum notatum*) pasture under cattle grazing—by M. Hirata and W. Pakiding, on pages 180-192.

Most of the leaf weight (60-90%) on a bahia grass tiller under grazing belonged to the younger age classes. Cattle grazed 15-65% of the mature length of the leaf before and immediately after these were fully expanded. In the next 2 months, a further 25-80% of mature length of the leaf was removed by cattle or litter fall.

Seeing the wood for the trees

- An idiosyncratic view of Queensland woodland studies (1965-2005)

Bill Burrows, DPI, Rockhampton

(Editor's note: For reasons of space, this is a considerably shortened version of Bill's fully-researched paper; references have been omitted. Please read the full paper in the December 2002 issue of the Journal for the full content)

Tree-grass relationships

The competitive interaction between trees and grass in Queensland woodland communities has been developed into ecological theory which helps explain the nexus between trees and grass in this State's pastoral environment. I commend the latest issue of The Rangeland Journal [Vol 24(1) 2002] on 'Sustainable management of Queensland's landscapes' – to anyone interested in our tree-clearing legislation.

From these tree-grass competition curves we can easily derive estimates of potential pasture production and livestock carrying capacity, and also predict future carrying capacity.

Tree-shrub dynamics

Government regulators and conservationists seem reluctant to acknowledge the general negative effect that tree-grass competition has on pastoralism. And that the woodland communities now protected from clearing could in time lose their livestock production capacity due to continued thickening up of tree and shrub populations under grazing - with serious impacts on management of the remaining pasture on the landholding.

We need to know the rate of change in tree/shrub basal area over time. Yet even after 150+ years of pastoralism this subject still arouses considerable debate, despite a wide range of evidence indicating that there has been significant structural change in most woodland communities. Unfortunately I believe that vested interests have clouded perspectives – especially amongst many who see pastoralism as an affront on Queensland's landscape, or amongst those who do not have any comprehension of differing woody plant – pasture responses under livestock grazing.

Ingress of trees and shrubs into rangeland areas grazed by domestic livestock is not a uniquely Queensland or Australian phenomenon. It seems to be a universal consequence of Europeans and their domestic livestock displacing most hunter-gatherer societies.

The recently published Australian Journal of Botany (50(4), 2002) brings together much of the evidence for vegetation change in Australia since European occupation.

It has been a logical step to attempt to better understand the speed and direction of change in our woody plant populations using permanent monitoring plots.

In 1969, we established the first permanent transects in south-west Queensland totalling 64 km in length. In 1980, we extended these as TRAPS (**t**ransect **r**ecording **a**nd **p**rocessing **s**ystem) to cover most of the state's grazed woodland communities - which account for 60 M ha or 1/3 of Queenslands land mass. Some of these recording sites have now been in place for 20 years, and there are about 130 currently positioned.

Monitoring vegetation change

Overall, they provide convincing evidence of a gradual increase in stand basal area and understorey shrub populations, representing a huge unreported C sink present in the grazed eucalypt woodlands.

Other indications of change have been based on analyses of early explorers and anecdotal records. I feel that conservationists see any acknowledgement that most woodland communities were more open at settlement as threatening their push for more stringent tree clearing controls. Indeed the conservation status of Queenslands regional ecosystems has been based on the alleged percent remaining of each R.E. compared with that present in 1788!

Those seeking to deny the reality of past vegetation 'flips' on grazing lands should read the ecological theory developed by Imanuel Noy-Meir, Brian Walker and Mark Westoby, and the 1901 Royal Commission into the Condition of the Crown Tenants in the Western Division of New South Wales. Referring to the Cobar-Byrock district, the report states. "Generally speaking it was originally open box-forest country with currajong and an occasional pine tree upon it. The overstocking of the country, coupled with the rabbits prevented the growth of grass to anything like its former extent and so causes a cessation of bush fires which formerly had occurred periodically. This afforded the noxious scrub a chance of making headway". To-days scrublands of the Cobar-Byrock region are a prominent feature in all contemporary satellite images of Australia.

When I commenced work at Charleville in 1964 Joe Ebersohn explained to me that the reason there was so little grass in the mulga lands was because this country was predominantly grazed by sheep, rather than cattle. European cattle (*Bos taurus*) he went on to explain, had the decency to die before the grass did, whereas sheep did not. This made sense to me, but it was also left unsaid that the presence of mulga guaranteed year-long feed supplies even in the most severe of droughts; while the ubiquitous artesian bore drains ensured stock grazing pressure in this arid area was never effectively reduced.

Many landholders and conservationists have failed to appreciate that the conversion of the northern cattle herd to mostly *Bos indicus* lines since the 1960s, along with the widespread use of dry season supplements, has in many respects paralleled the earlier influence of sheep and mulga feeding on vegetation structure in south western Queensland and north western NSW. While European livestock could traditionally exert no sustained grazing pressure in the monsoon north because of its long 'dry' season, Brahman cattle supported by modern infrastructure and dry season supplements certainly can. This should lead to lower fire incidence in this region.

Satellite imagery has obvious appeal in following vegetation change because of the completeness and frequency of its coverage. Likewise radar and laser altimetry have a rapidly evolving place in monitoring woodland resources, but aerial photo interpretation has been an underrated medium for assessment of vegetation dynamics. It has been used to quantify an average basal area increment of 21% in uncleared eucalypt woodland remnants in Central Queensland from 1952–1991.

Using soil carbon isotopes

Probably the most under-utilised tool available for quantifying and interpreting vegetation change in the tropics-subtropics is the analysis of stable soil carbon isotopes. This technique is based on the different carbon isotope signatures displayed by plants exhibiting the C_3 and C_4 photosynthetic pathway (or broadleaf plants and tropical grasses respectively).

Our exploratory analyses of $d^{13}C$ profiles under many woodland communities in Queensland strongly suggest that there have been widespread increases in woody plant presence in our grazing lands. And herein lies a conservation dilemma. For example, there is compelling evidence that Cypress pine has extended its range and thickened up considerably since European settlement and that gidgee is expanding into Mitchell grasslands. Does this mean that we should be clearing these invaded areas of such trees to protect their Regional Ecosystem status? And what implications does a detailed $d^{13}C$ study of soil carbon beneath remnant eucalypt woodlands have for the present tree clearing debate, if it is concluded that these woodlands were definitely more open when domestic livestock grazing commenced?

Why has it changed?

Intensified grazing and change in fire regimes are the most likely triggers for increase in woody plant cover and biomass. Above average rainfall may favour growth and establishment of woody plants but also promote competition from strong grass growth and increase the likelihood of subsequent fire. However, domestic livestock grazing may alter the balance towards successful establishment of woody plants and competitive advantage for existing trees and shrubs by reducing grass cover and fine fuel for fire, and by management for active fire suppression.

Effectsof fire

There has been increasing acknowledgement that aboriginal burning practices had a major role in determining the structure of Australian vegetation prior to the arrival of Europeans and their domestic (and feral) livestock. Indeed as early as 1911 Karl Domin concluded that in all parts of Queensland the open 'forests' are not a natural association, but a secondary one changed through the influence of the aboriginal inhabitants, mostly by means of bush fires. Yet, for all the attention the topic of fire management has received, the planned use of fire to manage vegetation structure or tree-grass balance in our grazing lands is rare; and the timing, frequency and intensity of planned burns to achieve vegetation management objectives are little understood. Paul Back's studies into the use of fire to control native woody weeds, especially wattles and currant bush are notable exceptions.

Yet there can be no denying that we do need to take pause in the extent of land clearing in Queensland. I concluded that intensification of livestock raising should be on already deforested lands – and that governments and the world community should now reduce the rates of deforestation in the interests of conserving our remaining forest resources. These comments were made in an international context.

For Queensland there are two very important provisos.

Firstly, landholders should be allowed to at **least maintain** conserved areas on their properties at current basal areas. And this does not necessarily endorse selective thinning as the optimum pathway to reach this objective since, in the absence of commercial timber harvest, selective thinning to maintain pasture production does not pay (Box 1).

Secondly, the landholder should not be further constrained on what pasture species he can sow on his land, provided these are not declared plants. For example, there is no doubt that both buffel grass and leucaena have made important contributions to livestock production and economic development in this State. Yet, there is a growing conservation chorus who see such economically important introduced species as an affront to their sensibilities. As a citizen and biologist I am totally supportive of the need for government to ensure that the biological diversity of this nation is maintained. But as a taxpayer I'm also of the view that government should pay to 'protect' areas of conservation interest, just as the farmer has to protect his crops and livestock from pests and diseases. All of the load should not be placed on the farmer and graziers' head.

Biodiversity, salinity and greenhouse

Biodiversity loss and salinity hazard have increasingly become the call to arms of all those seeking to constrain responsible development of this State's woodland resources – matching the alacrity with which Australia's greenhouse emissions problems were largely sheeted home to tree clearing rather than fossil

fuel use. Of course, as in most arguments there are genuine concerns, but scientific mores are largely ignored in favour of emotive outbursts on TV or other media. I believe that professional scientists who allow themselves to be associated with exaggerated claims (presumably on the basis that the end justifies the means) need to take pause, and revisit some childhood fables about the consequences of stretching the truth.

So at various times in the media we learn that the eastern Warrego is under salinisation threat (on deep red earths in a subtropical 450 mm MAR belt?); that Australia has the worst per capita greenhouse emissions in the world (it helps if you count tree clearing effects, while only including growth on 6% of the 60 M ha of Queensland's forests and grazed woodlands that are not being cleared); and we acquaint death of any individual organism as biodiversity loss, even if the population integrity of the organism is far from being threatened.

What of the future?

I believe that we would all benefit by concentrating in the future on educating, rather than further regulating rural landholders. And foremost amongst these lessons would be the need for more thought to be given by those clearing land to pre-clearing planning and post clearing management, rather than the clearing operation itself. Implicit in such planning, is the avoidance of the critical biodiversity loss and salinisation problems before they occur, and promotion of management which aims to minimise regrowth and overstocking after clearing.

There are many unanswered research questions concerning the management of our vast woodland resource. But the role of fire and the impact of changed fire regimes on the structure of our major woodland systems deserves most attention. Why did fire resistant species such as eucalypts apparently formed open woodland communities when fire was more frequent. Is it because their seedlings are not fire-resistant. We need to focus on the frequency of establishment events and subsequent fire frequency which would be necessary to prevent the seedlings reaching a fire-resistant stage of development.

Speakers Frank Smith and Bill Burrows discuss the future—or the past.

Too late for fire?

Simply encouraging fire into our current woodlands will do little to change the structure of the existing stands, it might limit future population increases but it will not prevent the basal area of existing stands from increasing and so further reduce pasture production. And while domestic livestock remain consumers of woodland pastures, fine fuel loads can never equate with their potential under Aboriginal management.

Woodland carbon sink

I have recently pointed out above-ground growth in eucalypt woodlands represents a significant greenhouse sink. When coupled with apparent huge overestimates of soil carbon loss on forest conversion to native pasture (30% of 70t/ha in the top 30 cm assumed, *cf*. <10% of 40t/ha in the top 30 cm more likely) it is highly probable that Australia's Land Use Change and Forestry sector was a net sink and not a net source of emissions in 1990. This would have serious implications for Australia as it would then make this country ineligible to avail itself of Article 3.7 of the Kyoto Protocol under the United Nations Framework Convention on Climate Change. To avoid this awkward problem I understand that Australia has now obtained approval from Kyoto signatories to allow it to calculate its targets in the first commitment period, assuming that this country had met Article 3.7 conditions. This is nothing less than a scientific confidence trick, which should seriously concern all professional scientists in this country.

One potential benefit of the on-going post-Kyoto negotiations is that grazing land management is now recognised as an acceptable 'additional activity' under Article 3.4 of the Protocol. This has the potential to make the huge sink identified in the grazed woodlands available for credit under the Protocol and also for trading as 'carbon offsets' if Australia ratifies. While any such sink has to be measured under net – net rules, we have shown that the above-ground biomass increment (t dry matter/ha/yr) increases as stand basal area increases across the likely values of measurement. I would therefore like to optimistically conclude that carbon offsets will become available for the credit of Queensland landholders at some future date. Should this occur it could provide a financial incentive for landholders to retain trees on their land and so meet wider community objectives in a more equitable manner than is current – without the need for regulation or the oft promised mirage of compensation payments for pasture development foregone.

Practical Abstracts

from Tropical Grasslands Journal, Volume 36, No. 3 (September 2002)

Impact of fire on bellyache bush (*Jatropha gossypiifolia*) plant mortality and seedling recruitment —by Faiz Bebawi and Shane Campbell, on pages 129-137.

The exotic weed, bellyache bush, predominantly infests river frontages and creek banks, but can spread into open pastures and rocky areas in the dry tropics of north Queensland. Dense stands of bellyache bush prevent the growth of pasture grasses, obscure fence lines, interfere with mustering, compete with and displace native vegetation and reduce profitability of cattle enterprises . Bellyache bush plants proved highly susceptible to fire, especially when young. Two annual burns may be needed before 90%of the original population is killed. However, fire may stimulate high emergence of bellyache bush seedlings which may soon reinfest the area. If fire is used as a management tool, further action such as a third annual burn must be taken to control the mass of seedlings which will inevitably emerge.

(Editor's note: bellyache bush infestations occur also in the Northern Territory and in Indonesia)

Effects of soil fertility and fertiliser nitrogen rate on seed yield and seed quality of *Paspalum atratum* in Thailand—by Chaisang Phaikaew, Ganda Nakamanee, S. Intarit, Sayan Tudsri, Y. Ishii, H. Numaguchi and E. Tsuzuki, on pages 138-149.

Nitrogen fertilisation up to 400 kg N/ha did not affect seed yield in the establishment year on either fertile clay or infertile sand, with high seed yield at all sites. In the second year, yields peaked at 200 kg N/ha on the clays but higher rates caused lodging. On the infertile soils, yields peaked at 250 kg N but decreased without any N. Seed germination and purity increased with increasing N. he optimum N rate for seed production was about 200 kg on good soils but at least 250 kg on infertile sands, applied at planting or early and then before flowering. High levels of N are needed in the second year.

Effects of time of final closing cut on seed yield and seed quality of *Paspalum atratum* in Thailand —by Chaisang Phaekaew, S. Intarit, Sayan Tudsri, E. Tsuzuki, H. Numaguchi and Y. Ishii, on pages 150-158.

Time of final closing cut has a critical effect on seed production. Mid-June closing produced 1300 kg/ha, followed by closing in mid-May and mid-April. Closing in mid-July yield only about a third of that in mid-June while closure in mid-August gave no seed. Severe lodging of the grass occurred with closure in April, may and June. The final date should be before July 1.

Experiences with greenleaf desmodium (*Desmodium intortum*) seed production in Bhutan —by Walter Roden, S. Tshering, J. Doryi, C. Samdup and P. Dangchuk, on pages 159-164.

Greenleaf desmodium is a promising fodder legume for the subtropical Himalayan especially across Bhutan. However, it could not be promoted because seed was not available internationally or locally. Seed production technologies and locations for greeenleaf were evaluated and silverleaf included. Seed yields ranged from 0-230 kg/ha for greenleaf and up to 780 for silverleaf with no effect of flowering in greenleaf across between altitudes of 640 to 1590 m. Greenleaf yield was increased with trellising on bamboo sticks and no cutting after April. Row spacing could be up to 150 cm. Recommendations for commercial seed production of greenleaf desmodium were released in the Himalayan foothills.

Effect of temperature on seedling growth characteristics of *Panicum maximum*—by Sayan Tudsri, H. Matsuoka and K. Kobashi, on pages 165-171.

In a controlled environment room, growth and development of 5 cultivars of guinea grass were severely reduced at the lowest temperatue (25/15 C) but responded up to 30/20 C. Natsukaze was best under low temperatures, a fact confirmed in the field. Natsukaze can be grown as a special purpose pasture during the dry cool season if soil moisture is adequate.

Continued on page 7 ...

Letters to the Editor

Eradicate brigalow regrowth?

Treatment of woody regrowth in cleared acacia scrublands using blade ploughs has been booming with buoyant cattle prices. Eradication of the regrowing woody species once and for all, and rejuvenation of the introduced grass pasture is the aim of this costly operation.

Referring to cleared brigalow in extensive grazing situations where the dominant regrowth is brigalow, I question the goal of eradicating the brigalow for ever, an end to which the blade plough is highly effective. In the absence of persistent nitrogen-fixing legumes, of deep rooted nutrient recyclers and salinity control, productivity decline of virtually pure grass swards is well observed and recorded, as well as salinity build-up in some situations.

In fact, I hear it often stated that brigalow is the most effective legume to achieve all this (not forgetting leucaena in its niche), but the philosophy to achieve maximum eradication with mechanical treatment still prevails. Why? Because of the fearful cost of treatment, brigalow is not eaten by cattle, there is a decline in pasture productivity as brigalow suckers grow in competition, and mustering difficulties arise as the suckers become higher than the cattle, and then it is time to retreat. But treatment of regrowth produces a renovation effect far superior to the renovation of a tired grass sward, and renovation designed to encourage brigalow regrowth should arrest fertility decline at some equilibrium point. Strategic burning to reduce sucker competition with grass can extend the time until treatment is need, but I believe spelling a pasture to allow grass build-up to obtain a good burn is false economy.

Are there survey or research figures that support my contentions? If the cost of mechanical treatment was reduced, maybe routine renovation to encourage and maintain brigalow regrowth could be a management strategy for the future. This approach should appease the conservation lobby.

I have recently seen a heavy duty disk plough developed specifically to treat woody regrowth, and is the inspiration for this letter. Developed from reforestation technology, it is up to the job and can be pulled by wheeled tractors fitted with logging tyres in most situation at higher speeds requiring less power than blade ploughs. Opened right out and set a shallow depth, it can control and renovate regrown brigalow while fostering regrowth at much lower cost. Or it can be closed up, sunk in deep, and power increased to embark on a programme of eradication.

I have directed this argument at regrown brigalow areas because brigalow is a legume with some nitrogen-fixing capacity. Maybe this philosophy has application in any areas of woody regrowth or incursion. Cost and ultimate benefit are the keys.

Tony Wetherell
Amamoor, Queensland

Tony suggests that heavy-duty ploughing is a cheaper and more effective way of handling light brigalow regrowth and renovating pasture than blade ploughing.

Roadside leucaena, get rid of it

It is most encouraging to see the actions taken by the Leucaena Growers Association to prevent leucaena escaping from commercial sowings and becoming an environmental weed in adjacent areas. It is also encouraging that growers recognise the threat posed by plants that have escaped and that they have initiated ways of dealing with this. This could go a long way to meeting the concerns about the potential environmental impact of leucaena.

However, there is still a problem in that I would guess that many of the people from these environmental groups live in Brisbane and larger cities or towns and will not be familiar with the good things happening with leucaena in Central Queensland. So they, quite reasonably, will draw on examples from the areas and the main roads they are familiar with to show the weed potential of leucaena.

Unfortunately, there are many examples of where leucaena is showing signs of becoming an important weed in such areas. Recently I drove from Prosperpine to Brisbane and although not widespread, occasional patches of leucaena were very obvious. There are also bad examples of weed leucaena, some of which are of the Peru/ Cunningham type, around Brisbane. For example, there are scattered but conspicuous trees along the Western Freeway between Moggill Road and the Toowong roundabout. If these are allowed to thicken up it would be hard to image a more visible and higher profile spot to demonstrate that the sale and use of leucaena should be banned. I have even encountered a few bushes when working along a small creek at the back of my place in Brisbane suburbia with a local "bush-care" group. (Although one of these trees was smothered and almost killed by *Neonotonia wightii* I do not recommend this as an option for leucaena control – there is no doubt that glycine can be an environmental menace!).

These highly visible infestations provide easy ammunition for anyone trying to bring about restrictions or bans on the use of leucaena and can be readily used to show proof of the need to do this. It is also highly unlikely that the advent of bruchid beetles will prevent all future seed set and spread and so fix the problem for us.

What can be done about this? Provided the will and dollars could be found it would be relatively easy to kill out the established bushes, but how do you get these two ingredients? With the various sources of environmental funding that are available it may even be more difficult to find the commitment than the funds. However, a bigger problem is that the regular monitoring to get rid of young plants arising from the seed bank, before they in turn set seed, would require a long-term commitment. Unfortunately, some data suggest that hard seed of leucaena may take longer to break down than hard seed of other commercial forage legumes (*Tropical Grasslands*, 2001, volume 35, page 218). It is not too unrealistic to assume that it could take 10 years to get eliminate a leucaena seed bank in the sub-tropics.

Another source of concern is the inadequate control of leucaena in a few of the locations where it was planted as part of a trial or demonstration. In these instances, the obligation to for eliminating the invasion should rest with the organization concerned once any problems have been brought to their attention. However doing this is made more difficult by the inevitable changeover of staff or disposal of properties/research stations and consequent loss of interest in or information about old trial plantings.. But such areas are not the main problem which is - how do you take action on the vast majority of unwanted but highly visible patches of leucaena that are spreading along roadsides and where these source of these patches will never be known ?

Dick Jones
Kenmore

"The most highly sustainable and productive grazing system for Northern Australia."

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"Promoting the responsible development of Leucaena as a productive and sustainable ecosystem to build stronger rural communities."

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The increasing use of leucaena for fattening cattle in central and northern Queensland is quite an exciting development. It is an environmentally friendly way to fatten cattle, it extends the normal fattening period because it harvests moisture and it fixes nitrogen in the soil; this becomes available to associated grasses. leucaena also seems to reduce wind speed on the soil surface which makes the moisture go further.

Within the Peart brothers operation, we first trailed leucaena twelve years ago and have been impressed by weight gains of between one and two kg/head/day, and also the productivity per hectare. Over the ensuing years, we have increased the area under leucaena to 3000 acres.

We are now in the process of putting 28,000 acres of brigalow country in Arcadia Valley under cell grazing. This will be a fattening operation and our experience suggests that we will need about one third of the country under leucaena to facilitate the finishing of the cattle.

The productivity of the leucaena would suggest that more country should be planted to it but that introduces management problems as in peak growing times the crop has to be heavily stocked to prevent it getting above the cattle. Also leucaena likes the heavier, higher (frost-free) area and doesn't like the lighter silt fan areas.

Leucaena is not easy to establish and we are still experimenting because we have had failures. Farmers are much better at getting it established than cattlemen. The seedling is weak, and crusting after rain can prevent emergence. But there are ways of breaking the soil surface to let the seedling through. A good profile of moisture in the soil is essential to get the plant started; once it is 50 cm high, it is tough and can stand a setback. We control the buffel grass competition with Spinaker, and keep inter-row cultivation to a minimum. Early grazing promotes stooling and is a good idea.

In the longer term, new and better varieties will become available but that may be sometime away, and it is too good a plant in its present form to ignore. There are also varieties that may be good for timber production , If enough of the brigalow is replaced with a productive, deep-rooted legume it must be good insurance against any potential salting.

Wally Peart

Top - frosted leucaena shoots
bottom - frost line in standing leucaeana

Below - establishing leucaena the right way

AGM and turf walk

The 39th th Annual General Meeting will be held on Thursday, 5th December 2002 at the Redlands Queensland Department of Primary Industries Research Station in Cleveland.

Tropical Grassland Society of Australia Inc.

39th Annual General Meeting on
5th December 2002 at 11.00 a.m.
Redlands QDPI Research Station

10.30 a.m. Arrival and Smoko
11.00 a.m. Annual General Meeting
Agenda

1. Apologies
2. Minutes of the 38th AGM
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 Redlands Research Station (price to be determined around $10–12)

2.00 p.m. Field tour of turf grasses and management on the station. For those interested, we will then drive to the sea front at Raby Bay to see trial plots of amenity turf grasses selected for high wear and high salinity conditions.

Don Loch and Ben Mullen inspect some of the dozens of different turf grasses at Redlands Research Station.

If you thought all turf was just blue couch or Tiff Dwarf, think again. Come and see the great array of species and lines. These include *Bothriochloa, Cynodon, Dactyloctenium, Digitaria, Eremochloa, Panicum, Paspalum, Pennisetum, Stenotaphrum and Zoysia.* They are being grown by Dr Don Loch to define their characters so that, in the future, selections can be based on a local environment and conditions. Uses range from tidy bowling greens to low-mowing council parks.

How to get there

Firstly, note that the Redlands Research Station is in Cleveland, NOT Redland Bay!

From Brisbane, the most direct route seems to be the Old Cleveland Road, then down Finucane Rd. The Research Station turnoff is on the right side on a (nasty) bend just past the newly developed Redland Heritage Garden. (Both are signboarded).

From the west, try turning off the Ipswich Motorway to Granard, then head Mt Gravatt-Capalaba. From the south, the Beenleigh-Redland Bay road, then Cleveland Redland Bay Rd.

Sorry country people, but there are roads everywhere in the big smoke, so please bring a road map.

Please let Ian Partridge (see front page for contact details) or Ben Mullen know if you are going to the AGM, to the lunch or to the afternoon field walk. This is for numbers for seating at the AGM and for catering purposes. (By the end of Novmber, please.)

If not delivered, please return to
Tropical Grassland Society Inc.
306 Carmody Road
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TGS news & views

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