Tropical Grassland Society of Australia Inc.

TGS news & views

about pasture development in the tropics and subtropics

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Biofuels

What might they mean for pastures?

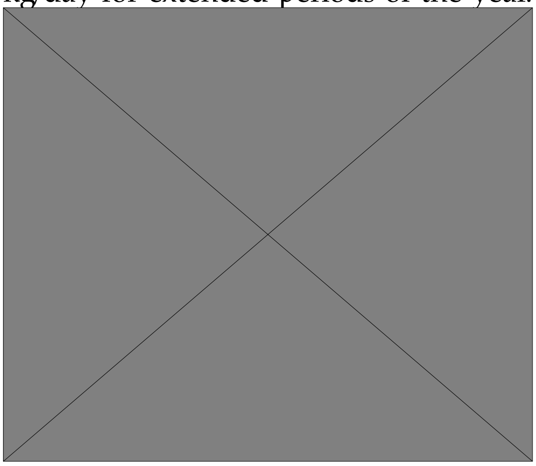
Can some perennial stemmy grasses produce large amounts of cellulose biomass on less fertile soils?

If ethanol manufacture from grains competes with the intensive animal industries and pushes the price of grain too high, can leucaena become the economically viable and biologically more efficient substitute for fattening ruminants?

CSIRO and the Rural Industries Research and Development Corporation have published an excellent and readable summary of 'Biofuels in Australia – an overview of issues and prospects' and this can be found on the Internet at http://www.rirdc.gov.au/reports/EFM/BiofuelsSummaryWEB_READY.pdf

First generation biofuels

The summary describes feedstocks for producing biofuels such as ethanol and biodiesel. Most of us have heard about the 'First generation' feedstocks such as grains and sugarcane for ethanol, and used cooking oils and canola for biodiesel. But some of these, especially grains, compete with their use as human and animal feeds and this shortage has already raised the price of feed and ultimately the price of grain-fed beef to consumers. Should competition for grains restrict their use to biologically-efficient feed converters —the monogastric pigs and poultry? The cost of grain-feeding ruminants at the nutritionally inefficient late stage of their lives might offer livestock producers the opportunity to finish their animals off good improved grass-legume pastures. The obvious choice are leucaena-grass pastures that can put on over 1.3 kg/day for extended periods of the year.



Second generation feedstocks

The future may see the development of 2nd generation biofuels (or 1st and 2nd generation electricity) using lignocellulosics such as crop residues, forestry products and grasses – both annuals and perennials to produce cellulosic ethanol. Even further in the future, the reports mentions biorefineries for a range of high-value biobased products, with energy co-products. It mentions the use of new grasses such as Switchgrass.

Switchgrass (*Panicum virgatum*) is a warm-season perennial grass found in the central North American tallgrass prairie. It can grow to three metres tall in a year,

continued on page 4

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Society News

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

The Pasture Picker is running again. The database was not searching for a couple of weeks in March when Microsoft changed their requirements and these changes were not enabled in Pasture Picker at the time. My thanks to Greg Pinington who keeps us going when things fall over, as they have again in August when I have lost ftp access to the site!

The journal archive is now more up-to-date; the latest volume available on the web site is now Volume 39 for 2005. There should always be an 18-month delay before the new issues are accessible so that our members get the science before the general public.

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Date Claimer for AGM and Field Day

AGM on 23rd November in Brisbane; field trip on 24th in the Darling Downs

The AGM and field day will be held at the end of November. This year we have decided to split the AGM from the field day because it has often resulted in a too tight schedule and many interested in the practicalities of pastures don't necessarily want to attend the AGM.

The AGM will be held in Brisbane on Friday 23rd November at CSIRO on the 1st floor of the Queensland Bioprecinct at 306 Carmody Road, St Lucia at 3 pm. We are planning to finish with a BBQ at the Staff Room.

The field tour will be on the next day, Saturday 24th November and will visit two enterprises on the western Downs. As you can imagine, with the continuing dry conditions and severe winter there are few good pastures to be seen at present but we might get some rain over the next few months.

The first port of call will be the NAPCO Wainui feedlot at Bowenville (about 45 minutes from Toowoomba).

Wainui was purchased by NAPCO in 1985 and subsequently has been developed into one of Australia's most modern and efficient feedlots with the operation managed by Geoff Cornford.

The Wainui property covers 4500 ha and includes an irrigation and dry-land farm on which silage and grain is produced for feedlot use.

The feedlot fattens some 7200 cattle at any one time and turns off each year about 30,000 cattle from the NAPCO northern breeding properties.

The feedlot and farm is certified to the ISO 140001 specifications for Environmental Management Systems.

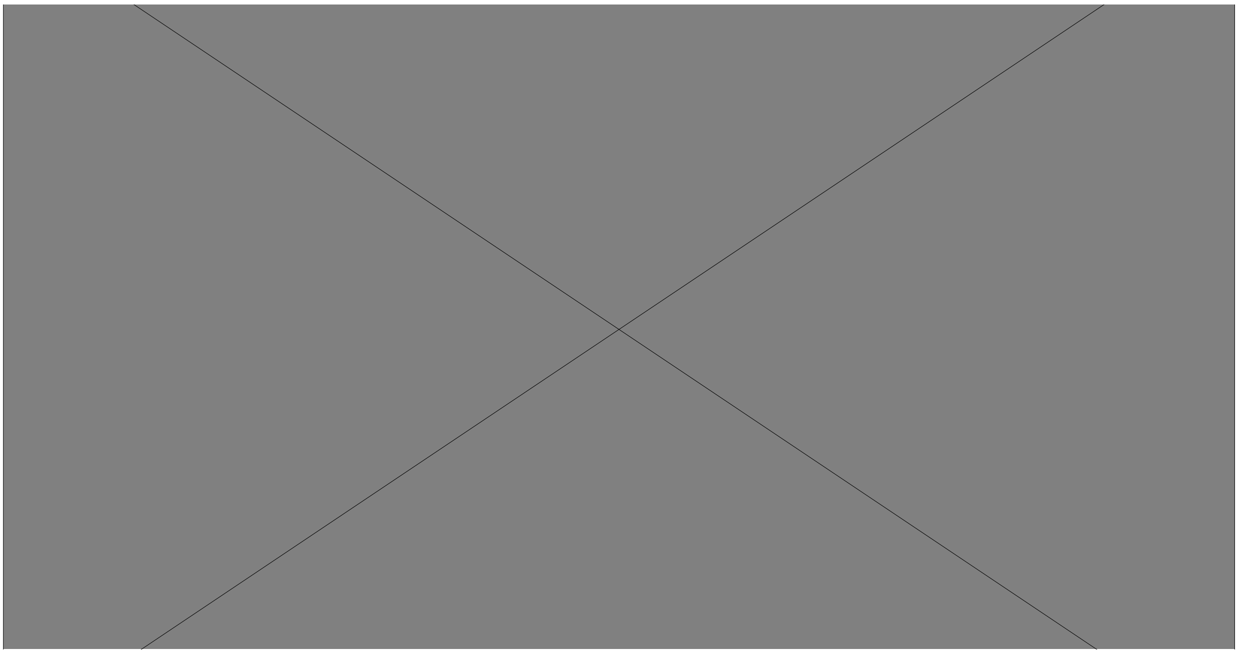
The second enterprise is a further 30 minutes drive westward to Dalby Downs near Kaimkillenbun.

Jonathon Schmidt is manager of Dalby Downs, a conglomerate of some six properties. Dalby Downs has an Angus stud, a small 200-head feed lot, for which it grows silage, and has planted some 300 ha of leucaena.

The return trip to Toowoomba will take about one and a half hours.

The current plan is for easterners to meet at the DPI&F complex (Client Service Centre carpark) at 203 Tor Street in Toowoomba around 9:30 on the Saturday morning or for westerners to go direct to the NAPCO Wainui feedlot near Bowenville for 10:30.

This is a date claimer; more details will be posted on our TGS website closer to the dates (check on www.tropicalgrasslands.asn.au).



Cattle on the western Downs

Biofuels ... continued from page 1

As a fast growing energy crop, switchgrass yields over 11,000 litres of ethanol per hectare, more than three times the yield of corn. As an energy crop, it grows fast, turning solar energy into chemical energy— cellulose—that can be liquified, gasified, or burned directly. It also reaches deep into the soil for water, using the water it finds very efficiently while preventing soil erosion and sequestering lots of carbon in the root system. A USA pasture scientist has estimated that switchgrass fields had an average of about seventeen tonnes more soil carbon per hectare than nearby corn and wheat fields. Greater soil carbon under switchgrass was observed at all depths, but it was most pronounced at 30 to 100 centimetres—a depth in the soil profile where switchgrass has more root biomass than corn or wheat.

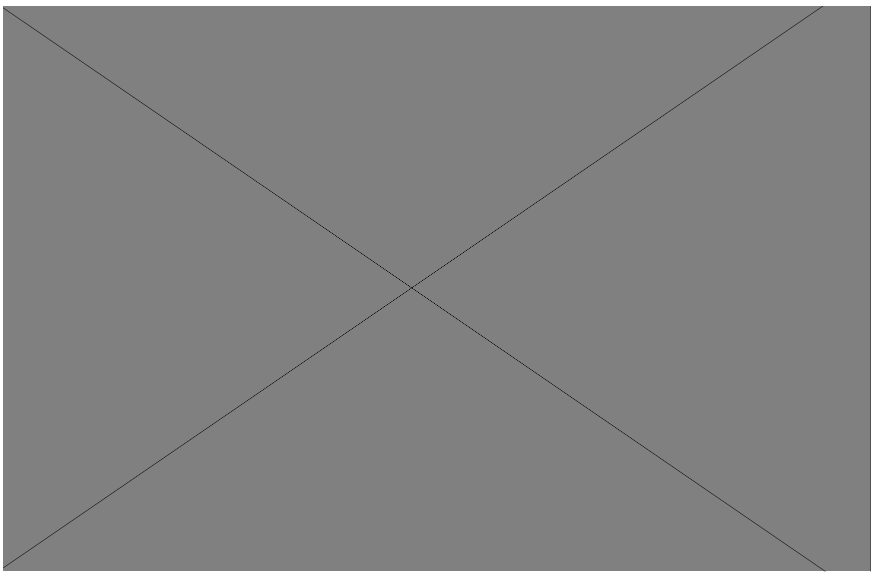
Besides being used as a source of heat, these lignocellulosic feedstocks can be processed with enzymes and fermented. The challenge for scientists is in unlocking the sugars held in switchgrass so that it can be converted into cellulosic ethanol.

In some ways, we could be turning energy production back 100 years. One century ago, farms produced the biomass that provided the motive power for the towns and country through horse-drawn equipment and transport.

As a candidate for biofuel — especially ethanol fuel — production, switchgrass can produce 13–25 tonnes of biomass per hectare on less fertile soils. As it can produce up to 380 litres of ethanol per tonne of biomass, switchgrass has the potential to produce 11,000 litres of ethanol per hectare, compared to 7500 litres for sugar-cane and 4500 litres for corn. However, there is debate on the viability of switchgrass, and all lignocellulosic feedstocks, as efficient energy sources as their low energy density usually means that it is uneconomical to cart them more than 50 km to the biofuel plant.

Another tall perennial grass, or reed, that has been evaluated in Europe as a bioenergy crop during the past 5–10 years is *Miscanthus.* (My experience with *Miscanthus* is through *M. japonicus* which was the original reedy vegetation on the hills in the dry zones of the islands of Fiji. Its woody stems are used as thatch on the traditional village houses). Most of the miscanthus cultivars proposed as a commercial crop in Europe are sterile hybrids (*Miscanthus x giganteus*) which originated in Japan. *Miscanthus* can be harvested every year with a sugarcane harvester and can be grown in cool and presumably warm climates. Like other bioenergy crops, the harvested stems of miscanthus may be used as fuel for production of heat and electric power, or for conversion to other useful products such as ethanol.

Interesting, tree crops listed in the review as having high production include *Jatropha*. *Jatropha gossipiifolia* is known as belly-ache bush in northern Australia and is an invasive weed especially around Charters Towers.



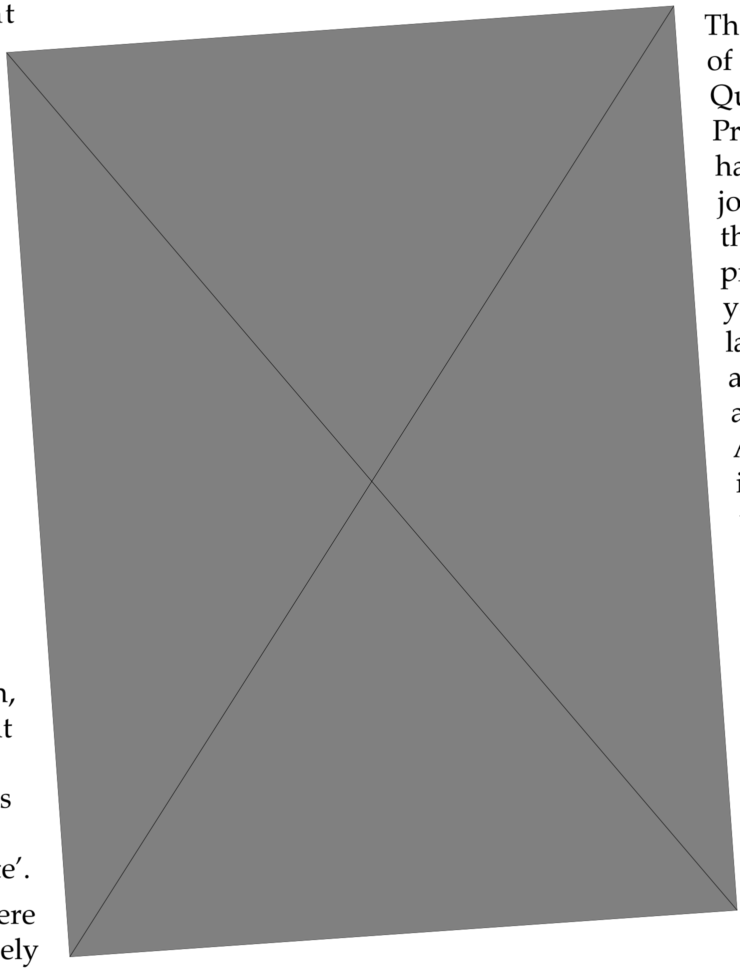
Bellyache bush (Jatropha gossipiifolia) on the Indonesian island of Sulawesi —– biofuel stock?

Pasture plant identification book available again

Pasture Plants of Southern Inland Queensland is available again.

The DPI book 'Pasture Plants of Southern Inland Queensland' was first printed in 1995, and has been one of the most useful publications for all those involved, or interested, in the management of grazing lands in the region.

Unfortunately, the stocks were sold out a couple of years ago —just at the time when interest in pasture plant identification is booming under the Grazing Land Management workshops.



The original book was put together by a publishing group in the old Department of Natural Resources but no electronic version was archived and no film remained after 12 years. Besides which, the latest print technology no longer uses film but goes 'direct-to-plate'.

The options were to completely reproduce a new edition of the book which would include finding the original photographs of the plants from all the sources or to try the cheaper and faster system of scanning each page of the book and putting the page images back together. Two problems arose with this method. One was that each page has a different background colour and scanning such printed pages generates a moiré effect of patterns. To remove these patterns requires a slight blurring which is going to affect sharpness. The other problem was that each scanned page image has to be enlarged slightly so that the final book can be trimmed to size. But the page numbers in the original were too close to the edge of the page and trimming would have cut off part of the number.

The University of Southern Queensland Printing Services have done a great job to overcome these technical problems and you will find the latest edition almost as good as the original. An addendum in the back lists the botanical name changes.

Copies of this full colour, 270-page book are available through Brian Pastures Research Station for $45 including GST (plus $6 postage).

Phone Joanne Cotter (07 4161 3716) or email (Joanne.Cotter@dpi.qld.gov.au).

Pasture Plants of Southern Inland Queensland is an important resource for the GLM (Grazing Land Management) workshop.

Letter to the Editor

I am a tropical pasture convert. I have recently found your site and I'm finding the info great. I hope the current drought may serve as a catalyst for marginal dry land farmers and native pasture graziers (as I was) to step into improved pastures and better management practices alike. I believe they are the future if many properties want to remain viable both financially and personally.

I definitely don't miss driving tractors for days on end, worrying about weed control every time it rains, panicking when there's a frost, racing to harvest before the oncoming storms and especially growing a big crop only to sell into an oversupplied market at values which have barely changed for some 20 years whilst all our input cost have tripled?

Where the sense in that, when I first planted pasture into wheat paddocks I made more net profit backgrounding on it through the winter-spring than I ever had growing crops and it was a fairly dry year! We recorded 300kg av growth over 330 days on steers in fresh pasture, forage sorghum and native grass mix.

Pastures are something you need to be passionate about as the weather can make establishment hard but it's well worth the persistence. We are currently preparing our remaining forage farming ground to plant leuceana in the spring (Weather permitting)

Keep up the good work, the tide is changing with more and more farmers showing interest.

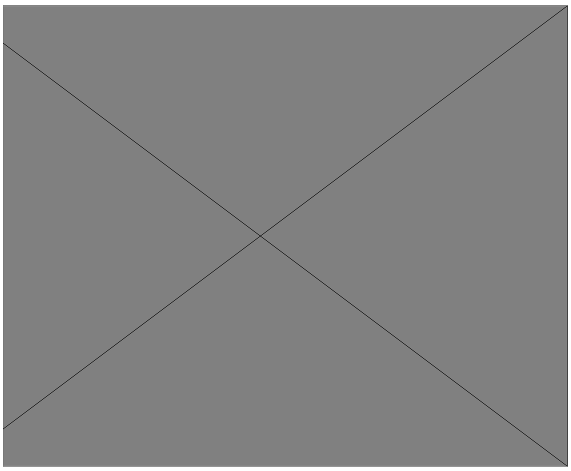
Yours sincerely, Andrew Swan

Best practice in irrigated leucaena

Ernie Young (ernyoung@tpg.com.au)

Irrigated leucaena can produce very high daily weight gains under high stocking rates but the animals also need a continuous supply of roughage. They also need extra energy in their diets to balance the very high protein levels and to prevent wastage of this protein. It is provided as silage or forage with supplemented energy as molasses.

These irrigation growers are taking this feeding system to the next level in pasture-fed production using best management practice to maximise return on their investment.



Leucaena under central pivot irrigation

Best management practice for irrigated leucaena (non-organic) includes:

- drenching at induction to control internal parasites
- inoculation with the leucaena bug before 30 days
- reweighing at 30 days and culling poor feeders
- grazing management – with rotation based on roughage DM residue
- managing for best leucaena leaf production
- providing appropriate energy supplement in summer and winter
- feeding mineral mix
- HGP (feedlot implant)
- scheduling in-crop watering for high water use efficiency
- managing for psyllids when necessary with appropriate withholding periods
- NIRS sampling.

Organic beef from irrigated leucaena

Ernie Young (ernyoung@tpg.com.au)

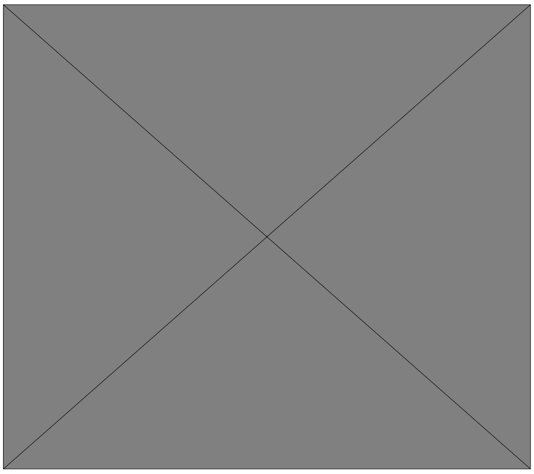
The "Lake Learmont" cattle property was once part of the Alice Springs Pastoral Group. ASPG was an integrated cattle breeding, growing and finishing operation with the business built on the registered certified 'organic beef'.

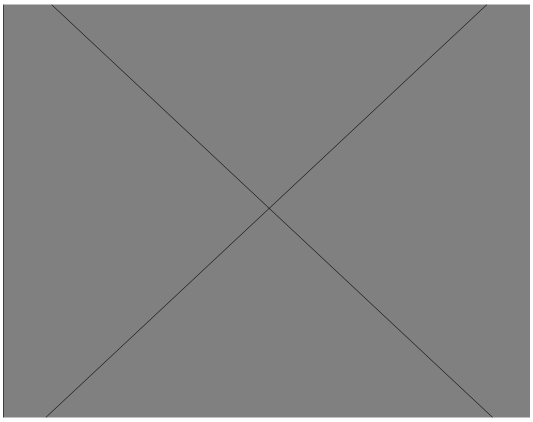
Two years ago, the company was sold up and the properties were sold off separately. 'Lake Learmont' is on the Fitzroy River and the property has two 120 hectare centre pivots irrigators and a large water allocation.

In April this year, the new property owners planted leucaena under the two pivots as they were no strangers to growing and managing leucaena in Central Queensland. The Cunningham was 100–150 mm high within a month.

This property is still certified organic. To my best knowledge, this is a first for the Australian leucaena industry as the beef production from the irrigated leucaena feed will be under the banner of the certified organic beef label.

Phosphorus and sulphur are supplied from the natural products of rock phosphate and Winton gypsum





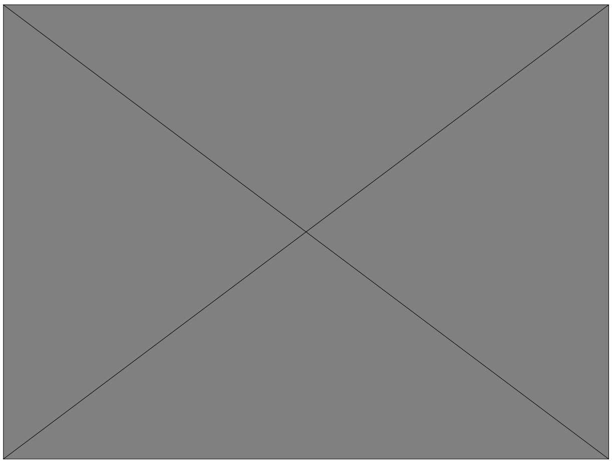
Heavy nodulation in 18-month old leucaena under central pivot irrigation.

2007 frosts – make or break for southern leucaena

The old rule of thumb was that leucaena was best planted to the north of the Warrego highway across the Darling Downs in southern Queensland because of the cold winters to the south.

More recently considerable areas of leucaena are being planted much further south, not necessarily because it grows so well but because it is still better than the alternatives. Some said that the growers of leucaena were lucky because we had not had a cold winter in recent years. This year should be a good test. The soils have been too dry to promote fast establishment and vigorous growth and the frosts have been severe.

Will the small seedlings, planted late because of the poor rains, survive? Will the larger established plants killed by frost to ground level recover when it does start to rain again?



Frosted leucaena with winter herbage weeds

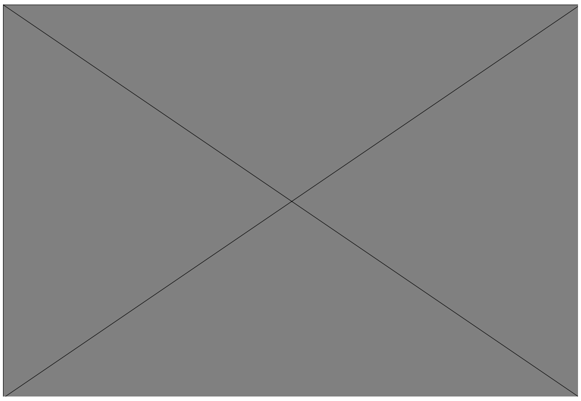
‘Grass pest threatens to spread’

Don’t get your—
Science from the media

The media exists to make money for its shareholders, and public interest in its products is best generated by controversy and hyperbole.

Thus the Courier Mail in early August carried an article titled ‘Grass pest threatens to spread’. The Environmental Reporter went on to say ‘An African grass with the potential to turn vast areas of Queensland eucalypt country into treeless plains is on the verge of taking over large slabs of Queensland. It has been described as so dangerous to the environment that the cane toad fails to even compare.’

This alleged grass pest is Gamba grass (*Andropogon gayanus*). Fortunately yesterdays newspaper lies in the tray of the budgy cage because what absolute rot. Just where in Queensland is it posing the described threat?

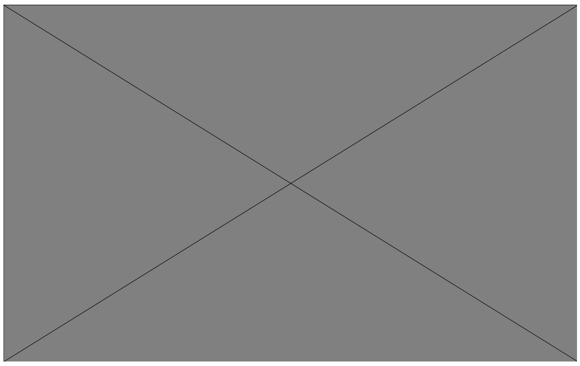


Gamba grass–green and highly palatable

Gamba grass was first introduced into Australia in the 1930s, tested in the 1950s and the cultivar Kent released in 1986. Yes, gamba grass can grow to 4 metres high—if it is not grazed. But the species is highly palatable to stock, and has the ability to remain green well into the dry season. It is thus unlikely to become a dangerous fire hazard in commercial grazed paddocks. Where it is a potential hazard is on ungrazed rural residential blocks around Darwin and maybe along ungrazed and unmown roadsides, but that is the fault of the relevant residents.

Our TGS web site carries the following resumé of the production and environmental benefits of gamba grass:

Gamba grass cv. Kent can produce a big bulk of palatable feed in the monsoonal areas of north Australia. It is useful for planting in holding paddocks where it can feed a large number of cattle for a short time.



Grazed gamba grass in Colombia

Kent was introduced into the Northern Territory for the seasonally dry tropics. These monsoonal areas receive 750-1500 mm of rainfall annually with a dry season of 6-9 months.

Gamba grass will grow on a wide range of soil types, from light sands to clay loams, but not on very heavy clays which become waterlogged.

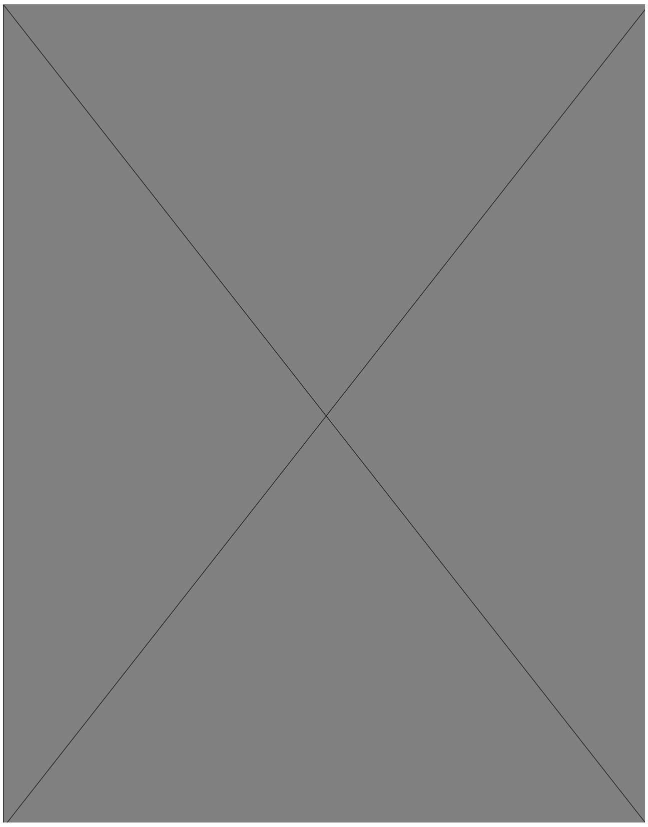
Gamba grass has a special root system with three types of roots: fibrous surface feeders, thick cord-like roots which store starch and anchor the plant, and long vertical roots which can extract soil water from depth well into the dry season.

As a result, Gamba grass comes away well to provide early growth at the start of the wet season, and remains green well into the dry season if grazed. As it is very palatable when green and stock graze it heavily, it is susceptible to overgrazing until well established, after which it can be very persistent. Heavy grazing reduces the clumps to low crowns.

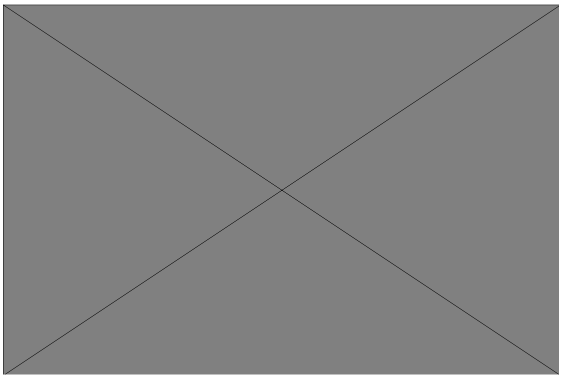
Being a clump species, Gamba grass will combine well with many twining and erect legumes, of which Seca stylo is the best adapted.

Gamba grass must be managed well; if allowed to go to seed in April, the great bulk of 2-3 m-high seed stems become a major fire hazard when it cures during the dry season.

However, because Gamba grass is so well adapted and sets large amounts of seed, it can naturalise. With the very hot fires generated altering the fire regime, it has the potential to become an environmental weed in the Northern Territory.



Tall ungrazed gamba grass in an agricultural department demonstration plot on Sumba Island, Indonesia

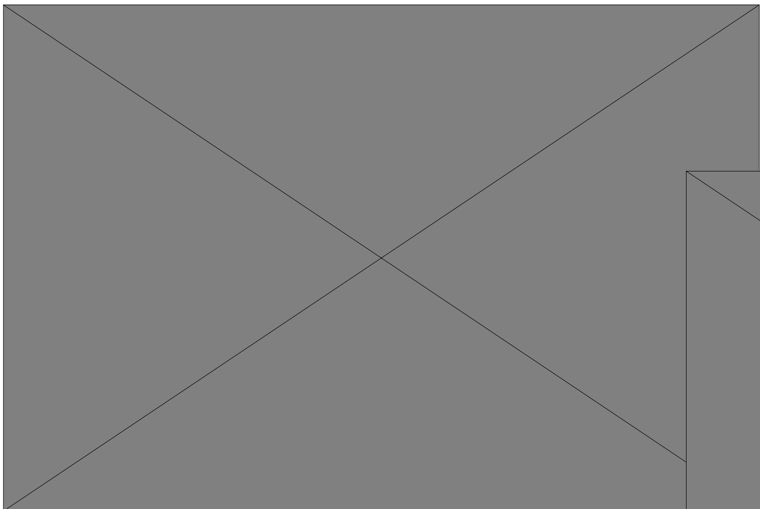


Moderately grazed gamba grass with eucalypt regrowth

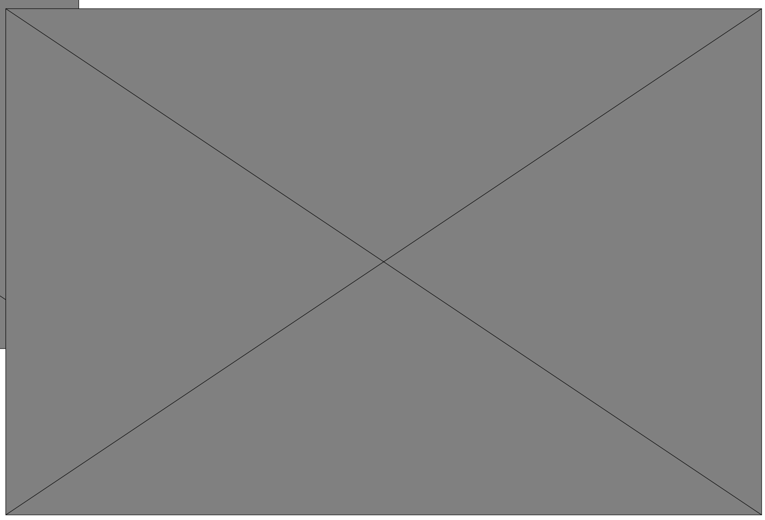
Despite the caveats on this and some other species, I still get criticism from environmentalists for even mentioning them on our web site.

Our policy with herbage species is to provide information, not recommendations. Information allows people to make choices, and they can always follow up with other sources of info. Our Internet site is on the World-Wide Web, and is not limited to narrow restrictions from one section of the community from any particular state.

Photographs by Arthur Cameron, Trevor Hall and CIAT are from the Tropical Forages database. Image of tall grass by IJP.



How will this new planting of leucaena survive the hard frosts of 2007? (Photo taken in mid-June the day after a good frost touched the young leaflets.)



Vast coal deposits lie under the Darling Downs but biofuels are more carbon-friendly. If grain goes to ethanol production, will leucaena supplement feedlots?

Practical Abstracts
from Tropical Grasslands Vol 40 No 4 Dec 2006

A review of current knowledge of the weedy species Themeda quadrivalis (grader grass) — by Anita F. Keir and Wayne D. Vogler in volume 40 pages 193–201.

Grader grass, also known as habana oats, is native to India but was introduced to Australia in the 1930s. It spread rapidly along the east coast of Queensland, as well as into drier inland areas, across the Northern Territory and south into New South Wales.

It is a vigorous annual with limited palatability and can invade native and improved pastures, cropping land and protected parklands. Control options depend on herbicides, grazing management and slashing while it is favoured by overgrazing.

Impact of short-term exclosure from grazing on pasture recovery from drought in six Queensland pasture communities — by David Orr, M.C. Yee and Don Myles, on pages 202–212.

After a prolonged drought, various pastures were rested for periods of between 3 and 12 months. However, the following rainfall was still generally below average (deciles 2–5) except at one site. Short-term resting from grazing does not lead to rapid recovery in pasture condition in the absence of above average rainfall. Even with good rainfall, speargrass needed 12 months rest to recover. Despite the prolonged drought and consequent heavy grazing, the basal area of perennial grass remained moderate, all be it with undesirable species and these responded most to rest.

Shoot and root growth of two tropical grasses, Brachiaria ruziziensis and B. dictyoneura, as influenced by aluminium toxicity and phosphorus deficiency in a sandy loam Oxisol of the eastern plains of Colombia — by K. Haüssler, I.M. Rao, R. Schultzekraft and the later H. Marschner, on pages 213–221.

On these soils, growth of these grasses was less due to phosphorus deficiency or aluminium toxicity than calcium supply. Although Ruzi grass had shorter roots, it still more abundant roots than dictyoneura with similar P or Ca concentrations. This more efficient nutrient uptake may contribute to its rapid establishment.

Phosphate rock biofertiliser with Acidithiobacillus and rhizobia improves nodulation and yield of cowpea (Vigna unguiculata) in greenhouse and field conditions — by N.P. Stamford, C.E.R.S. Santos and S.H.L. Dias, on pages 222–230.

Biosuper is a physical mixture of rock phosphate and sulphur inoculated with a sulphur-eating bacteria. The associated acidity improves the availability of the phosphorus. In the field, biosuper improved nodulation and yield of cowpea. Cowpea rhizobia selected for acid soils were more efficient than native rhizobia in pot trials.

Radiation use and stomatal behaviour of three tropical forage legumes — by Wang Li, Yang Yunfei, Liu Jinxiang and Ma Fang, on pages 231–236.

Desmodium velutinum had a higher net photosynthetic rate and water use efficiency than *Cratylia argentea* and *Flemingia macrophylla*. Water status was important in controlling stomatal behaviour than the direct effect of light at intermediate or intense levels but light was more important at low intensities.

Enhancement of ethylene production by dormant seeds of Stylosanthes humilis induced to germinate in closed environments — by Raimundo Santos Barros and Dimas Mendes Ribeiro, on pages 237–243.

Scarified dormant seeds of Townsville stylo produce ethylene when germinating. Ethylene produced by seed in bulk encourages further germination. Seed dormancy might be broken by germination of other nearby seeds, contributing to flushes of germination under favourable conditions.

Effects of ingestion by cattle and immersion in hot water and acid on the germinability of rain tree (Albizia saman) seeds — by A.O. Jolaosho, B.O. Oduguwa, O.S. Onifade and J.O. Babayemi, on pages 244-253.

Seed germination improved the longer seed was retained in the rumen. The White Fulani breed retain more seeds that the N'dama and Muturu breeds. Hot water treatment increased germination, with the highest result for 50 C for 15 minutes. Acid treatment resulted in 85–100% germination. To introduce rain tree seeds to new areas cattle must be allowed to stay in the area preferably for 96 hours. Alternatively if seeds are not to be introduced, the area must be quarantined for a similar period.

Volume 40, 2007 No. 1

2006 Presidential Address. The changing face of forage systems for subtropical dairying in Australia — by Kevin Lowe, on pages 1–8.

Dairy farming in the subtropics has changed from the early days of small farms grazing paspalum, kikuyu grass and Rhodes grass to a much smaller number of larger farms feeding nitrogen fertilised summer- and winter-growing grasses. Since deregulation in 2000, farm numbers from fallen from around 1700 to fewer than 900 in 6 years. Production per farm has not kept up with this attrition rate and total milk production in the state has fallen. Current work in concentrating on ways to improve the utilisation and water use efficiency of the forage base, along with the development of computer programs to help dairy farmers integrate their resources for optimal efficiency and economic return.

Evaluating temperate species for the subtropics. 1. Annual ryegrasses — by K.F. Lowe, T.M. Bowdler, N.D. Casey, S.A. Lowe, J.A. White and P.M. Pepper, on pages 9–25.

Irrigated ryegrass is the most productive cool season feed for dairy cattle but lack of persistence requires yearly sowing. Yield and rust resistance of commeerical cultivars and breeders' lines of *Lolium multiflorum*, *L. rigidum*, *L x boucheanum* and *L .perenne* have been evaluated over the past 20 years. Barberia and Aristocrat 2 have been the best adapted older cultivars but newer selections from overseas such as Passerel Plus, Crusader, Hulk, Status and Warrior are performing better.

Seed production of two brachiaria hybrid cultivars in north-east Thailand. 1. Method and time of planting — by Michael Hare, P. Tatsapong and K. Saipraset, on pages 26–34.

Seed yields of the hybrids Mulatto (*B. ruziziensis* x *B. brizantha*) and Mulato II (*B. ruziziensis* x *B. decumbens* x *B. brizantha*) were extremely low at around 150 kg/ha even from stands planted by tillers. Planting in the early wet season produced more inflorescences. The low yield of Mulato was attributed to a failure to set seed (probably caused by pollen sterility) or for caryopses to mature. The failure of the stand of Mulatto II was caused by waterlogging because an adjacent trial yielded over 500 kg/ha of seed.

Seed production of two brachiaria hybrid cultivars in north-east Thailand. 2. Closing date defoliation — by Michael Hare, P. Tatsapong and K. Saipraset, on pages 35–42.

The best time for final defoliation of second and third year Mulato seed crops was around early July and early August rather than May or September. For first-year crops, Mulato and Mulato II were best in May–August. The highest seed yield was from Mulato II at 260 kg/ha c.f Mulato at 160 kg/ha. Any time in July is now recommended for the final defoliation of these brachiaria hybrids.

Seed production of two brachiaria hybrid cultivars in north-east Thailand. 3. Harvesting method — by Michael Hare, P. Tatsapong and K. Saipraset, on pages 43–49.

Methods tested ranged from non-destructive manual harvesting to manual ground recovery of fallen seed. Tying nylon net bags over the seed heads at anthesis gave higher seed yield (500 kg/ha for Mulato II) than hand knocking seed from seedheads. Sweeping up fallen seed gave the lowest yield. Hand collecting gave very high seed viability and purity but has obvious commercial difficulties.

The role of grasslands and forests as carbon stores — by L. 't Mannetje,on pages 50–54.

Grasslands can be as important as forests for carbon storage. Grasslands have a positive role in C storage but a negative one in the production of methane from grazing ruminants. Extensively managed grasslands have negligible nitrous oxide and ammonia emissions unlike intensive European pastures. Improved, well managed tropical in Latin America store 220–260 t/ha with grazed grasslands storing more than mown ones. Mature trees in forests with little net growth are about carbon neutral.

Effects of ethephon, salicylic acid and cidef-4 on the yield and quality of guinea grass seed — by T.B.M Joaquán, C. Trejo, A. Hernández-Garay, P.J. Pérez, S de G. García and C.A.R. Quero,– on pages 55–60.

Plant growth regulators were applied before seed head emergence and at the beginning of anthesis to see the effect on seed yield and quality. Ethepon reduced yield whereas salicylic acid and cidef-4 increased it. Seed quality was not affected.

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