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TGS news & views

about pasture development in the tropics and subtropics

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Tree legumes for the sub sub tropics

This issue carries articles on tree legumes for areas outside of our warmer climes.

Tree legumes have a number of advantages over the herbaceous types. They are especially hardy in semi-arid climates, their deep rooting systems allow them to access water from well below the range of grasses (1.5 metres). This means that they can keep growing into dry times while their tall stems may keep their foliage above the level of milder frosts. A 'hidden' benefit of this deep rooting is that their extra extraction of soil water can prevent rising water tables that can bring salt towards the surface in dryland salinity. The two legumes described in this issue are leucaena and tagasaste.

Leucaena

The benefits of leucaena are well know to many of our readers. They include the best quality foliage of any tropical legume and the high leaf production that can give fantastic liveweight gains per animal that rival feedlotting for finishing cattle. Tens of thousands of hectares have been planted on brigalow soils in central Queensland. But the disadvantages of leucaena are the need for good soil fertility, slow establishment, damage by the psyllid insect and poor tolerance of cold conditions.

Traditionally we have said that leucaena is not really suited south of the east-west Warrego Highway in southern Queensland because of the colder and longer winters. But enthusiastic beef producers have established leucaena as far south as Milmerran and now that cold spot, Inglewood. Leucaena is said to grow well at Milmerran because irrigation can get it moving soon after the last frosts of spring, but what at Ingelwood?

The Tropical Grassland Society and Goondiwindi BeefPlan Group held a field day on John and Julie Slack's property, Carisbrooke, about 10 km west of Inglewood on April 13th. (See page 3)

Visitors inspect John's first planting of leucaena.

Tagasaste

Being a native of Mediterranean regions, tagasaste is much more tolerant of cold conditions than leucaena and is grown well south of the subtropics. Tagasaste has never grown well in Queensland. It needs deep soils but these have to be deep sands.

The article on page 4 describes commercial plantings of tagasaste on deep sands in Western Australia.

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Society News

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We are not alone

Obviously the Tropical Grassland Society is not the only grassland organisation but you may not have realised how many other grassland societies there are until you tap into the Web site of the International Grassland Societies at www.grasslands.org.au/

This web site can direct you to the other societies in Oceania (Australasia), North America, Europe and Africa and to dozens of members of the European Grassland Federation.

But we are the only society in the world that specialises in the tropics and with so many international links.

Fellows

No new Fellowships have been awarded for the last couple of years because there have been no nominations. There are many worthies who have provided much to pasture science or to the Society during their working lives.

Please think about who has been a light to others in the pasture field and send your nomination for the year 2005 to the Secretary in an envelope marked 'Fellow Nomination in Confidence'.

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Leucaena field day

Some 120 visitors came along to see and learn about the possibility of growing leucaena in the southern downs.

What did we see? Certainly the leucaena is not as vigorous as that in the more northern central Highlands but it will probably be more productive than any other legume in the long run. What are the other choices? There's lucerne but that will rarely last for more than three or four years under grazing; annual medics may provide good spring feed but good medic years occur mostly when poor summer rainfall leaves little grass competition and is followed by good autumn rainfall. And good medic years can cause problems with bloat.

Green growth killed by hard frost

Leucaena will be defoliated to increasing heights by frost. Although the frosted leaf falls, cattle can lick up some leaf while the rest breaks down to fertilise the grass growing between the leucaena rows. The taller and more cold-tolerant variety of leucaena, Tarramba, should be more suitable than the shorter varieties.

Learn before planting

What are the lessons being learned by John in growing leucaena?

- Learn from someone else's mistakes; it's cheaper.
- Go to a leucaena workshop to learn the best way to plant and manage the stands.
- The establishment years are critical. Good leucaena can last for 20+ years; poor leucaena never seems to recover.
- Young seedlings need all the water available and no competition from weeds or grasses.
- Farmers seem to be more successful growers than graziers! They understand the need for crop-like care in seedbed preparation, planting and weed control. Graziers tend to be more slap-happy at planting.
- Let the seedling grow strongly in the first year. Frost will kill any green growth but the plant will sprout again from the base.
- Small areas of leucaena won't significantly improve production of a herd.
- When planting a small area, allow half for the pests – grasshoppers, wallabies, hares.
- Cattle eating plenty of leucaena need inoculating with the rumen bug.

New regrowth from the stump. Old stem in centre was frosted in the last winter.

Twin row precision planter with side press wheels and covering chains.

Shielded rig for spraying herbicide around twin rows of leucaena.

More leucaena field day pictures on page 6.

Tagasaste in WA —
sustainable feed for the sands

Robert Wilson, Tagasaste Farm
Lancelin, WA

Bob Wilson and tagasaste in early stages of growth.

"A definition of insanity is doing the same thing over and over again, and expecting a different result."

Sand and subclover

When I returned, after studies, to the family farming business in the wheat-belt of WA, I soon found that it would be difficult to work there. But I had no money to buy another farm so I had to turn to a cheap lease on a new land block near the west coast fishing town of Lancelin.

The 1980 ha farm was poor quality sandplain, but it did have more reliable rainfall (650-700 mm) than further inland. During the first ten years, we developed the farm using the traditional methods of multiple cropping to get rid of regrowth, followed by traditional Western Australian pastures based on Wimmera ryegrass and subclover. The crops were supposed to provide the profit to establish the pasture but that didn't happen too often. Also we would often have parts of our paddocks blowing away in early summer as the sheep dug up the sand looking for clover seed. Then we would have to reduce the carrying capacity even through the paddock was covered in burr.

The catalyst

A definition of insanity is doing the same thing over and over again, and expecting a different result.

In 1984, I attended a field day to hear Dr Laurie Snook talk about the benefits of a shrub called Tree Lucerne or Tagasaste (*Chamaecytisus palmensis*) on sandy soils. Tagasaste is an evergreen perennial shrub. Its deep root allows it to use moisture and nutrients deeper in the soil profile than annual pastures.

Sand and tagasaste

We started trials with Tag in 1985 with some seedlings from New South Wales, but soon realized that we would need direct sowing to plant large areas. We modified a little vegetable seeder which was quite successful but then wingless grasshoppers wiped out our 20 ha plantation. The next year we build a custom-made seeder and managed to control the grasshoppers. Over the next five years, we di-

rect planted nearly a thousand hectares using a double row layout (about 2 metres apart) with 6 metres between the double rows.

60,000 ha planted over the decade

In the ten years following 1985, some 60,000 ha of tag were planted on the sandplain areas of WA, with a lot of research on a farm owned by Sir James McCusker at Dandaragan. Originally this research centered around using Tag to fill the autumn feed gap for sheep where it was found that planting as little as 10% of a farm allowed the whole farm stocking rate to be increased by 50-100%.

However, we planted half the farm to tagasaste, and developed a different system to graze Tag on a year-round basis. We began rotationally grazing the tag with large mobs of sheep (1500 into a 20 ha paddock for 3-4 weeks) which gave us control of the tag without the need for mechanical cutting—in some paddocks.

However, in many paddocks the Tag got away and we had to develop our own cutting machinery. This consisted of a 5-foot circular saw blade driven by a hydraulic motor and mounted on the back of our 120 hp tractor. A mean machine, but it did the job.

From wool to beef

During this time, the wool industry virtually died so although we had raised our numbers from 3500 dse to nearly 12,000 dse in the year of the price crash, it wasn't enough to keep us in the industry. After burying 3500 old ewes in a hole, we didn't take much convincing to give cattle a try. Cattle can be left for longer periods without totally defoliating the leaves as sheep do and they can use more of the tree.

The cattle story

Through much trial and error, we have developed a pretty robust system of using the tagasaste. We use a loose system of rotational grazing on a year-round basis. In a trial in 2001, we showed that we could rotate a mob of about 400 head of 300 kg steers through 5 or 6 paddocks and expect to put on about 150 kg per head over the June to November.

Tagasaste and kikuyu grass at Esperance

We participated in another large trial, again funded by MLA and carried out by a cooperative effort by researchers from Agriculture WA, CSIRO and Murdoch University. The aims of this were to investigate how to increase cattle production during summer and autumn and to find out the reason for poor productivity over this time.

Briefly, the study showed that the main reason for low production was due to low intake of Tag most likely because high levels of phenolic compounds make the leaf relatively unpalatable. Cattle grazing Tag had low numbers of rumen bacteria and

5-ft circular saw to cut back tall tagasaste.
(Call that little Critter a knife, Peter?)

Tagasaste at 18 months , after being grazed.

Cattle growing well on tagasaste

urinary allantoin, indicating poor rumen function. It was found that supplementing with relatively low levels of lupin grain could correct this. Feeding 1 kg/hd/day of lupin grain gives weight gains of 0.5 kg/head/day, 2 kg a day gives gains of 0.6 kg and 3 kg/day gives 0.8 kg gain.

We now run a breeding herd of around 350 cows. As well as their calves and about 150 other dry cattle, this year we agisted about 1500 weaner heifers and cows. We will supplement about 1000 of these heifers to background them for a feedlot in March/April.

Our biggest problem is developing stable long-term relationships with inland pastoralists who tend hold onto their animals if there is a sniff of rainfall.

We have persevered and have started with a large processor in WA who is looking to set up year-round supply of animals for their abattoirs.

(This article has been taken from a talk by Bob Wilson at the Australian Farm Business and Management Conference in Orange in early December last year.)

Inglewood leucaena field day continued.

John Slack describes his experiences with planting and grazing leucaena.

One year's growth of leucaena. But does the Sesbania growing on this flooding flat land foretell problems if it ever starts raining heavily again?

Letters to the Editor

Cell grazing

I appreciated the judicious discussion of cell grazing in the issue of last December and wish to add my five cents worth.

Since 1960 I have opposed cell grazing, essentially because presenting aged feed of inferior nutritive value to grazing animals reduces their performance. I envisage that benefits from cell grazing might arise through attaining greater and more even pasture utilization and through the secondary consequences of managers seeing animals more often, attending to water availability and health.

1. There is abundant evidence that heavy trampling causes a packing of soil particles, and a loss of the larger pores in the soil mass increases soil bulk density. The changes in total porosity, pore size distribution and aggregate stability reduce aeration, moisture infiltration, moisture retention and drainage, and these increase runoff and erosion. These changes are more a function of stocking rate rather than of stocking method, although animal concentration on wet soils causes local damage.

2. Manipulation of grazing pressure can be tailored to generate a favoured botanical change. Heavy stock concentration can create a 'gap' in the pasture which facilitates seedling regeneration and plant replacement of a desired species, e.g. lotononis. Heavy grazing during lotononis seedling regeneration reduces shading by companion grasses and the contractile growth of the hypocotyls, which gives a grazing resistant crown, only occurs in full sunlight. Seasonally reduced grazing pressure can be used to increase seed production.

3. We should distinguish normal grazing practice from management directed to rehabilitating run-down pastures, which require rest. What is not often appreciated is that under reasonable stocking rates individual plants get a similar rest under continuous grazing as under most rotational systems.

4.The primary aim of grazing management is to synchronize forage availability with animal needs, in terms which sustain the basic resources of vegetation, soils and animals. Apart from the choice of overall stocking rate, this requires seasonal adjustment of grazing pressure through the timing of mating, the policy of purchase and sale of animals, seasonal fertilizer application, and the provision of special purpose feeds. The variation in seasonal needs of animals, e.g. for advanced pregnancy, can be accommodated by stockpiling of special feeds for this purpose.

5. Graziers will get a better return for their money by investing in elite seeds, fertilizer, brush control and the planting of special purpose forages than by purchasing more fencing materials.

These and other ideas are expounded in two books available from Cambridge University Press: 'Tropical Pasture Utilisation' [1991, now in paperback], and 'The Evolving Science of Grassland Improvement', [1997, chapter 6].

Ross Humphreys
4 February 2005

I wish to comment on the Cell Grazing debate (TGS News 12/04):

From the remoteness of retirement, I find it interesting to read comments such as, "Ok in practice, but how is it in theory?" Let's face it fellas, it would be almost impossible to answer this question definitively using traditional experimental protocols, and beyond the financial and intellectual resources of most.

The reason — there are just too many variables (soil type, fertility, climate, botanical composition, age and breed of cattle, to name but a few); and where the hell could you get reliable controls? Certainly, surveys could be conducted where some broad-brush analysis could be made — but that ain't real science. And if by chance, some great piece of work was carried out, who would believe it? After all, what has been reported on the application of Savroy's hypothesis, both here and overseas, seems to be rigorously questioned. In the dim distant past, I seem to remember endless unresolved debate about continuous versus rotational grazing, including the great 'put and take' system'.

"The practice was developed by graziers and not pasture scientists." Heavens above! What's

new? Most of the most fundamental advances have been made this way, including the practical application of research findings.

There are some things about cell grazing that seem fairly straightforward to me. Under crash grazing, it seems likely that greater utilisation might be made of dry matter production (hence the inclusion of medicaments in the drinking water — the old drought feeding technique).

With fairly even defoliation, it would seem likely that some degree of population shift towards the more palatable species might be possible (depending on the nature and diversity of the species involved). If this occurred, wouldn't it be a wonderful tool for wiping out unproductive areas of say blady or white spear grass?

If researchers choose to study the practice, some reasonable work could be done to try and get some sort of handle on the biology of factors involved (for example, targeted monitoring of botanical change and soil fertility, including the integration of sophisticated plant nutrition and physiology studies). Bit by bit, data could be gathered which could be modelled (for those who believe in that sort of thing).

My gut reaction is that Cell grazing seems like a good idea, particularly if astute graziers are sticking with it.

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Scented Top 'invading' some coastal pastures

Grasses of Southern Queensland describes scented top as 'widespread in forest country in eastern Queensland', 'is readily eaten by stock', and lists two species *Capillipedium spicegerum and C. parviflorum*.

I had samples identified last year, I think as *C. parviflorum* but these have been lost in our recent shift Around 6-10 landholders have brought in samples over the past year saying that it has been invading coastal sown pasture areas over past few years and is not eaten by cattle or horses. Some are concerned enough to slash to prevent seed set and some have been spraying it with glyphosate. One landholder says that his neighbour has it colonising up hilly country having spread over several hectares in couple of years.

I guess a similar situation has been happening in past ten or so drier years with number of grasses; we have also had forest blue grass (*Bothriochloa bladhii*) brought in for identification as growing in coastal pastures where it is vigorous and invasive and not grazed. Thatch grass (*Hyparrhenia rufa*) is certainly starting to spread away from roadsides and is starting to dominate many coastal pasture paddocks; it is grazed but is less palatable than most sown pastures.

Has anyone had experience with scented top in a native pasture where it is readily grazed? Has anyone heard of it invading sown pasture areas closer in to the coast?

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Observations from the coastal Burnett

Scented top is fairly common grass in native pastures and run-down sown pastures in the coastal Burnett but is seldom dominant.

In D.G. Cameron's "Notes on selected grasses native to Queensland" it has been recognised since the 1880's. The respective collectors' views have varied from quite useful as a forage to of limited use. They generally conclude that *C spicegerum* is more robust and coarser than *C. parviflorum*.

continued on page 11...

Practical Abstracts

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Pasture management in semi-arid tropical woodlands: levels of germinable seeds in soil and faeces of cattle grazing *Stylosanthes* pastures—by John McIvor, on pages 129–139.

Soil seed banks in stylo pastures and native pastures, and the seeds of stylo and other species in faeces of cattle grazing stylo pastures, were measured near Charters Towers. Both total numbers of seeds in the seed banks and the seed banks of the stylos (Verano and Seca) were small. Forbs were the major group in the seed banks. There was little relationship between sward and seed bank composition.

Both Verano and Seca rely on seedling recruitment to persist. There small seed banks mean that these species may be lost if the existing plants die and conditions are unsuitable for establishment. These environments are marginal for stylos and careful management will be needed to ensure that they will continue to contribute. Grazing should be reduced during seed set in as many years as possible to increase the seed banks. This may reduce the immediate benefit but increase persistence.

The small seed banks of perennial grasses are dwarfed by some of forbs which may then dominate seedling populations.

Stylos seeds are well suited to spread in dung, especially Seca which was present throughout the year. The few seeds of perennial grass suggest these are less likely to be spread through dung.

The economic performance of steers grazing black speargrass pastures oversown with legumes in south Queensland, Australia—by Neil Macleod and Sid Cook, on pages 140–153.

The GLASS grazing trial ran from 1989 to 1996 to look at the effect of sowing legumes with the bandseeder into native pastures on beef production and financial gains. Although these years suffered from severe drought and the legumes had to be resown in early 1993, animal production with legumes was higher than from the native grass alone in all except one year. This higher production came from relatively little legume (70-223 kg/ha). An economic model confirmed that oversowing native pastures is a potentially profitable investment. However, it carries definite risks associated with poor establishment, and profitability is highly dependent on the ultimate carrying capacity of the oversown pasture.

Effect of pre-planting seed treatment on dormancy breaking and germination of *Indigofera* accessions—by Abubeker Hassen, P.A. Pieterse and Norman Rethman, on pages 154–157.

Seeds were either untreated or scarified and treated with hot water to break dormancy. Generally scarification was best, but it sometimes killed the seed

Effect of cutting frequency on productivity of five selected herbaceous legumes and five grasses in semi-arid tropical Kenya—by D.M.G. Njarui and F.P. Wandera, on pages 156–166.

Growth and effect of cutting frequency were evaluated on Wynn cassia, Siratro and three stylos and on signal grass, buffel grass, Rhodes grass and setaria over 3 years in the subtropics. Over time, the number of plants of Wynn and Verano increased in numbers while Siratro, Cook and Fitzroy remained fairly stable in most seasons but then declined. Signal and Narok setaria established best, and signal spread to give the best yield of the grasses.

Inter-row planting of legumes to improve the crude protein concentration in *Paspalum atratum* cv. Ubon pastures in north-east Thailand—Michael Hare, I.E. Gruben, P. Tatsapong, A. Lunpha, M. Saengkham and K. Wongpichet, on pages 167–177.

The quality of these pure pasture in Thailand is usually low as few farmers apply fertiliser. Introducing legumes could be a cost-effective way to improve quality. *Stylosanthes* species, CIAT 184, Verano and ATF 3308 were the best legumes to plant in alternate rows with Ubon paspalum and increased total crude protein yields by up to 80%.

Yield and quality of *Digitaria eriantha* and *Eragrostis curvula* with nitrogen fertilization in Argentina—by A.O. Gargano and M.A. Aduriz, on pages 178–185.

The increases in dry matter yield, crude protein and digestibility suggest that fertilising with nitrogen could be used but the productive and economic advantages need to be evaluated by grazing studies.

Response of lablab varieties to farmyard manure in the northern Guinea Savanna of Nigeria—by J.T. Amodu, I.A. Adeyinka and C.A.M. Lakpini, on pages 186–191.

Poultry manure was applied to three varieties of lablab at rates up to 35 t/ha. The varieties Rongai brown and Rongai white seem most promising for forage and seed production in this region. Forage and seed yields increased linearly with increasing manure.

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Grazing buffalo on flooded pastures in the Brazilian Amazon region: a review—by A.P. Camarao, J.B. Lourenco Jr, S. Datra, J-L. Hornick and Miriam Bastos da Silva, on pages 193–203.

Water buffalo, swamp buffalo and the Baio type are superior to cattle in flooded ecosystems because they maintain good productivity (2.5 L/day milk, 0.5 kg/day weight gain and 420 kg live weight at 27 whereas cattle could not survive). The flooded pastures receive plenty of sediment and the native pastures of Aleman grass (*Echinochloa polystachia*), Venezuela grass (*Paspalum fasciculatum*) and water paspalum (*Paspalum repens*) have high feed quality. Buffalo could reduce the need to clear forest for dryland ranching. Integrating flooded native pastures during the dry season with cultivated pasture during the wet season can offer returns eight times higher.

The effect of seedbed treatment, cutting frequency and selective grass defoliation on the production and botanical composition of experimental swards of *Urochloa mosambicensis* and *Bothriochloa pertusa* mixed with *Stylosanthes*—by F.D. Hu and Ray Jones, on pages 204–216.

Yields of Verano and Seca stylo are reduced when sown with Sabi grass or Indian couch. Vera produced three times the yield of Seca.

In the growing season, cattle preferentially graze the grass. In the trial, the whole sward was cut or just the grass. Less frequent cutting gave higher yields. When cut every 3 weeks to simulate heavy grazing, yields of Verano and of grass and legume were higher when growing with Sabi grass than with Indian couch. Over the 20 weeks of the experiment, Verano always produced more with Sabi grass, which reflects the results of grazing at high stocking rates. Indian couch appears to be more competitive than Sabi grass for some nutrients, especially sulphur.

Effect of plant spacing, cutting and nitrogen on establishment and production of *Digitaria milanjiana* cv. Jarra in north-east Thailand—by Michael Hare, P. Tatsapong, A. Lunpha and K. Wongpichet, on pages 217–226.

Jarra digit is a grass with higher than average nutritieve value. It can be established easily by planting stolons into moist soil with 50 cm spacing to give high yields in the first season. Harvesting every 60 days gives higher yields whereas cutting at 30-40 day intervals gives a compromise of large amounts of good quality forage. Applying 20 kg/ha nitrogen fertiliser every 60 days to Jarra on infertile soils gives best yield and quality. Higher applications may not be economical.

Waterlogging tolerance of some tropical pasture grasses—by Michael Hare, M. Saengkham, P. Tatsapong, K. Wongpichet and S. Tudsri, on pages 227–233.

Former rice land subject to waterlogging is increasing being used as pasture land for the expanding dairy and beef industries. *Paspalum plicatulum* remains one grasses most tolerant of waterlogging, but Ubon paspalum (*P. atratum*) has better yields and quality and is becoming more popular. Jarra digit has moderate to good waterlogging tolerance; purple guinea will survive for short periods but with reduced vigour. Both ruzi and signal had low tolerance although signal may survive for short periods.

Harvesting management options for legumes intercropped in napier grass in the central highlands of Kenya—by D.M. Mwangi, G. Cadisch, W. Thorpe and K.E. Giller, on pages 234–244.

Greenleaf desmodium, axillaris and Tinaroo glycine were sown with napier grass. When cutting was at 8 and 16 week intervals, and at ground level and 10 cm, only greenleaf desmodium competed with the grass, reducing its yield but giving the highest total yield. Longer cutting interval increased total forage yield but reduced quality and legume yield. Cutting height did not affect yield or quality of grass or legume. Greenleaf desmodium performed consistently well with napier grass in central Kenya.

Estimation of genetic variation in *Dichanthium annulatum* genotypes by the RAPD technique—by A. Chandra, R. Saxena, A.K. Roy and P.S. Pathak, on pages 245–252.

High levels of genetic variation in 76 accessions of wildly grown *Dichanthium* were found using random amplified polymorphic DNA markers (RAPD), despite the species being largely apomictic.

Effect of scarification and growing medium on seed germination of *Desmanthus bicornotus*—Edgar Medina-Sanchez and Roberto Lindig-Cisneros, on pages 253-255.

Highest germination was obtained with acid scarification; mechanical scarification was also efficient but depended on conditions of the growth chamber or glasshouse. Acid scarification for less than 10 minutes would seem most appropriate for propagating the species; longer treatment damages the seed.

... continued from page 9

My own observations are that it is generally selected after the bluegrasses and black speargrass, but is up there with tambookie, silky brown top and the native sorghums.

Like most sown pastures that are beginning to run down, the natives start to recolonise. They are probably selected less than the remaining sown species, and as such are more apparent in the sward. You probably see seasonal differences. As an example here in 2003 we had heavy rain late (February and March) in the growing season. Most grasses quickly ran up to head and the taller species such as thatch grass became apparent in paddocks they hadn't been noticed in before but had probably been in for some time.

I'd question the economics of spraying a native grass that is probably indicating a fertility decline. The risk is that something even less desirable will colonise the sprayed patches.

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