# Conference Posters

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## An expert system for predicting cattle liveweight gain

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The display describes an expert system module developed to specify pasture quality into one of five classes: sub-maintenance, low, medium, high, and very high. This pasture quality module complements other modules (pasture improvement, cattle crossbreeding) integrated into a multiple domain expert system to improve technology transfer to beef cattle producers.

The aim is to use input data readily obtained from farmers presented with multiple choice questions like:

The dominant grass species in your pasture are (i) temperate or (ii) tropical grasses.

Or: What is the usual length of the period between the start of the growing season and early flowering of the dominant pasture species — in months?

These data are used to derive diet quality attributes such as crude protein and digestibility for vegetative and mature forage. This information is then used to classify pasture into one of the five quality categories above.

Assuming that grazing pressure is adjusted so that pasture intake is not restricted by feed availability, the program can estimate liveweight gain, weaning weight and turnoff weight. An example of input required and resultant output for a property in Taree, NSW:

**Input data**

* The dominant grass species in the producer's pastures are tropical (C-4) grasses.
* In most seasons the average proportion of legumes (clovers, lucerne, medics, stylos, glycines etc.) in the total pasture is less than 10%.
* The producer's dominant pasture is supplied with either no nitrogenous fertiliser or less than a total of 200 kg/ha per year in split applications.
* This property produces light store calves.
* The peak calving period usually occurs while pasture is not actively growing.
* Age at weaning — in months = 8.
* The usual length of the period from the start of growth season to seed set — in months = 7.
* The period from peak calving to start of the growth season — months = 1.
* Average birth weight — in kg = 35.

**Output**

* Pasture quality is low.
* Predicted potential weaning weight (in kg) of straight bred British cattle grazing this pasture, without supplementation is = 155.

# GRASSMAN — a computer program for managing native pasture in eucalypt woodlands

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Reducing tree competition in grassland generally increases animal production in Queensland. But the regrowth after development has to be controlled to prevent woodland re-establishing and a subsequent decline in grass growth and beef production.

GRASSMAN is an easy-to-use computer program that can help graziers in the eucalypt woodlands of central Queensland compare the effect of strategies of tree clearing and grazing on beef production and profits.

The effects on trees, pasture growth, beef production or finances over the 15 years can be displayed in separate tables, or graphically altogether on one screen.

Inputs that can be selected include the type of eucalypt community, the understorey if present, and soil type; the density of mature trees or height and stand of regrowth; the average rainfall; the method of controlling trees and regrowth; the life span of the tree treatments; the costs of treatments, the price of beef and interest rates; the type of season each year in relation to the average rainfall; and the method of calculating stocking rate and level of stocking.

Relationships between these factors have been determined experimentally but are combined with some expert opinion.

The main relationship in the program is the efficiency with which the grass can use rainfall to grow. Grass production is modified by the fertility of the soil, trees competing for moisture and the condition of the pasture.

The relationship between animal production, grass yield and stocking rate is determined from the animal's liveweight gain from the grass growth, its level of utilisation and the level of intake by the animal.

GRASSMAN is useful to extension officers, financial consultants and land use planners, as well as beef producers, both to compare the profitability of tree-control treatments and to assess sustainable production from different grazing intensities.

# Estimating acid addition rates in a dairy production system in subtropical Australia

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Acidification of agricultural soils occurs mainly when there is an imbalance of inputs and outputs from either the nitrogen or the carbon cycles (Helyar and Porter 1989). On dairy farms, major imbalances can occur when nitrate is lost from the root zone by leaching or runoff and when organic anions which accumulate in pasture tops are exported off the paddock in the form of milk, hay and dung.

Acid addition associated with the nitrogen cycle depends upon the form of nitrogen added, the form of nitrogen removed and the degree of leaching. We can calculate from figures proposed by Cregan and Helyar (1986) that a ryegrass pasture receiving eight applications per year or 50 kg/ha N in the form of Urea or Ammonium nitrate and an average of 5 kg/ha N is leached as nitrate each time; 144 kg/ha Lime will be required each year to neutralise the acid added to the root zone.

The tops of pasture plants tend to accumulate more alkaline than acid compounds, the measure of this difference is called the net ash alkalinity. Jarvis and Robson (1983) measured the net ash alkalinity of nitrate fertilised ryegrass at 113 centimoles/kg. When the plant matter is recycled to the soil there is no net change in soil acidity. However, if the plant tops are removed the soil will acidify. This would occur, in the most extreme case, when hay is cut and fed off the paddock. One ton of nitrate supplied ryegrass slashed and removed from the paddock is neutralised by 56 kg of lime.

When plants are grazed, much of the feed is returned to the soil in urine and dung. The problem here is their uneven distribution through camping vehaviour, night paddocks, and the dairy. One cow producing 5 kg of dung per day is a random lime spreader distributing the equivalent of 103 kg of lime each year.

Losses also occur in removal of feed which has been converted into animal products such as in milk. One cow producing 16 litres of milk per day over 300 days, requires 2.22 tons of ryegrass for milk production alone. Lime required is 124 kg/cow/year.

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# Bandseeding: an effective and reliable method of pasture establishment

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## Introduction

A reliable, low-cost method of pasture establishment was needed for the improvement of native or run-down pastures. While full replacement methods involving cultivated seedbeds are reliable, they require the land to be clear of logs and stumps, are expensive and may create erosion problems on sloping land. Low input techniques such as aerial seeding are generally unreliable in the lower rainfall areas of the subcoastal regions. Seedling emergence is usually poor and high rates of post-emergent seedling mortality, induced by plant competition and aggravated by moisture stress, are common.

## Research solutions

Drilling seed at a consistent shallow depth of 10 mm increased seedling imergence by 2.5 to 9 fold, depending on species. Planting the seed too deep was a bigger problem than planting too shallow, with small-seeded species such as Seca and fine-stem stylos being particularly sensitive to planting depth. The stylos failed to emerge from depths greater than 20 mm. Wynn cassia and Siratro were less sensitive to planting depth.

Root competition for nutrients and moisture was the main form of plant competition. Competition control methods based on burning and grazing proved inadequate in controlling plant competition because root competition was not adequately controlled. On the other hand, a narrow band of systemic herbicide, that killed the roots as well as the tops of the plants, controlled root competition and resulted in increased seedling growth rates and better seedling survival, especially during dry conditions.

## The technology package

Accurate seed placement and control of plant competition using bands of herbicide have been combined in a technology package called BANDSEEDING. A BANDSEEDER machine has been designed, tested and commercialised. The BANDSEEDER is capable of placing seed at a consistent shallow depth, even under rough operating conditions. A small amount of fertiliser is placed below the seed to boost seedling growth and a narrow band (50 cm wide) of herbicide is sprayed over the row to control plant competition. A wide row spacing is used to minimise input costs. This wide row spacing (1.5 m), when combined with a heavy duty frame and high under-frame clearance, allows the machine to operate in rough, partially cleared country where some trees, logs, stumps and rocks are present. The use of coulters in conjunction with narrow points minimises soil disturbance thus allowing the machine to be used on sloping country without fear of soil erosion.

# *Desmanthus virgatus* — a summer legume for clay soils

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A companion legume for summer grasses is needed to improve animal production, renovate run-down pastures and rehabilitate old cultivation. *Desmanthus virgatus* is one such summer growing perennial legume with potential for growth on clay soils in the semi-arid subtropics.

## Origin and adaptation

*Desmanthus* is a native legume of North and South America. It is highly regarded in many regions as a valuable forage plant (Skerman 1977). In Brazil it is recognised for its capacity to regenerate after heavy grazing by cattle. Accessions introduced to Australia have been collected from a diverse range of latitudes (28° N-25° S), altitudes (5-1900 m) and rainfall (150-1600 mm) regions of the Americas. About half the recognised species of *Desmanthus* are found in Mexico. It grows on many soils with a range of pH from 5.0 to 9.0 and some accessions were collected from clay soils. There are various forms of *D. virgatus* ranging from 1.5 m high shrubs in the humid tropics to prostrate plants and compact bushes in semi-arid areas (Reid 1983). *Desmanthus spp.* are thought to have xylopodic roots which are capable of storing water and contributing to this plants ability to survive dry conditions (Carvalho and Mattus 1974). This legume can survive in cold frosty climates. Though the plant top may be burnt off by frost, *Desmanthus* shoots vigorously again from basal buds if adequate soil moisture is available in spring.

## Evaluation

The *Desmanthus* collection has not been widely tested in Queensland although several accessions have been included in plant evaluations of CSIRO and QDPI. On grey clay soils at Wandoan and Bringalilly some accessions (including 30205, 40071, 52401, 78373, 78372 and 78383) were persistent, productive and set seed although seedling recruitment was minimal (Conway *et al.* 1988). Also at Collinsville and Charters Towers on cracking clay soils, persistance, production and spread of four accessions (57960, 65947, 67642 and 78373) compared favourably with *Leucaena, Clitoria* and *Stylosanthes.* In the dry tropics of north Queensland, ten accessions of *Desmanthus* have persisted under grazing for four years on a grey cracking clay soil on "Wrotham Park".

In the current QDPI plant evaluation programme 40 accessions have been sown. Recordings and information collected to date have identified seven accessions (CPI 33201, 38351, 40071, 78373, 78382, 79653 and 92803) for further evaluation. Sward trials comparing these accessions and grazing trials (with some accessions) are presently being undertaken to provide information on establishment, productivity, population dynamics, reaction to grazing and animal performance in northern, central and southern Queensland.

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# The 'GLASS' project: Improving pasture and soil stability, beef production and profitability on degraded granite pastures

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## Introduction

Economic conditions and a poor understanding of the functioning of grazed landscapes within the subtropics has led to overgrazing, land degradation and reduced production potential. Degradation is particularly serious on granitic lands; in many areas black speargrass (*Heteropogon contortus*) has been replaced by inferior species such as wiregrass (*Aristida spp*) and annual grasses.

Grazing tolerant legumes and mineral supplements are seen as potential avenues for increasing animal production in the short term. However, these may compound degradation problems in the longer term.

Commercial paddocks typically contain several land classes which differ in herbage and soil characteristics. These can affect the spatial pattern and seasonal intensity of grazing across the landscape and lead to degradation, even at apparently 'safe' stocking rates.

## The Project

The 'GLASS'[1] project studies unimproved speargrass pastures and Bandseeded legume-native grass pastures at a hierarchy of scales, and includes field surveys, glasshouse, small plot and large grazing trials.

The 'GLASS' project structure can be conveniently grouped into four phases of research:

1. Understanding grazed landscapes;
2. Development of a cost-effective legume sowing technology;
3. Ways to speed up development of the legume component of native grass-legume pastures; and
4. Stability and productivity of native grass-legume pastures and profitability of beef production, within and across the landscape.

Pasture, soil and climatological characteristics and interrelationships across the granite landscape are being defined. Optimal post-sowing management of Bandseeded legumes is being investigated, along with the general success of a Bandseeded mixture of legumes at a range of grazing pressures in paddocks comprising either several land classes or a single land class.

Other studies include the feeding behaviour and performance of beef cattle on individual land classes and across the landscape, as well as pasture stability, run-off and soil loss in relation to grazing pressure.

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[1]'GLASS' is an acronym for Grazing, Legumes/Land classes, And Sustainability of pastures in the Subtropics.