



An introduction to

Leucaena

– the productive and sustainable forage legume

Introduction

This publication provides an introduction for beef producers to establishing, managing and grazing leucaena, considering intensification and maximising live weight gains for a forage-based production system. The principles, detailed further in the soon-to-be-released producer manual *Leucaena – the productive and sustainable forage legume*, have been compiled from evidence-based research and development activities conducted by The University of Queensland, the Queensland Department of Agriculture and Fisheries and CSIRO.

Why plant leucaena?

High productivity

Leucaena is a deep-rooted perennial shrub legume that makes the most productive and sustainable legume-grass pasture for northern Australia.

Steers on grass without supplements typically gain 140–190kg/year because the grass protein content is too low. To grow well, cattle need a diet with more than 13% crude protein, and that requires a legume.

Grazing leucaena, steers will on average gain 250–300kg/year – without supplements – and at higher stocking rates.

Total production per hectare can be more than twice that from improved grass pasture, and profitability can also be doubled.



Heavier cattle and higher stocking rates

Other benefits of leucaena

- Planting leucaena offers the best opportunity to sustainably intensify production on the best land, freeing more vulnerable land for protection from over-grazing or conservation.
- A 30+ year productive life makes leucaena more profitable than any other improved pasture – despite its higher establishment cost.
- Drought tolerance delivers dry season forage, lessening drought management costs.
- Soil fertility is improved by nitrogen fixation and cycling of organic matter; methane emissions from ruminants are lowered and carbon is sequestered.

But... leucaena is not suitable for the whole of northern Australia.

- It grows best on deep fertile soils with more than 600mm rainfall.
- It may take one to two years to establish fully, during which time it can only be lightly grazed.
- Its green leaf and stem can be frosted to ground level, but the plant will recover.
- Psyllid insects can damage older cultivars in humid environments with rainfall above 800mm.
- Heavy seed production can occur without good management. Tall growth must be controlled by appropriate grazing or mechanical slashing.
- Short-term leucaena toxicity can occur in unadapted animals if they are not introduced gradually and managed properly.



Vigorous establishing leucaena

Leucaena is profitable

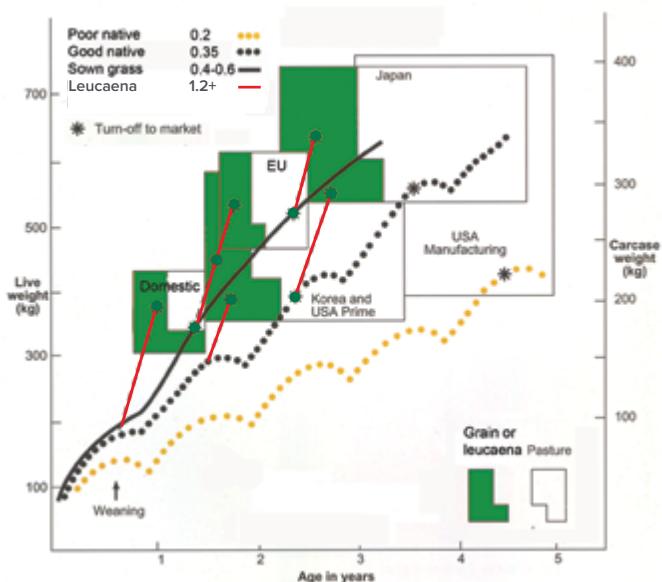
You can choose your market

Leucaena-fed steers can reach 600kg at 24–30 months, 6–12 months earlier than those on grass-only pasture.

This rapid live weight gain on leucaena means that cattle can be targeted to any domestic or export market according to the best price (Figure 1).

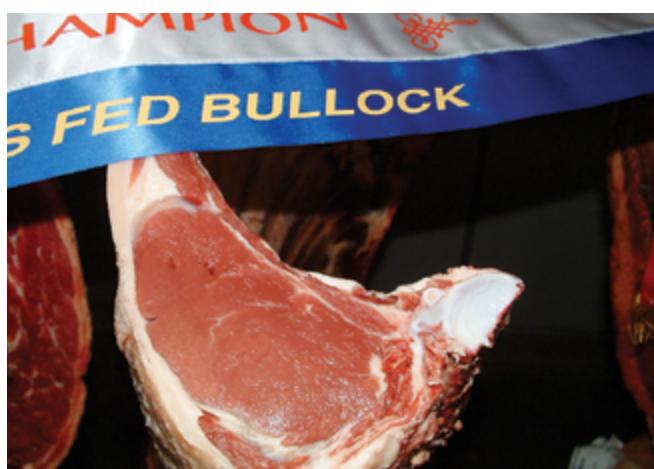
Cattle on leucaena-grass pastures can achieve high meat quality standards – without grain feeding.

Figure 1: Leucaena increases weight gain each year, enabling access to higher value markets



Source: Gramshaw D and Lloyd D (1993). *Grazing the north: creating wealth and sustaining the land*. Information series QI92042. Queensland Department of Primary Industries, Brisbane

Cattle consistently meet MSA (Meat Standards Australia) requirements and qualify as PCAS (Pasture-fed Cattle Assurance System) when finished on leucaena.



BEEF 2018 cattle championships

Leucaena-fed cattle were successful in the crop/pasture-fed section at BEEF 2018.

The champion pens of grass-fed steers and heifers were both from leucaena-buffel grass production systems.

Costs and returns

Commercial data from producers in central Queensland show that leucaena-grass pastures produce up to 2.5 times more beef than grass-only pasture, and gross margins are twice as high.

Economic modelling shows that fattening cattle on leucaena is more profitable to the whole farm business than other forage options in central Queensland because of its long life and low maintenance costs.



Introducing leucaena into grass pasture can more than double productivity and profitability

Economics of irrigation – Irrigation can greatly boost the productivity of leucaena. This intensification can make better use of existing leucaena and may be more economical than buying more land.

Irrigation requires adequate water resources, costly infrastructure, maintenance and intensive management.



Irrigation can maximise beef production where suitable soil, water and irrigation infrastructure are available

Successful irrigators experiment with narrower row spacing, regular fertiliser application and frequent cutting along with providing energy supplements to the animals.

Profitability will depend on the value of increased turn-off and the cost of enterprise intensification.

How do I establish leucaena?

Soils, climate and cultivation

Soils and climate – Choose an area with deep, fertile, well-drained neutral to alkaline soils.

Correct nutrient deficiencies, especially of phosphorus and sulphur.

Select a cultivar suited to your regional rainfall and proposed grazing management.

Establishment – **The key to successful leucaena is to plant it like a crop** into a fully prepared, weed-free seedbed with ample stored moisture.



Like a crop, plant leucaena into a fully prepared seedbed

Well-established leucaena will last for 30+ years; poorly established leucaena is difficult to correct.

Seeds and insects – Scarify the seed and inoculate with rhizobium. Many graziers coat seed to control insects. Apply beetle bait after planting.

Which leucaena cultivar should I plant?

Peru – a shrubby plant with good basal branching, but it is very seedy and highly susceptible to psyllid damage. Now superseded by newer varieties.

Cunningham – a multi-branched, bushy grazing plant. More productive than Peru, but susceptible to frost and psyllid damage. Also a prolific seed producer.

Tarramba – tree-like and needs more frequent height management. Compared to other varieties, it is more vigorous, more tolerant of cool conditions and maintains growth under psyllid attack. Tarramba is the most suitable variety for regularly frosted areas.

Wondergraze – has the branched and leafy habit of Cunningham and Peru, with the superior growth under psyllid attack and excellent seedling vigour of Tarramba. Seed production of Wondergraze is greater than Tarramba, but less than Cunningham and Peru.

Redlands – a new hybrid that is highly psyllid-tolerant, has a branched habit and high levels of forage production. It is recommended for humid coastal psyllid-prone areas with over 800mm annual rainfall.

Row spacing, weeds and grass

Row spacing – Sow double rows 6–10m apart to maximise animal productivity, but expect to manage this intensively. Wider rows (10–15m) allow leucaena plant height to be more easily controlled.



Keep weed-free during early growth

Planting into cultivated strips in an existing pasture slows leucaena establishment. There is more competition for stored soil moisture but it retains the established feedbase.



Competition from existing grass slows leucaena establishment

Weed control – Leucaena seedlings are very susceptible to competition from weeds and grass – it can double the time to first grazing and permanently stunt stands. Control weeds using pre- and post-emergent herbicides and/or mechanical control.

Inter-row grass – A grazing-tolerant grass between the leucaena rows will stabilise the soil and provide a balanced diet, especially if the leucaena is frosted.

Do not plant the grass until the leucaena is well established.



Inter-row grass stabilises the soil and balances the diet

Managing grazing

When to start grazing – The leucaena plants can be grazed lightly when they are 1.5m tall, and grazed fully once they reach 2–3m.



Allow leucaena to grow 2–3m tall before heavy grazing

Carrying capacity and productivity – Stocking rates and weight gains will depend on the proportion of leucaena and on the total amount of pasture. With good leucaena, productivity per hectare can be doubled. Carcase weights of 320kg can be achieved in under 30 months at stocking rates of 1.3ha/animal.

Making the best use of leucaena – If leucaena is limited, reserve it for stock with the highest market value or for managing autumn-winter protein gaps.



Reserve some leucaena to finish cattle in autumn when the grass has dried off

Grazing management – High-intensity, short-duration rotational grazing is best to maximise production and manage leucaena height. Periodic cutting will still be necessary to reduce woody growth and promote leafy regrowth.

Rotational grazing is more expensive to set up and manage but allows better rationing of the leucaena and helps rapid soil nutrient cycling. Allow full recovery (6–10 weeks) between grazing periods and after frost.

If the leucaena gets too tall, introduce mature stock to break down the branches or slash with heavy machinery.



Mature cattle can reach and pull down tall leucaena

Leucaena toxicity

Edible parts of leucaena contain mimosine which can be toxic. When cattle first eat leucaena they may show hair loss and salivation for a time. Rumen microflora adapt quickly to convert toxic mimosine to less toxic dihydroxypyridine (DHP), which is then degraded by the liver and by other rumen microflora.

It is recommended to inoculate cattle with *Synergistes jonesii* (a rumen bacterium) as insurance and protection against leucaena toxicity. Further research is needed to clarify whether this inoculation will still be necessary in the future.



Leafy regrowth after tall leucaena was cut back

What are the effects on the environment?

Environmental opportunities

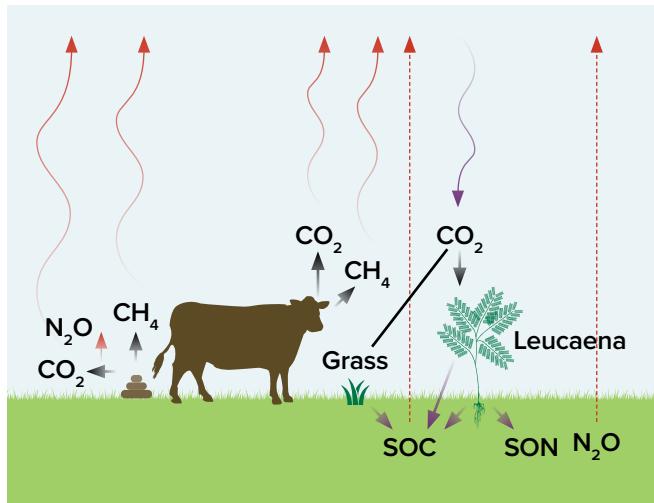
Sustainability – Leucaena-grass pasture is a sustainable silvopastoral farming system that provides environmental (Figure 2) and economic benefits.

Soil improvement – Good ground cover under leucaena-grass pastures increases soil organic matter, reduces erosion and dryland salinity, and improves run-off water quality.

Carbon credits will depend on developing suitable accounting methods and data. Soil carbon can be increased by 17–30% after 40 years under leucaena.

Methane emissions – More efficient rumen fermentation with high protein leucaena can reduce enteric methane production by 20–30%.

Figure 2: Leucaena grazing systems have been shown to mitigate enteric methane emissions and increase soil carbon



Emissions Reduction Fund credits may become possible based on reduced methane emissions and on improved soil carbon sequestration.

Animal welfare is improved by better quality feed being available during the dry season and droughts.

Breeders on leucaena can maintain body condition to produce healthier calves. Weaned calves on leucaena do not suffer a post-weaning set-back. However, unadapted cows (especially maiden heifers) should not be introduced to leucaena during their first trimester or foetal abortion may occur.

Economic efficiency – Long-lived leucaena pastures do not require the regular cultivation of annual field or forage crops. This reduces machinery use and makes for more economic beef production.

Having established leucaena pastures makes it possible to be less reliant on expensive grain feeding to finish animals prior to slaughter.

Environmental constraints

Weediness – Without proper management, commercial varieties will produce large amounts of long-lived seed that can spread between the rows and outside of the planted areas.



Leucaena seedlings thickening between rows



Well-managed leucaena kept in leafy non-seedy condition

- Continuing concern about the potential of leucaena to become an environmental weed is addressed with factual information and a voluntary Code of Practice for the responsible use of leucaena.
- The Leucaena Network's Code of Practice promotes best management practices to prevent and control unwanted plants.
- Unwanted seedlings and larger plants can be effectively controlled with herbicides.

The Leucaena Network Best Management Code of Practice

- Avoid planting leucaena near potential weed risk zones.
- Minimise seed set in grazed stands.
- Reduce the risk of seed dispersal.
- Control plants that escape from grazed stands.

www.leucaena.net

Future prospects

There is great potential to expand leucaena pastures in northern Australia. A recent analysis suggests that 5% of northern Australia (some 25 million hectares) fits the requirements for growing leucaena.

There are four to five million hectares suitable for leucaena in the Fitzroy River catchment in central Queensland.



Leucaena in central Queensland

While most of this suitable land may never be planted to leucaena, the potential for increasing beef productivity is significant.

New varieties – The introduction of a psyllid-tolerant cultivar (see Redlands under 'Which leucaena cultivar should I plant?' on page 4) has expanded leucaena's potential into more humid and higher rainfall coastal regions.

Leucaena in other countries

Indonesia – For decades, producers in eastern Indonesia have profitably fattened pen-fed Bali bulls on high leucaena diets (often feeding 100% leucaena). They 'cut and carry' the foliage from their nearby leucaena plantings of 0.5ha to 5ha. After a two-week settling period, the cattle tend to grow well.



Pen feeding 100% leucaena in eastern Indonesia

Leucaena has greatly increased animal growth rates, carcase dressing percentages and meat quality, and consequently has improved household incomes.

Thailand – Leucaena is fed to meat and milk goats (often as 100% leucaena diets) and as a supplement to dairy cattle. It is either fed fresh, as partially fermented silage or as dried leaf meal.

Latin America – Broad-area grazing of leucaena with grazing-tolerant grasses is increasing in Argentina and Paraguay. In Mexico, leucaena is used as a protein bank for grazing beef and dairy cattle.

Other countries promote an Intensive Silvopastoral System in their tropical regions. High-density leucaena (>10,000 plants/ha) is planted with grazing-tolerant grasses and low densities of high-value timber trees. The system is intensively managed with rotational grazing.



Dairy cattle in leucaena pasture in Colombia

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