4. Grazing management

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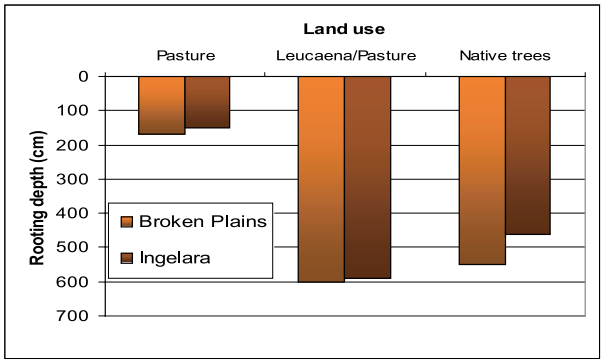
4.1 Forage growth

The aim is to grow as much leucaena leaf as possible, and then to use it efficiently. A general target is to have at least 30–60% of the pasture as leucaena. Following the guidelines for successful establishment will affect productivity for many decades.

The greatest influence on plant growth is rainfall. While producers cannot control rainfall, they can maximise the amount of leucaena grown per mm of rainfall. Options include:

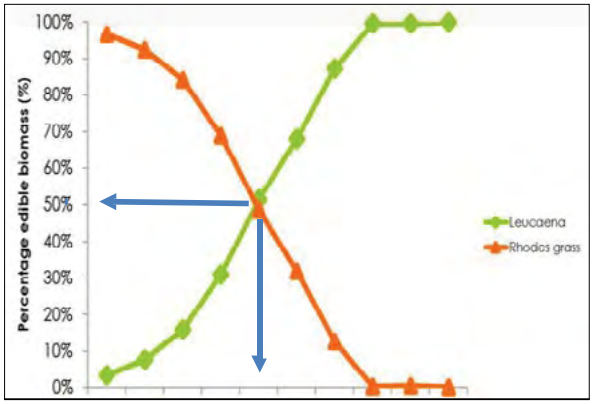
- **Choice of site.** Plant leucaena only on soil of suitable fertility and deep enough to store adequate moisture. This will keep leucaena growing even when dry conditions stop grass growth.
- **Closer rows.** Although leucaena can tap water from deeper in the soil profile than can grass, most of its roots are in the same 1.5m depth rooting zone (Figure 4.1).

Figure 4.1: Rooting depth of pasture grasses, leucaena and native trees at two sites in central Queensland



Grass in inter-rows competes directly with the leucaena for soil moisture. The dense root systems of buffel grass can capture 80–90% of rainfall and can reduce leucaena growth by 60–70%. Competition from grass can be reduced by planting double rows at 5–6m centres rather than at 8–10m (Figure 4.2).

Figure 4.2: Row spacing affects the balance of leucaena and grass.



Row spacing
Wide >20m ———————— narrow <2m

- **Role of grass.** Grass is needed for good animal nutrition and to use the nitrogen available from the legume. Grass forage production allows year-round grazing of leucaena pastures, even if leucaena is frosted during winter. Good grass cover minimises runoff and prevents seedlings of leucaena and weeds establishing between the rows.

Grass is essential for a sustainable grazing system but it competes with leucaena for water.

Row spacing affects the proportions of leucaena and grass forage available. Wide spacing (15m) (left) decreases the proportion of leucaena, narrow spacing (5–6m) (right) increases it.

Grass competition can be reduced by spraying or ploughing out strips of grass adjacent to the leucaena rows.

- **Fertiliser use.** Promote leucaena growth by applying phosphorus and/or sulphur fertiliser if needed.
- **Time to regrow.** Leucaena responds well to rotational grazing systems when it is allowed to recover after grazing — or after winter frosting. If leucaena is grazed to a leafless woody frame, leaf regrowth is slowed.

How much leucaena do I need?

What area should be planted? The availability of suitable soil limits the total area that can be planted on an individual property. The time available to adequately prepare, plant and control weeds influences how much leucaena can be established in any given year.

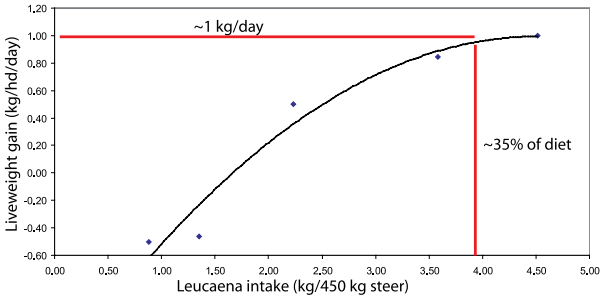
Typically, aim to establish 50–100ha per year with a target of 200–1000ha depending on area of suitable land available. Small areas can be devastated by hungry wildlife (marsupials, birds, hares, rabbits) during establishment, and are not recommended.

What is the best proportion of grass and leucaena in the paddock? The proportion of leucaena in the pasture will vary with spacing of the leucaena rows (wider rows = less leucaena), soil depth and fertility, and adoption of best establishment and management practices.

The proportion of leucaena in the pasture is determined by row spacing, soil depth and fertility, and good establishment and management.

Animal weight gain is closely related to the amount of leucaena consumed – theoretically 40% leucaena in diet for 1kg/hd/day LWG (Figure 4.3). However, voluntary intake of leucaena varies from 5–100% depending on availability and season. Cattle normally graze more grass at the start of the season when it is young and nutritious, but prefer leucaena as the grass matures.

Figure 4.3: Relationship of live weight gain with intake of leucaena



Under heavy grazing, there may be less than 10% of leucaena leaf and small stem available.

If there is limited grass available due to drought, cattle may consume over 90% leucaena in their diet when it is first introduced. Excess consumption of leucaena is wasteful if the area of leucaena is limited. Frost will also partially or completely reduce the amount of leucaena leaf available, depending on severity.

More leucaena leaf than grass may be available under drought conditions, and cattle can do well.

Graziers should aim to have 40—-60% of forage dry matter on offer in the paddock as leucaena, and then manage stocking rate to ensure adequate leucaena when most needed in late summer and autumn.

4.2 Grazing leucaena

Carrying capacity

The number of cattle that can be finished from a paddock of leucaena is based on:

- The amount of edible feed in the paddock (edible leucaena and grass). This depends of the success of establishment of both leucaena and grass, the fertility and depth of the soil, whether fertiliser was applied, and the amount of rainfall received over the growing season.
- The percentage of feed available that can be eaten without damaging the pasture. This might be 30% of the grass but 90% of the leaf and edible stem of the leucaena.

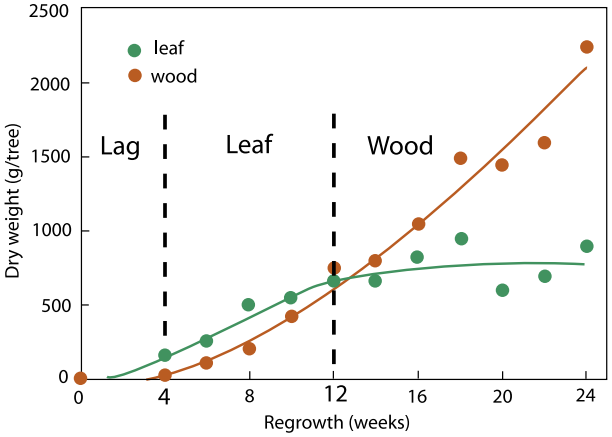
There are few good estimates of the amount of edible pasture produced in leucaena-grass systems. Predictions based on rainfall use efficiency which estimate forage and animal productivity are shown in Table 4.1. This is being achieved by some producers, for example by Stuart and Sharee Ogg at Carnarvon, but will vary from property to property. Case studies from central and southern Queensland indicate a lower carrying capacity and therefore lower production per hectare (Table 4.2).

Regrowth after grazing

Regrowth after heavy grazing and rain can be described as having three phases (Figure 4.4).

- Phase 1 (lag phase) lasts about 4 weeks during which regrowth is slow due to low leaf area.
- Phase 2 (leaf phase) is a 4–10 week period of maximum growth of leaf and young green stem with little growth of wood.
- Phase 3 (wood phase) occurs when leaf yield increases slightly but woody biomass increases dramatically as the trees grow taller.

Figure 4.4: Leaf and stem regrowth of leucaena after cutting



Grazing management should aim to leave 10% leaf area and then to allow sufficient time for regrowth to maximise the yield of edible forage. In the example shown in Figure 4.4, optimal edible foliage is achieved 8–12 weeks after regrowth starts assuming adequate soil moisture and temperature. This is a good time to put cattle back on the leucaena.

Table 4.1: Potential forage production, stocking rate and animal production from leucaena-grass pastures in Queensland, based on rainfall use efficiency (RUE).

Species/item	RUE (kg/ha/mm	Forage yield (kg/ha/yr)	% utilisation	Edible yield (kg/ha/yr)
Annual rainfall 700mm % leucaena in diet 67%				
Leucaena	4	2,800	90	2,520
Grass	6	4,200	30	1,260
Total	10	7,000		3,780
Estimated carrying capacity of 500kg steers consuming 2.5% of body wt (ha/AE/yr)				1.21
Estimated LWG assuming 270 grazing days at 1 kg/hd/d (kg/ha)				270
Estimated LWG assuming 270 grazing days (kg/ha/yr)				224

Table 4.2: Case studies of carrying capacity (ha/adult equivalent AE), live weight gains (LWG) and gross margins on leucaena properties in central and southern Queensland

Location	Grazing days (days/yr)	Stocking rate (ha/AE	Average LWG (kg/day)	LWG (kg/hd)	LWG (kg/ha/yr)	Gross margins ($/ha)
Central Qld (open downs)	270	2.3	1.12	302	133	163
Central Qld (brigalow)	270	2.3	1.12	302	133	169
Southern Qld (brigalow)	240	2.8	1.23	294	106	107

Regrowth after grazing

Three distinct phases – 1 lag, 2 leaf and 3 wood:

- Forage growth is slow during lag phase.
- Maximum forage growth occurs during leafy phase, and is ready for grazing when 50–60% of regrowth is edible.
- Regrowth period of 8–12 weeks is optimal, depending on temperature and soil moisture.

Wood production is wasteful and needs height control management with machinery.

At this point, edible forage (leaf and small stem) would make up 50–60% of total regrowth biomass. Longer intervals will give a lower proportion of leaf and higher wood yields (Figure 4.4).

Grazing systems

Continuous grazing

Some producers leave cattle on leucaena continuously; all gates are open and cattle are free to choose where and when they graze. This system is low maintenance but, as it does not maximise productivity from the investment, it is not recommended.

Seasonal and rotational grazing

Most leucaena is grazed on a seasonal or rotational basis. Leucaena responds well to intensive short-duration grazing with adequate time for recovery.

In seasonal grazing, the leucaena is locked up to accumulate leaf for feeding cattle at critical times such as autumn and early winter when steers need to be finished but grass quality is dropping quickly. This system is useful where the area of leucaena is insufficient for a more continuous forage supply.

In rotational grazing, cattle are moved around blocks of leucaena allowing time (at least 8–12 weeks after severe defoliation) for paddocks to fully recover before the next grazing.

Rotational grazing aims to keep cattle grazing prime leucaena pasture year-round. To achieve this, graziers need to monitor pasture yield and composition and adjust animal feed days, rotation times and stocking rates accordingly.

Irrigated leucaena pastures are well suited to rotational grazing as pasture yield can be guaranteed by the timely application of water, simplifying feed-budgeting and stocking rate management.

Which grazing system?

Continuous

- need large areas of leucaena
- simplified management
- but no control of height and seediness.

Seasonal

- best for smaller areas of leucaena
- use leucaena to fill autumn/winter protein gap
- target specific animals.

Rotational

- rests leucaena and grass periodically
- maintains grass yield and vigour
- good control of leucaena utilisation and height.

Cell grazing

A large number of cattle rotationally graze small paddocks (cells) for a short time. They quickly eat most of the available fodder and are then moved on, with the cell rested for 8–12 weeks to recover.

Leucaena-grass pastures are well suited to cell grazing because:

- Intense grazing pressure helps manage the height of leucaena preventing it growing out of the reach of cattle.
- Intense stocking leads to more even grazing pressure, better utilisation of pasture resources, and therefore easier pasture feed budgeting.
- High animal traffic accelerates nutrient cycling, better redistribution of nutrients from dung and urine across the paddock, and improves water infiltration.
- Once established, leucaena tolerates heavy grazing – although the grass must not be over-grazed.
- High productivity (and economic viability) of the leucaena system means that smaller areas can be developed.

but

- Cell grazing needs substantial infrastructure in electric fencing, watering points and speargates for managing cattle movement.
- Cell grazing is labour intensive as pasture condition and utilisation need to be monitored regularly and cattle shifted frequently (even daily).

4.3 Producer experience – southern Queensland

Craig Antonio – 'Borambil', Millmerran

Craig Antonio on 'Borambil', Millmerran has one of the most southerly inland plantings of leucaena. Millmerran lies on the Darling Downs about 300km west of Brisbane at a latitude of 18°S; annual rainfall is 625mm, mostly in summer.

Most of Craig's cultivated country has brigalow clay soil, on which he has planted 400ha of Wondergraze and Tarramba leucaena, and plans a further 1,500ha. He considers that the key factors in successful establishment have been meticulous seedbed preparation and post-planting weed control.

Planting. After any brigalow or grass regrowth has been removed by thorough cultivation, in September he uses a purpose-built planter to sow the leucaena in double rows 8m apart, along with fertiliser (P, S and Zn) banded along the hedgerow. To control the mass of grass seedlings in old cropping land, Craig applies Spinnaker® pre-planting and Verdict™ post-planting – and sometimes uses tillage to control weeds in the inter-row.

Craig sometimes sows oats between the establishing hedgerows during the first winter. He then sows grass in the inter-row in spring following rainfall (October/November).'

Grazing. The first grazing of the leucaena is in March after the September planting, but it can take up to three years before it is fully established.

Craig uses high stocking rates of 5–10 AE/ha in rotationally grazed leucaena pastures. This controls the height of the leucaena; he says that the cattle preferentially graze leucaena and pull down any tall branches.

Cattle on the leucaena gain 1.6 kg/day for two months and 1.3–1.4 kg/day for seven months to achieve 250 kg LWG/ha/yr. Craig says that this allows him to target his market as he can forecast weight gains even over long dry spells, with shorter fattening periods than on grass-only pasture. Other benefits from the leucaena pastures include better ground cover which reduces runoff and soil loss.

Better stock and profits. Craig has three Angus breeding properties and one finishing property. His markets include feedlot steers at 400–500kg and cull heifers to a kill weight of 500kg with carcases reaching Meat Standards Australia (MSA), and Grassfed or Angus grids if the season allows.

The returns from leucaena-grass pasture is $200-250/ha/yr on old farming country, and $300/ha/yr on regrowth country.

Once the leucaena is established, production is relatively cost free, and it has doubled Craig's carrying capacity and profitability.

Craig checks his leucaena sown after a winter cereal crop

Leucaena rows with Callide Rhodes grass at 'Borambil'.

4.4 Making the best use of leucaena

Leucaena as a protein supplement

The main value of leucaena is as a much-needed protein supplement to cattle grazing tropical grass pastures. Rapidly growing cattle need about 13% crude protein in their diets to produce good weight gains, and they cannot get this from grass pastures alone.

When cattle are introduced to leucaena paddocks, their intake of protein immediately increases when they select a high proportion of leucaena — which depends on the leucaena leaf available, seasonal factors and animal behaviour (Table 4.3).

Table 4.3: Percentage leucaena in diet of cattle grazing leucaena and grass on six properties in central Queensland from December to May 2005

Property	Average leucaena in diet (%)	Seasonal range in diet (%)	
		December	May
A	75	98	60
B	51	92	32
C	53	74	24
D	50	79	30
E	44	67	13
F	15	48	5

For cattle accustomed to leucaena, leucaena intake can initially reach almost 100%, and then gradually reduce as there is less leaf available.

Cattle often prefer young nutritious grass early in the season and leucaena later in the season as the grass matures. However, if the leucaena area and associated grass is limited, leucaena is highly palatable and cattle will keep eating it while available. Thus, without a grazing strategy, they tend to eat excessive amounts of leucaena protein early in the growing season — more than they need nutritionally — leaving insufficient leucaena forage for when the grass hays off in autumn. Over the first half of the season cattle consume a high quality diet of both green grass and leucaena, resulting in more dietary protein than they need for growth.

Animal performance can reduce later in the season (autumn) if insufficient leucaena is available as the quality of grass declines.

Managing leucaena intake by restricting access early in the growing season, or by a rotational or cell grazing system, with some grass-only paddocks can improve production efficiency.

Strategic use of leucaena

Leucaena is commonly used to finish cattle for local and export markets. Strategies to make best use of limited leucaena include:

- finishing steers to market specifications (see Producer experience – Stuart and Sharee Ogg)
- backgrounding weaners going into a feedlot (see Producer experience – Paul and Claire Harris) or to live export
- growing and conditioning young bulls for sale – as an alternative to finishing on grain (see Producer experience – Jonathon and Kerry Schmidt)
- as a protein supplement at a specific time of year, usually from autumn through to spring
- 'spike feeding' breeders, usually heifers, before calving.

These strategies assume that there is insufficient leucaena to feed the entire herd year-round and that maximum benefit is obtained by using the limited resource for the most valuable animals.

In all cases of occasional feeding of leucaena, cattle must be protected against mimosine or DHP toxicity.

High protein feed during droughts

Broadscale plantings of leucaena in Queensland have proven to be effective for drought and dry season mitigation.

Producers with substantial areas of leucaena have been able to survive recent severe droughts with their cattle in better condition than those of producers without leucaena. The 5–6m deep roots of leucaena allow it to produce some high-protein leaf during dry periods and so enables cattle to better digest poor quality grass roughage.

Drought, no grass but cattle maintaining body condition on leucaena

4.5 Producer experience – Darling Downs

Jonathan and Kerry Schmidt (Managers), 'Dalby Downs', Kaimkillenbun

Jonathon and Kerry Schmidt manage Burenda Angus & Brangus at 'Dalby Downs' producing 500 bulls each year from a breeder herd of 1,200 head. 'Dalby Downs' is run in conjunction with lease and agistment properties in western Queensland where breeders are run for eight months of the year (November to June)

'Dalby Downs' covers 3,030ha, with 1,095ha of leucaena, mostly cv. Tarramba but with small areas of Cunningham and Wondergraze.

They have 810ha of cultivation for oats for grazing, forage sorghum for silage and barley for hay with an additional 1,135ha of buffel, Rhodes and blue grass on basalt ridges.

Alluvial soils are heavy black cracking clay on flats and red clay soils on stony ridges. Average annual rainfall is 610mm. Low-lying areas are frosted in winter.

Establishing leucaena. Jonathan first planted leucaena on 'Dalby Downs' in 2005. He had difficulty with grass weed control when planting into cultivated strips but much better leucaena establishment with full paddock cultivation, careful seed bed preparation and total weed control. Soil fertility has been improved by the application of feedlot manure, sometimes at 15–16 t/ha.

As low temperatures and frost limit leucaena growth during winter, oats are sown for winter forage. Establishing leucaena on poorer box soil types is challenging as surface crusting affects water infiltration and seedling emergence. Psyllids can cause minor damage in March–April after wet summers.

Managing leucaena. All leucaena is planted in twin rows with Bambatsi, Rhodes and purple pigeon grass in the inter-row. Plant height is controlled by frost and by crash grazing with cows and calves.

Leucaena is usually rotationally grazed – with a silage ration supplied in the paddock to intensify production (increase stocking rate) and to maximise the return per hectare of land. The silage ration, which provides about 30% of the animal's diet, comprises silage, cotton seed meal, hay and grape mark. Oat crops are grazed during winter.

Recent droughts and poor summer rains have resulted in some set stocking and overgrazing of the leucaena, but it recovers quickly with spelling.

Cattle productivity. Once cows have calved, they are joined (AI) while on leucaena/silage. When pregnant they are sent to the agistment properties to graze improved grass pastures from November to June. Weaners are returned to 'Dalby Downs' in March and fed on leucaena/silage and then oats over winter before returning to leucaena/silage. Bulls are run on leucaena/silage and oats from weaning until sale.

Managing toxicity. Cattle were inoculated with the QDAF rumen bug and carrier animals are kept on leucaena; no symptoms of toxicity have been seen.

Although cows graze on leucaena during insemination and early pregnancy, pregnancy rates have been maintained at 91% constantly after a six-week joining period. Bulls grow out on leucaena for eight months of the year (on oats for the remainder) and have no fertility problems.

Productivity and the future. The high productivity of the leucaena pastures has justified the cost of establishment and maintenance.

Feeding leucaena with silage supplement has intensified production with more bulls being produced each year.

The leucaena pastures provide all cattle with a high plane of nutrition and maximise animal growth rates for herd data recording purposes.

4.6 Producer experience – central Queensland

Stuart and Sheree Ogg, 'Ingelara', Rolleston

'Ingelara' is a 7,280ha property near Carnarvon National Park, receiving annual rainfall of 750mm. The native pastures were black speargrass on deep loamy, well-drained creek flats leading into narrow-leaf ironbark ridges.

Establishment. Stuart established 445ha of Cunningham and Peru leucaena, starting some 30 years ago. Leucaena rows of 6–8m apart were generally planted into oat stubble in October-December, with another planting of forage oats between the leucaena rows in the winter of establishment. A further 240ha of forage oats are grown for winter fattening feed.

Weed grasses are controlled with fluazifop-p-butyl (Verdict®) and bentazone (Basagran®) for broad-leaf weeds.

Leucaena ready for grazing

Grazing system. Their grazing system comprises a 4-paddock-200-day cattle rotation, with the cattle moved when the paddock has been optimally grazed.

About 450 cross-bred steers (300–350kg) enter the system in November and gain 200–240 kg/head (1.0–1.2 kg/hd/day) over the 200-day grazing period.

When the leucaena is frosted (90%) around June, cattle are moved to oats at weights from 500–550kg and grazed until they reach slaughter weights of 560–600kg.

Weaner steers are rotated through frosted leucaena paddocks in winter and graze inter-row Callide Rhodes grass until spring.

The leucaena is rested in spring for 6–8 weeks to allow regrowth.

Frosted leucaena recovering in spring

Better stock and profits. Stuart and Sheree see that leucaena has transformed the property from speargrass country into sustainable, prime fattening country, and this has increasing the land value from $3,700/ha to $12,000/ha.

Establishment costs of leucaena in old cultivation land were $200–250/ha.

Fat cattle are now marketed under 24 months and average 300kg dressed weight with MSA grading, thus targeting premium EU and PCAS markets.

Limitations and challenges. Psyllid attack can significantly reduce leucaena production in the occasional humid years.

Any spread of leucaena into creeks and waterways is controlled with herbicide.

Future plans. The Oggs intend to expand the area under leucaena by planting psyllid-tolerant cv. Redlands.

Cross-bred steer fattened on leucaena

4.7 Producer experience – central Queensland

Paul and Clare Harris, Sunland Cattle Co Pty. Ltd.

Paul and Claire Harris own Sunland Cattle Co Pty Ltd., which operates two central Queensland cattle properties, totalling 18,176ha with annual rainfall averaging 640mm. They stock 10,000 full-blood and pure-bred Wagyu, employ embryo transfer and artificial insemination to improve herd genetics.

Paul began planting leucaena in the early 1990s and they now have 6,000ha. This forms an integral part of their beef business.

Establishing leucaena. While Paul initially planted single rows of leucaena in strips of pasture, he now ploughs whole paddocks and plants double rows 1m apart with a 6m inter-row. Seed is treated and beetle baits applied at planting to deter insects.

Spring plantings are preferred to avoid summer heat. Spinnaker® (700 g/kg imazethapyr) is applied in 3m strips to suppress grass growth. As its effect declines, buffel, green panic, Bambatsi panic, Urochloa and Rhodes germinate naturally.

Phosphorus fertiliser will be applied where soil tests indicate deficiency.

Cv. Tarramba was used but because it grows tall, other cultivars will be planted in the future.

Managing leucaena. Plant height has been controlled using a large mulcher but Paul's philosophy is: "When cattle eat the leucaena we make money; when we mulch it, it costs us money".

Heavy duty mulcher for cutting back excess leucaena growth

Cell grazing (high intensity-short duration grazing) will now be used to control excess height and to allow pastures to recover.

Cattle productivity. Leucaena has increased carrying capacity, weight gains and the high marbling score of the Wagyu.

Wagyu cattle grazing leucaena

All categories of cattle graze the leucaena pastures including:

- stud bulls and feeder steers (400–450kg) which reach target weights quickly at reduced age
- young heifers which reach the desired mating weight of 300kg early
- cull females, bulls, cows and calves.

At first, some cattle showed symptoms of mimosine toxicity but there has been no problem since dosing with the 'rumen bug'.

Psyllids have not been a significant problem.

Future plans. Leucaena is essential to their future operation. It greatly increases carrying capacity and rate of turnoff and profitability.

We have the soils, climate, equipment, staff and know-how to establish more leucaena but will not proceed until they are confident that they can manage it in accordance with The Leucaena Network Code of Practice.

Aerial view of some of the leucaena area