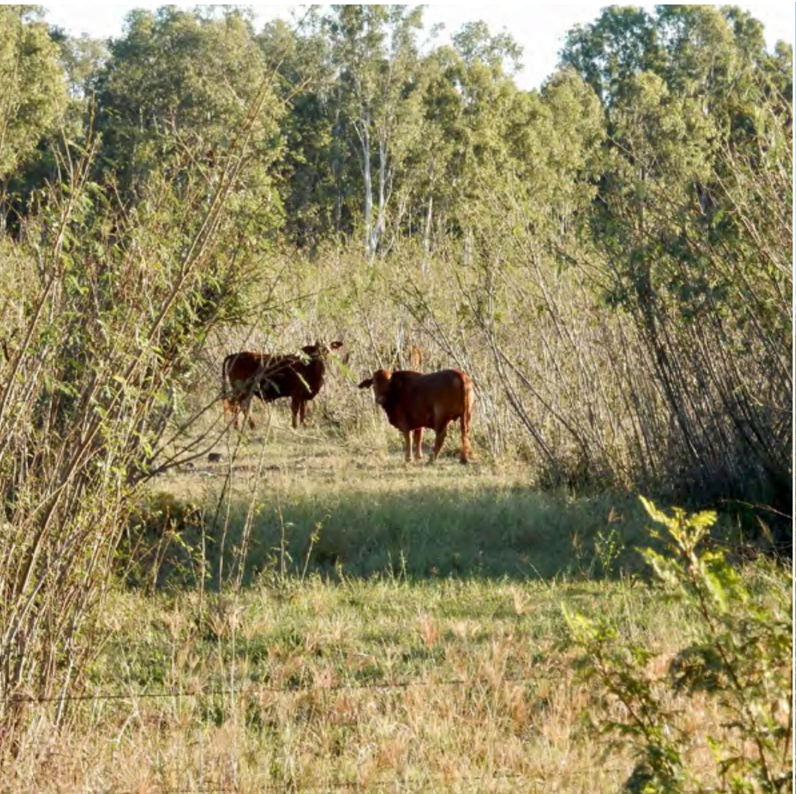
3. Managing the leucaena plant



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3. Managing the leucaena plant

3.1. Mineral nutrition

If cattle are to achieve their maximum weight gains from leucaena, the plants must also be growing to their full potential.

Most leucaena is planted on fertile soils without fertiliser and it is generally assumed that it will look after itself; but this is not the case.

Soil fertility depletion

Soil types suitable for leucaena can have different levels of fertility. Alluvial and clay soils contain higher levels of plant nutrients than those of sandier texture. Some red basalt soils chemically bind sulphur (S) so that it is not available to plants.

Previous paddock management may determine soil nutrient availability when establishing leucaena.

Large areas of marginal farming cultivation have been converted to leucaena pastures. This country was often not fertilised and nutrients have been depleted under cropping. If fertiliser is not applied when planting leucaena, P and S can soon become deficient.

Under intensive grazing of leucaena pastures, large amounts of soil nutrients are removed in animal weight gain or relocated from the paddock in excreta, further accelerating the onset of plant nutrient deficiencies (Table 3.1).

Table 3.1. Amount of plant nutrients removed or relocated from leucaena paddocks in animal live weight gain and excreta

Nutrient	Amount of nutrient removed from paddock (kg/ha)			
	5 yr	10 yr	20 yr	30 yr
Phosphorus	38	76	152	228
Potassium	8.5	17	34	51
Sulphur	10	20	40	60
Calcium	48	96	192	288
Magnesium	3	6	12	18

Nutrient deficiencies of P and sometimes S were observed on six out of eight properties in one study. The deficient leucaena had lower forage yield and lower protein content due to suppressed N fixation by *Rhizobium* bacteria.

Some leucaena pastures planted on old cultivation that had been cropped for more than 20 years were nutrient deficient three to five years after establishment. The symptoms and lost production were not obvious to the producers involved.

Plant nutrient status should be monitored every three to five years by testing the soil and leucaena leaf for P, K, S, calcium and magnesium.

Pale young leucaena leaves indicate sulphur deficiency on a basalt soil in north Queensland.

Soil testing

When planning a leucaena development, soil fertility should be tested before planting. Soil testing is typically limited to the surface 0–10cm layer of the soil from which leucaena seedlings will extract the plant nutrients required to support their early growth. But deeper testing might expose other limitations.

Identifying these deficiencies can decide the formulation and application of ‘starter’ fertiliser to promote early leucaena growth and effective nodulation with *Rhizobium* bacteria for N fixation.

Specific critical soil nutrient levels have not been developed for leucaena, but those developed for lucerne are a good guide. Analytical laboratories usually provide benchmark comparisons to determine the soil nutrient status.

Monitoring nutrition of established pastures by leaf testing

Testing soil to determine the nutrient status of established leucaena pastures is not recommended; small soil samples from 10cm or 30cm depth are not representative of the large volume of soil exploited by the extensive root system of leucaena.

Although leucaena roots can reach five metres out from the hedgerow and to four metres depth, most are concentrated in the top one metre of the soil profile. Soil nutrients in grazed pastures are unevenly distributed due to dung and urine patches.

Leaf tissue testing is the preferred method of determining plant nutrient status of established plants. The nutrient concentrations of specific leaves are compared with the benchmark figures required for optimal plant growth (Table 3.2). Fertiliser applications should be based on this and soil nutrient sampling.

How to sample leaf tissue

Index tissue – The youngest fully expanded leaf is the index tissue collected for plant nutrition testing. These are the youngest leaves (i.e. located closest to the stem tip) that have reached full size (similar to leaves lower down the stem). Often this is the 4th or 5th leaf from the stem tip. If in doubt, always take the next oldest leaf.

Leaf sampling protocol – Youngest fully expanded leaves should be collected from at least 30–40 different plants that represent the average performance of the paddock, or from the patch of poor performing leucaena.

Collecting another sample from an area of leucaena that appears to be healthy and growing vigorously can be used for direct comparison with the unthrifty plants.

- Avoid sampling leaves from trees along the edges of the paddock. Move in at least four rows.
- Leaf samples should be either air-dried (in a place free from dust or soil contamination) or oven-dried (fan forced oven) at temperatures below 60°C with the oven door left ajar. Dried samples can then be provided to laboratories for analysis.

Sampling conditions – collect the youngest fully expanded leaves only from actively growing leucaena that is free from any growth impediments. Samples should be collected:

- during November-April to avoid cold temperatures that limit plant growth
- following a significant amount of rain (or when adequate soil moisture is present) so that water stress is not limiting nutrient uptake and plant growth
- in periods free from psyllid attack
- when the plant is in a state of active vegetative growth, avoiding periods of heavy flowering, seed set or pod production.

Critical concentrations of plant nutrients

Leaf tissue concentrations of essential plant nutrients provide a reference point; lower levels will result in poorer yield (Table 3.2). Critical concentrations for macronutrients are expressed as % dry matter and micronutrients as mg/kg dry matter.

Comparing the concentration of nutrients in your leaf samples with the critical concentrations will identify if any nutrients are marginal or deficient.

Scheduling leucaena leaf tissue sampling

Monitoring plant nutrition should be part of routine leucaena pasture management.

Leaf tissue should be sampled within three to five years of establishment, followed by repeat sampling every two to three years to determine when maintenance fertiliser application is required. The frequency of ongoing monitoring can be determined by leucaena plant nutrient status and grazing management.

Table 3.2: Critical nutrient concentrations in youngest fully expanded leaves of actively growing leucaena

Macronutrients (%)	Deficient	Marginal	Adequate	High	Toxic
Nitrogen (N)	<3.5	3.5–4.0	4.0–4.5	>4.5	
Phosphorus (P)	<0.18	0.18–0.20	0.20–0.28	>0.28	
Potassium (K)	<0.8	0.8–1.0	1.0–2.0	>2.0	
Sulphur (S)	<0.20	0.20–0.24	0.24–0.30	>0.30	
Calcium (Ca)	<0.30	0.30–0.40	0.40–1.50	>1.50	
Magnesium (Mg)	<0.18	0.18–0.20	0.20–0.30	>0.30	
Ca:Mg ratio			>2		
Micronutrients (mg/kg)					
Aluminium (Al)			1–100	>100	
Boron (B)		<20	>20	<40	
Copper (Cu)		<2	2–10	>10	
Iron (Fe)	<20	20–40	40–100	>100	
Manganese (Mn)			20–100	100–325	>325
Sodium (Na)			>20		
Zinc (Zn)	<8	8–12	12–24	>25	

If some nutrients are deficient (or marginal), apply fertiliser and repeat sampling the next year after a good wet season to check the results. Do not sample in drought conditions. Plants need rainfall to take up the applied nutrients.

Remedying nutrient deficiencies

From the results of the leaf analysis, an agronomist can formulate fertiliser applications to address any macro or micro nutrient imbalances.

The major nutrient deficiencies likely are P and/or S. Both elements are in single superphosphate (9% P plus 10% S). Although many legumes also need molybdenum (Mo) for good N fixation, critical concentrations have not been developed for leucaena. Trace nutrients can be supplied in fortified superphosphate, for example superphosphate Z (with zinc).

The type and rate of fertiliser can be formulated from the leaf tissue analysis and soil sampling. Test strips of fertiliser can be applied to the paddock and plant growth monitored to confirm any response.

Maintenance fertiliser applications

Healthy leucaena pastures require maintenance applications of fertiliser to replace moved and removed nutrients and to sustain high levels of production. Maintenance fertiliser can be applied every three to five years.

Fertilising the grass

Although leucaena does fix significant quantities of N each year (typically 100–200 kg/ha/yr), only a small proportion (10–20%) is cycled to the companion grass.

All tropical grasses need high and sustained nitrogen supply, the amount needed will depend on rainfall and target production level. Applying N fertiliser could optimise grass performance in high rainfall areas (more than 900mm annual rainfall), or for irrigated pastures where more intensive production and higher stocking rates are required.

Grasses may also respond to phosphorus and potassium fertiliser on less fertile soils.

Methods of fertiliser application

Broadcast spreading – will apply fertiliser to both the leucaena and the grass pasture. Surface applied fertiliser will not be effective until adequate rainfall dissolves the nutrients and carries them into the soil profile where they can be accessed by plant roots.

Incorporation – uses mechanical cultivation to mix the fertiliser into surface soil. This can bring the fertiliser into direct contact with plant roots, accelerating growth response following rainfall.

Broadcasting fertiliser to the leucaena rows

Incorporating fertiliser also reduces nutrient losses by volatilisation and dissolution/erosion in runoff water.

Band application – targets the delivery of nutrients to the leucaena roots by applying fertiliser in a concentrated band (usually at depth in the soil) adjacent to the hedgerows. Banding fertiliser can increase nutrient availability in soils that chemically bind phosphorus or sulphur in forms that are not accessible to the plant. Band application also reduces nutrient losses.

Lime requirements

Lime application is only required to address acidity in soils with pH<5.5, and these are generally unsuitable for leucaena.

As lime has limited mobility within the soil, surface-applied lime is best incorporated by cultivation.

3.2. Height management

To optimise beef production and minimise environmental concerns, leucaena hedgerows should be maintained with a dense leaf canopy within browse height.

Excessive growth of woody stems can reduce the amount of leaf growth. Leucaena plants should be prevented from seeding as flowering and seed production also reduce leaf growth.

Light early grazing when leucaena reaches 1.5m in height (usually 6–12 months after planting) will encourage prolific branching and maximise future leaf production. In subsequent years, high grazing pressure, achieved by high-intensity short-duration rotational grazing, with strategic cutting as necessary, will manage hedgerows at a desirable height of 2–3m. Frost damage can also control plant height.

For the best productivity, leucaena should be kept within browse height.

Controlling height of leucaena

A leucaena canopy above browse height may shade grasses excessively, especially in narrow row spacings, and so weaken the grass.

The height of leucaena hedgerows can be controlled by:

- planting in twin rows to reduce the size of individual plants
- high-intensity short-duration rotational grazing
- increasing the number and size of grazing animals. Large animals such as bulls can break down stems 4–5m high after fattening steers have eaten all leaf within reach. Lactating cows, with their high nutritional need, pull down high stems to reach leaf at the tips.
- slashing or cutting when too many plants are beyond reach of stock or after seed harvesting. Large trees will need to be cut back with a heavy-duty slasher.
  Slashing which lacerates and splits stems will promote more budding and regrowth branches than a clean cut.

Slashing leucaena to control height. Lacerated and split stems regrow well from multiple bud sites.

Large animals, especially lactating cows, will pull down stems four metres tall.

How high and when to cut

Regrowth of leucaena is maximised after cutting when:

- cutting heights of 0.5–1m maintain numerous residual active buds and sprouts.
- there is residual leaf for photosynthesis.
- residual stems and root systems are strong.
- there is ample soil moisture.

Leucaena regrowth after cutting

Cut leucaena to manage grazing height only when there is adequate soil moisture and a high enough temperature for rapid regrowth. Trees may die if cut when the soil is waterlogged or be severely weakened if cut during drought.

Height management

- Practice intensive rotational grazing.
- Use large animals to break down tall stems.
- Slash if many stems too tall for cattle.
- Slash at a height of 0.5–1m.
- Cut only when soil moisture is adequate for rapid regrowth.

Contact The Leucaena Network for available slashing contractors in your area.

3.3. Psyllid insects

Damage by psyllids

The leucaena psyllid (*Heteropsylla cubana*) damages plants when both nymphs and adults feed by sucking sap from the developing shoots and young foliage. Heavy infestations defoliate the plant and stop growth.

Psyllid attack on growing tips of leucaena prevents new growth.

Older leaves are less directly damaged but can be covered in sooty mould.

Where psyllids have been active, there may be no new leaf growth for up to 30cm from the stem tip, representing a loss of several weeks or even months of growth.

Quantifying the damage caused by the psyllid is difficult, but most commercial planting of leucaena has been restricted to areas with 600–800mm rainfall because of potential psyllid damage. Even in these subhumid inland regions, uncontrolled psyllids can reduce production by 20–50% and in humid coastal regions by 50–80%.

Options for combating psyllids

Only plant susceptible leucaena varieties in subhumid environments (less than 800mm rainfall) where psyllid attack is less frequent and severe.

Cultivars Tarramba and Wondergraze have superior psyllid tolerance than Cunningham and Peru, and respond better under occasional psyllid attack.

Use more tolerant varieties – Use only the psyllid-tolerant cv. Redlands when planting leucaena in humid (>800+mm annual rainfall) coastal environments.

Note that cv. Redlands is described as psyllid tolerant. It is not resistant and can still be damaged by severe psyllid attack.

Do nothing – Although some forage production is lost for a time, environmental conditions change and the psyllids disappear. Drought and frosts lead to leaf drop and reduction in psyllid populations. Very heavy rain (or overhead irrigation) and hot, dry winds will also reduce psyllid populations.

Fertilise rundown leucaena – Leucaena plants under nutrient stress are more prone to psyllid attack and suffer a greater degree of damage. Applying fertiliser improves plant health and minimises susceptibility to insect attack.

Spraying insecticide – The psyllid is readily killed by low doses of several insecticides. Dimethoate, a systemic insecticide, is registered for use on leucaena, and provides effective control for up to 3–4 weeks.

Producers must strictly observe the correct withholding period before grazing to ensure pesticide residues are not present in the foliage eaten by stock.

Insecticide use is warranted to protect establishing leucaena and high-value seed crops.

Grazing management – Some producers graze their leucaena heavily as soon as the psyllid populations build up in an attempt to remove their feed source and break the population cycle. However, psyllids will generally remain in high numbers as the plants regrow.

Biological control – In any environment, there will be some predators that feed on one or more stages of the life cycle of the psyllid; Natural predators effectively control psyllids in its native habitat in Central America.

In Australia, the larvae of the common ladybird beetles are good predators but are unable to keep psyllid populations under control in commercial leucaena pastures.

Plant breeding – An MLA-supported breeding and selection project with the University of Queensland has developed the psyllid-tolerant cultivar Redlands from the hybrid between two leucaena species *L. leucocephala* and *L. pallida.*

This breeding program is described in detail in Chapter 2.

The psyllid insect

The leucaena psyllid (*Heteropsylla cubana*) is a small yellow-green insect 1–2mm long. It is native to Central America and the Caribbean where it has presumably co-existed with leucaena for thousands of years.

Although it has been reported to occur on a few other leguminous shrubs and trees, these are not damaged to any great extent and it is probable that the psyllid can only complete its life cycle on plants in the genus *Leucaena*.

The psyllid first became a problem on experimental plantings in Florida in 1983. From there, it spread rapidly throughout the tropics and subtropics and is now present in all areas where leucaena is grown.

In Australia, following the first recording at Bowen in north Queensland in April 1986, the insects spread 800km to Gympie within three months, and by mid-October had reached Brisbane.

The extremely rapid rate of spread suggests that air currents (including high-level winds and cyclone activity) are largely responsible for their dispersal. It is not uncommon to find psyllids on isolated stands of leucaena.

Life cycle

Female psyllids lay up to 400 eggs on very young shoots where they are lodged between the folds of the developing leaflets. Eggs hatch in 2–4 days, and through five nymphal stages, become adults 10–16 days later, depending on climatic conditions. The nymphs rapidly become mobile and congregate in large numbers on the growing points of young shoots. Populations can build up extremely rapidly, producing many generations in a year.

In the field, psyllid populations normally fluctuate widely over time. Peak numbers of nymphs tend to occur soon after rain but are affected by humidity and plant nutrient status, leucaena stand density, and exposure to wind. Management that maximises forage production (i.e. abundant young leafy growth) greatly increases psyllid numbers.

In Queensland, psyllid numbers are highest during the wet season whereas in South-East Asia they are most abundant at the end of the monsoon season and early dry season. The build-up of psyllid populations is reduced by periods of sustained intense rain (or irrigation) or one or two days of hot, dry (35+°C) temperatures. Frost will kill psyllids (but also the leucaena).

3.4 Other insect pests

Long soft scale

The long soft scale insect (*Coccus longulus*) is a periodic pest of leucaena in central Queensland. Adult scale insects are 4–6 mm long and congregate on the stems and leaf petioles on leucaena plants.

Heavy infestation of soft scale on leucaena

Heavy infestation retards plant growth as the insects suck sap; photosynthesis is reduced by sooty mould that grows in the honey dew excreted by the scale insects and deposited on the lower leaves. Trees suffering scale insect attack typically have black stems covered in sooty mould.

The life cycle of this insect is typically 2–3 months. Females give birth to live young called 'crawlers' that disperse and infest younger plant stems. Four to six generations can be completed in one year.

Cutting/mulching leucaena for height control kills established infestations and breaks the pest's lifecycle. As with psyllids and other insect pests, scale insects often attack rundown leucaena and overcoming plant nutrient deficiencies will enhance plant tolerance.

No chemicals are currently registered for controlling soft scale on leucaena. For other crops, long soft scale can be controlled by applying white oil (for citrus at 2L/100L water) and methidathion EC 400 g/L (for trees/shrubs, macadamias, custard apples at 125mL/100L water). Best control is achieved by spraying at the insect's 'crawler' stage. Scale insects are sedentary (they do not move) so good coverage with sprays is required to give adequate control. White oil has been found to be phytotoxic on young leucaena growth in glasshouse trials. Both these chemicals should be tested with caution.

Certain ants will climb leucaena plants seeking the sticky exudate of scale insects. They protect the scale from predators and spread the sooty mould. Controlling ants can reduce scale infestation.

A common ant bait used in citrus orchards to reduce scale infestations can be made as follows:

- mix 25kg polenta + 2.5kg Cerevite in a cement mixer
- separately mix 150mL food colour + 50mL fipronil SC 200 g/L + 800mL water
- spray 500mL of corn oil evenly into the corn mix in the cement mixer
- spray the coloured fipronil solution as a fine mist onto the grain while mixing.

Apply ant bait at 2.5 kg/ha by fertiliser spreader.

Note: These chemicals and baits are not registered with the APVMA for use on leucaena. Use at your own risk and be aware of withholding periods before grazing treated plants.

Stem borers

Stem borers can attack severely rundown leucaena – older stands that have never been fertilised, annually frosted with regular heavy grazing of the young regrowth. Borer damage is opportunistic and is rarely seen in vigorous healthy leucaena stands.

Stem borers can attack run-down leucaena.

Identifying and applying the nutrients deficient in the leucaena stand, and allowing more time for recovery of heavily frosted leucaena, are the best remedies for stem borer attack, Temporarily removing grass competition (e.g. by cultivation or selective herbicide) for soil water can speed the recovery of rundown leucaena.

Thrips

Thrips have been a periodic pest on leucaena grown in the Ord Irrigation Area of north-west Western Australia. They damage plant growing points during pasture establishment and regrowth after grazing. They have not been observed as a pest of leucaena in the eastern states.

3.5. Irrigating leucaena

Irrigation can have a large impact on the productivity of leucaena systems. It promotes higher productivity, allows increased stocking rates, improved reliability, flexibility in marketing finished cattle and more accurate budgeting of costs and returns.

A number of producers have established irrigated systems in Queensland, predominantly using centre-pivot and flood irrigation.

Some of the technologies discussed earlier for dryland leucaena do not necessarily apply to irrigated leucaena; different establishment and management issues may be appropriate but knowledge is still far from complete.

Planning an irrigation development

Irrigation is expensive and must ultimately be profitable; irrigated leucaena pasture systems must be planned carefully.

Production objectives need to be clearly defined, and may include:

- maximising forage production and balancing leucaena and grass forage available
- maximising animal output and profitability from the land and water resources available
- targeting particular high-value markets such as feeder steers for feed lots, or finishing for slaughter.

The layout of paddocks must consider efficient water delivery and animal management; cattle may need access to adjacent 'dry' pastures when irrigated paddocks are waterlogged, and extra grass forage may be needed to complement the high leucaena production. It is recommended to locate stock watering points outside irrigated paddocks to aid mustering.

Irrigation water quality is important; leucaena can tolerate overhead irrigation with water of salinity (electrical conductivity) 2–3 decisiemens dS/m without suffering foliar damage. However, if the water contains salts, an adequate leaching fraction is required to ensure soil salinity does not build up over time. Leucaena is moderately salt tolerant, but plant yield decreases when soil salinity (of a saturated soil paste) exceeds 4.5 dS/m.

Establishing irrigated leucaena

Cultivar selection is important. Branchy cultivars such as Cunningham and Wondergraze are better for ease of height control rather than arboreal Tarramba; cv. Redlands is recommended for high psyllid environments.

In northern Queensland, planting early in the dry season (April), frost and temperature permitting, will allow stricter control of the amount of water applied; this will avoid seedlings getting waterlogged if heavy rain follows irrigation. On loamy soils, planting in cool seasons prevents the seedlings getting burnt by high soil surface temperatures in summer.

Row spacing will depend on whether grass production is required to supply additional energy and fibre to support higher stocking rates within the irrigated paddock.

A strong grass sward that contributes to the diet uses fixed nitrogen and reduces the incidence of cattle bogging in wet conditions. Row spacings over 5m, similar to dryland leucaena, have been used to promote stronger grass growth.

Narrow row spacing (less than 4m) inhibits the establishment of a productive inter-row grass. Supplementary roughage (hay) and energy (grain or molasses) may need to be fed or adjacent grass pastures grazed in conjunction with the irrigated leucaena.

Higher seeding rates (up to 4 kg/ha) are used to achieve dense plant populations within spaced double leucaena rows. Stands with mature plants spaced approximately 15cm apart produce many fine stems and a high proportion of leaf. Seed can be planted at a shallower depth for rapid germination as irrigation can keep the surface soil moist.

Soil, insect and weed management are still of prime importance during establishment.

Effective weed control improves water use efficiency. The same herbicides used for dryland leucaena are effective for irrigation systems although pre-emergent herbicides may be less effective if overhead irrigation leaches the active ingredients from the soil profile. Mechanical methods of weed control can also be used, although not on flood-irrigated heavy clay soils.

Inter-row grass species such as bambatsi, Callide and Finecut Rhodes, Gatton panic and creeping blue grass have been used successfully in Queensland. The selected species must be able to tolerate heavy grazing and soil compaction under high stocking rates. Grass establishment practices are similar to those for dryland leucaena.

As large amounts of soil nutrients are removed in animal live weight, soil fertility (P, S, K, Zn or Mo) should be monitored every two years. Regular application of fertiliser should be economically viable due to the higher level of productivity. At wider row spacings, the inter-row grass can be fertilised (e.g. with N and P) to optimise growth and water use efficiency.

In subtropical areas, winter forage crops (oats, rye grass and medic) are occasionally sown in the interrow to provide forage while leucaena growth is constrained by frost and low temperature.

Pivot irrigation of leucaena at Gogango

Water management

Irrigation management should aim to maximise economic returns per megalitre (ML) of water through strategic water application. Irrigators report using 3–4 ML/ha/year over 3–5 applications.

Spray systems give better and more even water application than flood irrigation and reduce the need for land levelling.

Both pivots and guns, and even hand-sets, have been used to deliver water during establishment. Drip irrigation systems have been used short-term to establish leucaena and boost early production, and longer-term for high value seed crops.

In Queensland, furrows for flood irrigation vary in length from 500 to 2,000m, with a maximum of 1,000m now recommended. Furrows can be damaged by cattle tracks which divert water and cause uneven watering, while grass in the furrows slows the flow of water. Furrows or bays require maintenance every one to two years to deliver uniform water flow and optimise irrigation efficiency. Irrigating alternating furrows has proved just as effective as irrigating every furrow while halving water use.

Flood irrigation at Home Hill

Leucaena is sensitive to waterlogging and will often die out where surface water fails to drain rapidly. Flood-irrigated paddocks need laser-levelling and may require more than one levelling operation as settling commonly occurs where fill is deposited.

Planting an annual crop between the first and second levelling operations will give best results. Length of irrigation run must match soil type so that blocks can be wet up over a 12–24 hour period. Tail drains and furrows should be regularly maintained to distribute water evenly and to remove excess water rapidly out of the paddock.

Irrigation water is normally applied immediately after a paddock has been grazed. The pasture is then spelled for 6–8 weeks to recover before being grazed again. In central and southern Queensland, heavy irrigation of inter-row winter forages reduces evaporative water loss and water not used by the crop replenishes subsoil moisture ready for leucaena growth in spring and early summer.

Grazing management

In north Queensland, irrigated leucaena pastures are spelled during the wet season (December-March) to avoid soil compaction and pasture damage. Animal performance also declines under the high temperature and humidity between the hedgerows and with muddy conditions reducing grazing time and feed intake.

Stock are rotationally grazed, with grazing periods ranging from 10–28 days to maintain the vigour and productivity of the grass. In Queensland, stocking rates can be 5 hd/ha.

Feeding supplementary roughage and energy (grain, molasses, hay, silage or adjacent grass pasture) may be required to make efficient use of the leucaena protein source if insufficient grass is grown in the pasture.

Steers fed roughage grass hay as supplement to irrigated leucaena

Height management

Vigorous leucaena under irrigation may need more regular slashing, even when using rotational grazing systems and high stocking rates for short periods. Wet season spelling in north Queensland allows leucaena to grow too tall.

Slashing stems of plants growing on waterlogged soil, due to over-watering, in the Ord River irrigation scheme in Western Australia, resulted in root rots leading to plant death. ‘Leucaena dieback’ caused by a crown rot (*Pirex subvinosus*) became common in stands of irrigated leucaena in the late 1990s, and spread from localised infection points at the rate of about a metre a year. *Pirex* may not become a management issue for irrigated leucaena in Queensland, as less water is applied.

3.6. Producer experience – irrigating leucaena in the Burdekin

Don, Laurel, Peter and Scott Heatley

Don, Laurel, Peter and Scott Heatley run 8,000 head in an integrated breeding and fattening operation across 27,000ha in north Queensland. They have developed 500ha of leucaena under flood irrigation on 'Byrne Valley', 44km south of Home Hill.

Don says, "Initially we were hesitant about planting leucaena as we were cattle producers not farmers". However, after inspecting irrigated leucaena pastures in the Ord River Irrigation Area at Kununurra, he was convinced that irrigated leucaena was the intensive fattening system that his operation needed.

Establishment. Their first leucaena paddock, a converted rice paddy, was planted in 1998. Soils are sandy loams on the river levee and heavy cracking clays on the flood plain. Most paddocks are about 80ha (2000m long x 400m wide) and were laser-levelled with a fall of 0.1%. A deep V-shaped furrow maintains fast irrigation water flow with cv. Cunningham leucaena planted in twin rows on the raised beds 4m apart.

Leucaena is planted during the early dry season (late April/early May) under irrigation. Wet season plantings have failed because, under heavy rainfall, soil crusting prevented seedling emergence. Weeds are controlled with selective herbicide applications (usually twice) as cultivation is not possible on the wet clay soils. Rhodes grass has colonised the inter-rows.

Irrigation. Originally every inter-row was flood irrigated from two pumps lifting water (150 L/s) from the adjacent Burdekin River. Now irrigation water is applied to every second inter-row as a fast flush on an alternating basis. This has improved water use efficiency (halved water and power usage) whilst maintaining forage production.

Leucaena paddocks are irrigated immediately after grazing and each paddock typically receives 4–5 applications per year delivering a total of 4–5 ML/ha/yr depending upon rainfall. Furrows are delved every four years to maintain consistent fast water flow.

Management. Maintenance fertiliser (44 kg/ha P and 55 kg/ha S) is applied every 4–5 years. Psyllids cause significant damage periodically and future plantings will use psyllid-tolerant cv. Redlands. Despite intensive rotational grazing, hedgerows have to be cut back every 4–5 years.

Cattle are removed from the leucaena paddocks during the wet season to avoid pasture damage and graze adjacent improved stylo/grass pastures.

Paddocks are rotationally grazed during the dry season only (April-November) at an effective stocking rate of >20 livestock unit (AE/ha. The leucaena is spelled for 5–6 weeks before being grazed again.

The Heatleys produce Rhodes grass hay which is fed ad lib as a source of roughage with cattle eating about 5 kg/hd/day. Molasses is fed (2 kg/hd/d) as an energy supplement.

Production and marketing. Growth rates are 0.9–1.4 kg/day totalling a live weight gain of 1000 kg/ha/yr from the leucaena pastures.

Steers are sold direct to meat processors supplying export markets in Japan, Korea and USA at 630–670kg live weight (340–360kg carcase weight) at 24–26 months of age. This leucaena feeding system has halved the age to turn-off compared with grass-only pastures.

The quality of the finished cattle has improved giving the Heatleys flexibility to target premium markets. The irrigated pastures have enabled finished cattle to be sold throughout the dry season when supply is short and prices high. Irrigation has also reduced the impact of seasonal conditions on production, guaranteeing income and profit security.

Lessons learnt. Despite many challenges, the Heatleys have developed a method of establishing leucaena under flood irrigation. Lessons learnt include:

- deep rip ground under beds before planting
- do not plant in the wet season
- do not plant seed too deep
- keep grass competition away from young leucaena
- maintain a consistent irrigation schedule (do not rely on rainfall)
- maximise leucaena production within the irrigated area; provide roughage (grass or hay) and energy supplements outside the paddock
- always locate stock water for cattle outside leucaena paddocks.

Future plans. The Heatleys plan to develop another 800ha of irrigated pasture, planting cv. Redlands and reducing inter-row spacing to 2m to maximise leucaena production and control shrub height. Water will be delivered by an underground pipe network rather than through fluming.