final report

Project code: E.PDS.1308

Prepared by: David J Hickey
Department of Agriculture and Fisheries

Date published: 5 November 2015

PUBLISHED BY
Meat and Livestock Australia Limited
Locked Bag 991
NORTH SYDNEY NSW 2059

PDS to test and demonstrate establishment techniques and quantify productivity on commercial scale Leucaena in QLD

Meat & Livestock Australia acknowledges the matching funds provided by the Australian Government to support the research and development detailed in this publication.

Executive Summary

With the mutual consent of the Department of Agriculture and Fisheries (DAF), Meat and Livestock Australia (MLA) and the co-operators (demonstration site hosts) of, this project was terminated at the completion of Milestone 4. As at the completion of Milestone 4, there were little to no established plants present in the plots and in the reasonable opinion of MLA and DAF it was anticipated that the project would be unable to meet the objectives by 20 December 2015.

This early termination was agreed upon due to significant challenges with plant germination and establishment, primarily attributed to adverse seasonal conditions over the several years of the project.

This project was commenced in summer of 2012.

The Mackenzie River CQ BEEF Group identified that nutrient rundown in pastures is impacting productivity, and believe integrating Leucaena into the pasture system is a long term solution. However, they question the traditional paradigms of Leucaena production and proposed to investigate, through practical demonstration of a range of establishment techniques, the impacts on the resulting productivity from Leucaena/pasture system.

This PDS project aimed to demonstrate and investigate, on-farm, the impacts, both physical and economic, of land preparation and planting techniques (row spacing and configuration [single versus twin], and seeding rate) on the productivity of dry land Leucaena in a Buffel grass pasture.

The site hosts, , aimed to plant 40ha of Leucaena (twin row, with 12m spacing) in the summer of 2012/13, and this PDS project aimed to piggy-back on this venture. As a result of being approached by the group to host this project, the site hosts volunteered to plant a further two by 20ha of Leucaena at 6m and 18m row spacing.

The project aimed to monitor and analyse soil, plant and animal nutrient effects and economic outcomes. Due to the fact that weaners, first introduced into the Leucaena in the first year of this project, would not have been turned off until a few months prior to the end of the project, it was intended to apply for a follow-on PDS project after this one to be able to fully evaluate the economics of each of the row spacing's.

The project was terminated before any of the aimed demonstration and investigation took place. Although the original intent of the project did not eventuate, there are some significant learnings, documented in the Discussion section of this report.

Table of Contents

1 Background

Many graziers believe establishing Leucaena is 'too hard', 'too risky' or 'should only be done with cropping experience'. Some also question the 'grass/Leucaena' balance recommendations and the cost/benefits of fertilizing. This PDS project aimed to demonstrate that if important yet simple principles are followed, the risk and productivity of Leucaena can be vastly improved leading to enhanced enterprise profitability and sustainability.

Beef producers in the Central Highlands, involved in the CQ BEEF project from 2007-2010, undertook annual, comprehensive business and situation analyses to identify scope for improvement in their businesses. The key finding of these annual analyses (as resolved by the Mackenzie River CQ BEEF group), was the need to increase turnover and/or enterprise scale. Due to declining productivity of pastures from nutrient rundown, improved resource use efficiency through the utilisation of higher protein pasture systems is a solution to this need. A number of the CQ BEEF groups participating in the CQ BEEF project, 2007-2010, identified the need to investigate the opportunities with Leucaena being a high protein fodder source to complement existing pasture systems.

The Mackenzie River CQ BEEF Group (for further information on the background of the Mackenzie River CQ Beef Group see appendix 9.1) resolved during the course of the CQ BEEF project, 2007-2010, that nutrient rundown in pastures is impacting productivity, and believe integrating Leucaena into the pasture system is a long term solution. The group proposed to investigate, through practical demonstration of a range of establishment techniques, the impacts on the resulting pasture system.

Extensive areas of Leucaena have been sown in central Queensland. This experience, along with the comprehensive 'Leucaena for Sustainability and Profitability' courses, delivered by Professor Max Shelton of Central Queensland University, on behalf of The Leucaena Network, Queensland, has produced significant amounts of knowledge. Due to advancement in production technologies for the establishment of Leucaena, producers are challenging the traditional paradigms associated with these practises, particularly establishment techniques, planting configurations (row spacing and arrangement) and seeding rates. These factors are critical to the successful establishment and profitability of Leucaena; get these wrong and the producer faces either costly replanting, or significantly reduced production and longer investment rate-of-returns.

This PDS project was about demonstrating the principles and quantifying the productivity impact of Leucaena using on-farm demonstration, to promote and assist producers to successfully integrate Leucaena into their pasture systems. PDS host's aimed to plant 40ha of Leucaena in summer of 2013, and this PDS project aimed to piggy-back on this venture. As a result of being approached by the group to host this project, the site hosts volunteered to plant a further two by 20ha of Leucaena at 6m and 18m row spacing. It has been the hosts assessment that a row spacing of less than or greater than 12m spacing can lead to pasture/grass production efficiencies, which is critical for a sustainable pasture system.

The project aimed to monitor and analyse soil, plant and animal nutrient effects and economic outcomes. Due to the fact that weaners, first introduced into the Leucaena in the first year of this project, would not have been turned off until a few months prior to the end of the project, it was intended to apply for a follow-on PDS project after completing this one to be able to fully evaluate the economics of each of the row spacing's. This did not eventuate as the project was terminated.

Host property is situated approximately 38 kilometres NNW of Dingo and 39 kilometres NE of Blackwater.

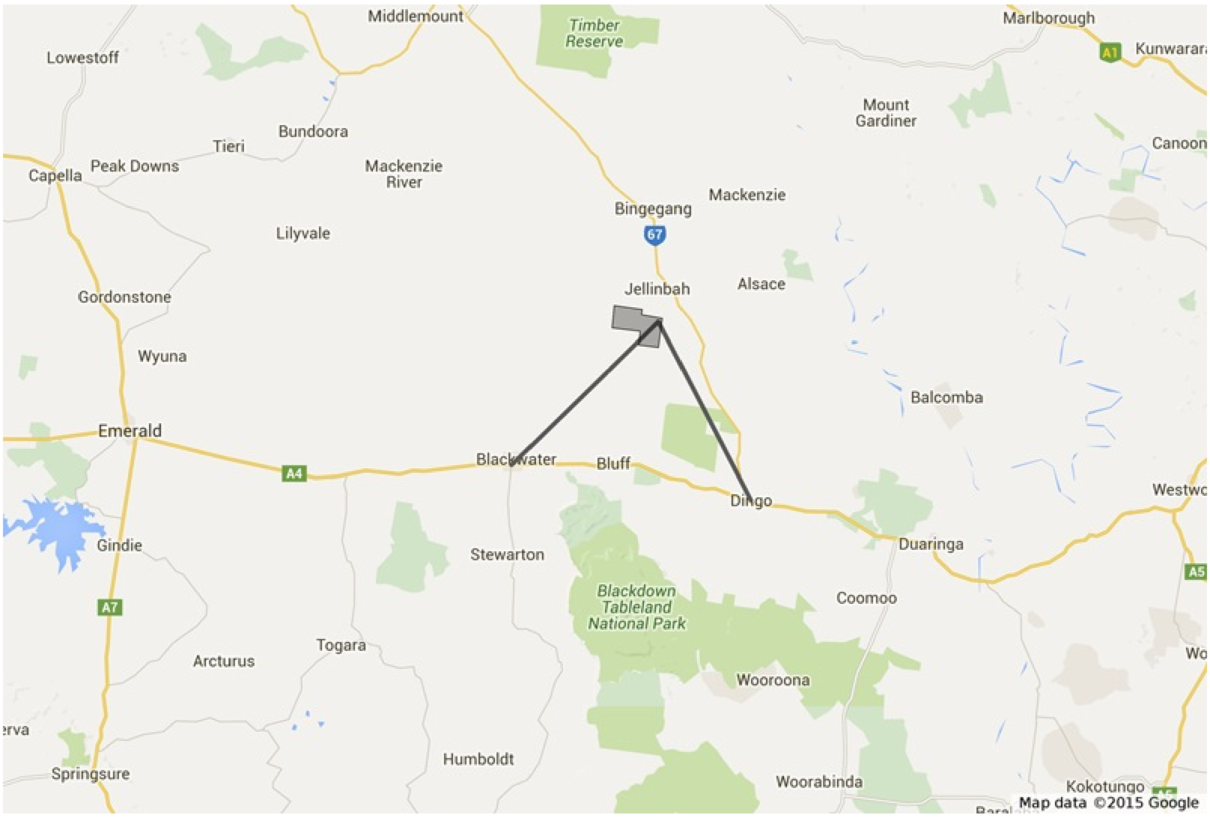


Figure 1: Location of host site

1.1 History of this project

This project was first submitted and accepted as a PDS project for the same purpose and with the same objectives in November 2009. Progress of this project was compromised by extremes of unsuitable weather conditions through the first two planting opportunities (exceptionally dry 2009/10 and exceptionally wet 2010/11). This new project began in July 2013. The demonstration site is a commercial beef producing business and as the PDS piggy-backed on top of the commercial developments of the property, the site hosts were already implementing the plan. While the PDS was being re-negotiated the site hosts continued, as much as was possible within their financial constraints and impacts of weather, to progress the project, including land preparation and planting.

The plots were finally planted in March 2013. Germination and subsequent plant establishment was extremely poor. In May of 2014 a decision and plans were made to replant the plots, in the following summer (Dec 2014 – Feb 2015) depending on planting rains. Land preparation was carried out in anticipation of the rain. No planting rains eventuated, so the re-plant did not occur.

With the mutual consent of DAF and MLA this project was terminated at the completion of Milestone 4, in mid-2014.

2 Projective objectives

2.1 Planting techniques

Test and demonstrate the impacts of planting techniques (row spacing and configuration [single versus twin], and seeding rate) on the establishment of dry land Leucaena.

2.2 Production and economic benefits

Quantify the production and economic benefits of a range of land preparation and planting techniques.

3 Method

This was an un-replicated trial, the aim of which was to test and demonstrate row spacing and sowing rate impacts of Leucaena in a Leucaena/grass pasture, through to production and economic outcomes through the collation and presentation of relevant data.

Soil moisture is critical for successful Leucaena establishment and subsequent early growth. Therefore, the aim was to plant into a full soil moisture profile in late spring using land preparation techniques that would turn Buffel grass pasture into a seed bed with minimal preparation.

3.1 Plot selection

The area is mapped as Highworth land system in the CSIRO Dawson-Fitzroy study. The geology is Blackwater Group sandstones and siltstones, which are extensively overlain by unconsolidated clay sediments which would indicate mainly cracking clay soils (Speck, et al., 1968).

Briefly Highworth is described as:

Softwood Scrub on deep red clays	Bauhinia	3%
Softwood scrub on Clay or loam	Brigalow	22%
Brigalow with Melonhole	Brigalow / Yellowwood	50%
Brigalow with softwood scrub species	Brigalow, Yellowwood & Bottle Tree	22%
Brigalow Blackbutt / Yapunyah	Brigalow & Blackbutt / Yellowwood	3%

The plots were selected as a result of soil cores and analysis carried out as part of a Soils Field Day, as the demonstration site in August 2008. As a result of the favourable analysis three plots were selected.

3.2 Land preparation

The paddocks the plots are in contained Buffel grass. These paddocks had previously been blade-ploughed (there was little to no re-growth), and were extremely rough to traverse even at very slow speeds in a Toyota Hilux. As such they were not level enough for machinery, including a spray rig, to operate at the required speed of 8km/hr.

The focus of the land preparation for this demonstration was to get the seed bed prepared with as few passes and least cost as possible. To facilitate this two key process were adopted.

Figure 2: Demonstration Plots

3.2.1 Strip Planting

Though not rare in the preparation of land for Leucaena, to reduce costs and time the plots were planted in strips. These strips were three meters wide as dictated by machinery width. The Agro plough, Offsets and Power harrows were all three meters wide. Planting seeds in the centre of the rows for the twin row configuration, at one metre separation, would mean there would still be one meter on either side of the plants that would be plant free, to support nutrient and moisture availability.

3.2.2 Power harrow

The use of a Power harrow was adopted in the endeavour to reduce the number of passes that would 'normally' be carried out (potentially three to four) for Leucaena seed bed preparation; by two or more passes.

3.3 Seed bed preparation

To facilitate minimal competition for moisture and nutrients of the germinating and young establishing Leucaena plants, it is necessary to kill off all vegetation in the strips. The whole of hosts propoerty had previously been blade ploughed, and the terrain was very rough. It was anticipated that it would take at least one rip and offset pass to make lines accessible for spraying.

Initial seed bed preparation commenced with the original project in 2009-2011

Table 1: Timing of operations (2009-2013)

Pass no. : Date	Activity	Machinery	Speed	Soil condition	Comment
Pass 1 : Jun 2009	Rip	Agro Plough	5km/hr	dry	Contract - rip planting lines
Pass 2: Sept 2009	Ground preparation	Offset Harrow	3km/hr	dry	Difficulty in sourcing contractor. Offset broke due to inexperienced operator.
2010					No further preparation occurred due to extensive rainfall (1,500 mm) which filled all the melon holes. Then regular seasonal rain kept melon holes full and so soil preparation was not able to be resumed.
2011					No further preparation occurred due to melon holes remaining full from regular seasonal rainfall.
Pass 3 : Sept 2012	Ground preparation	Offset Harrow	4km/hr	dry	Due to an 18 month delay caused by seasonal conditions, a second pass with the offsets was required. This operation was supposed to level the ground enough for the spray rig; however, it was still too rough to achieve the ground speed of 8km/hr required. Initially tried to use power harrow, however, the soil was hardened due to lack of rainfall and the power harrow would not penetrate to the required depth, so reverted to Offsets after ½ a row. Drawbar on Offset broke again
Pass 4 : Oct 2012	Soil preparation	Power Harrow	2km/hr	dry	Turn soil to fine seed bed
Pass 5: Nov 2012	Spray - Roundup	Spray Rig	8km/hr	dry	kill off vegetation along planting row and 1m either side
2013					Ready for planting. 100 mm of rain fell upon arrival of planting contractor on 26 February. The subsequent drying of the soil surface resulted in crusting. Disc planting implement would not penetrate to required depth due to crusting. Contractor took equipment back to Biloela. It was suggested by contractor that a tined planting implement would be needed to do the job. Sourced and purchased "Leucaena" planter for $3,000. (Some time after the "Leucaena" planter was purchased, the original planting contractor pointed out that the fertiliser tine of the disc planting implement could have been used to break the crust and create a small furrow for that implement to plant into, though he hadn't thought of that at the time.)
Pass 6: early Mar 2013	Spray - Roundup		8km/hr		Due to planting delay caused by rain, weeds and grass had started to regrow.
Pass 7: 23 Mar 2013	Soil preparation	Offset Harrow	4km/hr	moist	This operation was carried out as the light tined "Leucaena" planter would not penetrate the crust on the soil.
Pass 8: 23 Mar 2013	Planting	"Leucaena" planter	3km/hr	moist	Seed was prepared for planting by mixing with inoculant and water in a cement mixer and then allowing to dry.
Pass 9: late Mar 2013	Spray - Spinnaker	Spray rig	8km/hr	dry	
Pass 10: late Mar 2013	Beetle bait	Fertilizer spreader	8km/hr	dry	Bait Recipe: 2.5kg cracked grain 125ml vegetable oil 100ml Lorsban 500EC Mix and let stand overnight. Spread with fertiliser spreader at a rate of 2.5kg per ha. Apply as soon as seedlings appear and then weekly until first fern leaf develop.

3.4 Soil tests

Soil test were carried November 2011. These were the initial soil test to “benchmark” the status of the soil, prior to Leucaena establishment. Results of analysis and recommendations are included in Appendix 9.2.

4 Results

The project aimed to monitor and analyse soil, plant and animal nutrient effects and economic outcomes. The project was terminated due to significant challenges with plant germination and establishment, which may be attributed to adverse seasonal conditions over the several years of the project and the need to possess or source high levels of ‘cropping’ experience and skills, before attempting to sow Leucaena (see appendix 9.3 for photos of demonstration site activity). Thus, most of the aimed demonstration and investigation did not take place. Although the original intent of the project did not eventuate, there are some results and significant learnings.

4.1 Germination

Good rain fell for the first three weeks after planting and the temperature remained high, providing conditions suitable for good seed germination. However, initial germination results were lower than expected in the good soil conditions. Factors that potentially contributed to this low germination result are considered in the section 5, the discussion of this document.

Plants did continue to germinate over time with the rain in October of 2013 coupled with warm spring temperatures resulting in some further germination.

The final plant germination in each plot was estimated at;

- 6m -> ~ 50%
- 12m -> ~ 80%
- 18m -> ~ 40%

4.2 Establishment

The prevailing weather conditions after germination were not ideal, although consistent with winter seasonal conditions for the Central Highlands of Queensland. Useful rain fell in April (60mm) and May (35mm), however, no rain fell during winter. The next rain was not until late October, when 55mm fell. Five months of no useful rain resulted in plants struggling to establish.

The rain event of October of 2013 coupled with warm spring temperatures invigorated struggling plants, though predation by rabbits, hares, kangaroos and emus resulted in an estimated establishment of plants across the plots of less than 10%.

Figure 3: Plot rows at the demonstration

5 Discussion

5.1 Germination

Planting occurred in March 2013, into a full profile after good summer rain.

The low plant germination rate is considered primarily due to uneven soil surface (undulations) causing varying seeding depth (up to 30cm and as shallow as 2cm). Though the soil had been prepared to a fine tilth, the landform being gilgious, was of undulating character. The planter was unable to cope with these undulations due to the non-floating design. There was also what appeared to be a variation in soil type across the paddock due to the undulation and the gilgious nature of the landform.

5.2 Establishment

The dry winter period meant the quality of the surrounding pastures in the district was low, and thus the young Leucaena crop was very attractive to wildlife. The poor initial establishment and the severity of wildlife grazing resulted in very few plants surviving into the following summer (2013/14). Hares, rabbits, emus, bush turkeys and particularly kangaroos chewed the young plants almost to ground level and few plants survived.

Replanting was planned for spring or summer (2014/15), using floating draft planter. Timing was to be dependent on sufficient rainfall, a deep soil water profile and adequate weed control. This did not occur due to the termination of the project.

Initial soil tests were taken and the results are included 9.4 Soil Test.

A range of learnings has been drawn from the project.

- a high level of overall farming knowledge required
- there is a need to possess or source 'cropping' skills, before attempting to sow Leucaena.
- resources including;
  - appropriate machinery(see appendix 9.2 for equipment purchased by hosts)
  - adequate time and
  - competent labour, are also important considerations.
- timing is crucial
  - it is imperative to cultivate an area that can be adequately prepared and sown in one summer.

5.3 Other extenuating circumstances

In 2012, the hosts property was quarantined for Bovine Johne's disease. This was a stressful time for the co-operator, consequently, they were unable to devote the levels of time and effort to the trial, as previously planned.

With the property being drought declared in April 2015.

6 6 Conclusions/recommendations

These include:

1. The lack of practical farming skills, made it difficult to estimate the time/effort and inputs into the trial, such as:

   - timing of operation
   - overall time required
   - time available.

   As a result, it is clear that more work time was needed to be devoted to the trial to successfully meet all commitments.

2. The trial was too extensive given the labour units and resources available. Other extenuating circumstances earlier in the year also had a negative impact on the trial.

3. Conflicting "expert" knowledge made it difficult to be self-assured of the correct method.

4. The project team should have prepared rows in the dry and waited for rain, rather than attempting to undertake the entire task following rain.

5. Equipment and labour
   - Started with very little equipment and was reliant on contractors and contract labour.
   - Contractors were unreliable, expensive and difficult to source on demand.
   - Competent external (direct) labour was also difficult to secure due to demand from the strong local resource industry, and this resulted in additional costs (damage to the drawbar on the offset)
   - Suitability of machinery for the job:

- Ripper (Agro Plough) is a one-off requirement, so is probably beneficial to hire
- Offset – continued use made purchasing, rather than hiring, a better option.
- Power Harrow – reduces number of passes by turning very rough offset country of grass filled clods into fine seed bed making it easy to spray and plant. However, it is slow (<3 km/hr); requires a high powered tractor; and time is still required for soil moisture accumulation, nutrient mineralisation and reduction of weed seeds (grass).

6. Purchase of tractor and machinery facilitates ongoing development.

7. When working previously blade-ploughed country into a seed bed, primary working of land, ripping and offsetting is very hard on equipment.

8. It is necessary to consider the area being planted and consider the available resources (labour and time).

9. Establishing Leucaena in autumn presents more risk than in summer due to greater impact of grazing animals on Leucaena, and the low quality of the surrounding pastures. Alternative is to plant earlier, i.e. spring or summer, and have effective animal control measures in place, which might include exclusion fencing.

10. While it's clear that a number of operations (which cannot be rushed) are required to prepare a previously blade ploughed Buffel grass paddock to a level suitable for Leucaena planting, experience suggests that soil preparation should start in the dry season, followed by spraying after summer rains. Following is a potential process to adopt:
    1. Rip – leave adequate time to allow weed seeds to germinate
    2. Offset – removes germinated weeds and most grass
    3. Power Harrow – produces seed bed free of weeds and grass
    4. Spray – if needed. Roundup (knockdown)
    5. Plant – fertilise, spray, plant, beetle bait

7 Key messages

7.1 Practical farming skills required

In lacking practical farming skills, it was difficult to estimate time/effort inputs into the trial, such as:

- timing of operation
- overall time required
- time available.

As a result, it is clear that more work time was needed to be devoted to the trial to successfully meet all commitments.

7.2 A successful process

While it is clear that a number of operations (which cannot be rushed) are required to prepare a previously blade ploughed Buffel grass paddock to a level suitable for Leucaena planting, experience from this project suggests that soil preparation should start in the dry season, followed by spraying after summer rains. All things (weather events etc.), falling into place, the following would be a successful process to adopt:

1. Rip – leave adequate time to allow weed seeds to germinate
2. Offset – removes germinated weeds and most grass
3. Spray out Strips - Roundup
4. Power Harrow – produces seed bed free of weeds and grass
5. Spray – if needed. Roundup (knockdown)
6. Plant – fertilise, plant,
7. Beetle bait
8. Spray – as needed (Spinnaker)

8 Bibliography

Speck NH, Wright RL, Sweeney FC, Wilson IB, Fitzpatrick EA, Nix HA, Gunn RH, Perry RA (1968) No. 21 Lands of the Dawson–Fitzroy Area, Queensland. Land Research Surveys 1968, 1–205.

9 Appendix

9.1 Mackenzie River CQ BEEF group

The Mackenzie River CQ BEEF group was formed in 2007 as part of the CQ BEEF project.

At the end of 2008, as a result of the interruption of the business analysis the group had under taken for the 2007/2008 financial year, individual group members identified “scale” as one of their economic barriers.

The group decided, for them, “scale” was to do with the number of head they could run in the enterprise. They further determined that this was as a result of the most limiting resource of the enterprise and that in most cases the safe carrying capacity of the enterprise was the most limiting factor in terms of productive capability.

They identified that “scale” could therefore be overcome by a couple of ways;

1) Increase production area
2) Increase productive capacity of existing area.

Lauchie and Carlie elected to do both of these things, they agisted further land and proposed to improve the quality and productive capacity of their existing enterprise through the inclusion of Leucaena into the pasture mix.

The group in discussing this, as declared in the opening paragraphs, questioned the traditionally thinking associated with “Leucaena”. Hence the PDS proposal was born.

Initially the group meet every 6 to 8 weeks and had input into the PDS proposal and it objectives. No-one else in the group was proposing to plant Leucaena, choosing to await the outcome of the PDS.

CQ BEEF as a project was wound up in late 2010. The Mackenzie River CQ BEEF group remained a network of like-minded producers. The group maintained an ongoing interest in the PDS and through an unstructured process of telephone conversations had input it the ongoing operation of the PDS.

9.2 Equipment acquired (funded by co-operator)

Light Bar - $2,500

Power harrow - $3,500

Offset Draw Bar - repair/replace – two times at over $3,500 each (2nd repair not yet done)

Tractor – John Deere - $35,000

Leucaena Planter - $3,000

John Deere Planter (share) - $4,500

Cup and saucer Tank – 25,000 litre

9.3 Photos

Photo 1: Paddock pasture 6m plot pre planting

Photo 2: Paddock pasture 18m plot pre preparation

Photo 3: Harrowing 6m plot prior to planting – 24 March 2013

Photo 4: Planting 6m plot – 24 March 2013

Photo 5: Planted 18m plot – 24 March 2013

Photo 6: Initial strike 6m plot - 2 May 2013

Photo 7: Initial strike 12m plot - 2 May 2013

Photo 8: Initial strike 18m plot - 2 May 2013

Photo 9: Healthy emergent plants 18m plot - 2 May 2013

Photo 10: Re-shoot plant recovered from being eaten down 18m plot – 17 January 2014

Photo 11: Surviving plants (probably germinated after 2013 spring rain)

Photo 12: Tractor used to harrow and spray

Photo 13: Offset harrows

Photo 14: Leucaena planter

Photo 15: Rippers

Photo 16: Fence design

9.4 Soil tests

9.4.1 Soil test – 6m plot

Nutrient Advantage®

Nutrient Advantage Advice® — Deep Nitrogen Report

DAVID J HICKEY
PO BOX 308

ROMA
QLD 4455

Report Print Date:	06/05/2015
Agent/Dealer:	
Advisor/Contact:	Admin CSV User
Phone:	9731 3100
Purchase Order No :	DAVID HICKEY

Grower Name:	DAVID J HICKEY	**Nearest Town:**	ROMA
Sample No:	030007403	**Test Code:**	A13
Paddock Name:	E PDS 1308 NAMGOOYAH	**Sample Type:**	Soil Cropping - Topsoil
Sample Name:	6M	**Sampling Date:**	03/03/2015

Sample No		**030007403**	**030007404**		
Test Code		A13	A62		
Lab Report No.					
Lab Report Date		03/03/2015	03/03/2015		
Sample Name		6M	6M		
Sample Type		Topsoil	Deepsoil		
Sample Depth		0 - 10	10 - 30		
Analyte / Assay	**Unit**	**Value**			
Soil Colour		Grey	Grey		
Soil Texture		Clay	Clay		
%H2O (Soil)	%		3		
pH (1:5 Water)		8.3 Slightly alkaline	8.7		
pH (1:5 CaCl2)		7.7	8.1		
Electrical Conductivity (1:5 Water)	dS/m	0.34	0.55		
Electrical Conductivity (Saturated Extract)	dS/m	2.1 Satisfactory	3.4		
Chloride	mg/kg	100 Satisfactory	370 High		
Organic Carbon (OC)	%	1.2 <Optimum			
Nitrate Nitrogen (NO3)	mg/kg	22 Optimum	8 Marginal		
Ammonium Nitrogen	mg/kg	36 na	16 na		
Total Nitrogen	%	0.14 na			
Phosphorus (Colwell)	mg/kg	14 <Optimum			
Phosphorus Buffer Index (PBI-Col)		95 Low			
Sulphate Sulphur (KCl40)	mg/kg	7 Optimum	10 Optimum		
Cation Exchange Capacity	cmol(+)/kg	33.0			
Calcium (Amm-acet.)	cmol(+)/kg	21.0 Optimum	25.0 Optimum		
Magnesium (Amm-acet.)	cmol(+)/kg	9.9 Optimum	12.0 Optimum		
Sodium (Amm-acet.)	cmol(+)/kg	1.50 Optimum	4.00 Very High		

Analyses conducted by **Nutrient Advantage Laboratory Services**
For a copy of Laboratory Methods of Analysis please go to www.nutrientadvantage.com.au
8 South Road, Werribee VIC 3030
NATA Accreditation No: 11958 Tel: 1800 803 453
Certificate of Analysis is available upon request. Email: lab.feedback@incitecpivot.com.au

Sample No: 030007403 Version: 5 Page 1 of 4

Nutrient Advantage®

Nutrient Advantage Advice® Deep Nitrogen Report

Grower Name:	DAVID J HICKEY	**Nearest Town:**	ROMA
Sample No:	030007403	**Test Code:**	A13
Paddock Name:	E PDS 1308 NAMGOOYAH	**Sample Type:**	Soil Cropping - Topsoil
Sample Name:	6M	**Sampling Date:**	03/03/2015

Sample No Test Code	**030007403** A13	**030007404** A62		
Lab Report No.				
Lab Report Date	03/03/2015	03/03/2015		
Sample Name	6M	6M		
Sample Type	Topsoil	Deepsoil		
Sample Depth	0 - 10	10 - 30		

Analyte / Assay	Unit	Value			
Potassium (Amm-acet.)	cmol(+)/kg	0.50 Optimum	0.29 <Optimum		
Available Potassium	mg/kg	190 Optimum	110 <Optimum		
Aluminium (KCl)	cmol(+)/kg	0.1			
Aluminium (KCl)	mg/kg	<9.0			
Aluminium Saturation	%	<0.3 Satisfactory			
Calcium % of cations	%	64.0 Optimum			
Magnesium % of cations	%	30.0 High			
Sodium % of cations	%	4.50 Satisfactory			
Potassium % of cations	%	1.50 Low			
Calcium/Magnesium Ratio		2.1 Low	2.1 Low		
Potassium to Magnesium Ratio		0.1	0.0		
Zinc (DTPA)	mg/kg	0.9 Optimum			
Copper (DTPA)	mg/kg	1.8 Optimum			
Iron (DTPA)	mg/kg	16.0 Optimum			
Manganese (DTPA)	mg/kg	29.0 Optimum			
Boron (Hot CaCl2)	mg/kg		1.8 Optimum		

Calculation				
Bulk Density	1.20	1.40		

The results reported pertain only to the sample submitted.
Analyses performed on soil dried at 40 degrees Celsius and ground to <2mm (excluding moisture assay)
* One or more components of this test are below their detection limit. The value used is indicative only.

Sample No: 030007403 Version: 5 Page 2 of 4

Nutrient Advantage®

Nutrient Advantage Advice® Deep Nitrogen Report

Grower Name:	DAVID J HICKEY	**Nearest Town:**	ROMA
Sample No:	030007403	**Test Code:**	A13
Paddock Name:	E PDS 1308 NAMGOOYAH	**Sample Type:**	Soil Cropping - Topsoil
Sample Name:	6M	**Sampling Date:**	03/03/2015

Sample Details

Crop Type:	UNKNOWN	**Variety:**	
Expected Yield (t/ha) :	0.0	**Expected Protein %:**	0.0
Sowing Month:	March 2015	**Harvest Month:**	April 2015
Sub Region:	Callide	**Soil Type:**	
Years of Cultivation:	0	**Row Spacing:**	0 cm(s)
Growing Season Rainfall (mm):	950	**Stored Moisture (mm):**	0
Evaporation (mm):	0	**Irrigation Water (mm):**	
Water Use Efficiency (kg/mm):	0	**Nitrogen Use Efficiency (%):**	0
Potential Yield (t/ha):	0.0		
Topsoil Organic Carbon (%):	1.20	**Topsoil Total Nitrogen (%):**	0.12

Recommendations

Nitrogen Requirements (kg/ha)		**Sulphur Requirements (kg/ha)**	
Crop Nitrogen Requirements:	0.00 kg/ha	**Crop Sulphur Requirements:**	0.00 kg/ha
Mineralisation (from OC%):	10.00 kg/ha	**Sulphur Mineralisation (from OC%):**	0.00 kg/ha
Mineralisation (Sampling to sowing):	5.00 kg/ha		
Mineralisation (Sowing to Harvest):	5.00 kg/ha		
In Crop Nitrogen Estimate:	0.00 kg/ha		
Available Soil Nitrogen:	49.00 kg/ha	**Available Soil Sulphur:**	0.00 kg/ha
Estimated Nitrogen Requirement:	-59.00 kg/ha	**Estimated Sulphur Requirement:**	0.00 kg/ha
Advisors Suggested Nitrogen Rate:	10.00 kg/ha	**Advisors Suggested Sulphur Rate:**	10.00 kg/ha

Product Recommendation	**Application Rate (kg/ha) (Unless Stated)**	**Application Timing**	**Application Method**	**N kg/ha**	**P kg/ha**	**K kg/ha**	**S kg/ha**
Total Nutrient							

This Recommendation has been done by : Ken Orr (193)

Other Elements In recommendation	Ca kg/ha	Mg kg/ha	Cu kg/ha	Zn kg/ha	Mo gm/ha	Co gm/ha	B kg/ha	Fe kg/ha	Mn kg/ha	Si kg/ha
Total Nutrient										

Legends: N : Nitrogen; P : Phosphorus; K : Potassium; S : Sulphur; Ca : Calcium; Mg : Magnesium; Cu : Copper; Zn : Zinc; Mo : Molybdenum; Co : Cobalt; B : Boron; Fe : Iron; Mn : Manganese; Si : Silicon

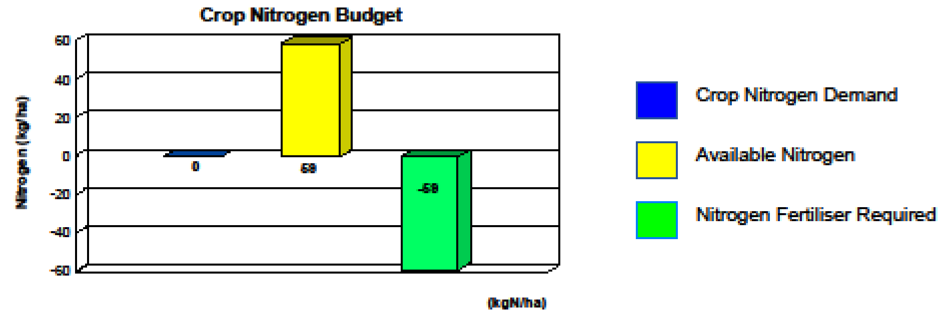
Incitec Pivot

Sample No: 030007403 Version: 5 Page 3 of 4

Nutrient Advantage®

Nutrient Advantage Advice® Deep Nitrogen Report

Grower Name:	DAVID J HICKEY	**Nearest Town:**	ROMA
Sample No:	030007403	**Test Code:**	A13
Paddock Name:	E PDS 1308 NAMGOOYAH	**Sample Type:**	Soil Cropping - Topsoil
Sample Name:	6M	**Sampling Date:**	03/03/2015



Comments

Nitrogen is not recommended on these pastures

At establishment, apply 5 - 10 kg/ha P where the seed and fertilizer are broadcast.
Where a Band-Seeder is used (1.5 m row spacings), the phosphorus rate can be halved to 3 - 5 kg/ha P. The fertilizer should be placed 5 cm below the seed, not in direct contact with it. Seed is placed on the soil surface behind the tyne and in front of a press-wheel, pressing it to a depth of 0.5 - 1 cm. Fertilizer should not be allowed to come in direct contact with inoculated seed that has not been pelleted.

Where Leucaena is being planted, apply 500 g of P per 100 m of row. The fertilizer should be placed 5 – 7.5 cm under the seed, or banded beside the row. At 5 m row spacings, this equates to 10 kg/ha P. Row spacings vary from 2 - 4 m in high rainfall areas (> 1 000 mm) to 5 - 10 m in areas receiving less than 1 000 mm rainfall. Maintenance rates are as for Stylo (10 kg/ha P every 3 - 5 years)

On soils that test low in P and S, single superphosphate (SSP) can be used to supply both nutrients. Plants take up phosphorus (P) and sulfur (S) in approximately equal amounts. Alternatively, a high analysis phosphorus fertilizer (TSP or MAP) can be used in combination with Sulfur Bentonite Granules.

Sulfur inputs (rate and frequency of application) are usually dependent on when phosphorus is applied. In higher rainfall areas and on more productive pastures, sulfur and phosphorus may be applied annually, but usually the interval between applications is two or more years in the dry tropics.

The Phosphorus Buffering Index (PBI) measures the soils capacity to hold phosphorus (P), and how tightly the phosphorus is held by the soil. PBI values can range from a very low value of less than 35 to an extremely high value of greater than 840. The PBI result determined for your soil will impact on the availability of phosphorus. It may also indicate whether your soil is prone to the leaching of phosphorus or the phosphorus being tied up in forms unavailable to the plant. The PBI values will also influence how much phosphorus you will need to apply to build up soil reserves of P.

Incitec Pivot

9.4.2 **Soil test – 12m plot**

Nutrient Advantage®

Nutrient Advantage Advice® — Deep Nitrogen Report

DAVID J HICKEY
PO BOX 308

ROMA
QLD 4455

Report Print Date: 06/05/2015
Agent/Dealer:
Advisor/Contact: Admin CSV User
Phone: 9731 3100
Purchase Order No : DAVID HICKEY

Grower Name:	DAVID J HICKEY	**Nearest Town:**	ROMA
Sample No:	030007405	**Test Code:**	A13
Paddock Name:	E PDS 1308 NAMGOOYAH	**Sample Type:**	Soil Cropping - Topsoil
Sample Name:	12M	**Sampling Date:**	03/03/2015

Sample No Test Code		**030007405** A13	**030007406** A62		
Lab Report No.					
Lab Report Date		03/03/2015	03/03/2015		
Sample Name		12M	12M		
Sample Type		Topsoil	Deepsoil		
Sample Depth		0 - 10	10 - 30		
Analyte / Assay	**Unit**	**Value**			
Soil Colour		Brown	Grey		
Soil Texture		Clay	Clay		
%H2O (Soil)	%		2		
pH (1:5 Water)		7.6 Slightly Alkaline	8.3 Mod Alkaline		
pH (1:5 CaCl2)		7.2	7.7		
Electrical Conductivity (1:5 Water)	dS/m	0.25	0.28		
Electrical Conductivity (Saturated Extract)	dS/m	1.6 Satisfactory	1.7		
Chloride	mg/kg	19 Satisfactory	37 Satisfactory		
Organic Carbon (OC)	%	1.1 <Optimum			
Nitrate Nitrogen (NO3)	mg/kg	27 Optimum	9		
Ammonium Nitrogen	mg/kg	60 na	25		
Total Nitrogen	%	0.12 na			
Phosphorus (Colwell)	mg/kg	10 <Optimum			
Phosphorus Buffer Index (PBI-Col)		64 Low			
Sulphate Sulphur (KCl40)	mg/kg	11 Optimum	11 Optimum		
Cation Exchange Capacity	cmol(+)/kg	16.3			
Calcium (Amm-acet.)	cmol(+)/kg	12.0 Optimum	16.0 Optimum		
Magnesium (Amm-acet.)	cmol(+)/kg	3.4 Optimum	6.7 Optimum		
Sodium (Amm-acet.)	cmol(+)/kg	0.52 Satisfactory	1.40 Satisfactory		

Analyses conducted by **Nutrient Advantage Laboratory Services**
For a copy of Laboratory Methods of Analysis please go to www.nutrientadvantage.com.au
8 South Road, Werribee VIC 3030
NATA Accreditation No: 11958 Tel: 1800 803 453
Certificate of Analysis is available upon request. Email: lab.feedback@incitecpivot.com.au

Sample No: 030007405 Version: 7 Page 1 of 4

Nutrient Advantage®

Nutrient Advantage Advice® Deep Nitrogen Report

Grower Name:	DAVID J HICKEY	**Nearest Town:**	ROMA
Sample No:	030007405	**Test Code:**	A13
Paddock Name:	E PDS 1308 NAMGOOYAH	**Sample Type:**	Soil Cropping - Topsoil
Sample Name:	12M	**Sampling Date:**	03/03/2015

Sample No Test Code		**030007405** A13	**030007406** A62		
Lab Report No.					
Lab Report Date		03/03/2015	03/03/2015		
Sample Name		12M	12M		
Sample Type		Topsoil	Deepsoil		
Sample Depth		0 - 10	10 - 30		
Analyte / Assay	**Unit**	**Value**			
Potassium (Amm-acet.)	cmol(+)/kg	0.24 Optimum	0.18 <Optimum		
Available Potassium	mg/kg	94 <Optimum	69 <Optimum		
Aluminium (KCl)	cmol(+)/kg	0.1			
Aluminium (KCl)	mg/kg	<9.0			
Aluminium Saturation	%	<0.6 Satisfactory			
Calcium % of cations	%	74.0 >Optimum			
Magnesium % of cations	%	21.0 Optimum			
Sodium % of cations	%	3.20 Satisfactory			
Potassium % of cations	%	1.50 Marginal			
Calcium/Magnesium Ratio		3.5 >Optimum	2.4 Optimum		
Potassium to Magnesium Ratio		0.1	0.0		
Zinc (DTPA)	mg/kg	0.7 Optimum			
Copper (DTPA)	mg/kg	1.4 Optimum			
Iron (DTPA)	mg/kg	23.0 Optimum			
Manganese (DTPA)	mg/kg	63.0 Optimum			
Boron (Hot CaCl2)	mg/kg		1.2 Optimum		

Calculation				
Bulk Density	1.20	1.40		

The results reported pertain only to the sample submitted.
Analyses performed on soil dried at 40 degrees Celsius and ground to <2mm (excluding moisture assay)
* One or more components of this test are below their detection limit. The value used is indicative only.

Incitec Pivot

Sample No: 030007405 Version: 7 Page 2 of 4

Nutrient Advantage®

Nutrient Advantage Advice® Deep Nitrogen Report

Grower Name:	DAVID J HICKEY	**Nearest Town:**	ROMA
Sample No:	030007405	**Test Code:**	A13
Paddock Name:	E PDS 1308 NAMGOOYAH	**Sample Type:**	Soil Cropping - Topsoil
Sample Name:	12M	**Sampling Date:**	03/03/2015

Sample Details

Crop Type:	UNKNOWN	**Variety:**	
Expected Yield (t/ha) :	0.0	**Expected Protein %:**	0.0
Sowing Month:	March 2015	**Harvest Month:**	April 2015
Sub Region:	Callide	**Soil Type:**	
Years of Cultivation:	0	**Row Spacing:**	0 cm(s)
Growing Season Rainfall (mm):	950	**Stored Moisture (mm):**	0
Evaporation (mm):	0	**Irrigation Water (mm):**	0
Water Use Efficiency (kg/mm):	0	**Nitrogen Use Efficiency (%):**	0
Potential Yield (t/ha):	0.0		
Topsoil Organic Carbon (%):	1.10	**Topsoil Total Nitrogen (%):**	0.11

Recommendations

Nitrogen Requirements (kg/ha)		**Sulphur Requirements (kg/ha)**	
Crop Nitrogen Requirements:	0.00 kg/ha	**Crop Sulphur Requirements:**	0.00 kg/ha
Mineralisation (from OC%):	9.00 kg/ha	**Sulphur Mineralisation (from OC%):**	0.00 kg/ha
Mineralisation (Sampling to sowing):	5.00 kg/ha		
Mineralisation (Sowing to Harvest):	5.00 kg/ha		
In Crop Nitrogen Estimate:	0.00 kg/ha		
Available Soil Nitrogen:	58.00 kg/ha	**Available Soil Sulphur:**	0.00 kg/ha
Estimated Nitrogen Requirement:	-67.00 kg/ha	**Estimated Sulphur Requirement:**	0.00 kg/ha
Advisors Suggested Nitrogen Rate:	10.00 kg/ha	**Advisors Suggested Sulphur Rate:**	10.00 kg/ha

Product Recommendation	Application Rate (kg/ha) (Unless Stated)	Application Timing	Application Method	N kg/ha	P kg/ha	K kg/ha	S kg/ha
Total Nutrient							

This Recommendation has been done by : Ken Orr (193)

Other Elements In recommendation	Ca kg/ha	Mg kg/ha	Cu kg/ha	Zn kg/ha	Mo gm/ha	Co gm/ha	B kg/ha	Fe kg/ha	Mn kg/ha	Si kg/ha
Total Nutrient										

Legends:
N : Nitrogen; P : Phosphorus; K : Potassium; S : Sulphur; Ca : Calcium
Mg : Magnesium; Cu : Copper; Zn : Zinc; Mo : Molybdenum; Co : Cobalt
B : Boron; Fe : Iron; Mn : Manganese; Si : Silicon

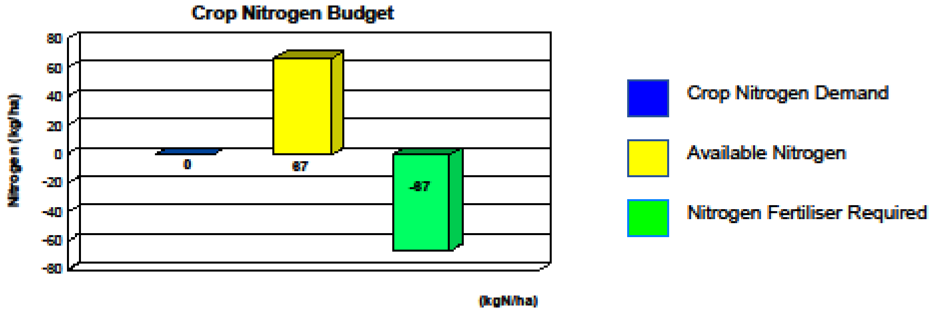
Incitec Pivot

Sample No: 030007405 Version: 7 Page 3 of 4

Nutrient Advantage®

Nutrient Advantage Advice® Deep Nitrogen Report

Grower Name:	DAVID J HICKEY	**Nearest Town:**	ROMA
Sample No:	030007405	**Test Code:**	A13
Paddock Name:	E PDS 1308 NAMGOOYAH	**Sample Type:**	Soil Cropping - Topsoil
Sample Name:	12M	**Sampling Date:**	03/03/2015



Comments

Nitrogen is not recommended on these pastures

At establishment, apply 5 - 10 kg/ha P where the seed and fertilizer are broadcast.
Where a Band-Seeder is used (1.5 m row spacings), the phosphorus rate can be halved to 3 - 5 kg/ha P. The fertilizer should be placed 5 cm below the seed, not in direct contact with it. Seed is placed on the soil surface behind the tyne and in front of a press-wheel, pressing it to a depth of 0.5 - 1 cm. Fertilizer should not be allowed to come in direct contact with inoculated seed that has not been pelleted.

Where Leucaena is being planted, apply 500 g of P per 100 m of row. The fertilizer should be placed 5 – 7.5 cm under the seed, or banded beside the row. At 5 m row spacings, this equates to 10 kg/ha P. Row spacings vary from 2 - 4 m in high rainfall areas (> 1 000 mm) to 5 - 10 m in areas receiving less than 1 000 mm rainfall. Maintenance rates are as for Stylo (10 kg/ha P every 3 - 5 years)

On soils that test low in P and S, single superphosphate (SSP) can be used to supply both nutrients. Plants take up phosphorus (P) and sulfur (S) in approximately equal amounts. Alternatively, a high analysis phosphorus fertilizer (TSP or MAP) can be used in combination with Sulfur Bentonite Granules.

Sulfur inputs (rate and frequency of application) are usually dependent on when phosphorus is applied. In higher rainfall areas and on more productive pastures, sulfur and phosphorus may be applied annually, but usually the interval between applications is two or more years in the dry tropics.

Incitec Pivot

9.4.3 **Soil test – 18m**

Nutrient Advantage®

Nutrient Advantage

Nutrient Advantage Advice® — Deep Nitrogen Report

DAVID J HICKEY
PO BOX 308

ROMA
QLD 4455

Report Print Date:	06/05/2015
Agent/Dealer:	
Advisor/Contact:	Admin CSV User
Phone:	9731 3100
Purchase Order No :	DAVID HICKEY

Grower Name:	DAVID J HICKEY	**Nearest Town:**	ROMA
Sample No:	030007407	**Test Code:**	A13
Paddock Name:	E PDS 1308 NAMGOOYAH	**Sample Type:**	Soil Cropping - Topsoil
Sample Name:	18M	**Sampling Date:**	03/03/2015

Sample No	**030007407**	**030007408**		
Test Code	A13	A62		
Lab Report No.				
Lab Report Date	03/03/2015	03/03/2015		
Sample Name	18M	18M		
Sample Type	Topsoil	Deepsoil		
Sample Depth	0 - 10	10 - 30		

Analyte / Assay	Unit	Value			
Soil Colour		Grey	Grey		
Soil Texture		Clay	Clay		
%H2O (Soil)	%		3		
pH (1:5 Water)		8.2 Moderately alkaline	8.8 Moderately Alkaline		
pH (1:5 CaCl2)		7.7	8.1		
Electrical Conductivity (1:5 Water)	dS/m	0.37	0.47		
Electrical Conductivity (Saturated Extract)	dS/m	2.3 Satisfactory	2.9 Satisfactory		
Chloride	mg/kg	150 Satisfactory	230 Satisfactory		
Organic Carbon (OC)	%	1.1 <Optimum			
Nitrate Nitrogen (NO3)	mg/kg	29 Optimum	8 Marginal		
Ammonium Nitrogen	mg/kg	30 na	13 na		
Total Nitrogen	%	0.12 na			
Phosphorus (Colwell)	mg/kg	15 Optimum			
Phosphorus Buffer Index (PBI-Col)		82 Satisfactory			
Sulphate Sulphur (KCl40)	mg/kg	7 Optimum	8 Optimum		
Cation Exchange Capacity	cmol(+)/kg	29.2			
Calcium (Amm-acet.)	cmol(+)/kg	18.0 >Optimum	22.0 >Optimum		
Magnesium (Amm-acet.)	cmol(+)/kg	9.1 Optimum	11.0 Optimum		
Sodium (Amm-acet.)	cmol(+)/kg	1.50 Satisfactory	3.50 Excessive		

ASPAC

Analyses conducted by **Nutrient Advantage Laboratory Services**
For a copy of Laboratory Methods of Analysis please go to www.nutrientadvantage.com.au
8 South Road, Werribee VIC 3030
NATA Accreditation No: 11958 Tel: 1800 803 453
Certificate of Analysis is available upon request. Email: lab.feedback@incitecpivot.com.au

Incitec Pivot

Sample No: 030007407 Version: 6 Page 1 of 4

Nutrient Advantage®

Nutrient Advantage Advice® Deep Nitrogen Report

Grower Name:	DAVID J HICKEY	**Nearest Town:**	ROMA
Sample No:	030007407	**Test Code:**	A13
Paddock Name:	E PDS 1308 NAMGOOYAH	**Sample Type:**	Soil Cropping - Topsoil
Sample Name:	18M	**Sampling Date:**	03/03/2015

Sample No Test Code	**030007407** A13	**030007408** A62		
Lab Report No.				
Lab Report Date	03/03/2015	03/03/2015		
Sample Name	18M	18M		
Sample Type	Topsoil	Deepsoil		
Sample Depth	0 - 10	10 - 30		

Analyte / Assay	Unit	Value			
Potassium (Amm-acet.)	cmol(+)/kg	0.46 Optimum	0.22 Optimum		
Available Potassium	mg/kg	180 Optimum	88 Marginal		
Aluminium (KCl)	cmol(+)/kg	0.1			
Aluminium (KCl)	mg/kg	<9.0			
Aluminium Saturation	%	<0.3 Satisfactory			
Calcium % of cations	%	62.0 <Optimum			
Magnesium % of cations	%	31.0 High			
Sodium % of cations	%	5.10 Satisfactory			
Potassium % of cations	%	1.60 <Optimum			
Calcium/Magnesium Ratio		2.0 Marginal	2.0 Marginal		
Potassium to Magnesium Ratio		0.1	0.0		
Zinc (DTPA)	mg/kg	0.5 <Optimum			
Copper (DTPA)	mg/kg	1.6 Optimum			
Iron (DTPA)	mg/kg	16.0 Optimum			
Manganese (DTPA)	mg/kg	32.0 Optimum			
Boron (Hot CaCl2)	mg/kg		1.4 Optimum		

Calculation				
Bulk Density	1.20	1.40		

The results reported pertain only to the sample submitted.
Analyses performed on soil dried at 40 degrees Celsius and ground to <2mm (excluding moisture assay)
* One or more components of this test are below their detection limit. The value used is indicative only.

Incitec Pivot

Sample No: 030007407 Version: 6 Page 2 of 4

Nutrient Advantage®

Nutrient Advantage Advice® Deep Nitrogen Report

Grower Name:	DAVID J HICKEY	**Nearest Town:**	ROMA
Sample No:	030007407	**Test Code:**	A13
Paddock Name:	E PDS 1308 NAMGOOYAH	**Sample Type:**	Soil Cropping - Topsoil
Sample Name:	18M	**Sampling Date:**	03/03/2015

Sample Details

Crop Type:	UNKNOWN	**Variety:**	
Expected Yield (t/ha) :	0.0	**Expected Protein %:**	0.0
Sowing Month:	March 2015	**Harvest Month:**	April 2015
Sub Region:	Callide	**Soil Type:**	
Years of Cultivation:	0	**Row Spacing:**	0 cm(s)
Growing Season Rainfall (mm):	950	**Stored Moisture (mm):**	0
Evaporation (mm):	0	**Irrigation Water (mm):**	
Water Use Efficiency (kg/mm):	0	**Nitrogen Use Efficiency (%):**	0
Potential Yield (t/ha):	0.0		
Topsoil Organic Carbon (%):	1.10	**Topsoil Total Nitrogen (%):**	0.11

Recommendations

Nitrogen Requirements (kg/ha)		**Sulphur Requirements (kg/ha)**	
Crop Nitrogen Requirements:	0.00 kg/ha	**Crop Sulphur Requirements:**	0.00 kg/ha
Mineralisation (from OC%):	9.00 kg/ha	**Sulphur Mineralisation (from OC%):**	0.00 kg/ha
Mineralisation (Sampling to sowing):	5.00 kg/ha		
Mineralisation (Sowing to Harvest):	5.00 kg/ha		
In Crop Nitrogen Estimate:	0.00 kg/ha		
Available Soil Nitrogen:	57.00 kg/ha	**Available Soil Sulphur:**	0.00 kg/ha
Estimated Nitrogen Requirement:	-66.00 kg/ha	**Estimated Sulphur Requirement:**	0.00 kg/ha
Advisors Suggested Nitrogen Rate:	10.00 kg/ha	**Advisors Suggested Sulphur Rate:**	10.00 kg/ha

Product Recommendation	**Application Rate (kg/ha) (Unless Stated)**	**Application Timing**	**Application Method**	**N kg/ha**	**P kg/ha**	**K kg/ha**	**S kg/ha**
Total Nutrient							

This Recommendation has been done by : Ken Orr (193)

Other Elements In recommendation	Ca kg/ha	Mg kg/ha	Cu kg/ha	Zn kg/ha	Mo gm/ha	Co gm/ha	B kg/ha	Fe kg/ha	Mn kg/ha	Si kg/ha
Total Nutrient										

Legends:
N : Nitrogen; P : Phosphorus; K : Potassium; S : Sulphur; Ca : Calcium
Mg : Magnesium; Cu : Copper; Zn : Zinc; Mo : Molybdenum; Co : Cobalt
B : Boron; Fe : Iron; Mn : Manganese; Si : Silicon

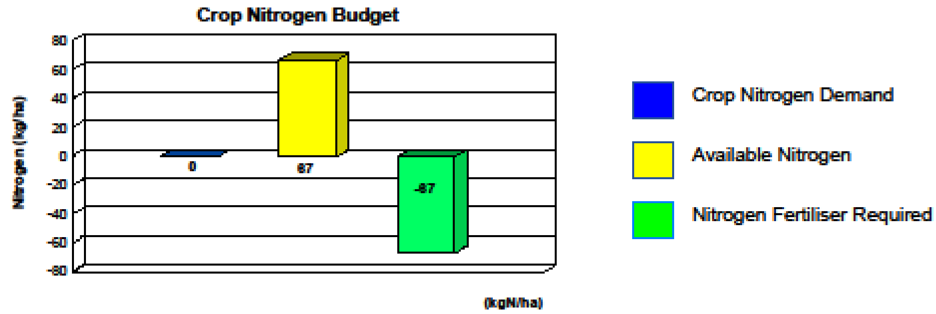
Incitec Pivot

Sample No: 030007407 Version: 6 Page 3 of 4

Nutrient Advantage®

Nutrient Advantage Advice® Deep Nitrogen Report

Grower Name:	DAVID J HICKEY	**Nearest Town:**	ROMA
Sample No:	030007405	**Test Code:**	A13
Paddock Name:	E PDS 1308 NAMGOOYAH	**Sample Type:**	Soil Cropping - Topsoil
Sample Name:	12M	**Sampling Date:**	03/03/2015



Comments

Nitrogen is not recommended on these pastures

At establishment, apply 5 - 10 kg/ha P where the seed and fertilizer are broadcast.
Where a Band-Seeder is used (1.5 m row spacings), the phosphorus rate can be halved to 3 - 5 kg/ha P. The fertilizer should be placed 5 cm below the seed, not in direct contact with it. Seed is placed on the soil surface behind the tyne and in front of a press-wheel, pressing it to a depth of 0.5 - 1 cm. Fertilizer should not be allowed to come in direct contact with inoculated seed that has not been pelleted.

Where Leucaena is being planted, apply 500 g of P per 100 m of row. The fertilizer should be placed 5 – 7.5 cm under the seed, or banded beside the row. At 5 m row spacings, this equates to 10 kg/ha P. Row spacings vary from 2 - 4 m in high rainfall areas (> 1 000 mm) to 5 - 10 m in areas receiving less than 1 000 mm rainfall. Maintenance rates are as for Stylo (10 kg/ha P every 3 - 5 years)

On soils that test low in P and S, single superphosphate (SSP) can be used to supply both nutrients. Plants take up phosphorus (P) and sulfur (S) in approximately equal amounts. Alternatively, a high analysis phosphorus fertilizer (TSP or MAP) can be used in combination with Sulfur Bentonite Granules.

Sulfur inputs (rate and frequency of application) are usually dependent on when phosphorus is applied. In higher rainfall areas and on more productive pastures, sulfur and phosphorus may be applied annually, but usually the interval between applications is two or more years in the dry tropics.

Incitec Pivot