2009-2012

Biological Pasture Trials

Hillcrest Pastoral Company

(Avenue Range)

LawrieCo

Healthy Soil Healthy People

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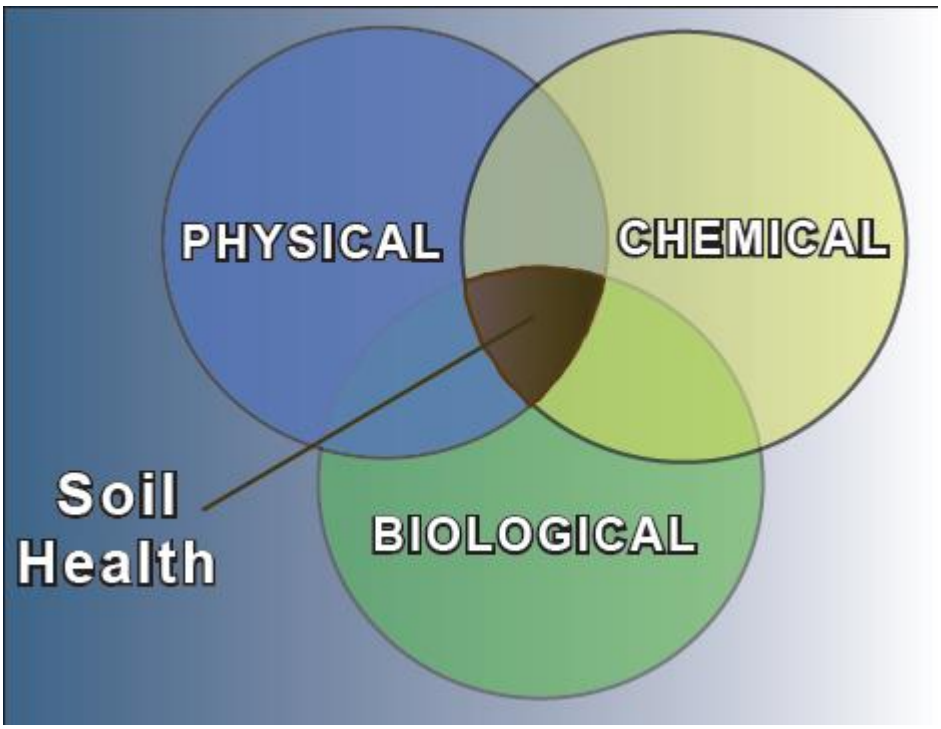
1. Introduction

The Biological pasture trial aims to investigate and compare biological and conventional pasture fertiliser systems.

While the conventional system incorporates the physical and chemical aspects of agriculture, the biological system has a strong emphasis on the biological properties of your soil. (See figure below). Sustainability is achieved through a combination of these three areas of agriculture.



Source: Gugino, B.K., Idowu, O.J., Schindelbeck, R.R., van Es, H.M., Wolfe, D.W., Moebius-Clune, B.N., Thies, J.E. and Abawi, G.S. 2009. Cornell Soil Health Assessment Training Manual, Edition 2.0, Cornell University, Geneva, NY.

We aim to improve soil, pasture and stock health through a balanced nutrition program incorporating biological properties into the system.

This will be **Measured, Monitored** and **Managed** through:

- Soil and tissue testing
- Soil physical analysis
- Stock analysis (blood testing and weight gain trials)
- Pasture quality (feed tests)

- Budget analysis (at the finalisation of trial)

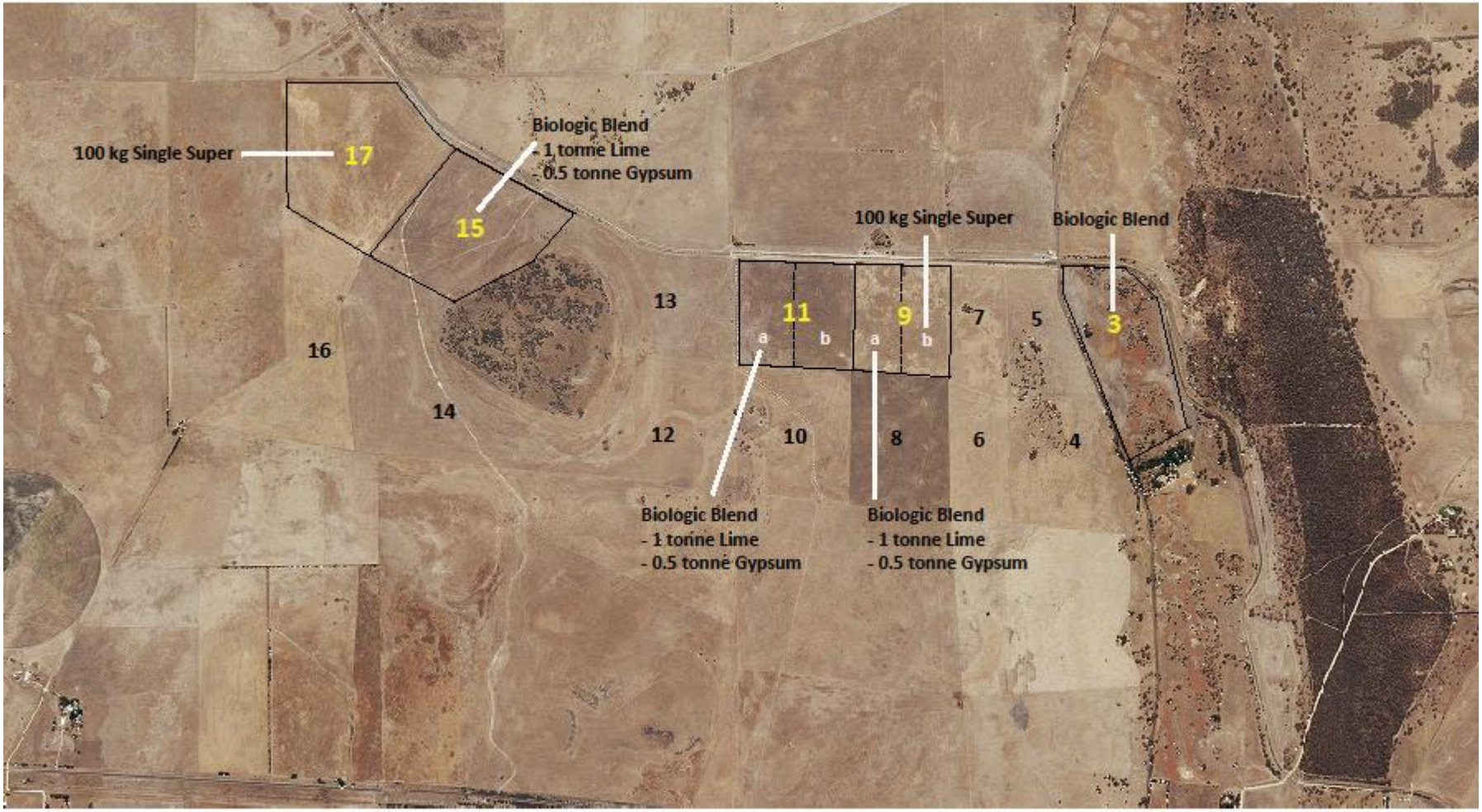
Analysis of the current system has identified a plateau in production with the use of conventional fertilisers. The paddocks ability to hold water (water infiltration) and soil compaction (friability) have been identified as issues facing Hillcrest.

‘You are what you eat’

‘We aim to achieve a sustainable farming system’

‘Bruce Creek’

2. Trial Plan


100 kg Single Super
17
Biologic Blend
- 1 tonne Lime
- 0.5 tonne Gypsum
15
100 kg Single Super
Biologic Blend
13
11
a
b
9
a
b
7
5
3
16
14
12
10
8
6
4
Biologic Blend
- 1 tonne Lime
- 0.5 tonne Gypsum
Biologic Blend
- 1 tonne Lime
- 0.5 tonne Gypsum

3. Paddock 11

3.1 Soil physical and field observations

Soil physical assessments were recorded on commencement of the trial and after 12 months.

Soil Physical aims to characterise soil properties by measuring;

1. Water infiltration
2. pH and EC
3. Soil compaction (use of penetrometer)
4. Soil temp and moisture
5. Pasture/crop observations

Soil Physical **27th April 2009** (GPS: S 3655.128 E 140.12.688)

Water infiltration and soil compaction issues were evident through soil physical and field observations.

- Soil type- Grey clay/loam over limestone

A significant layer of thatch was identified on the soil surface.

3.3 Treatment

Paddock 11 went into a new pasture of Ryegrass, Clover, Phalaris and Chicory.

Pasture seed was treated with Sure Crop VAM, a seed treatment containing nutrients and mycorrhiza fungi. Mycorrhiza forms a symbiotic relationship with the plant root, accessing nutrients and water.

JAN	FEB	MARCH	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC
					Solid				**Foliar**		

June 09 (Solid)

Lime **1 tonne**
Gypsum **0.5 tonne**

Application	Rate (Kg)
LawrieCo Biologic Prescription blend	400
+ extra Phosphorus	
Trace Elements	13.2

Oct 09 Foliar Application (9th October 2009)

Application	Rate (L)
Biologic Growth (N,P,K, Kelp)	5
Biologic Trace	3
Fulvic Acid	1
Digest Fungi (Cellulose digestion)	30

3.4 Results

Excellent pasture persistence and growth through the summer months

Feb 2010

Newly established pasture

Feb 2010

Jan 2010

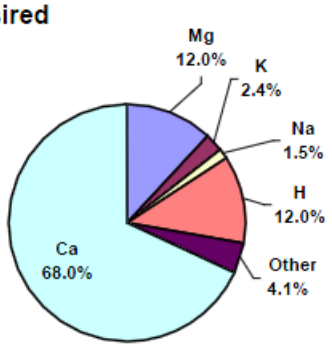
Soil Cations- **Calcium** (Ca), **Magnesium** (Mg), **Potassium** (K), **Sodium** (Na)

Influence soil physical properties (structure)

Cation balance determines:
-nutrient availability
-rainfall infiltration rates
-soil water holding capacity
-length of pasture growing season

Nov 2008

Desired



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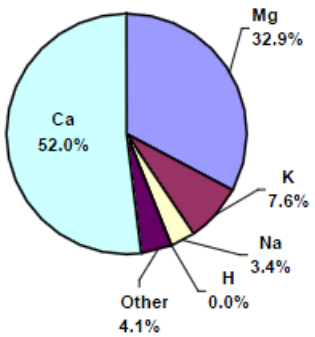
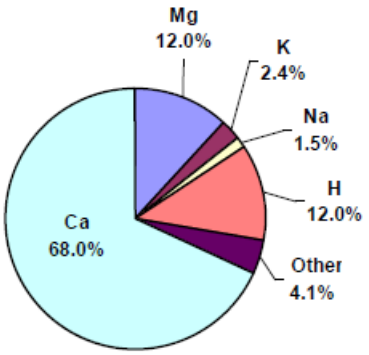


2010

Desired



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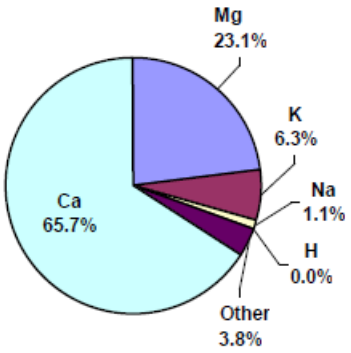


Base Saturation %

	2009	Ideal	2010
Calcium (%)	52	68	65.7
Magnesium (%)	32.9	12	23.1
Potassium (%)	7.6	2.4	6.3
Sodium (%)	3.4	1.5	1.1

- Noticeable improvement in cation base saturations since original soil testing

4. Paddock 15 and 17

Paddock 15 and 17 were established pastures at Hillcrest containing annual/perennial grasses and clover.

The trials compared biological fertilisers (15) with single super (17).

- Tissue testing was used to identify pasture deficiencies, working towards achieving balanced nutrition
- Feed tests were used to analyse pasture quality
- The brix meter was utilised as an infield guide of pasture quality
- Paddocks were run at 17 DSE for 53 days and weight gains recorded
- Cattle blood tests taken

4.3 Treatment

Paddock 17 was treated with 100 kg of single super. No lime or gypsum was applied to paddock 17. Paddock 15 was treated with biological fertilisers

Biological fertiliser (Paddock 15)

JAN	FEB	MARCH	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC
					Solid				**Foliar**		

June 09 (Solid)

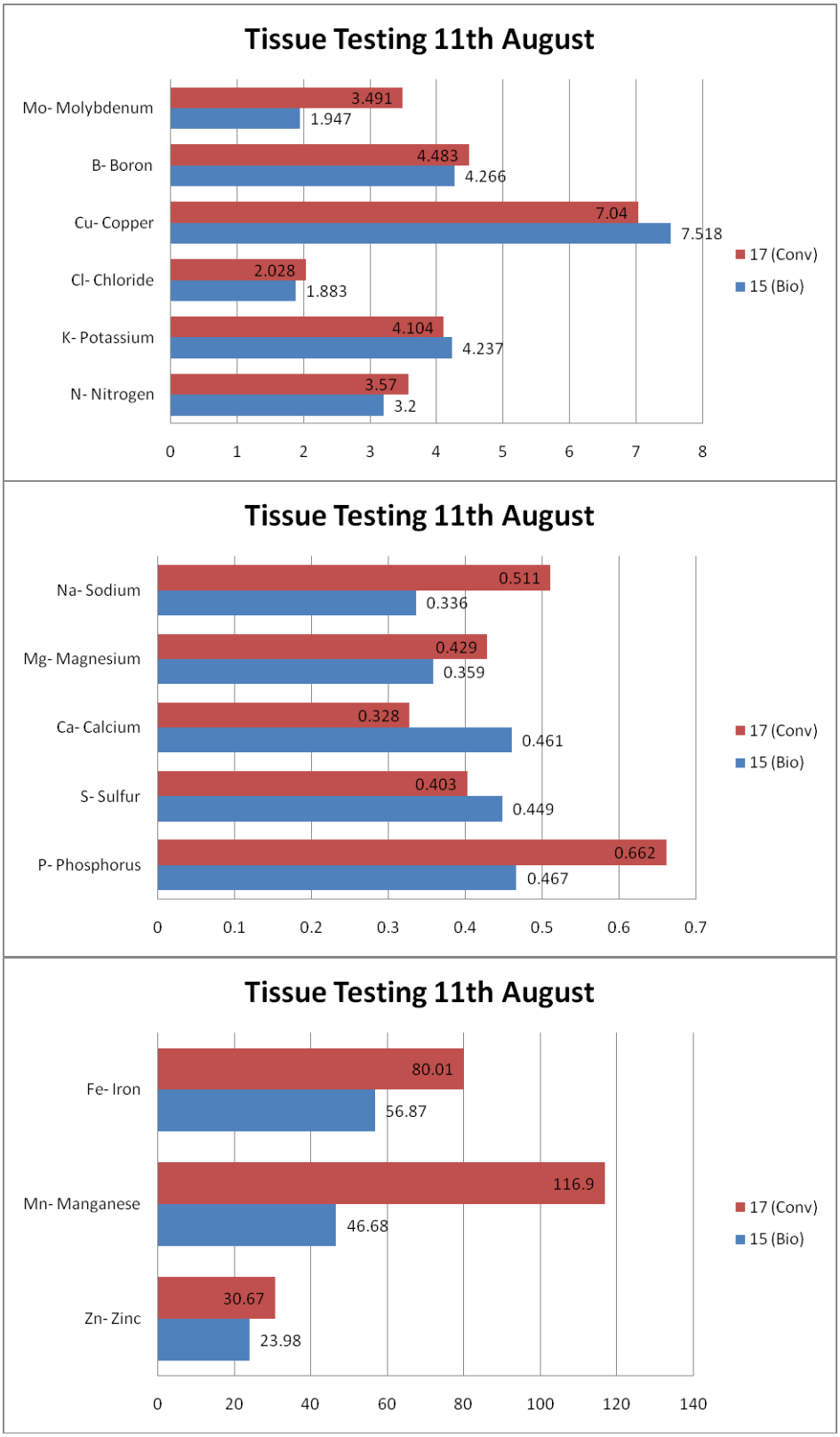
Lime **1 tonne**
Gypsum **0.5 tonne**

Application	Rate (Kg)
LawrieCo Biologic Prescription blend	400
+ extra Phosphorus	
Trace Elements	13.2

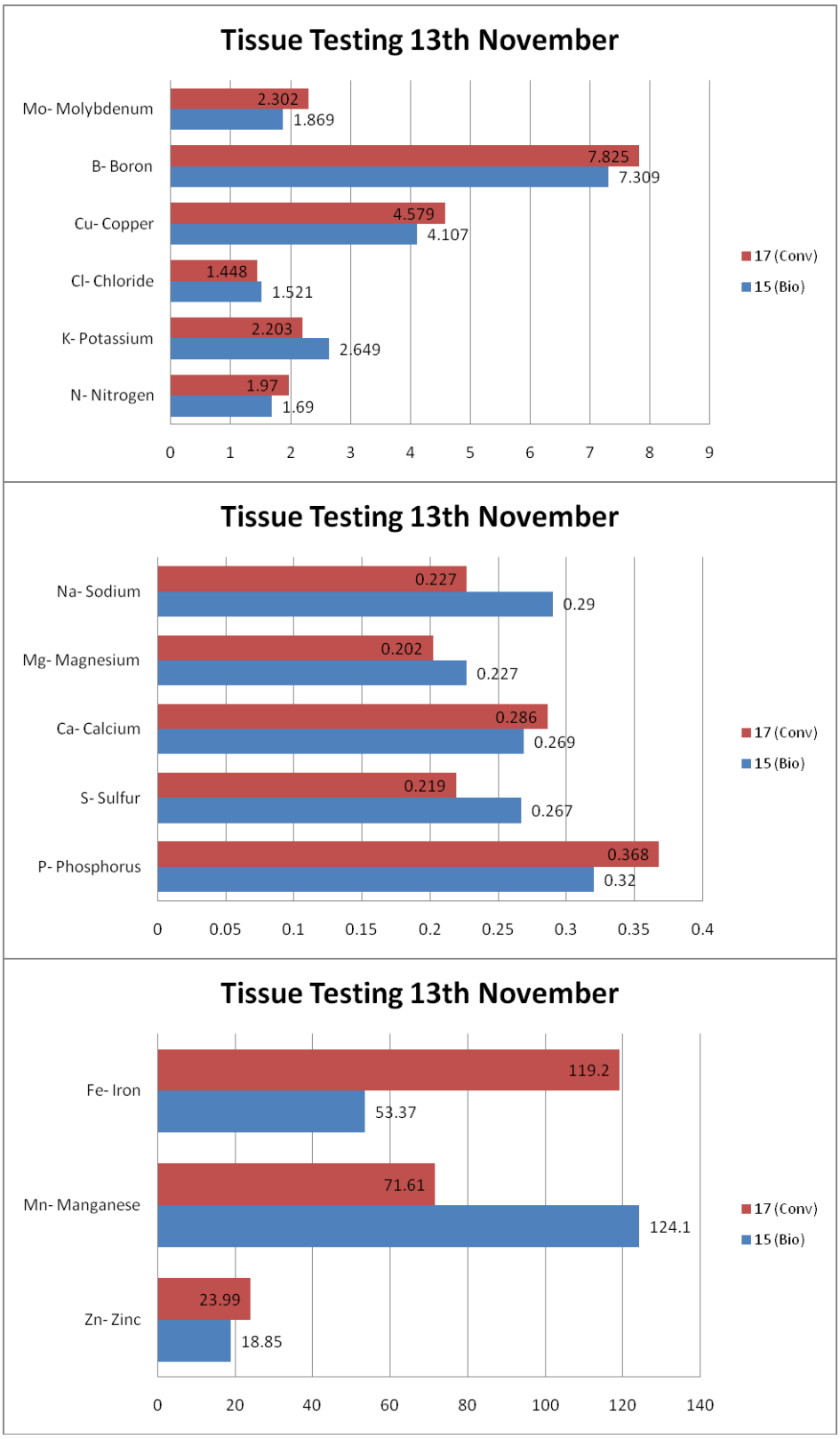
Oct 09 Foliar Application (9th October 2009)

Application	Rate (L)
Biologic Growth (N,P,K, Kelp)	5
Biologic Trace	3
Soluble Boron	
Manganese Sulfate	
Fulvic Acid	1
Digest Fungi (Cellulose digestion)	30

4.4 Results Tissue testing

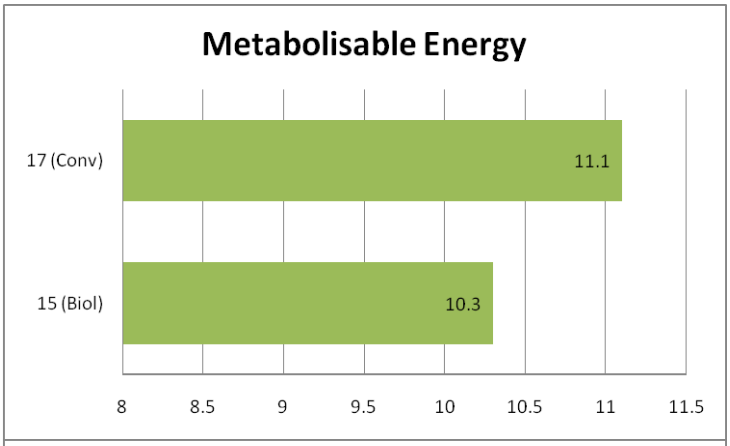


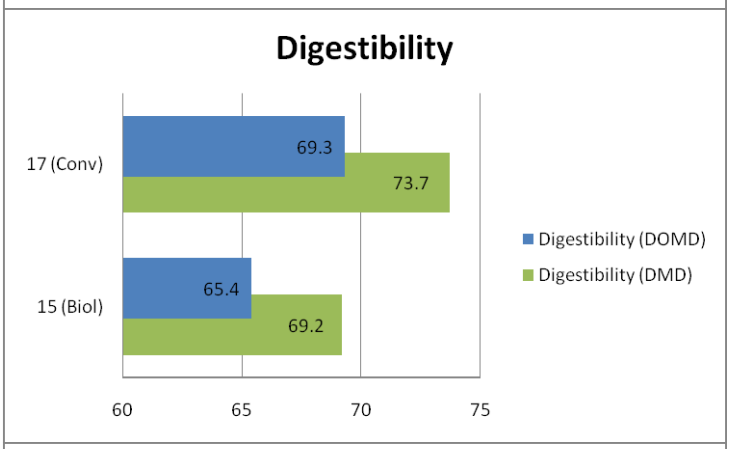
Comparative tissue testing results. Biological program vs. single super at 100 kg/ha
Date: 11th August 2009

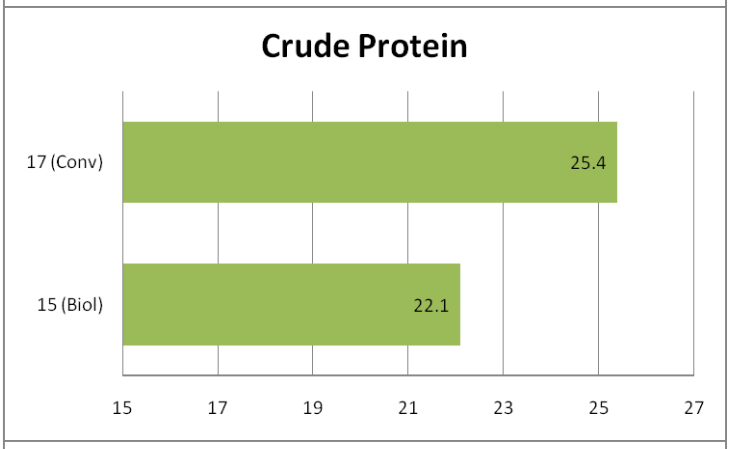


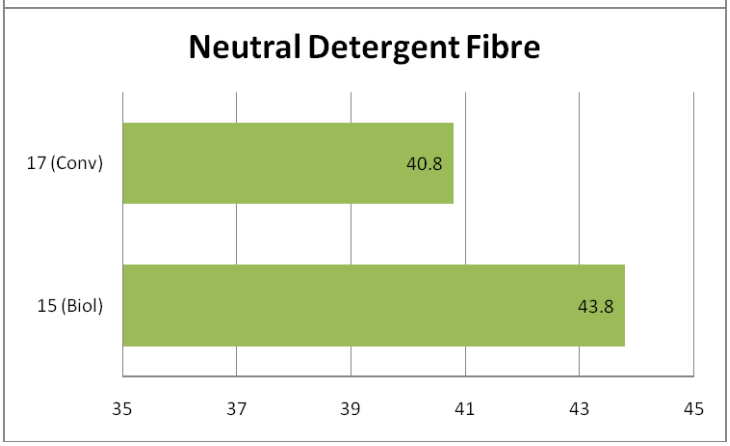
Comparative tissue testing results. Biological program vs. single super at 100 kg/ha
Date: 13th November 2009

Feed Tests (Agrifood) Indicators of pasture quality







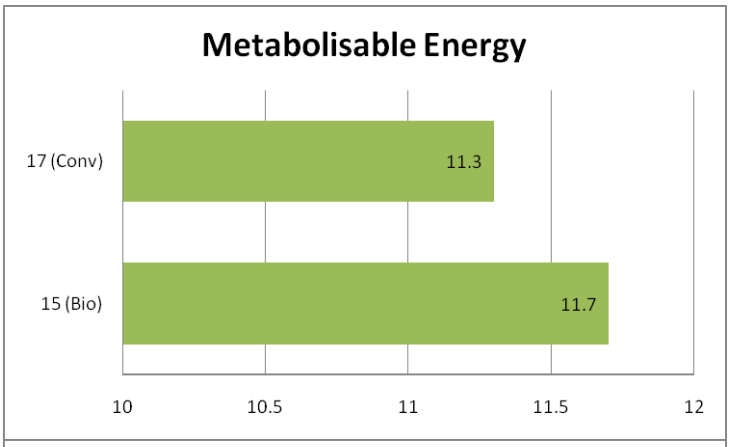


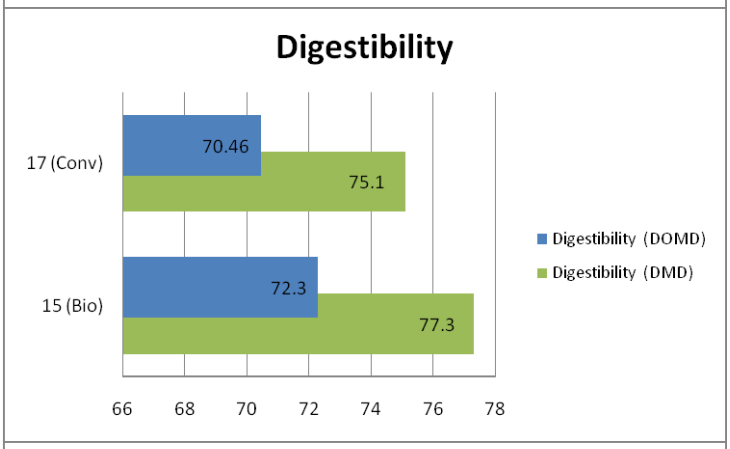
Feed test comparisons

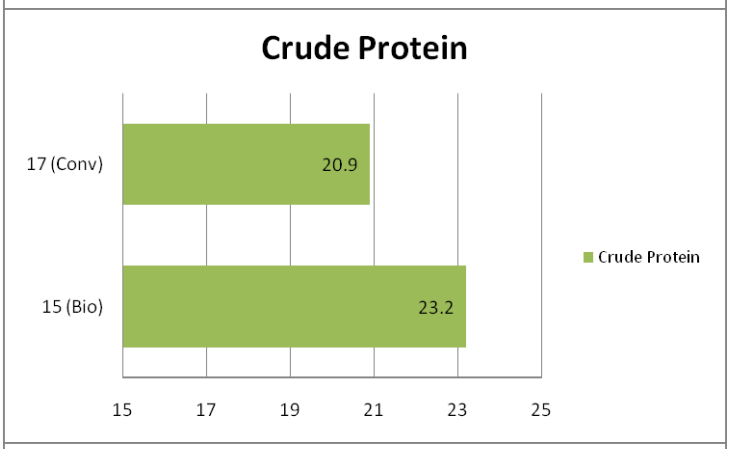
2 months after solid application

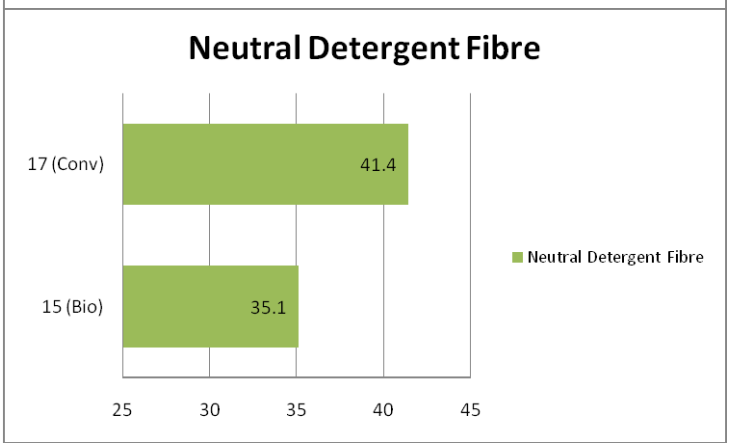
5th August 2009

17= Single super @ 100kg/ha
15= Biological







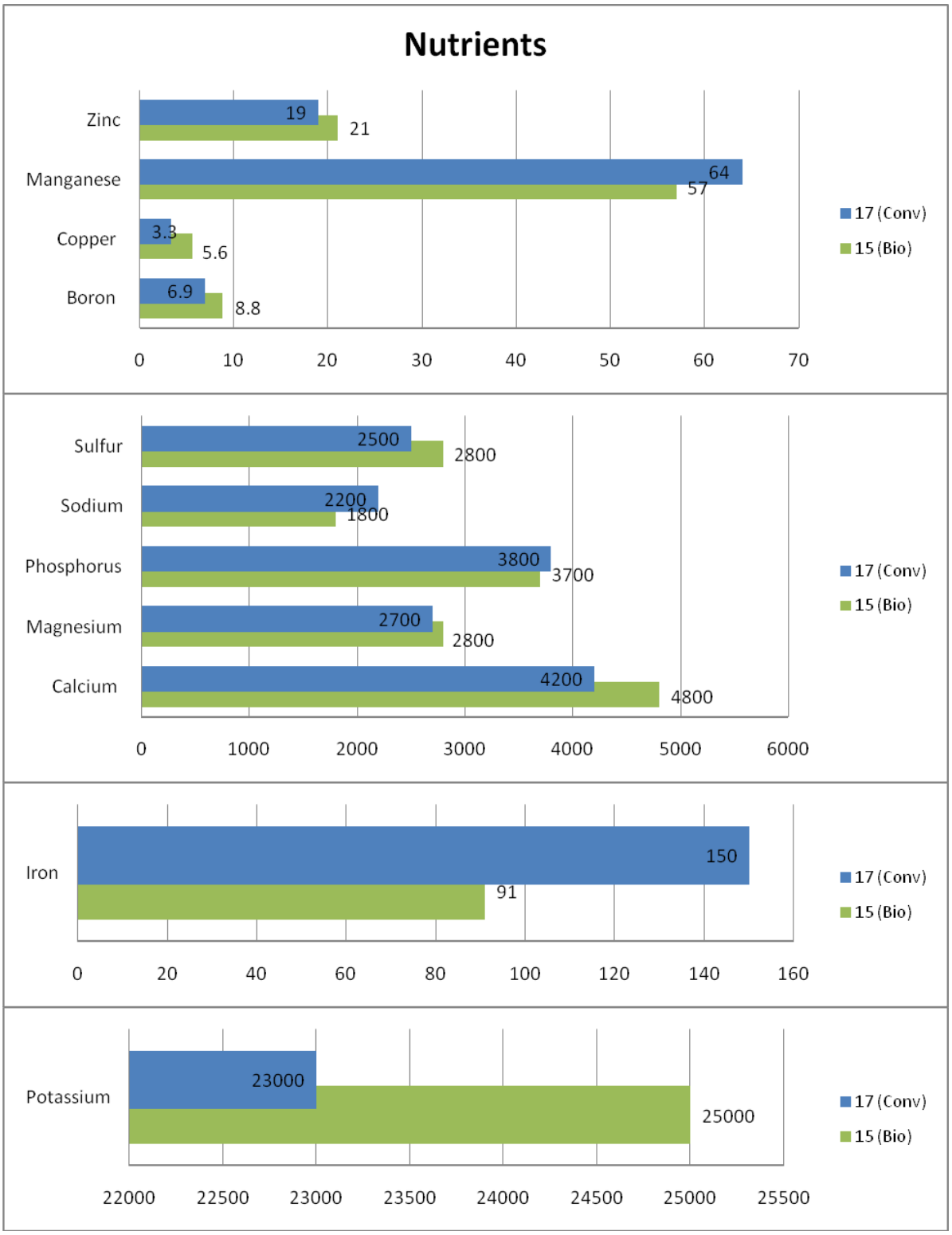


Feed test comparisons

4 months after solid application

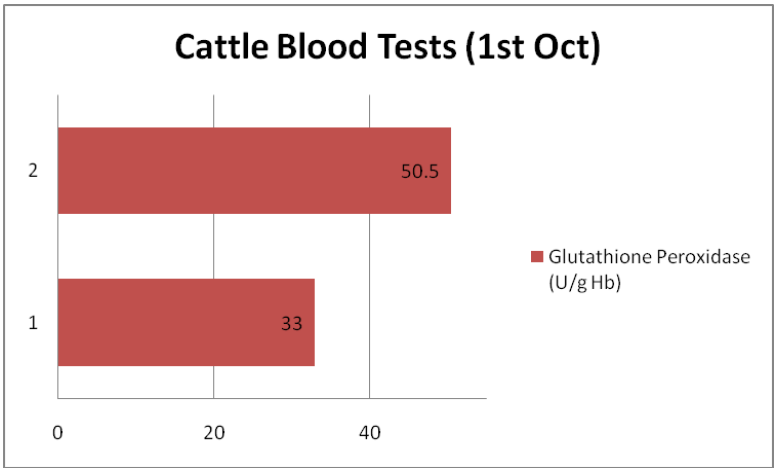
2nd October 2009

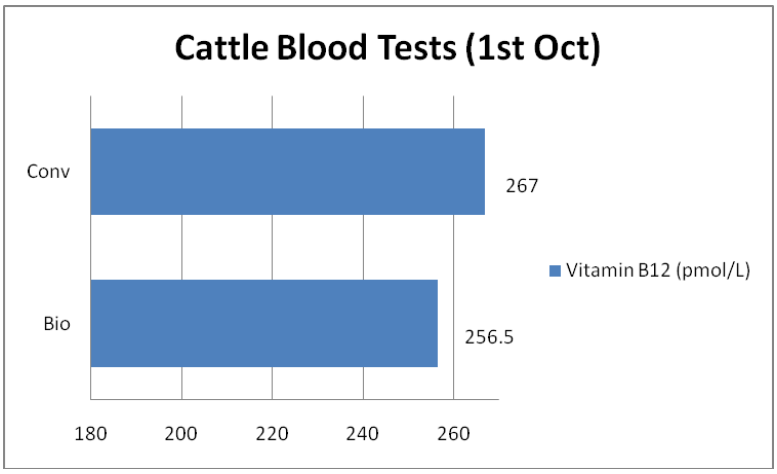
17- Conventional 100 kg/ha single super
15-Biological

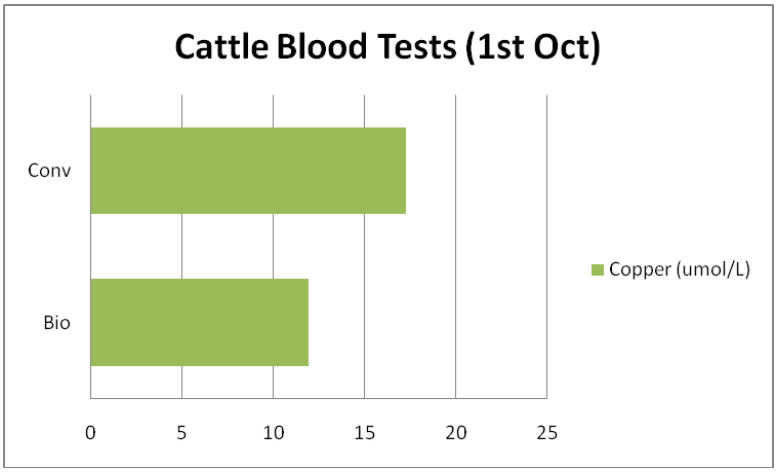


Comparative Feed test results. 2nd October 2009. Plant nutrients Biological v Conventional

Cattle blood tests







Comparative Blood test results. 1st October 2009. Conventional v Biological Measuring Glutathione Peroxidase, Vitamin B12 and Copper

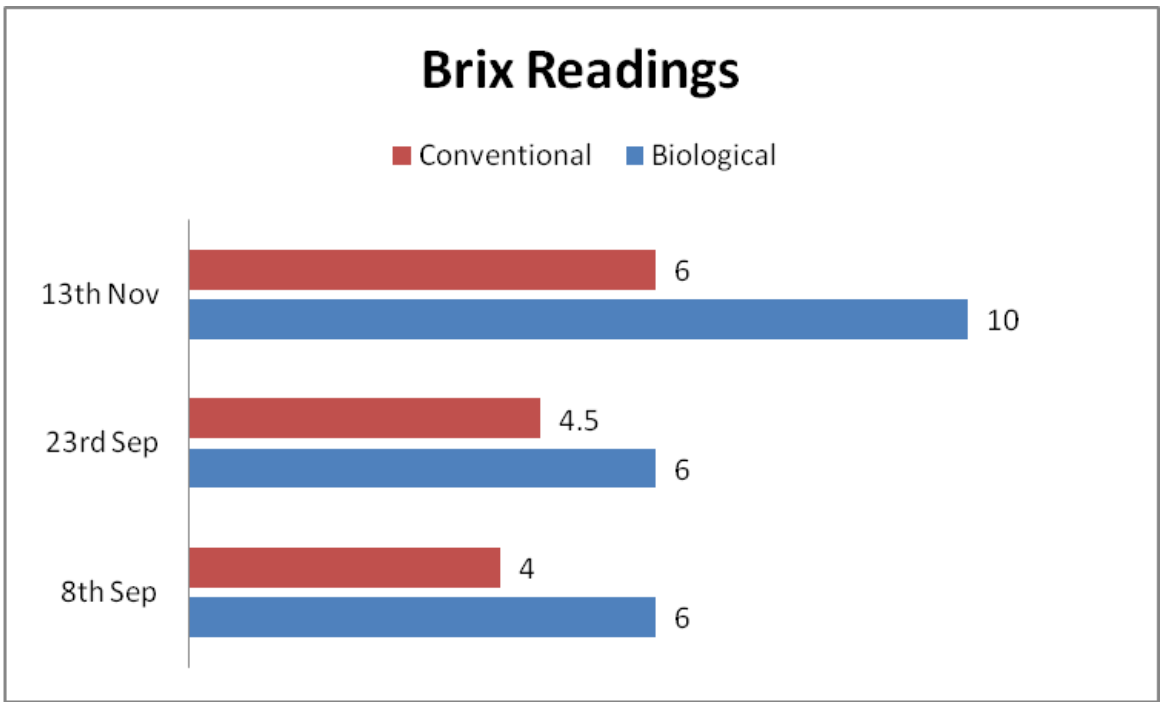
Brix Readings

Brix readings were measured as an indication of pasture quality.
Brix measures dissolved solids (sugars) in the plant sap, directly indicating how well the plant is photosynthesising.

We aim to achieve and sustain a brix of above 12.

High brix in plants provides healthy, high yielding and high quality pasture. Resulting in improved nutritional value of pasture and increased stock performance.

High brix in plants = Increased feed conversion and weight gain



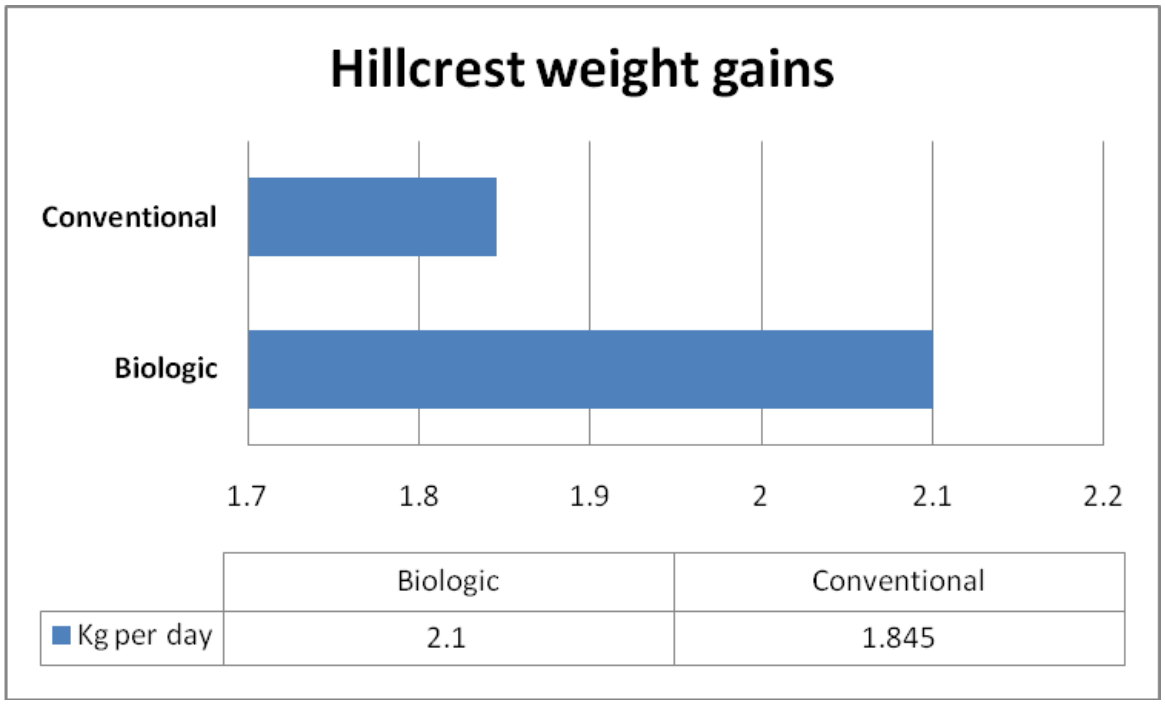
Plant Brix readings. Paddock 15 (Biological) v Paddock 17 (Conventional)

Weight Gain Trial

Cattle were weighed and entered within a 5 kg weight range

Paddocks were run at 17 DSE

Daily weight gain measured over 53 days (Kg/day)



Weight gain trial (53 days). Biological v conventional fertiliser

Biological had an increased weight gain of 255 g/day over conventional fertilisation

Summary:

- Feed tests and pasture brix readings have shown increased pasture quality in the biological paddocks.
- Increased cattle weight gains with biological fertiliser compared to conventional.
- Tissue tests gave an idea on pasture nutrient deficiency. In order to compare the biological and conventional paddocks accurately on a nutrient level more replications are required.
- Similar results for the blood tests. A result was obtained with no major differences between paddocks. To accurately compare the two, again more replicates are needed.

Good results in year 1. It is important to collate results and examine trends over the coming years to account for seasonal variation.

Observations from Hillcrest manager, Bruce Creek:

- Biological paddock 15 showed a quicker/earlier response of annual grasses
- Earlier feed evident
- Noticeable improvement in the biological fertilised paddocks relative to the rest of the farm
- Pasture persisted for longer

5. Paddock 3

5.1 Soil physical and field observations

Soil physical assessments were recorded on commencement of the trial and 12 months later.

Soil Physical **27th April 2009** (GPS: S 3655.298 E 140.13.695)

Notes:

Soil type- Grey clay/loam over limestone

Thatch and dead root material through the profile was evident

Shallow soil over limestone

A moss growing on soil surface was identified across the paddock.

Indication of poor soil biological balance

Low Active Fungi : Bacterial dominance

5.3 Treatment

Paddock 3 was an identified problem paddock. Trouble has been experienced in the past with pasture establishment (Lucerne).

A biologic blend was applied in June

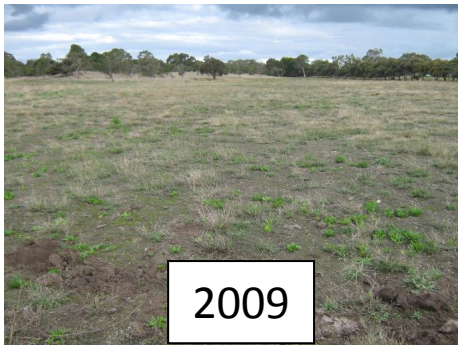
JAN	FEB	MARCH	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC
					Solid						

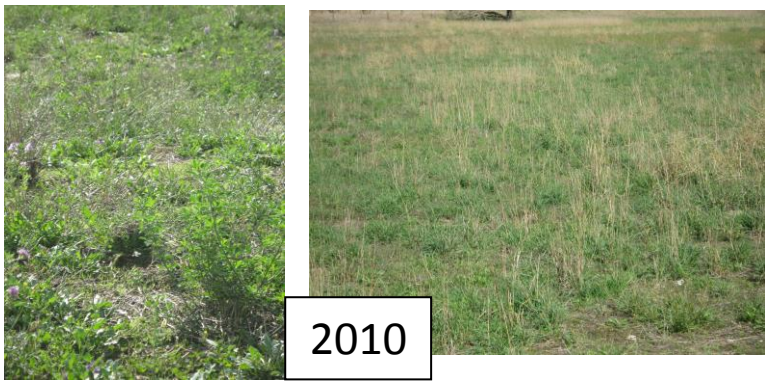
June 09 (Solid)

Application	Rate (Kg)
LawrieCo Biologic Blend	300
Trace Elements	34.2

5.4 Results

- Good pasture response in 2009 (Lucerne evident)
  Pasture has persisted through the summer months





Conclusions Year 1

- **Improved Pasture Persistence**

  Biological pastures have persisted for longer resulting in increased feed. Pastures have persisted in previous problem paddock (number 3).

  Early green feed and increased response of annual grasses is evident in biological paddock.

- **Pasture Quality**

  Improvements in pasture quality have been shown with weight gains in cattle compared to the single super treatment.
  Increased brix levels in biological pasture have been observed.

- **Cation Balance**

  Transformation of cation balance closer to ideal ratios.

- **Water Infiltration**

  Improvements have been shown in water infiltration rates. It is important to look at the trend over the next 2 years.

- **Biological balance**

  Evidence of improved microbial balance. Reduction off early succession moss on soils.
  Increased Calcium base saturation is indicative of higher active fungi retaining calcium.

- **Plant Nutrients**

  Comparisons of nutrient values and blood testing requires more replications.

Improvements in pasture quality, soil mineral and microbial balance and soil structure correlate with improvements in productivity and sustainability at Hillcrest Pastoral.

Improvements in productivity indicate higher forecasted returns than that of conventional fertilisation.