

Project Catalyst Trial Report

Mixed biodiversity legume cover crop Trial 1

Grower Information

Grower Name:	Lawrence DiBella
Entity Name:	RGS Farming Co.
Trial Farm No/Name:	Farm # 0134A, B# 1-4
Mill Area:	Victoria
Total Farm Area ha:	100ha
No. Years Farming:	4 th generation Cane Farmers
Trial Subdistrict:	Forest Home
Area under Cane ha:	96 hectares under cane

Background Information

Aim: Trial hypothesis:

Does a mixed fallow crop increase soil biodiversity leading to improvements in soil health and a reduction in the use of inorganic nutrient inputs.

Background: (Rationale for why this might work)

- It is known that legume fallow crops can reduce soil and nutrient loss from fallow blocks when compared to a bare fallow.
- It is well documented that monoculture farming systems create unhealthy soil conditions by removing specific nutrients from the soil and there becomes an increase in the number of pathogenic organisms that have a negative impact on cane yield.
- It is also well documented that legumes have the potential to fix atmospheric nitrogen in their root systems and provide nitrogen for the subsequent crop.

Potential Water Quality Benefit:

- Less soil and nutrient runoff by having a cover crop instead of a bare fallow
- Improvements to soil health to enable the soil to better hold onto nutrients instead of being lost into the environment
- Less reliance on unstable inorganic sources of nitrogen (like urea) through the introduction of organic forms of nitrogen inputs into the farming system

Expected Outcome of Trial:

- Improved soil health
- Reduced sediment and nutrient loads being exported from the field, especially in the fallow and plant cane phase
- Reduction of inorganic forms of nitrogen
- Improvement in farm economics
- Improvements in cane yield

Service provider contact: Megan Zahmel 0447 317 102

Where did this idea come from: Lawrence DiBella

Plan - Project Activities	Date : (mth/year to be undertaken)	Activities : (breakdown of each activity for each stage)
Stage 1	Trial established 2016	Baseline soil nutrition test taken – 24 th of Nov 2016 Baseline Pachymetra and Nematode test taken – 24 th of Nov 2016 Block worked and prepared for trial Mixed legume trial was planted on the 24 th of Dec 2016 – by Handheld Fertilizer spreader.
Stage 2	Monitoring, bio massing and sampling on legume crop 2017	<ul style="list-style-type: none"> - 1st month weed pressure and height monitoring recorded – Jan 27th, 2017 - 2nd month crop height and weed pressure data recorded – Feb 21st, 2017 - 3rd month crop height and weed pressure data recorded – March 13th, 2017 - 2nd Nematode sampling done – 24th March 2017 - Legume biomass – Total nutrient analysis for each legume treatment. Nutrient analysis will be done by Volume kg/Ha – 13th March 2017 - Soil bulk density -14th March 2017 - Soil incubation samples – 14th March 2017
Stage 3	Establish plant cane crop. Sampling, biomass and CCS. 2017/2018	<ul style="list-style-type: none"> - Cane planted on the 14th of June 2017. Variety Q242. - Stalk counts at 14, 28, 56, 122 days over 5m section - 18th July 2017, 1st August 2017, 25th September 2017, 2nd November 2017. - CO2 Burst Test. – 13th July 2017 - Water infiltration testing – 9th August 2017 - Worm population test – 25th October 2017 - 8-9mth biomass of cane crop – 12th February 2018 – <i>Cancelled as crop has lodged at six months. Samples will now be taken from the face at harvest</i> - CCS sampling – 12th February 2018 - <i>Cancelled as crop has lodged at six months. Samples will now be taken from the face at harvest</i> - Trial was too lodge to even taken biomass from the face of the harvester, so only CCS sampling were collected for this trial. – 27th August 2018
Stage 4	Economics analysis 2018	DAFF. Due to serverer lodging within the trial unfortunately biomass couldn't be recorded and this has effected the Economic analysis. We will try for trial 2.
Stage 5		
Stage 6		

Project Trial site details

Trial Crop:	Mixed Fallow crop
Variety: Rat/Plt:	Plant Q242 2017
Trial Block No/Name:	Biodiversity in Fallow
Trial Block Size Ha:	2,305.8m ²
Trial Block Position (GPS):	Refer to google earth map
Soil Type:	Alluvial

Block History, Trial Design:

Mill Mud was applied in 2015
 1.83m row spacing since 2010
 Previous crop was 5th ratoon Q183.

Total 18 rows

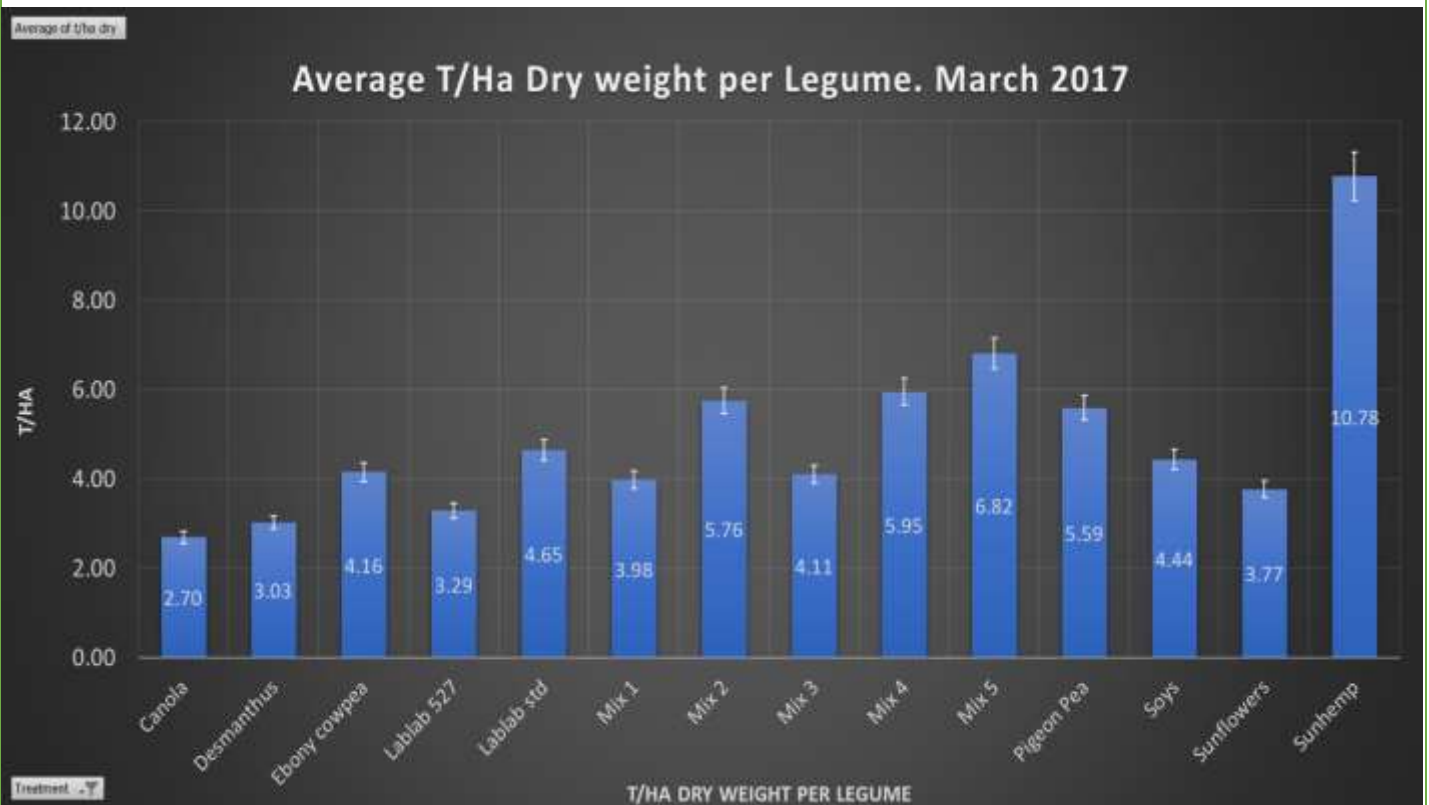
Rep 2			Rep 1			Rep 3		
9	2	13	12	15	11			
13	10	5	3	4	1			
4	11	2	10	5	8			
8	5	6	11	14	12			
12	1	7	8	13	2			
14	3	9	14	7	6			
6	7	4	1	3	9			
3 rows	3 rows	3 rows	3 rows	3 rows	3 rows			

Treatments:

- Trt 1 – Soybeans (Leichardt)
- Trt 2 – Pigeon pea
- Trt 3 – Sun Hemp
- Trt 4 – Canola
- Trt 5 – Lablab 527
- Trt 6 – Lablab Std
- Trt 7 – Sunflower
- Trt 8 – Ebony (cowpea)
- Trt 9 – Desmanthus
- Trt 10 – Bare Fallow x 2 reps
- Trt 11 – Mix #1 – Sunflower, Soybean, Desmanthus, Ebony
- Trt 12 – Mix #2 – Sunflower, Soybean, Ebony, Sunhemp
- Trt 13 – Mix #3 – Soybean, Ebony, Lablab Std
- Trt 14 – Mix #4 – Sunflower, Soybean, Canola, Ebony
- Trt 15 – Mix #5 – Mixed Lablab, Soybeans x 1 rep

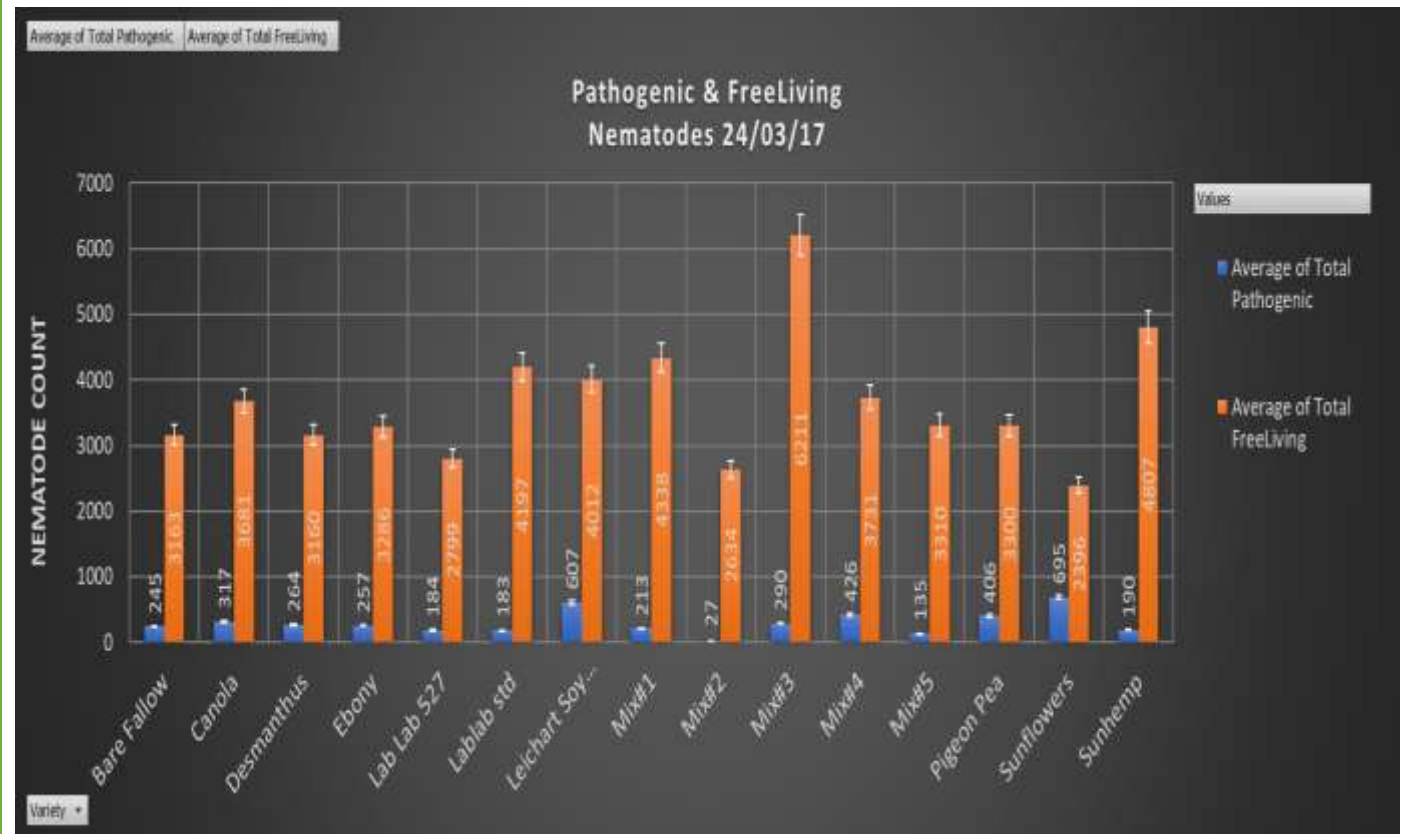
Results:

Legume Biomass Dry Tonnes per Hectare – Taken March 2017

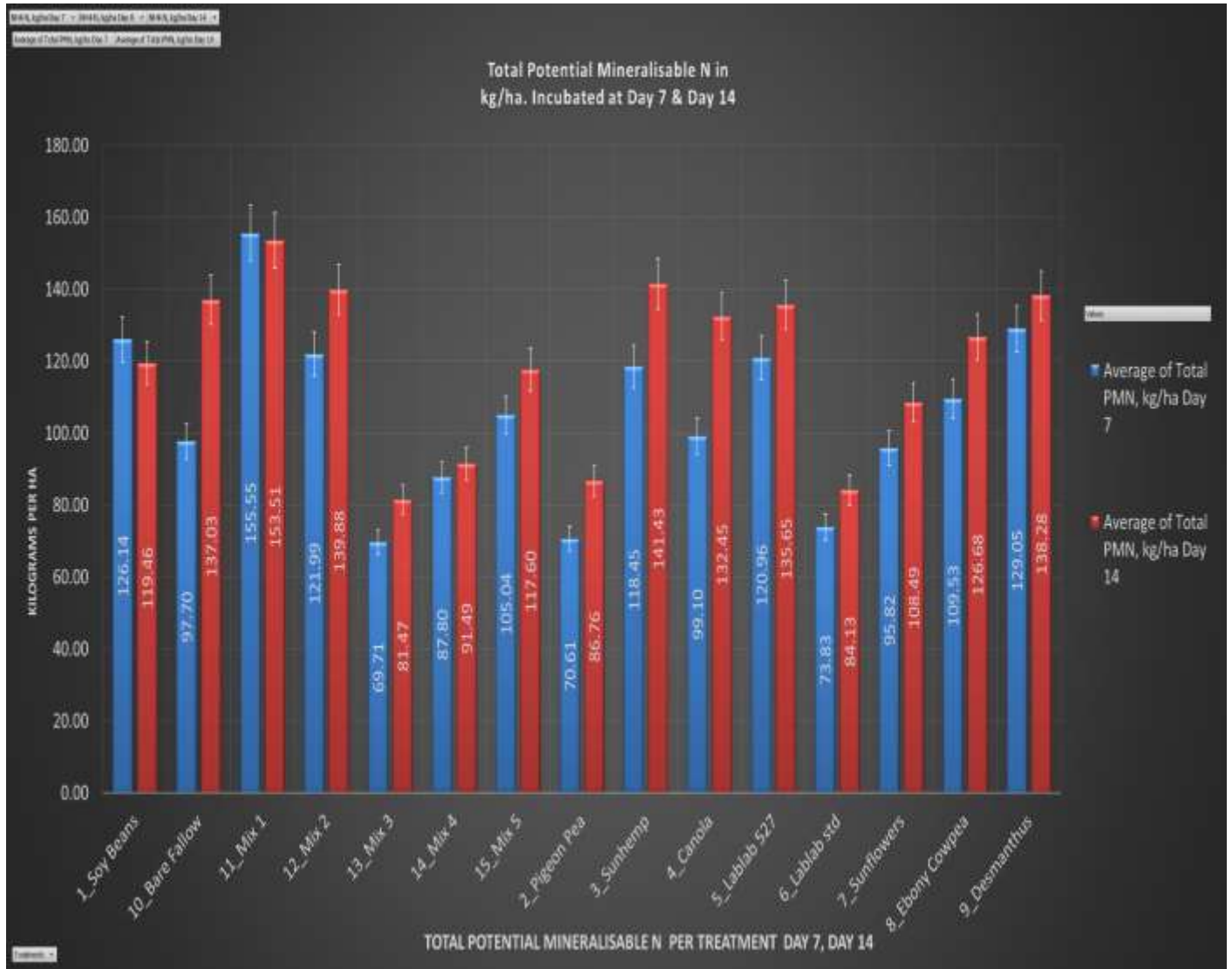


Results for Nematode data collect in full grown legume crop

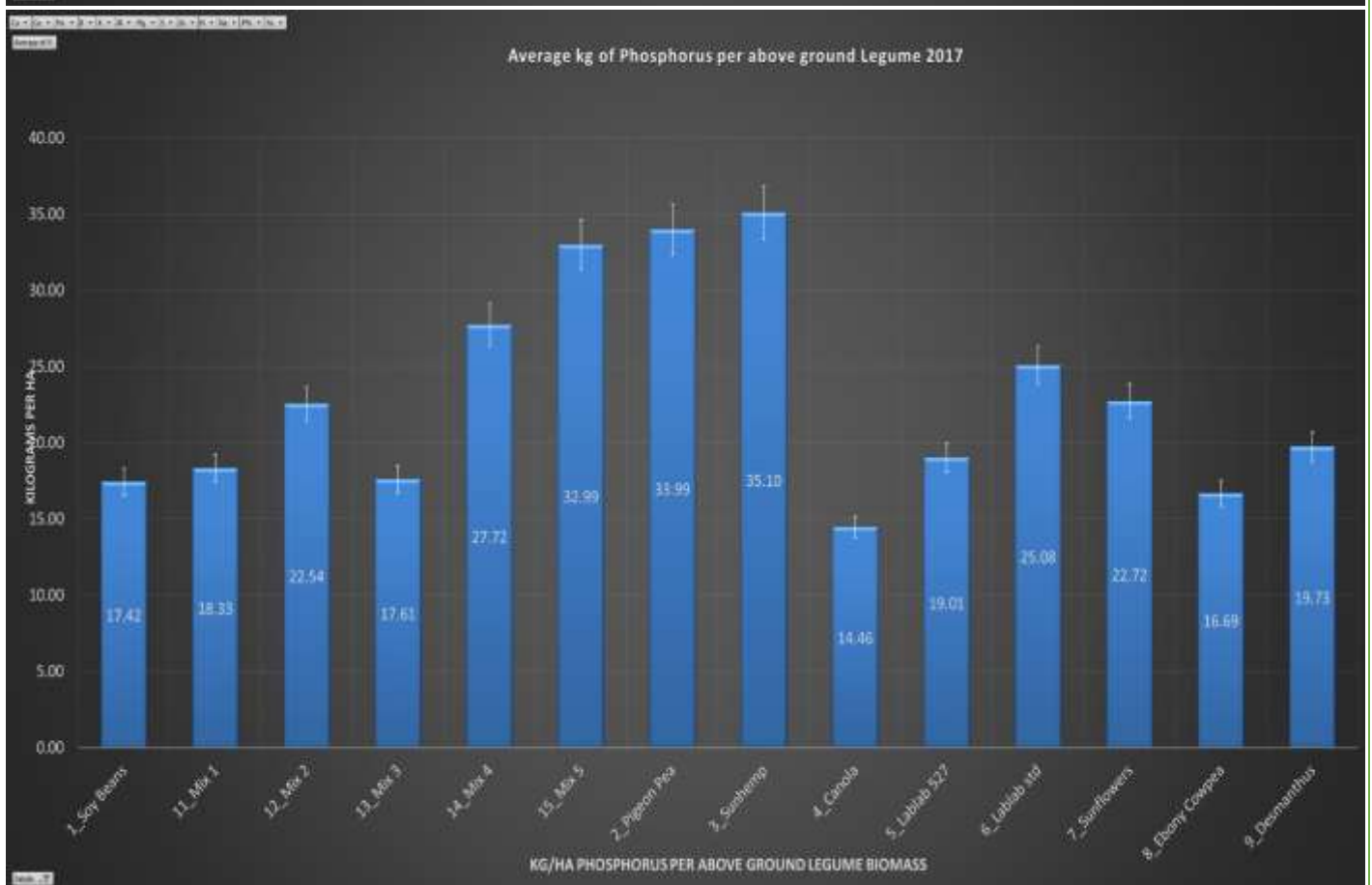
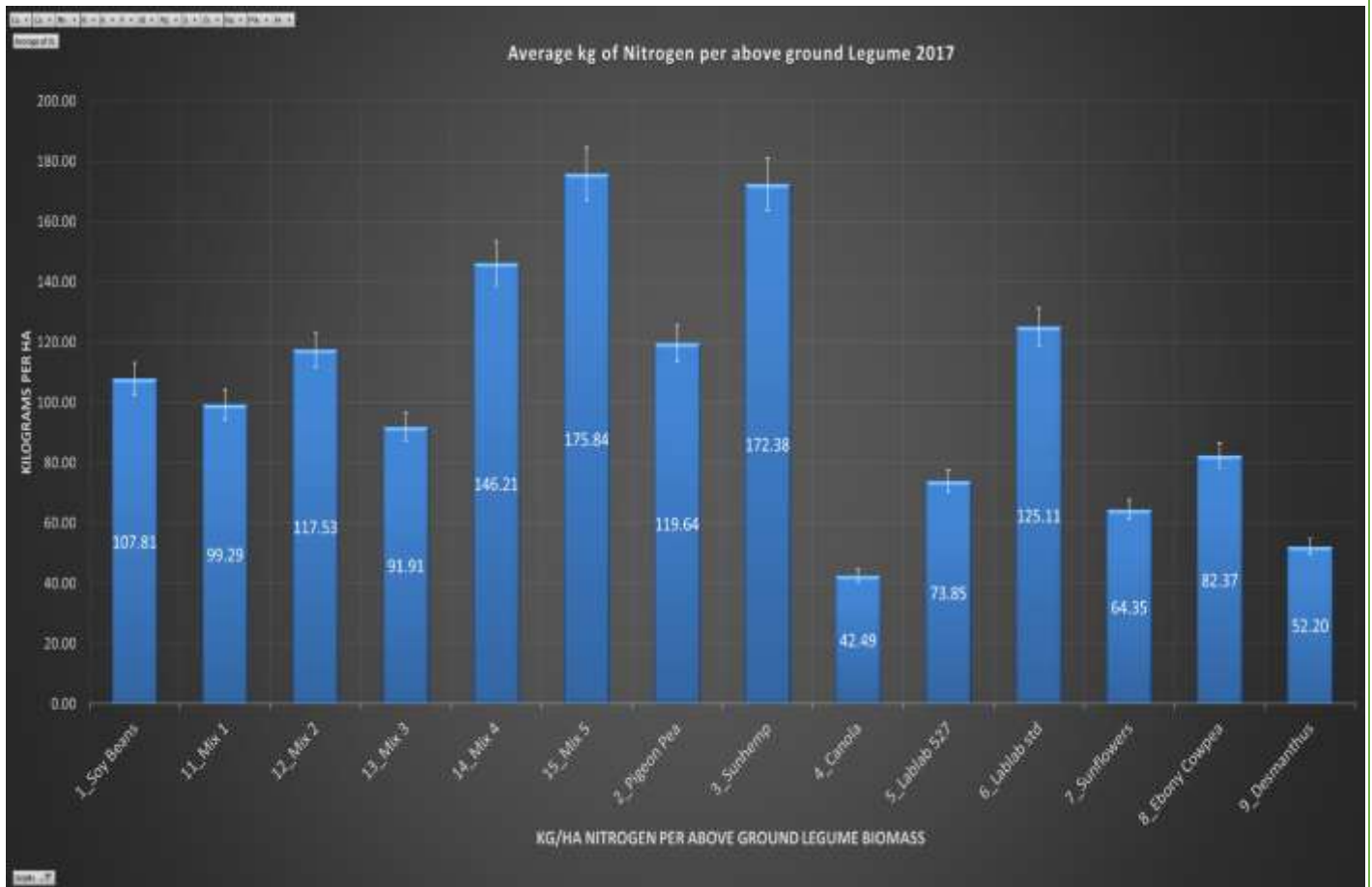
Pathogen vs Freelifving - March 2017

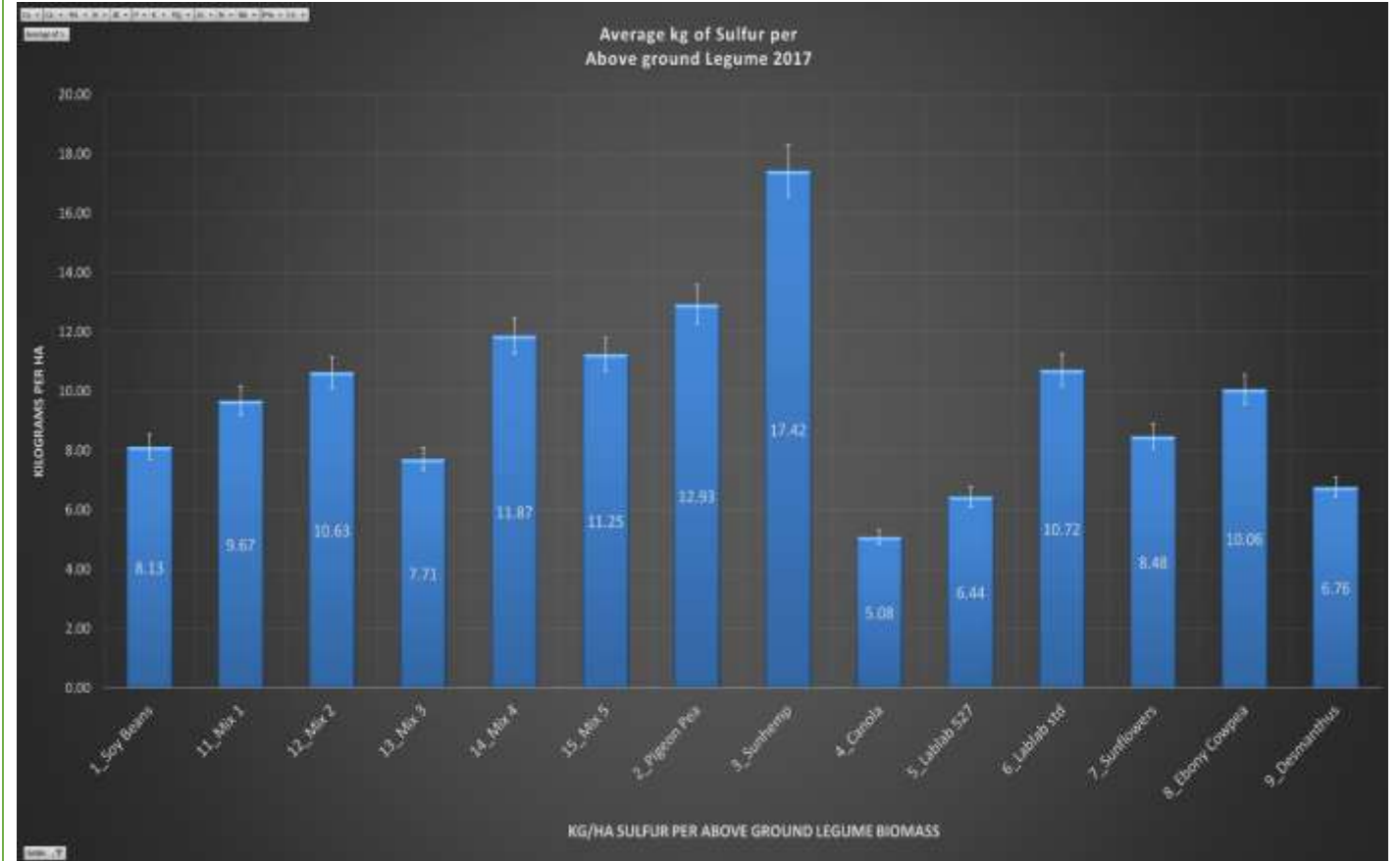
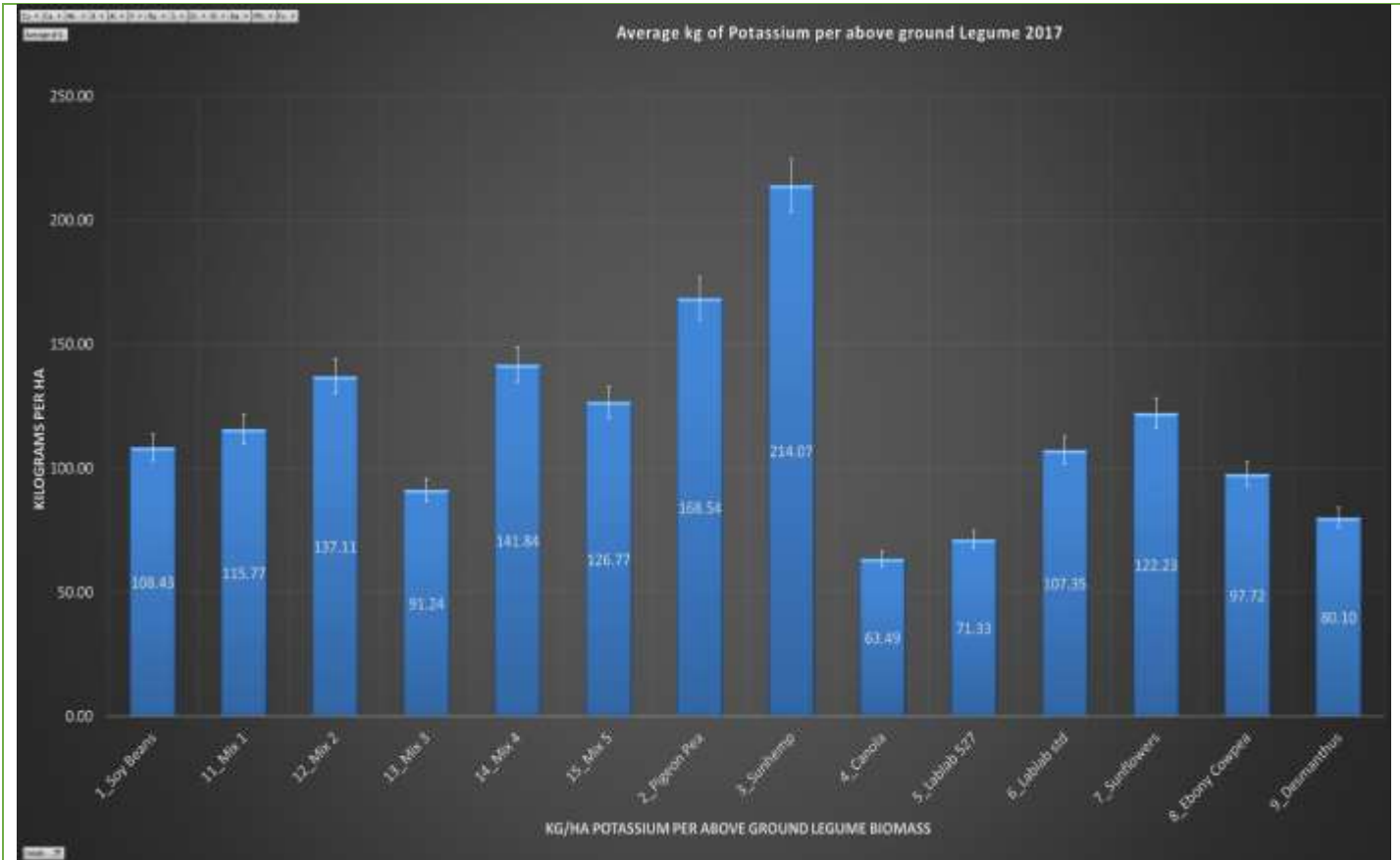


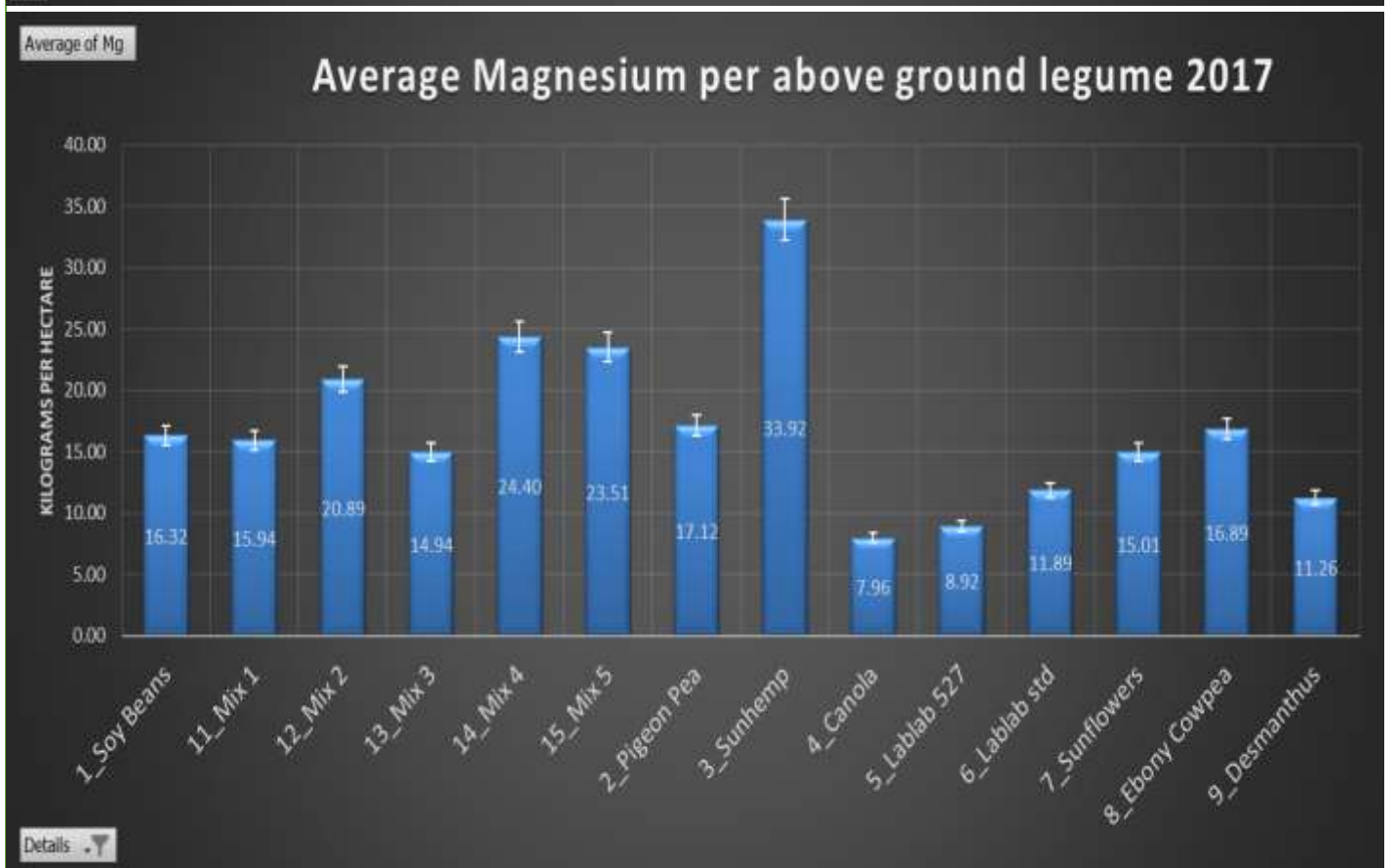
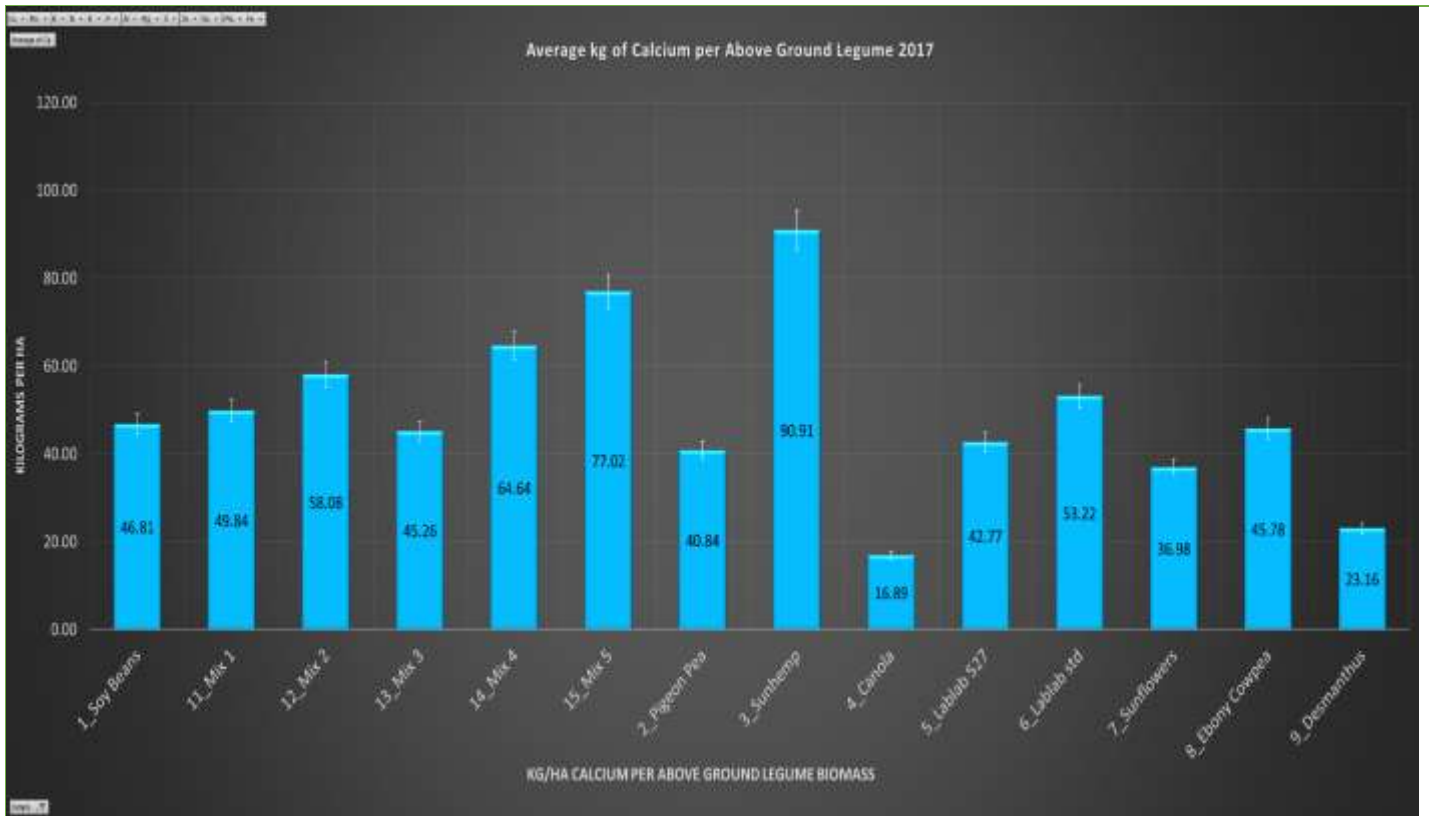
Total Potential Mineralisable N -kg/ha. Incubated at 7 & 14 Days



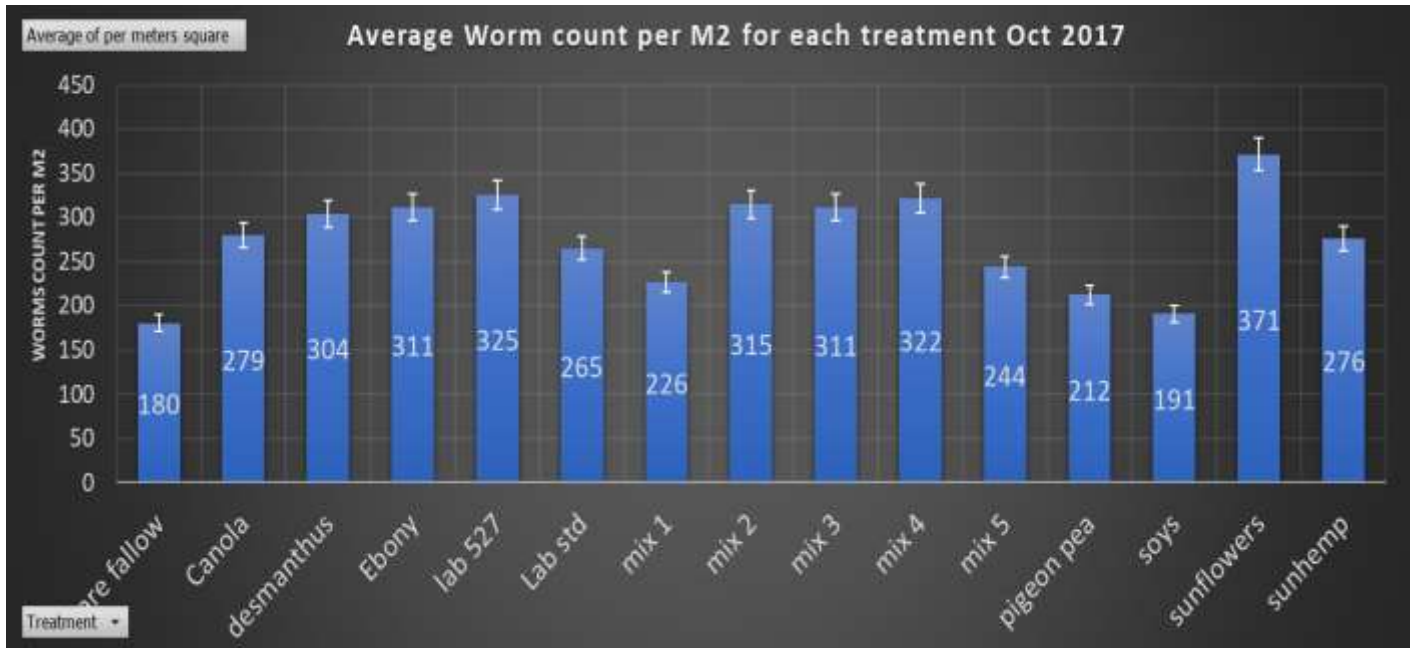
Average Kilograms per hectare of Macronutrients taken up by legume plant March 2017







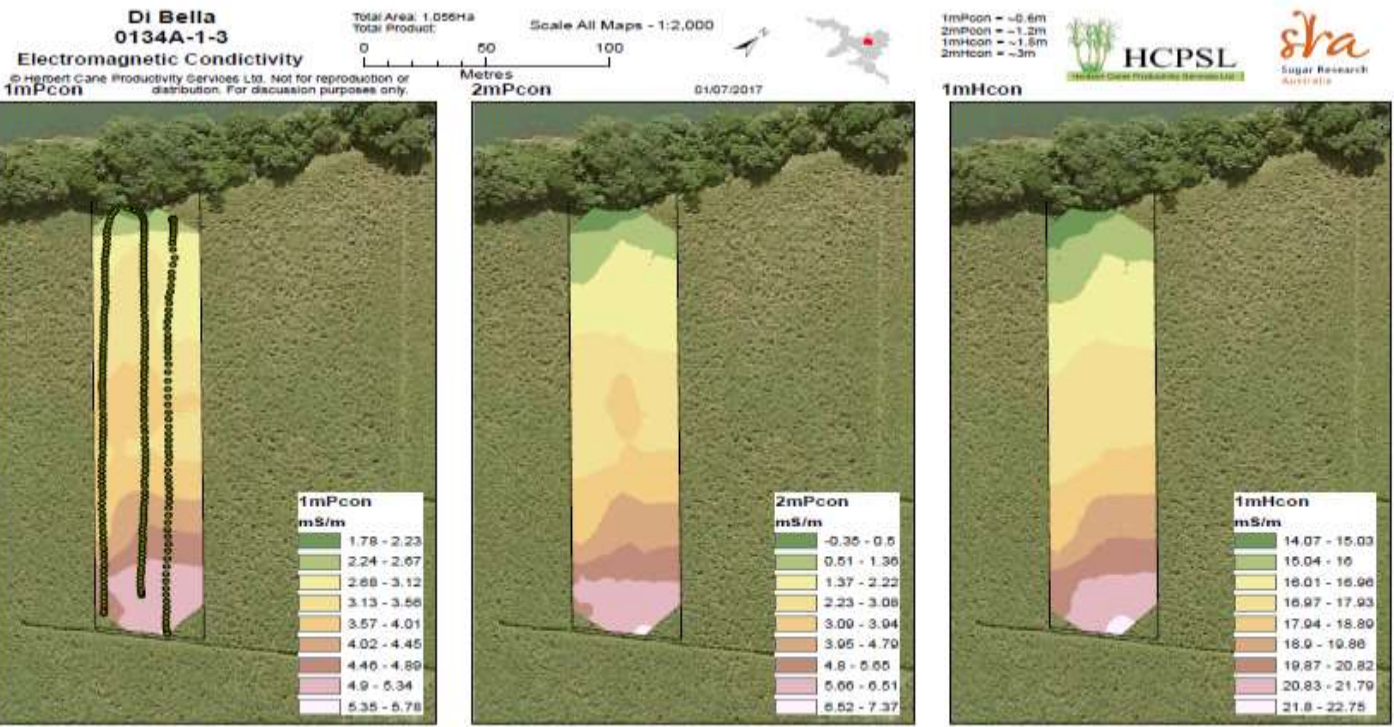
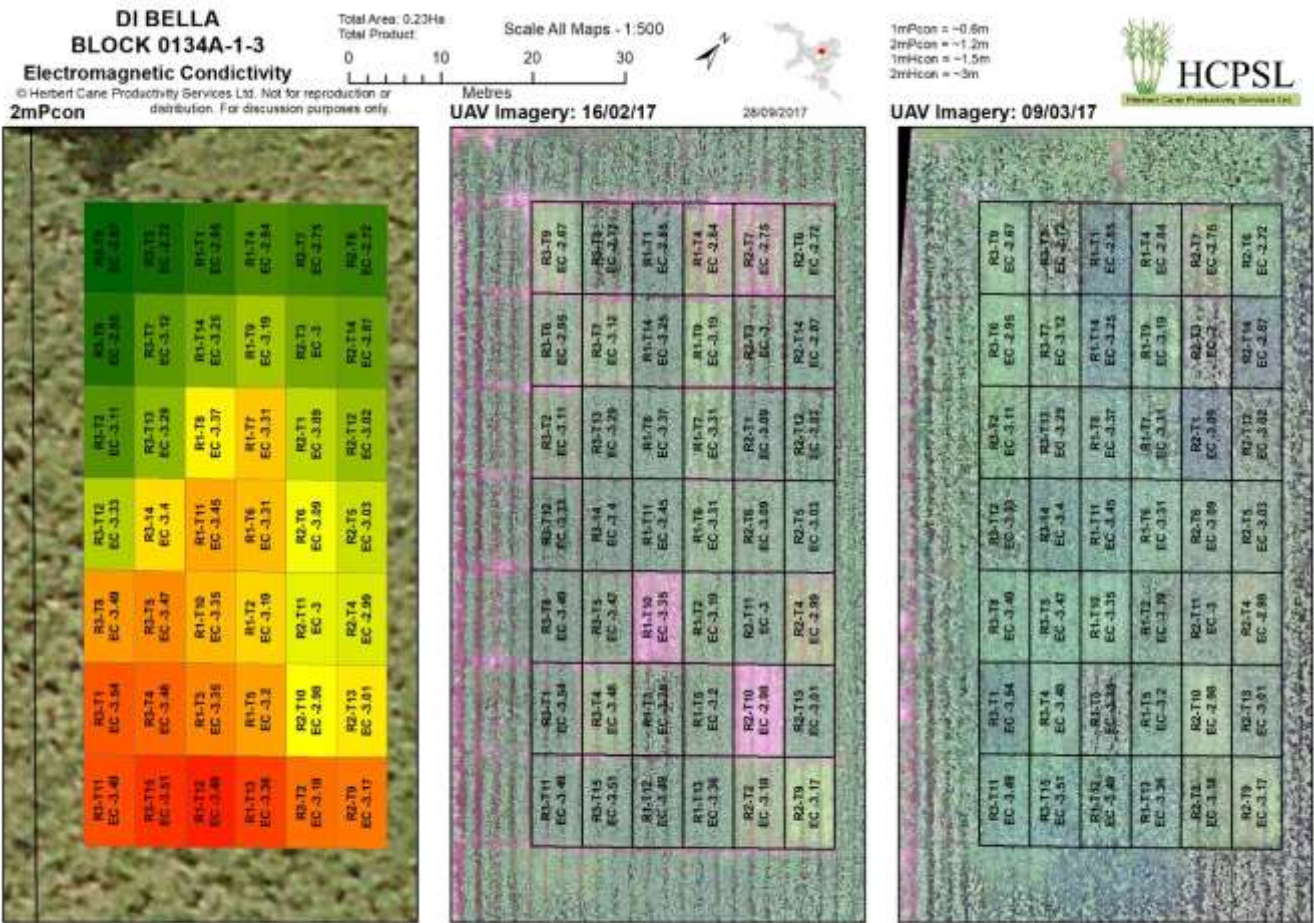
Average Worm count per M2 for each treatment after cane planted October 2017.



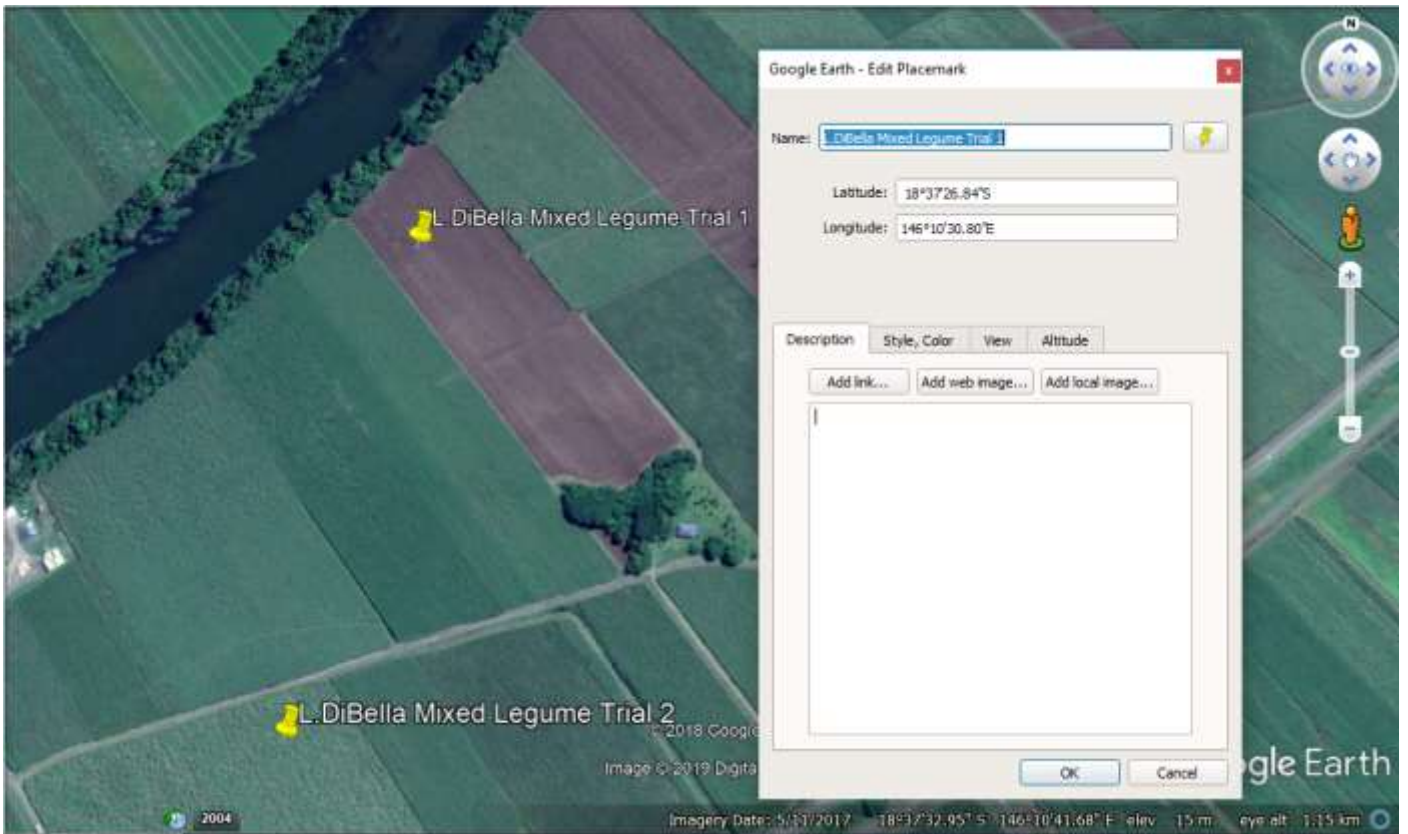
CCS results for Mixed Legume trial 1 in 2018



EM mapping of trial 1, 2017



Google Earth Reference map



Conclusions and comments

The trial has produced some interesting data that is showing positive effects from having such a mixed crop. The trial will continue into 2018 plant harvest. Another block has been chosen to put another legume crop to further assess the effects of different legumes in fallow systems.

One legume crop was unsuccessfully grown this year and that was the canola. This crop is more suited to cooler climates and didn't grow well with the hot summer season. Perhaps it would have been more successful as a winter cover crop and not a summer cover crop.

Advantages of this Practice Change: The mixed fallow plots have been very successful in shading out weed species. The crop has provided organic nutrients back to the soil and the grower was able to reduce the rate of inorganic fertiliser inputs. Only 35kg of N/ha from an inorganic source was used to grow the crop to harvest. Further reduction in inorganic nitrogen inputs are being considered because the crop was extremely large at 6 ½ months and lodged early .

Disadvantages of this Practice Change:

- Some legume seeds can be costly.
- The smaller seeded varieties of legumes can be more difficult to spread through a bean planter. Though if weather conditions and soil health permits, seed can be spread with a spinner spreader and harrowed in, which is much easier.
- The risk of crop failure would cause loss of income and advantage provided by the fallow crop will not be realised

Will you be using this practice in the future: YES

% of farm you would be confident to use this practice:

All fallow blocks will have a mixed legume crops in the future.