SRDC Grower Group Innovation Project

Final Report

SRDC Project Number: GGP047

Project Title: Maximising Soy's in Central Queensland

Group Name: Mackay Soybean Study Group

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Photo 1

Scouting for insects utilising a beet sheet.

Australian Government
Sugar Research and Development Corporation

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Executive Summary:

Background: The Mackay region is currently expanding into soybeans as a legume for green manure and for grain production. The lack of region specific information has meant that growers are relying on information that has been developed in other regions. Some of this agronomic or varietal advice has resulted in crop failure when applied in the central region. Soybean crops in the central region are often lower yielding and have a higher frequency of failure than in other cane growing regions due to the lack of good local understanding of the crop. Our region's climatic conditions such as: day length, temperature, rain fall and the number of rainy or clear days will impact on soybean production. These needs must be addressed to further encourage the adoption of legume break crops in the central region. Soy bean yields in the central region have not reached their potential when compared to the other regions and we believe that some of the issues relate to poor variety selection and the lack of good local information. This project experimented with current and new varieties and documents the results of these experiments. This information will give cane growers in the central region a process for better decision making.

R & D Methodology:

- This project has tested a selection of soybean varieties and identified their adaptation in terms of planting date, soil type, insect pressure and management options in the Central region. All trials had soil samples taken prior to planting to determine nutrients, and insect numbers were monitored by weekly beats with numbers recorded with that info collated to make the graphs in milestones 3 and 6.
- Establish grain yield and quality potential for each variety used in the trial. All trials were individually weighed using a specially designed trailer loaned from Pacific Seeds in Emerald.
- Utilise current information produced by soy bean plant breeders to best identify selection of different varieties as well as new variety clones that will test performance of grain production / nitrogen fixation in the Central Region. One metre quadrants were sampled at flowering time in each of the trials with all plant material removed and tested for biomass both wet and dry and nutrients.
- Establish trial sites that will identify optimum plant date and density, compare flat planting verses mound planting and evaluate different row spacing. Plant populations were confirmed by measuring out 1 metre quadrants, then counting the plants within and averaging across the trials.
- Investigate what parameters will determine if a soy bean crop is utilised for green manure or for grain production.
- The data from the trials was analysed by the Statistix program, using AOV analysis. The means were compared using the LSD Comparison test or the Tukey HSD Comparison test.

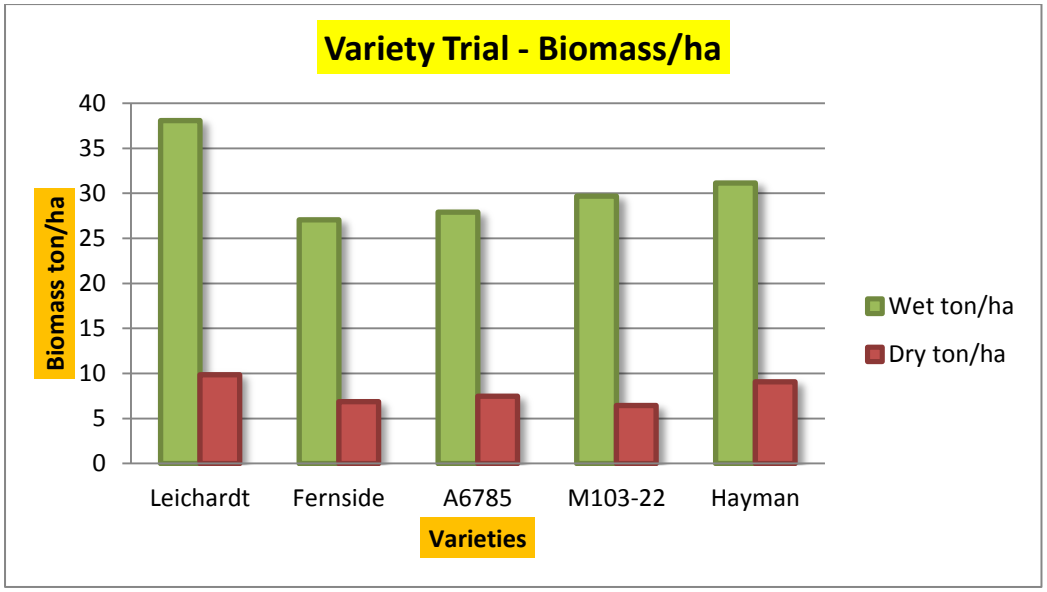
Our group sought help from a number of different people who gave advice on most aspects of the trials. We thank these people sincerely for their advice and are listed below, along with the organisation they represent -

Andrew James CSIRO, Dave McCallum MAPS, Joe Muscat GGS, Pat McKey Bettacrop, Ian Morgan PB Agrifood, Sue Knights Insightrix Research Pty Ltd, John Hughes DPI&F, Maryann Salvetti NQ Tropical Seeds.

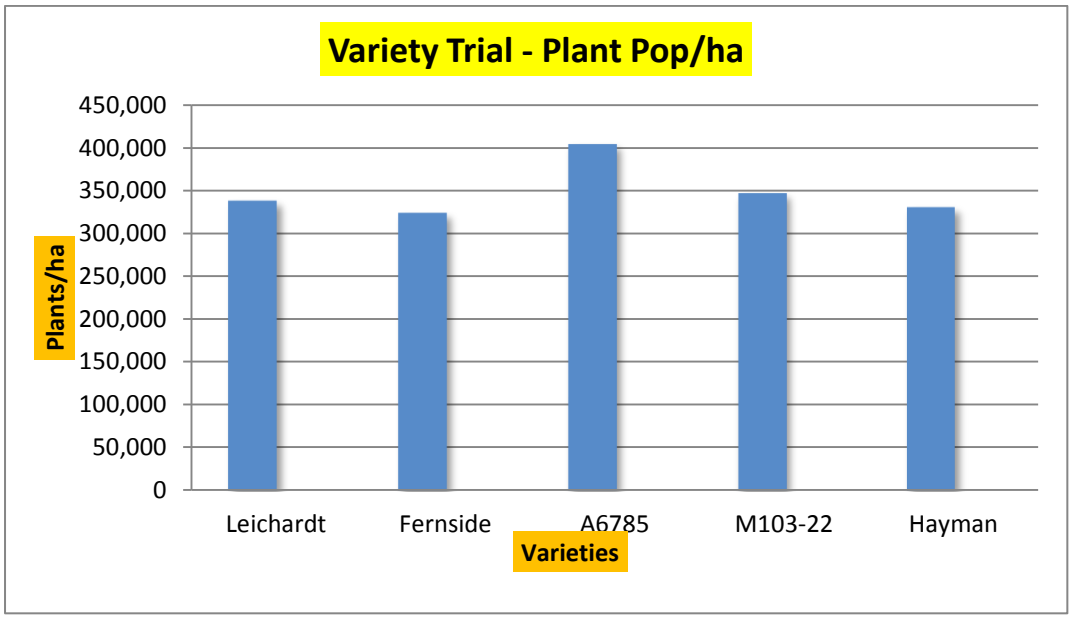
Outputs from this project:

- To rank soy bean variety performance in nitrogen fixation, grain yield and quality in the Central region.
- To produce soy bean information that will highlight best management practices in regard to row spacing, plant population and variety selection for different situations in the central region.
- Region specific soy bean information will create better adoption of legume break crops.

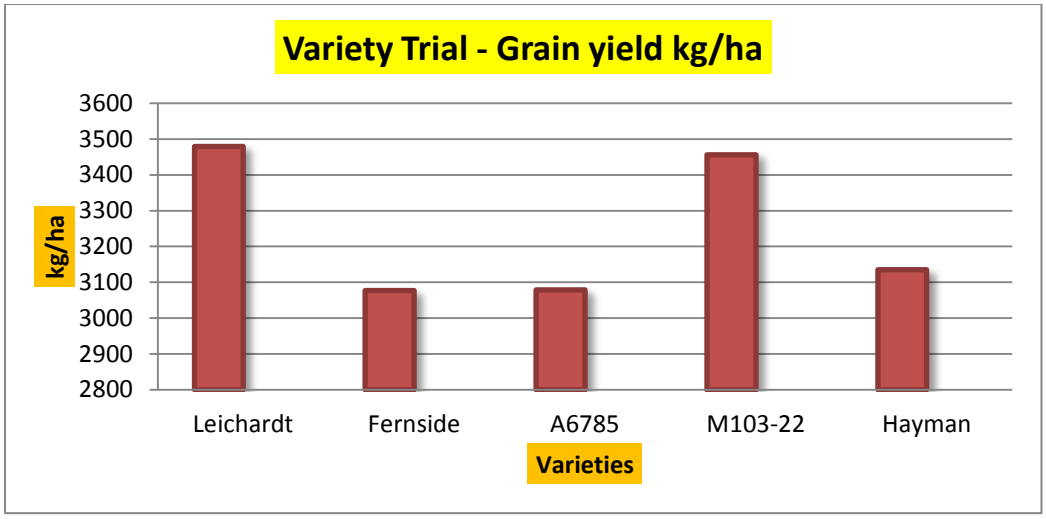
Statistical Results
Simon Mattsson's Variety Trial (2011-12)



Leichardt, as expected, has significantly more wet biomass than the other varieties (p=0.0002).
With regard to moisture content %, M103-22 was significantly higher than the other varieties (p<0.0001). Fernside was significantly higher than A6785 & Hayman, with the latter being significantly lower than all the varieties.

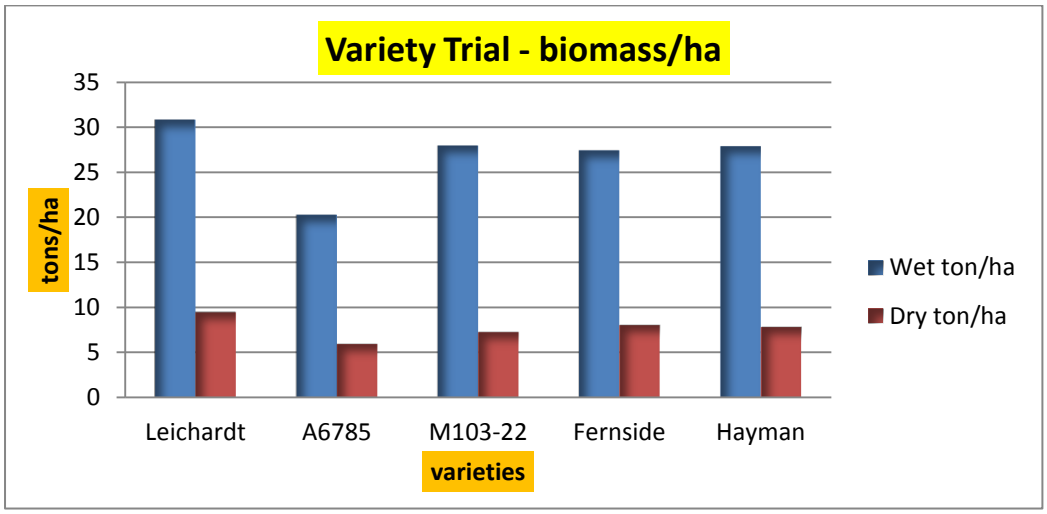


A6785 has a significantly higher plant population than the other varieties (p=0.0025), probably because of the higher seed germination % and smaller seed size.

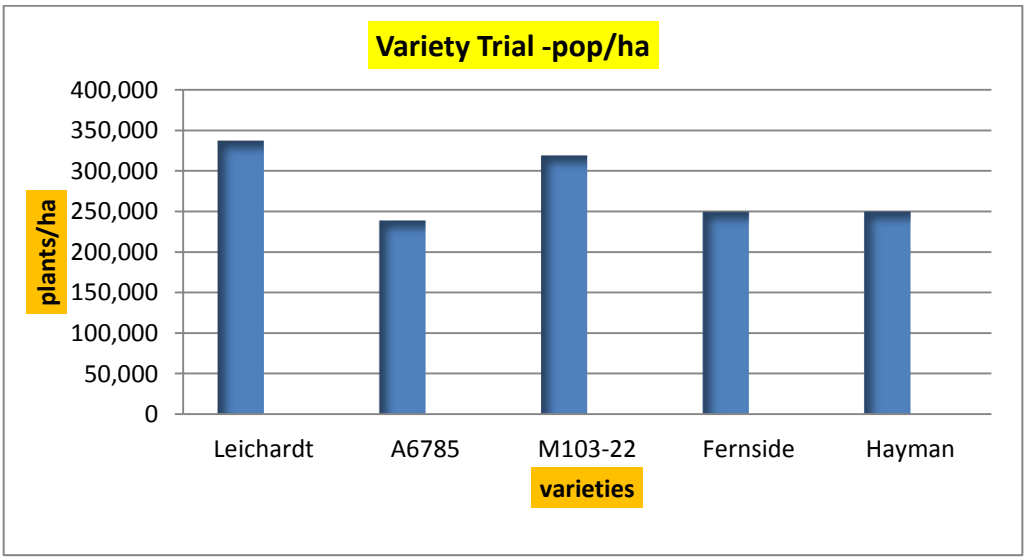


Leichardt and M103-22 were higher yielding than the other varieties, but because the different reps were not harvested separately, there was insufficient data to analyse if this was statistically significant.

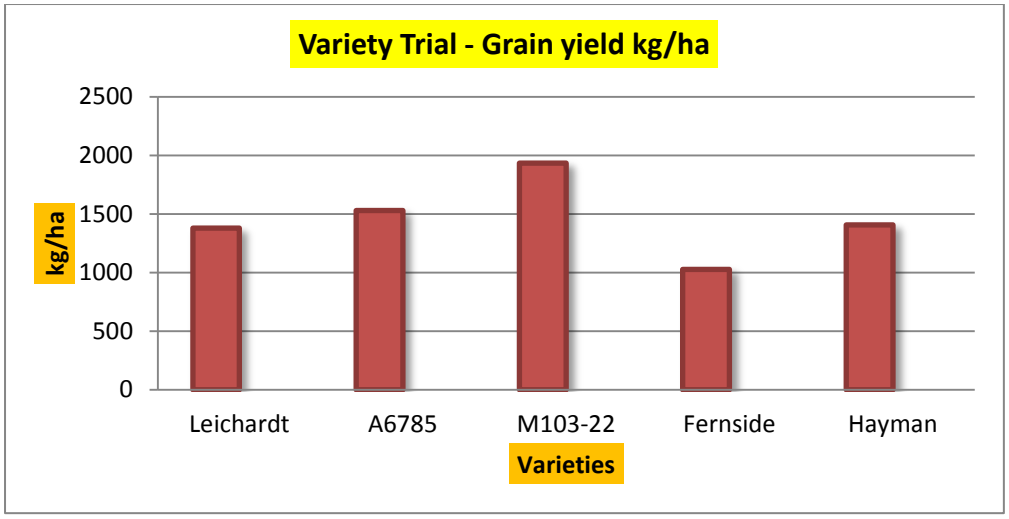
Rudy Mattsson's Variety Trial (2011-12)



All the varieties had significantly more wet biomass than A6785 ($p=0.0062$).
Again M103-22 had the highest moisture content %, which was significantly different from the other varieties ($p<0.0001$); Leichardt was significantly lower than all the others.

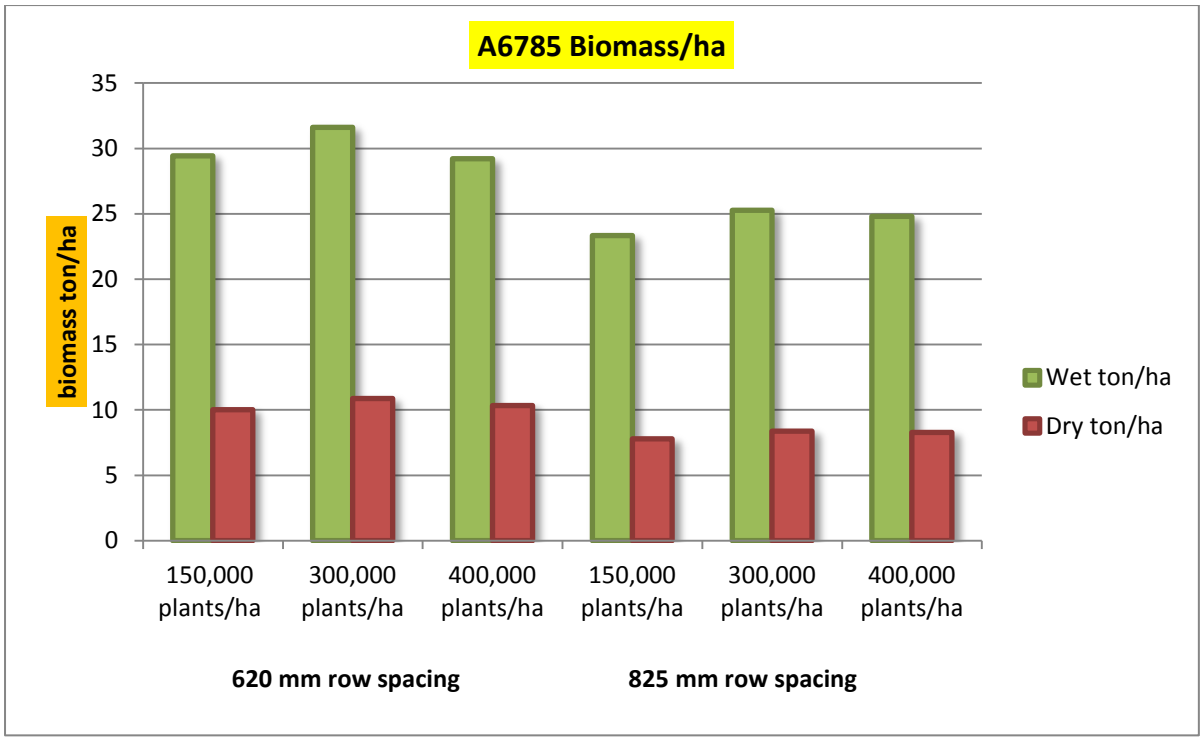


There was no significant difference between the varieties in plant population per ha, possibly because all germination was affected adversely by the high trash content in the soil when planting.

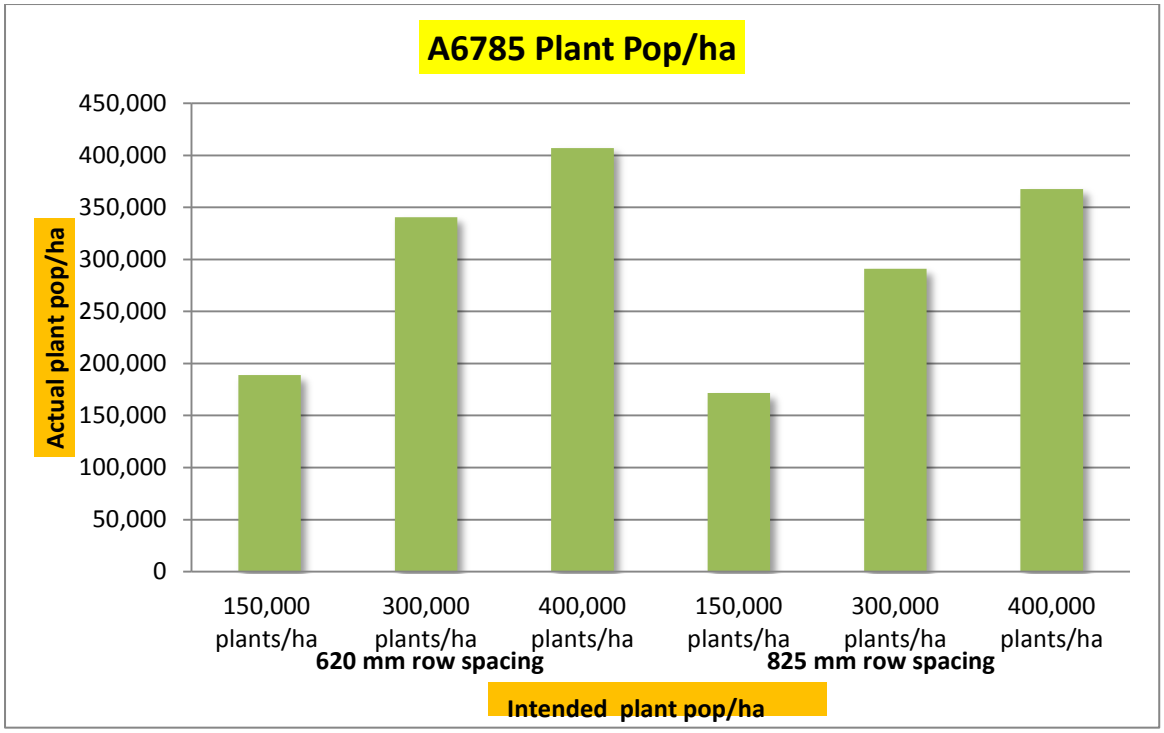


M103-22 was the highest yielding variety, but again there was insufficient data to analyse to determine if this was statistically significant.

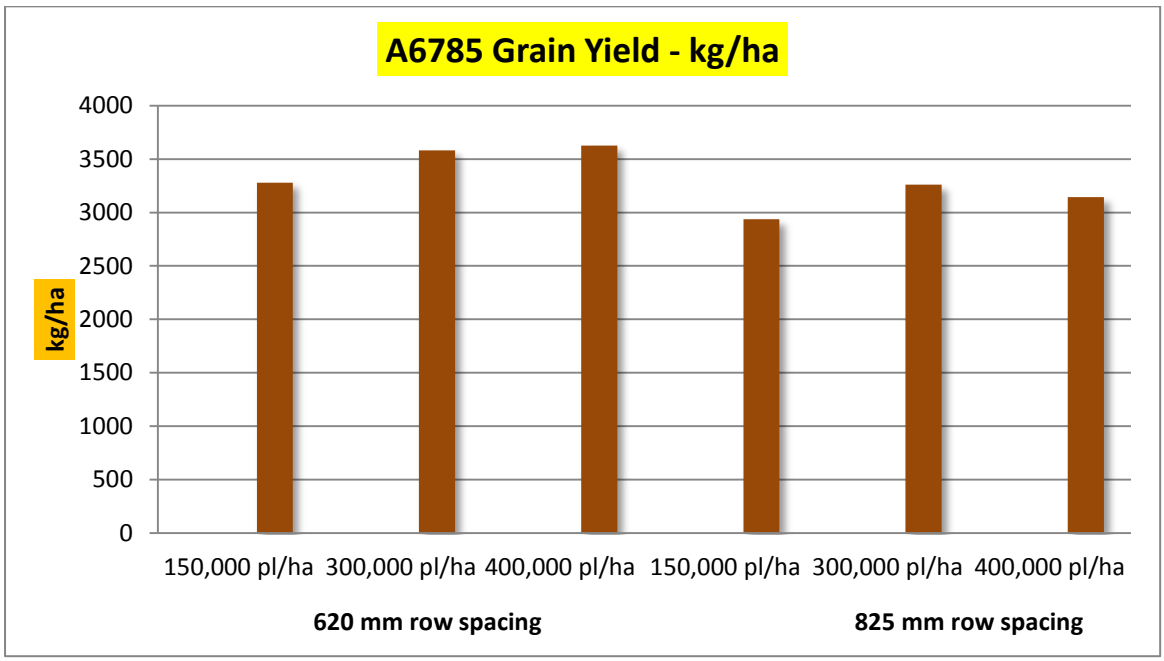
Ian & Luke Stevenson's A6785 Population Trial (2011-12)



There was no significant difference in wet biomass weights over the trial. The observation here is that the plants in the lower plant population density trial (150 000) have compensated in more biomass growth, while the plants in the high density trial (400 000) were slender and fragile.
There is also no significant difference in moisture content % over the trial.



The actual plant population of A6785 at the intended 400,000/ha at the narrower row spacing (620 mm) is significantly higher than at the wider row spacing (p=0.0008). There is no significant difference between the other populations at the different row spacings.



The grain yield in the narrow row spacing (620 mm) in all population densities was significantly higher than the yield in the wider row (p=0.0160). This was because the actual population/ha in the narrower rows was higher than those in the wider row, due to the latter having less rows/ha.

The grain yield from the 300,000/ha plant density trials was significantly higher than the yield from the 150,000/ plant density (p=0.0376). Although the plants in the lower density were able to compensate in biomass, they were not able to compensate sufficiently in grain production.

Summary of Results (11/12 & 9/10)

The following tables contain the condensed results from the two years of the trial when we were able to harvest the crop; there was two more years in the trial that was destroyed by flooding.
The target plant populations were 300 000 except where listed otherwise, actual populations achieved varied quite widely for a number of reasons, differing ground conditions, older model planters not infinitely adjustable, varying seed size between varieties, and the wet weather.

All trials were commercially harvested using an older model harvester, which struggled with some of the variations between trial plots; this will have contributed to some of the difference between results. What the trials do show is that grain yields above 3000kg per hectare or 350kg per hectare of N are consistently achievable here in the central region.

Soybean Variety Trials 2011-12

(Trial 1 - Simon Mattsson, Devereux Creek, Mackay)
(Trial 2 - Rudy Mattsson, Victoria Plains, Mackay)

Variety	Plants/ha		Grain kg/ha		Biomass ton/ha (green crop)		N kg/ha (green crop)	
	Trial 1	Trial 2	Trial 1	Trial 2	Trial 1	Trial 2	Trial 1	Trial 2
Leichardt	338,445	337,140	3479	1378	38.075	30.845	247	183
Fernside	324,295	249,374	3077	1028	27.076	27.460	233	218
A6785	404,445	239,067	3079	1530	27.922	20.307	244	192
M103-22	347,370	319,218	3456	1933	29.691	27.999	226	171
Hayman	330,756	249,990	3135	1407	31.153	27.922	257	196

Soybean Variety Trial 2009-10

(Trial - Rudy Mattsson, Victoria Plains, Mackay)

Variety	Plants/ha	Grain kg/ha	Biomass ton/ha (green crop)	N kg/ha (green crop)
Leichardt	405,112	3166	31.076	378
Stuart	329,047	2896	25.069	330
A6785	488,015	2319	18.774	273
Warrigal	355,114	1850	22.150	319
M103-17	231,615	1897	26.234	316
M103-22	240,161	2292	26.191	328

A6785 Soybean Population Trial 2011-12

(Trial - Ian & Luke Stevenson, Victoria Plains,Mackay)

Intended Plant/ha	Actual Plants/ha		Grain kg/ha		Biomass ton/ha (green crop)		N kg/ha (green crop)	
	620mm rows	825mm rows	620mm	825mm	625mm	825mm	625mm	825mm
150,000	189,044	171,708	3278	2935	29.437	23.335	383	298
300,000	340,504	290,928	3580	3259	31.615	25.274	443	342
400,000	406,799	367,660	3624	3143	29.195	24.790	407	326

Leichardt Soybean Population Trial 2009-10

(Trial - Ian & Luke Stevenson, Victoria Plains,Mackay)

Intended Plant/ha	Actual Plants/ha	Grain kg/ha	Biomass ton/ha (green crop)	N kg/ha (green crop)
150,000	201,333	3034	40.027	424
300,000	342,667	3077	36.376	358
400,000	460,000	3035	43.501	484

Triple bottom line objectives;

The Economic Benefits will be:

- Improving cash returns from a legume break crop from the nitrogen fixation and grain produced.
- Increased production of cane following a legume crop.
- Maximising the regional potential in the production of soybean

The Environmental Benefits will be:

- Increased soil health from a legume rotation with the correct selection of soy bean varieties there by maximising production (nitrogen fixation / grain) across the region.
- Maximising the regional potential for nitrogen fixation, increased ground cover (erosion control), and lessen the reliance on granular fertilisers.

The Social Benefits will be:

- Increased capacity of growers in the central region to make better decisions when producing soy beans
- Increase faith / confidence / skills / knowledge to produce legume break crops as a normal component of their farming system.
- This project will renew confidence in the individual grower and the community in general to maintain a profitable situation in their farming business. (Keep Farmers Farming)

Achievements of the project to date:

Over the course of the project, the group has conducted a number of field walks which have all been well attended. An example of which is the 30 local growers who attended on the 24th Feb 2012. There have been a number of articles published in the local media and interviews given to the ABC; these are widely read and listened to locally.

Our group finds it very difficult to quantify just what influence our trials may have had in encouraging local cane growers to adopt soybeans into their farming system. Legume fallows are one of the cornerstones of the New Farming Systems that has been promoted by the BSES state wide now for a number of years and our work on a local level would be expected to have contributed to that. In the Mackay region about 38% of growers have adopted the new farming system and as part of that, local seed sellers are seeing about 5% of new growers buying soybean seed each year.

The biggest single influence over the course of the project has been the weather. It has caused the project to be extended by a year after the total failure of plantings in 2010 due to heavy and ongoing rain. This also badly affected the results of several individual trials. When a local grower is asked if he intends to plant soybeans in his fallow, the weather is the most often used reason for either not planting or the failure of a planting. How to overcome the weathers influence is well beyond the scope of our trials, but what we have been able to demonstrate is the fact that regardless what the weather does, if a grower follows a few simple principles he will give himself the best chance of achieving a worthwhile out come in most years.

Intellectual Property and Confidentiality:

There are no matters with in this trial related to the above.

Expected Outcomes:

Our group feels that over time there will be further uptake of soybean in rotation with cane across the Central Region and that our trials will enhance that uptake but the speed at which this happens will probably be determined more by the weather from year to year and the timing of the crushing season; i.e. if the weather is favourable and the crush is finished at the right time then more soybeans will be planted.

Future Research Needs:

Our group feels that ongoing research in this area is not only needed but vital because new varieties are being bred in other parts of Australia and overseas and these new varieties will always need to be tested locally to confirm their potential performance in a range of areas from grain yield to insect resistance. This ongoing research would have two fold benefits; firstly it would give the local growers constantly up to date information, but would also show growers that some local growers still feel that soybeans are worth the time and effort no matter what the weather or when the crushing season may finish.

Photo 2

Weighing soybean strip trial treatments.