SRDC Grower Group Innovation Project
Final Report

SRDC project number:	GGP 021
Project title:	Bed forming utilising GPS guidance by the CAS (Calen and St Helen) Young Farmers Association
Group name:	Calen and St Helen Young Farmers Group
Contact person:	Brad Gordon or Colin MacKenzie
Due date for report:	September 1 2009
Funding Statement:	This project was conducted by the Calen and St Helen Young Farmers Group in association with the Sugar Research and Development Corporation (SRDC). SRDC invests funds for sugar R&D derived from the sugar industry and the Australian Government.

Australian Government
Sugar Research and Development Corporation

The Calen and St Helen Young Farmers Group is not a partner, joint venturer, employee or agent of SRDC and has no authority to legally bind SRDC, in any publication of substantive details or results of this Project.

Body of Report

Executive Summary:

(An overview of the aim, conduct, key results and learnings from the project. Maximum 500 words)

This project aimed to enhance controlled traffic farming with GPS guidance in undulating conditions in the Calen and St Helen district of Mackay. The project focused on the use of preformed beds, as well as investigating different planting techniques (eg dual row and wide shute on preformed beds). The group also wanted to investigate the potential for a contracting facility to bed form under guidance.

Key results from the project include:

- Controlled traffic systems were enhanced through the use of GPS. Without GPS we had issues with maintaining even row spacings along the contours and side slopes, and holding a billet planter in position on slopes. Through the use of GPS, and the Alexander (flat top) bed former, we were able to overcome these issues.
- We found that the flat top bed shape formed with the Alexander bed former was the most suitable for our region. While the trial results indicated there was no yield, NIR or financial difference between the flat top, round top bed and conventional planting, we found the flat top beds were much easier to manage in our undulating farming conditions as the tractor/planter can more easily stay on the wheel ruts and not stray from the desired position. With the flat top bed former we found we could mark out with a GPS tractor and then conduct other paddock operations without the GPS because the bed shapes kept the tractor and implement in the GPS wheel tracks.
    - The flat top beds provided the best wheel track for our planting equipment, as this profile seemed to form a "railway like track centre", making it very easy to keep the planter in the correct position without the need for GPS guidance. The round beds seem to have a wider wheel space and we experienced some movement and uneven row spacing, however this could be eliminated with the use of guidance equipment on the planting gear (which we don't have).
- Different planting techniques on preformed beds had very similar yields. The dual rows on preformed beds performed the worst with a yield of 103.7 t/ha, compared to singles on beds and conventional planting with 108.63 and 107.81 t/ha respectively.
    - Based on the gross return per hectare, the single wide shute treatments planted on preformed beds performed the best with a return of $2,582.78 per hectare. However the conventional treatment was very close with a return of $2,539.34 per hectare. The dual rows had a return of $2,464.90 per hectare. Across the treatments there was only a difference of $117.88/ha.
- A FEAT analysis conducted by a DPI economist showed that the group's current farming system (controlled traffic and tilled system) resulted in a Farm Operating Return of $20, 070 and a Return on Investment of 1.44%. While the improved farming system which involves controlled traffic, preformed beds, soybean fallow and reduced tillage resulted in a Farm Operating Return of $54, 947 and a Return on Investment of 3.94%.
- There was very little difference in yield and NIR data between the conventional planting method, and the two different bed shapes. The CASH preformed beds, which have a flat shape, had the highest yield with 98.97 t/ha, however it also had the lowest PRS. Tonnes of sugar per hectare across the treatments were almost identical and as a result the Gross Return per hectare only had a difference of $29 between the treatments.
    - While there was no major difference in gross return between the treatments, we noticed that the flat bed shape was much easier to form, plant and harvest, compared to the round shape.

- Preliminary results indicate that the flat top bed system has much greater water infiltration and plant extraction than the other systems. However more detailed, long term work needs to be conducted before final conclusions can be drawn.
- In 2007 approximately 160 acres outside of the group members farms was contract bed formed, and an additional 100 acres was contract bed formed in 2008. The equipment will continue to be available for hire into the future.
- The group members have determined that in this area, preformed beds are essential for a successful legume fallow. All group members will use the bed former prior to planting soybean.

Background:

(Why did you need to do this project?)

Currently there are a small number of growers in the Calen district (50km north of Mackay) conducting their own trials on controlled traffic and legume fallows. However the use of beds is not being investigated due to concerns regarding soil types and undulating conditions. As a group we identified the benefits of moving to a bed system to compliment our controlled traffic systems, but also identified the need for GPS guidance to enhance this system in our area.

Undulating conditions have been identified by growers throughout the central region, not just in our area, as a barrier to moving to controlled traffic systems mainly due to difficulties maintaining even row spacings along the contours and side slopes, and holding a billet planter in position on slopes. Our project will investigate these issues. Harvester stability also presents problems at wider row spacings, particularly with elevator extensions on slopes. We won't be directly investigating this issue, but will need to determine a way to harvest our trials.

Aims:

(Include the Aim and the expected benefits that were listed in Section 2 of your original Application)

The aims of the project are to:

- Enhance controlled traffic farming with GPS guidance in undulating conditions
- Optimise bed shape to maximise benefits from:
    - Water infiltration
    - Legume crops
    - Minimise water runoff or encourage shedding water - for different situations
    - Row spacings and controlled traffic
    - NIR results affecting cane quality and payment
    - Different soil types
- Trialling planting techniques to maximise bed shape and determining effectiveness based on economic return, with evaluation of:
    - Double disc opener dual row planter
    - Wide shute billet planter
    - Narrow shute whole stick planter
- Investigate contracting facility to bed form under guidance with the CAS young farmers associations tractor

The Economic Benefits will be:

- Reduced production costs through:
    - More uniform application and reduction in chemical and fertiliser application
    - Improved field efficiencies
    - Reduced cultivation
    - Less wear on machinery
- Increase in cane payment with improved cane quality

The Environmental Benefits will be:

- More environmentally sustainable farming system through:
  - Reduced erosion on undulating country
  - Address sodic soil problems through reduced cultivation and managing water movement
  - Reduced herbicide use and chemical movement off farm
- Improved soil health
- Improve water infiltration and/or shedding depending on our requirements

The Social Benefits will be

- This is a step forward in terms of succession planning as the older generation have limited knowledge of GPS systems, and minimal experience with incorporating beds into the farming system. Therefore these aspects of farm management will be the responsibility of the younger generation.
- Reduced time inputs in the paddock
- Contributing to the GPS network within the Northern area of Mackay Sugar

Methodology:

(How was the project conducted?)

Trials

Three replicated trials were established on three separate farms to investigate different bed shapes and planting techniques. Each treatment in each replicate is a minimum ½ hectare plot (to produce at least 30 tonnes) to enable yield data to be collected by Mackay Sugar. The trials were established on different soil types throughout the Calen and St Helen district. The main aim of these trials is to collect data on yield differences, and compare the ease of farming these different techniques. The trials are detailed below.

Trial 1. Flat Mound V's Round Mound V's Conventional Method

Trial 2. Preformed Beds Dual Row disc open V's Preformed Beds Wide Shute (400mm) V's Conventional Flat Planting in a controlled traffic system

Trial 3. Flat Mound vs Round Mound V's Conventional Method

Legumes on preformed beds

Initially the group had planned to establish a trial to compare legumes on flat mounds vs round mounds vs conventional. Due to wet weather the trial was not harvested for biomass to provide a comparison of yield. However, an observation assessment was conducted throughout the growing period and this is included in Trial 1. A variation to remove the soybean trial from the project was accepted in 2007.

Controlled traffic vs conventional planting

In the project proposal we specified that we wanted to compare bed shapes in controlled traffic to our conventional 1.6m system. However, after the project was approved all group members had made the decision to convert to controlled traffic. We believe controlled traffic is what we should be doing and therefore did not see the point in including 1.6m minimum tillage systems in any of our trials. This was outlined in Milestone 3 in the Proposed Changes section.

Soil Moisture Monitoring

After consultation with BSES, our extension officer offered to support us with these monitoring tools. An Enviroscan was established in Col's trial to constantly record soil moisture infiltration between treatments – round bed vs flat bed vs conventional planting during the soybean crop. The Enviroscan was installed in November 2007 prior to the soybean being planted.

Contract Planting
A contract planting opportunity was established within the local district. Growers are able to dry hire the GPS tractor and bed former, or hire group members to plant for them.

Results and Outputs:
(What results were produced by the Project? The results should include data collected, articles or reports written, events held and anything else you see as relevant to the industry. Relevant files including photographs should be provided on a CD.)

Trial 1. Flat Mound V's Round Mound V's Conventional Method

The intention of the trial is to compare new bed forming methods to the conventional method of planting that is currently used throughout our industry. This trial will compare the impact of preformed beds on a legume fallow.

Trial Information:

Trial Location: Colin Mackenzie's Cane Farm
Row width: 1.8m
Variety: Leichhardt followed by Q208
A variation was accepted to remove the soybean component of this trial from our project due to wet weather constraints, however we have included our observational assessment.

Observational Results Regarding Bed Formation

We found that the flat top beds can be formed up when the ground is not in perfect condition, whereas the round type beds need to have slightly fluffier ground to form the beds properly. The flat bed shapes appeared to stand up to the all-weather conditions well (including large amounts of rain), whereas the round beds seem to compress a little in size. The flat top beds also provided the best wheel track for our planting equipment, as this profile seemed to form a "railway like track centre", making it very easy to keep the planter in the correct position without the need for GPS guidance. The round beds seem to have a wider wheel space and we experienced some movement and uneven row spacing, however this could be eliminated with the use of guidance equipment on the planting gear.

A visual assessment of the soybean growth between treatments was conducted:

Within the trial we planted Leichhardt soybean into the different shaped beds, as well as into the conventional flat ground.

We planted the bean on the 14th December 2007 and at this time we noted that the top 20-30mm of soil was dry but there was good moisture beneath this. The following week after planting the bean, we received some good rain.

All of the seed germinated and we observed that 100% of the bean which was planted into flat type beds appeared to be growing well with little to no misses. We also noticed that the bean planted in the round type beds appeared to be going well, however there were some uneven strikes. We feel that this problem may be attributed to the fact that the seed was planted in the round bed using a tractor with no guidance, and when the tractor was not driven straight the bean was not planted deep enough.

Soybean results
Following the soybean crop, EM mapping was conducted to identify the different zones within the paddock and allow the EM consultant to identify the area where soil tests should be taken. The soil tests would then allow us to conduct a variable rate fertiliser application, and identify any differences in the soybean Nitrogen fixation between bed shapes and the conventional treatment. Unfortunately, the EM mapping was conducted, but the consultant did not follow up with soil tests. The block needed to be planted and as a result we could not variable rate fertilise, or compare Nitrogen fixation between treatments. A copy of the EM maps is attached in Appendix 1.

Cane Yield
Unfortunately due to consignment issues at the mill, the yield results from this trial were lost.

Trial 2. Preformed Beds Dual Row disc open V's Preformed Beds Wide Shute (400mm) V's Conventional Flat Planting in a controlled traffic system

The intention of this trial was to compare the different planting techniques in a controlled traffic system to investigate and discover which method provides farmers with more profitable results.

Trial Information:

Trial Location:	Andrew Pratt's Cane Farm
Row width:	1.8m
Variety:	Q208

This trial was planted in May 2007. More than 200mm of rain fell in June 2007 and the weather remained colder than normal, with a number of frosts recorded. Due to these weather conditions the trial block had a very patchy strike across all treatments. One of the benefits promoted about preformed beds is the shedding of water in high rainfall areas which assists cane establishment. In this trial the bed treatments did not visually outperform the conventional treatment. This could be due to the cooler weather conditions.

Visual assessment of growth
The cane strike in all treatments was poorer than expected. As explained above this would be due to cold and wet weather. However, this trial was also planted to Q208 which is known to have some difficulties achieving an even strike. The trial was fairly patchy to begin with, however the cane did compensate for this and fill in some of the gaps.

Yield Results
As can be seen the yield results were very similar across all treatments (these yield results are the harvested weights and PRS measured at the mill). The dual rows on preformed beds performed the worst with a yield of 103.7 t/ha, compared to singles with108.63t/ha and conventional planting with 107.81 t/ha. The dual rows did have the highest average PRS, however when investigating each individual rep, one of the dual row reps had the highest PRS with 16.79, while one of the other dual row reps had the lowest PRS with 16.10.

Based on the gross return per hectare, the single wide shute treatments planted on preformed beds performed the best with a return of $2,582.78 per hectare. However the conventional treatment was very close with a return of $2,539.34 per hectare. The dual rows had a return of $2,464.90 per hectare. Across the treatments there was only a difference of $117.88/ha.

Plant Treatment	Tons/ha	PRS	T sugar/ha	Gross return/ha
Dual row	103.7	16.44	17.0	2,464.90
Singles on bed	108.63	16.43	17.9	2,582.78
Conventional	107.81	16.34	17.6	2,539.34

Note: Gross return is based on a sugar price of $315, harvest costs of $8/tonne and levy costs of $0.50/tonne

The mill data recorded no difference in cane quality (impurities and dirt) between the treatments. The NIR data was very similar.

Financial comparison

Recording accurate, detailed financial inputs can be difficult on small area replicates. Instead a detailed financial comparison of farming systems was conducted based on Andrews's trial. This was conducted with assistance from an agri-economist from the DPI&F who was commissioned by the Mackay Whitsunday Natural Resource Management group to look at the economics of improved farm practices. Both Col and Andrew assisted in ground truthing the scenarios by providing information on their actual farming system.

This analysis involved comparing their current controlled traffic, tilled farming system to one which included a soybean fallow and preformed beds. The current system was based on an "average" system across the farms. The DPI&F spreadsheet FEAT was used to conduct the comparison.

The results showed that the current farming system (Appendix 2 - Base Level) resulted in a Farm Operating Return of $20, 070 and a Return on Investment of 1.44%. While the improved farming system which involved preformed beds, soybean fallow and reduced tillage (Appendix 3 - Base Level + soybean) resulted in a Farm Operating Return of $54, 947 and a Return on Investment of 3.94%. See Appendix 2 and 3 for a copy of the cost summary.

Trial 3. Flat Mound vs Round Mound V's Conventional Method

The intention of this trial was to compare new bed forming methods to the conventional method of planting that is currently used throughout our industry.

Trial Information:

Trial Location: Brad & Trent Gordon's Cane Farm
Row width: 1.8m
Variety: Q208

Visual assessment of growth

During the planting process we noticed that the flat shape beds were the easiest to drive/plant due to the shape of the bed and the V created in the wheel space allowing the tractor to be easily navigated/driven down. The worst bed formation for planting relating to the driving of the machinery was the round beds as there was a significantly flat area between the mounds causing the tractor/planter to stray from the desired position.

We have diverted from the conventional method of planting in terms of the shape of the set after planting. In 1998 we first trialled this method of planting to ensure that the plants did not become water logged. The idea was to have the mound over the set, so the lowest point was the wheel spacing which was 1" – 3" below where the set was positioned in the mound, the aim was to

minimise the effects of water logging. It turned out that this move was very beneficial as 1998 planting/crushing season was one of the wettest on record. We were fortunate not to lose any plant cane that year, compared to the rest of the local area where everyone had a failure in plant cane to some extent. We also noticed that in the winter months the soil remained warm as the shape of the mound meant that it received sun all day and not just from 10 – 2 like the traditional deep v plant set.

To our family, this method is now classed as traditional to us. However we had never completed accurate trials to determine whether there was an additional benefit in yield, which this trial has allowed us to do. We know that it has eliminated the number of passes required after planting, as you are able to harvest the cane with this shape mound easily if weather is unfavourable and does not allow one additional pass to board up to the older cane.

Yield Results

As can be seen there is very little difference in yield between the conventional planting method, and the two different bed shapes. The CASH preformed beds, which have a flat shape, had the highest yield with 98.97 t/ha, however it also had the lowest PRS. Tonnes of sugar per hectare across the treatments were almost identical and as a result the Gross Return per hectare only had a difference of $29 between the treatments.

Plant Treatment	Tons/ha	PRS	T sugar/ha	Gross return/ha
Conventional	96.65	16.75	16.2	2,446
BSES bed former	96.72	16.89	16.3	2,474
CASH bed former	98.97	16.47	16.3	2,450

Note: Gross return is based on a sugar price of $315, harvest costs of $8/tonne and levy costs of $0.50/tonne

It should also be noted that the mill NIR data showed no difference in dirt and purity levels between the treatments.

Financial Comparison

All treatments were treated the same and therefore there was no difference in input costs. There was no difference in preparation or management of the block as a result of planting into preformed beds. This is due to the fact that we have altered our planting method, as described above, which already eliminated additional workings. The treatments of the block are listed below.

The block had the following treatments in preparation for planting:

Application of Roundup @ rate of 8L/Hectare	
Disk Bumpered with 28 plate Grizzly's	2 times
Ripped with 7 Leg Ripper	2 times
Power Harrow	1 Pass
Bed forming completed also with GPS Tractor	1 Pass

Planting Details:

Details of planting equipment/rates for trial:

Date of cane planting 14 / 08 / 2007

Equipment Used	Austoft Billet Planter John Deere 7710
Speed of planting	6.5km/hr
Applications	Lorsban @ 1L/100L to the Ha Growth Formula 200ml/100L Tilt 20ml/100L GF & Tilt water rate of 250L/Ha DAP Fertilizer @ 375kg/Ha Plants @ 3.5tonne/acre 3.5 m3/Ha Liquid One Shot

No Irrigation has been given to this trial up to this point in time due to regular rainfall since planting.

Spraying Details:

Spraying Application 1 @ 8 weeks	1.5L/Ha of Amicide 500g/Ha of Diurex 100ml/100L Wetter
Spraying Application 2 @ 16 weeks	8L/Ha of Gesapax 500g/Ha of Diuron 100ml/100L Wetter

All spraying applications were applied at a water rate of 200L/Ha

First Ratoon
At the due date of this report, none of the trials had been harvested as first ratoon. The trials were monitored though through visual assessment and all the trials showed no visual difference in ratooning or yield.

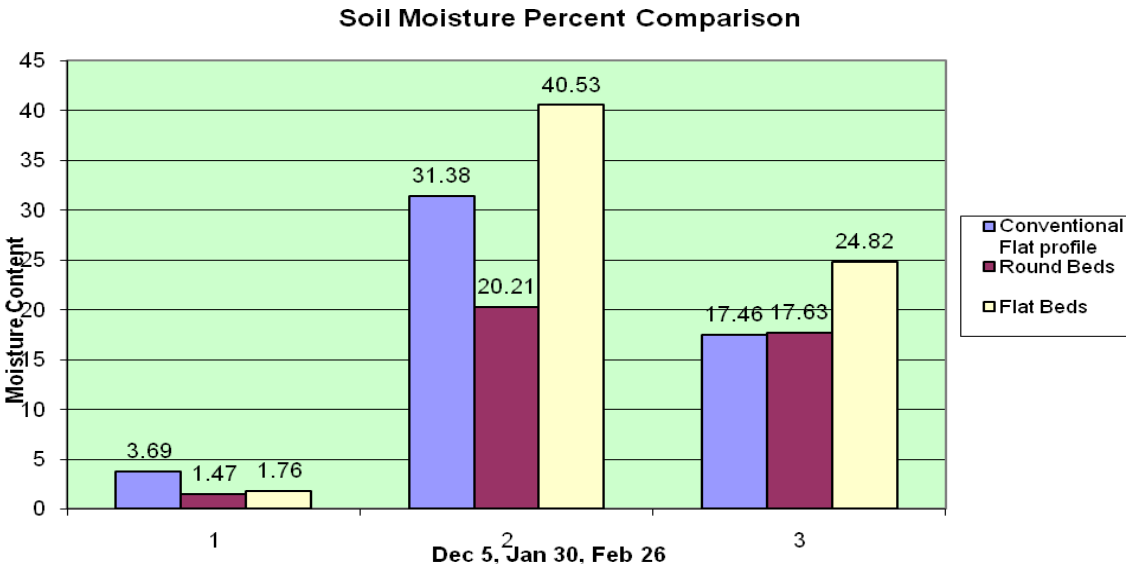
Results from soil moisture monitoring tools

PLEASE NOTE: The group have been advised that the data collected through the enviroscans may have been compromised by moisture in the probe. Readers of this report should not base any decisions on the enviroscan data presented in this report, as it may or may not be accurate data.

Using an Enviroscan soil moisture monitoring tool, the group received assistance from BSES to conduct a comparison in soil moisture infiltration and plant extraction in Col's trial. The results interpreted by BSES were as follows:

An Enviroscan was installed at Col MacKenzies to compare water infiltration and extraction in a conventional system, to a flat top preformed bed system, to a round top preformed bed system. Six probes were installed with sensors located 100mm, 300mm, 500mm, 700mm and 900mm below ground level.

By focusing on periods of rainfall, we conducted a comparison of water infiltration using the Enviroscan data. We were able to compare the differences in soil moisture levels between the conventional system, flat top beds and round top beds. The following graph highlights 3 different rainfall events and the percentage increase in soil moisture levels in the soil profile to a depth of 900mm.

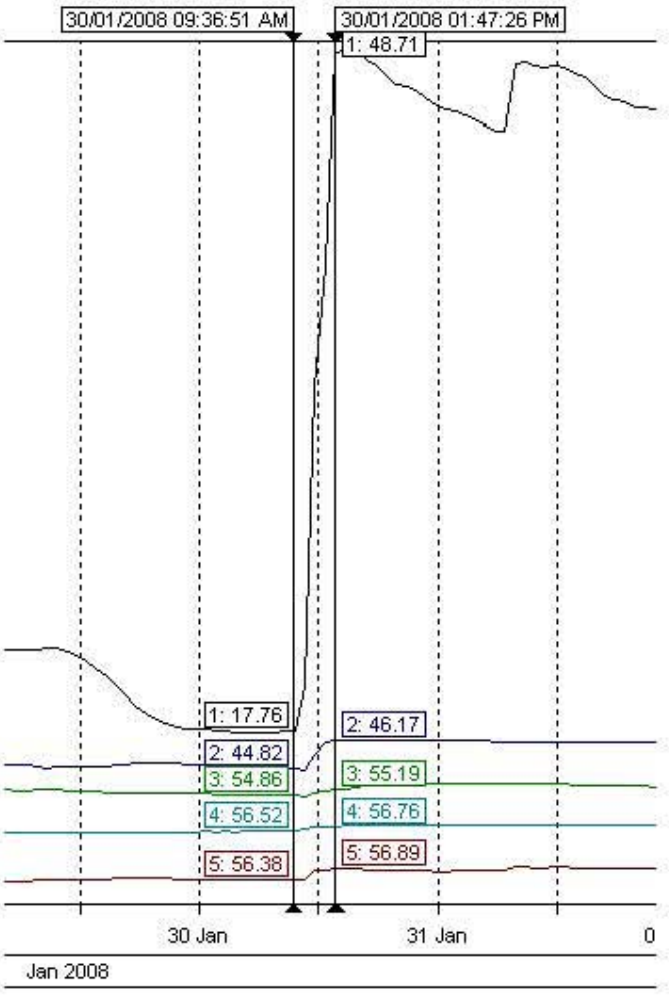


In the first rainfall event, December 5, 43mm fell. As can be seen in the graph, the conventional system had a total soil moisture increase of 3.69%, the round beds increased by 1.47%, and the flat beds increased by 1.76%.

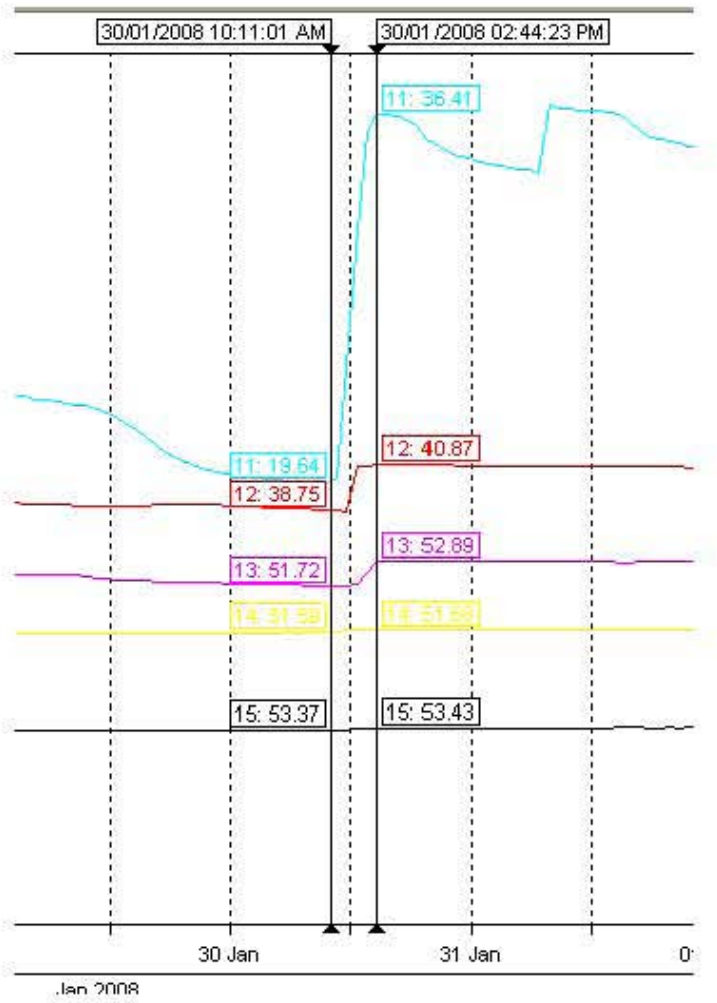
On January 30, 61mm of rainfall was recorded, while another 61mm was recorded on February 26. It should be noted that there were a lot of other rainfall events during this time, but we chose to focus on these 3 events.

From looking at these rainfall events it appears that the flat top beds allowed for more total water infiltration. From looking at the individual sensors in the profile, it would also appear that the flat beds allowed for deeper infiltration. The other 2 systems had increases in moisture content in the top 300mm, with minor increases at 500mm, 700mm and 900mm, while the flat top beds had greater increases deeper in the soil profile compared to the other systems. The following graphs demonstrate this point.

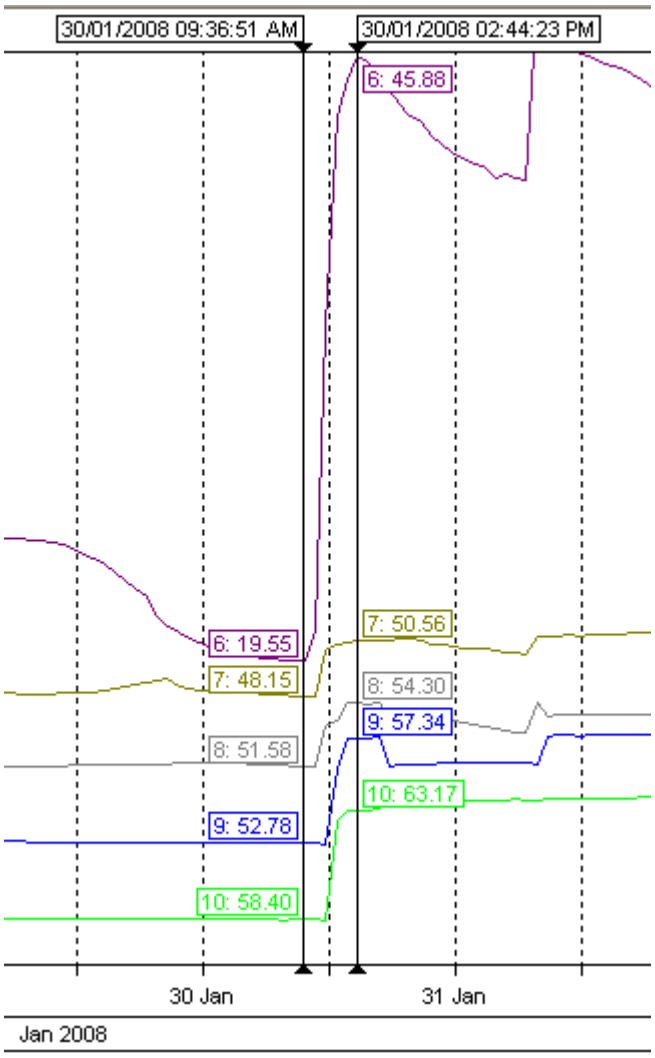
This first graph is of the conventional treatment on January 30, before and after rain. Line 1 is the sensor located 100mm below ground level, line 2 is 300mm, line 3 is 500mm, line 4 is 700mm and line 5 is 900mm. You can see how line 1 has a dramatic increase in soil moisture content following the rainfall event, while the other sensors only have a very small increase indicating that the moisture did not infiltrate too far into the profile.



This following graph is of the round bed treatment on January 30, before and after rain. Line 11 is the sensor located 100mm below ground level, line 12 is 300mm, line 13 is 500mm, line 14 is 700mm and line 15 is 900mm. You can again see how line 11 has a dramatic increase in soil moisture content following the rainfall event, while the other sensors only have a very small increase. The sensors at 700mm and 900mm depth have virtually no increase at all, therefore the moisture did not infiltrate to that depth.



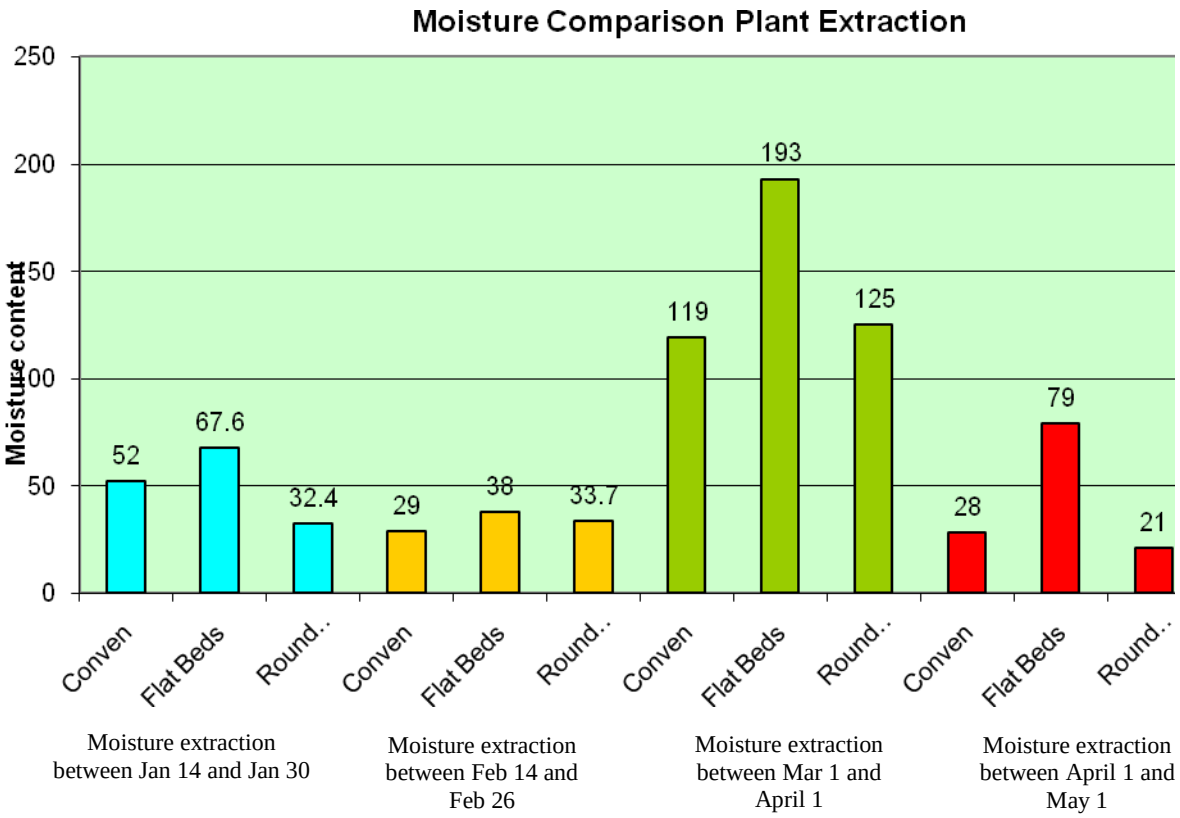
This graph is of the flat bed treatment on January 30, before and after rain. Line 6 is the sensor located 100mm below ground level, line 7 is 300mm, line 8 is 500mm, line 9 is 700mm and line 10 is 900mm. You can see how line 6 has a dramatic increase in soil moisture content following the rainfall event, and all the other sensors also have an increase much greater than the other treatments. This indicates that during this rainfall event the moisture was able to infiltrate at least to a depth of 900mm.



Plant extraction

Another aspect that we looked at while monitoring soil moisture content was moisture extraction. To do this we focused on time periods in between significant rainfall events. What was interesting from this data was that it appeared the flat bed treatments had the greatest decreases in soil moisture content during these periods. So during rainfall events there was greater soil moisture infiltration in the flat beds, and then over set periods of time there were also greater decreases in soil moisture content either due to plant extraction or deep drainage.

The following graph illustrates 4 different time periods and the amount of soil moisture extraction.



The following table shows moisture infiltration at a specific time of rainfall during these periods monitored for moisture extraction. Please note these values are not a soil moisture percent like those presented earlier. These values can be considered more like a total soil moisture value.

You can see on May 12, 22.5mm of rainfall was recorded. This rainfall event had an infiltration time of 2.5 hours in the treatments. While the flat bed treatment had a total soil profile moisture content increase of 24mm, the conventional treatment only recorded an increase of 1mm, while the round beds recorded an increase of 7mm. This table shows that for the 3 rainfall events, the flat beds recorded the greatest soil moisture infiltration.

			Infiltration rate			
Date of Rainfall	**Amount of Rainfall**	**Treatments**	**Start of rainfall - Moisture value**	**End of rainfall - Moisture value**	**Difference**	**Infiltration period**
Jan-30	61mm	Conventional	424	474	50	12.5 hrs
		Flat Beds	422	485	63	
		Round Beds	394	425	31	
Feb-26	61mm	Conventional	445	472	27	16hrs
		Flat Beds	486	525	39	
		Round Beds	397	424	27	
May-12	22.5mm	Conventional	312	313	1	2.5hrs
		Flat Beds	248	272	24	
		Round Beds	274	281	7	

Conclusions

While these results and figures are interesting, and raise questions about the water infiltration between a conventional, flat top bed shape and round top bed shape, they can only be considered preliminary findings and no final conclusions can be drawn. Due to the short time frame of the GGIP projects a thorough investigation of soil moisture comparisons cannot be made. We cannot confidently draw final conclusions from this data.

Our recommendations are that more work needs to be done, by trained professionals, to compare water infiltration, shedding, deep drainage and water quality, between different farming systems. With a current focus on water quality and its impact on the barrier reef, this type of work comparing farming systems should be a priority. Our trial work indicates there is no real difference in yield or gross margins between different bed shapes, planting techniques and a conventional system. However if there are water use differences, this could lead to major (as yet unquantifiable) benefits in changing farming systems.

Group members feedback/thoughts regarding their findings

MacKenzie

- The biggest benefits we've gained from these trials is identifying that we must plant all of our soybean onto preformed beds. On blocks where we conventionally planted soybean, we had failures. The trial demonstrated to us that we need to change our farming system
- Moving to GPS preformed beds on our fallow has then created additional benefits.
    - Our cane is planted directly into the area where the soybean was growing, which helps with obtaining Nitrogen
    - We have been able to move into a zonal tillage system. Our farming system is now based on preformed beds, soybean fallow, soybean sprayed out or harvested and then cane planted into the beds.
    - Based on this new system, we can use the groups GPS tractor to preform the beds, and then use our tractors for the other passes because the tractor follows the beds.

Pratt

- From conducting our trial we decided to continue planting a single shute on preformed beds. We decided to stay with the single shute simply because we can easily modify our existing planter, rather than invest in a double disc opener. We had considered dual rows as we thought the yield might be higher, however this trial confirmed that there was no yield difference. We have decided that once we get guidance set up in the harvester, then we would move to dual rows as the guidance would make it easier to harvester the 2 rows, particularly if it is sprawly cane.
- Our planting system is now based on performing beds, planting soybean if the weather suits, spraying or harvesting the bean and then planting the cane into the beds after zonal tillage.
- From conducting this project we have gained more experience with setting up and managing trials, and it has given us the opportunity to trial different farming practices (dual rows on beds). We had considered moving to dual rows, and this project allowed us to trial this different planting technique on our farm, and under our farming conditions.

Gordon

- We've decided not to totally change our farming system after completing the trial. The main reason being that from marking out stage to the final pass for hilling up the amount of passes required is the same. We believe there is a benefit in our way of planting mainly through the protection of water logging of plant cane. Our mound over the plant after planting (our conventional trial) allows the set to be higher than the wheel mark keeping it from being water logged, unlike the furrow left after the planter in the mound planting trials. We first trialled our method in 1998 when we had the wettest crushing/planting

season for a long time, and we were fortunate enough to suffer zero loss in all of our plant cane, whilst everyone around us was forced to plough out and replant a percentage of their plant cane.

- We do plan to use the bed former however for preforming beds of fallow blocks at the end of the crushing, to plant cowpea or soybean. Like Col, we believe the bed forming gives us the greatest benefit in the area of rotational crops. Col preformed his beds this year and got a good result; we just planted on flat fallow and had a poor result due to water logging in parts of the blocks.

Investigate contract bed forming service

The group has established a contract bed forming service. Using a cost analysis spreadsheet we identified a hire out rate which would cover the operating and fixed costs for the GPS, tractor, and bed forming equipment. Members of the CASH group are charged this fee when using the equipment. To date there has not been much contracting work done outside of the group members. In 2007 approximately 160 acres outside of the group members farms was contract bed formed. In 2008 approximately 100 acres were contract bed formed. It is hoped this figure will increase in the future, especially as more growers in the region move to a farming system that incorporates preformed beds and controlled traffic.

The tractor and bed former will continue to be available into the future.

Intellectual Property and Confidentiality:

(If there is any protected Project Technology, eg information that has been kept confidential, such as equipment specifications, patentable knowledge please outline. Is there anything in this report that should be treated as confidential, and if so under what circumstances?)

No

Capacity Building:

(How has the Group's capacity to conduct R&D and implement better farming systems been enhance?)

Prior to being involved in this project, the group members have been involved in working with researchers conducting trials on their farm, however have not been directly involved in trial design, data collection, interpretation of results or communication of results. Being involved in the GGIP has given all group members a greater understanding of the factors to consider when testing different farming systems and drawing a conclusion to either change practices or continue with traditional methods.

Outcomes:

(What benefits have been achieved or are expected from the project, and what more has to happen to get the full benefit from the project? How do the expected benefits compare with those predicted at the start of the project, as outlined in the Application?)

The project outcomes showed that there was no real difference in harvest yield between the traditional farming system, the different bed shapes, or the different planting techniques. This lays to rest concerns group members (and family members) had prior to beginning the project, that changing farming system could result in reduced yields.

We also identified that through the use of GPS and the Alexander bed former, that we could enhance controlled traffic in undulating conditions by overcoming issues of maintaining even row spacings on contours.

Harvesting issues were overcome during the completion of the project through the use of elevator extensions.

Environmental Impact:
(Outline any adverse or beneficial environmental impacts of conducting the Project and/or implementing its findings)

These trials confirm that the use of legume fallows, and preformed beds on a controlled traffic system have no adverse yield losses. These support the beneficial environmental impacts documented through the sugar yield decline joint venture.

It is possible that the flat top bed shapes allowed for more water infiltration and less run off, however more detailed work needs to be done to confirm this.

Communication and Adoption of Outputs:
(Outline any communication activities that have been conducted and any that are planned. How has SRDC been acknowledged or involved? Have any lessons from the project been applied by members of the Group, or others?)

A number of promotional events have been conducted at these trial sites. The National Landcare conference was held in Mackay in August 2007. This conference included a number of bus trips to various locations throughout the Mackay region. One of the buses came to the Calen area where the group inspected both trial sites at Brad and Trent Gordon and Andrew Pratts. There were about 50 people on the bus, the majority of which were not from within the sugar industry. This provided a valuable opportunity to showcase some of the innovative work being conducted in the sugar industry.

Our group were one of the three hosts for the GIVE 2008 conference held in Mackay on the 28th and 29th of February. We were involved in planning the event, chairing sessions on the day, and we were involved as one of the stops on the half day bus tour.

The local shed meetings held in early 2008 provided another opportunity for us to raise awareness of the project in the local area. We provided information on the aims of the trials and updated other growers on our progress. We are also going to present trial results at the shed meetings held in late 2009.

Natural Resource Management leaders from the Department of Environment and Heritage have also visited our group and inspected the trial site at Andrew Pratts. These managers are part of the ReefLink project and were interested in inspecting various projects throughout the Mackay region. Andrew Pratt was also involved in hosting an irrigation workshop as part of the Rural Water Use Efficiency project. While the workshop obviously focused on irrigation and Andrews Centre Pivots, he used this opportunity to raise awareness of this project and the trials with growers from the local area.

This project has raised a lot of interest within the local community and as a result all group members have been involved with numerous one on one discussion with other farmers about the progress and results of the trials.

Recommendations:
(What recommendations would you make as a result of the project, including suggestions for further research and development?)

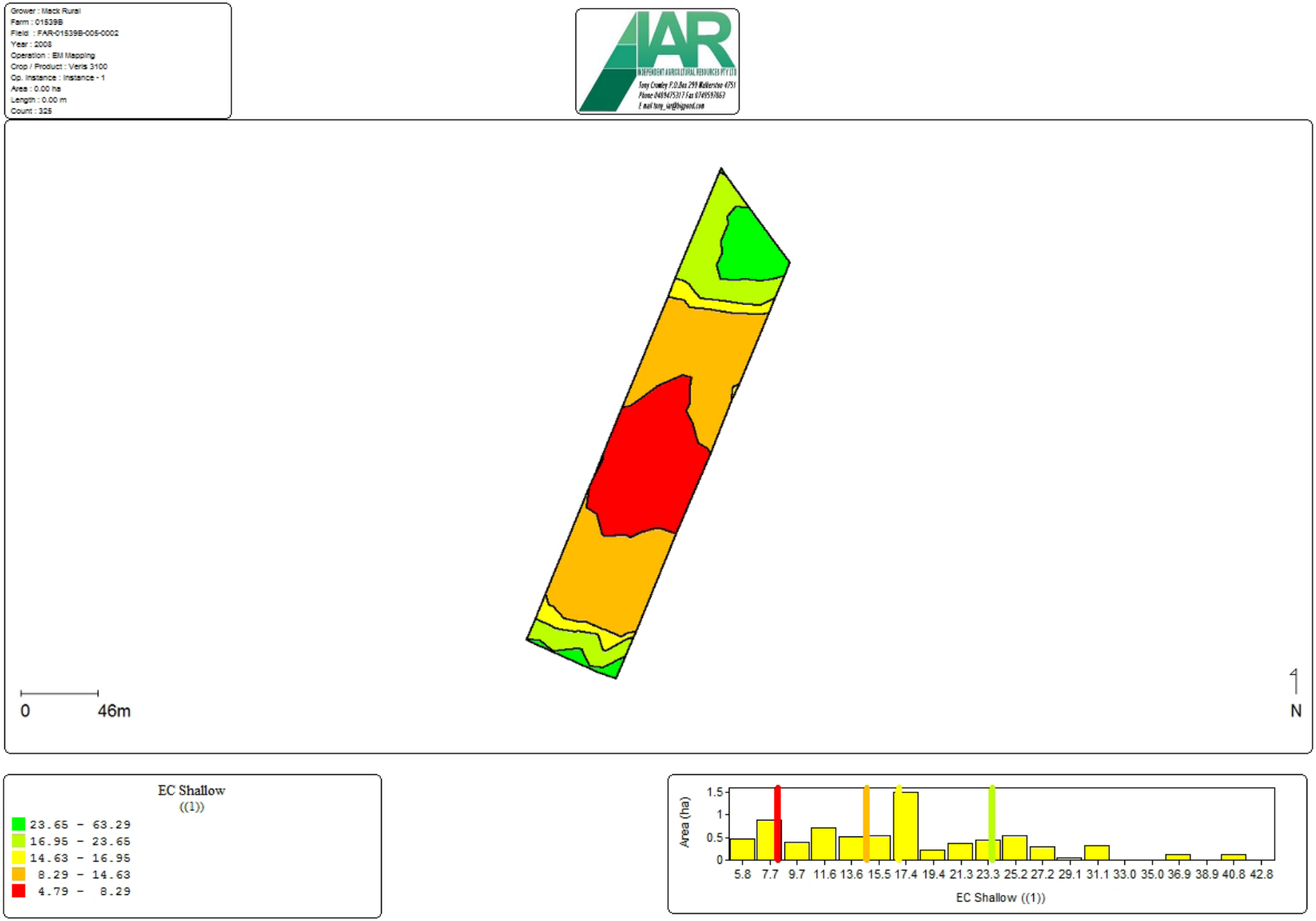
A lot more detailed work needs to be conducted looking at the water infiltration and shedding of different farming practices. To fully understand the water management of different systems, trials would need to be established with Enviroscans to monitor water infiltration and extraction; automated samplers to collect and monitor runoff water; and lysimeters to monitor deep drainage.

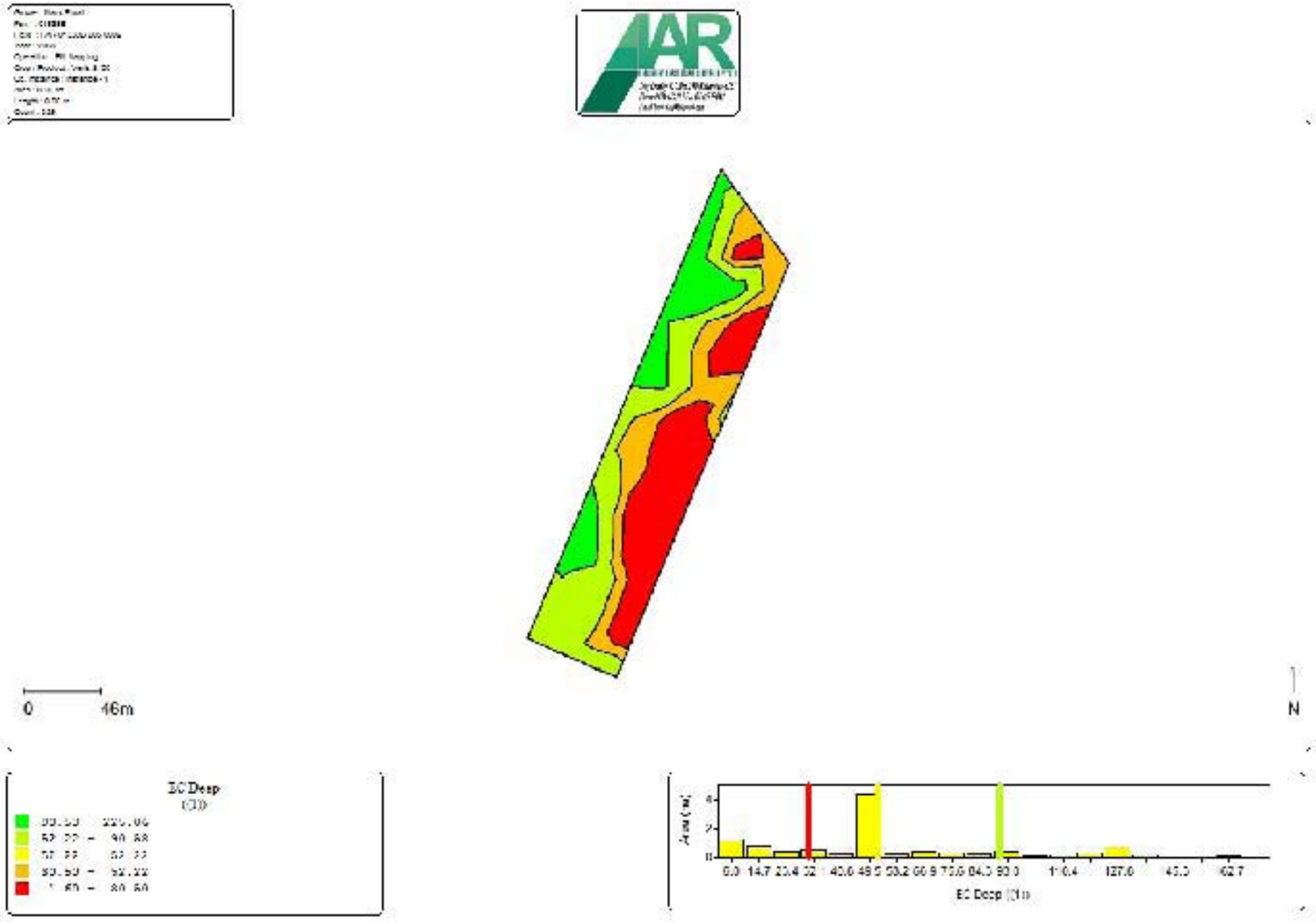
New grower groups should be encouraged to establish a lot more on-farm trials than we did. Due to consignment issues at the mill we lost 1 out of our 3 cane yield trial results. And due to wet weather we were not able to get any tangible results from our soybean trial. If more trials were planned in the initial work plan we could have overcome this loss of information by simply having more trials to rely on.

Publications:

(List and attach copies (electronically if possible) of all articles, newsletters and other publications from the project.)

Appendix 1 – EM maps of Trial block 1




0
16m
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EC Deep
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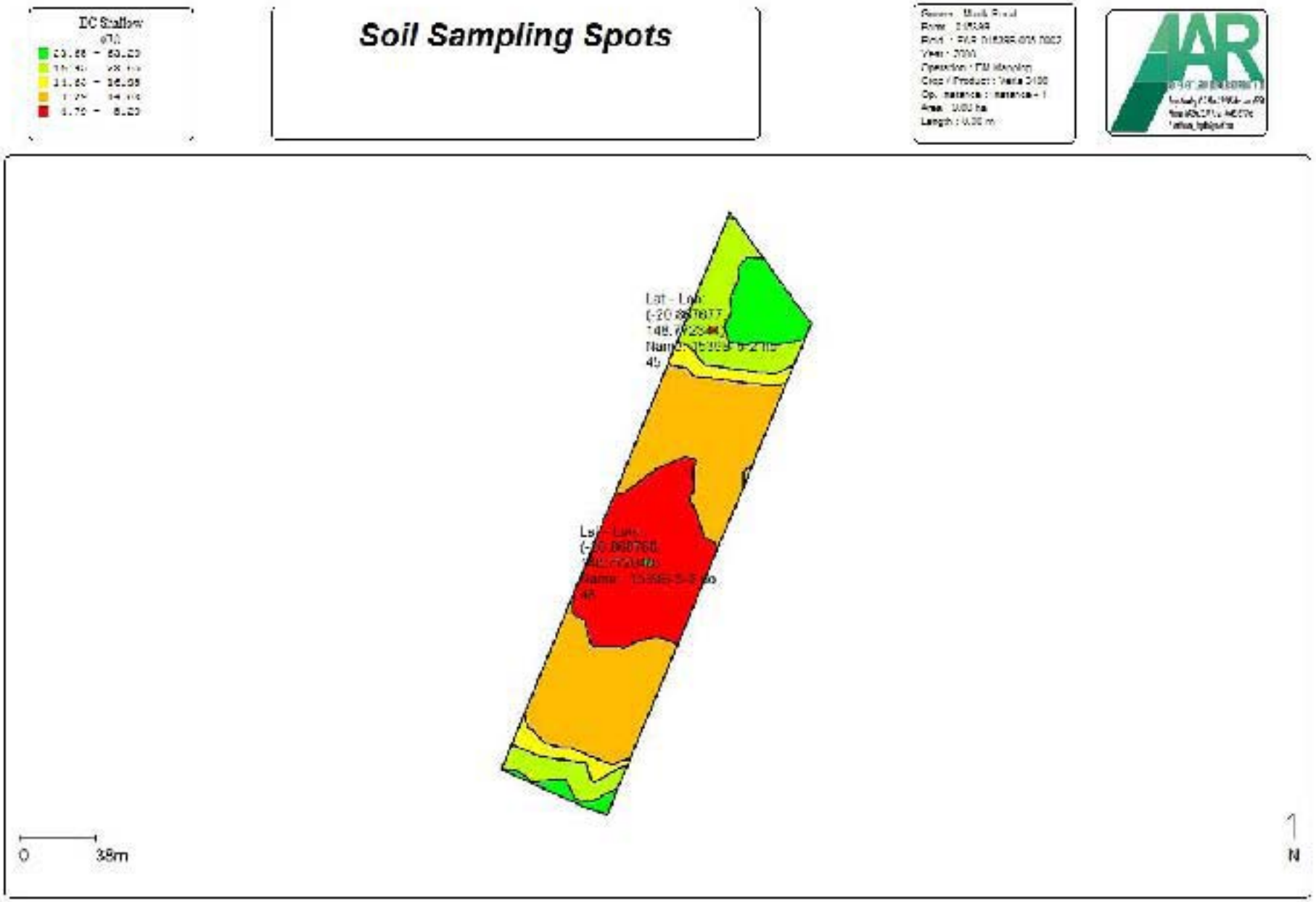
EC Deep (D)


EC Shallow
Soil Sampling Spots
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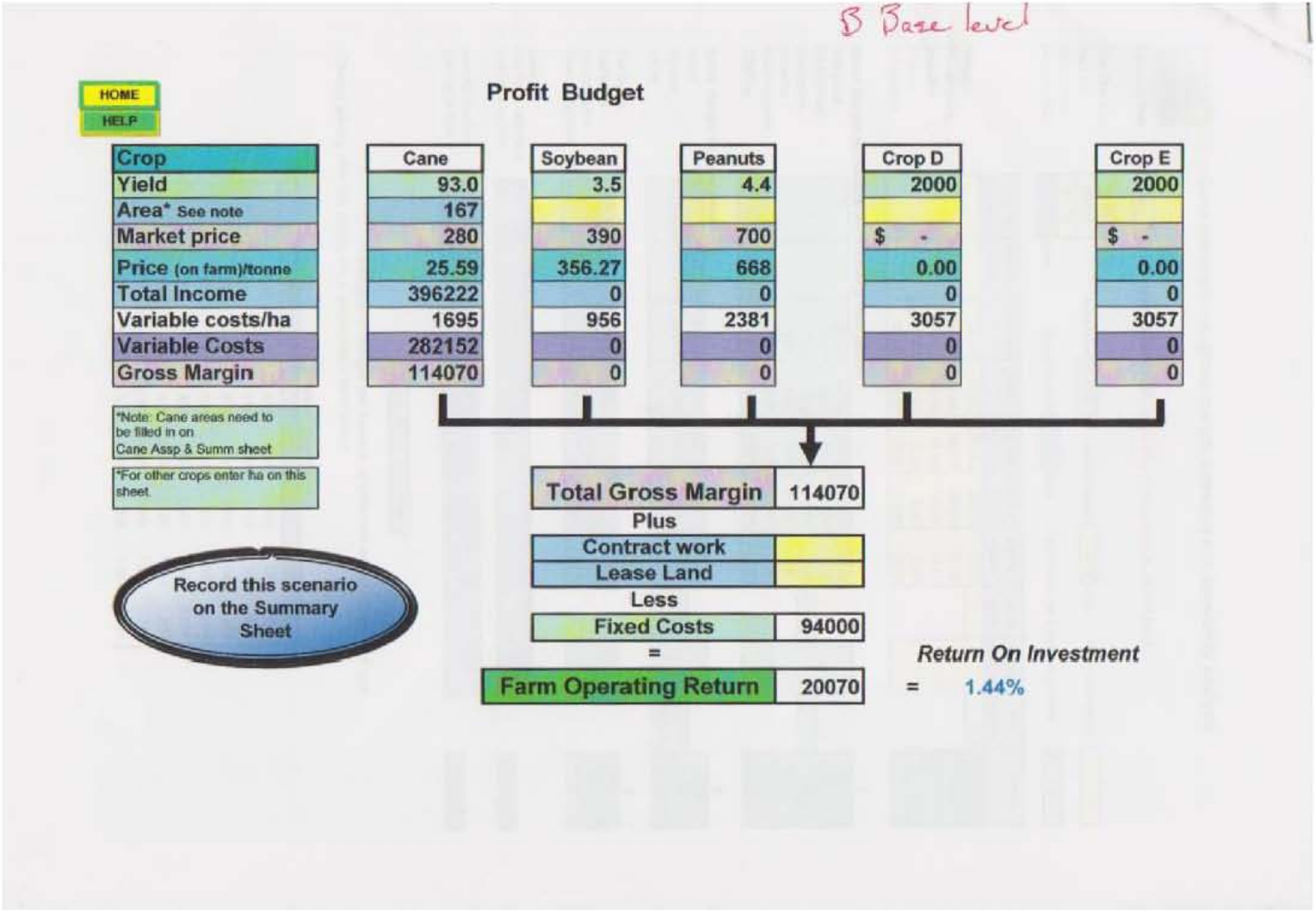
38m
N

Appendix 2 – Base Level financial comparison conducted by DPI&F agri-economist commissioned by the Mackay and Whitsunday Natural Resource Management group. This comparison is based on a controlled traffic, tilled farming system



B Base level

HOME
HELP

Profit Budget

Crop	Cane	Soybean	Peanuts	Crop D	Crop E
Yield	93.0	3.5	4.4	2000	2000
Area* See note	167				
Market price	280	390	700	$ -	$ -
Price (on farm)/tonne	25.59	356.27	668	0.00	0.00
Total Income	396222	0	0	0	0
Variable costs/ha	1695	956	2381	3057	3057
Variable Costs	282152	0	0	0	0
Gross Margin	114070	0	0	0	0

*Note: Cane areas need to be filled in on Cane Assp & Summ sheet

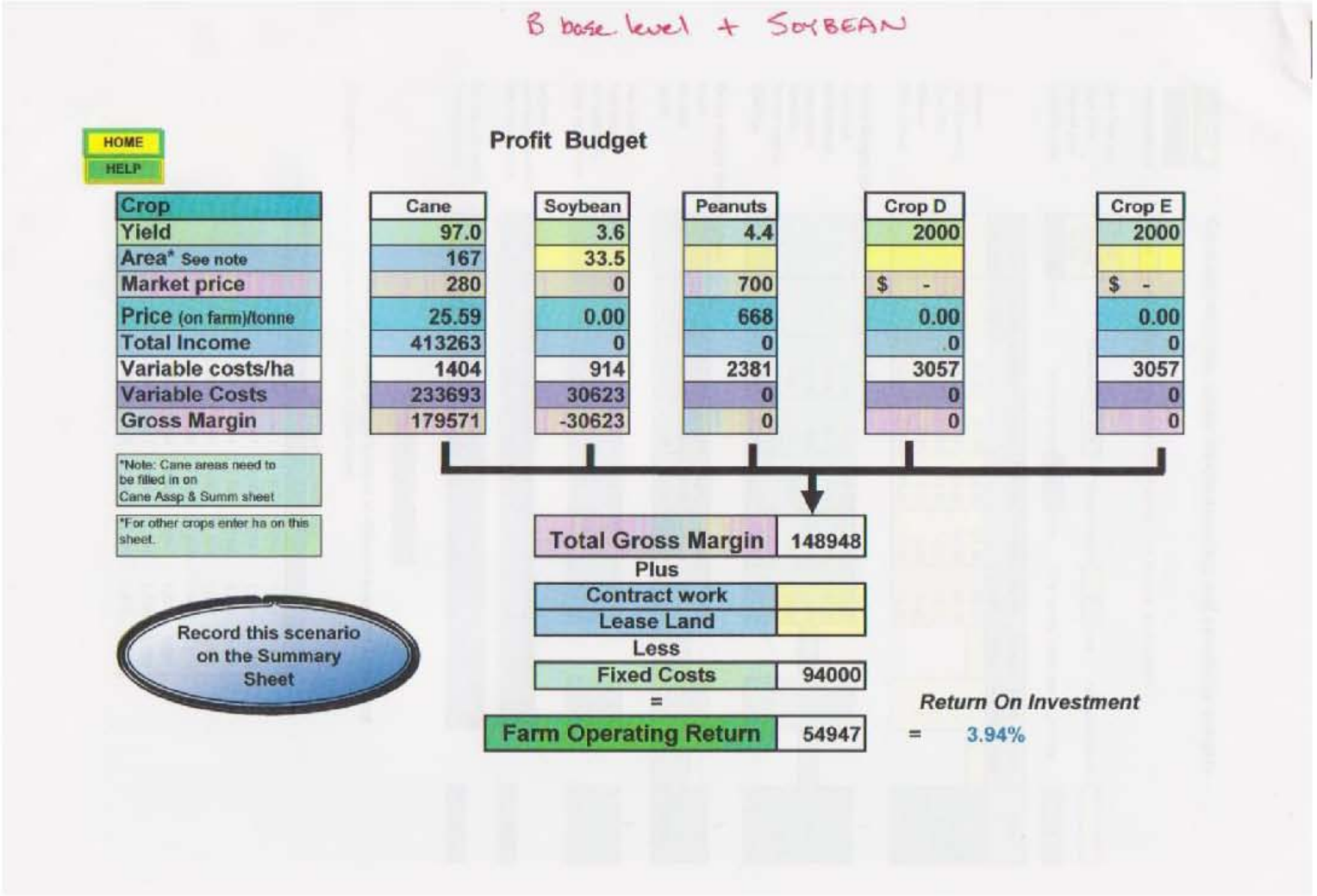
*For other crops enter ha on this sheet

Record this scenario on the Summary Sheet

Total Gross Margin	114070
Plus	
Contract work	
Lease Land	
Less	
Fixed Costs	94000
=	
Farm Operating Return	20070

Return On Investment
= 1.44%

Appendix 3 – Base Level + soybean financial comparison conducted by DPI&F agri-economist commissioned by the Mackay and Whitsunday Natural Resource Management group. This comparison is based on legume fallows, minimum tillage, preformed beds and controlled traffic



B base level + SOYBEAN

HOME
HELP

Profit Budget

Crop	Cane	Soybean	Peanuts	Crop D	Crop E
Yield	97.0	3.6	4.4	2000	2000
Area* See note	167	33.5			
Market price	280	0	700	$ -	$ -
Price (on farm)/tonne	25.59	0.00	668	0.00	0.00
Total Income	413263	0	0	.0	0
Variable costs/ha	1404	914	2381	3057	3057
Variable Costs	233693	30623	0	0	0
Gross Margin	179571	-30623	0	0	0

*Note: Cane areas need to be filled in on Cane Assp & Summ sheet

*For other crops enter ha on this sheet.

Record this scenario on the Summary Sheet

Total Gross Margin	148948
Plus	
Contract work	
Lease Land	
Less	
Fixed Costs	94000
=	
Farm Operating Return	54947

Return On Investment
= 3.94%