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Final report - SRDC project BSS306 - Establishing the second crop cycle into permanent beds

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FINAL REPORT - SRDC PROJECT BSS306
ESTABLISHING THE SECOND CROP CYCLE INTO PERMANENT BEDS
by
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SUMMARY

The ‘establishing the second crop cycle into permanent beds’ project operated over a 3-year period from 2007 until 2010. The project aimed to assist growers who had adopted controlled traffic to re-establish a second crop cycle into the permanent beds. To do this, the project used a participatory action learning model where grower groups were formed and grower learnt from growers’ experiences.

Using the project resources four pieces of specialised farming equipment were developed to aid growers with crop re-establishment. Most growers used a form of zonal tillage where just the row area was cultivated and not the entire field. The implements developed were a bed renovator, zonal ripper, wave disc cultivator and zonal rotary hoe.

To aid with the spread of information 36 extension activities were held. These activities were held throughout the region with field days held from Koumala in the south to Proserpine in the north. The machinery was also demonstrated in Bundaberg and the Burdekin.

Project information has also been present to growers through BSES Bulletin articles and several local BSES newsletters. Reef Rescue operations in the region are also promoting the concept of zonal tillage and this has further encouraged growers to participate in the project.

These extension activities have resulted in a high level of grower awareness of the project and its objectives.

Additionally 12 focus groups meeting were held during the project providing guidance and clarity of thoughts to the project team. These meeting were essential for machinery design as they gave grower ownership of the project concepts and lead to easier adoption of the ideas.

To gauge the success of the project a survey of grower practices was completed each year. These surveys show that the total area planted using zonal tillage has increased from 30 ha in 2007 to 2500 ha in 2009 and that the number of growers adopting the practice has increased from 5 in 2007 to 100 in 2009.

The area planted in 2009 represent 15% of the plant cane area of the Central district.

An economic analysis of the system was also completed and this showed a saving of $400 per hectare could be achieved by using zonal tillage as opposed to full cultivation.
1.0 BACKGROUND

This project follows from the ‘New Farming Systems’ project BSS269 with the aim of assisting growers who are taking the second step of establishing the next crop cycle into permanent beds using limited or no cultivation. Many growers were aided by BSS269 to establish controlled traffic farming system and were enquiring as to the best method to establish the second crop cycle into their permanent beds.

This project was able to assist these growers by developing practical solutions to establishing break crops and the second cane-cropping cycle onto permanent beds with appropriate bed maintenance and appropriate retention of undisturbed crop residues. By maintaining the beds and crop residues, the soil structure and biology in the beds will be maintained.

2.0 OBJECTIVES

The following four objectives were established during the development of the project:

1. Continue to work with the grower group established in the existing new farming systems project (BSS269)

2. Facilitate establishment of trials with both the new farming system group and other interested growers by providing equipment, technical guidance and extension activities

3. Work with the grower group to develop equipment suitable for bed maintenance and crop establishment

4. Share information generated by the trials conducted on the properties of participating growers with others growers through extension activities aimed at raising the awareness of the new system.

These objectives were met during the life of the project. The following is a brief summary of the activities undertaken to meet these objectives

3. EQUIPMENT USED IN OTHER INDUSTRIES WITH PERMANENT BEDS RESEARCHED

At the commencement of and prior to the project three study tours were undertaken to investigate equipment used in other industries as well as what was currently being used in the cane industry. From these study tours and the initial grower focus groups, the project team was able to develop the machinery requirement for the project.
Study tour 1 - Western Australian grain industry

A study tour to Western Australia was conducted in conjunction with the controlled-traffic farming conference. On this tour we were hosted by Greg Hamilton from the Western Australian Department of Agriculture who has worked on forming and maintaining raised beds for many years. A number of farms were visited and we were able to discuss bed forming and maintenance with the growers.

The farms visited were in the south-eastern area of the grain-growing region and were using 1.8 m or 3 m beds to aid in drainage to reduce water logging during the wet winter growing season.

1.8 m beds used in the wheat-growing region

Bedformer used to form and maintain 1.8 m beds.

Note the rippers with large sweeps that rip the centre of the bed and the small discs at the rear of the machine that level the bed by breaking up any large lumps.
Beds in Western Australia grain areas:
- Beds form part of the controlled-traffic system, 1.8 m beds are used with the larger 3.6 m wheel-centre harvester, or a single 3 m bed with the 3 m wheel-base harvesters.
- 3 m beds on flat country do not provide adequate drainage to the centre of the bed.
- Once formed, the beds last a number of years. We saw some beds that had been zero tilled for 10 years after the initial forming, and others that were ripped and reformed after 5 years.
- The wetter areas had higher beds 200 mm high in wet areas and 100 mm high in the drier areas.
- Whole-farm planning is needed to install the beds and drainage system.

**Study tour 2 - Victorian grain industry**

In September in 2006, a study tour to view southern farming systems was conducted in conjunction with attendance at the controlled-traffic farming conference at Ballarat. During this study tour, we viewed raised-bed farming in the wetter area of Victoria with Colin Hacking from Southern Farming Systems.
Raised beds in the Victorian grain industry:
- Beds are formed to increase drainage to prevent water logging during the wet winter.
- Beds are formed at 1.8 m wheel tracks.
- Wheel track are not sown.
- Beds are formed with discs or tines.
- Once beds are established, zero tillage is practiced on the beds.

![Trial plots of wheat on raised beds at the Southern Farming Systems research farm](image)

**Study tour 3 - Queensland sugarcane industry**

Bedformers have been in use in the cane industry for a number of years. Most of the current bedformers are not capable of working through trash blankets - this will be necessary when establishing the second crop cycle.

The current bedformers fall into two broad categories:
1. Those that use ‘boards’ to form the beds. With these bedformers, the soil is forced between large steel plates to form the beds. For this to be possible, the soil needs to be of a fine tilth and free of trash. The beds that are formed by these bedformers are of a consistent height and shape.
2. Those that use large disc to form the bed. With these bedformers, the soil is thrown up into a bed using large disc. These bedformers can work in soil with high trash loads. The beds formed by these bedformers are often inconsistent in height and shape and can be lumpy and full of trash.
Type 1 bedformer
Only used in fine soil with no trash but produce consistent beds.

Type 2 bedformer
Can be used with trash blankets, but produce inconsistent beds.

A new bedformer developed by a Mackay grower that is similar to those used in the grain industry
3.0 EQUIPMENT FOR BED RENOVATION DEVELOPED

After the study tours and numerous focus groups consensus was reached that several types of implements would be required, depending on soil type and the condition of the block at the end of its crop cycle. Blocks that have been damaged by wet-weather harvesting will require more extensive cultivation than those which have not. The heavier clay soils will require a different approach than the lighter sandy soils.

To meet these various needs three implements were decided on and purchased for the project.

1. The coulter ripper. This machine is run through the bed area to remove compaction. The ripper may be used in conjunction with the rotary hoe to give a ripper rotary hoe effect. If beds are in good condition with consistent height and shape, it may be possible to just rip the beds and replant.

2. Zonal till rotary hoe unit. A small 1500 mm second-hand rotary hoe was been purchased for use in the project. This was then modified by removing the rotary-hoe blades from the edges of the machine and leaving only the blade in the centre of the machine. The rotary hoe was set up to cultivate a 750 mm wide band over the old stool area. This rotary hoe unit was used to chop up the old stool in preparation for planting soybeans or cane. In soils that are highly compacted, the beds would be ripped with the coulter ripper unit before being rotary hoed.
Zonal rotary-hoe unit. Note the blades removed from the edge of the machine so only the centre of the bed area is cultivated.

Zonal rotary-hoe unit working in soybeans after the soil had been ripped with the coulter ripper
3. **The bed renovator.** This machine was similar to a machine designed and built by Ken Clark from the Mulgrave area. The machine has six scalloped discs and three rippers and was built in a way that would allow it to be adjusted to suit a wide range of soil types and trash conditions. The machine was built by Hodge machinery in Mackay.

This machine was used where the most extensive bed renovation and reforming was required.

This machine was used by a number of growers and has been used through spray-out cane and soybean trash and into worked ground. The machine can handle large amounts of trash and stubble. When large amount of trash and stubble are incorporated, the growers who have used the machine preferred to see the incorporated material rot down before using the machine for a second pass.
Wave disc cultivator

As the project progressed, the project team identified the need to have a machine to make some fine soil to allow for improved soil set contact but did not want to use the rotary hoe.

During a study trip to New South Wales the team met with growers who were using 2-wave disc to create a small amount of fines to allow double-disc-opener planter to gain a better sett-soil contact. From this concept we developed the full-width wave-disc cultivator to create some fine soil over a wider area to allow a wide-chute planter to be used.

To test the concept, the team used the bedformer frame and four modified tynes on to which we mounted wave disc. This concept machine was trialled and proved to be successful. Wanting to build a more substantial machine, the team applied to Reef Rescue for funding and were successful in obtaining funding to build two new machines.
Prototype machine trialling various disc profiles

New 3-row machine built with Reef Rescue funding
To achieve the objectives of the project the team felt it was better to hold a number of small group meetings with each of the many groups that were involved in the new farming system. By keeping the groups small and working with the groups that are currently in place, we felt we would gain a greater understanding of the current practices and growers would be more willing to commit to trial work in their current group structure.

The grower group meetings were designed:
- to inform growers of the new project;
- to gain a greater understanding of the farming system currently then by the growers;
- to seek input into the equipment required to replant back into beds;
- to seek some commitment to conduct on farm trials to investigate the best ways of replanting back into beds.

*Focus group meeting 1 - O'Connell Catchments Precision Services*

**Location**
Bloomsbury, 50 km south of Proserpine.

**Members**
Four farming families.
Area/tonnes
The group grows around 1,000 ha of cane producing 70,000 t and contract harvesting an additional 40,000 t.

Current activities of the group
The group is currently moving to the new farming system. The year before the group planted 200 ha of cane on a controlled-traffic farming system using 1.8 m single row system. The tractors used for planting are equipped with GPS auto-steer system. That year the group moved to dual rows planted into preformed beds at a wheel spacing of 1.9 m; again beds and planting operation are conducted using GPS auto steer systems.

The future
The group is to install auto-steer on to the harvester this will also allow them to yield map and map areas of grub damage to allow for precision application of grub-control products.

Planting back into beds
The group currently has no older ratoons on a bed system that need replanting and will not have any for a number of years. The group has used a zero-till planting system in the past to repair blocks that were damaged by greyback canegrubs. In these situations they used their double-disc-opener cane planter and planted direct back into the old cane row through the trash blanket.

When asked about their thoughts on re-establishing cane back into beds the following comments were offered:
- If the block is in good order they may just spray out the cane, plant soybean spray again and plant directly back into the old row using the double-disc-opener planter;
- If the ground is compacted it may be necessary to rip the bed area before planting;
- If the block had been damaged with a wet weather harvest it may need additional cultivation.

Focus group meeting 2 - Gregory River Planting Company

Location
10 km north of Proserpine.

Members
Three farming families.

Area/tonnes
The group grows around 60,000 t of cane.

Current activities of the group
The group was formed to share in planting and bed-forming equipment. This group has been operating for a number of years and use a 1.8 m farming system with permanent beds and dual rows planted at 500 mm. This group has a number of fourth-ratoon blocks that have been planted to the system and are due to be replanted soon.

The future
The group’s next step is to install GPS auto-steer system on the tractors used for planting and bed forming. Planting back into the existing beds will also be challenge.
**Planting back into beds**
The group has a number of older ratoon blocks and will be looking to replant these blocks over the next few years. This year the group replanted their first block back into the existing beds.

The process they used was:
- The block was harvested green and allowed to ratoon before being sprayed out with Roundup;
- Soybeans were planted into the block;
- Soybeans were harvested;
- Block was sprayed again with Roundup;
- The block was ripped with a single ripper with a large sweep down each bed;
- Cane was planted using the dual-row double-disc-opener planter;
- The beds were reformed with the bedformer after planting.

When asked about their thoughts on re-establishing cane back into beds in the future the following comments were offered:
- The process used this year has worked well but will not work in all situations
- May need some additional cultivation in some cases
- Have used the rotary hoe just on the bed area in the past in a fallow situation and this may be necessary in the re-planting situation as well
- Would be keen to compare the BSES ripper to their ripper.

[Image of a ripper used to rip the beds before replanting]
Focus group meeting 3 - Back on Track group

Location
Eton.

Members
Five farming families.

Area/tonnes
The group grows around 1,200 ha of cane producing 100,000 t of cane.

Current activities of the group
This group currently farms on a 2 m bed system with dual rows planted at 800 mm apart on the beds. This farming system maximises the distance between the dual rows and the area covered in a single pass and has the lowest amount of compacted soil. The trade-off is that machinery, particularly harvesting equipment, needs to be highly modified to suit the system.

The future
This group has been operating for a number of years and was one of the first groups to plant large areas to the new farming system. The group now operates with GPS auto-steer tractors and harvesters and is investigation GPS auto-steer systems for the haul-outs as well.

Planting back into beds
This group is the most advanced in the area of permanent beds and controlled traffic and has a number of older ratoon blocks that will require replanting soon. Unfortunately, many of the earlier plantings were established without GPS guidance and the blocks will now be fully cultivated to allow the beds to be formed using GPS guidance systems. The group has agreed to work with the project team by leaving a small area of the original beds where we can trial different re establishment methods.

Focus group meeting 4 - Sarina Sustainable Farmers Group

Location
Sarina mill area.

Members
15 growers.

Current activities of the group
This larger group has been operation for a number of years and started out as an SRDC-funded grower group investigating the New Farming System and its application to the dry-land areas of the Plane Creek Mill area.

The group has a number of grower planting dual rows into both preformed beds and onto flat soil.

The group has conducted trials into:
- Minimum-tillage planting;
- Fallow legumes;
- Harvester elevator extensions;
- Variable rate fertiliser;
- Herbicides.
Planting back into beds
As this group has been operating for a number of years, it has a few growers who have areas of older ratoons that will need replanting in the next few years. Several of the growers have already replanted back into the beds and have done this by ripping the beds and replanting with a dual-row double-disc-opener cane planter through the trash blanket.

The issue the growers see in doing this is that the bed heights have become uneven. To overcome some of these issues, one grower has developed a planter that automatically adjusts its height to obtain a consistent planting depth. While this is good, it does not help the harvester that also needs a consistent bed height.

Focus group meeting 5 - New Farming Systems Group

Location
Mackay.

Members
40 growers.

Current activities
This group of growers have been supported by the SRDC-funded New Farming System project. The aim of this group is to adopt the finding of the yield decline project on to their farms. Growers in this group are growing cane on a controlled-traffic farming system, using either dual rows on pre-formed beds, or wide single rows that are planted conventionally.

Planting back into beds
Many of the growers in this group have only recently adopted a controlled-traffic farming system and it will be a number of years until they have older ratoons that require replanting. Several growers who are members of this group did have areas of controlled-traffic cane established before the commencement of the project, and these growers do have some ratoons nearing the end of their life that will need to be replanted.

Focus group meeting 6 - Focus group meeting held with more advanced growers

To gain an understanding of the issues facing growers planting the second crop cycle, a focus group meeting was held. This meeting included growers of the Back on Track group, as well as some of the more advanced growers from the Sarina Sustainable Farmers and the New Farming System group.

During this meeting, a discussion was held as to the work needed at each stage of the process from crop removal through to replanting the following cane crop. The topics discussed and points raised at this meeting included:

Cane removal
- Hard to get good soybean germination through trash.
- Do you remove cane early in the harvest period or late?
- Best to form beds before the wet season.
- How do you incorporate filter mud into beds with minimum tillage?
- Discussed various machines for the removal of the cane while maintaining the beds.
- Concern about retaining or destroying trash.
Fallow period

- Fallow legumes seen as an essential part of the system.
- Need to maintain the wheel tracks even if cultivating.
- May need GPS.
- If the field is damaged from a wet harvest wheel ruts etc will need to be prepared.
- May need to till the surface of the beds to get a better soybean crop.
- Spray out the beans.

Beds

- Best to bed up before the wet.
- Need to reshape the beds – cultivate.
- May need to take soil of the beds to repair the wheel tracks.
- Trash will be issue in the early part of the season.
- Need to form beds that are a consistent shape regardless of soil type
- May need to remove the trash.
- Beds will sink if the trash is incorporated.

Planting cane

- Plant 1 row or 2 rows onto beds.
- The amount of trash will influence the planter type.

Plant-cane management

- Chemical selection limited on sands.
- Need to be committed to full chemical program if using zero tillage on trash.
- How do you apply mill mud to the zero-tillage system.

Summary of meeting

It was felt that to replant back into the existing beds that some cultivation of the bed area would be beneficial as this would allow the beds to be reformed to give a consistent shape and height, which are critical when harvesting. Tillage of the surface of the bed would also allow for easier planting of soybeans as pinning from cane trash would be reduced resulting in improved soybean strike.

To achieve these out comes, various machines were discussed. The group felt that a machine with a small rotary hoe on the beds area and system of tynes and disc in the inter-rows would produce the best result.

Focus group meeting 7 – Plane Creek Sustainable Farmers

A focus group meeting was held with the Plane Creek Sustainable Farmers group at the Koumala Hotel and was attended by 16 growers and 5 industry staff.

Items discussed at the meeting included:

- The project aims and objective
- The trial at Tedlands, with which the group is working
- Other trials in the district
- Project equipment
  - Bed renovator
  - Coulter ripper
  - Rotary hoe
- New equipment ideas
  - Strip cultivation unit as used in the NSW
The question used to focus thoughts on the equipment were:
  1. Does this machine have a place in the farming system?
  2. Where would you use it?
  3. Will this machine reduce your cost?
  4. What improvement could be made?

**Bed renovator**

1. Does this machine have a place in the farming system?
   - The group thought that the machine had a place on the farm.
   - Could be used in the place of offset disc.
   - Produces big lumps.
   - BSES bedformer crossed over three rows and maintained bed formation in field demonstration in a ploughout trash blanket field at Berardi, Koumala. Most people expected the bedformer to fail and were surprised at the good result.
   - Old stool root mass difficult to manage.

2. Where would you use it?
   - Use it straight after harvest before you plant soybean.
   - Use it one month before you plant, then a second pass close to planting.
   - Need to use the machine and then have a rainfall event before doing a second pass.

3. Will this machine reduce your cost?
   - Need to be careful the emphasis is not on the reduction of cost at the expense of doing the job which is needed.
   - Some felt that cost could be reduced by replacing some of the current working with the machine.

4. What improvement could be made?
   - Discussed the roller shape and some felt that a shape roller would be better while other felt that the current flat roller was best.
   - Discussed the ripper and there was a feeling that maybe two rippers would be sufficient. The machine currently has three rippers.
   - Discussed the rear disc and whether these should be replace with a gang of discs to give a fine cutting of material - this was thought to be unnecessary as would then clog in moist soil.
   - Discussed the final bed shape and the possible need for a finisher - this was also thought to be unnecessary.
   - Should front discs be moved wider as no cultivation is needed in soft bed centre.

**Coulter ripper**

1. Does this machine have a place in the farming system?
   - Yes, in the controlled traffic system, only need to work the bed area.
   - Still need to manage compaction on the sides of the beds.
   - Difficult to drive straight and keep ripper and planter on bed without GPS.

2. Where would you use it?
   - Some debate about the best time some felt it would be best to rip after harvest and before the wet season, others had tried this practice and found that the soil set over the wet season and need to be re-ripped before planting so timing would depend on the soil type and condition.
3. Will this machine reduce your cost?
   - Yes, reduction in cost, as only ripping the bed area.
   - Bed should be soft so power needed would be lower.

4. What improvement could be made?
   - Discussed putting an hour-glass roller on the back of the ripper and this was thought to be a useful addition.

**Rotary hoe**
1. Does this machine have a place in the farming system?
   - Much debate about this point as some felt that a rotary hoe produced a good tilth quickly and if it is only used once every 5 years or so it would not be a problem. Other felt that rotary hoes should not be used due to their aggressive cultivation impact on the soil.

2. Where would you use it?
   - If it was used it would be used close to planting to produce a fine seed bed.
   - Be used after a previous operation such as a ripping or bed renovation operation.

3. Will this machine reduce your cost?
   - No.
   - Yes, as it can replace several operation and, although it is expensive, one pass may be cheaper than three.

4. What improvement could be made?
   - Discussed adding ripper to the rotary hoe either in front with coulters or behind the rotary hoe.
   - The machine much be able to work through trash to have the maximum flexibility.

**New equipment**
The group was shown some photos of strip cultivation equipment used by the growers in the NSW industry to allow them to plant with double-disc-opener planters back into soybean beds. These strip cultivators use a wavy disc coulter to produce fine soil to give good sett coverage. The area cultivated is about 100 mm wide and about 100 mm deep.

The group thought that an implement of this design would be of benefit and, if the machine was available, it would have been of benefit in the Tedlands trial.

**Focus group meeting 8**
The second focus group meeting was held at BSES Mackay. All of the growers in the local area who had used the equipment and several other growers who have developed their own equipment were invited to the meeting. 13 growers and 1 machinery builder attended the meeting.

The format of the focus group meeting was to first go around the room and each grower was given the opportunity to explain how the machinery was used on their farm and how it work for them and then finally how it could be improved. All of this information was collated on the white board. At the end of this session, a general discussion was held as to any improvement that could be made.
Three separate sessions were held, one for the bed renovator, one for the ripper and one for the rotary hoe.

**Bed Renovator**

**Comments from growers during the around the room discussion**

Grower 1: The grower first cultivated the block with a Lely Roterra, then the BSES bed renovator at a row spacing of 1.65 m. The grower reports the bed renovator direction was difficult to control with a 110 hp tractor in the black earth soil. The bed renovator directional control was good in sandy soil.

Grower 2: The grower used offsets for the first block working then the BSES bed renovator. The grower would use the rotary hoe before the bed renovator next time and commented that the use of the bed renovator promotes good inter-row drainage.

Grower 3: The grower sprayed out smut-infested ratoon cane. The block was then cultivated twice using the BSES bed renovator but the implement was not able to process the large volume of cane in the field and choke-ups were common. The grower then moved the position of the discs and was able to improve the flow of cane through the implement. The grower thought that the implement is too long and could be shortened by 300-400 mm. This was later done by unbolting the machine and moving all of the ground-engaging parts are far forward as possible. This achieved a shorting of 300 mm.

Grower 4: The grower used the BSES bed renovator in the field straight after a peanut crop was rotary hoed, and, even though the tractor direction was difficult to control, the grower was satisfied with the job. No further cultivation of the block was necessary before planting and the grower eliminated one ripping, one rotary hoe and one marking out.

Grower 5: Two offset discing for the first land preparation was used by this grower in dry soil conditions. The BSES bed renovator was then used with difficulty, as the soil moisture varied along the drill and bed formation was not consistent, even though a 190 hp tractor was used.

Grower 6: The grower sprayed out the old ratoons and offset the block twice. This block is in stony country. The direction of the tractor with the BSES bed renovator attached was difficult to control and this was with a 200 hp tractor. However, the formation of the beds was satisfactory and planting straight into the beds was completed successfully. The grower would like better adjustment provided on the front discs.

Grower 7: A crop of soybeans was grown. The block was then offset and beds formed with the BSES bed renovator and cane planted. In this block, the tractor had sufficient power to handle the bed renovator and direction control was easy to maintain.

Grower 8: A 3-metre rotary hoe was used to incorporate soybeans. The grower then used a 135 hp GPS guided tractor and set the bed renovator slightly shallow. The tractor handled the implement easily and did not override the GPS control, as it did when the bed renovator was set too deep. This is the second time this grower has used the bed renovator and still considers the implement too long to manage.

Grower 9: This grower used the bed renovator and would like a depth wheel assembly fitted to maintain depth control, graduations placed on the tynes, ripper legs and coulters to accurately adjust depth and working angle. Also better quality shear pins are required, as the existing ones do not always work, resulting in damage to the implement. The crumble roller was considered too narrow and should be widened 100 mm. The open space angle iron crumble roller is a good design, as it breaks-up lumps even in black earth. A hydraulic...
top link should be investigated as they are beneficial for implement control but it would have to be a heavy-duty link, as the grower has already bent a normal duty top link.

**Place for and use of the bed renovator**
The following are a few notes from the general discussion about the machine:

- If a change is being made from 1.5 m row spacing to 1.8 m row spacing, it is necessary to work the land - probably conventionally – as it is not possible to form even beds when changing row spacing.
- The bed renovator has to be used in the right conditions and can not be used to short-cut land preparation.
- The bed renovator is considered to be a first operation implement only, as the discs and rippers create lumps. These lumps are not readily broken up even with a rotary hoe.
- Beds should be formed before the wet season as this makes it easy to manage the lumps.
- Then in the right conditions the bed renovator can be followed by the planter.
- Comment was made that the bed renovator only does one row at a time, however, one row at a time was considered acceptable, as long as the total number of passes is reduced from about eight to ideally two.

**Ripper**
The second discussion was about the ripper and the use of it. As fewer growers had used the ripper, the discussion was of a more general nature.

-Grower used the ripper in black earth with the ripper legs as close as the machine would allow. The ground was lifted, but was still too hard and a rotary hoe had to be used for seedbed preparation.
-It was difficult to get the ripper deep enough in sand and difficult to keep the ripper shallow enough in black earth.
-Grower suggested fitting the Berends rippers to the bed renovator. Also suggested a roller fitted with a hydraulic link could be used for depth control and would also break up lumps.
- The ripper is not necessary in lighter soil types.

**Place for and use of the Ripper**
-It was agreed that blocks should be ripped before the wet season. A roller with hydraulic control should be attached to the ripper. A depth control mechanism is needed for the ripper.

**Rotary Hoe**
The final discussion of the day was on the rotary hoe and, even though only a limited number of growers had used our rotary hoe, all grower have used a rotary hoe in the past and several grows had made modification to their rotary hoes to allow them to zonal cultivate.

- A combined ripper rotary hoe was recommended by a grower, with a parallelogram used to attach the rotary hoe to the ripper. The depth of the ripper can be controlled with the tractor hydraulics and the depth of the rotary hoe should be controlled by a roller.
- The question “is the rotary hoe a waste of money?” was put to the group with mixed responses. The rotary hoe was needed in clay soils to prepare the seed-bed. Set the tractor forward speed to 4.5 km/h when using the rotary hoe in light soils and 3.0 km/h in heavy soil. These speeds are about optimum, although it was recognized that speed is determined by the finished product.
- When planting at 1.83 m row spacing, this grower uses a zonal ripper hoe combination. A tine has been fitted in front of the rotary-hoe chain case to allow the hoe to work deeper at a rate of 1ha / hour.
The first working by this grower was a ripper rotary hoe combination then used his own bed renovator built by a local implement manufacturer. The grower used 182 L/ha of diesel for land preparation in 2007 and 100 L/ha of diesel for land preparation in 2008. Planting uses 13.8 L/ha diesel with a 400 mm wide planting chute.

Focus group meeting 9

The third focus group meeting for the year was held at BSES Mackay on 3 December 2008. All of the growers in the local area who had used the equipment and several other growers who have developed their own equipment were invited to the meeting. 10 growers and 3 staff from Hodge Machinery attended the meeting.

This meeting was called as Hodge Machinery has received orders to build two more bed renovators and we wanted to ensure that any learning from the group were incorporated into the new models of the bed renovator. The format of the focus group meeting was to first highlight the progress made on the project to date and to have a focused discussion on how to build a better bed renovator. During the discussion, each component of the machine was discussed and each member of the group recorded the changes that they felt would improve the machine.

The discussion areas were:
1. Front disc setup
2. Rippers
3. Side disc
4. Frame
5. Roller
6. Wave disc.

Consensus was not reached or sought on all points, but the following provides an outline of the changes we will be seeking to make to the machine as a result of the feedback from the users.

Front disc setup
- Move the front disc setup on the front bar (currently they are on an adjustable bar)
- Trash clearance can be an issue between the disc and the machine stands. Move the stands
- Place a ripper tine immediately behind the disc to cultivate the uncultivated strip between the disc
- Place a sweep on the front tine

Rippers
- Ripper are too hard to adjust the depth
- May just have two rippers not three
- Should make the ripper have hydraulic adjustment

Side disc
- Relation ship of first disc to front disc is critical
- Need to move the back disc as far forward as possible

Frame
- By moving many of the components forward, the frame can be made shorter
- The two centre bars need to be closer to allow more adjustment width for the side disc
**Roller**
- Roller works well
- Could be slightly wider out to 1.2 m
- Depth gauge on the roller at the rear of the machine

**Wave disc**
- Wave disc are currently not installed, but were discussed as a tool to manage lumps and trash
- General consensus that we should try them

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**Growers discussing the bed renovator at the focus group meeting**

**Focus group meeting 10**

A focus group meeting was held in conjunction with the GPS information day. During this event 5 groups of 16 growers were formed to focus on the issue of GPS guidance and zonal tillage. In each group of 16 there was a BSES or MAPS facilitator, a GPS dealer to act as the technical support, and several current users of GPS. The others were growers who were considering GPS.

**Issues:**
- Big learning curve after you buy the system
  - 'Getting started' lessons.
  - More training needed.
  - Maybe by a consultant or extension officer.
  - Call centre might help.
- Economics
  - Need good data on benefits of system/measurability.
• **Drop outs**
  - Have to plan – like watching the tides when fishing.
  - Mark out so you have a backup line to follow.
  - You can still operate with drop-outs, it’s not as big an issue as first thought.

• **Repeaters**
  - Repeaters can be mobile.
  - Have no effect on accuracy.
  - Make sure they are locked on repeater mode and not base station.

• **Changing between machines and farms**
  - General concerns.
  - Time it takes to change.
  - What management is required when you move between farms? What if the farms are in different base station areas?

• **Watch out for…**
  - Back up data on data file disc.
  - Don’t loose the original utility.

• **Benefits**
  - If you want to drive in a straight line and farm the same way as you always have, then forget about GPS.
  - If you want to do controlled traffic, zonal tillage, savings in fuels, time, and labour, and change in lifestyle (less stress/fatigue) - then go for a GPS.
  - Time to watch other things like the planter.
  - Current users would buy a GPS again if given another chance.
  - Using the GPS unit now for more things than the unit was originally bought for.

• **Harvesting**
  - There’s a fuel saving.
  - In lodged cane, you can pick up extra tonnes.
  - Big reduction in stool damage.
  - Ability to mark in-field obstacles, i.e. poles, hydrants.
  - Better concentration on other aspects of harvesting.
  - Haulouts’ ability to reverse!?!?

• **Data compatibility**
  - How do we get the information into AgDat or other programs – data transfer.
  - Legislation coming – can we get GPS to help us.
  - Don’t want it to be time-consuming to transfer data.

• **Tips**
  - Good for contours.
  - Start the operation 90 degrees to the headland to avoid wobbly rows.
  - Cloud has no affect on signal.
  - Underlying ground conditions from previous workings can pull implements off-line.
The interesting point for this project is that growers see that the adoption of GPS is not useful on its own but very useful as a part of a whole of farming system change that includes controlled traffic, zonal tillage and fallow legumes. To this end, 65 growers have purchased a GPS system and 35 additional growers are considering buying one. This would give a total of 100 growers who are heading for controlled traffic and improved farming systems.

Focus group meeting 11

A focus group meeting was held at BSES Mackay to discuss improvements that could be made to the wavy disc cultivator. This focus group was attended by 12 people, comprising growers and machinery manufacturers.

Summary of the group’s thoughts:

- A wavy disc cultivator is very useful machine.
- A bigger disc would be better (currently we can only source a 17” disc).
- The more aggressive wave the better.
- The disc could be mounted on a shaft similar to an offset.
- The crumbler roller should be flat, not hour-glass to give better contact with the bed.
- Much debate as to the benefits of closed rollers versus open rollers and group decided to make both to try.
- Significant fuel saving are being made with the new farming system.

Focus group meeting 12

The third wave disc focus group meeting was held in the Sarina mill area in the shed of Neil Warpole. Neil is the chairman of the Sarina Sustainable Farmers Group and invited the
group to his shed to discuss the farming system. The group is currently considering building a wave disc cultivator and invited the project team to meet with them and discuss our wave disc cultivator. This meeting was attended by 8 growers and 2 industry staff from the Plain Creek Productivity Service.

After the meeting at the shed the group moved to the field to under take a demonstration of the wave disc cultivator.

Summary of the group’s thoughts:
- A wave disc cultivator is a good fit to the new farming system.
- Useful when planting soybean into fallow and preparing land for planting.
- Bigger disc would be better to give a deeper cultivation.
- One grower who had used the machine found a very fine surface finish but lumpy underneath.
- A great deal of discussion was held as to the best design for crumble rollers
- You may need a big tractor to use the machine due to it weight not its horse power requirements.
- May need to add weights to get the machine into the ground.
- Thought that the disc should have some sort of cover similar to a rotary hoe.
Looking at the wave disc on the trailer

Wave disc field demonstration
Summary of focus groups

The 12 focus groups held during the project provide guidance and clarity of thought to the project team. These meetings were essential for machinery design as they gave grower ownership of the project concepts and led to easier adoption of the ideas.

5.0 GROWER STRIP TRIALS

All of the trials conducted by the growers during the project were replicated strip trials with different treatments to re-establish the crop. The treatments included a zero-till treatment, strategic-tillage treatment, and a more extensive tillage. The actual treatments applied and final trial designs were decided by each group before the treatments are applied.

Replicated strip trials are the preferred trial design. When designing these trials the strips need to be large enough to produce 30 tonnes of cane if yield data is to be collected from the mill. To allow for variable yields it is best if each strip is about 0.5 ha. Due to this large plot size the number of treatment and replicates needs to managed to suit the block size. If a trial has 5 treatment and 2 replicates, then 5 ha is needed and blocks of this size are rare.

The trial components of the project operated as a participative action-learning process where the growers/ grower groups are involved in the planning and implementing of the trials. The agreed trial designs were influenced by the soil type, paddock history and crop-residue level.

The following is a list of treatments which were possible with the equipment available to the project team. Not all treatments were suitable for all situations

1. Zero till plant
   - In this treatment, the cane will be sprayed out and replanted using a double-disc-opener planter.
   - This treatment will only be possible where the beds are in good order and the block is free from bog marks from harvesting - there will be no opportunity to repair the beds.

2. Rip and plant
   - In this treatment, the cane will be sprayed out. The beds will be ripped with the coulter ripper and the cane will be replanted with the double-disc-opener planter.
   - This treatment will only be possible where the beds are on good order and the block is free from bog marks from harvesting – there will be no opportunity to repair the beds. The ripper will remove compaction from the beds but will not reform or repair the beds.

3. Rip and rotary hoe before planting
   - In this treatment, the cane will be sprayed out. The beds will be ripped with the coulter ripper and then rotary hoed with the zonal rotary hoe. If necessary, the beds could be reformed using the bedformer to produce consistent beds.
   - In this treatment it will be possible to plant with either a double-disc-opener planter or a conventional planter.
   - Due to the high level of cultivation and the option to re-form beds, this treatment could be used when beds are in poor condition.

4. Bed renovate
   - In this treatment, the cane will be sprayed out. The beds will then be renovated by using the bed-renovator machine.
In this treatment it will be possible to plant with either a double-disc-opener planter or a conventional planter.

Due to the high level of cultivation and the bed reforming by the bed renovator, this treatment could be used when beds are in poor condition.

5. Full cultivation

- In this treatment, full cultivation will be used to prepare the ground for planting. This will involve using the grower’s standard practices of offset discing, ripping, rotary hoeing and bed forming.
- In this treatment, it will be possible to plant with either a double-disc-opener planter or a conventional planter.
- Due to the high level of cultivation and the bed reforming by the bed renovator, this treatment could be used when beds are in poor condition.

Trial 1 - Plane Creek Sustainable Farmers

This grower group held a grower group meeting on 17 April 2008 to discuss the new project and the trials they would like to undertake in their area.

The group had an 8 ha fallow block on the farm of Tedlands Pastoral which was available for trials. This block had been planted to the 1.8 m dual-row system and had completed one crop cycle. The cane had been sprayed out with Roundup and no further operations had been undertaken in the block.

After some discussion the following treatment were agreed upon:

1. Zero till plant. In this treatment, cane was to be planted back into the old cane rows using a double-disc-opener planter with dual rows at 440 mm apart.
2. Rip and replant. In this treatment, the old cane rows would be ripped with the coulter ripper before the cane is planted with the double-disc-opener planter.
3. Rip, rotary hoe and replant. In this treatment, the old cane rows would be ripped with the coulter ripper before being rotary hoed to the depth of the bed. Cane would then be planted using the double-disc-opener planter.
4. Bed renovate and replant. In this treatment, the bed renovation machine would be used to prepare the beds before planting.

The treatments would be planted in two replicates across the block. Each treatment would be at least 0.5 ha to enable mill yield data to be collected from the strip. During the establishment of the trial the time taken to undertake each treatment and the fuel used by the tractor for each treatment would be recorded. Collection of this data will allow economic analysis of the treatments to be used using FEAT.

The trial:

<table>
<thead>
<tr>
<th></th>
<th>Rep 1</th>
<th>Rep 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ripped Bed renovator</td>
<td>Zero till</td>
<td>Zero till</td>
</tr>
</tbody>
</table>

Plot size was 6 rows by 500 m. This allowed mill yield data to be collected from each of the strips.

The cultivation treatments for the trial were undertaken on 29 April 2008, and the times taken to cultivate each treatment and the fuel used were collected. The tractor used was a Kubota 125 hp front-wheel assist.
The remaining area of the block was cultivated with a machine of similar design to the project’s bed renovator. The machine, owned by Neil Warpole, a local grower, began its life as a ripper but was modified after the Sarina field day. Neil saw the value of the setup of the front disc on our machine and had that added to his machine along with two gangs of rear discs.
Ripping treatment

Tillage unit designed by the Sarina sustainable farmers used in the trial
**Time and fuel use data**

Bed renovator
- Fuel used - 16.6 L/ha
- Operating speed – 1.5 ha/hr

Ripper
- Fuel used - 15.7 L/ha
- Operating speed – 1.5 ha/hr

**Planting**
The trial was planted to Q208 on 2 May 2008 using a dual-row double-disc-opener planter with the dual rows at a spacing of 440 mm.

During planting, there were some difficulties encountered in closing the soil behind the double-disc openers in the non-cultivated and ripper treatments. Where the soil had been cultivated with the bed renovator it was in a more friable condition and flowed back over the sett much easier. To overcome the lack of soil cover on the zero tilled and ripper treatments, the beds were harrowed after planting. These light harrows produced some fine soil that closed the gap left by the planter chute. After planting and harrowing, the block was sprayed with the pre-emergent herbicide Flame. Liquid One Shot fertiliser was also applied.
Shoot counts
Shoot counts were undertaken as a measurement of crop development. Counts were made for each tillage practice with four 10 m sections of row counted in each plot. The shoot counts show that during the early stages of crop development that the zero-tilled treatments
had significantly more shoots established. As the crop progressed and developed tillers, the differences among the treatments reduced.

Harvest results
The trial harvest was completed on the 21 August 2009. Plot weights and CCS data were collected by keeping the cane harvested from each strip separate and collecting mill data. The table below shows the yield achieved from each of the four treatments.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Cane yield (t/ha)</th>
<th>CCS</th>
<th>Sugar yield (t/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSES bed renovator</td>
<td>85.5</td>
<td>16.00</td>
<td>13.68</td>
</tr>
<tr>
<td>PCSF bed renovator</td>
<td>83.4</td>
<td>16.45</td>
<td>13.72</td>
</tr>
<tr>
<td>Zonal rip</td>
<td>84.9</td>
<td>16.15</td>
<td>13.72</td>
</tr>
<tr>
<td>Zero till</td>
<td>87.4</td>
<td>15.85</td>
<td>13.85</td>
</tr>
</tbody>
</table>

Analysis of the data shows that there were no significance differences among any of the yields or CCS.

Trial 2 - Rod Watt
Rod Watt farms in the Mirani area and has been using a form of zonal tillage for a number of years. When Rod heard of our new bed renovator he was keen to compare it to his current zonal tillage practices. Rod decided to establish a trial with four treatments as follows:

1. Sprayout and rip and with the coulter ripper then zonal rotary before planting with conventional planter.
2. Sprayout and work the soil with the bed renovator and then plant cane with a conventional billet planter.
3. Sprayout and work the soil with Rod’s trash incorporator setup and then plant the cane using the conventional billet planter or double disc.
**Trial design**
Trial plan (row length 550 m):

| 6 rows Trash incorp | 6 rows Bed renovate | 6 rows Rip rotary hoe | 4 rows Bed renovate | 4 rows Trash incorp | 6 rows Rip rotary hoe |

Trial site bed renovate on left and rotary hoe treatments on right
**Planting**

The trial was planted on 21 August 2008 using a wide-chute billet planter. The variety Q208 was chosen due to its smut resistance and its suitability on all soil types. The planter used was a single-row unit and caused a reasonable amount of soil movement during planting operations. This resulted in the beds being pushed apart and conventional furrow shape being left.
Shoot counts
Shoot counts were taken as a measurement of the establishment of the young cane in the different treatments. Shoot counts were taken over 10 m of row on two rows at four locations throughout each plot - a total of 8 counts per plot.

Tillage impacted on the number of shoots, with fewer shoots in the trash incorporated and bed renovated treatments. This trial site is a particularly heavy clay soil and a fine tilth was not achieved with either of these machines on this soil type - the rotary was able to produce a much finer tilth.

![Shoot counts chart]

Trial harvest
The trial harvest was completed on 9 September 2009. Plot weights and CCS data were collected by keeping the cane harvested from each strip separate and collecting mill data. The table below shows the cane yields achieved from each of the treatments

<table>
<thead>
<tr>
<th>Plant-cane harvest yield (t/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trash incorporated</td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td>Rep1 68</td>
</tr>
<tr>
<td>Rep2 60</td>
</tr>
<tr>
<td>Average 64</td>
</tr>
</tbody>
</table>

This trial was quite variable with large differences in yield among the three treatments and between the replicates. Much of this variability is due to the establishment of the cane and shoot counts taken to measure emergence showed that the tillage method had impacted on the number of shoots, with fewer shoots in the trash incorporated and bed renovated treatments. This trial site is a particularly heavy clay soil and a fine tilth was not achieved with either of these machines on this soil type - the rotary hoe was able to produce a much finer tilth and in some area still led to surface sealing.
**Trial 3 - Rod Watt**

Rod Watt farms in the Mirani area and has been using a form of zonal tillage for a number of years. When Rod heard of our new bed renovator he was keen to compare it to his current zonal tillage practices. Rod decided to establish a trial with three treatments as follows:

1. Spray out and rip and with the coulter ripper then zonal rotary before planting with conventional planter
2. Spray out and work the soil with the bed renovator and then plant cane with a conventional billet planter
3. Spray out and work the soil with Rod's trash incorporator setup and then plant the cane using the conventional billet planter or double disc.

**Trial design**

**Trial plan:**

<table>
<thead>
<tr>
<th>6 rows Rotary hoe</th>
<th>6 rows Bed renovate</th>
<th>6 rows trash incorp</th>
<th>6 rows Rotary hoe</th>
<th>6 rows Bed renovate</th>
<th>6 rows trash incorp</th>
<th>4 rows Rotary hoe</th>
<th>4 rows Bed renovate</th>
<th>4 rows trash incorp</th>
</tr>
</thead>
</table>

Rotary hoe treatment on left, bed renovate on right
Discussion of trial with harvesting contractor and planting contractor (trash incorporated treatments)

Shoot counts
Shoot counts were taken as a measure of the establishment of the young cane in the different treatments. Shoot counts were taken over 10 m of row on three rows at four locations throughout each plot - a total of 12 counts per plot.

Tillage impacted on the number of shoots, with fewer shoots in the trash incorporated and bed renovated treatments. Although the strike was lower, it was consistent along the row. However, all treatments have shoot counts that should not be yield limiting.
Trial site on 22 October – 52 days after planting, note the clods in the soil from the trash incorporator

**Trial harvest**
The trial harvest was completed on 9 September 2009. Plot weights and CCS data were collected by keeping the cane harvested from each strip separate and collecting mill data. The table below shows the cane yields achieved from each of the treatments.
The site was consistent with similar yield being achieved in each treatment. The more consistent yield may in part be due to the more uniform establishment that was achieved in the loam soil.

**Trial 4 - Ross and Colin McKenzie**

Ross and Colin McKenzie have two farms in the Calen area and recently made the move to controlled traffic using permanent beds with 1.8 m row spacing. The beds are prepared using full conventional cultivation at the end of the cane-cropping cycle. This is done as the current crop cycle is based on 1.5 m rows and there is a need to remove any underlying compaction before moving to the new row spacing at 1.8 m.

The operations from harvesting cane to planting cane were:
- Harvest the cane
- Fully cultivate the field
- Form beds at 1.8 m spacing
- Plant soybeans into the beds in December
- Spray out the beans April
- Prepare the beds for cane planting by using zonal tillage.

**Trial design**

To prepare the block for cane planting it was agreed that two cultivation methods would be trialled:
1. Bed renovator – in this treatment the beds were prepared for planting using the bed renovator.
2. Rip and Rotary hoe – in this treatment the beds were first ripped with the zonal ripper before being rotary hoed with the small rotary hoe on the tops of the beds.

The cultivation treatments were undertaken on 14 May 2008.

The trial plan (rows 950 m long):

<table>
<thead>
<tr>
<th>Rep 1</th>
<th>Rep 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rip and rotary hoe 3 rows</td>
<td>Bed renovate 4 rows</td>
</tr>
</tbody>
</table>

**Time and fuel use data**

Bed renovator
- Fuel used – 15.7 L/ha
- Operating speed – 1 ha/hr

Ripper
- Fuel used - 15 L/ha
- Operating speed – 1 ha/hr
Rotary hoeing
- Fuel used – 27.2 L/ha
- Operating speed - 0.6 ha/hr

Block before treatment, one row-bed renovated

Ripping treatments
The trial was planted on 5 June 2008 using a wide-chute billet planter. The variety Q208 was chosen due to its smut resistance and its suitability on all soil types. The planter used was a single-row unit and caused a reasonable amount of soil movement during planting operations. This resulted in the beds being pushed apart and conventional furrow shape being left.

After planting there was very little difference between the two cultivation treatments. The bed-renovated treatment was slightly cloddiER and the soybean trash was not cut up as fine, but the soil around the setts was of similar texture.
**Shoot counts**

Shoot counts were taken as a measurement of the establishment of the young cane in the different treatments. Shoot counts were taken over 10 m of row on three rows at four locations throughout each plot - a total of 12 counts per plot.

Counts in the two treatments were very similar, suggesting that the tillage method had little impact on crop establishment.

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**Shoot counts**

![Shoot counts graph]

Trial site on 23 October 2008, 140 days after planting
**Trial harvest**
The trial harvest was completed on 14 September 2009. An attempt was made to harvest each strip separately and collect the mill data. Unfortunately, some the cane bins for each of the replicates were combined during the crushing and the replicate data was lost. The table below shows the yield achieved from each of the treatments.

<table>
<thead>
<tr>
<th>Plant-crop harvest yield</th>
<th>Rip rotary hoed</th>
<th>Bed renovated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cane yield (t/ha)</td>
<td>108</td>
<td>122</td>
</tr>
<tr>
<td>PRS</td>
<td>17.28</td>
<td>17.26</td>
</tr>
<tr>
<td>Sugar yield (t/ha)</td>
<td>18.66</td>
<td>21.05</td>
</tr>
</tbody>
</table>

This trial established very well with both treatments having a similar shoot count. The yields produced by both treatments were high, but the bed renovated treatment yielded 14 t/ha more than the rotary hoed treatment.

**Trial 5 - Bill Atkinson**

Bill Atkinson farms in the ‘up river’ area of Proserpine. Bill has been using a farming system based on 2 m beds and dual rows at 600 mm for a number of years. He has now completed a full crop cycle using the controlled traffic system.

**Trial design**

As a block was ready for replanting, Bill decided that he would like to try the bed renovator and compare it to a zero till treatment. Bill uses GPS guidance on his farm operations.

Operations Bill used in the cultivated section:
- Harvest cane green.
- Spray out cane with Roundup.
- Cultivate with one pass of the bed renovator.
- Rotary hoe the beds.
- Plant with double-disc-opener planter.

Operations Bill used in the zero till section:
- Harvest green.
- Spray out with Roundup.
- Plant with double-disc-opener planter.
Trial site with cultivated and zero till treatments before planting – 14 August 2008

Trial site 23 October – zero till on left, bed renovated and rotary hoed on right
Shoot counts
Shoot counts were taken as a measure of the establishment of the young cane in the different treatments. Shoot counts were taken over 10 m of row on two rows at four locations throughout each plot - a total of 8 counts per plot.

Numbers of shoots on 23 October 2008 were:
- Zero tilled: 33
- Bed renovated: 54.

Trial harvest
The trial harvest was completed on 27 August 2009. Plot weights and CCS data were collected by keeping the cane harvested from each strip separate and collecting mill data. The table below shows the yield achieved from each of the treatments.

<table>
<thead>
<tr>
<th>Plant-crop harvest yield (t/ha)</th>
<th>Zero tilled</th>
<th>Bed renovated + rotary hoed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rep 1</td>
<td>95.6</td>
<td>94.8</td>
</tr>
<tr>
<td>Rep 2</td>
<td>95.0</td>
<td>93.7</td>
</tr>
<tr>
<td>Average</td>
<td>95.3</td>
<td>94.3</td>
</tr>
</tbody>
</table>

The harvest data shows very little difference between the treatments or replicates. In this trial, no benefit was achieved from the cultivation in the cultivated treatments.

Trial 6 – Geoff Hall
Geoff Hall is a grower from the North Coast Grower Group who established a comparison block. The block was a conventional 1.5 m row spacing block. The cane was ploughed out with two passes of the offset disc and then bed-formed before Christmas. Cane and weeds in the block were then controlled with herbicides during the wet season.
Prior to planting, half of the beds was ripped with the coulter ripper and the other half was ripped and rotary hoed. The cane was then planted into the block using a dual-row double-disc-opener planter.

Geoff Hall's block showing ripping and rotary hoeing on the left and ripping only on the right
Trial block on 23 October – ripper rotary hoe on left of the person, rip only on right

**Shoot counts**
Shoot were counted on nine 10-m sections of row in each treatment. Cane shoots in both of the dual rows were counted to give a total shoot count for the bed. There was very little difference between the two treatments in crop emergence and crop establishment.
**Trial harvest**

The trial was harvested on 25 August 2009 and follow results were achieved

<table>
<thead>
<tr>
<th>Jeff hall yield data 25/9/2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>Ripper</td>
</tr>
<tr>
<td>Ripper and rotary hoed</td>
</tr>
</tbody>
</table>

**Trial 7 - Mick Sheehan**

Mick setup a trial on his Seaforth road property which is an area where limited new farming system activities had been undertaken.

Steps under taken by Mick in the establishment of the trial:

1. Harvest the old 1.5 m row spaced ratoon in September and October 2008.
2. Prepare the land for soybean planting using full cultivation (offset disc and harrows).
3. Mark out soybean blocks at 1.6 m spacing.
4. Pre-water ground in December to allow of soybean planting.
5. Plant soybeans using the BSES planter in December.
7. Prepare soybean block for cane planting using 3 methods
   a. Bed renovate
      * Spray-out cane
      * Bed renovate
      * Trash incorporate
      * Zonal rotary hoe
      * Plant
   b. Zonal rip and zonal rotary hoe
      * Spray-out cane
      * Zonal rip
      * Trash incorporate
      * Zonal rotary hoe
      * Plant
   c. Full cultivation
      * Offset disc twice
      * Grub twice
      * Full rotary hoe
      * Harrow
      * Plant
8. Cane was planted using a conventional wholestick planter in early May.

**Trial plan**

<table>
<thead>
<tr>
<th>Bed renovate</th>
<th>Rip and rotary</th>
<th>Conventional cultivation</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 rows</td>
<td>6 rows</td>
<td>6 rows</td>
</tr>
<tr>
<td>Bed renovate</td>
<td>Rip and rotary</td>
<td>Conventional cultivation</td>
</tr>
<tr>
<td>6 rows</td>
<td>6 rows</td>
<td>6 rows</td>
</tr>
</tbody>
</table>
**Shoot counts**

Shoot counts were undertaken as a measurement of crop development. Counts were made for each tillage practice with four 10 m sections of row counted in each plot. Shoot counts show that all treatments established well with little variation in shoot counts by the final count in December.

![Shoot counts chart](image-url)

**Trial site 19 November 2009**

**Trial harvest**

The trial was harvested on 17 July 2010 and following results were achieved.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Cane yield (t/ha)</th>
<th>PRS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional</td>
<td>99</td>
<td>14.19</td>
</tr>
<tr>
<td>Rip Rotary</td>
<td>108</td>
<td>14.20</td>
</tr>
<tr>
<td>Bed renovated</td>
<td>111</td>
<td>13.87</td>
</tr>
</tbody>
</table>
Trial 8 - Mal Burston

Mal Burston established a large replicated trial on his Narpi property. Mal converted a large area of cane farm to cattle in the early 2000s but with the rise in the cane prices Mal was converting the cattle country back to cane. The operations he used to re-establish cane are:

- Pasture sprayed out - October 2008
- Field cultivated and formed into beds – November 2008
- Purchase soybean seed with desire to establish soybean but unable to plant due to wet – December 2008
- Spray weed growth – March 2009
- Slash sprayed weeds – April 2009
- Zonal rip beds and conventionally planted – May 2009

The project team worked with Mal and established a trial in May 2009. The trial had the following four treatments each with two replicates:

- Zonal rip
- Zonal rip + wavy disc cultivate
- Bed renovate
- Bed renovate + wavy disc cultivate

**Trial plan**

<table>
<thead>
<tr>
<th>Zonal rip</th>
<th>Zonal rip + wavy</th>
<th>Bed renovate + wavy</th>
<th>Zonal rip + wavy</th>
<th>Bed renovate</th>
<th>Zonal rip</th>
<th>Bed renovate + wavy</th>
<th>Bed renovate</th>
</tr>
</thead>
</table>

Each treatment strip in the trial was 4 rows wide and 1000 m long.

**Fuel use**

Fuel use for each treatment was measured during the establishment of the trial:

<table>
<thead>
<tr>
<th>Operation</th>
<th>Speed (ha/hr)</th>
<th>Fuel use (L/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zonal rip</td>
<td>1.5</td>
<td>16</td>
</tr>
<tr>
<td>Bed renovate</td>
<td>1.6</td>
<td>10</td>
</tr>
<tr>
<td>Wavy disc</td>
<td>2.7</td>
<td>3.7</td>
</tr>
</tbody>
</table>

**Shoot counts**

Shoot counts were undertaken as a measurement of crop development. Counts were made for each tillage practice with four 10 m sections of row counted in each plot. Shoot counts in this trial were lower than desired but increased as the cane stools out. All treatments in this trial suffered from a gappy establishment resulting in reduced shoot counts. The shoot counts were similar for each treatment, with gaps present in all treatments.
**Trial harvest**

Unfortunately the trial was harvested by the contractor without informing the project team and the harvest data was lost.

**Trial 9 - Michael Deguara**

Michael has been working at adopting the new farming system for several years on his Farleigh cane farm. Michael established a trial to compare conventional tillage to zonal tillage and a double fallow treatment was also established.
Prior to establishing the trial the entire area was fallowed and planted to soybeans, which were harvested for grain. The block was then split into three and following treatment was undertaken:

1. conventional cultivation:
   - soybeans harvested.
   - weeds sprayed out with 4 L/ha of Roundup Powermax.
   - offset discing x 3.
   - grubbing x 2.
   - rotary hoeing x1.
   - conventional cane planting.

2. Zonal tillage:
   - Soybeans harvested.
   - weeds sprayed out with 4 L/ha of Roundup Powermax.
   - addition spraying at 3 L/ha and 2L/ha.
   - one pass with the bed renovator.
   - conventional cane planting.

3. Double fallow:
   - Soybeans harvested.
   - weeds sprayed out with 4 L/ha of Roundup Powermax.
   - addition spraying at 3 L/ha and 2 L/ha.
   - planted to chickpeas as a double legume fallow.

**Trial plan**

<table>
<thead>
<tr>
<th>Conventional cultivation</th>
<th>Zonal tillage</th>
<th>Double fallow</th>
</tr>
</thead>
<tbody>
<tr>
<td>36 rows</td>
<td>14 rows</td>
<td>26 rows</td>
</tr>
</tbody>
</table>

**Shoot counts**

Shoot counts were undertaken as a measurement of crop development. Counts were made for each tillage practice with four 10 m sections of row counted in each plot. Counts were made in the sandy loam soil and the end of the block.

The initial shoot counts showed a reduction in shoot numbers in the zonal tillage; this was due to slight delay in the planting date between the two treatments. By the second count, the shoot counts were similar and had peaked at unsustainable high numbers. By the third count, the shoot counts were falling to more sustainable numbers. This rise and fall of shoot count shows that both treatments established well and that any differences in yield would not be due to establishment issues.
Shoot counts

Trial site at planting - Conventional on left and zonal on right
Trial 17 November 2009 conventional on left and zonal on right

**Trial harvest**
The trial was harvested on 27 July 2010 and follow results were achieved.

<table>
<thead>
<tr>
<th>Plant-cane harvest yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment</td>
</tr>
<tr>
<td>Conventional</td>
</tr>
<tr>
<td>Zonal</td>
</tr>
</tbody>
</table>

**Trial 10 - Gary McDermott**
Gary farms in the Sarina area and is in process of converting his farm to controlled traffic. Gary conventionally worked his fallow ground and established a soybean fallow crop that was taken through to grain. After the grain harvest, the block was offset and marked out before zonal ripping. Gary then established a trial comparing the wave disc cultivator to the rotary hoe as a final finish before planting.

**Trial plan**

<table>
<thead>
<tr>
<th>Zonal rip + Wave disc 6 rows</th>
<th>Zonal rip + Rotary hoe 6 rows</th>
<th>Zonal rip + Wave Disc 6 rows</th>
<th>Zonal rip + Rotary hoe 6 rows</th>
</tr>
</thead>
</table>

**Fuel use**
Zonal ripper 16 L/ha
Wave disc cultivator 3.9 L/ha
Zonal rotary hoe 18.3 L/ha
Shoot counts
Shoot counts were undertaken as a measurement of crop development. Counts were made for each tillage practice with four 10 m sections of row counted in each plot. Counts were similar for both treatments.

Zonal rip + rotary hoe on left, zonal rip + wave disc on right
**Trial 9 December - Zonal rip + rotary hoe on left, zonal rip + wave disc on right**

**Trial harvest**
The trial was harvested on 7 September 2010.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Cane yield t/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zonal rip + wave disc</td>
<td>76.5</td>
</tr>
<tr>
<td>Zonal rip + rotary hoe</td>
<td>75.0</td>
</tr>
</tbody>
</table>

**Trial 11 – Case study, Lindsay and Slim Altmann**

Lindsay and Slim farm north of Proserpine and use a farming system based on dual rows on 1.8 m beds. As well as running the farm, they operate a contacting business with some of the largest heavy tillage farming equipment in the Proserpine area. It was through their experience with tillage gained on their own farm and on the farms that they contract cultivate that the two brothers developed a difference of opinion.

To settle their differences they decided to conduct a trial where Slim would farm one block his way with full tillage and Lindsay would farm an adjacent block his way with reduced tillage practices.

The blocks chosen for the trial were a true second-cycle blocks that had completed one crop cycle with dual rows planted into 1.8 m beds.

Operations carried out in Slim’s block:
- Offset disc out the old stool with 2 passes.
- Rotary hoe the block.
- Fallow over the wet season with weeds controlled with herbicides.
After the wet season:
- Cultivator x 1.
- Rip longways.
- Rip crossways.
- Rotary hoe x 2.
- Apply mill mud.
- Rotary hoe.
- Markout.
- Hillup.
- Plant dual rows and 1.8 m spacings.

Operations carried out in Lindsay’s block:
- Spray-out the cane and control weed during the fallow with 2 applications of glyphosate.
- Single ripper up the middle of the beds x 2.
- Zonal Berends ripper.
- Zonal rotary hoe.
- Hill up.
- Plant dual rows and 1.8 m spacings.

Note this block was very dry at the time of cultivation and the initial two rippings could have been replaced with pre-irrigation.
Shoot counts
These were taken on 6 November 2009:
- Slim's – 138.
- Lindsay's – 71.
- Replant – 113.

The experiences
Slims block
- After the cultivation to prepare for planting the block was very dry and required overhead irrigation prior to planting
- After planting the block was irrigated immediately a second time as it was still dry. The block had a further three irrigations during the growing season to give a total of five irrigations
- The block was harvested and yielded 110 t/ha.

Lindsay's block
- After the ripping and zonal hoeing the block was planted dry.
- The block was then furrow irrigated. This caused a few problems as the beds sunk into the area which had been ripped. This resulted in the beds being very wet for a long time. An addition two irrigations were applied for the growing season.
- The block was harvested and yielded 90 t/ha.
- Lindsay feels the yield reduction is not due to the system but due to his management of the system. He feels that has to learn how to manage the new system and then he should be able to close the yield gap.
The economics
The economic comparison used a sugar price of $450 and a CCS of 13.5 to give a cane value of $39/t.

The cost of Slim’s cultivation using their contact rate and partial budget:

<table>
<thead>
<tr>
<th>Operation</th>
<th>Cost per ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offset disc 2 passes</td>
<td>120</td>
</tr>
<tr>
<td>Rotary hoe</td>
<td>100</td>
</tr>
<tr>
<td>Cultivator</td>
<td>60</td>
</tr>
<tr>
<td>Rip</td>
<td>60</td>
</tr>
<tr>
<td>Cross rip</td>
<td>60</td>
</tr>
<tr>
<td>Rotary three times</td>
<td>300</td>
</tr>
<tr>
<td>Mark out</td>
<td>30</td>
</tr>
<tr>
<td>Hill up</td>
<td>30</td>
</tr>
<tr>
<td><strong>Plant cane cultivation</strong></td>
<td></td>
</tr>
<tr>
<td>Multi weed by 3</td>
<td>90</td>
</tr>
<tr>
<td>Grubber by 2</td>
<td>120</td>
</tr>
<tr>
<td>Irrigation by 5</td>
<td>300</td>
</tr>
<tr>
<td><strong>Total cost</strong></td>
<td><strong>$1270</strong></td>
</tr>
<tr>
<td><strong>Income</strong></td>
<td></td>
</tr>
<tr>
<td>110 t/ha at 13.5 CCS and harvest cost of $8 per tonne</td>
<td><strong>$3410/ha</strong></td>
</tr>
<tr>
<td><strong>Partial budget</strong></td>
<td><strong>$2140/ha</strong></td>
</tr>
</tbody>
</table>

The cost of Lindsay’s cultivation using their contact rate and partial budget:

<table>
<thead>
<tr>
<th>Operation</th>
<th>Cost per ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zonal rip</td>
<td>30</td>
</tr>
<tr>
<td>Berends rip</td>
<td>30</td>
</tr>
<tr>
<td>Zonal rotary hoe</td>
<td>50</td>
</tr>
<tr>
<td><strong>Plant cane cultivation</strong></td>
<td></td>
</tr>
<tr>
<td>Multi weed by 1</td>
<td>30</td>
</tr>
<tr>
<td>Grubber by 2</td>
<td>120</td>
</tr>
<tr>
<td>Irrigation by 3</td>
<td>180</td>
</tr>
<tr>
<td><strong>Total cost</strong></td>
<td><strong>$440</strong></td>
</tr>
<tr>
<td><strong>Income</strong></td>
<td></td>
</tr>
<tr>
<td>90 t/ha at 13.5 CCS and harvest cost of $8 per tonne</td>
<td><strong>$2790/ha</strong></td>
</tr>
<tr>
<td><strong>Partial budget</strong></td>
<td><strong>$2350/ha</strong></td>
</tr>
</tbody>
</table>

Summary
Through this case study many lesson were learnt:
- High levels of cultivation tend to dry out the soil and lead to need for extra irrigation.
- High level of cultivation leads to high cost.
- Flood irrigation of deep ripped beds can cause slumping.
- A good uniform strike must be achieved if a good yield is to be achieved.
- The highest yield may not lead to the highest profit (highest yield made $200 less).

Trial 12 - Doug Pedersen
Doug Pedersen farms in the Koumala area of the Plane Creek mill area. Doug has been using a farming system based on 1.8 m beds and dual rows for a number of years. He had a block that needed to be replanted and decided to establish a trial where most of the block would be conventionally worked and a small trial section would be planted using zero tillage.
The following activities were carried out by Doug to establish his trial:

- In December 2008 the cane variety RB76-5418 was sprayed out with one application of 6 L/Ha glyphosate. The grass fallow was not cultivated and six rows of the 1.8 m row spacing beds were left intact. No legume break crop was planted.
- The cultivated section of the block was disced twice and harrowed once to remove the beds, marked out with GPS, beds formed and ripped once down the centre.
- On 28 August 2009 Doug attempted to plant the six intact beds with a dual-row double-disc opener planter but the soil was too hard for the planter to achieve sufficient planting depth and sett cover. The beds were then ripped down the centre with a single tyne ripper and were then planted successfully with the dual-row double-disc opener planter.

**Shoot counts**

Shoot counts were undertaken as a measurement of crop development. Counts were made for each tillage practice with four 10 m sections of row counted in each plot. The shoot count show a slower emergence of the zero tilled treatment, but by December the counts were similar.
Plant cane in September showing slower establishment in the zero till area

Trial site December 10: zero till on left, conventional on right

**Trial 13 - Michael Comin**

Michael used glyphosate at 6 L/ha to destroy the old cane stool. No break crop was planted and the blocks to be planted in 2009 were left as grass fallows.
When using conventional tillage methods, Michael would have used a ripper, then a rotary hoe and then marked out. For land preparation in 2009, Michael disced the area twice, then attached a mark-out tyne on the bed renovator. Hence, conventional marking out before planting was not required. The time spent in land preparation for a 7.65 ha block using the bed renovator was 5 hours and used 112 L of diesel or 14.6 L/ha. Michael estimates land preparation time was halved compared to his conventional tillage method.

The cane block prepared for planting with the bed renovator.
The rows on the right were prepared for planting with the bed renovator. The rows on the left were prepared for planting using the bed renovator followed by the wavy disc coulters.

**Trial plan**

| Bed renovate 4 rows | Bed renovate + wave disc 4 rows | Bed renovate 4 rows | Bed renovate + wave disc 4 rows | Remainder of block bed renovate up to creek |

The trial area was planted on 10 July 2009 using a single-row wide-chute billet planter at 8 km/h using 8 t of Q183\textsuperscript{c} planting material per hectare.

Newly planted cane showing soil cover
**Trial harvest**

The trial was harvested on the 13 of September 2010 and there was little difference between treatments with all treatment producing good yields:

- Bed renovate 109 t/ha, 15.7 CCS, and 110 t/ha, 15.6 CCS
- Bed renovate and wave disc 109 t/ha, 15.7 CCS, and 115 t/ha and 15.2 CCS.

### 6.0 WORKSHOPS, SHED MEETINGS, BUS TRIPS AND OTHER EXTENSION ACTIVITIES

During the 3-year life of the project the project team held 36 extension activities. These activities included shed meetings, focus groups, field walk, seminars and machinery demonstrations. The following details these extension activities.

**Activity 1 – Machinery design meeting - 5 November 2007**

A meeting was held at BSES Mackay to discuss the machinery required to implement the trials required for the project. At that meeting, we had several growers who were involved in controlled traffic farming and several growers who were conventional 1.5m row spacing farmers, as well as two machinery manufacturers.

During the meeting, the group was shown video footage and pictures of zonal tillage equipment used in North Queensland. A discussion was then held as to the suitability of the equipment for our needs.

It as agreed that the group should build a unit similar to the machine used by the Mulgrave Landcare group. The machine would be very adjustable allowing us to assemble the ground-engaging parts is various layouts. To enable this, the machine will be a bolt-together not a welded unit, and, while this will add to the over all cost of the machine, it will make it more flexible.

The two machinery manufacturers at the meeting, Hodge Machinery and EHS Manufacturing, then held some discussions on the best ways to build the machine. They decided that Hodge Machinery was in the best position to build the machine.

**Activity 2 – Calen grower meeting - 16 November 2007**

A meeting was held with 16 growers at the Calen Bowls Club. During the meeting the group was shown video footage and pictures of zonal tillage equipment used in North Queensland. A discussion was then held as to the suitability of the equipment for our needs.

The 16 growers at the meeting had only recently moved to controlled traffic and had not yet completed their first crop cycle. All felt that the move to zonal tillage was the next positive step and were in favour of us building a tillage unit similar to the one used by the Mulgrave Landcare group.

**Activity 3 – Bruce Davies shed meeting - 11 December 2007**

A meeting was held in the shed of Bruce Davies to discuss the project and the zonal tillage units. This small meeting was attended by Bruce, his mangers and some of the farm staff, during the meeting a DVD and photo presentation was made to the group.
This meeting was held as Bruce Davies was going to build a zonal-tillage unit for his farm and we able to supply drawing of our machine and those used in the north.

**Activity 4 – Gerry Deguara shed meeting - 19 December 2007**

A meeting was held in the shed of Gerry Deguara to discuss the project and the zonal tillage units. This small meeting which was organised and led by Gerry attracted 10 local growers, and during the meeting a DVD and photo presentation was made to the group. This led to a discussion of the farming system and the move to zonal tillage. Several growers indicated willingness to trial the new zonal tillage unit when it was constructed.

**Activity 5 – BSES/MAPS shed meetings - February to March 2008**

Shed meetings take the form of small groups of 10-15 growers who meet in a grower’s shed to discuss current industry issues. The round of 35 shed meetings attracts about 45% of the growers in the Mackay industry.

During these meetings one of the topics of discussion was the new project and the move to zonal-tillage systems.

**Activity 6 – Neil Blackburn meeting - 4 March 2008**

A meeting was held at Neil Blackburn’s farm with growers invited from the Eton and Pleystowe regions. Neil Blackburn had moved to zonal tillage and controlled traffic on a 1.83 m system. During the meeting, Neil presented to the group his new farming system and his vision for the future. An economic analysis of his old system and his new system was presented to the group - this has shown that $111/ha could be saved by making the change to the new farming system.

After the meeting, growers viewed the equipment used by Neil and conducted a farm tour to see blocks that have been planted using the zonal-tillage method.

This meeting resulted in very strong interest from the growers who attended the day, with a number of growers interested in trialling the new zonal tillage unit on their own farm with the view to implementing a GPS-based zonal tillage system similar to Neil’s.
Phil Ross from MAPS (now BSES) running through a FEAT exercise with the group

Growers inspecting the machinery after the meeting
Activity 7 – Machinery demonstration at BSES Mackay - 12 March 2008

A demonstration of the new bed renovator was held for a group of growers who were undertaking a FPIP course. These growers were some of the more innovative growers who were completing the course as part of the process to access funding from the sustainable landscape project for a project that they were undertaking on their farms.

The growers at the demonstration were impressed with the ability of the machine and several of them expressed an interest in trialling the machine on their property.

Activity 8 – Machine demo morning at Neil Blackburn’s - 20 March 2008

A demonstration of the bed-renovation machine was held at Neil Blackburn’s farm at Eton as a follow-up activity from a shed meeting. The participants from the shed meeting and several other local growers were invited to the morning. 17 growers attended the demonstration. During the morning, the bed-renovator machine was demonstrated in both standing soybean stubble and into ground that had previously been cultivated with an offset disc.

The morning created considerable interest in the zonal-till concept and the project. Three growers at the meeting expressing an interest in trialling an area of zonal tillage.
Growers watching a demonstration of the machine working through soybean stubble

Preparing a block of soybeans for cane planting
Activity 9 – MAPS field day - 3 April 2008

MAPS, the Mackay Area Productivity Services, held an annual field day at their plant-propagation and distribution farm at Victoria Plains. The field attracted 300 growers to see various exhibits of varieties, herbicide and grub-control trials, as well as machinery demonstrations.

During this field day, the project team displayed and demonstrated the new bed renovation machine. The machine was well received by the growers and generated considerable interest in the area of zonal tillage.
Field demonstration site at the MAPS field day

Discussion under the mango tree over lunch
Activity 10 – Farm demonstration at Gary Considine’s, Proserpine - 9 April 2008

Gary and Ian Considine farm in the O’Connell River area 30 km south of Proserpine. The farm is operated as part of a larger co-operative called O’Connell Catchment Precision Services or OCPS. This group was moving to a farming system based on 1.9 m dual rows with GPS guidance and fallow legumes.

The bed-renovator machine was used on this farm to reform some beds that had been levelled by flood waters. The beds had been formed before the wet season, and Ian and Gary were unable to establish a fallow legume crop, so the beds were left with a grass weed cover.

During the day 10 local growers came to inspect the machine and its operation. All felt that the machine had a place in a new controlled traffic system, but several of growers would like to see a finer tilth before planting cane. This could be achieved by a second pass at a later date or by using a rotary hoe.

Activity 11 - BSES Sarina/Plane Creek Productivity Services field day

This field day was held on the farm of Serge Beradi at Koumala, 25 km south of Sarina. The field day had several exhibitors with information on varieties, sugarcane smut, canegrub control, GPS guidance and bed renovation demos. Attendance at the day was very good with 60 growers participating.

During the both the coulter ripper and bed renovator were on display and demonstration of the bed renovator were conducted on both roughly prepared ground and sprayed out-ratoons. Growers who attended the sprayed-out ratoon demonstration were impressed with the ability of the machine and the soil tilth achieved.
Growers at the Sarina field day

Growers at the spray-out demo
Activity 12 - *Tedlands planting day – 29 April 2008*

The planting of the trial at ‘Tedlands’ was a project which was organised by the Sarina Sustainable Farmers group. During the cultivation and planting phase of the trial day, many of the group members visited the trial site to discuss the treatments and the equipment with the project staff.

Activity 13 - *Sarina focus group – 4 June 2008*

A focus group meeting was held with the Plane Creek Sustainable Farmers group. This meeting was held at the Koumala Hotel and was attended by 16 growers and 5 industry staff. During the evening project operations and the management of the trial at Tedlands was discussed.

Activity 14 - *Mackay focus group – 25 July 2008*

A focus group meeting was held at the BSES in Mackay with the local growers who had used the project tillage equipment. This meeting was attended by 13 growers and 2 industry reps. During this meeting the project and the equipment owned by the project was discussed at length.

Activity 15 – *Zonal tillage planting demo – 3 September 2008*

The zonal tillage demo day was held at the farm of Rex Stroppiana at Marian. Rex has recently adopted controlled traffic using GPS guidance and has developed a 3-row zonal cultivator and a powered rotary attachment for his billet planter. By using these two new machines in his farming system, Rex has been about to halve his fuel use from 180 L/ha to 90 L/ha.

During the day the growers meet on a grassed area where Rex’s zonal tillage unit and the project equipment were on display. They were then taken on a bus trip to the field to watch the planter with its modifications in operation. 57 growers attended the morning field day.
Field day site setup before the growers arrived

Bus trip to the field to watch planting demo
Activity 16 – Transition to control traffic field day – 25 September 2008

This field day was held on the farm of Lawrence Bonaventura at Habana. The Habana area is a dryland farming area just north of the Mackay city. This area comprises smaller hilly farms which have high real estate value and growers in this area had had very little adoption of the principles of the New Farming System.

It was with this background that it was decided to hold a field day in the region. The field day was held in a block across the road from an earlier row-spacing trial so that growers could view both the row spacing trial and the planting demonstration.

This event had low attendance with only 6 growers attending the day. This attendance was expected due to the nature of the growers of the area and the acceptance of the farming system in the area. However, the site was on a main road and several growers commented about the trial site after the day.

Activity 17 – Tedlands field day – 10 October 2008

A field day was held at the Tedlands trial site on an afternoon that allowed the board members of the Plane Creek Productivity Services to attend. The field day took the form of a field walk through the young plant cane which had been established using zero and zonal tillage practices. The equipment used to establish the tillage treatments was also displayed.

The field day was attended by 14 growers including 2 board members.
Growers on a field walk

Equipment displayed at the field day
Activity 18 – Soybean information meeting -Koumala – 20 October 2008

A meeting was held in the CWA hall at Koumala where three presentations were made:

1. John Hughes from DPI&F FutureCane – soil health and the benefits of soybean break crops
2. John Stevens a grower – growing soybean a growers perspective
3. Dave Parker from Austagri – soybean marketing

This meeting was attended by 25 growers from throughout the Plane Creek mill area.

Activity 19 – Soybean information meeting and bus tour, Mackay – 7 November 2008

A large grower meeting was held at the West Leagues Club in Walkerston. This event consisted of three sessions:

1. Presentation of information by various seed suppliers and BSES staff.
2. A machinery display of soybean planting equipment.
3. A bus tour to farm to view soybeans and corn in the field.

This event was attended by 124 growers.

Activity 20 – Shed meetings – Mackay – February and March 2009

A round of 35 general shed meeting was held during the February-March period. One of the topics discussed at this years round of meeting was zonal tillage and the ‘establishing the second crop cycle into permanent beds’ project. At several of the meetings the in-shed discussion was followed by a farm tour where the zonal tillage equipment and practices were discussed in detail.
This round of meetings attracted about 400 growers or about 50% of the growers.

**Activity 21 – GPS information day – 2 April 2009**

A GPS information day was held at the West's football club in Walkerston. This workshop was held due to the increased interest in GPS to aid growers in the adoption of zonal tillage. Many growers consider GPS necessary for successful zonal tillage.

**Agenda for the day**
- Independent expert speaker – Robert Lorimer (Position One Consultants) – the whys and wherefores of GPS systems
- Mackay Sugar base stations
- Focus groups – experiences from existing users and question from intending users
- Trade displays

This day was very well received with 93 people attending. Many of the growers who attended were considering purchasing a GPS system.

**Activity 22 – Bundaberg BSES field day – 23 April 2009**

The project team was invited to the Bundaberg BSES field day to demonstrate the zonal tillage equipment. The bed renovator and zonal ripper were trucked to Bundaberg and demonstrated in the field during the field day.

The Bundaberg field was well attended with around 150 growers attending the zonal tillage demonstrations. Two groups of growers, one from Maryborough and one from NSW who have adopted the new farming system, also attended the field day and had positive comment about the zonal tillage concept.
Activity 23 – Mackay BSES field day – 21 & 22 May 2009

The Mackay BSES field is a large annual field day that runs over two days and attracts most of the growers in the district. As well as displaying information from BSES, the field day is a large trade display with 80 exhibitors attending the field day.

At this field day the project team established an in field display where various cultivation practices were established. The demonstration treatments established were:
- Bed renovate
- Bed renovate + wavy disc
- Bed renovate + rotary hoe
- Zonal rip
- Zonal rip + wavy disc
- Zonal rip + rotary hoe

These treatments were demonstrated into both sprayed-out cane that had been harvested green and a bed that had been cultivated and had a small amount of weed growth.
Project team display at the BSES field day

Grower interest
Activity 24 – Tedlands field day – Koumala – 17 September 2009

A field day farm walk was held at the Tedlands trial site to discuss the results of the trial harvest and the management of the new plant cane with the Sarina Sustainable Farmers grower group and any other interested growers.

This meeting was attended by 30 growers and industry staff.

Activity 25 – Mackay February - March 2010 shed meetings

During February-March the staff from the BSES and ArgiServ held a series of 35 shed meetings. One of the topics discussed during was the tillage project. The trial results and equipment used in the project were discussed by the grower groups.

On 5 occasions some of the project equipment was taken to the meeting. This led to further discussion and follow up with on farm trials.
Machinery on display at shed meeting
Activity - Sarina Sustainable Farmers' demonstration – 26-29 April 2010

Tim Staier and Mark Hetherington were invited by the Plane Creek Sustainable Farmers Group to attend a demonstration of a wave disc cultivator by Niel Warpole in a fallow block that had been sown to soybean.

Several farmers attended the demonstration where Neil applied the machine directly to the standing soybean. Whilst the machine was not intended for this type of primary tillage it effectively tilled the soil to 125 mm depth in the dry conditions. The soybean residue was pushed aside off the row profile. After this demonstration Neil reconfigured the disc on the machine to better place the soybean stubble.
Activity - Michael Commen’s grower demonstration of bed renovator – 27-29 April 2010

Plane Creek grower Michael Commen had recently trialled he BSES Limited bed renovator on his property and was pleased with the concept. Michael has built, in conjunction with Hodge Industries, a bed renovator version suited to his farming operation. The machine comprises disc sets for both the plough out and the soil return functions ensuring a maximum particle size of 50 mm, thus reducing the need for additional working to reduce large clods. Additionally the machine features a legume seeding arrangement so that primary bed building and early legume seeding will all take place at the same time saving another pass over the field.
Activity 28 – Equipment demonstrations in the Burdekin - May 2010

Due to the very wet condition during the early part of the year there was an option to send equipment to the Burdekin for on-farm demonstrations. This option was taken and the wave disc was sent to the Burdekin for a month. During this time the equipment was trial on 10 farms and caused considerable interest in the region.

The following story was sent to Burdekin growers in the newsletter after the wavy disc demonstration days.

**Wavy disc cultivator**

BSES and Burdekin cane growers have recently been trialling a wavy disc cultivator. This zonal tillage machine loosens the centre of the bed prior to planting and helps to improve soil to sett contact at planting.

This is a demonstration machine from BSES Mackay and consists of two rows of wavy discs followed by a crumble roller. It works three rows at a time, and while it is currently set up for 1.8 m rows it can be adjusted for row spacing from 1.5 m to 2 m.

While in the Burdekin, the machine was trialled on a number of soil types and different situations. BSES used the machine to loosen preformed beds and provide additional loose soil before planting with a disc opener. Other growers used the disc cultivator to incorporate soybean stubble following harvest and before planting, or simply to dry out soil before planting.

The general response to the cultivator has been positive. The only negative comments have been that the bar is a bit light and that the discs need to be bigger. The current discs were the largest available when the machine was manufactured, but larger ones are now available and will be fitted. The light weight cultivator is a demonstration model and has been designed to be transported on a trailer.

For more information on the cultivator contact Tim Staier at BSES Mackay on 4963 6819.
Activity 29 – BSES Mackay field days - 20 & 21 May 2010

At this field day the project team established an in field display where various cultivation practices were demonstrated. The treatments demonstrated were:

- Bed renovate
- Bed renovate + wavy disc
Activity 30 – Plane Creek Sustainable Farmers' group meeting - 27 May 2010

During the meeting the harvest results from the Tedlands trial site and the newly developed wave disc cultivator were discussed.

This meeting was attended by around 20 grower member of the group.
Activity 31 – *Plane Creek pre-season meetings - 15, 16 & 17 June 2010*

Three meeting were held in the Plane Creek mill area prior to the commencement of the crushing season. These meeting were held at Sarina, Koumala and Carmilla and were attended by 75 Plane Creek growers.

The main focus of these meeting were issues relating the management of the harvest season but the project team was able to use a few minutes of the meetings to update the growers in the area on the tillage project. After these meetings the team was approached by several growers wanting to know more the project and the equipment.

Activity 32 – *Zonal tillage demonstration day at Allan McLean’s - 30 June 2010*

An afternoon activity was held at the farm of Allan McLean to demonstrate a new style of ripper leg that Allan had sourced from a cotton-growing region. Banded mill mud application was also demonstrated.

The day was attended by 16 growers and most of the Agriserv team and considerable discussion about the zonal tillage concept was held. During the day Allan demonstrated several different tillage methods.
Activity 33 – Neil and Ray Eton field day - 14 July 2010

A field day was held on the farms of Neil Blackburn and Ray Abela in the Eton area. Both Ray and Neil are average size farmers which have been developing the farming system on their farms for a number of years. It was felt important to show what the average size growers could implement as many changes have been made by the larger growers and some growers feel that the cost of changing is too high and only something the larger growers can afford.

The focus of the day was for Neil and Ray to explain their system and their thinking. The day was designed to be a day where growers learnt from other growers and this worked very well.
Agenda for the day:
- Equipment inspections of project equipment and Ray’s and Neil’s equipment. Ray and Neil to lead the discussion
- Field demonstrations at Neil’s farm including banded mill mud and incorporation of mill mud using zonal equipment
- Smoko
- Field demonstrations at Ray’s farm

This field day was well supported with 15 industry staff and 25 growers attending the day. Following the field day many growers requested follow up visits from the team and machinery use request.

Activity 34 – Proserpine field day at Bill and Paul Atkinson - 22 July 2010

A field day was held at the farm of Paul and Bill Atkinson in the Up River Road region of the Proserpine mill area. Paul and Bill have been using a controlled traffic farming system with 600 mm dual rows on a 2 m bed system for many years but recently purchased a new farm with 1.5 m rows.

Before the field day the field which was to be used for the demonstrations was rotary hoed to remove the old 1.5 m beds and allow the new beds to be formed at 2 m.
Agenda for the day:

- Equipment inspections of project equipment
  - Bed renovator
  - Zonal ripper
  - Wave disc
- Field demonstration
  - Bed renovator
  - Zonal ripper
  - Wave disc
- Smoko

This field day was well supported with 4 industry staff and 15 growers attending the day. Following the field day many growers requested follow up visits from the team and machinery use request.
Activity 35 – Mirani Field day at Graham Blackburn’s - 27 July 2010

A field was held at the farm of Graham Blackburn in the Mirani area. Graham has a large farm and has adopted controlled traffic farming system with zonal tillage and GPS guidance for all in-field operations.

During the field day Graham and his team were undertaking zonal tillage practice on a 160 ha block in preparation for planting.

Operations Graham used to prepare for planting:
- Off-set disc the field to remove the old 1.6 m rows
- Zonal rip at 1.8 m
- Bed form
- Apply banded mill mud
- Wave disc cultivate.

The block was then irrigated and either wave disc cultivated or zonal rotary hoed before being planted with single row bed forming planter.

This small neighbourhood field day was attended by only 5 growers but many more dropped by to watch progress during the land preparation process.

Activity 36 – GC agriculture field day – 28 July 2010

A second field day was held at the farm of Allan and Scott Mclean to demonstrate the winged ripper tynes and the cultipac roller. These machines are produced by GC agriculture in northern NSW. During the field day representatives from GC agriculture were available to discuss with growers the use of there winged tyne and the cultipac roller.

This field day created considerable interest with 40 growers attending over the afternoon.
Agenda for the day:
- View ripper legs with wings
- Watch in field demonstration
- View plant cane established using the tillage system

Summary

During project 36 extension activities were held. These activities were held throughout the Central region with field days held in Koumala in the south and Proserpine in the north, and at activities at Bundaberg and the Burdekin.

Project information has also been present to growers through BSES Bulletin articles and several local BSES newsletters. Reef rescue operations in the region are also promoting the concept of zonal tillage and this has further encouraged growers to participate in the project.

These extension activities have resulted in a high level of grower awareness of the project and its objectives.

7.0 ECONOMIC COMPARISON OF THE PLANT-CANE SYSTEM

Information for the economic comparison was collected by conducting a survey of grower practices. 20 growers completed the survey, but only 16 growers were able to supply sufficient details to enable the model runs to be completed. Growers were asked to list the tillage operations carried out in the conventional system, as well as the operation which they now use in the zonal tillage system. The survey was carried out as a face-to-face survey with the aim of collecting as much information as possible. Information sought included:
- Tractor size (horsepower)
- Machine working width
- Operating speed (km/h)
- Fuel use (L/h).

When this information was collected the machinery section of the economic model FEAT (farm economic assessment tool) was used to cost each operation to allow a comparison to be made between the conventional system and the zonal tillage system.

When using FEAT the following assumptions were made
- Tractors cost $1000 per horsepower
- Small tractors less then 150 hp are used for 4 h/ha of farm size per year
- Large tractor of 150 hp and more are used for time it takes to undertake fallow cultivation operations
- Fuel usage was the actual fuel use from the grower or a percentage of engine load if fuel use was not known
- The implement costs used in the model were as per the table below these prices were sourced from machinery dealer in Mackay during November 2009
- Tractors and machinery had a life of 20 years, except for rotary hoes which had a life of 10 years.
Machinery cost current November 2009 as used in the FEAT model

<table>
<thead>
<tr>
<th>Machine</th>
<th>Cost price ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rippers</strong></td>
<td></td>
</tr>
<tr>
<td>3 tyne 1.8 zonal</td>
<td>2700</td>
</tr>
<tr>
<td>7 tyne</td>
<td>7700</td>
</tr>
<tr>
<td>9 tyne</td>
<td>10300</td>
</tr>
<tr>
<td>11 tyne</td>
<td>12700</td>
</tr>
<tr>
<td><strong>Rotary hoe</strong></td>
<td></td>
</tr>
<tr>
<td>2 m</td>
<td>13500</td>
</tr>
<tr>
<td>2.5 m</td>
<td>24500</td>
</tr>
<tr>
<td>3 m</td>
<td>30000</td>
</tr>
<tr>
<td>4 m</td>
<td>51000</td>
</tr>
<tr>
<td>5 m</td>
<td>57600</td>
</tr>
<tr>
<td><strong>Offset disc</strong></td>
<td></td>
</tr>
<tr>
<td>24 plate – 2.7 m</td>
<td>19000</td>
</tr>
<tr>
<td>28 plate – 3.1 m</td>
<td>26000</td>
</tr>
<tr>
<td>32 plate – 3.6 m</td>
<td>29000</td>
</tr>
<tr>
<td>36 plate – 4 m</td>
<td>34000</td>
</tr>
<tr>
<td><strong>Grubber</strong></td>
<td></td>
</tr>
<tr>
<td>3 m</td>
<td>7500</td>
</tr>
<tr>
<td>5 m</td>
<td>13200</td>
</tr>
<tr>
<td><strong>Bedformer</strong></td>
<td></td>
</tr>
<tr>
<td>2 row</td>
<td>8500</td>
</tr>
<tr>
<td>4 row</td>
<td>15000</td>
</tr>
</tbody>
</table>

Economic comparison of tillage systems

<table>
<thead>
<tr>
<th>Grower</th>
<th>Area of plant cane (ha)</th>
<th>Soil type</th>
<th>Zonal</th>
<th>Conventional</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Number of operations</td>
<td>FORM</td>
</tr>
<tr>
<td>1</td>
<td>80</td>
<td>light</td>
<td>4</td>
<td>107</td>
</tr>
<tr>
<td>2</td>
<td>35</td>
<td>med</td>
<td>3</td>
<td>130</td>
</tr>
<tr>
<td>3</td>
<td>20</td>
<td>heavy</td>
<td>4</td>
<td>178</td>
</tr>
<tr>
<td>4</td>
<td>70</td>
<td>heavy</td>
<td>4</td>
<td>221</td>
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<tr>
<td>5</td>
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<td>heavy</td>
<td>5</td>
<td>482</td>
</tr>
<tr>
<td>6</td>
<td>10</td>
<td>light</td>
<td>3</td>
<td>244</td>
</tr>
<tr>
<td>7</td>
<td>150</td>
<td>light</td>
<td>4</td>
<td>109</td>
</tr>
<tr>
<td>8</td>
<td>48</td>
<td>light</td>
<td>4</td>
<td>177</td>
</tr>
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<td>9</td>
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<td>10</td>
<td>30</td>
<td>light</td>
<td>2</td>
<td>83</td>
</tr>
<tr>
<td>11</td>
<td>30</td>
<td>light</td>
<td>2</td>
<td>87</td>
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<tr>
<td>12</td>
<td>35</td>
<td>med</td>
<td>2</td>
<td>83</td>
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<td>14</td>
<td>100</td>
<td>light</td>
<td>5</td>
<td>173</td>
</tr>
<tr>
<td>15</td>
<td>150</td>
<td>light</td>
<td>5</td>
<td>113</td>
</tr>
<tr>
<td>16</td>
<td>15</td>
<td>light</td>
<td>3</td>
<td>167</td>
</tr>
<tr>
<td>Average</td>
<td>51.7</td>
<td></td>
<td>3.4</td>
<td>160</td>
</tr>
</tbody>
</table>
Observations from the comparisons

- When growers move to zonal tillage they generally also undertake fewer tillage operations, averaging 3.4 zonal cultivations compared to 5.6 conventional cultivations.
- The reduced number and intensity of cultivation lead to a reduction in cultivation cost from $314 to $160 if the FORM cost are considered (FORM = fuel, oil, repairs and maintenance).
- If the total cost, which include FORM + interest + depreciation and labour, are considered, then the savings are greater - $615/ha for zonal compared to $1038/ha for conventional. This is largely due to smaller tractors being used with zonal cultivation, giving better utilization of the machinery and reduced fuel use.
- As the area of plant cane increases, the FORM costs for both conventional and zonal tillage falls (Figure 1).
- The total cost follows the same trend with the larger farms having lower cost than the smaller ones (Figure 2); this is due to the larger farms having better utilisation of the equipment.
- Some of the small farms have large tractors that are only used to prepare a limited area of fallow ground; in some cases, these tractors have an annual utilisation of less then 100 hours, resulting in high (around $2000/ha) total cost.

![Figure 1 - Cultivation FORM cost](image)
Fuel use and work rate

<table>
<thead>
<tr>
<th>Bed renovator</th>
<th>Ripper</th>
<th>Zonal rotary hoe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel use L/ha</td>
<td>Work rate ha/hr</td>
<td>Fuel use L/ha</td>
</tr>
<tr>
<td>16.6</td>
<td>1.5</td>
<td>15.7</td>
</tr>
<tr>
<td>15.7</td>
<td>1.06</td>
<td>15</td>
</tr>
<tr>
<td>12.8</td>
<td>1.4</td>
<td></td>
</tr>
<tr>
<td>9.8</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>1.3</td>
<td></td>
</tr>
</tbody>
</table>

Conventional operations

Conventional ripping with the 3-m ripper:
- 16.6 L/ha of fuel used
- 1.8 ha/hr

Conventional rip, rotary hoe and mark out:
- Fuel used - 63.7 L/ha
- Time - 0.38 ha/hr

Operation used to prepare fallow for planting
- Offset disc two passes @ 15 L/ha per pass
- Rotary hoe @ 40 L/ha
- Zonal cultivator three passes at 5 L/ha per pass.

Normal rotary hoe
- Fuel use - 33.6 L/ha
8.0 FARMING COMMUNITY MADE AWARE OF THE PROJECT THROUGH MEDIA ACTIVITIES

**Media**
The media was used throughout the project to inform growers of the project activities.

**BSES Bulletin**
Articles were prepared for issue 15 of the *BSES Bulletin*, which outlined the operations of the *New Farming Systems* project and informed growers of the new project *Planting the Second Crop Cycle into Permanent Beds*. Information about the project and the results of trials were been presented to the industry through articles printed in edition 23 and 25 of the *BSES Bulletin*. The information in article 23 was supported with 3 short videos which were available for growers to view on the BSES website.

**BSES newsletters**
Newsletters are sent to all growers in the Central region every 3 months and, during the life of the project, several articles outlining the project activities were published in the newsletters.

**Channel 7 news**
A short story was shown on channel 7 local news on 3 April 2008 after the MAPS field day.

**Rural Weekly**
Numerous articles have been printed in the local rural paper *The Rural Weekly*.

The Appendix gives a selection of articles from the local newspaper and newsletters that have been sent to all growers the Central region.

9.0 OUTPUTS

Obvious outputs produced as a results of this project were four pieces of specialised farm equipment:
- Bed renovator
- Zonal ripper
- Wave disc cultivator
- Zonal rotary hoe.

The project also increased awareness of new farming systems and allowed growers to trial adoption at little capital cost.

10.0 EXPECTED OUTCOMES

10.1 Short term

During each of the 3 years of the project a survey of the area planted back into beds using zonal tillage was completed. These surveys were conducted by contacting the BSES extension staff and the productivity service staff in each region to determine which growers were replanting back into beds. The growers were then contacted to determine the area which they had replanted.
2008 survey results for the 2007 planting season

<table>
<thead>
<tr>
<th>Grower</th>
<th>Area replanted (ha)</th>
<th>Method used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peter Creber – Sarina</td>
<td>6</td>
<td>Spray out rip DD dual row plant</td>
</tr>
<tr>
<td>Bill Blair – Proserpine</td>
<td>6</td>
<td>Spray out rip DD dual row plant</td>
</tr>
<tr>
<td>Mark Blair – Proserpine</td>
<td>4</td>
<td>Spray out rip DD dual row plant</td>
</tr>
<tr>
<td>Brian Barfield – Mackay</td>
<td>4</td>
<td>Spray out DD single row plant</td>
</tr>
<tr>
<td>Rod Watt</td>
<td>10</td>
<td>Spray out DD single row plant</td>
</tr>
</tbody>
</table>

During the 2007 planting season 5 growers planted a total of 30 ha into beds.

2009 survey results for the 2008 planting season

<table>
<thead>
<tr>
<th>Grower</th>
<th>Area planted (ha)</th>
<th>Zonal rip</th>
<th>Zonal hoe</th>
<th>Bed renovate</th>
<th>Bed form</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ross MacKenzie</td>
<td>30</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Joe Atkinson</td>
<td>35</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peter Creaber</td>
<td>16</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scott Simpson</td>
<td>150</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
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<tr>
<td>Ron Ross</td>
<td>18</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Geoff Hall</td>
<td>4</td>
<td>X</td>
<td></td>
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<tr>
<td>Tony Bugeja</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
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<tr>
<td>Bruce Davies</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Peter Doyle</td>
<td>10</td>
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<td></td>
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<tr>
<td>Neil Blackburn</td>
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<td>X</td>
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<td></td>
<td></td>
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<tr>
<td>Lee Blackburn</td>
<td>70</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Michael Attard</td>
<td>5</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Gary McDermott</td>
<td>10</td>
<td>X</td>
<td>X</td>
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<td>X</td>
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</tr>
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<td><strong>17/27</strong></td>
<td><strong>5/27</strong></td>
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During the 2008 planting season 27 growers planted a total of 1009 ha into beds.
2010 survey results for the 2009 planting season

Mackay growers

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<tr>
<td>Total</td>
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During the 2009 planting season 100 growers planted a total of 2501 ha into beds.

**Summary**

The surveys show that the total area planted using zonal tillage has increased from 30 ha in 2007 to 2500 ha in 2009 and that the number of grower adopting the practice has increased from 5 in 2007 to 100 in 2009.

The area planted in 2009 represent 15% of the plant cane area of the district.

**10.2 Long term**

This project has led to an increased adoption of the principles of the new farming system. During the life of the project, surveys have shown adoption level of zonal tillage has increased from very low levels to around 15% of the area currently planted being on a controlled traffic system with zonal tillage.

As the project has been an extension project working with growers it is expected that the learnings from the project will not be lost but will continue to be used by the growers who were involved in the project. These learning should result in additional areas being established using the principles of the new farming system and should encourage other growers (the ‘later adopters’) to adopt.
11.0 FUTURE NEEDS AND RECOMMENDATIONS

The work and effort started with this project need to be continued to support the remaining 70% of growers who have not yet adopted the ‘new’ farming system. Additionally the Central region has invested heavily into farming systems with $23 million invested by local growers in recent years. To assess the benefits of this investment we need to be able to measure the change to soil health. There is currently no simple way to do this. I recommend that SRDC consider funding a project to develop a simple method to assess soil health.

12.0 PUBLICATIONS ARISING FROM THE PROJECT

Various BSES Bulletin articles in issue 23 and 25 have outlined the findings of the project.

13.0 ACKNOWLEDGMENTS

Thanks go to:
- The growers of the Central district which have worked with the project team to make this project to be the success that it has been.
- BSES, DEEDI and DERM staff who have contributed to the project.
- SRDC, DEEDI and BSES for co-funding this project.
APPENDIX – Newspaper articles

Farmers try new mode of tillage

Environnmentally Sustainable Practices

Sucrogen BioEthanol AgServices offer A-class fertiliser applications through 95% of our contractor fleet.

Customer Enquiries  (07) 4966 9832
Anthony Lee  0419 337689
Rob Staggett  0419 677 478

Finalists in the 2009 EPA Rural Sustainability Awards
New sugar farming equipment on trial at industry open day

Farmers try zonal machines at info morning

With harvesting still a month away, sugar growers are still planning their planting. The long lead time from planting to harvest means growers need to plan well ahead. The latest wave of new technology aims to improve efficiency and cut costs.

"With harvesting still a month away, sugar growers are still planning their planting. The long lead time from planting to harvest means growers need to plan well ahead. The latest wave of new technology aims to improve efficiency and cut costs."

That's a huge saving in both time and diesel for me and my business.

-- Tony Jones, Kyogle

Delighted to receive the equipment, I am extremely satisfied with the machine.

-- Mike and Carol Smith, Bowloona

The new machines will be coupled to the harvesters from the hotel.

-- David and Fionna Jones, Mogo

The new machines allow us to prepare the ground for the harvesters from the hotel.

-- John and Pauline Green, Moree

The new machines allow us to prepare the ground for the harvesters from the hotel.

-- John and Pauline Green, Moree

Delegates deliver strong Aussie presence on world sugar front

With sugar harvesting season set to begin in about four weeks, delegates from across the globe are gathering in Cairns for the annual World Sugar Conference. The conference, attended by delegates from 34 countries, is a major event for the global sugar industry and provides a platform for discussions on key issues affecting the sector.

With sugar harvesting season set to begin in about four weeks, delegates from across the globe are gathering in Cairns for the annual World Sugar Conference. The conference, attended by delegates from 34 countries, is a major event for the global sugar industry and provides a platform for discussions on key issues affecting the sector.

Bridges – celebrating 25 years in Business

We have learned a lot. Let me share that with you. Peace of Mind: Value for Money.

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GPS technology helping put growers on new tillage path

Savvy cane farmers are going zonal

... continue reading...
Mackay Newsletter

GROWERS SHARE THEIR EXPERIENCE

This time, cane growers Neil Blackburn and Ray Abla, along with AgFutures’ Neil Howse, welcomed about 40 farmers to an information evening to discuss new tillage, soil, and equipment available on loan from RFSF.

With the assistance of funding from the Reef Rescue Program, RFSF purchased several different soil tillage implements. These include a ripper, wide disc, narrow disc, and a wide disc cultivator. All are designed to evenly cultivate the soil, ensuring the seeds will be planted into the right soil.

Tillers are then used to plant the seeds. Before planting, the tillers are attached to the rear of the implement, which is then used by the farmer to plant the seed directly into the soil.

The new implement was tested in 2009, and more than 50% of cane planted in Mackay was planted on controlled traffic systems, the program’s in Queensland is the next logical step.

“With increasing numbers of growers moving to controlled traffic systems, the program in Queensland is the next logical step,” Neil Howse said.

Neil Blackburn has been working the land for about four years. He has converted from a 0.8m single row for about four years and this is the only of our blocks to be converted.

“It seems to be working well for me so I was happy to have others come to look at what I am doing,” he said.

“I am looking forward to spread much more time in the tractor cab, and this is it,” he said.

Ray Abla said: “Reduced cultivation got me more seed and even if this year’s yield isn’t greater than historical, the most costs for diesel and my time used are certainly less.

“This is quick, simple and works well,” he said.

“I have been able to do other things, like work in the shed or on the bookwork for the farm.”

All of those implements have been purchased with assistance from the Federal Government’s Reef Rescue Program and are aimed at developing good farming practices and protecting the Great Barrier Reef from damage by nutrient, chemical and sediment runoff from farms.
NORTHERN AGRICULTURE

SWEET TALK

BILL KERR

LOOKING at the the success of the new generation sweet potato harvest, it's clear that new technology and the use of varietals have helped to improve yields and reduce costs.

One farmer who has seen a significant increase in his sweet potato production is Mr. Smith, who has invested in new irrigation systems and improved planting methods.

"With the new irrigation system, we are able to increase our yields by 30%," Mr. Smith said. "And thanks to the improved planting methods, we are also able to reduce our costs by 20%."