

SRDC Grower Group Innovation Project

Final Report

SRDC project number: GGP 008

Project title: Overcoming Barriers to Controlled Traffic Adoption

Group name: Plane Creek Sustainable Farmers Inc.

Contact person: [Chris Aylward, 0437 330 877]

Due date for report: 01/01/07

Funding Statement:

This project was conducted by Plane Creek Sustainable Farmers Inc. in association with the Sugar Research and Development Corporation (SRDC).

SRDC invests funds for sugar R&D derived from the sugar industry and the Australian Government.



The Plane Creek Sustainable Farmers Inc. is not a partner, joint venturer, employee or agent of SRDC and has no authority to legally bind SRDC, in any publication of substantive details or results of this Project.

Body of Report

Executive Summary:

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

Background:

(Why did you need to do this project?)

At the commencement of this project, the available solutions for keeping harvesting traffic centred on wider row spacings while adequately filling cane bins are not effective. This was due to unsuitable harvester elevator design, which results in a larger proportion of the field area being compacted, defeating the purpose of controlled traffic farming.

The issue of getting cane into bins in wider row spacings is more problematic than was currently recognised by those promoting the adoption of CTFS in the sugar industry. The existing harvester elevator suits 1.5m row spacings. Simply extending the whole elevator is too expensive and increases weight, as do bolt on elevator extensions, which reduces harvester stability on uneven fields, being a major safety issue. This problem has plagued several of our group members and visitors from other areas such as Maryborough, have nominated this safety issue as a major reason growers will not adopt wider row spacings. Several of our group members (in a harvesting Co-op) have spent \$5000 repairing slews, bearings, pivot points etc due to the additional wear and tear caused by the weight of a bolt on conveyor. Other group members have reported reduced bin weights which have raised concerns for mill transport scheduling staff.

In 2004, three of our group members trialled powered paddles on their harvesters. All successfully overcame the weight and stability issues, they were cheap to construct, they were effective in allowing machinery to remain centred in the interspace, thus minimising compacted area, and they were effective at maintaining suitable bin weights in both wide row spacings (CT) and narrow (1.5m) row spacings of farms in conversion to CTFS. However, because of different elevator designs on the different harvesters, only one paddle operated successfully, the other two increased cane losses through recirculation and also through the secondary extractor. Group members realised we need assistance from experienced harvester engineers to successfully overcome these problems. SRDC funding was sought to assist with these costs.

This project aimed to continue work commenced by group members in 2004 harvest season.

Aims:

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

The aim of this project was to overcome a key practical barrier preventing many growers and harvesting contractors from converting to controlled traffic farming systems (CTFS) and overcoming problems incurred by growers presently converting to CTFS.

The economic benefits from CTFS will flow quicker to industry due to more rapid uptake of CTFS following the removal of a major barrier. It will be a low cost, permanent option for growers and harvesting contractors to modify their harvester to suit controlled traffic on 1.8 – 1.9 m row spacings and will be effective in 1.5m row spacings during the period of conversion. Growers will be able to use current harvesting machinery and accrue the benefits of a more sustainable cropping system.

The environmental benefits will be: improved soil health, reduced soil erosion, improved water infiltration and improved quality of water leaving cane fields. Controlling traffic will reduce the requirement for tillage in the cropping system. Reducing tillage requires less use of fossil fuels (diesel).

Social benefits include improved safety for machinery operators harvesting wider row spacings on sloping fields because of improved machine stability. Additional Social benefits will flow from the CTFS requiring less labour input per hectare, so increasing its adoption will improve growers and their families lifestyles. It may allow management of increased area under cane (making a larger, more efficient

production unit) or it may allow the grower to seek off farm income, leading to improved family and community prosperity.

Methodology:

(How was the project conducted?)

The action plan and methodology for the project was as follows:

1. Review previous activities, Travel to Bundaberg & NSW

Review our 2004 results with BSES Engineering Staff in Bundaberg. Visit NSW to examine operation of permanently extended elevators and covered elevators during the harvest period.

2. Assist SYDJV team to develop and field test prototype elevator paddle designs and other modifications

Provide practical input to SYDJV work and field test prototype designs they develop in 2005 season.

3. Review field trial results

Review results from 2005 harvest and make available progress report to industry

4. Build commercial prototype & test 2006 Season

Build and field test commercial prototype of both elevator paddle and elevator extension.

5. Results Communicated to industry

Communication will be ongoing during the life of the project with articles submitted to industry media and bus trips and field days examining group activities. Present results at GIVE 2006 and GIVE 2007. An effective commercial elevating system shall be constructed and demonstrated to growers and harvesting contractors.

The results will be taken up and used by: growers and harvesting contractors, benefiting CTFS growers, millers and the wider community.



PCSF Inc group members inspect extended elevator operation in NSW.

Results and Outputs:

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

Following the visits to NSW & Bundaberg, a review of results from 2005 harvest, and investigations with staff from SYDJV, the following comparison table was developed.

	Bin Weight	Safety	Stability	Ease of use	Compaction control	Suits 1.5 & 1.85m	Cane loss	Maintenance & durability	Cost \$
Kratzman Extension	X	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	X	X	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Louisiana Extension	<input checked="" type="checkbox"/>	X	X	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	X	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Bolt on Conveyor	<input checked="" type="checkbox"/>	X	X	X	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	X	X
Hook on Conveyor	X	X	X	X	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	X	X
Steep Elevator & top floor	<input checked="" type="checkbox"/>	X	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	X	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Powered paddles	<input checked="" type="checkbox"/>	?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					

2005 Prototype Testing Results

Four prototype powered rollers were tested. The first roller tested was of the “original” design with deep, aggressive fins (see Figure 1). This particular paddle was used commercially in 2004 and as the bench mark to compare the other types against in the 2005 assessments. This roller had limitations of increasing cane losses through the secondary extractor and recirculation losses.

The second roller tested was similar to the original design, but with “fill” to reduce risk of billet recirculation (Figure 2).

The third roller type assessed was a plain roller lagged with grooved rubber. Two sizes were tested, 300mm and 400mm drum sizes (Figure 3).

The final roller assessed was a 400mm drum with seven 50mm slats (Figure 4).

The rollers were tested on several different harvesters. Paddle size, design, placement and speed were tested under different conditions. Assessments included several trials examining effectiveness of bin filling ie bin weights, and observations of general performance such as ability to throw cane under moist, dewy conditions, in light crops with weed infestations and on slopes. Assessments also involved observation of cane loss through the secondary extractor, wear rate and the effect of different rotational speeds.



Figure 1: Original powered roller, 180mm slats on 37mm shaft



Figure 2: Modified powered roller, 300mm centre and 50mm slats



Figure 3: Lagged Rollers, 300mm and 400mm diameter



Figure 4: Flat 400mm roller with 50mm fins

Roller Type	Plain Roller kg	Lagged Roller kg
Original	33kg	
Filled Original	54 kg	
300mm Hodge	18 kg	30.5 kg
400mm Hodge	25.5 kg	41.5 kg
Extension conveyor	125kg	

Table 1: Powered roller & Extension conveyor weights.

Trial 2	RPM	Av Bin Wt	Observations
400mm rubber coated roller	360	3.35	Not throwing past bin centre
400mm Steel + slats	360	3.5	More positive throw, more cane out secondary fan
400mm Steel + slats	255	3.37	Reduced secondary loss
400mm Steel + slats	180	3.3	Too slow, not enough throw
400mm Steel + slats	228	3.19	Improved performance

Table 2: Summary of Selected Roller Performance at Different Speeds

The results presented in Table 2 are typical of what was observed during assessments. More aggressive rollers throw cane more positively but have the ability to increase cane losses through the secondary extractor, particularly at higher speeds. Even at lower speeds however, cane loss was still increased above that observed when no powered roller was fitted.

Roller	RPM	Secondary Cane Loss	Comment
400mm rubber coated roller	360	Low to Medium	Not throwing past bin centre
400mm rubber coated roller	247	Low to medium	Less positive cane throw, difficult to fill far side of bin.

Table 3: Rubber coated roller assessment

Table 4: Impact of Elevator Loads on Harvester Weight

Harvester Details: 1993 Toft 7000 (wheeled machine)
Elevator Length: 4.4m from pivot point to 2ndry fan hub
Modifications to Elevator: Powered roller fitted
Scales Used: Hinnen 10000kg +/-50kg

Situation	Left Rear Kg	Left Front Kg	Right Rear Kg	Right Front Kg	Gross Mass	Notes
Elevator partly filled with cane	5900	1500	5150	1650	14200	Elevator straight back
Elevator partly filled with cane	3200	1850	6800	2650	14500	Elevator right
Elevator partly filled with cane	6750	2900	2950	1600	14200	Elevator left
Elevator empty	6150	1400	4900	1850	14300	Elevator straight back
Elevator empty	3700	1600	6250	2900	14450	Elevator right
Elevator empty	6550	2950	3000	1650	14150	Elevator left
Elevator extension on	6250	1250	5300	1600	14400	Elevator straight back
Elevator extension on	3250	1700	6750	2700	14400	Elevator right
Elevator extension on	6650	2900	2800	1600	13950	Elevator left

From this data it can be seen that increasing the load on the elevator, gross machine weight increased as you would expect, but more importantly, weight distribution changed. This caused a change in the centre of gravity of the machine, which changed its stability. Increasing weight reduces stability with resultant safety issues.

The load rating for the rear tyres of this machine was 4000kg. This load rating was exceeded when the elevator was placed in the operating position. This is a typical situation for many wheeled harvesters. The excess weight reduces tyre life, increasing costs of operation.

Conclusions

From the trials and assessments undertaken during the 2005 harvest season, the project team drew the following conclusions:

- All rollers tested were suitable for use in 1.5m and 1.85m row spacings. They achieved acceptable bin weights under most conditions.
- Position of the roller is crucial in relation to elevator flights and secondary fan position. Ideal roller position will depend on elevator design, operating speed and any modifications that have been made to it. Suitable placement dimensions are included in the information sheet to guide other growers and harvester operators.
- All elevators tested with powered paddles required a “wedge” to be inserted to move the secondary fan away from the trajectory of cane as it leaves the paddle. The size of the wedge will depend on elevator design and modifications, but a 75mm to 420mm wedge has been found to be suitable on several machines.
- Paddle speed needs to be balanced between achieving adequate throw but without increasing cane loss through the secondary fan. Shaft rotational speeds of around 225 to 300 rpm were found to be suitable, with slower speeds for more aggressive rollers.
- A speed control valve is useful to adjust roller speed on initial setup, but once a suitable operational speed is established, compromising between throw and cane loss, it is not necessary to adjust it.
- Aggressive rollers with large slats caused increased cane loss through the secondary fan and increased recirculation losses.
- Recirculation losses were reduced by “filling in” between slats
- The lagged rollers tested were not as aggressive and gave inadequate throw particularly at lower rotational speeds and in high trash and wet conditions.
- Lagging is robust and showed little sign of wear after harvesting over 2000 tonnes
- The bin flap needs to be extended to give improved control of billet flow. The mounting position of the bin flap ram can be adjusted to allow the bin flap to move in closer and reach out wider for better filling of bin sides and corners.
- Powered rollers add little weight to the harvester and make a very small contribution to reduced harvester stability. Bolt on conveyors are sufficiently heavy to reduce machine stability and are unsuitable for use on wheeled harvesters on sloping ground.
- The option of moving the secondary extractor forward, out of the trajectory of cane thrown by a powered roller is likely to be the most suitable solution, within the constraints of weight, cost, cane loss and cleaning efficiency.

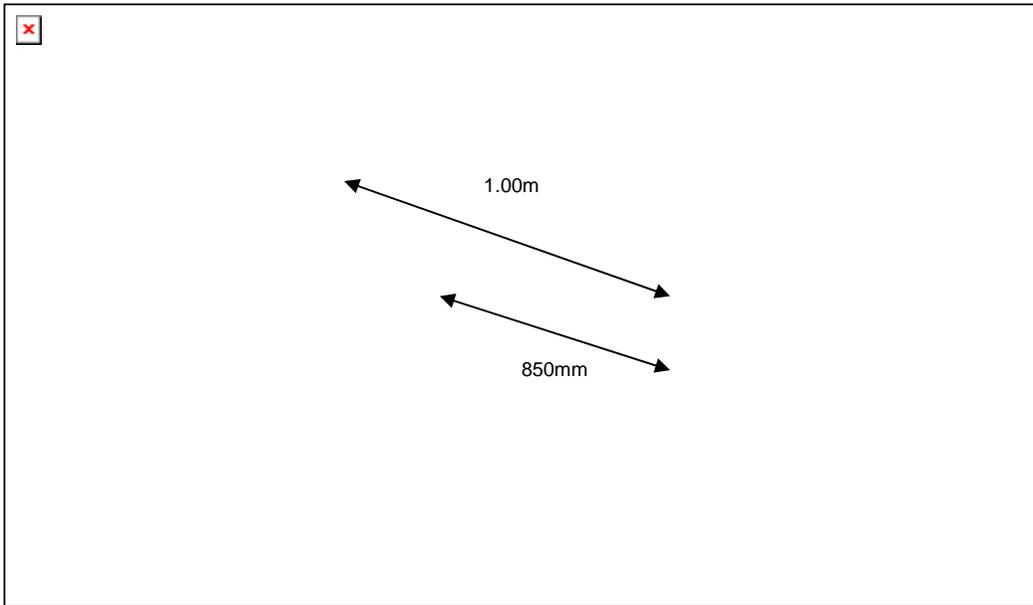
The project team then began completing modifications to an elevator to allow the testing and proving of a modified secondary fan position combined with a powered roller to achieve the objectives of the project. The elevator modifications were completed in late May 2006, ready for operation during the 2006 crushing season. The harvester this elevator is to be fitted to harvested approximately 15,000 tonnes that season, 75% of which will be dual row on 1.83m row spacings.



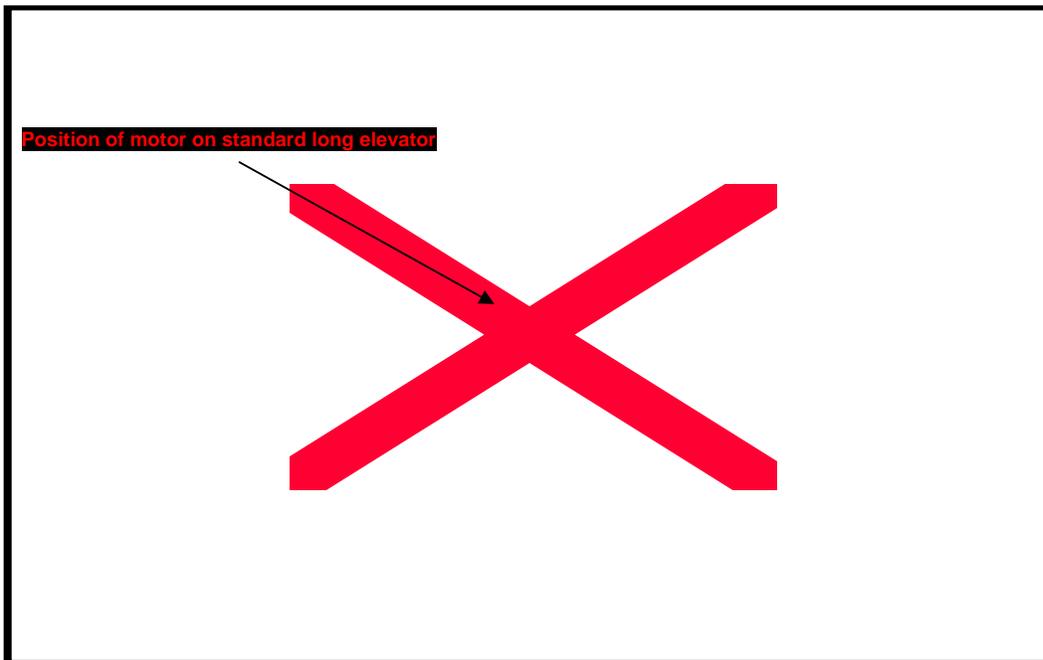
Conveyor test bench constructed to test uniformity of billet delivery and distance of throw

The group developed a workplan to further develop a light weight conveyer extension.

1. Cut down the long elevator
2. Reposition the secondary extractor
3. Increase the speed of the extractor
4. Cut down standard Adds Up Engineering bolt on elevator extension
5. Attach 4 cleats & increase speed of belt
6. Make bin flap out of 3mm black poly



1. Photo displaying the areas “cut down” from the long elevator



2. Photo displaying the cut down elevator, repositioned secondary extractor, repositioned conveyor and the point where the motor would sit on a standard long elevator



3. Photo displaying the cut down standard Adds Up Engineering bolt on conveyor.

Materials used include:

Aluminium frame with plastic running strips under the belt. Twenty five millimetre (1 inch) aluminium shaft & 100mm (4 inch) pullies. Conveyor belting is 2 ply PVC with 8 x 30mm cleats attached.

These modifications reduced the weight of the conveyor from the original weight of 137kg to only 64kg (including motor, belt, hoses).

Summary of Belt Elevator and Conveyor Extension Modifications

- Modifications work well to deliver cane at 5ft & 6ft configurations with no need to remove the conveyor on narrow rows,
- Extracts trash well and delivers trash to the ground in a directed and uniform way
- Problems may occur with wear of cleats
- Problems may occur with belt life
- The extension is vulnerable to damage from haulouts or trees

Future modifications will include:

- Cutting the elevator back even further
- The use of better quality alloy
- Improved design of pulley
- Attachment of “bash bar” under belt

Intellectual Property and Confidentiality:

NA – the group has made all information and designs available to the industry

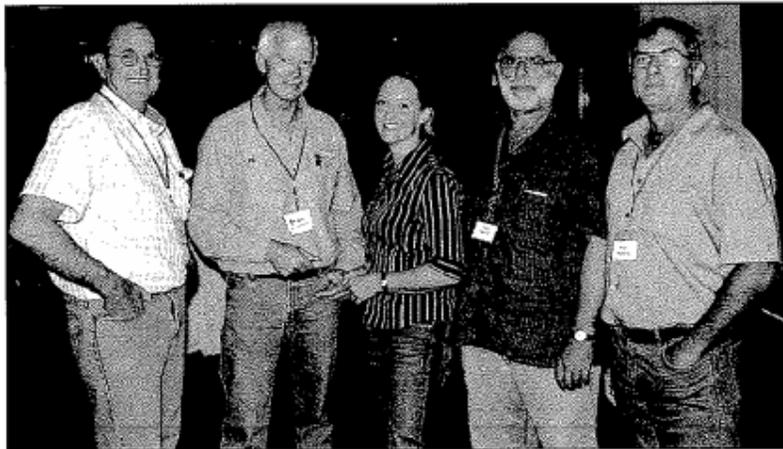
Capacity Building:

The group engaged Kate Roberts from Roberts Consulting to assist them with capacity building. While the project with Roberts Consulting was not completed, a number of capacity building activities were undertaken. These activities included: skills audits, communication training, and team work exercises. As a result of the skills audit, the group identified a need for support in areas of project management (milestone reporting funding proposal etc) and have formed an arrangement with Plane Creek Productivity Services. The group also identified the need to become an incorporated body, and developed and completed separate project to investigate and undertake this process. The group presented at GIVE 2006 and GIVE 2008 and therefore further developed their

skills in collating trial results and presenting information.



Brian Stevens presents on behalf of PCSF Inc at a DPI Future Cane information meeting



Pictured at the Give 08 conference in Mackay were (l to r) Brian Stevens, Plane Creek grower; Brian Robotham, GPS-Ag consultant, Bundaberg; Kalya Abbey, BSES Mackay extension officer; Serg Berardi, Plane Creek grower, and Neil Waipole, chairman, Plane Creek Sustainable Farmers.



One of many field demos held during 2005 and 2006



Argentinian sugar industry staff are shown a presentation of trial work



Ramu Sugar staff visit Pedersen's to inspect the latest modifications.



BSES Engineering staff visit Pedersen's to inspect operation of cut down elevator



Mike Smith and Brian Stevens address a bus load of Mackay district growers



Bryan Baker and Robert Sluggett discuss harvester issues in controlled traffic at a BSES Field Day



Measuring caneloss of one of the many roller prototypes tested.



A new idea – the first time the secondary fan has been repositioned

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

Outcomes:

The project achieved the objectives as outlined in the application. This was – to develop adaptations for harvesters that are low cost and light weight and allow harvesters and haulouts to stay on the controlled traffic path while harvesting. Two options were developed and refined as a result of this project: (1) Elevator paddle, (2) Elevator extension. Both options were extensively trialled until desirable results were achieved. This required modification to both the paddle (or) extension itself, plus modifications to the harvester, plus modification to the operation of the harvester. As a result of this project, the group now have no difficulty in delivering cane to the haulout while maintaining a controlled traffic farming system. The options developed by this project are suitable for all harvesting conditions, including steep sloping ground.

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

Environmental Impact:

This project addressed one of the barriers to the wide spread adoption of controlled traffic farming systems. Therefore, it has contributed to the environmental benefits that arise from controlled traffic farming systems. These environmental benefits have been widely documented.

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

Communication and Adoption of Outputs:

The group has undertaken numerous communication activities to promote the outcomes of this project. SRDC has been acknowledged as a funding partner at all times. Communication activities included: displays at BSES Field days, On-farm demonstrations, presentations at GIVE 2006 & 2008, hosting numerous bus trips/field tours organised by central region industry bodies, several articles in the CANEGROWER magazine, production of "Effective Bin Filling" information sheet (2006) (Appendix 1), "Effective Bin Filling in Controlled Traffic" 2006 Field Day Handout (Appendix 2), presentations at SRDC Regional Workshop, Hosting numerous grower groups/tours from other regions.

Media Interviews

Radio interviews Doug Pedersen 19/10/2006, ABC Rural Report Mackay Re: elevator modifications to harvester and upcoming field day.

Bryan Baker 26/10/2006, ABC Rural Report Mackay and Wide Bay re: elevator modifications to harvester and powered rollers.

We are aware of approximately 15 harvesters with paddle rollers fitted and 4 with conveyor extensions fitted following interaction with our group members and our work. Over 150 growers and harvester owners from Queensland and New South Wales have visited farms of our group members to view the work we undertook in this project.

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

Recommendations:

As the project has achieved its objectives, there is little future research required on the actual rollers or conveyors, apart from minor refinements such as our group intends to pursue such as comparing new components and materials to strengthen the elevator extension while maintaining its light weight and improving its serviceable life.

However, the repositioning of the secondary fan on the elevator structure has been viewed as a bit radical by some visitors and has not been readily adopted as our results suggest it should. We believe some additional testing and trial work by an independent body such as BSES may assist with the acceptance of that particular modification.

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

Publications:

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

Appendix 1: 2005 Information Sheet

Effective Bin Filling in Controlled Traffic – keeping traffic where it belongs

by **Plane Creek Sustainable Farmers Inc.**

What is the Issue?

- Present solutions to keeping harvesting traffic centred on wider row spacings while adequately filling cane bins are often not effective, due to unsuitable harvester elevator design, which results in a larger proportion of the field area being compacted, defeating the purpose of controlled traffic farming.
- The issue of getting cane in the bin in wider row spacings is more problematic than is currently recognised by many promoting the adoption of CT in the sugar industry. The existing harvester elevator suits 1.5m row spacings. Simply extending the whole elevator is unsuitable for wheeled machines due to the increase in weight, as are bolt on elevator extensions. Increases in weight reduce harvester stability on uneven fields and is a major safety issue. Additional weight also increases wear and tear on pins and bushes and increases costs.

Project Aim

SRDC have funded this GGIP project to develop a low cost, low weight system to adequately fill cane bins, maintaining harvester traffic centred in the inter-row, minimising compaction and improving safety in wide row farming systems and during conversion.

Criteria

- Relatively cheap
- Light weight
- Suit 1.5m to 1.85m rows

What was done?

- In 2004, three PCSF Inc. group members trialled powered paddles on their harvesters. The paddles were light weight, were fairly cheap to make and could be operated in both wide row spacings (1.83m) and narrow (1.5m) row spacings of farms in conversion to CTFS. However, because of different elevator designs on the different harvesters, all of the paddles increased cane losses through the secondary extractor and two increased cane losses from recirculation.
- In 2005 SRDC funded Plane Creek Sustainable Farmers Inc. to examine potential options and develop a commercial prototype unit for industry use.
- Group members travelled to Ingham, Proserpine, NSW and spoke to BSES engineers in Bundaberg to examine other ideas being used.
- As a result of investigations of the different options available, a table of options was developed and is presented in Table 1 below. Powered rollers satisfy most criteria and offer the best opportunity to achieve a solution to bin filling on wider row spacings.
- During the 2005 season four prototype powered rollers were tested on several harvesters. A variable speed valve was fitted to one harvester to allow the effect of different roller speeds on throw and cane loss to be compared.

- The impact of an elevator extension on the weight and stability of a harvester was examined.

Elevator Modification Options

There are a number of elevator modification options available for harvesting wider row spacings. However, each option has positive and negative attributes. Table 1 below summarises the attributes of each option.

Table 1: Options for Elevator Modifications to Fill Bins on Wide Row Spacings

	Bin Weight	Safety	Stability	Ease of use	Compaction control	Suits 1.5 & 1.85m	Cane loss	Maintenance & durability	Cost \$
Kratzman Extension	X	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	X	X	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Louisiana Extension	<input checked="" type="checkbox"/>	X	X	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	X	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Bolt on Conveyor	<input checked="" type="checkbox"/>	X	X	X	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	X	X
Hook on Conveyor	X	X	X	X	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	X	X
Steep Elevator & top floor	<input checked="" type="checkbox"/>	X	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	X	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Powered paddles	<input checked="" type="checkbox"/>	?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					

From this table it can be seen that the powered paddle option satisfies most requirements. The major drawback of powered paddles is their ability to significantly increase cane loss through the secondary extractor. Permanent elevator extensions such as the Louisiana extension are not suitable for wheeled machines, or during the period of conversion from 1.5m row spacings to 1.8m row spacings. Following the analysis of these options, Plane Creek Sustainable Farmers Inc. decided the most appropriate course of action was to refine and make commercially viable the powered paddle.

The Prototypes Tested

Four prototype paddles were tested on several harvesters. Paddle size, design, placement and speed were tested under different conditions.



Figure 1: Original Powered Roller (180mm slats on 37mm shaft, 35kg)



Figure 2: Modified Powered Roller (300mm centre, 50mm slats, weight 54kg)



Figure 3: Lagged Rollers, 300mm and 400mm fins, diameter, weight 41.5kg



Figure 4: Flat Roller with 50mm weight 25.5kg

The Results

Each roller was tested at different rotational speeds. Assessments were made of cane loss, throw and bin weights. Video footage was taken of each roller in operation for later review. Table 2 provides an example of results recorded for one trial.

Table 2: 2005 Powered Roller Assessments

Trial 2	RPM	Av Bin Wt	CCS	Observations
16" Lagged roller	360	3.35	14.6	Not throwing past bin centre
16" Steel + slats	360	3.5	15.35	More positive throw, more cane out secondary fan
16" Steel + slats	255	3.37	15.5	Reduced secondary loss
16" Steel + slats	180	3.3	15.2	Too slow, not enough throw
16" Steel + slats	228	3.19	15.2	Improved performance

Observations

- All rollers tested were suitable for use in 1.5m and 1.85m row spacings
- Position of the roller is crucial in relation to elevator flights and secondary fan position. Ideal roller position will depend on elevator design, operating speed and any modifications that have been made to it.
- All elevators tested with powered paddles required a “wedge” to be inserted to move the secondary fan away from the trajectory of cane as it leaves the paddle. The size of the wedge will depend on elevator design and modifications, but a 75mm to 420mm wedge has been found to be suitable on several machines (see Figure 6 below).
- Paddle speed needs to be balanced between achieving adequate throw but without increasing cane loss through the secondary fan. Shaft rotational speeds of around 225 to 300 rpm were found to be suitable, with slower speeds for more aggressive paddles.
- A speed control valve is useful to adjust roller speed on initial setup, but once a suitable operational speed is established, it has not been found to be necessary to adjust it.
- Aggressive rollers with large slats caused increased cane loss through the secondary fan and increased recirculation losses.
- Recirculation losses were reduced by “filling in” between slats (as for modified roller Figure 2, above).
- The lagged rollers tested (Figure 3, above) were not as aggressive and gave inadequate throw particularly at lower rotational speeds and in high trash and wet conditions.
- Lagging is robust and showed little sign of wear after harvesting over 2000 tonnes
- The bin flap needs to be extended to give improved control of billet flow. The mounting position of the bin flap ram can be adjusted to allow the bin flap to move in closer and reach out wider for better filling of bin sides and corners.



Figure 5: Approximate dimensions for fitting a powered roller. Specific location will depend on elevator design, existing modifications, speed of elevator motors, and type, design and speed of operation of the powered roller.



Figure 6: Powered roller placement is critical in relation to elevator flight rotation. Note the 75mm to 420mm “wedge” used to moved secondary extractor fan assembly away from the cane flow. A similar modification is essential to minimise cane loss through the secondary fan. Note lengthened bin flap and mounting bracket allowing roller positioning to be adjusted.

Further Work

More work is planned to refine powered paddle use. Work is also underway to examine the advantages for machine stability from moving the secondary extractor assembly along the elevator.

Acknowledgements

Thanks to Sugar Research and Development Corporation, Hodge Industries and BSES for supporting this activity.



**For further information contact: Brian Stevens, PCSF Inc. info@pcsf.com.au
Visit our website: www.pcsf.com.au**

Elevator modifications deliver in safety

Contributed by Gordon Collie

Bryan Baker bought a cane harvester last year, but he has no intention of cutting his own cane.

The Sarina farmer invested in the machine to improve commercial modifications for wide row harvesting.

The work is part of a major research project being undertaken by Plane Creek Sustainable Farmers.

"I've been mucking around with changes for the last three years but it's frustrating working on other people's machines," said Mr Baker, the Plane Creek group treasurer.

A relative newcomer to cane growing in the last 10 years, Mr Baker is used to thinking outside the square when it comes to designing an optimal farming system.

"The harvester has always been the big stumbling block when it comes to putting new farming systems into practice," he said.

He has almost completed the transition to 1.8 metre dual row cropping over the last five years with only a small 8 ha block still growing on a 1.5 metre layout.

Mr Baker has been a key member of the Sustainable Farmers team working on harvester elevator modifications to deliver cane to the haulout without having it compact the cropping area.

The group carried out extensive research on various elevator modifications to increase the cane throwing distance and concluded that fitting a powered paddle was the best option, despite the potential for increased cane loss through the secondary extractor.

From this work, two prototypes were built for commercial evaluation



Bryan Baker with the cane harvester he bought last year.

during the 2006 season.

Mr Baker is confident the modifications to his harvester are close to achieving the goal of extending the cane delivery distance without compromising machine safety.

He had the concept firmly in his mind when he bought the machine and went to work with a local engineering firm to turn it into reality.

The extractor assembly was moved back up the elevator about half a metre and powered paddles fitted to propel it the extra distance to the haulout.

"The issue has always been having too much weight at the end of the elevator creating safety issues with a wheeled machine. Bolting on a conveyor extension adds considerable weight. The modified machine is probably more stable than it was before."

"It's close to the way we want it, but

modifications are always a work in progress," Mr Baker said.

He cut about 11,000 tonnes of cane with the demonstration unit last season. As part of the research grant agreement, the modifications will be promoted and working drawings made available.

It has created a lot of grower interest with some farmers already signalling their intent to adopt the concept and Mr Baker said his harvesting contractor would be fitting a version.

He will use the demonstration machine to cut planting material.

Mr Baker said he was experimenting with planting the dual rows closer together, adjusting in from 500mm to 350mm.

"Growing the cane in what is effectively a wide single row rather than separate rows would help overcome problems with lodging," he said. ■

Grower innovation

Estimating crop size is an example of change. Using remote sensing, Mackay Sugar can collect in one day data that previously took four people four weeks.

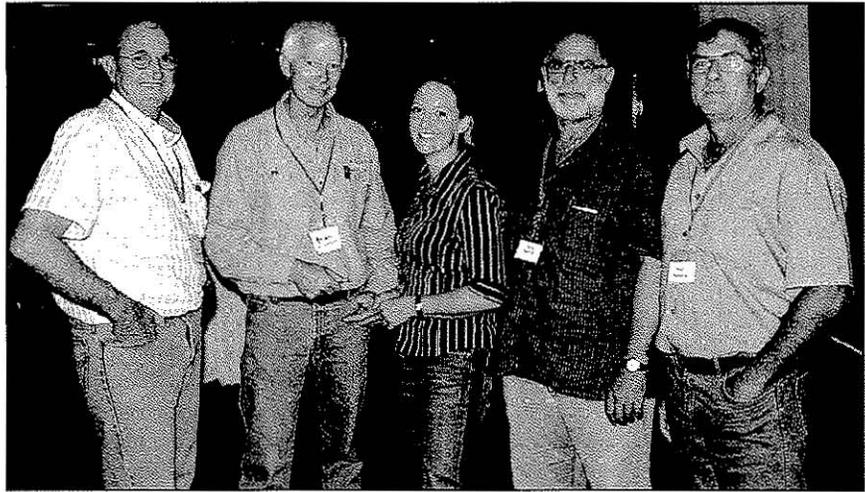
Comparisons of images over time enable farmers to identify areas of yield volatility, assist soil mapping and give early warning of pests/diseases. Satellite monitoring is limited by cloud cover so automatic monitors in 46 of the district's 160 harvesters measure the area cut and generate other useful data for 45% of the cane supply area.

Six machines have yield monitors that record hydraulic pressure loadings. Data on harvester performance, analysed weekly, helps operators improve operating efficiency. Last season over 10 million reports recorded harvested area and machine efficiency.

Tony Deguara, Homebush Innovative Farmers, showed that more is not better when it comes to planting. A planting density trial showed that after 180 days there was no significant difference at 3.7, 5.5 and 7 t/ha in 1.8 m rows. He was surprised at how many plants are being wasted.

If all Mackay growers reduced planting rates from the current average of 8 t/ha to 5.5 t/ha an extra 55,000 t cane could be milled, worth around \$1.65 m at \$30 a tonne. Lower rates would also minimise nutrients, moisture and less wear-and-tear.

Another trial examined whether all plant nutrients can be supplied as



Pictured at the Give 08 conference in Mackay were (l to r) Brian Stevens, Plane Creek grower; Brian Robotham, GPS-Ag consultant, Bundaberg; Kalya Abbey, BSES Mackay extension officer; Serg Berardi, Plane Creek grower, and Neil Walpole, chairman, Plane Creek Sustainable Farmers.

biodunder prior to planting. Not having to top dress produced substantial savings in time and labour during planting, less pressure during harvesting and there was no yield loss.

Greater minimum tillage in cane will probably increase farm chemical costs so there was keen interest in Andrew Lashmar's 4-row optical spot spraying unit. Similar to units already used by grain producers, the unit uses WeedSeeker sensor technology. The gear is costly but growers can pay it off in several years from herbicide savings of 50-80%. It may even have potential for use in fertilising.

Ingham's Total Concept Sugarcane Planting System Group modified a planter to form beds as it plants, reducing hilling-up problems from

heavy rain and helping alleviate chronic labour shortages. Last year Daryl Morellini planted 60 ha this way and saved 149 hours compared with conventional planting and an estimated \$8400 in wages, fuel, and wear and tear.

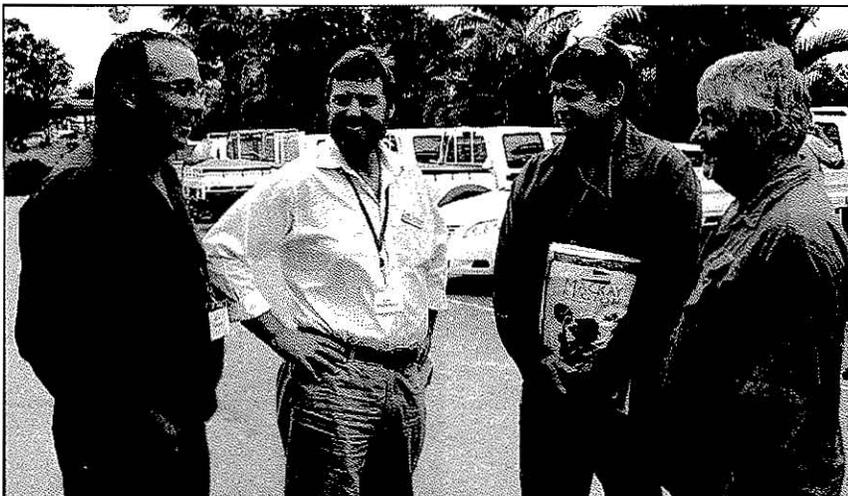
Growers were reminded that they are caught in a worsening severe cost-price squeeze. Eton farmer John Ross said growers get the same cane price now as in 1981 but they have to pay \$1250 a tonne or more for DAP fertiliser and diesel fuel now costs \$1.40/L compared with .04 cents in 1967.

The Ross, Werner, Walker and George families have formed a company to trial composting of cane trash and mill wastes, as a means of reducing costs, restoring soil health and minimising dependence on commercial fertilisers and chemicals.

Edward Blosser, President of Midwest Bio-Systems, Illinois, USA, discussed the potential gains that cane be achieved by using humus compost.

Bus tours took growers to see new farming systems and supplementary crops such as kenaf and sunn hemp although muddy conditions limited farm access.

Innovative machinery on show included hooded sprayers, variable rate fertiliser boxes, bean planters, dual row hilling-up and zonal tillage units, a rear steerable axle cane transporter, a centre pivot with GPS controlled swing arm, and a compost turner and spreader. ■



Discussing the GIVE 08 program in Mackay were (l to r) Gary Sandell, mechanical engineer, Mackay, Les Robertson, SRDC investment manager, Brisbane, Michael Zamparutti, cane grower Wagoora, and Ross MacKenzie, cane grower Calen.