

# SRDC Grower Group Innovation Project

## Final Report

**SRDC project number:** GGP 003

**Project title:** Implementation of controlled traffic farming in the Herbert River District.

**Group name:** Pinnacle Precision Farming

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**Funding Statement:** This project was conducted by Pinnacle Precision Farming 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.



1.85m Single rows V's Dual rows

## **Body of Report**

### **Executive Summary:**

The Pinnacle Precision Farming (PPF) Group was formed with the goal of implementing and benefiting from the principals of controlled traffic farming using techniques being used by the *Sugar Yield Decline Joint Venture Team* on a trial and demonstration plot located on the farm operated by Ed Morris located in Toobanna. However we could not envisage a Double Disc Opener Planter (DDOP) being viable unless it was able to successfully plant cane billets instead of using whole cane stalk planters as used by the SYDJV Team.

We had anticipated a Precision Billet Planter being developed by the BSES but it did not eventuate and we did not think it would be capable of dealing with most of the planting material available at most times. Sprawly cane and some varieties do not always provide good planting material.

A decision was made to modify an existing proven billet planter design to use the concept of double disc openers capable of planting sugar cane into preformed beds in a no till or minimum till method. Rather than sacrifice a new planter and also to keep costs down. A second hand HBM Billet Planter was purchased and the following modifications were carried out.



Modified Planter

We also saw the need to develop a bed former, which would work satisfactory in a green cane farming system. The bed former would have to be able to work in trashier conditions as all the sugar cane in the Herbert is harvested green and most farmers prefer to return their organic matter to the soil. Most of the commercially available bed formers are designed to work in a trash and crop residue free situation. We settled on a concept of an implement designed to reform cane rows after harvesting and cultivation in the Burdekin irrigated cane lands.



Bed Former

The bed former needed to conform with these requirements.

1. Form three preformed beds in one pass and be folding to allow transport along roads and turning around at row ends against obstacles such as tree lines, fences drains, etc.
2. Be adjustable from 1.6m to 2.0m to allow for different row spacing.
3. Be able to work in soil with some crop residue.

Farm trials were set up to compare yield differences and also compare costs between the conventional and new farming system.

This consisted of a 4ha plot divided into 3 replicated areas of 1.6m single rows, 1.85m single rows and 1.85m dual rows.

The new planting system has numerous economic and agronomic advantages compared to the old planting system. Given the shortage of labour in the sugar industry and our commitment to the contract business, we realize that maximizing the efficiency of plant cane operations is critical for the viability of our farming business. The new planting system has shown to reduce planting operation by up to 57%. Variable costs have also been reduced by \$144/ha and the amount of machinery required to undertake the operations has also decreased. The Morris family recognize the need to continually improve their farming business and believe that the new farming system principles are critical for the long-term viability of the sugar cane industry.



## Background:

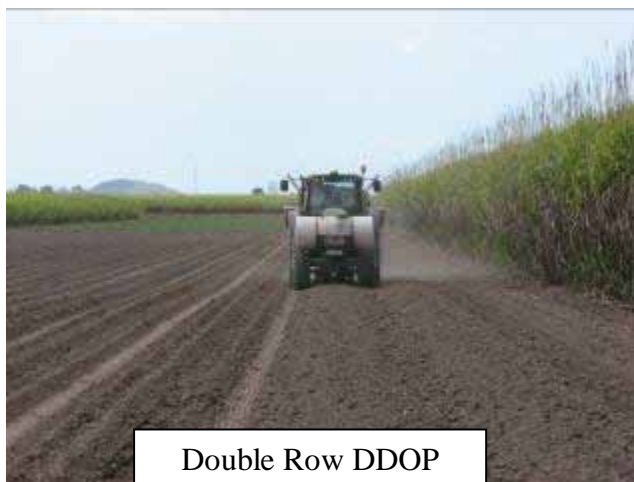
Three members of the group had already committed to the implementation of Controlled Traffic Farming having begun planting 1.85m or 1.9m dual rows conventionally since the late 1990s. The original aim was to increase yield by up to 25% as was being promoted at the time. Substantial yield increases did not eventuate but the potential for costs and time saving was identified. The *Sugar Yield Decline Joint Venture Team* headed by Alan Garside established a 3ha trial plot on the Morris Farm in 2002. The SYDJV aims to demonstrate and provide recommendations on ways to improve the sustainability of our sugar cane farming systems from an economic and environmental perspective. The main components of the new farming system include the use of controlled traffic farming matching machinery width, minimum or no tillage and legume crop rotation.

Apart from the benefits of CTF and legume crop rotation the use of Double Disc Opener Planters to minimise cultivation and soil disturbance, was the main difference in our planting system at the time. Billet planting using HBM Billet Planters on all the Group Members Farms had been used very successfully since the early 1990s. HBM was still not able to provide a DDOP using billets and we saw the possibility of modifying a conventional HBM Billet planter after visiting Kieth Schmidtke and the Pederson farms in Sarina in 2004 and seeing how they had been modifying and using Double Disc Opener Planters.

In early 2005 Ed and Ken Morris Purchased a new John Deere Tractor fitted with GPS Guidance, the first in the Herbert River District and this made it possible for true precision planting of sugar cane leading to the possibility of harvesting with GPS guidance in the future.

## Aims:

1. The implementation of Controlled Traffic Farming is critical to ensure the future sustainability of Sugar Cane Farming.
2. The application and implementation of on farm research findings and principals generated by the *SUGAR YIELD DECLINE JOINT VENTURE TEAM*.
3. To develop a minimum or no till planting system with the development of a *Double Disc Opener Planter* and a Bed (mound) Former.
4. Adapt techniques to suit different soil types.
5. The economic benefits with the creation of permanent beds will allow cost saving compared to conventional farming methods because of reduced cultivation, a reduction in chemical usage over time and the potential for longer crop cycles.



Double Row DDOP



Single Row DDOP

### Methodology:

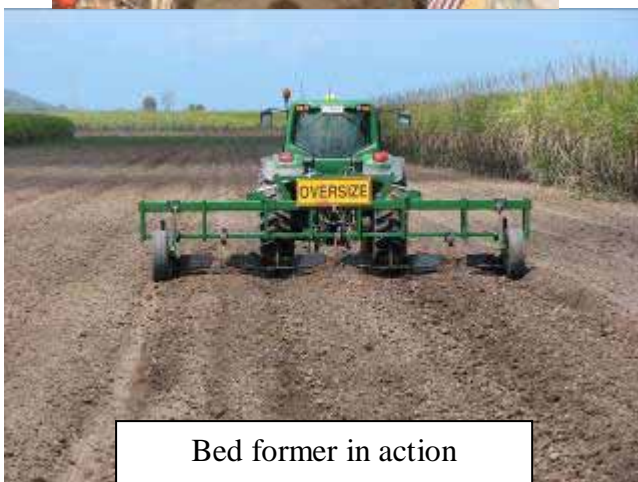
A second hand HBM Planter was purchased and modifications were made using our own and other ideas and theories from other *DDOP* from the Sarina district. Modification including:



Modifications to planter



1. The original ground engaging plough drill was removed and discarded.
2. The front frame of the planter was moved 250mm forward to accommodate the 4 X 30inch(762mm) coulters which are the basis of double disc opener planters.
3. Two new shuts (a single and a dual row) which carry the billets from the planter elevator to the disc openers had to be designed and built.
4. The fertilizer boxes were relocated to a higher position to allow fertilizer to flow to the disc opener drills.
5. The planter drive wheels and rear swivel wheels had to be modified to deal with the wider (1.9m) row spacing and planting into preformed beds which requires the planter to operate at about 200mm higher than conventional.
6. A press wheel configuration had to be designed and built. It had to be adjustable to cater for different soil types, texture and moisture levels. Press wheels are used to maintain soil and cane set contact, the required level of soil cover and maintain the correct bed profile.



Bed former in action

Visits were made to the Burdekin district and various types of bed formers were inspected and a final design was completed and a 3-row adjustable bed former was completed in January 2006.

A 4ha trial comparing 1.6m conventional widths, 1.85m single row and 1.85m dual rows was planted in late September 2006 to compare yields over different row spacings and configurations.

Costs of both farming systems and any labour and machinery usage were worked out with the assistance of Mark Poggio an economist with the QDPI&F FutureCane project who prepared a case study to compare costs in conventional farming and the new farming system. Economic analysis was conducted using the Farm Economic Analysis Tool (FEAT) developed by the DPI&F FutureCane initiative. FEAT is a computer based program designed specifically for canefarmers and allows growers to undertake a whole of farm economic analysis or to compare the economics of various components of any farming system.

## Results and Outputs:

The Case study as prepared by Mark Poggio an economist from QDPI&F and Ed Morris comparing the economics of both farming systems was written. It was found (refer appendices) that given today's input costs, the old planting system would cost the Morris Family \$1578/ha compared to the \$1434/ha with the new planting system. These figures include the variable costs of fuel, oil, repairs and maintenance. The biggest saving in the new planting system is in land preparation costs (\$233/ha → \$96/ha), weed control (\$219/ha → \$177/ha) and a reduction in the time spent maintaining a plant crop by 57% (\$174/ha → \$76/ha). The number of hours spent on farm planting operations has decreased by 57% with the new planting system. Given the same complement of tractors and machinery the Morris family could increase their farming area by at least 50% while maintaining a similar plant cane operations time, depreciation costs and interest costs over a greater area and significantly increasing their farm profitability. It was further found that a 56% return on the extra capital requirement needed to change from the old to the new system could be achieved based on 20ha planted. This was due to the high costs saving recorded in the new farming system compared to the capital outlay less the sale of obsolete equipment required to farm the new system. The area planted under this new system to cover the net capital requirement is only 14.78ha more than is already planted which means the Morris family has paid off the system change in less than 2 years.



Poggio planting farm walk



Sett to Soil Contact

Area planted in 2006 using the DDOP:

1. 35 ha Dual Rows at 1.9m into preformed beds. Most of this area was contract planted on the Poggio family farms. They were very satisfied with the way the DDOP performed in their various soil types. This area received more than 500mm of rain within two weeks of planting and damage was minimal.
2. 33 ha Dual Rows at 1.85m into minimum till fallow. Most of this area was also contract planted using GPS guidance. This area was also affected by heavy rain but the majority of the area recovered enough to be able to produce a viable plant crop.
3. 40 ha Dual Rows at 1.9m into conventional fallow. The majority of this area was planted with GPS Guidance on the Morris and Reid farms where the final modifications were tried and completed. About 3 ha on the Morris farms was killed by the heavy rain event and was then reworked and 1.9m beds were formed in the same rows and replanted with the DDOP. The final results of the planting were very pleasing.
4. 8 ha Single Row at 1.625m into conventional fallow. This area was planted on Allan Lynn's farm and the results were very successful.

The DDOP in it's various configurations operated very successfully. The DDOP has sufficient height adjustments to plant either conventional flat or into preformed beds. The adjustable press wheels can be altered to provide the required amount of soil cover to suit the different soil texture and moisture conditions.

### **Capacity Building:**

The Groups capacity to undertake research, modify and build the HBM DDOP and Bed Former was definitely made possible by the SRDC Grower Group Funding. The SRDC funding ensures the higher than usual costs of developing new ideas is shared by the whole of industry so that industry may benefit by taking up new ideas and methods.

### **Outcomes:**

The long-term benefits of using a DDOP in a Controlled Traffic Farming system with regards to soil health cannot be realised in the short term. The economic benefits will be partly realised in the PPF Groups first planting into preformed beds in 2007 as the first beds using GPS and the Bed Former were completed in December 2006 and January 2007.

The most cost savings should be apparent in the next crop cycle when the already formed permanent beds would only need spraying out and replanted with break crop legumes and sugar cane the following using DDOP.



1<sup>st</sup> Ratoon DDOP in preformed beds 2005

The economic benefits are yet to be quantified, but it is expected that the creation of 'permanent' beds will allow considerable cost savings because of reduced cultivation (eg. fuel, labour and wear and tear of equipment). A reduction in chemical costs is also likely to occur over time. The potential for longer crop cycles will contribute to costs saving too. A uniform shaped planting bed will lead to a better harvesting job and increase cane quality for mill supply.

The social benefits will allow more time to be spent with the family because less time will be spent in the paddock on soil preparation. Timeliness of operations will be less critical and will allow for a longer planting window. This inturn will enable a longer planting season and greater production.

### **Environmental Impact:**

The Controlled Traffic Farming System with the preformed beds and the use of DDOP in conjunction with GPS Guidance creates the chance for minimal cultivation and soil disturbance with reduced runoff and the potential for chemical, fertilizer and most importantly soil export.

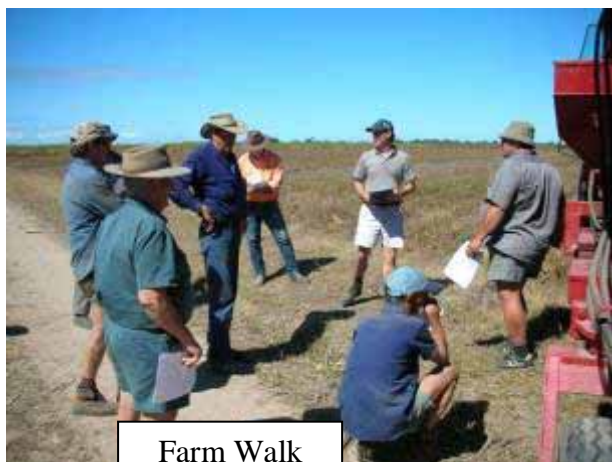
The reduced area of compaction will improve the chemical, physical and biological properties of the soil and combined with the use of legumes, as a break crop should overall contribute to improvements in soil health in the long term.



1.9m Beds planted with Soybeans Dec 2006

### **Communication and Adoption of Outputs:**

The progress of the Pinnacle Precision Farming Group has been reported at most meetings of the Herbert Cane Productivities Initiative's Soil Health Team Meetings. Recommendations from these meetings and in conjunction with the Herbert Productivity Forums have seen farm walks and bus tours organised with more farm walks planned for the 2007 Planting season.



Farm Walk

On the 15<sup>th</sup> August 2006 a farm walk was held on the Poggio family Farm where the modified DDOP was used to plant into 1.9m beds, which were formed the previous year. Mark Poggio distributed copies of the Case Study and Mike Hanks from *FutureCane* also contributed advice and information. Lawrence Dibella from BSES Herbert conducted bus tours on the 9<sup>th</sup>, 10<sup>th</sup> and 11<sup>th</sup> October 2006 visiting the Poggio Farm and also other Controlled Traffic plots in the Herbert River District.

An article on the Morris farm and the new farming system appeared in the December 18<sup>th</sup> 2006 Canegrowers magazine.

Mark Poggio from QDPI, Lawrence DiBella from BSES and PPF Grower members Norm Reid and Ed Morris have submitted a paper on a Case Study on New Farming Practices in the Herbert to the ASSCT to be presented to the ASSCT Conference in Cairns on the 8<sup>th</sup> to the 11<sup>th</sup> May 2007.

SRDC Funding has been acknowledged where possible.

### **Recommendations:**

While the conversion of the conventional billet planter was successful, further R&D would be required to manufacture a fully functional and purpose built Double Disc Opener Billet Planter. Further research and development funding should be encouraged to enable grower innovations to reach their full potential and the benefits can then be shared with the whole farming community.

### **Publications: (following)**

1. Canegrowers article of December 18<sup>th</sup> 2006 - page 9-10
2. ASSCT paper – please remain confidential until published – page 11-18
3. Case Study by M Poggio & E Morris. ASSCT Paper by M Poggio, L DiBella, N Reid and E Morris – page 19-26

# New system a cash saver

By Bill Kerr

Planting into pre-formed mounds with a GPS-guided double disc opener planter is improving soil health and saving time and money on Ed and Angie Morris' cane farm near Toobanna, south-east of Ingham.

Their new approach to planting is part of an ongoing plan to adapt and implement into their farming and contracting operations, the principles of the Sugar Yield Decline Joint Venture (SYDJV) based on controlled traffic, minimal tillage and crop rotation.

Mr and Mrs Morris are members of Pinnacle Precision Farming (PPF), a group of six like-minded growers endeavouring to ensure the future sustainability of their operations through the adoption of improved farming systems.

Changes to their planting practices reflect the dramatic evolution occurring in the way Herbert growers manage and operate their farms.

Ed and Angie Morris realise the need for continual improvement in their farming methods to achieve essential cost savings and other benefits, particularly rejuvenation of their soils. They recognise that success does not come overnight and are prepared to invest time, energy and money into improving the system in their situation.

They were early converts in the industry's move towards a better farming system, having experimented with controlled-traffic principles and 1.85 m dual rows since the late 1990s. Many thought they were wasting their



Ed Morris with the double disc opener planter.

time and money dabbling with such "foolish" ideas.

They had a golden opportunity to assess the advantages of these innovations when Alan Garside established SYDJV trial plots and they worked closely with other BSES and Department of Primary Industries and Fisheries (DPI&F) FutureCane staff on their farm.

## Benefits include cost savings, less work, more time

Having comparison plots on their doorstep has allowed them to see firsthand the practical outcomes of different types of planting preparation.

Although the expected yield jump didn't happen, controlled traffic and dual rows have delivered substantial advantages on their farm compared with the former system based on furrow-opener planters and 1.54 m single rows. Benefits include time and cost savings through more efficient work rates and fewer

cultivations before planting, improved soil health and water infiltration, potentially longer ratoons, and social and environmental advantages, such as reduced erosion and movement of soil, nutrients and chemicals. Ed believes that the gains outweigh establishment costs and extra harvesting difficulties.

In addition, Alan Garside expects that productivity increases are likely to occur in the second cycle once the permanent beds have settled down. Experimental results are indicating this is likely to occur.

Analysis by DPI&F FutureCane's farm economics analysis tool (FEAT) showed that the new planting system has cut Ed's planting time by up to 57% and reduced variable input costs (chemicals, fertilisers, fuel, repairs, maintenance, etc) by \$144 a hectare – from \$1578/ha to \$1434/ha. Under the new system a rotary hoe, four-time ripper, weeder and grubber are no longer required to grow a plant crop.

Mark Poggio of DPI&F, estimates that the biggest cost savings are in land preparation (from \$233/ha down to \$96/ha), weed control (\$219/ha to

## BETTER FARMING

\$177/ha) and time spent maintaining the plant crop (\$174/ha to \$76/ha).

About 80% of the Morris' crop is planted dual row at 1.85 m spacings. They will adopt this format exclusively in the future, planting into pre-formed beds. Ed expects to make further changes as they become more experienced in the new farming practices, including incorporating legume rotations and zero or minimum tillage to further reduce planting time and input costs such as fuel and fertiliser.

He believes that, while some growers will never adopt the new system, it is inevitable that drill widths will be wider in future, influenced by the use of larger haulouts and concerns about compaction. Controlled traffic reduces soil compaction around the cane plant, a major cause of yield decline and poor soil health. BSES research has shown that up to 95% of the area is compacted in conventional 1.5 m row spacings. Some Herbert growers are already planting 1.625 m single rows and there is considerable interest in 1.8 m single rows.

### Efficiency

The Morris family had the Herbert's first GPS-guided tractor and were the first to plant using GPS, a vital part of precision farming. GPS ensures straight, even rows, reduces time and inputs and helps minimise driver stress and fatigue.

All planting is now done with GPS, even conventional rows. In July 2006 a Queensland Government \$49,000 Sugar Industry Innovation Fund (SIIF) grant was approved for a second GPS base station and improved double disc opener planter.

The three Morris brothers are fourth-generation Victoria Mill suppliers. Steve and Ken operate the farm previously run by their parents while Ed Morris has his grandparents' farm. They share machinery and conduct a large contracting business for cultivating, fertilising and planting. With a shortage of skilled labour in the industry, they believe it is crucial to maximise efficiency of their farming and contracting operations.



Steve Morris with the three-row bed former.

## Raised beds prove worth in downpour

Planting cane into 1.85 m dual rows on permanent raised beds proved its value this season on the Poggio family's farm at Trebonne when the heavens opened up with a vengeance.

Two weeks after Ed and Ken Morris planted the crop for them with a dual row disc opener planter, the Poggios received more than 500 mm of rain over several days.

This unprecedented rainfall event severely damaged many planted areas or paddocks prepared for conventional planting in the Herbert River district, particularly clay soils, causing serious erosion and waterlogging. The damage was

minimal on permanent raised bed areas because the bed shape and hard interspaces helped control runoff more effectively.

Peter Poggio grows about 20,000 tonnes of cane with one employee and part-time help from his sons Alan and Mark, who have professional jobs. About 32 ha are under dual rows, including 26 ha planted this season. They intend to increase the area to reduce labour and other costs.

Alan Poggio said they had been able to plant earlier than usual this season because they were able to go straight into preformed beds without extra cultivation. ■

Their parents raised six children on a farm producing just 2500 tonnes. The record 7400 tonnes that Mr Morris grew on his farm in 2005 would have stamped his parents as large growers, however this size of operation would not be viable today without extra income from contracting and the savings achieved by using more productive and efficient farming methods.

Although Mr Morris began implementing SYDJV-recommended practices in 2000, the biggest step forward came with the acquisition of specialised machinery.

Pinnacle Precision Farming, with help from Mike Hanks and Dave Brown of

FutureCane, obtained SRDC funding for a HBM double disc opener billet planter and three-row bed former.

This type of planter can plant through weed stubble or trash, meaning that fewer cultivations are needed before planting. Weed pressure is reduced due to less soil disturbance and soil health is improved.

The Morris brothers have high expectations of the group's custom-built three-row bed former that can be adjusted for beds at 1.6 m to 2 m spacings. The impressive hydraulically folding unit produces a low, flat mound and can work in trashier conditions. ■

# **GROWER GROUP CASE STUDY ON NEW FARMING PRACTICES IN THE HERBERT**

By

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**KEYWORDS:** grower group, farming system, legume, controlled traffic, GPS, economics

# **CASE STUDY ON ECONOMICS OF TWO PLANTING SYSTEMS IN THE HERBERT RIVER DISTRICT**

By

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