2007

SRDC Grower Group Innovation Project
final report Improved harvesting efficiency in farming systems

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SRDC Grower Group Innovation Project

Final Report

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Project title: Harvesting Efficiency in Farming Systems

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This project was conducted by Tabone Harvesting Group 131 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.

Funding Statement:

The Tabone Harvesting Group 131 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.
**Executive Summary:**

The aim of the project was to achieve more efficient harvesting within our group. We monitored the harvesting effort for each paddock to determine the levels of paddock efficiency and increase awareness of the results. A summary of the group results for both seasons is presented below in Figure No1.

The results from two seasons are as different as the weather conditions during the growing and the harvest. It can be noted the through put during both years in both crop configurations is less in the 2006 season. The 2006 season had a damp start and a very wet middle and a dry end (thank goodness) As a result, more engine hours per ton were required to harvest the crop. Wet field conditions and lower bin weights, equates to more trips for the haul outs realising a small increase in fuel consumption. The work efficiency is the relationship between total engine hours and total elevator hours expressed as a percentage. The elevator was running 5% longer while harvesting twin rows in 2006 which indicates a slower forward speed during cutting.

To reward on farm efficiency, a new payment system needed to be formulated to achieve a harvester price differential. The payment system most widely accepted is the hourly rate as can be monitored easily and ratified by the growers. The growers would also get an instant benefit from any on farm improvements they made such as pipe crossings making hauls shorter and haul road improvements. Also, conditions change each year which makes it difficult to adopt any other formula which would be as indicative or relative to each situation. The results of both years are summarised below to demonstrate how much per hour each grower is currently paying at the current tons per engine hour average value.

![Figure No 1](image-url)
The foreseen problem with going to an hourly rate is that the harvester crew might tend to go slow to increase the working hours spent, therefore increasing their pay. It is important to mention that under the current system, harvesters are accused of going too fast causing significant stool damage and instructed to slow down. However, the results indicate that the harvester operator is already going steady, driving to the field conditions.

There doesn’t appear to be a perfect system as each has pit fulls however by including some safety nets on the upper and lower limits of a payment system some reassurance can be given for both the harvester and farmers. The concept provides for a price per ton range between $6.00 and $8.00. The idea discussed is to run with an hourly rate and reference it back to the tonnes per engine hour to verify the cost per ton. Providing the hourly rate falls within that range, all is well, otherwise the floor and ceiling determines the minimum and maximum limits.

The group is undecided on which payment method will be adopted and more discussions and conversations are required. The growers who have the longest hauls and lower pour rates are not keen to change the payment system from the per ton rate. However the farmers who have better than average conditions realise they are subsidising the farms that are below average conditions. Understandably there is potential for confrontation within the group if a change is forced yet, the prior information collected over time will provide evidence that supports the decisions made or no new direction can be undertaken.

A summary of the growers opinions expressed during the project are dot pointed below.

- I see no need to change the payment system because other industry service providers such as aerial spraying and contract planting have a fixed price and don’t consider farm layouts.
- The out comes from this project are likely to pitch grower against grower.
- We should try to become more efficient, anything that saves time saves money.
- I think farm performances will equalise over the longer term with different seasons.
- I look forward to an hourly rate. Bring it on.
- A two in one harvester front is more suited to our farm equipment and business set up.
- It is great for growers to see how their farm compares against others. It can be a wake up call to improve and compete.

To measure harvesting efficiency in farming systems, some new system needed to be implemented for comparison. We decided to use a system that adopts controlled traffic principles and wider swath harvesting simultaneously. Current harvesting equipment operates on 1.9 metre centres and newer machines will most likely be wider. It will take at least 5 years to change the farm over to the new system, therefore, the system we adopted uses 2metre centres. This system accommodates the current wheel tracking centres and allows for future growth. It also is more compatible with the standard elevator length when haul outs move one drill closer to the harvester when cutting. Changing to a 2metre system necessitates the use of multiple rows to improve the crop canopy and maintain yields.

Considering the results achieved from multi-row trials, dual rows perform just as good and require less seed cane to establish than other multi-row configurations. The new system would need to be harvested with a standard harvester configuration to avoid expensive modification and then risk reducing the performance of the harvester in the single row crops. All things considered, we believe dual rows at 600mm apart on a 2metre raised bed would be the system to pursue and compare against the industry standard. The benefits of the new system are clear when harvesting short rows and poorer yielding crops. Good yielding crops in single rows with long row lengths compare well against dual rows in the same circumstances.
Background:
The focus of the project is rising costs for the harvester and very limited capacity for the growers to accept a harvesting charge price increase. Rising costs, particularly fuel is seriously impacting on how we do business. The project set out to demonstrate how whole of systems changes can reduce costs in the field.

Aims:
The project seeks to achieve;

- **More efficient harvesting** – will allow us to contain the harvesting costs and keep the harvester price at a minimum. Farms with efficient harvesting conditions will be rewarded in the longer term by changing the harvester pricing structure.

- **Monitoring of harvester and paddock expenses.** Efficient harvesting conditions needed to be identified and demonstrated to the growers. Through monitoring the hours spent harvesting the various paddocks and allocating the tonnes as per the ticket book, we can record the fuel used when refuelling at the days end. The fuel used should be reflected by the machinery operating hours. Every paddock and every day the harvester is operating, we recorded the following parameters,
  - The hours spent harvesting via the harvester hour meter.
  - The fuel consumed by each machine (harvester and 3 haulouts)
  - The bins filled from each paddock to record the tonnes.
  - Other – any particular event abnormal to the day – interrupted arrival of haulouts, irregular supply of bins, breakdowns etc.

Testing a different harvesting payment system. At the season’s end, all the information from every grower (farm and paddock) is correlated and the tonnes are allocated as per the farm field sheets from the mill and cross-referenced by the field tickets. Using an excel spreadsheet format, a formula is determined to achieve the same gross turnover of the harvester business in an average year, but allowing for parameters such as tonnes, hours, and fuel consumed. The hours parameter will reflect the costs associated with time; eg. Wages and on costs. The tonne parameter will reflect expenses associated with throughput. The repairs such as knives and blades and other maintenance items (not service items) reflect wear and tare. The new payment system will identify harvesting efficiency in paddocks. Once a formula has been designed it will be benchmarked the following season and “dummy invoices” will be generated for each grower’s paddock after each harvesting round.

Ground proofing the controlled traffic benefits. There has been much research into the controlled traffic principle over time. This project offers the opportunity for our grower group to assess the system for themselves on their own farms.

Commence the transition to a new twin-row (dual-row) 2 metre farming system. There is an additional cost in establishment of the new system and the project aims to reduce the costs through reimbursement to the growers involved so as there is no additional out of pocket establishment expenses. The project also aims to encourage full group participation from each grower in the harvester group and has identified the following advantages of the new system to be ground proofed.

- Less ground driven on – reduced soil compaction
- 30% Less turning around - increased effective working time
- Increased harvester efficiency – ability to contain costs.
- Compatible with some existing farm equipment
- Planted on a pre-mounded bed – uniform mound = better ground job
- Better water use efficiency
- Less stool damage = older, more productive ratoons, less planting costs per annum
- Better soil health – quality assurance, environmental benefits
- Lower cost of production – Increased efficiency
• Less reliance on chemicals and applications
• Better turning circle on modern 4wd tractors- suits standard machines.
• Compatible track width to modern machinery
• Potential increase in yield
• More sustainable and compatible with other row crops.

Comparing harvester and farmer efficiencies (between the industry standard and the 2-metre system.) The growers will be able to compare the harvest costs of both systems by comparing similar yields and similar paddocks against the “dummy invoice” for those paddocks. Recording the time spent cultivating/working and determining the number of turns per hectare will demonstrate on farm efficiencies. Comparisons between the two systems will determine the level of efficiency improvement. Table No.1 below best illustrates the comparisons made given a row length of 100 metres.

Table No.1 Comparing Farming Systems on a Hectare

<table>
<thead>
<tr>
<th>100 metre Rows</th>
<th>Row Width metres</th>
<th>Area in 100m</th>
<th>Number of Drills</th>
<th>Time turning / Hrs</th>
<th>Distance Travelled</th>
<th>Harvest time @ 7km/hr</th>
<th>Total Time Taken</th>
<th>Total Cost @ $365/Hr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry Standard</td>
<td>1.5</td>
<td>150</td>
<td>67</td>
<td>1.67</td>
<td>6667</td>
<td>0.83</td>
<td>2.50</td>
<td>$ 912.5</td>
</tr>
<tr>
<td>Dual Rows at 1.8mtrs</td>
<td>1.8</td>
<td>180</td>
<td>56</td>
<td>1.39</td>
<td>5556</td>
<td>0.69</td>
<td>2.08</td>
<td>$ 759.2</td>
</tr>
<tr>
<td>Twin Rows at 2 metres</td>
<td>2</td>
<td>200</td>
<td>50</td>
<td>1.25</td>
<td>5000</td>
<td>0.63</td>
<td>1.88</td>
<td>$ 686.2</td>
</tr>
</tbody>
</table>

The above graph considers a short row length in a Hectare field and the likely cost per hectare if the harvester charged at an hourly rate. Table No.2 below uses the same parameters except the row length is now 500 metres long.

Table No.2 Comparing Farming Systems on a Hectare – Long Rows.

<table>
<thead>
<tr>
<th>500 metre Rows</th>
<th>Row Width metres</th>
<th>Area in 500m</th>
<th>Number of Drills</th>
<th>Time turning / Hrs</th>
<th>Distance Travelled</th>
<th>Harvest time @ 7km/hr</th>
<th>Total Time Taken</th>
<th>Total Cost @ $365/Hr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry Standard</td>
<td>1.5</td>
<td>750</td>
<td>13</td>
<td>0.33</td>
<td>6667</td>
<td>0.95</td>
<td>1.29</td>
<td>470.85</td>
</tr>
<tr>
<td>Dual Rows at 6 foot</td>
<td>1.8</td>
<td>900</td>
<td>11</td>
<td>0.28</td>
<td>5556</td>
<td>0.79</td>
<td>1.07</td>
<td>390.55</td>
</tr>
<tr>
<td>Twin Rows at 2 metres</td>
<td>2</td>
<td>1000</td>
<td>10</td>
<td>0.25</td>
<td>5000</td>
<td>0.71</td>
<td>0.96</td>
<td>350.4</td>
</tr>
</tbody>
</table>
The economic benefits will be
The new system will demonstrate cost savings to the harvester. The farmer will realise a significant saving when the harvester payment system changes, however until then the savings realised over the short term are minimal. The costs of farming the new system compared to the industry standard are illustrated in table No3 below.

<table>
<thead>
<tr>
<th>Process Discription</th>
<th>Particulars</th>
<th>Number of applications</th>
<th>Hectare Cost per Application</th>
<th>Single Row Costs</th>
<th>Number of applications</th>
<th>Twin Row Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Removing stools preparing the fallow.</td>
<td>Discing</td>
<td>3</td>
<td>50</td>
<td>150</td>
<td>3</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>Ripping</td>
<td>1</td>
<td>100</td>
<td>100</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Ploughing</td>
<td>1</td>
<td>100</td>
<td>100</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Bed Forming</td>
<td>100</td>
<td>0</td>
<td>2</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>Preparing for Crop Establishment</td>
<td>Spraying out</td>
<td>1</td>
<td>50</td>
<td>50</td>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Discing</td>
<td>3</td>
<td>50</td>
<td>150</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Ripping</td>
<td>1</td>
<td>100</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Hoeing</td>
<td>1</td>
<td>120</td>
<td>120</td>
<td>2</td>
<td>240</td>
</tr>
<tr>
<td></td>
<td>Line marking</td>
<td>1</td>
<td>30</td>
<td>30</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Planting Cane</td>
<td>1</td>
<td>120</td>
<td>120</td>
<td>1</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>Fungicide / chem</td>
<td>1</td>
<td>20</td>
<td>20</td>
<td>1.2</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Seed cane</td>
<td>2.5</td>
<td>30</td>
<td>75</td>
<td>4</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>Herbicide control</td>
<td>1</td>
<td>50</td>
<td>50</td>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>Cultivating plantcane</td>
<td>cut away discs</td>
<td>1</td>
<td>75</td>
<td>75</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>weeder</td>
<td>2</td>
<td>35</td>
<td>70</td>
<td>2</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>centre busting</td>
<td>1</td>
<td>70</td>
<td>70</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>fertilizing / grubing</td>
<td>1</td>
<td>150</td>
<td>150</td>
<td>1</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>filling in</td>
<td>1</td>
<td>70</td>
<td>70</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>pre emerge spray</td>
<td>1</td>
<td>65</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>aerial spraying</td>
<td>1</td>
<td>35</td>
<td>35</td>
<td>1</td>
<td>35</td>
</tr>
<tr>
<td>Totals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$1,535.00</td>
<td></td>
<td></td>
<td>$1,439.00</td>
<td></td>
</tr>
</tbody>
</table>

There are theoretical cost savings over the longer term which needs to be verified or that may or may not become reality. The wider row width means less rows per hectare and less turning around, however most growers are already set up to service multiple single rows in the one pass which has a similar outcome. The controlled traffic principles do help manage adverse weather and therefore help stabilise the roller-coaster ride of variable productivity, yet there are other natural disasters which could over-ride and disguise the controlled traffic advantages. Things like cane grubs, rust, smut and floods adversely effect productivity and require replanting as a remedy. There are no guarantees that the new system will perform better than the current industry standard in any of those circumstances and this is why growers are reluctant to try it. Over the longer term it is expected soil health will improve and a yield increase would be realised and therefore lift total production. The project has also signalled to the grower which paddocks and conditions are costing him more to harvest and eventually reward growers who make farm layout and workability improvements.
• The environmental benefits will be
Our harvesting group consists generally of lowland areas, which I believe would benefit for planting in a mound/ bed profile. This would reduce the risk of water logging and soil putrefaction, encourage the crop to grow in wet conditions thus consuming the fertiliser rather than loosing it through run off. Reducing operating time reduces fuel consumption, which is a benefit to the environment. The new system has a higher plant population per hectare, which would consume more water allowing vacancies in the soil profile for addition water rather than running off. The new system also promotes the crop to canopy much earlier, shading out competition weeds and reducing the need to apply herbicide chemicals.

• The social benefits will be
Better interaction and sharing of knowledge between growers and the machinery operators. There is currently 1 harvesting contractor and 5 farming families in our harvesting group, farming approximately 400 hectares. These growers are all looking for ways to make a living from farming and are willing to participate in the project provided they are not subjected to additional costs. The cost pressures applied to the industry often cause different points of view between the growing and harvesting sectors. We hope this project will create a better working relationship between the growers and the machinery contractor as both need each other to be viable and profitable. This project will surely be the catalyst for other harvester groups to adopt a farming system that rewards efficiency.

Methodology:
This project was born based on a need for our group to have a serious look a becoming more efficient. Our harvest group is known for the number of deep drains running through the farms and the consequential shorter drills. We identified that adoption of the new system would remove about 30% of the short drills. The benefits of fewer short drills was identified by the harvester crew as they moved from farm to farm and made some comparisons. Good harvesting conditions were easily recognised and the need to make tangible measurement of those conditions in some way that would reward and encourage growers to make on farm improvements was also identified.

We began measuring different parameters for each harvest day such as
- fuel usage,
- engine hours
- elevator hours
- bin weights
- through put
- lost time
- and special circumstances of the day such as servicing, breakdowns, bin delays.

In year one, the harvester crew manually recorded the information from all the machinery gauges and the meter on the fuel tanker, onto a printed data sheet. This ensured all the information was captured into the right columns and made further processing easier. This information was then collated into a excel spreadsheet to derive 3 harvesting efficiency parameters. Namely;
- Harvester throughput per hour
- Machine efficiency – comparing the % of time the elevator was on.
- Fuel usage per ton.

Each grower was then given the results of his farm blocks and the total seasonal averages for his farm. We discussed the results with each grower individually so as they understood the terminology and how his farm compared to the others in the group.
In the second year, we installed a data logger in the harvester, which automatically logged the information. The information collected was downloaded onto a pocket computer and uploaded to the home PC which had the required software installed to make detailed reports from that raw data. As the bin weights and other rake information became available, those were manually entered into the HELP program on the home PC.
The information collected by the data logger is more detailed and precise than what was achieved manually in the first year. It was able to collect all the same information plus much more detail. This was a problem as the reports for each year were different and it was confusing to make cross comparisons from each year. The reports from the data logger system were reconfigured so as meaningful comparisons could be made with year one. The information collected is illustrated in Charts 9 & 10 later in the report.

The two catalysts for us having a go were, having control of the harvester business and the desire to change our own farming system. At first, we understood there would be significant cost in modifying the harvester and couldn’t justify the cost based on our own small tonnage. Therefore we sort to provide an opportunity for the other growers in our group to assess the new system on their own farms. In a proactive way, Tabone Harvesting took the opportunity to obtain funding to initiate significant change within the harvester group.

Results and Outputs:

We modified the harvester fronts to be adjustable to suit both single row and twin – row configurations. Once the season commenced, no adjustment was necessary when moving between the different configurations. Picture No1 displays the harvester fronts in the current wide position and Picture No2 shows some of the mechanics behind the scenes which makes it all work.

During the 2 year term, we have been experimenting with single row equipment which has been modified to suit twin rows. Some equipment required surprisingly little modification and while not the flashiest, proved it could be done. The single row cutaway and scratcher set up was duplicated to suit dual rows as shown in picture 3. The fertiliser box in picture 4 required the main drive shaft to be extended, a recalibration and tynes repositioned otherwise it remained standard.
Bedforming equipment needs more development as we currently form one bed at a time which makes the job expensive. We have tried different cutting edge designs (the most recent shown in picture 5) which bolt on to a standard Ripper foot and manufactured a concave crumble roller as shown in picture 6.

We tried to do ripping and bed forming in the one pass with limited success by attaching 3 ripper legs to the main frame. The ripping process requires a slow ground speed whilst the bed forming process requires a much faster ground speed. Therefore the two processes are not really compatible and required multiple passes to achieve the desired outcome. It is just as easy if not better to rip the bed area prior to forming the beds up. Picture 7 shows the bed former/ripper and picture 8 shows the bed ripped and formed.
**Capacity Building:**

The level of understanding about what is involved to do research properly has been raised a few notches. Essentially we see ourselves as farmers and not researchers as per say and operate with a hands on and practical understanding about our farming system. Putting that knowledge into a written report that captures the interest of the reader and illustrates the infield findings accurately has proven to be very challenging.

**Outcomes:**

The results recorded from the harvester data logger during the 2006 season were unexpected and contradictory to the first year’s findings. The results recorded in the single row were very similar to the results recorded in the dual row system when comparing efficiency and throughput. There are a number of considerations which are explained below and will be rectified in the future.

**Operator Experience.**

Harvesting dual rows is very different to harvesting single rows as it is much easier to go off course or leave “snakes” behind due to an incorrect base cutter height. As a consequence the concentration of the operator is significantly more than what he is used too in single rows. For much of the time the harvester is not operating at its full capacity because the operator is not comfortable travelling at a faster speed and is trying to achieve a satisfactory ground job.

**Haulout Capacity & Capability.**

When conditions are ideal and the harvester does manage a higher throughput, the advantage is lost because the haulout units can no longer keep up as indicated below in the Twin Row Results, chart No9. The haulout units are also in a different position in relation to the harvester whilst harvesting duals and are more likely to drive off course encouraging the harvester to also go off course.

**Crop Yields**

During the 2006 season, the yields achieved in dual row were comparable to those of single row. There has not been a noticeable change in crop yields thus far which has also contributed to the 2006 results. When comparing 2006 farm yield averages across the group, two farms that are committed to
single rows recorded a higher average crop yield than the twin row blocks. This result could be attributed to time of harvest the previous year and the subsequent seasonal conditions. There is also a significant difference in the soil type and quality of the single row farms and dual row farms which should be considered. As the planter undergoes further modification, the crop establishment should improve which should lift the plant cane production next time as well the improved soil health from using a whole new farming system.

For growers to get the full benefit from the new system, we need to embrace precision agriculture and install more technology into the harvester cabin. We believe technology such as auto steer, auto base cutter height control and forward speed optimisation will be a huge benefit in realising the potential of the new farming system. The area harvested to date has not been planted using GPS guidance and therefore a significant row variation has been noticed. New area planted to twin rows is now established using GPS guidance which will be a step forward for the harvesting operation. Yield monitors and variable speed fertilizer applicators will also be essential in managing production costs and the environment. It is envisaged this equipment will also reduce the infield crop variations and improve paddock yields.

The harvester charge price system will also need to change as costs escalate and harvester contractors become service providers. A hourly rate system is most likely to be implemented in the coming harvest season which reflects costs and allows for additional technology to be installed providing more services.

Two of the six growers involved in the group are committed to changing their farming system with a futuristic and proactive attitude. This is because the harvester payment system has not yet changed and the benefits of controlled traffic are not yet realised. It could take another 7 years before the advantages of controlled traffic principles are practically realised and another 2 years before the growers are comfortable with changing the harvester payment system. As every year passes, more data is collected and hopefully trends will be identified. It seems the outcome from year to year can vary as much as the crop size, with field conditions at the time of harvest underpinning the results. Everyone in the group acknowledges that a variable harvester charge price will need to be implemented at some point in the future. When this happens, the growers who have started to change their system over now will be in a more favourable position than those who have not.
As chart No9 demonstrates, there were 7 blocks that the harvester throughput was outstanding indicated in italic and underlining. The paddock plus and minus columns indicates the difference in paddock rates achieved if there was no waiting for haulouts. The greater difference indicates the advantage of running an extra haulout. The amounts highlighted in bold indicate occasions where an extra haulout would have been beneficial but was unavailable. Although there were moments of excellence, the average result of the twin rows is not very exciting as indicated across the bottom line. It is imagined that once the new technology is installed in the harvester the results will be different. To compare, the average result of all farms (mostly single row) in the group is summarised in Chart 10 below.
The above tables indicate a strong correlation between fuel per ton and the pour rate. This is because there is little change in fuel consumption per hour (not indicated) for the harvester. The haulout fuel usage creates a more significant fuel consumption differential from farm to farm as illustrated in Table 11 below.

**A Summary of Haulout Operator Records 2006**

**Table 11**

<table>
<thead>
<tr>
<th>Grower</th>
<th>Hours at Work</th>
<th>Bins / hour</th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>Harv. fuel</th>
<th>Total fuel</th>
<th>Hours worked</th>
<th>Time lost</th>
<th>Fuel tonne</th>
<th>Fuel / Bin</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>101.20</td>
<td>16.17</td>
<td>929</td>
<td>831</td>
<td>256</td>
<td>4835.9</td>
<td>6851.9</td>
<td>97.45</td>
<td>3.75</td>
<td>1.22</td>
<td>4.35</td>
</tr>
<tr>
<td>B</td>
<td>242.8</td>
<td>14.08</td>
<td>2390</td>
<td>1762</td>
<td>636</td>
<td>12758.5</td>
<td>17546.5</td>
<td>223.55</td>
<td>19.25</td>
<td>1.54</td>
<td>5.57</td>
</tr>
<tr>
<td>C</td>
<td>85.8</td>
<td>11.81</td>
<td>945</td>
<td>776</td>
<td>516</td>
<td>4511.1</td>
<td>6748.1</td>
<td>82.8</td>
<td>4</td>
<td>1.92</td>
<td>6.90</td>
</tr>
<tr>
<td>D</td>
<td>108.75</td>
<td>13.17</td>
<td>968</td>
<td>821</td>
<td>0</td>
<td>6575.7</td>
<td>8364.7</td>
<td>100.1</td>
<td>8.65</td>
<td>1.72</td>
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</tr>
<tr>
<td>E</td>
<td>186.75</td>
<td>13.67</td>
<td>1556</td>
<td>1320</td>
<td>470</td>
<td>9406.2</td>
<td>12752.2</td>
<td>146.15</td>
<td>40.6</td>
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</tr>
<tr>
<td>F</td>
<td>158.9</td>
<td>16.50</td>
<td>1316</td>
<td>1095</td>
<td>277</td>
<td>9425.6</td>
<td>12113.6</td>
<td>136.65</td>
<td>22.25</td>
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<tr>
<td>TOTALS</td>
<td>884.2</td>
<td>14.33</td>
<td>8104</td>
<td>6605</td>
<td>2155</td>
<td>47513.0</td>
<td>64377.0</td>
<td>786.7</td>
<td>97.5</td>
<td>1.56</td>
<td>5.71</td>
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</table>
The fuel consumption per tonne for the 2006 season was 1.56 litres per tonne. In comparison the previous years consumption was 1.33 litres per tonne. This could be explained by the adverse harvesting weather experienced in 2006 and other differences in the two crops. The other consideration is the fuel was recorded manually in the first year and the data logger was used during the second year producing more precise numbers. There is also reports of changes in the quality of the diesel fuel which need to be verified. Because one grower has two farms, there is one less grower illustrated on the chart as his data was combined.

**Environmental Impact:**
Making the growers aware of fuel consumption / tonne of cane and rewarding those who can make reductions in that fuel consumption has benefits for them and the environment. Moving to a controlled traffic system will over time improve soil health as demonstrated in other industries and reduce the inputs to grow a crop. Improving the drainage in the field by bedding up will reduce the water logging of the growing zone, reduce the anaerobic bacteria in the soil and promote crop growth which will utilise the applied fertilizer inputs. Caution should be exercised as bedding up too high may cause soil erosion during extreme weather events or encourage the soil to dry out during prolonged dry spells.

**Communication and Adoption of Outputs:**
During the term of the project there have been a number of advertisements communicating the projects existence and some of the findings at that time. As with all SRDC funded projects, the SRDC website has references to the project and the Canegrowers magazine has communicated the project also. Locally, the newspaper(Herbert River Express) has run a few articles on the project findings and have shown interest in following up after the final report is completed.

I was invited to present the project findings from year one at the Give Day organised in the Burdekin. The SRDC logo was always advertised in any presentation I conducted and references were made so as everyone was aware of the involvement of SRDC.

About 40 interest people attended the Open Day held in November 2006 on our farm. It was a great success as I made the commitment to present on the good, the bad and the ugly. Farmers commented that it was very good to have concepts explained at the house and then go down the farm and see some real life examples. Below are some of the communications and photo’s of the open day which was well received.
Below, Brian Tabone explaining the benchmarking trial planted in 2003.

A section of the crowd who attended the Open day.

Discussions about bed forming and fallow management

Real life examples of stool damage from traffic crossing the beds.
Some comments from growers on the day.

✓ I see a lot of time and thought has been put into it and the benefits are now showing – D. Duffy

✓ Good tour, need more of them – S. Fighera, Bambaroo

✓ Very good! Stick with it.- A.Pace, Rollingstone

✓ I also see a lot of R&D has been put into the new farming methods and it’s the future of cane growing in Australia. I hope we can follow in the same footsteps. Thanks for letting us look and learn. M.Porta  Burnside.

✓ This is the way for future farming. – S.Lamari

✓ Very informative. Well done. - A. Girgenti

✓ A lot of work into a good presentation. - R. Durso, Stone River

✓ Thanks for sharing info. – W.Tento.
Recommendations

In my opinion the results of the two year project are inconclusive and we intend to keep recording data into the future to monitor changes in crop efficiency and harvester performance. This is necessary to determine trends as each year presents different challenges to the previous one. The two year term hasn’t allowed recording of same blocks under single row and then twin rows because in year one the blocks were fallow and planted and not harvested until the following year. Our intentions and recommendations are dot pointed below.

1. We intend to maintain records indefinitely to allow trends to develop. I recommend that every harvester business owner undertake some form of measuring costs and efficiency so as the industry can improve its performance as a whole and begin to make informed business decisions. We will continue to pursue significant reform in how the harvester gets paid so as efficiency can be rewarded.

2. Although the average results from the second year were not encouraging, we will continue to change our farm over to twin-rows. This is because we believe that the whole of system changes will demonstrate a benefit in the medium or longer term. The system changes I refer to start with proper fallow management and promote soil health. Growing a break crop in rotation to cane so as the soil has time to recuperate. Controlling traffic in the paddock to reduce the soil compaction by using GPS technology and matching row widths to wheel tracks.

3. We recommend the use of GPS guidance from planting will ensure row uniformity and is the pre-cursor to auto steering of the harvester and greater harvester efficiencies. Only the new farming system can accommodate all of these concepts which would make it superior to the current industry standard. From this foundation more technology can be added.

4. We are planning to install automatic base cutter and forward speed controllers to reduce the concentration of the harvester operator. This technology coupled with auto steering will help us provide effective and efficient harvesting of all crop configurations. This technology will also help us combat the skill shortage in the future as we wouldn’t require an experienced operator to do the best job because the harvester basically operates itself. We would only require a driver who has some computer skills, such as those that matches the school leaver’s profile.

5. Finally, I would like to recommend that farmers wanting to change their farming system ensure that a standard harvester will have the ability to harvest that configuration effectively. This is because during the change over period at least, there will be more single row to harvest than duals and an extended lag time to recoup modification costs. Harvester owners need to understand that a standard machine harvests single row effectively, however any modifications made may compromise that effectiveness. Even if the modifications haven’t compromised the effectiveness, other group members may perceive it to be so and have reason to abandon the group. For these reasons, I recommend that dual rows be planted no wider than 600mm apart on a 2 meter raised bed.

Publications: The following documents can be found as attachments to this file.

- A copy of the power point slideshow presented at the Give day in February 2006
- A copy of the power point slideshow presented at the Farm Visit afternoon in November.
- The newspaper story published on the 14 November 2006 in the Herbert River Express.