SRDC Research Project
Final Report

Cover Page:

Title of the Project: Benchmarking harvest group practices in the Burdekin

Project Reference Number: **CSR033**

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The Research Organisation 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.

A statement of confidentiality:

The study will collect data from individual harvest groups that may or may not be comfortable with widespread publication of their performance. The results of the study will have to be presented to the industry in such a way as to protect the anonymity of the participants. In addition, the software developed will remain the property of the developer.

Any financial data collected from the groups to be used in the Harvest Haul Model is to be treated as confidential and will not be distributed in this report.

Executive Summary

This project was initiated due to a lack of information available to harvesting groups as to whether their operation was economically comparable to other harvesting groups in the Burdekin and if their current practices were economically sustainable. To do this, the project was designed to create a benchmarking system to enable harvest groups to compare harvester performance by:

- Establishing a low cost, reliable harvester reporting system which captures field conditions
- Generate reports showing harvester performance
- Enable harvest groups to compare different operating practices due to farming systems and model the cost associated to those practices
- Determine the impacts of different group configurations on profitability.

As this was a R&D project, it began by investigating the different technologies available to establish a benchmarking system. Looking at existing industry practices, it was observed that milling companies had invested in hardware and software to conduct harvester tracking operations to assist in cane allocation. These systems are comprised of Mobile Tracking and Data (MTD) Dats 3022 (3022) which uses Telemetry (Telstra CDMA Network) to transfer data and GPS position back to a central database. Due to the fact that a lot of the infrastructure was already in place, the project would build on this existing technology and develop it further to capture specific operating information. Each of the seven (7) harvesting groups in the Burdekin being; HCL Group, Sheep Station Creek Harvesting, Marano Harvesting, Mann Harvesting, Upper Haughton Harvesting, Agurie Harvesting and Stockham Harvesting had their harvesters fitted with a 3022 and a touch pad (5060) and one haulout was also fitted with a 3022

To facilitate the data collection process MTD developed software which enabled the operators to add inputs via the 5060. The data collected included headland spacing, paddock conditions, haul conditions as well breakdowns and stoppages encountered by the harvesting crew. AGTRIX Pty Ltd (AGTRIX) was engaged to provide the interpretation and reporting process for the data collected while Harvesting Solution Pty Ltd was engaged to model the data collected in the *Harvest Haul Model (HHM)* to provide the comparisons between the groups and their different harvesting practices and determine efficiencies and profitability. Social psychologist, Jeff Coutts, was engaged to interview the operators of the machinery, the owners of the machinery and the growers involved in the project to determine the social factors contributing to the current harvesting practices and what impact change may have on the people involved.

The project has achieved a number of significant outcomes which are beneficial to the sugar industry even though there were major set backs in the data collection process. Some of the achievements are:

- low cost and reliable data capture system for harvester using the MTD tracking system
- Automated reporting generation for harvester performance
- a better understanding of what social factors are restricting the adoption of changes to best harvesting practices (BHP)
- Better understandings of where the major costs are within the harvesting and hauling operation and what conditions contribute to those costs.
- Establishment of a low cost system to capture yield variation within a paddock
- Stimulated the adoption of yield data monitoring systems
- Stimulated the adoption of Precision Ag Projects such as the Burdekin Agricultural Technologies web site (B.A.T. Web)
- stimulated growers and contractors to look at their harvesting operations more closely to determine what practices and current methodology is restricting harvester performance and profitability
- The most substantial outcome is that participants showed enthusiasm and a willingness to embrace the data collection process and begin working to adopt change when it becomes continuous and reliable.

During the project there were some operating difficulties encountered which adversely affected the data collection process. In the context of the project these were seen as major limitations however, there has been beneficial information gathered on what can, can not and should not be done in the future. This includes:

- Ensure that any system to be employed into the field is robust and capable of withstanding the harvesting environment
- Be aware of inconvenience that entering data into a touch pad causes to operators
- The importance of having a spatial reference (GPS position) to all data collected
- Automate as much as possible to ensure data integrity

At the conclusion of the project there was still work to be done on the reports generated by the system and as with any new development there are always improvements to be made. The project has delivered a data collection process (without the touch pads) that is robust and fully automated that delivers growers and contractors harvester efficiency information which they can use to improve their harvesting operations. Product failure and the inability to link touch pad data to tracking data has not allowed the groups to capture paddock conditions to create a true picture of the harvesting conditions which has reduced the participant's ability to benchmark against each other.

Background

Benchmarking in the milling and growing sector has been viewed as the way to identify efficiency and performance indicators which lead to greater profitability. The SRDC review of the PROSPER/CPI programs recommended that the industry should adopt a greater benchmarking capability and currently there is no such tool/system in place to allow the harvesting sector to achieve this. There is a need for benchmarking and data collection to add credibility to industry models and increase revenue through the value chain. If it can be demonstrated through benchmarking that the adoption of HBP can benefit harvesters, growers and millers, this will lead to productivity increases throughout the value chain.

To ensure long term profitability, benchmarking operating parameters such as harvester performance and group structure will enable the industry to explore different harvest payment systems such as differential pricing. There has been an increase in pressure on harvester groups to reduce their harvesting costs and until this point there has been little information to assist in the pricing matrix. The drive for this project has come from the harvesting and growing sector and with support of CSR and BSES, will assist in building a greater working relationship between industry stakeholders. Demonstrating the costs associated with different farming systems and limitations on harvester performance will contribute to enhancing human capacity and partnerships by allowing better understanding of each sectors needs and issues.

Objectives:

To enable harvest groups throughout the Australian sugar industry to compare each other's performance on basis of:

a. where harvest groups can lower costs and increase efficiencies
b. the impact of group situation/conditions and modes of operation on profitability

It was established that the seven groups involved have a range of structures with 3 cooperatives, 3 grower contractors and an individual harvesting contractor. Three of the groups have purchased a new harvester this year, all being Cameco 3510 machines. The range of payment charged for harvesting is between $4.60 and $6.00 per tonne of cane, which may also reflect the amount of capital invested. This is based on a flat rate per tonne basis, with only two groups charging for extra fuel. A lack of labour may contribute to the variability of operator experience within the sugar industry particularly for the haul out operators. Most of the experienced personnel fill the position of harvester operators which may be explained by the higher wages paid to this position earning between $0.50 and $0.60 per tonne.
Another area that shows wide variability within this sample of harvesting groups is the number of farms harvested within each group. This ranged from harvesting 75 000 tonne off a single farm to 55000 tonnes off 16 farms. The group financial information collected was confidential and not presented to the working group nor is it presented in this document in detail however, it was used in the HHM to complete the financial benchmarking process. ***(See figure 14)***

Figure 1 and figure 2 show a graphical representation of time spent by a number of the participants. The collection of group structure and capital expenditure through the benchmarking process has identified for the project participants where profitability can be increased. An example of this is matching the number of haulouts to the size of the harvesting operation to reduce waiting periods and increase harvester efficiency. This can be clearly seen in the difference between Stockham Harvesting waiting time verus Sheep Station Creek Harvesting waiting time.

Figure 1: Stockham Harvesting- Time and Motion.

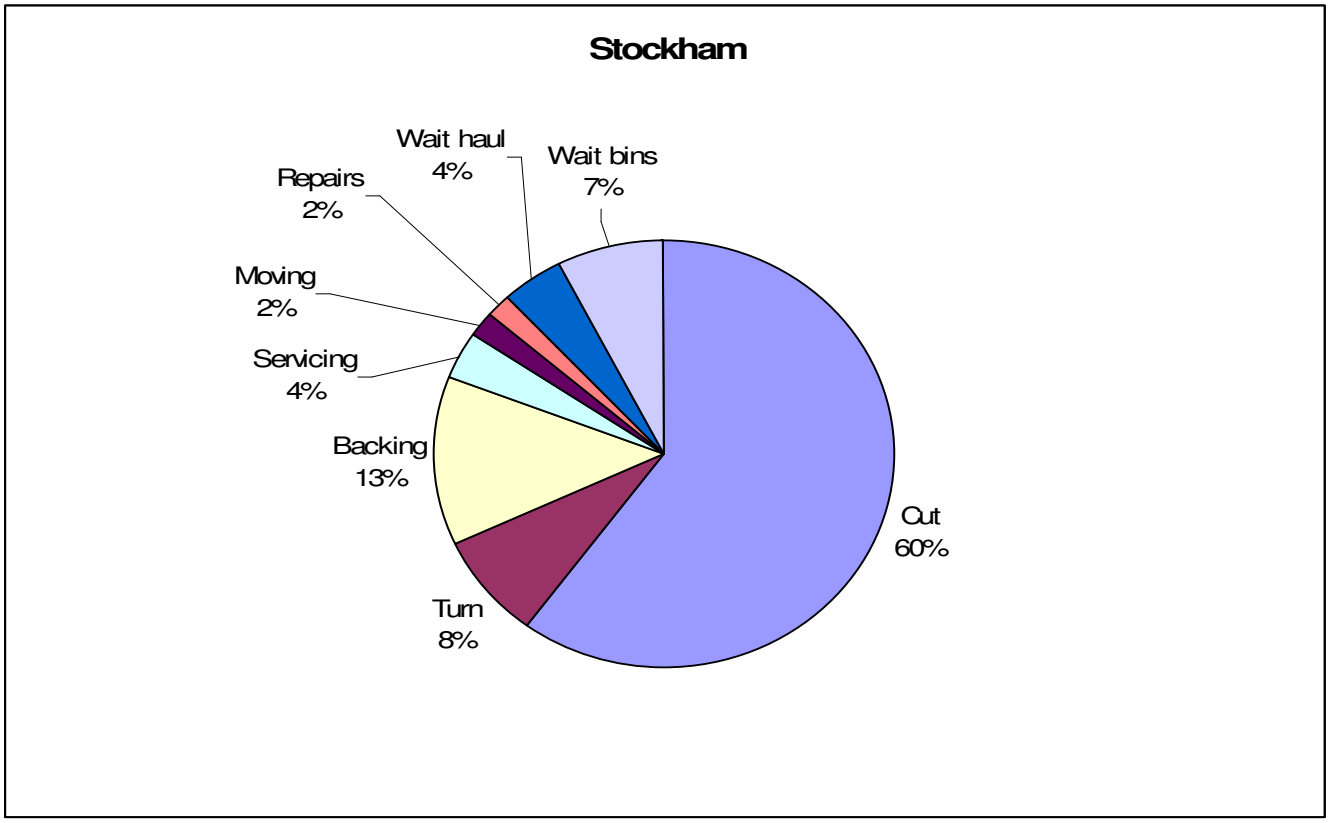
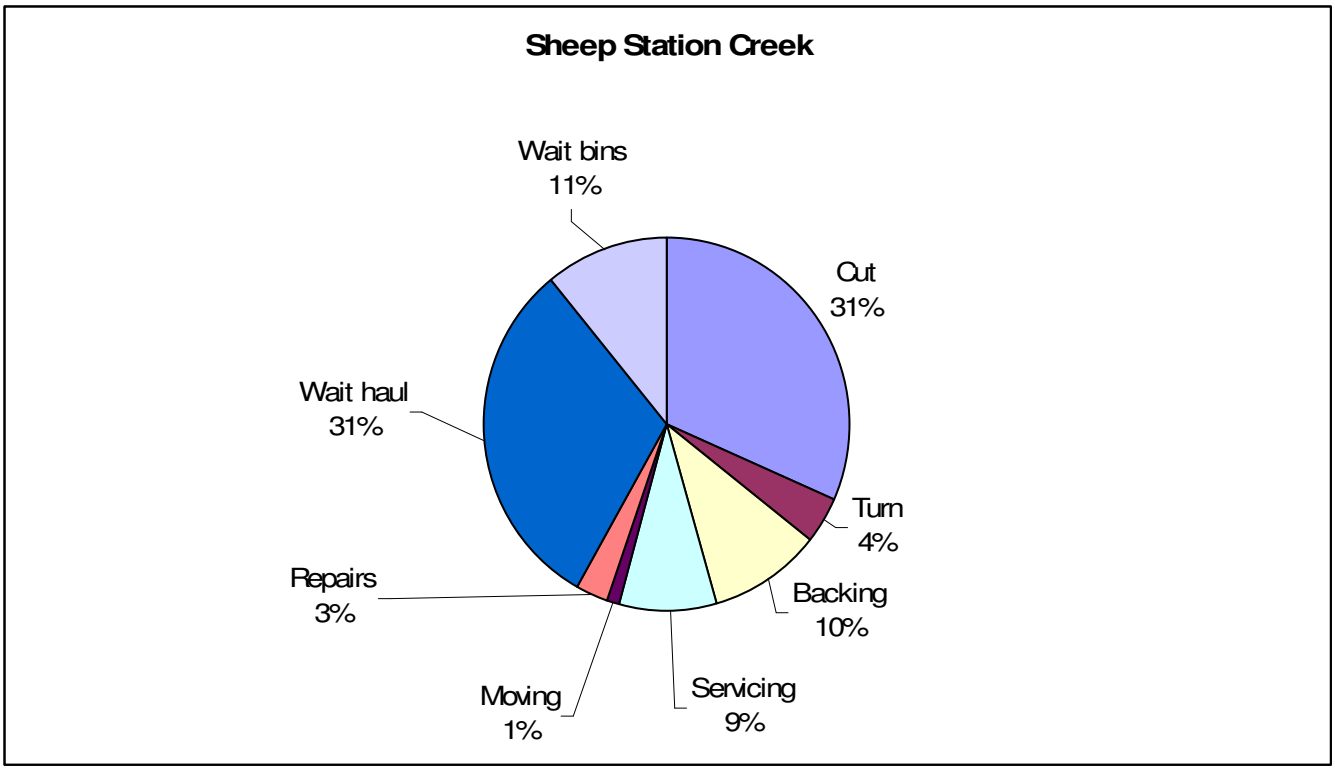
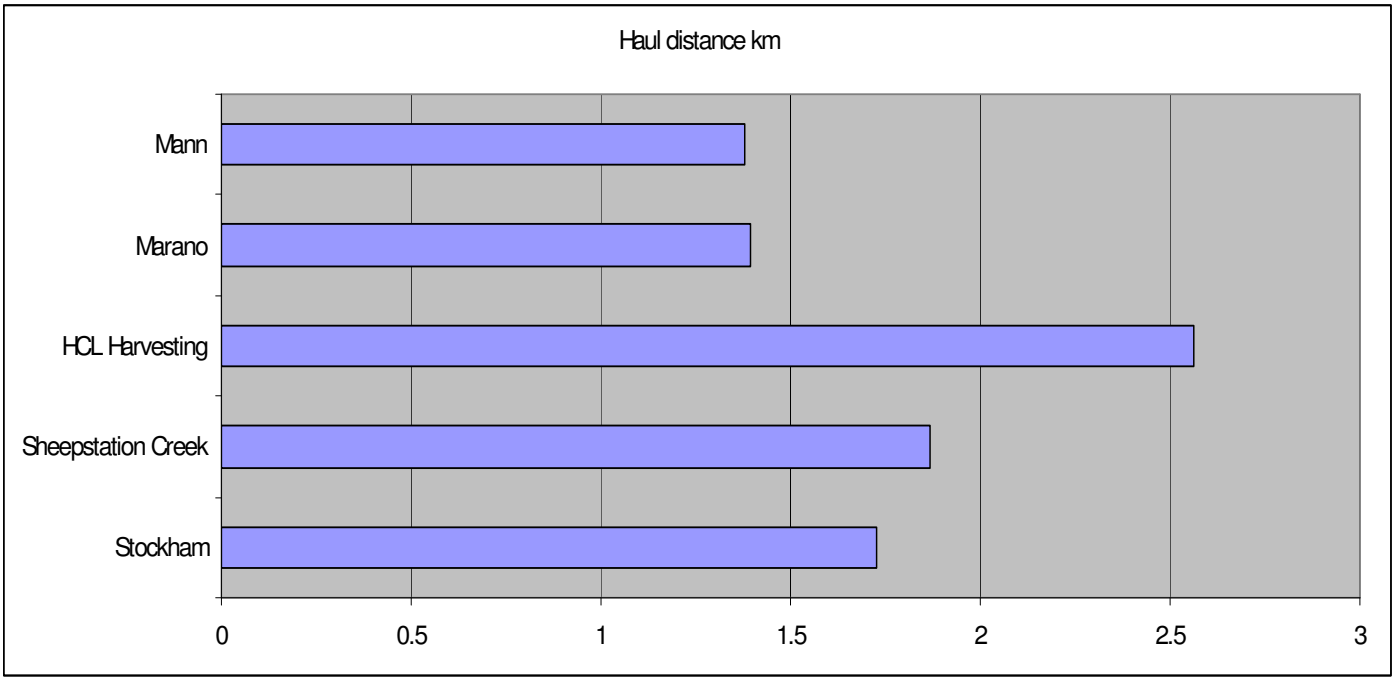


Figure 2: Sheep Station Creek Harvesting- Time and Motion



The HCL group were not able to deliver to the closet sidings at all times and this is clearly demonstrated in Figure 3 which shows the differences in travelled kilometres by the group compared to other participants. Although sometimes unavoidable, the groups have a greater awareness of the cost involved in not delivering cane to the closest drop off point

Figure 3- Group Haul Distances



Objective

a. **differences in the operational and cost performance of groups with different levels of adoption of recommended harvesting practices**
b. **the costs and efficiencies of harvesting different farming systems (different row spacings, green v burnt)**

The process of collecting the harvester cutting information from the tracking units allowed this project to establish what effect harvesting practices and farming system have on harvester performance. As an example, by examining the amount of one way cutting and row length, participants could see the difference in delivery rate that they were achieving.

Figure 4 shows a comparison between the project's participants amount of one-way cutting. The project was able to determine through the use of collected data that Sheep Station Creek had a higher percentage of one-way cutting compared to the other groups. As a result of this finding, Sheep Station Creek have modified their harvesting practice where possible to reduce this total. Cutting one-way is some times required when the crop is lodged along the drill to avoid both excessive cane loss and excessive stool damage. As cane lodging is a common occurrence in the Burdekin, all groups will have some degree of one-way cutting.

Figure 4: Group comparison of one-way cutting practises

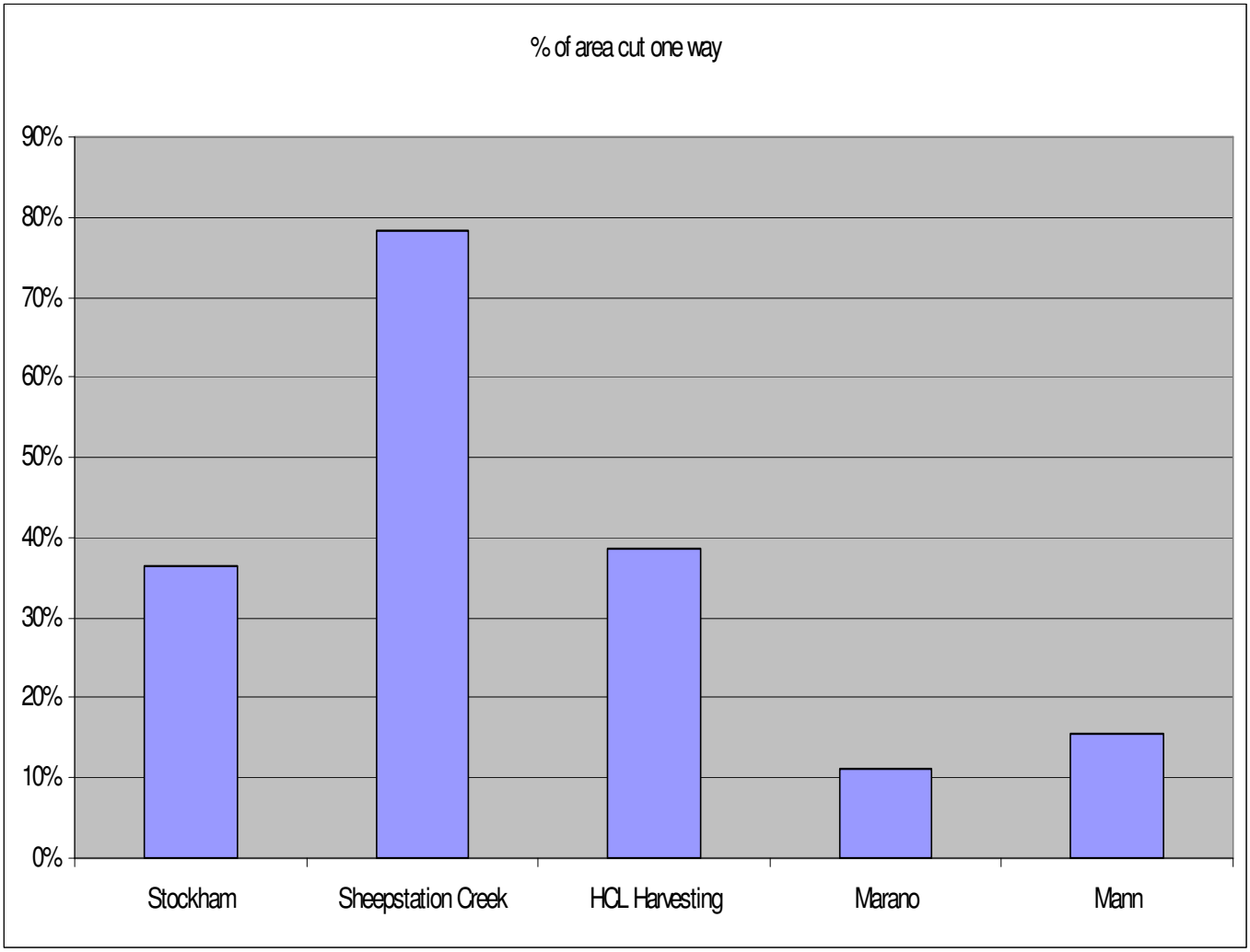
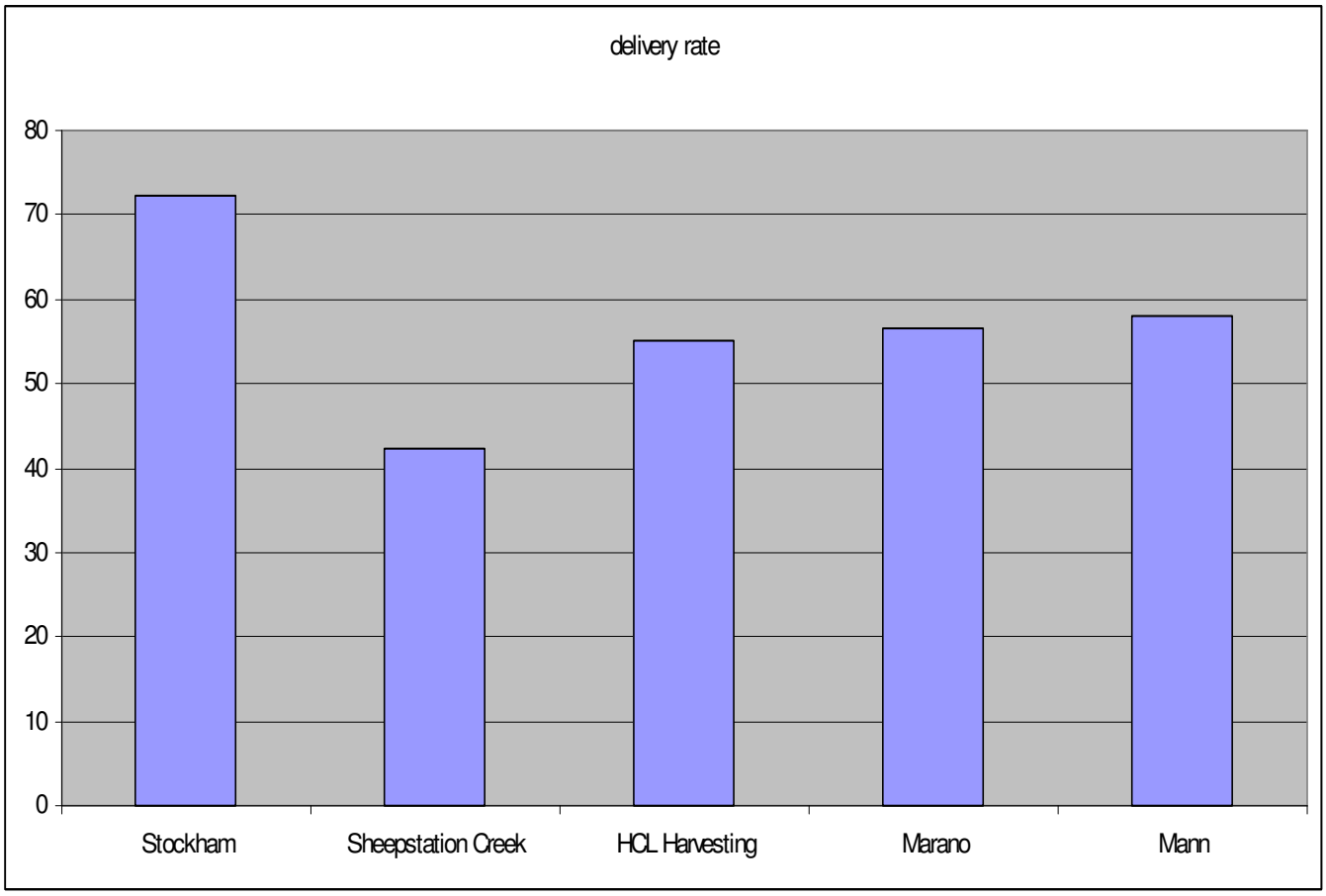


Figure 5 shows the affect of farming systems and farm layout on delivery rate of harvesting operations. Sheep Station Creek had by far the highest proportion of one-way cutting and the main reason for this was not cane lodging. Within the Sheep Station Creek contract there were a high proportion of farms where the headland was on a sharp angle to the cane rows which meant that turning the machine around was not possible. This of cause has an adverse affect on the delivery rate achieved by the machine which can be clearly seen.

Figure 5: Group comparison of harvester delivery rates



c. the benefits of HBP on ratoon performance

The benefits of HBP on ratoons performance was not achieved during this project. The time and resources required to conduct such an intense analysis of very complex variables which include not only the harvesting method but also climate, season length and crop variables made validating any ratoon performance unrealistic.

Objective
Information from the project will be used in conjunction with other related (SRDC funded projects) to derive information:

a. **to model how changes in harvest group structures and arrangements will impact on harvesting costs**
b. **to ground truth modelling of value chain integration options and**
c. **to ground truth harvesting cost models**

The information gathered from the Harvest Benchmarking Project which includes capital expenditure and operating costs will be used by the SRDC Project GGP0144 which "aims to have a way of optimising growing and harvesting operations in the Burdekin district that will be applicable across other districts and be used to reduce costs of operations". In order to achieve this, the HHM will be used to run "what if" scenarios to model the affects of change to group and business structure to establish any advantages prior to making any commitment.

Some of the outputs from GGP0144 are in appendix ***BKN Group Summary-HHM*** which is **confidential information and not to be published**.

Objective
Describe the key social factors affecting and likely to be affected by changes in harvesting arrangements to provide information on the possible social impacts from harvesting sector reform.

A number of growers, operators and contractors were interviewed one-on-one to establish what harvesting practice (or changes) impacted them. In order to promote and drive sector reform it was important to understand who would be resisting change. The project did establish that harvester representatives remained very keen to be able to benchmark data and to be able to compare farms within groups (and blocks) and with district averages. Impacts identified included: improved awareness of efficiencies by the harvesting crews; and some increased awareness by growers and openness to change harvesting procedures to increase productivity. The focus of the contractor/growers has changed from a more 'policing thinking' about monitoring harvester drivers to that of education and awareness raising.

Methodology:

Benchmarking is a concept that is widely used in many industries and in many sectors to allow comparison of an individual's or group/company's performance against others or against a baseline set by them selves. So far the concept has not been applied to the performance of cane harvesting groups. Work has been done on record keeping and the potential benefits harvester owners may derive from this, but a process is require to take record keeping a step further so it can be used to form comparisons against previous performance and the performance of other groups.

To achieve this:

- **A benchmarking system, suitable to the Australian sugar industry that will allow harvesting groups to compare performance across a range of conditions (e.g. different row spacings and haul distances) and**
- **Software and procedures that will enable standardised collection harvesting data**

This was the approach:

The projects first task was to establish a data collection process which would allow machinery owners to collect harvester and haulout information which could be used to evaluate efficiency. It was found that a number of sugar milling companies had implemented a telemetry (MTD 3022) based recording system to assist with cane allocation. Building on this existing technology fourteen (14) 3022 units were purchased as well as seven (7) 5060.

Each 3022 unit consists of:

- A fast acquisition GPS Module
- A Wavecom CDMA 1x Module
- A 16 bit powerful Microprocessor
- One (1) Serial Port
- Three (3) Digital Inputs
- Two (2) Digital Outputs
- GPS & GPRS Antenna
- 8 to 40 volt switch mode power supply
- firmware for the unit.

The 5060 unit consists of:

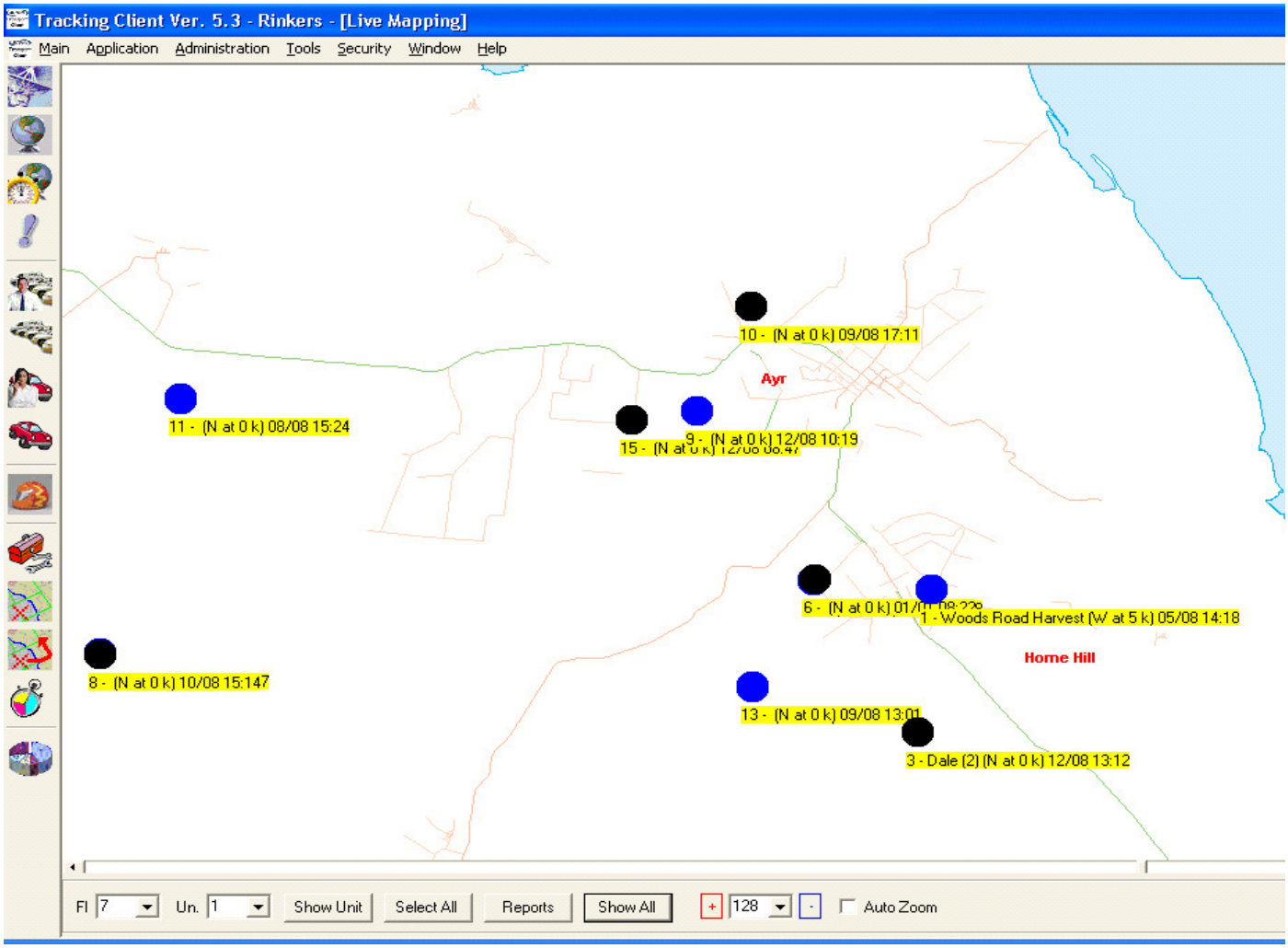
- A 3M Touch Screen Resistive
- A NEC VR4181 RISC Processor
- NEC TFT Active Matrix Colour LCD Module
- 32Mb of Intel Strataflash
- 64MD SD RAM
- CF Card Slot (Memory to 1GB)
- Windows CE Version 4.2
- USB Host
- Two RS232 Ports
- DC Power Supply 10v-36v

Figure 6 shows the 5060 touch pad being used inside the harvester during operation. The customised software allowed the operator to input daily operations.

Figure 6: 5060 touch pad

Figure 7 shows a number of the tracking units across the Burdekin region by using the Dats 8000 interface software. This enabled the participants to view the location of the machines and view the data collected from the tracking units. This software is also used to configure the systems.

Figure 7: Computer interface software



The next stage of this data acquisition process was to develop software for the 5060. To do this software was commissioned from MTD to enable harvester operators to record daily operations and harvesting conditions. The software is in the form of a menu based system. There are 4 main categories; reasons for stopping, harvesting conditions, labour details, fuel usage. The programs are structured as a series of drop down menus that allow the driver to choose from a range of options. The content of the software is described below;

1. Reason for Stopping:
    a. Waiting for Bins
    b. Break Down
    c. perform R&M (options)
        i. change base cutter blades
        ii. change chopper blades
        iii. other
2. Harvesting Conditions: The options available to harvest operators to choose at this level include:
    a. Headlands; (sub-options)
        i. Approximate Width
        ii. Conditions – with options

            1. Smooth
            2. Moderately Rough
            3. Extremely Rough
            4. Recently Graded
    b. Haul-out Route Condition (sub-options):
        i. Gravel Road - with options
            1. Many parts corrugated
            2. Presence of unavoidable potholes
            3. Presence of avoidable potholes
            4. Bitumen – with options
                a. Rough Edges
                b. Straight Rows
    c. In-Field Conditions (sub-options):
        i. Rows – with options
            1. Rough edges
            2. Straight Rows
            3. Rows not marked out properly
        ii. Rockiness – with options
            1. No rocks
            2. A Few Rocks
        iii. Ground Consistency – with options
            1. Level
            2. Presence of Low and High Spots
            3. Presence of Wet Patches
        iv. Crop Consistency – with options
            1. Evidence of Grub Patches
            2. Lodging - with options
                a. Sprawled
                b. Heavily Lodged
3. Labour Details with options
    a. Number of Haulouts
    b. Number of Additional Men Working
    c. Start Time
    d. Break 1 Start Time
    e. Break 1 Finish Time
    f. Break 2 Start Time
    g. Break 2 Finish Time
    h. Finish Time
4. Fuel Usage

In order for the information collected to be useful to the project participants it had to be presented in a user friendly format. The first step was to engage Agtrix to develop a software program that interpreted the information from the 3022 and 5060 and turn it into a harvest benchmark report (HBMR). The HBMR was to show the operating practices of the machines such as engine state, elevator hours, ground speed and engine hours as well as adding the data from the 5060; headland conditions, paddock conditions, stoppages and number of people working (*see figure 9)*. During the early parts of the project, it was realised that the data outputs from the two units were not linked with a spatial commonality such as a GPS position. This posed a significant (and resolved) challenge to AGTRIX to combine the two data sets. Some information was manually linked in the early stages to make some use of the data (see figure 8). During the course of the project it proved too difficult to automate to a satisfactory degree a report combining the two data sets.

Figure 8: Touch pad information combined with tracking data

WORK TIMESHEET

HARVESTER 1008 DATE 20051122

PADDOCK	START	FINISH	TIME SPENT IN STATE				DISTANCE COVERED IN STATE				
			CUT	RUN	MAL_CUT	UNKNOWN	CUT	RUN	MAL_CUT	UNKNOWN	
	04:43:36	04:44:05			00:00:30				45		
	04:44:06	04:44:35	00:00:30	00:00:00			11	0			
	04:44:36	04:57:39				00:13:04				5	WORK START
INV-00431-03-04	04:57:40	05:51:09	00:25:30	00:28:30			5399	3801			
	05:51:10	05:59:40				00:08:31				47	
	05:59:41	09:12:41	01:18:31	01:54:30			18185	16026			RM CHANGE BASE CUTTER
	09:12:42	09:22:11				00:09:30				14	
	09:22:12	10:07:11	00:19:00	00:26:00			2486	3085			RM CHANGE BASE CUTTER
INV-00431-03-03	10:07:12	10:09:41				00:02:30				10	
INV-00431-03-04	10:09:42	10:18:11	00:03:30	00:05:00			87	624			
	10:18:12	10:23:41				00:05:30				15	
INV-00431-03-03	10:23:42	12:49:13	01:00:00	01:23:32			11607	10292			
	12:49:14	12:52:43				00:03:30				33	
	12:52:44	13:08:13	00:04:00	00:11:30			789	919			
	13:08:14	13:10:43				00:02:30				22	
	13:10:44	13:41:13	00:10:30	00:20:00			1594	1355			
	13:41:14	13:43:43				00:02:30				30	
	13:43:44	13:48:13	00:03:30	00:01:00			1010	50			
	13:48:14	14:01:43				00:13:30				13	
INV-00453-07-01	14:01:44	14:49:43	00:40:30	00:07:30			13559	783			
	14:49:44	14:57:13				00:07:30				22	
	14:57:14	15:01:44	00:00:00	00:04:31			0	374			
	15:01:45	15:04:14				00:02:30				10	

Figure 9: Raw data collected by touch pads from operator inputs.

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CSR HARVESTER REPORT - Date: Thursday 29 June 2006
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HARVESTER ID: 107

12:13:43 STOPPING REASON - WAITING FOR BINS
12:13:44 FUEL USAGE LITRES = 100
12:13:44 HEADLANDS - MODERATELY ROUGH - APPROX WIDTH METERS = 8
12:13:45 FUEL USAGE LITRES = 99
12:13:45 STOPPING REASON - WAITING FOR BINS
12:13:46 FUEL USAGE LITRES = 88
12:13:46 HEADLANDS - SMOOTH - APPROX WIDTH METERS = 5
12:13:47 HAUL OUT COND - BITUMEN - 0
12:13:47 HAUL OUT COND - BITUMEN - 0
12:13:48 NO OF HAULOUTS = 3
12:13:48 HAUL OUT COND - BITUMEN - 0
12:13:48 BREAK FINISH
12:13:49 WORK START
12:13:49 BREAK START
12:13:50 IN FIELD COND - ROWS - STRAIGHT ROWS
12:29:08 HEADLANDS - MODERATELY ROUGH - APPROX WIDTH METERS = 3
12:29:19 NO OF HAULOUTS = 3
12:30:17 HAUL OUT COND - BITUMEN - 0
12:30:26 IN FIELD COND - ROWS - STRAIGHT ROWS
12:31:10 IN FIELD COND - ROCKINESS - NO ROCKS
12:31:26 IN FIELD COND - GROUND CONSISTENCY - WET PATCHES
12:32:05 IN FIELD COND - CROP CONSISTENCY - STANDING CROP
12:32:31 IN FIELD COND - CROP CONSISTENCY - LODGING LAYING ONE WAY
13:46:07 STOPPING REASON - RM OTHER
16:43:02 STOPPING REASON - RM OTHER
18:15:59 WORK FINISH

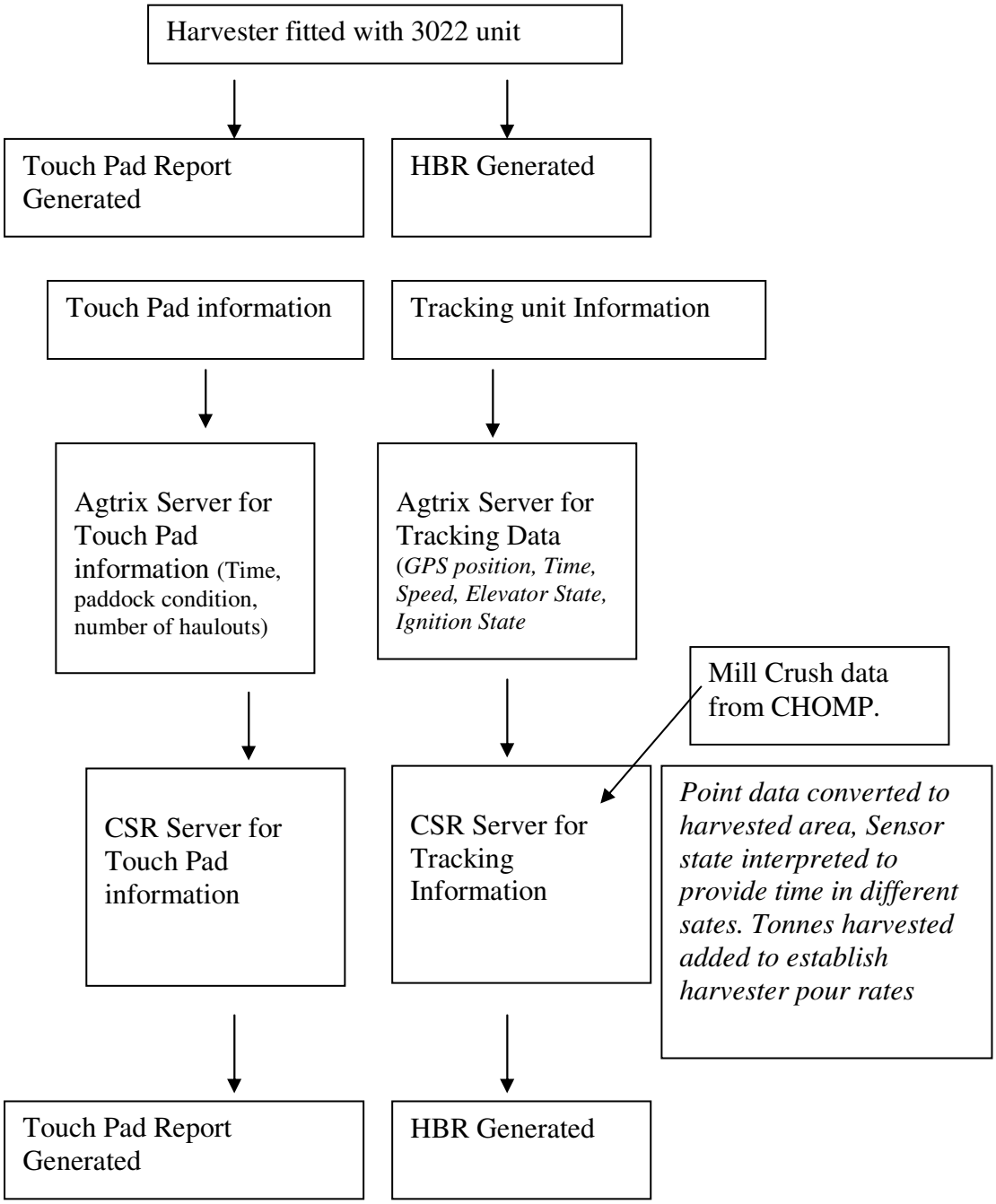
HARVESTER ID: 120

12:41:55 BREAK START

17:47:15 WORK FINISH

The reason why linking the two pieces of information was so difficult was due to the fact that they were two independent data strings without a common link. Figure 10 shows the data flow structure.

Figure 10: Flow diagram showing data flow and data processing once it has left the harvester



The data being collected from the 5060 was the paddock information (as previously listed) and the information from the 3022 was the harvester information being;

1. GPS Time
2. GPS position (Lat/Long)
3. Speed (derived from 1. and 2., above)
4. Ignition State (on/off)
5. Elevator State (on/off)
6. Direction of Travel

Not being able to link this data was the most substantial setback for the entire project as manual processing would be required if the two datasets were to be combined. This was the limiting factor in producing a cross operational benchmarking system.

Although the touch pad data proved to be less than desirable, the information obtained from the 3022 was very useful in giving owners and operators a very good understanding of the differences in efficiencies across their harvesting contracts which allows them to benchmark their performance. Owners could take the information and further investigate what factors had caused differences in the harvester performance. To present the 3022 data, AGTRIX produce three types of reports;

a. Daily activity summary report- this report showed the basic operating information being the cutting time, turning time, hours spent not cutting and average speed. Mill data was not added to this report ***(see*** figure 11)
b. Monthly summary report- this report showed block summary information with mill crush data added to include elevator pour rates and actual tonnes cut. This allowed the owners to compare efficiencies with actual data from the mill. (see figure 12)
c. End of year summary- This report compared farms within a contract to allow owners to determine which farming conditions and locations contributed to harvester performance. (see figure 13)

Figure 11: Daily activity Summary

I HARV DATE	HARV DATE	DIST CUT KM	TIME RUN HRS	DIST RUN KM	TIME STOP HRS	DIST STOP KM	TOTAL TIME HRS	TOT CUTTING TIME HRS	TOT WORK PERIOD HRS	TOT RUN STOP TIME HRS	TOT TURNING TIME HRS	TOT CUTTING DIST KM	AV SPEED KM HR	RATIO TURNING 2 CUTTING	PROP CUTTING OF TOTAL
20071205	5/12/2007	0	0	0.024	0.031	0	0	0.024	0			0.011	0	0	-1
20071206	6/12/2007	0.016	0	0.338	0.416	12.733	8.522	13.086	0.016			0.216	0	0	13.4

Figure 12: Paddock Summary Report

VEHICLE BKN241		SENSOR STATE									INTERPRETED TIME SPENT (HRS)			DIST WHILE CUTTING (KM)	AV SPEED WHILE CUTTING (KM/HR)	CALCULATED RATIOS		DELIVERIES		POUR RATES	
		TIME SPENT (HRS)					DISTANCE TRAVELLED (KM)									TURNING TO CUTTING	PROP CUTTING OF TOTAL	NUMBER	TONS	HARVEST	CUTTING
FARM	BLOCK	CUT	CUT (MALF")	RUN	STOP	TOTAL	CUT	CUT (MALF")	RUN	STOP	CUT	NOT STOPPED	TURNING							T / HR	
FARM 6488																					
6488A	01-02	0.6	0.0	0.7	0.0	1.3	3.6	0.0	2.1	0.0	0.6		0.2	3.6	6	0.32	0.46			0	0
6488A	03-01	5.3	0.0	8.9	0.0	14.2	31.8	0.0	44.7	0.0	5.3		3.4	31.8	6	0.64	0.37	11	1119.97	78	210
6488A	03-02	0.5	0.0	0.4	0.0	0.9	3.1	0.0	1.9	0.0	0.5		0.1	3.1	6.1	0.23	0.57	3	234.81	262	457
6488A	04-04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0		0.0	0.0	0	-1.00	0.00			0	-1
6488A	05-01	2.8	0.0	5.5	0.0	8.3	16.2	0.0	19.9	0.0	2.8		1.6	16.2	5.7	0.56	0.34	4	560.04	67	198
TOTALS FOR FARM		9.3	0.0	15.5	0.0	24.7	54.7	0.0	68.9	0.0	9.3		5.3	54.7	5.9	0.57	0.37	18	1914.82	77	206
FARM 6488																					
6488	11-01	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.7	0.0	0.0		0.0	0.0	0	-1.00	0.00			0	-1
6488	11-02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0		0.0	0.0	0	-1.00	0.00			0	-1
6488	12-01	0.1	0.0	0.1	0.0	0.2	0.3	0.0	0.9	0.0	0.1		0.0	0.3	5.9	0.67	0.33			0	0
6488	13-01	0.7	0.0	0.7	0.0	1.4	3.9	0.0	3.8	0.0	0.7		0.3	3.9	5.5	0.41	0.49			0	0
6488	13-05	2.4	0.0	4.6	0.0	7.0	14.3	0.0	20.1	0.0	2.4		2.0	14.3	5.9	0.81	0.34	6	650.56	92	269
6488	16-01	0.1	0.0	0.2	0.0	0.3	0.3	0.0	0.0	0.0	0.1		0.0	0.3	5.4	0.30	0.21			0	0
6488	18-01	0.1	0.0	0.0	0.0	0.1	0.4	0.0	0.0	0.0	0.1		0.0	0.4	6.9	0.39	0.58			0	0
6488	20-02	0.1	0.0	0.1	0.0	0.2	0.5	0.0	0.1	0.0	0.1		0.1	0.5	6	1.35	0.37			0	0
6488	20-04	3.4	0.0	4.7	0.1	8.2	23.6	0.0	27.7	0.0	3.4		1.9	23.6	6.9	0.56	0.42	5	676.15	82	197
TOTALS FOR FARM		6.8	0.0	10.6	0.1	17.4	43.4	0.0	53.4	0.0	6.8		4.4	43.4	6.4	0.65	0.39	11	1326.71	76	195
FARM 6488																					
6488	02-01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0		0.0	0.0	0	-1.00	0.00			0	-1
6488	02-04	0.3	0.0	0.4	0.0	0.6	1.1	0.0	0.6	0.0	0.3		0.2	1.1	3.3	0.68	0.44			0	0
6488	02-05	1.1	0.0	1.2	0.0	2.2	5.4	0.0	5.5	0.0	1.1		0.7	5.4	5	0.60	0.48	7	735.04	328	679
6488	02-07	2.7	0.0	3.8	0.0	6.5	13.1	0.0	15.6	0.0	2.7		2.0	13.1	4.8	0.73	0.42			0	0
6488	02-08	0.6	0.0	1.2	0.0	1.9	3.1	0.0	7.3	0.0	0.6		0.6	3.1	4.9	1.00	0.34			0	0
TOTALS FOR FARM		4.8	0.0	6.6	0.0	11.4	22.8	0.0	29.2	0.0	4.8		3.5	22.8	4.8	0.74	0.42	7	735.04	64	153
FARM 7093																					
7093	02-01	3.8	0.0	5.4	0.1	9.3	23.9	0.0	16.3	0.0	3.8		3.8	23.9	6.2	1.00	0.41			0	0
TOTALS FOR FARM		3.8	0.0	5.4	0.1	9.3	23.9	0.0	16.3	0.0	3.8		3.8	23.9	6.2	1.00	0.41			0	0
FARM 7392																					
7392	04-01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0		0.0	0.0	0	-1.00	0.00			0	-1
TOTALS FOR FARM																					
FARM 8176																					
8176	04-01	0.2	0.0	0.2	0.0	0.5	1.2	0.0	0.2	0.0	0.2		0.2	1.2	5.2	0.90	0.52			0	0
8176	06-01	17.0	0.0	11.6	0.1	28.8	118.1	0.0	23.6	0.0	17.0		6.4	118.1	6.9	0.38	0.59			0	0
8176	09-02	4.7	0.0	5.8	0.2	10.7	30.2	0.0	15.2	0.0	4.7		3.6	30.2	6.5	0.76	0.44			0	0
TOTALS FOR FARM		21.9	0.0	17.6	0.4	39.9	149.5	0.0	39.0	0.0	21.9		10.2	149.5	6.8	0.47	0.55			0	0

Figure 13: Farm Summary Report

VEHICLE BKN241	SENSOR STATE									INTERPRETED TIME SPENT (HRS)			DIST WHILE CUTTING (KM)	AV SPEED WHILE CUTTING (KM/HR)	CALCULATED RATIOS		DELIVERIES		POUR RATES	
	TIME SPENT (HRS)					DISTANCE TRAVELLED (KM)									TURNING TO CUTTING	PROP CUTTING OF TOTAL	NUMBER	TONS	HARVEST	CUTTING
FARM	CUT	CUT (MALF")	RUN	STOP	TOTAL	CUT	CUT (MALF")	RUN	STOP	CUT	NOT STOPPED	TURNING							T / HR	
	0.9	0.0	11.1	11.3	23.2	2.4	0.0	113.3	4.5	0.9		4.5	2.4	2.9	5.33	0.04			0	0
6023A	6.9	0.0	8.8	0.0	15.7	39.5	0.0	8.5	0.0	6.9		4.6	39.5	5.7	0.67	0.44			0	0
6031A	5.3	0.0	6.1	0.0	11.4	26.3	0.0	20.9	0.0	5.3		3.8	26.3	5	0.72	0.47			0	0
6084A	10.6	0.0	12.1	0.4	23.0	56.8	0.0	62.9	0.0	10.6		6.7	56.8	5.4	0.63	0.46	18	1829.79	79	173
6189A	17.8	0.0	19.7	0.9	38.5	110.8	0.0	61.6	0.0	17.8		8.2	110.8	6.2	0.46	0.46	23	2517.38	65	141
6488A	9.3	0.0	15.5	0.0	24.7	54.7	0.0	68.9	0.0	9.3		5.3	54.7	5.9	0.57	0.37	18	1914.82	77	206
6488B	6.8	0.0	10.6	0.1	17.4	43.4	0.0	53.4	0.0	6.8		4.4	43.4	6.4	0.65	0.39	11	1326.71	76	195
6488D	4.8	0.0	6.6	0.0	11.4	22.8	0.0	29.2	0.0	4.8		3.5	22.8	4.8	0.74	0.42	7	735.04	64	153
7093B	3.8	0.0	5.4	0.1	9.3	23.9	0.0	16.3	0.0	3.8		3.8	23.9	6.2	1.00	0.41			0	0
8176B	21.9	0.0	17.6	0.4	39.9	149.5	0.0	39.0	0.0	21.9		10.2	149.5	6.8	0.47	0.55			0	0

To Achieve this

- **Greater knowledge on the factors affecting harvesting economics; including information on harvesting different row spacings (1.5, 1.85 and 2m) and green Vs burnt cane**
- **Information to ground truth harvesting costs models**

The approach was:
In order to provide a true bench mark for each harvest contract, Gary Sandal from Harvest Solutions Pty Ltd conducted surveys of each participating group in order to establish;

- what capital expenditure each group had outlaid into their harvest contract
- a financial analysis of operating and maintenance costs
- Point of delivery each paddock harvested,
- Total tonnes harvested
- Equipment and labour used for the operation.

It was the intention of the project that over the three year time period the HHM would document group practices for each year and then identify gains made by the groups as a result of the data collected from the project. A lack of data collected due to a break in the data collection chain (equipment failure) has made it very difficult to actually model harvester performance over time however, the 2006 season has been modelled and a benchmark of practices has been established. The HHM has been used extensively both in Australia and overseas as a tool to evaluate the financial effect of planned changes plus the effect on the operator's shift length. For example, the model has been used to: modelling harvesting costs changes for farm re-design i.e.: changes in block (row) configurations; harvest group restructure or amalgamations; siding or pad location re-arrangements; and, determining the most cost effective number of haul-outs within a group. The HHM estimates the time performance of harvest and uses actual financial data for each group to derive accurate estimates of cost for each block harvested. Block data is aggregated to provide detailed reports to individual farms and groups. Details of all capital equipment were collected from each contractor and an equipment value schedule is used to estimate capital and salvage values of equipment using machine age, engine hours and horsepower.

Figure 14: Regional overview of financial Benchmarking

Harvest Haul Model
Regional Detailed Report

	$ / tonne $	$/ eng. hr	$ / ha	$	$ / tonne	$ / eng. hr	$ / ha	$	$/ tonne	$ / eng. hr	$ / ha	
Depreciation	$0.65	$38.32	$72.99	$255,102	$0.16	$9.57	$18.22	$63,682	$0.49	$28.76	$54.77	$191,420
Capital	$0.00	$0.00	$0.00	$0	$0.00	$0.00	$0.00	$0	$0.00	$0.00	$0.00	$0
TOTAL NON-CASH	$0.65	$38.32	$72.99	$255,102	$0.16	$9.57	$18.22	$63,682	$0.49	$28.76	$54.77	$191,420
Capital	$0.38	$22.26	$42.39	$148,147	$0.15	$8.80	$16.75	$58,547	$0.23	$13.46	$25.64	$89,600
Overheads	$0.22	$12.68	$24.15	$84,396	$0.11	$6.34	$12.07	$42,198	$0.11	$6.34	$12.07	$42,198
Wages	$1.67	$98.24	$187.09	$653,891	$0.54	$31.93	$60.80	$212,511	$1.13	$66.31	$126.29	$441,380
Fuel	$1.16	$68.17	$112.21	$453,747	$0.66	$38.71	$73.72	$257,653	$0.50	$29.46	$56.11	$196,095
R && M	$0.82	$48.12	$91.65	$320,318	$0.49	$28.87	$54.97	$192,136	$0.33	$19.26	$36.68	$128,182
Blades	$0.00	$0.00	$0.00	$0	$0.00	$0.00	$0.00	$0				
TOTAL CASH	$4.25	$249.46	$457.49	$1,660,500	$1.95	$114.63	$218.32	$763,046	$2.30	$134.83	$256.78	$897,454
	$4.90	$287.79	$530.48	$1,915,602	$2.12	$124.20	$236.54	$826,728	$2.79	$163.58	$311.55	$1,088,875

Tonnes	390,852	t
Area	3,495	ha
Yield	112	t/ha
Row Length	577.21	m
Haul distance	1.91	km
Season Length	168	days
Harvest Hours	7,907.02	hours
Shifts / day	1	
Shift Length	11.51	hours

Field Efficiency	0.56	%
Engine hours	6,656	hrs
Elevator pour rate	105	t/hr
Tonnes per engine hour	59	t/hr
Tonnes per crew hour	54	t/hr
Harvester fuel	0.74	l/t
Haulout fuel	0.56	l/t
Total fuel	1.30	l/t

Cutting Time	3740
Turning Time	588
Backing Time	640
Service Time	388
Repair Time	172
Moving Time	151
Wait for Haulouts	1538
Wait for Bins	690

Harvest Haul Model - ceh Beta07 *Page 1 of 1*

To Achieve this:

- **Information to test options developed from SRDC project CSE010 - Integrated value chain scenarios for enhanced region profitability and**
- **Information to test outputs from SRDC project BSES 261 Harvest payment signals project**

The approach was:
The use of the HHM model in this project to determine where efficiencies and profitability could be increased relates to other SRDC projects such as CSE010 and BSES 261 in the fact that the collection of financial and operating parameters for the harvesting groups was collected and modelled. At the outset of this project it was thought that three (3) years of data would test a number of different scenarios however the limited availability of validated data has reduced the projects ability to extend the outputs from the HHM.

To achieve this:

- **Shared knowledge (between harvesters and Extension staff) of the impact of HBP on harvesting operations, costs and benefits**

Through the process of the CPI meetings Lisa McDonald from CSR and Dale Chappel from the BSES promoted and presented the information gathered from the project to the growers attending. Dale also discussed what affects different farming systems had on the harvesting operation.
Dale also conducted a billet survey to establish what effect different harvesting practises affected billet quality. He found that there was a potential to significantly increase the dollar return to the growers if HBP was adopted. (see appendix 1 for the full survey)

One workshop was held in September 2005 for growers, millers and service providers interested in adopting a better approach to harvesting and reporting within the sugar industry. A number of different projects were discussed which included different approaches to benchmarking harvester performance.

Through out the project process there were three (3) project meetings in which the data collected was presented to the participants. These meeting were held at CSR pioneer sugar mill with service provider such as AGTRIX and Harvest Solutions attending.

To achieve:
- **Understanding of the social responses to the implications of harvesting best practice**

This was the approach:

This study was undertaken over the period between May – October 2005. Data was collected in the following ways:

Group Meetings: Representatives of the grower groups involved in the pilot project who attended a pre-harvesting meeting (2005) were asked a series of questions about their reasons for being involved; what benefits they hoped to derive and the issues that they saw. The answers and discussion around these questions were recorded, summarized and sent back to the group for confirmation. A mid-season workshop was held just prior to the equipment being fitted to explain details and discuss issues. Notes were taken at the meeting recording areas of interest, concern or issues arising.

Capturing Harvester Group details: Most of these representatives were also interviewed individually about their harvesting groups – how they were set up, how harvesting decisions were made, what the group hoped to gain from the project and any concerns that they had. A benchmarking summary of these discussions was made and sent back to the representatives for confirmation.

Interviews: A range of people involved in the project were interviewed face-to-face. These included: those managing cooperative or contract harvesting; participating growers; drivers of harvesters and haul-outs; and

mill staff working with the harvester groups. These interviews sought the range of perceptions, expectations, issues and concerns held by these different groups.
The interviews were semi-structured and covered areas such as;

- Group details and general management structure
    - the groups involved included the following structures;
        - harvester contractor and grower (3 groups)
        - cooperative (3 groups)
        - independent contractor (1 group)
- Harvesting issues they saw as important; examples of common issues were;
    - availability of skilled labour
    - concern about mill delivery of cane bins and the effect this has on harvesting operations, particularly efficiency of labour use
    - increasing operating costs; particularly rising fuel costs
    - harvesting effectively to compliment new farming systems (this was a common concern to the cooperative groups involved)
- Considerations when planning operations
- Decision making;
    - how this was structured in the group
    - what is the consultation process
    - how did they deal with disputes
- Expectations of the project; common expectations were;
    - Want to identify ways of improving performance
    - Want to be able to trial different things during the season and be able to use the information collected during the project to assess their impact
    - Being able to compare their operations against other groups as a means of improvement
- Aspirations, some aspirations were;
    - Want to look at expanding the size of the group
    - Want to buy new equipment and fit this into a new farming/harvesting system
    - Want to be able to reduce costs
    - Want to maintain on-farm productivity
    - Make coop successful, survive cost/price squeeze, maintain equipment in good order
    - Want to see improved group performance in 5 years
    - Aim to match farming and harvesting system and to optimise whole system
    - Plan in 5 years to upgrade the harvester and want to keep up with the latest technology
    -
- Concerns about the project; some concerns mentioned were;
    - The results of the project causing controversy that affected the social standing of the members of the group
    - Project may not reflect the real costs of harvesting (this was a particular concern of the harvester owners who contracted their services – they believed it could place pressure on them to reduce their price for harvesting)
- Main concerns about the outcomes of the project – social issues
    - Worries about the effect of GPS tracking being perceived as 'big brother watching over them' by their employees
    - Lack of rewards from the adoption of new practices
    - The revelation of the true costs of harvesting may induce cane growers to start harvesting their own cane.
- Project findings could lead to a push for longer working hours

For full reports ***<u>Please see appendix 2,3 and 4</u>***

Outputs

1. **A benchmarking system that will allow harvesting groups to compare performance across a range of conditions (e.g. different row spacings and haul distances)**

The project has developed a low cost data collection system to capture harvester performance parameters which can be used to benchmark performance within a harvesting contract (compare farms) as well as compare to other harvester operations. The system does not allow for the capture of field conditions such as headland width, cane presentation (standing or lodged) or road condition. The use of the 5060 touch pads has not been successful however the advent of the HMR has been successful and growers and contractor are enthusiastic about the potential to develop this further

2. **Software and procedures that will enable standardised collection of harvesting data**

The 3022 (soon to be 3026 Next G) has been improved significantly since the commencement of the project with substantial upgrades to the operating firmware. The improvements include a greater capability to store and forward collected data from the machine, greater flexibility in controlling the parameters in which data is collected. The upgrading of the 3022 to the 3026 will also improve the system through a greater capacity to fault find when the system is not communicating which will reduce downtime. The 5060 touch pads are not supported by the new firmware and therefore are not integrated into the system.

3. **Shared knowledge (between harvesters and Extension staff) of the impact of HBP on harvesting operations, costs and benefits**

The information presented to both parties through the course of the project through meetings in which the data was presented to the growers. This reinforced the substantial impact on harvester performance caused by inefficient farming and harvesting procedures. The work conducted by the BSES with the billets collected from the machines showed that there is the potential to increase profits through the value chain by adopting HBP where possible. The project has more than stimulated grower enthusiasm for the data collection process and this should not be underestimated in scale of achievement.

4. **Greater knowledge on the factors affecting harvesting economics; including information on harvesting different row spacings (1.5, 1.85 and 2m) and green vs burnt cane**

The outputs from the harvest haul model particularly with the one way cutting and haulout optimisation have given the participants the ability to identify harvesting practices that may be reducing profits however there is also the realisation that some “bad practices” can not be avoided due to geographical location, land position, rail infrastructure and farm layout. Without the ability to capture specific field information via the 5060, comparing farming systems such as row spacing has not been achieved. Although as a result of this project and the “end product” growers have the ability to investigate paddock conditions that have contributed to performance results on the HBR. This does allow for simple analysis of farming systems using grower interpretation.

5. **Information to ground truth harvesting costs models**

This project did not achieve any substantial improvement in the harvest cost model. Due to equipment failure, the 2006 season was the only data collected. In order to improve the harvesting cost models large volumes of accurate and validated data over sequential years would be required. It was the intention of this project to achieve continuos data for the three year period but unfortunately this did not occur.

Intellectual Property

The software developed by Agtrix will remain their intellectual property.

Environmental and Social Impacts

Social

A future impact of this project could be a change in the culture of harvester groups and those who use contract harvesting to accept responsibility for higher harvesting costs. If this was to occur then growers may also prepared to accept differential pricing for harvesting costs. If this was adopted it could lead to significant improvements to the lay-out of paddocks and the quality and maintenance of headlands and drains across the industry.

Some of the discussion about future impacts included:
One Harvester group has had informal discussions about using base costs and fuels as a basis for harvester costs for each farm (for example it costs more to harvest green cane) – but they were waiting on more accurate data to make the case.

Another said that since the project started, he had more systematically recorded fuel, maintenance and blades than they had in the past – being more aware of the importance of this data. A further participant also referred to modifying their recording and reporting to better separate out harvester costs from other farm costs.

One Harvester group member referred to changing back to 3 haul-out trucks instead of 2 because it was more efficient – but it was unclear if that was prompted by the project as such. Another participant referred to the price of fuel being a driver for him to make changes (independent of the project) – *litres per tonne cut* was the critical figure.

All harvester group representatives saw the benefits of having accurate figures of different costs between blocks, growers and harvester groups – so that there was back-up to negotiate changes in costing or to highlight where efficiencies could be gained. One example was given of the potential of saying to a grower…*if you improve the headlands on this block, the cost of harvesting will be less than it will be if you don't*. One participant pointed out that the figures could also show which blocks just aren't economical to harvest.

There was some discussion about the need for cultural changes in harvester groups if differential prices were to be accepted and negotiated…*if a grower costs more because he is further from a siding, whose responsibility is it*? It appeared that having accurate costs which could 'independently' show the differences in harvesting costs according to factors such as distance, row length, headlands etc, could at least start the discussion which otherwise was seen as just one person's opinion.

Another potential use raised was that figure comparisons between old and new machines could show at what point it became more economical to invest in new equipment – when the repairs and maintenance was greater than the purchase/ depreciation costs of the new machine.

Another suggestion was that accurate figures (efficiency and cost figures) could help with decision-making about whether a group should downsize – or upsize! It was pointed out that the models being developed would help with this issue of optimising farm operations. In terms of this issue, however, one participant highlighted that this decision was bigger than the harvesting costs but…*related to the whole system*.

A more accurate understanding of the waiting times and harvesting efficiency could also help in making adjustments which would improve conditions for drivers…*keep more workers*!

Other impacts noted in the second benchmarking meeting included:

- Even with the inaccuracies, the report summaries reinforced the value of the information (assuming accuracy) to improving harvesting efficiencies in harvesting groups to participants.
- Rigour and accuracy were seen as critical in being able to use the results with growers to motivate positive changes.
- Harvester representatives remained very keen to be able to benchmark data and to be able to compare farms within groups (and blocks) and with district averages.
- A number of suggestions were made to improve reporting and understanding of the information provided.
- Impacts described to date included: improved awareness of efficiencies by the harvesting crews; and some increased awareness by growers and openness to harvest both directions.
- The main expectations from the project were the same as for the first study (yielding information to benchmark across farms and hence highlight opportunities to improve performance and/or introduce differential payments for harvesting).
- The focus has changed from a more 'policing thinking' about monitoring harvester drivers to that of education and awareness raising (this was a significant shift –also brought about by the difficulty in competing for drivers with the mines).
- The distinction was clearer between what this equipment/project could achieve and precision-agriculture which required extra equipment than in the initial study.

In the initial benchmarking report, one of the harvester groups saw that improved analysis and recording through the equipment could lead to confidence in treating the farms within the cooperative as "one large farm" for the mutual benefit of all. There were some significant impediments to achieving that – with a suggestion that a framework and process was needed to help cooperatives break through the barriers. This did not come through again on the final benchmarking exercise reinforcing the impediments to making such changes – despite what the figures may show. The emphasis was rather the scope for differential pricing rather than maximising efficiencies across the group. There is scope for a research project on this topic.

Environmental

This project was primarily seen to be impacting on the technical nature of harvesting and improving the efficiency and effectiveness of harvesting. Some environmental benefits, however, were flagged as potential incidental impacts from the project. These included:

- Improvements to the headlands and drainage to improve harvesting efficiencies could result in better weed control, water management and erosion control.
- Blocks that are shown to be uneconomical to harvest may be converted to plantation crops or return to native vegetation.
- Improved ability to link productivity variations within paddocks can open the way for improved precision farming and an overall reduction in fertiliser application (reduced nutrient run-off).
- Improved ability to look at harvesting and haul-out efficiencies could result in a reduction in kilometres travelled and hence a reduction on fuel and oil usage.

Expected Outcomes

*** Adoption of recommended harvesting practices across the region which will lead to improved productivity and efficiencies in harvesting**

At the time of the project finishing, all of the 'bugs' had yet to be ironed out from the data collection and reporting – as a result, growers were still not confident in the data being supplied to make substantial changes in their operating procedures. On-going enthusiasm for what the technology could *potentially* deliver a desire to

continue to be part of its development and testing and a strong belief in the value of the technology to record performance is expected to continue the momentum of the benchmarking process. A direct outcome of the project is that growers are now using the BMR to measure and identify harvester performance across different paddocks and farms within their contract. This was not achievable before commencing this project.

- **Whole-of-industry profitability (HBP leads to reduced sugar losses - with concurrent environmental benefits - and**
- **greater returns for growers and millers, and harvester operators if payment systems are aligned to support HBP).**

Over time, the reports which independently measure harvester performance will provide contractors with the required information to begin negotiating harvesting rates with their grower clients, providing both parties with incentives to reduce costs by further increase harvesting efficiency. If contractors can see increase in profits through the adoption of HBP then will also lead value adding through the value chain. It is expected the development of the MTD unit and low cost yield monitor will see 20% of harvesters in this region adopting this system and use the Precision Agricultural Web Site (B.A.T. Web- RCP2) to view yield maps. If growers have the ability to map where yield is lower or higher within a paddock, inputs can be modified to ensure that the correct amount of nutrient is applied. This will potentially lead to a reduction in runoff and an increase in return for the growers. The ability to benchmark harvesting costs could also lead to an overall improvement in harvesting efficiency, a decrease in harvesting costs and more effective use of haul-outs and sidings.

Future Research Needs

Barriers to change and the lack of communication between sectors are still apparent and further research into the benefits of integrating the supply chain to a greater degree may benefit the industry.

Recommendations

Before this technology is widely implemented by the Burdekin region (or other regions) there is a need to:

1. Establish protocol (Burdekin) to determine:
    a. Who benefits when these units are installed on harvesters
    b. Total costs associated with the units including:
        i. Hardware
        ii. Software,
        iii. Firmware
        iv. Report Generation
        v. Telemetry , hardware
2. A coordinated approach between all regions to minimise duplication of systems and technology to ensure that growers achieve real benefits on the ground
3. Model the data collected in the Harvest Haul Model to establish what economic gain can be made by using the data. (This is being done in a SRDC projects)

If further development is undertaken for data collection and benchmarking, there is a need to ensure that any development be done in consultation with the operators of the machinery. This is critical to the success of any new technology as the operators are the ones required to use the interface. If the operators object to the systems installed on their machinery success will be limited.

The rotation system of harvesting provides a risk sharing mechanism for the individual, but limits the scope for overall more efficient harvesting in terms of harvesting logistics and cutting to maximize yield. One consequence of improved benchmarking is putting pressure on differential individual harvesting costs, further fragmenting the ‘group’ structure. This type of interaction between harvesting and grower groups to share financial details should be continued to maintain the drive to optimise industry performance.

Communication to the Industry

There has been a number of publications for the benchmarking process and a number of meetings with other regional bodies to collect feed back of the process undertaken by this project and also to collect information on what other systems are being used.

Published September 2006
Cane harvesters Magazine

Harvest benchmarking: a way to improve harvesting performance?

The Burdekin Cane Productivity Initiative (CPI) seeks to improve productivity, profitability and efficiency across the growing and harvesting sectors. As a way of utilising industry knowledge to identify ways that harvesting could be improved, a Harvesting Reference Group was formed under the CPI. Members of the group include grower harvesting owners and members of co-operative harvesting groups.

The harvesting reference group decided that benchmarking their harvesting businesses could improve their performance. The benefits of benchmarking are that it provides information that can be used to manage harvesting operations more effectively by identifying where harvest groups can lower costs and increase efficiencies and by promoting cross fertilisation of ideas and practices between harvest groups

The harvesting reference group developed a project to produce a useful benchmarking system. Seven harvesting businesses are involved in the project, which is jointly funded by SRDC and Queensland Department of State Development and Innovation.

The project uses recent technology to locate and track harvesters using GPS. This technology also allows collection of data such as elevator operation, primary extractor fan operation, fuel use and feed train chopper pressures. An on-board computer has been installed to allow harvester drivers to log daily activities and information including paddock conditions (see picture below).

The information is sent via the CDMA network to a central database where the information is processed using the Agtrix CHOMP program and a custom-built benchmarking program that develops harvesting reports for each harvest group.

The benchmarking program also developed by Agtrix processes the tracking information from the harvesters and their haulouts to calculate a number of indices. Harvesting managers can use these indices to rate their performance against other groups in the project or their own performance over time to measure any improvements in efficiencies.

Information from an electronic logbook, a touch screen computer similar to what you would use at your local ATM machine, is fed into the program to provide a holistic picture of harvesting performance.

The types of benchmarks produced by the program include;

- Haulout utilisation
- Field efficiency
- Delivery rate

- Maintenance frequency (on a tonnage basis)

The information will also show how much time harvest operations lose due to events such as breakdowns, maintenance, waiting for bin delivery and waiting for haulouts. The time spent waiting for haulouts is a useful measure that can indicate whether adding another haulout to the operation would be cost effective.

The benchmarking exercise will also examine the costs involved in each groups operation.

The project is in its second year and planned for completion in July next year.

Published September 2006
CANEGROWERS Magazine

Harvesting benchmarking to yield mapping

The harvesting reference group convened under the Burdekin Cane Productivity Initiative has developed a project to produce a useful benchmarking system for harvesting businesses. Seven harvesting businesses are involved in the project, which is jointly funded by SRDC and Queensland Department of State Development and Innovation.

The project uses recent technology to locate and track harvesters using GPS. This technology also allows collection of data such as elevator operation, primary extractor fan operation, fuel use and feed train chopper pressures. The information is sent via the CDMA network to a central database where the information is processed using the Agtrix CHOMP program and a custom-built benchmarking program that develops harvesting reports for each harvest group.

The benchmarking program, also developed by Agtrix, processes the tracking information from the harvesters and their haulouts to calculate a number of indices. Harvesting managers can use these indices to rate their performance against other groups in the project or their own performance over time to measure any improvements in efficiencies.

An interesting offshoot of this project has been an investigation into the use of chopper box hydraulic pressure to estimate yield variation across a block. Mackay Sugar and CSR Plane Creek originally developed the method as a variation to a single chopper pressure method already used in the industry.

The beauty of this new system is that it could provide a cheap and easy way for growers to collect yield maps. The entire system would cost less than $4000 to install on a harvester and can collate the data in a central database that would allow growers easy access to their yield maps.

Figure 1: A Burdekin grower compares his chopper pressure map with a satellite image of the same block collected earlier in the year

There is still a lot of work to do to make the system more accurate. Presently we are looking at relative differences in pressures over a block; we need to calibrate the chopper pressure readings against actual yield so we can understand the magnitude of variation in the field. We are also developing ways to process the data to remove any anomalies such as chokes.

Early work is promising. We have seen good agreement between the chopper pressure maps and satellite images and EM maps collected from the same block. We have also picked up areas that growers know have either very good or very poor yields. Work on the system is continuing in Mackay and the Burdekin.

Published October 2006
BSES Burdekin Newsletter, Local Cane Grower groups newsletter

Harvester Benchmarking Project

During the past two crushing season in the Burdekin, seven harvester groups have been facilitating the SRDC funded Harvester Benchmarking Project SRDC-033 (HBP) in which paddock information and harvester performance data is collected and interpreted into Benchmark Reports (BMR).

The purpose of the project was to develop a benchmarking system to enable harvest groups in the Sugar industry to compare their performance to other harvesting groups based on their adoption of recommended harvesting practices and the effect of different farming operations.

The project participants had tracking units and onboard computer touch pads fitted to their harvesters. The touch pads allowed operators to input a number of operating parameters such as field conditions, number of haulouts and the haul road conditions, while the tracking units collected GPS position, ground speed, elevator state (on/off) and ignition state (on/off). All of the information is then sent via the CDMA phone network to be processed. The processing of the data included the addition of the actual tonnes harvested from the paddock so that elevator pour rate and tonnage can be determined. The BMR shows the follow information:

1. Distance travelled
2. Time spent Harvesting
3. Time spent turning
4. Average speed while cutting
5. Turning to cutting Ratio
6. Proportion of cutting time compared to total time
7. Tonnes harvested
8. Pour Rate (T/hr)

K	TIME SPENT (HRS)				SENSOR STATE	DISTANCE TRAVELLED (KM)				INTERPRETED TIME SPENT (HRS)			DIST WHILE CUTTING (KM)	AV SPEED WHILE CUTTING (KM/HR)	CALCULATED RATIOS		DELIVERIES		POUR RATES	
	CUT	CUT (MALF*)	RUN	STOP	TOTAL	CUT	CUT (MALF*)	RUN	STOP	CUT	NOT STOPPED	TURNING			TURNING TO CUTTING	PROP CUTTING OF TOTAL	NUMBER	TONS	HARVEST	CUTTING
																			T / HR	
	1.6	0.0	2.0	0.1	3.7	17.9	0.0	19.2	0.0	1.562		0.778	17.9	11.5	0.50	0.42	2	180.76	48	115
	1.9	0.0	2.6	0.4	4.9	20.1	0.0	9.5	0.0	1.869		1.497	20.1	10.8	0.80	0.39	2	208.49	42	111
	0.5	0.0	0.6	0.0	1.1	6.8	0.0	2.4	0.0	0.544		0.383	6.8	12.4	0.70	0.48			0	0
	1.9	0.0	2.2	0.0	4.1	12.2	0.0	13.0	0.0	1.887		1.371	12.2	6.5	0.73	0.46			0	0
	0.3	0.0	0.3	0.0	0.6	1.6	0.0	2.3	0.0	0.276		0.138	1.6	5.6	0.50	0.45			0	0
	6.1	0.0	7.8	0.5	14.4	58.5	0.0	46.4	0.0	6.138		4.167								
	3.9	0.0	2.0	0.3	6.2	28.3	0.0	3.7	0.0	3.948		1.39	28.3	7.2	0.35	0.63			0	0
	3.9	0.0	2.2	0.0	6.1	30.4	0.0	6.7	0.0	3.935		1.685	30.4	7.7	0.43	0.64			0	0
	7.9	0.0	4.3	0.3	12.4	58.8	0.0	10.4	0.0	7.883		3.075								
	5.8	0.0	4.8	0.0	10.6	41.0	0.0	40.5	0.0	5.795		1.954	41.0	7.1	0.34	0.55			0	0
	1.0	0.0	0.7	0.0	1.8	10.0	0.0	1.1	0.0	1.045		0.426	10.0	9.6	0.41	0.59	2	151.53	85	144
	6.8	0.0	5.5	0.0	12.4	51.0	0.0	41.6	0.0	6.84		2.38								
	5.8	0.0	4.6	0.0	10.3	35.3	0.0	37.3	0.0	5.771		1.942	35.3	6.1	0.34	0.56			0	0
	2.5	0.0	0.8	0.0	3.3	21.5	0.0	0.7	0.0	2.494		0.653	21.5	8.6	0.26	0.75	2	213.40	64	85
	8.3	0.0	5.4	0.0	13.7	56.8	0.0	38.0	0.0	8.265		2.595								
	1.5	0.0	1.3	0.0	2.7	8.7	0.0	9.3	0.0	1.453		0.678	8.7	6	0.47	0.53			0	0
	0.6	0.0	0.5	0.0	1.1	4.7	0.0	2.8	0.0	0.593		0.158	4.7	7.9	0.27	0.53	1	68.74	61	115
	2.7	0.0	3.0	0.0	5.6	25.4	0.0	27.6	0.0	2.705		1.103	25.4	9.4	0.41	0.47	4	484.24	84	179
	0.8	0.0	1.1	0.0	1.9	6.9	0.0	9.9	0.0	0.816		0.533	6.9	8.5	0.65	0.43	1	127.61	67	156
	5.6	0.0	5.9	0.0	11.5	45.7	0.0	49.7	0.0	5.567		2.472								
	0.9	0.0	1.5	0.0	2.4	7.3	0.0	7.2	0.0	0.924		0.395	7.3	7.9	0.43	0.38	2	152.73	62	165
	2.2	0.0	2.7	0.0	4.9	19.7	0.0	22.9	0.0	2.166		0.841	19.7	9.1	0.39	0.44	2	345.07	70	159
	0.3	0.0	0.4	0.0	0.7	3.1	0.0	3.0	0.0	0.344		0.134	3.1	9.2	0.39	0.47			0	0
	1.8	0.0	1.7	0.1	3.6	12.7	0.0	13.8	0.0	1.8		0.554	12.7	7	0.31	0.50	2	262.11	72	145

As a result of this project the harvester groups will be able to compare their own harvesting performance against other groups in the district to ascertain where, if any improvements can be made to their harvesting practice.

The project will continue until the end of the 2007 crushing season. For further information contact Peter McDonnell on 47526 205.

Meetings Conducted

The project was discussed with a great number of growers through the CPI group meetings in which Lisa McDonald attended. The CPI meeting are an ideal format to discuss issues relating to the growing sector and there is broad interaction between growers at these meetings.

Harvest Group Meeting
24th February, 2005

Purpose

1. overview of information from 2 days at Bundaberg
2. quick description of nuts and bolts about how this will work
3. discussion on what factors we want to benchmark – this will form basis for the specifications for the computer program

Harvest benchmark project meeting
9th May 2005-05-11

Present: Lisa McDonald, Jeff Coutts, Dale Chapple, Ian Haigh, Frank Scuderi, Phil Marano, Vince Papale, Roy Young, Gary Stockham

Apologies; Bryan Granshaw, Kevin Mann

Purpose
Update on project proceedings

Harvester Meeting
23rd February 2006
Pre-season/report back on analysis of first season

Purpose

1. The purpose of this meeting was to share learning's from the initial trailing of the harvester equipment and analyses, review the initial social benchmark and to look ahead at what changes and needed and steps that need to be take.

Meeting Minutes
SRDC033
Harvester Benchmarking in the Burdekin

Meeting Date: Friday 10th August 2007
CSR Pioneer Mill Brandon

Attendees: Gary Sandal, Di Prestwidge, Steve Attard, Malcom Kelly, Ian Haigh, Gary Stockham, Phill Marano, Kevin Mann, Jeff Coutts.
Chair: Peter McDonnell

Purpose

- Discuss progress of the data collection
- To discuss the latest benchmark reports produced by Agtrix
- Document change in practices by the harvest groups
- Compare cost efficiencies of those changes (Harvest Haul Model)

9th October 2007

CSR representatives met with Mackay Sugar representatives at the Pioneer sugar mill and discussed the project reports being generated by Agtrix. Mackay Sugar use the same MTD units on the harvesters however do not produce a daily report. Instead Mackay have made the reports available to their growers twice a year in a slightly different format. Their report was of similar structure and their growers were beginning to see the value of such a report.

16th October 2007

On the CSR Burdekin representatives travelled to the Herbert to discuss the benchmarking process which is occurring in the Burdekin and to find out what is being done in the Herbert area. The party met with Michael Sefton and Lawrence Di bella of Herbert Cane and Productivity Board (HCPB) and discussed the equipment both regions have been using and the results they had achieved. HCPB is at the point of implementing benchmarking technology into the machines in the Herbert are and have not yet been producing reports on a daily basis for their growers however there is a plan to do this over time. HCPB was concerned that the operators would be scrutinised by growers over issues such as ground speed which may results in operator not installing the benchmarking technology.

Appendix

Appendix 1: Billet Survey
Dale Chappel from the BSES LTD

Aim

- To identify billet quality being produced
- To compare these results between groups
- Improve quality to reduce losses and enhance $ returns
- To develop a target benchmark for billet quality
- What groups are doing in relation to machine setup/operation and the effect on billet quality

Summary of Groups

Tables followed by the same data in a graph.

Table1. All samples for 2005

Group	Sound %	Damaged %	Mutilated %
Sheepstation	62	29	10
Mann	53	38	8
Haughton (new)	52	41	11
HCL (old)	47	35	18
Stockham (7000t)	47	43	10
HCL (new)	45	48	6
Stockham (A+B)	42	35	23
Haughton (old)	36	52	11
Kelly	33	58	8
Haughton	31	51	12
HCL	28	52	21
HCL (6-7000t)	19	53	28

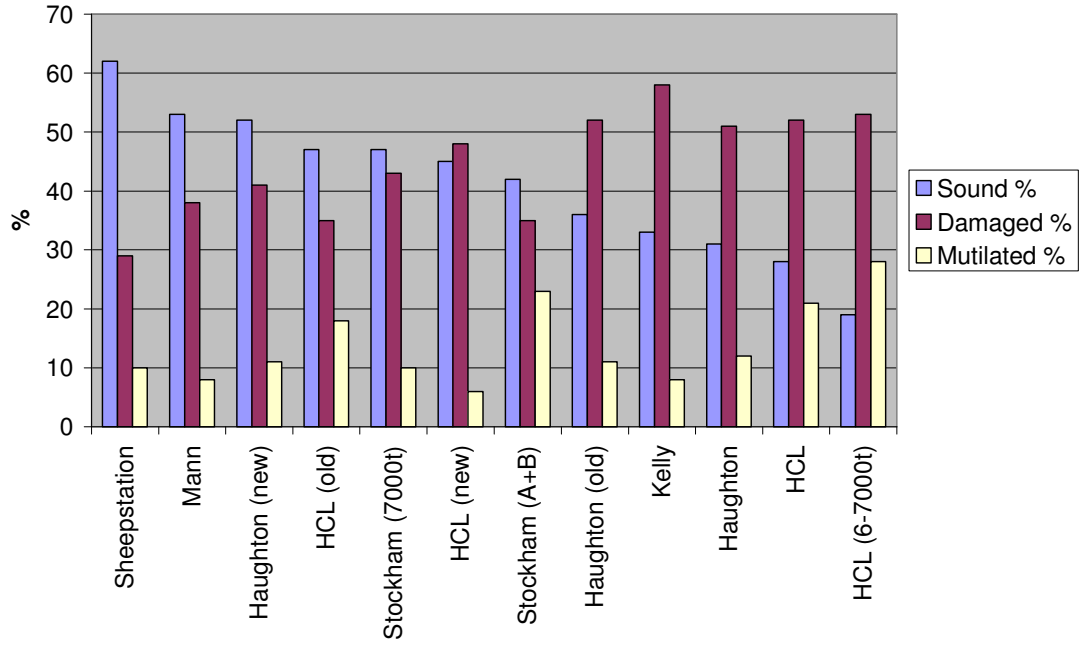
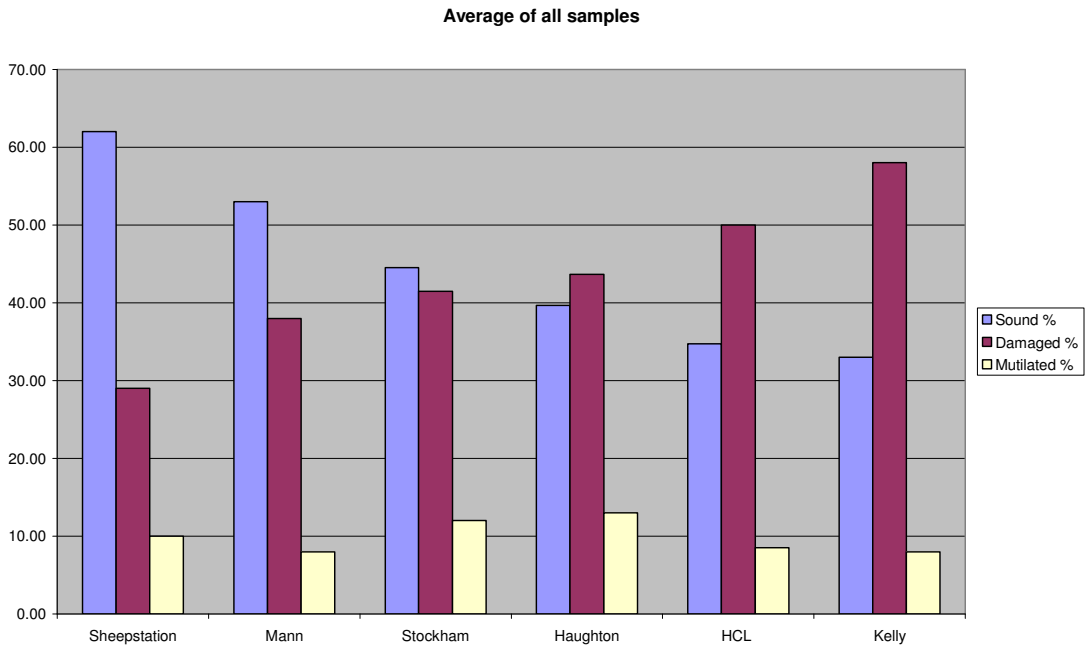


Table 2. Average quality achieved by all groups.

Group	No of Samples	Sound %	Damaged %	Mutilated %
Sheepstation	1	62.00	29.00	10.00
Mann	1	53.00	38.00	8.00
Stockham	2	44.50	41.50	12.00
Haughton	3	39.67	43.67	13.00
HCL	4	34.75	50.00	8.50
Kelly	1	33	58	8



CCS Difference in Billet Quality

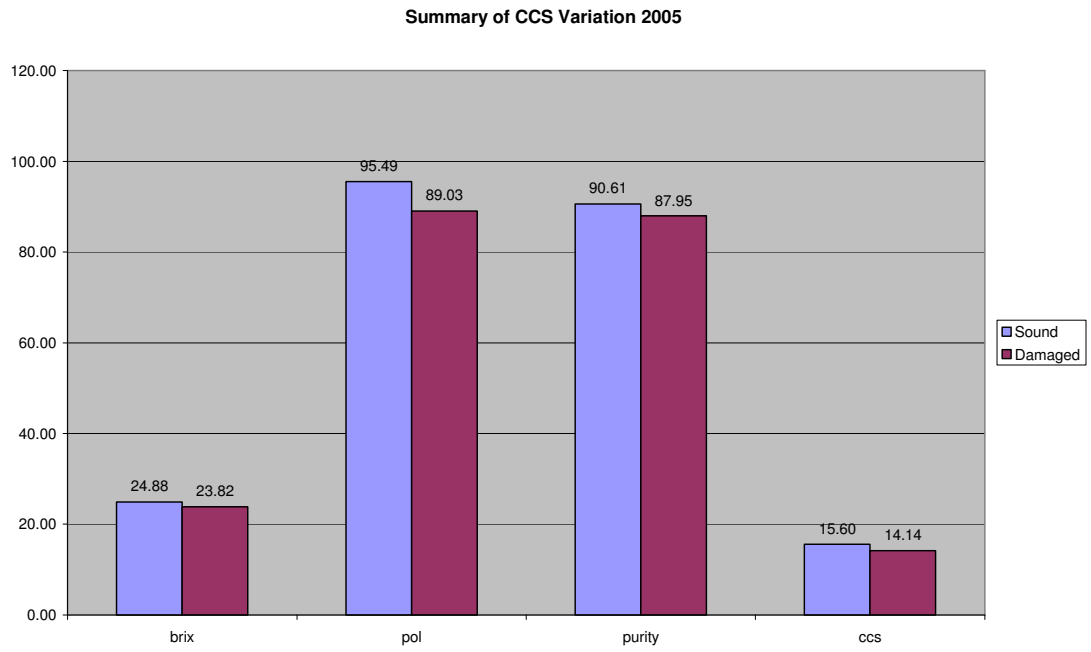
The effect of billet quality on CCS and other quality parameters were assessed for 4 groups over 7 separate samples. Each sample data is in the individual reports for each group

Table 3. Samples used for sugar quality analysis

	Total Kg Sampled	Sound	Damaged	Mutilated
Stockham	35.89	15.06	12.66	8.17
Sheepstation	27.48	16.94	7.85	2.69
Mann	36.27	19.35	13.88	3.04
Haughton	29.49	9.15	16.93	3.41
Total	129.13	60.5	51.32	17.31
%		47%	40%	13%

Table 4. From this the following averages for each parameter was measured.

	Sound	**Damaged**
brix	24.88	23.82
pol	95.49	89.03
purity	90.61	87.95
ccs	15.60	14.14



From these samples, a CCS loss of 1.46 units is measured from damaged billets. So how much $$ are lost due to poor billet quality.

For the following calculations, I have made the following assumptions:

Assumptions

- Crop 120 t/ha
- Billet Quality 60% Sound and 30% Damaged
- Mutilated billets have same quality as damaged
- Harvest and Levies = $7/tonne

- Sugar Price = $300/tonne

Points on these assumptions

- 120tha was used as this has been the district average for past couple of years.
- I am not sure if 60% sound billets is a reasonable target, maybe should be lower or maybe or maybe higher? Need to set some sort of benchmark.
- As mutilated billets were generally a low proportion of the sample, it was not able to get a reasonable amount of juice from the3s billets, therefore assumed they would have the same CCS as the damaged. If you saw what I called damaged and what I called mutilated, you would agree with me that this is definitely not the case, and they would be a lot lower!

So from the data in Table 4 above, sugar losses and $ returns were made using these assumptions

Table 5. Actual sugar yield and $ returns based on billet quality sampled

Billet Quality	% supplied	tc/ha	tc	ccs	tsh	$returns
Sound	47%	120	56.4	15.6	8.7984	$1,404.75
Damaged	40%	120	48	14.14	6.7872	$1,006.32
Mutilated	13%	120	15.6	14.14	2.20584	$ 327.05
				Total	**17.79**	**$2,738.13**

With the assumption that 60% sound billets is achievable the following would apply.

Table 6. Potential sugar yields and $ returns based on assumptions made.

Billet Quality	% supplied	tc/ha	tc	ccs	tsh	$returns
Sound	60%	120	72	15.6	11.232	$1,793.30
Damaged	30%	120	36	14.14	5.0904	$ 754.74
Mutilated	10%	120	12	14.14	1.6968	$ 251.58
				Total	**18.02**	**$2,799.62**

This would indicate that an increase in sugar of 0.23 t/ha is possible, at a value of $61.50/ha. That is a lot of money over the Burdekin, nearly $5M every year

Some points for discussion at our next meeting early in the New Year.

- Need to develop a more structured sampling process –
- Need to better identify where samples come from, tonnes cut, etc.
  Identify factors contributing to billet quality in relation to setup and operation of machines

Appendix 2
Social Benchmark November 2005
Jeff Coutts / Lisa McDonald

Initial Benchmarking Study Social Component

Benchmarking Harvest Group Practices in the Burdekin

Jeff Coutts
Lisa McDonald
November 2005

Acknowledgments

This study depended on the harvester groups (the owners and their staff), their growers and staff involved in the pilot project being prepared to give their time and to be open about their thoughts, concerns, and expectations. Their input and that of CSR staff is acknowledged and appreciated. The project is funded by the Sugar Research and Development Corporation.

Contents

Summary

This is the initial benchmark for the social component of the *Benchmarking Harvest Group Practices* project (CSR034).

The purpose of this benchmarking report is to understand the perceptions, attitudes, expectations and issues of the different players involved at the **commencement** of the project. It will provide a basis for measuring changes in perceptions and expectations over the length of the project and whether early expectations were met or concerns realized. It also provides a basis for addressing concerns and pursuing potential benefits.

Data was collected through group meetings and interviews and collated according to the different stakeholder groupings and emerging themes.

Key findings and implications include:

- There are high expectations of impact. There is a need to manage expectations through continual review and communication about potential outcomes.

- Benchmarking is the major benefit expected from the project expressed by group representatives – results hold potential concerns for some. *There is a need to ensure benchmarked information is put in context and sensitively handled within and between harvester groups*.

- Growers look to yield monitoring and precision farming – there are some doubts about accuracy. *There is a need to clarify the potential of the technology for yield monitoring and ensure growers have realistic expectations*.

- Drivers are concerned about the 'big brother' issue in relation to speed monitoring and the potential for longer hours. *There is a need for increased communication with drivers in terms of understanding the project and the technology and in dealing positively with concerns held.*

- There are a number of barriers to maximizing harvesting efficiency across groups – particularly in taking the next step to treating all farms as "a common farm". *A framework and process is needed to explore alternatives whereby the whole group can capture a net benefit by improved harvesting efficiencies – giving growers confidence to change.*

Initial Benchmark
Social Component
Benchmarking Harvest Group Practices in the Burdekin

Purpose

The overall purpose of the social component of the project is to explore the following elements:

- Understanding why people do – or don't – adopt best harvesting practice;
- What impact the information generated on harvesting operations has on learning, attitudes, decisions and practice of harvester groups;
- How exposure to the information impacts on the openness of harvester groups to innovativeness and evaluating their own decisions;
- Perceived benefits of the technology/information to the users;
- The attitudes, interest and impact on growers services by harvester groups; and
- The attitudes, interest and impact on drivers and milling staff.

The purpose of this benchmarking report is to understand the perceptions, attitudes, expectations and issues of the different players involved in the *Benchmarking Harvest Group Practices* project at the **commencement** of the project. It will provide a basis for measuring changes in perceptions and expectations over the length of the project and whether early expectations were met or concerns realized. It also provides a basis for addressing concerns and pursuing potential benefits.

Project Background

This project looks at the use of electronic monitoring of harvester operations to assist in decision-making to improve the efficiency of harvesting. Data loggers linked to GPS have been installed into harvesters belonging

to the seven harvesting groups involved in the pilot. These data loggers track the location of harvesters every 30 seconds and records (through a touch pad): start and finish times; labour details; fuel use; harvesting conditions and crop conditions. Four of the participating harvester groups have also installed a pressure measuring system on the chopper box in an attempt to monitor yield during harvest (yet to be tested).

Information is also collected on the harvest group structure (area harvested, number of tones harvested, capital equipment, rostering, etc)

The data collected and analysed is intended to be used to benchmark efficiencies for comparison between the harvester groups and for better understanding the factors that impact on harvesting efficiency.

The project focuses on the installation of a GPS unit in the harvester – with a touch pad – and on one of the haul-outs in each group (to track distances to sidings etc). The GPS unit tracks harvester movements. The touch pad unit is used for the harvester operator to enter details on:

- Labour factors;
- Stopping reasons;
- Fuel usage; and
- Harvesting conditions

Changes are being made to improve the software/menu based on feedback from the operators.

Four groups have installed equipment at their own cost (approximately $3000) aimed at measuring changes in chopper blade pressure as an indicator of yield. This would allow yield monitoring during harvesting and hence assist in precision farming. There is some conflicting opinion as to how accurate such an indicator is – and this will be tested in the project.

Billet samples are also being collected and assessed for damage – relating this to when blades are changed, crop conditions and harvesting speed.

There are approximately 140-150 harvesters operating in the Burdekin (potential market). There are 7 in the pilot.

Specific issues relating to harvesting in the Burdekin in 2005 included a late start; the increase in fuel costs (from 80c/litre in 2004 to $1.25/litre in 2005); and difficulties with attracting drivers.

Approach

This study was undertaken over the period between May – October 2005. The equipment itself was fitted to harvesting equipment in August/September 2005 but had not yet received print out information from the equipment at the time of the completion of this initial benchmark. Data was collected in the following ways:

Group Meetings: Representatives of the grower groups involved in the pilot project who attended a pre-harvesting meeting were asked a series of questions about their reasons for being involved; what benefits they hoped to derive and the issues that they saw. The answers and discussion around these questions were recorded, summarized and sent back to the group for confirmation. A mid-season workshop was held just prior to the equipment being fitted to explain details and discuss issues. Notes were taken at the meeting recording areas of interest, concern or issues arising.

Capturing Harvester Group details: Most of these representatives were also interviewed individually about their harvesting groups – how they were set up, how harvesting decisions were made, what the group hoped to

gain from the project and any concerns that they had. A benchmarking summary of these discussions was made and sent back to the representatives for confirmation.

Interviews: A range of people involved in the project were interviewed face-to-face. These included: those managing cooperative or contract harvesting; participating growers; drivers of harvesters and haul-outs; and mill staff working with the harvester groups. These interviews sought the range of perceptions, expectations, issues and concerns held by these different groups.

Themes and issues have been developed from the data and grouped to ensure that individuals or specific harvester groups are not identified. Data is grouped under: Harvester managers (may be growers within cooperative taking this role or owners/contractors); other participating growers; drivers and workers; project staff and mill staff.

The draft report was circulated to those involved for comment prior to finalising the benchmark. The results will be reported back to the harvester groups for discussion, reflection and planning.

Set-up of Harvester Groups

Types of harvester groups

Harvester groups involved in the pilot project range from groups serviced by a contractor to cooperatives with a company structure who own and share assets – some even going beyond harvesting to common ownership of ancillary equipment, sheds, fire-fighting equipment and spray equipment. Some groups have haul-out equipment, while others sub-contract haul-out (paid on percentage).

Some cooperatives have emerged from historical groups serviced by a common contractor – with extra growers joining to increase the total tonnage and hence efficiencies. Other are newly formed – with the trigger being a loss of their servicing contractor.

Some cooperative groups have well developed (five) year plans which also incorporate broader farming operations as well as harvesting (for example changing row spacing). Contracts to supply cane to the cooperative have been important for bank security.

Decision-making

Members of cooperative companies officially have shares according to tonnage – although voting is based on one vote per member. Most point out that decisions are made on consensus rather than voting – although examples of being 'outvoted' on some decisions were provided (including involvement in this project with the additional costs involved).

All groups use the 'equity rostering system' to program harvesting – that is, based on a percentage rotation that follows on from previous years (for example, the grower who was last the previous year goes first this year with a pattern of 1X10%; 4X20%; and 1X10% with minor modifications through the season). This is designed to share risk and ensure that individuals are not disadvantaged (for example ‘always being last’ or having their cane left standing at the end of the season). The mill gives an allocation to the cooperative based on crop estimates for the year – tones per day with “x” days to deliver for the year (altered as the year progresses according to conditions, revisions etc).

Mills have their legal dealings with the individual growers, but a view is that…*in reality daily contact is with the contractor/harvester manager and information about how much cane the mill wants and where to deliver it.* Individual farmers were seen to get more involved in issues such as quality.

Role of women

In most cases, farm women do not appear to be involved in the decision making about the organisation and management of harvesting groups or in the use of the technology involved in this pilot project. The general response has been…*we* (the men) *are fully involved in the farming operations…our wives leave the farming decisions to us*.

Reasons for participating in project/expected benefits

For Harvester Groups

The reasons given by Harvester Group representatives/contractors as to why their group was interested in being a part of the project were as follows (in order of mention/weight):

Benchmarking costs across farms within the group as well as against other harvesting groups (and for example economics of trucks versus in-field transporters)	#####
Improving harvesting performance generally.	####
Yield monitoring - for precision agriculture (fertiliser placement etc) [note 4 farms have purchased extra equipment intended to monitor yield during harvest – yet to be tested].	###
Showing up inefficiencies with siding placements and bin distribution and management.	##
Monitoring harvesting operations - to see if the harvester driver was following instructions (speeds according to conditions; time being wasted etc).	##
Ability to look at impact of changes made to harvesting equipment or management.	##
Recording flow of cane – for example recording where losses were occurring (for example between 4-6 am when dew is about).	#
Monitoring billet quality – scope to reward/penalize individual rather than area.	#
Gauging the value of investing in GPS systems.	#
Looking at ways to improve farm layouts.	#
Order of cutting – future scope to treat whole group as "one farm" and cut to maximize overall benefit.	#

It was pointed out that better figures could benefit harvester drivers/contractors…*when a grower says 'you are doing a poor job in my farm' the contractor will have the data to show the link between harvesting conditions and efficiency.*

Some drivers suggested that the main reason the groups were involved in the pilot was to cut costs and to monitor their speed.

For individual growers

A number of growers from different harvester groups were interviewed about their thoughts on their group's involvement in the project. Most growers were positive about the trial and their reasons reflected those given

by their representatives – although the higher belief that the technology would assist with yield mapping and the subsequent benefits for precision farming. A small number indicated concerns about the cost and the perception about the limited gains to be made…*we're told to cut costs, but we put $60,000 towards getting straight drills…not as critical in cane…can't see how we are going to recoup.*

Specifically, reasons that were given for their interest in the project are included in the following table (in order of mention/weight):

Yield mapping – to allow better decisions about fertilizer, lime etc.	#####
Providing data to show problems with siding distribution and bin management	###
Monitoring of speed and its effect	###
Providing a fairer basis for harvesting charging – a basis for negotiating with contractors	##
Environmental benefits – reduced nutrient run-off with precision farming	#
Showing up ways to make harvesting more efficient – for example, where to put culverts.	#
Efficiency of harvesting – waiting times etc	#

Some growers pointed out that farmers are criticized for not changing – but that they *are* changing all of the time to keep up…*we're not environmental vandals…we look after it for the next generation.* This project was seen as a further way of gathering data to help growers keep changing – to 'prove the benefits of change' and hence give people confidence to make the necessary changes.

For drivers

Although drivers generally didn't have a say in the decision making process (except owner-driver contractors), some could see the rationale from the growers point of view. It was also expressed that the information could highlight some current inefficiencies such as the time and fuel wastage when…*growers insisted on having their cane cut one-one only regardless of the situation.*

A mill staff member pointed out that some work was intended in the project to look at 'shoot counts' which could help clarify the impact of speed and blades on stool damage and future production.

For mill staff

The GPS unit mapped the position of the harvester/haul-out every 30 seconds (and *can* monitor harvester speed) and recorded factors that could benchmark and help to explain differences in harvesting efficiencies. Benefits from this were seen as comparing the efficiency of operations including such things as:

- differences between blocks and ways to improve – farm layout;
- the decision to use 2 or 3 haul-out units; transport efficiency (for example sharing of sidings or identifying the need to build new sidings);
- impacts of whole operation such as the effect of short rows;
- long hauls and crop conditions;
- reasons *why* there were differences between farms and harvester groups; and
- optimum number of harvesting rounds.

It was noted that the data could put pressure on the mill in terms of the need for more sidings or deficiencies in bin management – but that can also provide a basis for the mill to address inefficiencies. Scope was also seen to look at starting times – with the potential to stagger harvesting starts to permit better delivery efficiency of bins.

The collection of billet samples (part of the project) was seen as a way of providing information on feedback on the optimum time to change blades on the harvesters to minimize damage. This can also provide benchmarking data for all groups.

Another advantage to the mill staff is that the mill will be able to see what is happening on farms without the need for so many mill visits – a time saver.

Issues/concerns

For individual growers

While an advantage was raised as helping to set fairer harvesting rates, there is the potential for individual growers to be disadvantaged if they are shown to be more costly to harvest – and hence are charged more per tonne for harvesting. There was some interest in differential charging both within groups serviced by contractors as well as those within cooperatives. One concept was for cooperative growers to provide their own fuel for harvesting on their farms.

Concern was expressed by some growers that a lot of effort and cost might go into equipping machinery and collecting data without it being used or being of benefit.

In terms of the cooperative approach generally, a small number of examples were given where wives of some growers were concerned about the loss of individually owned farm harvesting equipment…*if the cooperative falls over we will need to go into debt to buy new machiner*y.

For Harvesting groups

One harvesting group saw that improved analysis and recording through the equipment could lead to confidence in treating the farms within the cooperative as "one large farm" for the mutual benefit of all. There were some significant impediments to achieving that – with a suggestion that a framework and process was needed to help cooperatives break through the barriers.

As pointed out above, more accurate costing could result in differential charging of farms for harvesting, however, as one informant pointed out…in one group, one farmer is 2 kms from the siding and another is 12 kms – there is a potential for differential cost…*but they say "do we charge a group member more…who we like and respect…just because they are further from a siding?*

Some drivers pointed out the limitations of equipment in providing the data that the growers expected (for example with yield mapping)…*grub damage gives as a high reading…and then there are clods of dirt…can't get true picture*. Weighing cane in haul-out bins was seen as more accurate.

There were issues related to optimum size of harvester groups. Smaller groups limit the return on investment of harvesting equipment. Groups that are too large can be difficult to service.

A concern was expressed by one group that they were worried about getting a 'tainted' reputation if people associated their involvement in the trial with a move to bring in 2-shift harvesting. This was something that they did not want to happen.

For Harvester owners/managers

Costs

The cost of fuel has not caught up with the contracted harvesting cost and there are no longer any centralized guidelines for harvesting costs (as previously provided through Canegrowers).

Farms on the Inkerman side are charged an extra 10 cents per tonne than those on the Ayr side of the Burdekin.

Concern was expressed that the benchmarking study could show up differences in costs between cooperative and contact harvesting putting pressure on contractors to reduce price. Linked to this was the fact that the project might not include all of the costs in running a cooperative harvesting business.

Shortages

It was pointed out across the different groups that harvester and haul-out drivers were increasingly becoming hard to get. One grower pointed out that he had never seen so many adverts for drivers during a season. A lot of comparison was made to the better pay and conditions for drivers in the mines. It was also pointed out that the equipment was better in the mines and that it made working in the sugar industry even harder. Examples were given of using backpackers and women as drivers because of the shortage of local men.

For Drivers

'Big brother' concerns around speed

Manufacturing and general recommendations are for harvesters to operate at about 7km/hour. The logic is that stools are prone to damage if speeds are faster and more cane is left on the ground. Harvesting teams, however, are paid on a tonnage basis rather than time – which leaves a tension between speed and maximum efficiency.

Some growers expressed concern that…*the lads are concerned that we can log on to a computer and see them operating*'. One grower stated however…*if they are doing the right thing they have no need to be concerned.*

Some drivers did express the concern that…*they just want to see how fast we are cutting…want to know that we are doing it their way*. One driver pointed out that he was…*chatted because I left a couple of sticks…*and the speed monitoring would provide more ammunition for growers to have a go at drivers. One person put it as…*they want us to do 200 bins per day…but how can you do that at 6 km/hour?...its a long day already – 12 hours*. Another comment was…*none of the growers have driven harvesters so they haven't experienced the conditions and don't have the same experience…haven't had to use the bad headlands.*

There was a feeling by some that they weren't trusted and that their experience wasn't appreciated.

Most drivers indicated that they can judge from experience the optimum speed – and that lower yielding cane can be cut at a faster rate….*we are told to drive at 7 km per hour over the whole farm to keep it even…but when cutting 1000 tonne/day we don't want to be here to 6pm…if you get rubbish cane you can do it at 15km.* There was also some scepticism about the damage that faster cutting did to the stools…f*armers say you belt the stool around…smash it…that too won't come up…but farmers use rippers which do far more damage*!

Long hours

The drivers often worked 7 out of 8 days from 4 am to 6 pm. A number pointed out the negative impacts on their social and family lives…*have to live close-by and only see the family once a week…go to have a beer with mates and after one round need to go to bed…* A number indicated that they would not be signing on for another season.

The time factor for some harvester/haul-out drivers was exacerbated by the lack of assistance by growers or the lack of 'gophers' to undertake support work. This meant that drivers who had been working for 12 hours were still required to undertake maintenance duties before knocking off. Workplace health and safety issues were raised by both some growers as well as some drivers…*in other industries drivers are forced to take a break after so many hours…we just have to keep working.*

Equipment issues

Some problems were being experienced with sending information due to poor telecommunications coverage. This linked to the extra responsibility some harvester drivers felt in getting the information right. A number of drivers had provided feedback on limitations to the recording pad – and changes in software were being done to rectify some of these.

Decision-making/understanding

A number of drivers felt divorced from the decision-making process and felt that their opinions and experience was not sought nor valued. Some were unaware of the purpose behind the equipment and what their role was in it. In one case the GPS unit fitted to a haul-out was considered a nuisance because it beeped a lot…*and we tried to disconnect it.*

Safety

Some growers expressed their concerns about safety for harvester/haul-out drivers if harvesting was to be undertaken around the clock…*starting at 4 am means that it is soon light and the working day…but if you start at 4 pm…its into the dark…and more difficult in getting assistance*.

For the mill

There were some concerns that the waiting times for bins limited efficiency…*we don't mind having a break for half an hour….but 3 hours*?

It was pointed out that the tracking equipment could mean that mill staff may need to make less filed trips to monitor progress of harvesting. While this was seen as a time saver, the reduced contact with harvesting groups and growers was seen as a potential downside. Currently in a normal season, mill staff were seen to have contact with growers…*2-3 times/season and with contractors/harvester managers 2-3 times/day*.

For the community

No concerns were expressed about negative consequences for the community in general as a result of using GPS equipment and related technology. A comment was made that if the mill ever introduced – or allowed – large trucks to deliver bulk cane to the mill for greater transport efficiency, it could result in problems for public roads.

Implications

Some of the major themes and implications emerging from the data are listed below.

1. There are high expectations of impact.

There is a high level of expectation that the technology and processes involved in this pilot project can provide data which can significantly impact on harvesting efficiency and management across all groups.

There is a need to manage expectations through continual review and communication about potential outcomes.

2. Benchmarking is the major benefit expected from the project by group representatives – results hold potential concerns for some.

The harvester group representatives in the project have a strong common understanding about the main outcome being benchmarking of their operations against other harvesting groups and hence highlighting scope for improving harvesting efficiency. The data is also seen as providing harvesting cost comparisons across farms. These outcomes hold some angst in terms of contractor costs being put under pressure (if cooperative costs are not fully comparative) and pressure on those farms in the group who may be costing more to harvest than others.

There is a need to ensure benchmarked information is put in context and sensitively handled within and between harvester groups.

3. Growers look to yield monitoring and precision farming – there are some doubts about accuracy.

The growers interviewed saw a great stock in the potential of yield monitoring and the implications for precision farming. Four groups have purchased additional equipment to monitor yield during harvesting operations, however there is some question about the accuracy of this approach – it is yet to be fully tested.

There is a need to clarify the potential of the technology for yield monitoring and ensure growers have realistic expectations.

4. Drivers are concerned about the 'big brother' issue in relation to speed monitoring and the potential for longer hours.

Some growers mentioned their concern about drivers feeling 'watched' via satellite. A number of drivers did express concern about this – particularly in relation to limiting their judgments about speed (for example in light crops) – and the potential for their already long work days to be extended unnecessarily. Some drivers also felt out of the decision loop and did not fully understand the intended use of the equipment – potentially leading to less than optimal use of the technology.

There is a need for increased communication with drivers in terms of understanding the project and the technology and in dealing positively with concerns held.

5. There are a number of barriers to maximizing harvesting efficiency across groups – particularly in taking the next step to treating all farms as "a common farm".

The rotation system of harvesting provides a risk sharing mechanism for the individual, but limits the scope for overall more efficient harvesting in terms of harvesting logistics and cutting to maximize yield. One consequence of improved benchmarking is putting pressure on differential individual harvesting costs, further fragmenting the 'group' structure.

A framework and process is needed to explore alternatives whereby the whole group can capture a net benefit by improved harvesting efficiencies – giving growers' confidence to change.

Appendix 3
Social Benchmarking February 2007
Jeff Coutts / Lisa McDonald

Second Benchmarking Study Social Component

Benchmarking Harvest Group Practices in the Burdekin

Jeff Coutts
Lisa McDonald
February 2007

Acknowledgments

This study depended on the harvester group representatives being prepared to give their time and to be open about their thoughts, concerns, and expectations. Their input and that of CSR staff is acknowledged and appreciated. The project is funded by the Sugar Research and Development Corporation

Summary

This second benchmarking report follows on from the first study in November 2005 – at the start of the project. The second report looks at what impact the involvement in the project has had on participants to date as well as their expectations of impacts and benefits based on the first full season of results and reporting.

Key findings include:

- There were a number of technical problems in relation to accurate matching of mill and GPS data, some malfunction with equipment and human error/failure to input data.
- Even with the inaccuracies, the report summaries reinforced the value of the information (assuming accuracy) to improving harvesting efficiencies in harvesting groups to participants.
- A key issue raised was the need to be able to flag malfunctions occurring in equipment quickly so that they could be addressed.
- Rigour and accuracy were seen as critical in being able to use the results with growers to motivate positive changes.
- Harvester representatives remained very keen to be able to benchmark data and to be able to compare farms within groups (and blocks) and with district averages.
- A number of suggestions were made to improve reporting and understanding of the information provided.
- Impacts described to date included: improved awareness of efficiencies by the harvesting crews; and some increased awareness by growers and openness to harvest both directions.
- The main expectations from the project were the same as for the first study (yielding information to benchmark across farms and hence highlight opportunities to improve performance and/or introduce differential payments for harvesting).

- The focus has changed from a more 'policing thinking' about monitoring harvester drivers to that of education and awareness raising.
- The distinction was clearer between what this equipment/project could achieve and precision-agriculture which required extra equipment than in the initial study.

Benchmarking Harvest Group
Practices in the Burdekin
2nd Social Component Benchmark
February 2007

Jeff Coutts
Lisa McDonald

Purpose

This is the second benchmark report for the social component of the Harvest Group Practices Project in the Burdekin. The first benchmarking study was undertaken in November 2005. The overall purpose of the social component of the project has been to explore the following elements:

- Understanding why people do – or don't – adopt best harvesting practice;
- What impact the information generated on harvesting operations has on learning, attitudes, decisions and practice of harvester groups;
- How exposure to the information impacts on the openness of harvester groups to innovativeness and evaluating their own decisions;
- Perceived benefits of the technology/information to the users;
- The attitudes, interest and impact on growers services by harvester groups; and
- The attitudes, interest and impact on drivers and milling staff.

The purpose of these benchmarking reports has been to understand the changes in perceptions, attitudes, expectations and issues of the different players involved in the *Benchmarking Harvest Group Practices* project at the **commencement** of the project.

Approach

This second benchmarking was based on an end of season meeting by Harvester Group representatives (with the project coordinator Lisa McDonald, social researcher Jeff Coutts and Technical data cruncher Robert Crossley) where the summary of results from data collected were distributed and explained. This included highlighting those components that did not work as expected. The discussion around these results was recorded and specific extra questions posed to the group at the end of the meeting covering:

- What changes have you made (or are you thinking of making) in your Harvester group as a result of your involvement to date?
- Now that you have a better feel for what could come out of this project, how do you expect to be able to use it to make a difference in your group?
- What disappointments/issues do you have with the project and its outputs/potential outcomes?

The answers to these questions were then compared to the first benchmarking discussions with the harvest group representatives to see if changes in understanding and expectations had occurred.

Interaction with data and reporting

The meeting was based around presenting the first full collated results over a whole season in a summary format for each harvester group. Five of Harvester groups participating in the pilot were present.

It was pointed out that the first 8 columns of data were directly associated with 'what the sensors' reported – eg time spent: cutting, running, stopped and the distance traveled in these states. Ratios provided a benchmark – eg turning/cutting (low number = long straight rows); cutting pour rates – delivery rate; elevator pour rates (to get ration up – need to spend ,ore of the time cutting); field efficiency ("says the most");

It was pointed out that:

- There are 2 systems that aren't directly connected: 1. the GPS system on the equipment that has the potential to be a little out and record the paddock next door (there is no cross check that this is the paddock you are in); and 2. Mill data – tickets recording tonnage relating to specific paddocks. These need to be matched exactly.
- If data showed up under 'Malfunction' then there as something wrong with the associated input data (engine sensor stops working);
- 'Interpreted time spent' included logic changes to the data in relation to elevator on/engine on (NSW has sensors in choppers);
- Time spend turning was based on 3 data points;

Problems with the data

- It was evident that were problems with some of the data. Problems included:
- Extra farms showing up on the harvester group summary (problem with linking GPS to map of farms and/or mill record sheets);
- Some elevator data was not recording;
- The 'time stopped' at the end of the day was not recorded as such (it was noted that ;
- One harvester group switched equipment with another group after the start of the season – affected results;
- There were significant problems with using touch pad data – for example few were inputting fuel usage ("*that was a key interest*"…"*eventually want to charge on fuel use*"), maintenance and other related data *…haven't come up with how to meaningfully use touch pad data*.

A second summary sheet was based on whole farm data rather than daily deliveries and was expected to show a truer picture – took out some of the uncertainties in daily cutting and delivery tonnes (although there could be a problem if there were 2 different harvesters being used on the same farm).

Suggestions resulting from the discussion of summaries and data:
Suggestions included:

- Sheets would be more useful if there was a clear explanation if what each column means – as well as an indication of 'what is a good pour rate' etc.
- Ratio averages across farms within a harvester group would help with benchmarking – also compared to district averages.
- Need to have a flag if there is a malfunction so that it can be fixed quickly – and not ruin a lot of data – daily reports to web based access of data was discussed as ways to do this – and incorporating a software flag…"*if we are going to be able to use this we have to be able to know if there is a malfunction*".
- Scope to compare field efficiencies between blocks;
- Provide results in excel data – "*so we can manipulate it*".
- Include a way to manually provide the fuel summaries over the season for benchmarking comparison (*"…need litres/tonne*") – average fuel price was also seen as useful data.
- Touchpad will need redesigning – eg: retain paddock conditions; take out Repairs and Maintenance; include paddock identification on touch screen to better match figures.
- Provide weekly summaries – so that 7 days of data can be scanned weekly.
- Use of graphs to show differences in reports.

Impacts on participants to date
The Harvester group representatives were asked whether their involvement in this project ahs had any direct impact on their (or their group's) thinking or practices to date. The responses included:

- Prompted awareness of efficiencies in the crew – more careful about the way the go about harvesting a block - …*definitely thinking a lot more*".
- Nothing to date - but we are hoping that this will help getting a better deal with the farmers we cut for (prices etc) – *the figures will be 'real figures' – not made up*!
- Some increased awareness – more farmers will let you go 'up and down' the rows if you can show the increased efficiency by doing that. There is scope for a 'farm price' versus a 'group price' for cutting.
- Teaches operators to take more notice – be more aware. Good for drivers to be able to see reports.
- There is an expectation that we will be able to show efficiency gains from year to year as the reports become more accurate – peer pressure on individual growers to do better – fix headlands etc.
- None yet - need to have plain English reports and confidence in the accuracy/rigour before taking it back to others in group and drivers….*'its got to be accurate'*. See the scope for benchmarking between farms and district.

Other expectations and benefits
Based on what they had experienced and seen to date (what could be done in practice as well as the limitations), the harvester group representatives were asked what expectations they now had. These are summarised below:

- Decisions about farm configuration etc.
- Growers can have an idea of what is really involved in harvesting their cane – real figures.
- Awareness to look at themselves (growers in group) – currently have no idea (of efficiencies) – scope to link to extra cost – and to prompt such changes as squaring up headlands etc.
- Ability to look at such things as whether 2 haul-outs are more efficient (although this isn't in the data summary yet).

There was recognition that this data as such did not help with precision agriculture – just that the satellite system could be used in association with extra equipment such as load cells etc.

The main disappointment raised was in the unreliability (or complexity) of the system to date (factor of equipment and people) – but there was an expectation that this would improve.

The comparison of the expectations raised in this meeting with those raised in the initial benchmarking study by the harvester representatives is shown in the table below:

Expectations from project	Nov 2005	Feb 2007
Benchmarking costs across farms within the group as well as against other harvesting groups (and for example economics of trucks versus in-field transporters)	#####	#####
Improving harvesting performance generally.	####	#### (increased awareness and actions to improve)
Yield monitoring - for precision agriculture (fertiliser placement etc) [note 4 farms have purchased extra equipment intended to monitor yield during harvest – yet to be tested].	###	
Showing up inefficiencies with siding placements and bin distribution and management.	##	
Monitoring harvesting operations - to see if the harvester driver	##	#

was following instructions (speeds according to conditions; time being wasted etc).		(but focus on education rather than policing)
Ability to look at impact of changes made to harvesting equipment or management.	##	##
Recording flow of cane – for example recording where losses were occurring (for example between 4-6 am when dew is about).	#	
Monitoring billet quality – scope to reward/penalize individual rather than area.	#	
Gauging the value of investing in GPS systems.	#	
Looking at ways to improve farm layouts.	#	##
Order of cutting – future scope to treat whole group as "one farm" and cut to maximize overall benefit.	#	

In this second benchmarking, the participants continued to expect that the data and reports would yield information to benchmark across farms and hence highlight opportunities to improve performance and/or introduce differential payments for harvesting. The distinction between this project/equipment capacity and that used for yield monitoring was clearer in the group.

Appendix 3
Social Benchmarking
Jeff Couuts

Benchmarking Harvest Group
Practices in the Burdekin

Update on social and economic impacts
For August 2007 Milestone Report

Jeff Coutts
August 2007

Purpose

The purpose of this report is to capture the reactions and impact of project activities and outputs to date from the representatives of the Harvest Groups involved in the project.

The central questions are:

- What value do participants see in the project and its outputs to date and as it progresses?
- What will increase the value of the project and its outputs for them?
- What impact has involvement had on their understanding, thinking or practice to date?
- What impacts do they expect it to have on them and their harvester groups into the future?

Approach

This report is based on participation in a mid-season meeting in August 2007 and observing the discussion around the outputs presented from the 2006 season and the 2007 season to date. It also included a special group session where participants were specifically asked about their reactions, impacts to date and future expectations.

The meeting was attended by 5 Harvester Group representatives, CSR and CSIRO representatives.

Key findings

1. The data is still viewed as not yet reliable enough to be useful in decision-making.
2. The reports need further refinements in terms of explanations, terms and indicators used.
3. Problems with the data were seen in the 2006 reports and efforts will be made to correct these.
4. Overall there remained a high level of interest in the potential benefits of the data and its analysis – once the bugs were ironed out.
5. Touch pads were seen to have failed - it was agreed that reliability was more important than persevering with touch pads.
6. Automation of data – for example linking in with mill data available – was seen to be the way to go rather than relying on extra human input.
7. There was strong endorsement for reporting on a block x time basis as a better way of highlighting variation and opportunities to improve efficiencies.
8. There were examples of improved record keeping for the harvester operations as a direct result of involvement in the project to date.
9. There was a lot of potential seen in being able to use the 'independent' accurate figures to negotiate differential pricing and highlight improvements that could be made (eg improved headlands). There were some 'cultural' issues to be addressed in this process.
10. There was also scope to use results to improve the conditions for harvester drivers (eg reducing unnecessary down-time).
11. Other ways of using the data (combined with costs) including looking at optimal sizes of harvester groups and making decisions about harvester machinery replacement.

12. It has taken until the end of the project to come close to useful outcomes – and the issue of continuity is an urgent consideration.

Results

Reactions to outputs

February meeting requests

At the February meeting, a number of suggestions were made by Harvester Group representatives about how to improve reporting and understanding of the information presented. These included: having a clear explanation of what each column meant – as well as an indication of a reasonable benchmark might be for each (for example, what is a "good" pour rate?); having ration averages across farms within a harvester group – as well as a comparison to a district average; need to be able to 'flag' a malfunction; and use of graphs.

Explanations

The new reports presented in August did include some explanations at the front. Although these were welcomed, the feedback was that they were still too 'technical' and the terms did not match the ones used in the columns. *A commitment was made to further improve the explanations*.

Graphs

Although the graphs requested had not yet been built in, a bar graph example was provided. There remained a strong interest in having graphs in the report for ease of understanding. *The graphs are being worked on and will be included in future reports..*

Daily reports

Daily reports were being received by some harvesters – and there seemed a general consensus that the headings and terms used in the daily reports were more useful that some in the monthly/seasonal report. One harvester pointed out that the main value of receiving daily reports was that it confirmed the sensors were working. Monthly reports were seen by some as more useful in terms of the figures themselves.

Touch pads

A key issue raised in February had been the problems with the key pads – technical malfunctions, inconsistency in use as well as the fact that the data did not directly connect to the other data being collected – and hence wasn't appearing in the reporting. Suggestions had been made about how to deal with this. The August meeting reiterated the same problems. Touch pads were described by one participant as '*a pain in the read end'*. The human elements of not using the touch pads…*the last thing you want to be bothered with at 4 am in the morning*…and…*some put the data in at the end of the day – and then it doesn't match*…were raised. This was coupled with their unreliability…*equipment is letting us down*…and lack of any data coming back to the growers or harvesters.

Another element was the unreliability of the firmware – with some systems having been replaced by new ones – with which, the touch pads would not work! As much as harvesters were interested to link field conditions to the data, it was agreed that they would rather ***focus on reliability*** of the firmware rather than persevered with the touch pads – and find other ways of linking in these other factors (eg paper based). Touch pads were therefore dropped from future considerations.

A key issue was that information needed to be automated as much as possible. It was pointed out that block tonnages, CCS, varieties and class could be obtained from the mill and linked to the harvesting data being collected. Accurate field meters that were being installed in some groups would also help.

Report data presented

Referring to the 2006 data presented, two participants pointed out that it did not reflect their true tonnes for the season – *it was agreed the figures would be redone with the actual tonnes provided by the groups*. Two

participants questioned whether the elevator figures were accurate…*appear back the front – that was to be checked*. The comment was made by one – and agreed by the others – that the report was indicating its potential value – once the explanations and figures were right!

The point was made that the real benefit was sharing between groups – and during the meeting that did happen. One comment made was…*speed wasn't as bad as we all thought it was* [this had been a significant issue raised in the first meeting – concern that drivers were going too fast and affecting yields and damage to stalks].

Data was also presented using harvester group's costs, using estimations of efficiencies and then modeling the harvesting costs per group. It was pointed out that the model values could be changed for actuals for comparisons. One participant pointed out that a key figure for him and his business was the bottom line "Harvester costs - cost of harvesting per tonne" – and how that compared between contract and cooperative.

Maps were passed around showing how assumptions were made about which sidings had been used from each paddock. There was much interest in these diagrams – as well as pointing out that different choices had been made in practice…*although maybe we should have used these*… Participants agreed to provide the actual sidings used so that the 2006 data figures could be made more accurate. It was pointed out that tracking haul-outs was a key part of the original project, however the changes in 'rules' of use made this less relevant.

Making use of data
A suggestion was made that reports could be provided in a (visual) block x time basis – so that it could clearly show the flow of work during the day, stoppages, average speeds per block (rather than farm) as in the below diagram.

Block No:	4.1		4.2			4.3	
4am							11 pm
Engine hrs	4		5			etc	
Efficiency	70%		70				
Crop Class	P		1R				
TCH	170		etc				
Flow rate	100						
Delivery rate	70						
Av Cutting Speed	4.2						
Turn Time	etc						
Other downtime							

There was strong agreement that this type of data would be most useful…*that's good! A quick readable output*! – and would also help pinpoint issues with downtime due to late bin deliveries as well as point to paddock and workflow problems – *this format will be worked on.*

Impacts
Changes made to date
Participants were asked about any changes they have made as a result of their involvement in the project…even though you haven't yet had reliable figures.

One Harvester group had had informal discussions about using base costs and fuels as a basis for harvester costs for each farm (for example it costs more to harvest green cane) – but they were waiting on more accurate data to make the case.

Another said that since the project started, he had more systematically recorded fuel, maintenance and blades than they had in the past – being more aware of the importance of this data. A further participant also referred to modifying their recording and reporting to better separate out harvester costs from other farm costs.

One Harvester group member referred to changing back to 3 haul-out trucks instead of 2 because it was more efficient – but it was unclear if that was prompted by the project as such. Another participant referred to the price of fuel being a driver for him to make changes (independent of the project) – *litres per tonne cut* was the critical figure.

Potential changes
Comments were made about the advantages there would be if they could track efficiency and cost figures before and after changes – to see the value in such changes.

All harvester group representatives saw the benefits of having accurate figures off different costs between blocks, growers and harvester groups – so that there was back-up to negotiate changes in costing or to highlight where efficiencies could be gained. One example was given of the potential of saying to a grower…*if you improve the headlands on this block, the cost of harvesting will be less than it will be if you don't*. One participant pointed out that the figures could also show which blocks just aren't economical to harvest.

There was some discussion about the need for cultural changes in harvester groups if differential prices were to be accepted and negotiated…*if a grower costs more because he is further from a siding, whose responsibility is it*? It appeared that having accurate costs which could 'independently' show the differences in harvesting costs according to factors such as distance, row length, headlands etc, could at least start the discussion which otherwise was seen as just one person's opinion.

Another potential use raised was that figure comparisons between old and new machines could show at what point it became more economical to invest in new equipment – when the repairs and maintenance was greater than the purchase/ depreciation costs of the new machine.

Another suggestion was that accurate figures (efficiency and cost figures) could help with decision-making about whether a group should downsize – or upsize! It was pointed out that the models being developed would help with this issue of optimising farm operations. In terms of this issue, however, one participant highlighted that this decision was bigger than the harvesting costs but…*related to the whole system*.

A more accurate understanding of the waiting times and harvesting efficiency could also help in making adjustments which would improve conditions for drivers…*keep more workers*!

Next steps
It was pointed out that…*just as we are getting close to having the problems sorted out and useful information, the project is due to end*. This left a number of unanswered questions in terms of: the continuity of data; the issue of who pays for it; access to expertise to explain and refine data and reports and consider implications; and an on-going forum for sharing. These issues were seen to be common to short-term projects in general.

In this case, there is opportunity to continue much of these gains in a new project looking at harvesting scenarios – at least for another 18 months. But what then?

Harvest Haul Model data is Private and Confidential

BKN Groups Summary-HHM.pdf

BKN Groups-Detailed-HHM

Group Inputs Summary - HHM.pdf

BNK Group Summary HHM is a comparison between five (5) of the participating groups taking into account their capital expenditure, harvester performance, labour and running