SRDC Grower Group Innovation Project
Final Report

SRDC project number:	HGP 004
Project title:	**Demonstrate the true value of harvesting best practice and provide the basis for the sharing of the additional revenue created by its adoption**
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Australian Government
Sugar Research and Development Corporation

Executive Summary:

The Cooperative Systems project (SRDC Project MSA003) considered how a cane quality incentive scheme might be incorporated into a cane payment. The report discussed the measurement and feedback of cane quality data to harvester operators and growers to ensure that the information delivered sends the right market signals and compensates the parties for the costs involved in achieving particular targets.

A good example is extraneous matter. Extraneous matter can be reduced by simply increasing the fan speed on the harvester's extractor. However this will also increase the loss of sound cane in the field, which is not the desired effect. Instead the harvester operator should slow down and adopt other "best practice" harvesting measures, but this will increase harvesting costs for no real benefit to the harvester.

This project aimed at identifying the true costs of adopting Harvest Best Practice "HBP" and to provide the basis of a cane payment option to share the additional revenue and costs generated from HBP between the grower and harvester operators. This was to be achieved through the development of a web based cane loss indicator. This indicator would be used by growers and harvester operators to monitor the cane loss and harvester throughput and for agreement to be reached on payment options that would deliver the best results for the grower, miller and harvester operator.

The project involved the installation of GPS tracking devices and associated equipment to harvesters that recorded the position of the harvester in the field as well as ground speed, direction and primary extractor speed. This data is then sent from the harvester tracking device to Mackay Sugar computer servers via the Telstra CDMA 1X mobile data network. Initially due to commence in the harvest season of 2005 the project was delayed for 12 months mostly due to concerns with the Telstra mobile network, however this was rectified in early 2006 and the project strated in the harvest season of 2006.

Mackay Sugar consulted BSES staff and Gary Sandells (Harvest Solutions) to design and undertake suitable field trials to best measure cane loss through the most common primary extractor fans being utilised on a variety of cane harvesters.

In all, nine trials were conducted to determine cane loss for the new 1500mm Cameco extractor fans and Vortex extractor fans being utilised in the later model Case cane harvesters.

Cane loss, calculated by deducting the clean cane yield at the highest fan speed from the clean cane yield at the lowest fan speed, showed additional cane being delivered at the higher fan speeds in eight trials (in one trial there was a decrease of 14 t/ha). On average, an additional 13 t/ha of cane was delivered at the higher fan speeds. This additional cane delivery shows that generally there is no significant cane loss at higher fan speeds. Similar results have not been found before – traditionally, as the fan speed increases, so does cane loss.

This set of harvest cane-loss trials has produced some unexpected results in terms of cane loss in relation to fan speed. Additional trial work needs to be completed to better understand the relationship between fan speeds and cane loss when using the new generation extractor fans.

The initial aim of this work was to develop a web-based cane-loss indicator. This was to be done by combining the existing cane-loss work that was undertaken with the smaller, standard extractor fans and this new work with the larger extractor fans and the new vortex type extractors. As the results from this set of trials are contrary to previous work, it is not possible to use this data to produce a web-based cane-loss indicator.

Background:

The Cooperative Systems project (SRDC Project MSA003) considered how a cane quality incentive scheme might be incorporated into a cane payment. The report discussed the measurement and feedback of cane quality data to harvester operators and growers to ensure that the information delivered sends the right market signals and compensates the parties for the costs involved in achieving particular targets.

A good example is extraneous matter. Extraneous matter can be reduced by simply increasing the fan speed on the harvester's extractor. However this will also increase the loss of sound cane in the field, which is not the desired effect. Instead the harvester operator should slow down and adopt other "best practice"harvesting measures, but this will increase harvesting costs for no real benefit to the harvester.
The answer lies in new harvesting contracts that incorporate the variable cost of harvesting different paddocks in different ways, and include quality bonuses for growers and harvest best practice incentives for the harvesting contractor. The emphasis is on measurement and reporting of cane quality data, and sending the correct signals with the data.

Aims:
This project needed to establish the true costs of meeting harvest best practice for a range of harvesters including "standard" harvesters, harvesters with the new vortex fan designs as well as the newer 1500mm fans fitted to the latest model of Cameco cane harvesters.
From the information gathered during field trials, the aims of the project are as follows:

- The project seeks to achieve the development of a web based cane loss forecasting tool that will allow growers / harvesting contractors to identify the true value of harvesting best practice and provide the basis for the sharing of the additional revenue created by its adoption.
- The economic benefits will be the extra revenue created by recovering an additional five to eight tonnes of cane per hectare currently left in the paddock after harvest through a combination of inappropriate harvesting practice and less than suitable crop presentation for harvest.
- The environmental benefits will be the reduction of sugar juice left in the paddock with the potential to become mobile after rain events/irrigation and enter the surrounding environment.
- The social benefits will be improved margins for growers and improved returns for cane harvesters – a major contribution towards industry sustainability.

Methodology:
Mackay Sugar purchased and installed MT Data GPS Tracking devices (Dats 3022) onto 40 cane harvesters throughout the Mackay Sugar region. These tracking devices record GPS location of the harvester at programmable intervals. In association with the Dats 3022 device, a second device (Dats1010) was also purchased and installed onto the 40 harvesters. The Dats 3022 has inputs that record harvester position, speed, direction, and elevator status. The combination of speed and elevator status allows the end user to verify that the harvester is in fact harvesting cane when the position GPS report is captured. At the same time, the Dats 1010 device record inputs from analogue devices attached to the harvester (e.g.- Hydraulic pressure sensors and extractor fan speed) and sends this information to the Dats 3022 device which subsequently packages all of the data at transmits this to Mackay Sugar computer servers via the Telstra CDMA – 1x mobile data network.
The engagement of staff from BSES and harvesting solutions and the subsequent methodology and design of field trials is detailed in Attachment 1 (HARVESTER CANE-LOSS TRIALS CONDUCTED FOR MACKAY SUGAR IN 2006)

Results and Outputs:
Refer to Attachment 1 and the attached CD (HGP004) for details of the results of the trials conducted.
A review of the milestones and the tasks involved are outlined in the Table 1

Milestone	Tasks	Status
2. • Additional hardware fitted to on-harvester units. • Design of field testing program for cane-loss predictive tool agreed.	Fit 1010 units to harvester to enable measurement of fan speed as well as selected analogue inputs	Complete
	Design field trials to determine cane loss at differing fan speeds	Complete
3. • Software developed for cane-loss forecasting tool and installed on Mackay Sugar website.	Engage harvesters to participate in field trials	Complete
	Engage BSES and Harvest Solutions to conduct field trials	Complete
	Collection and evaluation of data	Complete
	Development of a cane loss forecasting tool	Incomplete
4 • Preliminary testing of the cane loss predictive tool with 40 commercial harvester operators and growers.	Installation of additional Dats 1010 onto all harvesters with GPOS tracking devices	Incomplete

Table 1

In summary, the results have indicated that there appears to be no significant cane loss at higher fan speeds and in fact there appears to be an increase in clean cane supplied at higher fan speeds. These results differ from similar work where traditionally there has been significant cane loss at higher fan speeds.

The scope of this project was to build onto previous findings to develop a cane loss forecasting tool. However, given the unexpected results and the fact that they differed from previous findings, the publication of a cane loss forecasting tool advocating increasing fan speed to much higher levels than previously advised would have sent confusing signals to growers and harvester operators. Similarly, the testing of the cane loss tool with a large number of commercial harvesters could not be completed because of the trial results achieved.

Project investigators and staff from BSES spent considerable time in re-evaluating the results achieved and finalising recommendations for future research. Assistance was also sought from experienced researchers and staff not directly involved with the project to verify the results obtained.

Intellectual Property and Confidentiality:

Nil to advise

Capacity Building:

Whilst the finding certainly confused the group, it should not deter from the fact that the project was planned, instigated and analysed with great success. The project has reinforced the need for careful planning and co-operation from participating groups.

Outcomes:

The initial aim of this work was to develop a web-based cane-loss indicator. This was

to be achieved by combining the findings of previous cane-loss trials that has been undertaken using smaller, standard extractor fans with that of this new work with the larger extractor fans and the new vortex type extractors. Given that the results from this project are different to that of previous work, it is not possible to combine these results with any level of confidence.

Environmental Impact:
Nil to advise

Communication and Adoption of Outputs:
Given the sensitive nature of the final results achieved, the outputs from this project have remained confidential to the participating parties. To advocate the findings of the trials would have sent a confusing message to the growing and harvesting community. Further work needs to build on the trial results before any changes to current practices can be recommended for wider publication.

Recommendations:
This set of harvest cane-loss trials has produced some unexpected results in terms of cane loss in relation to fan speed. The project did not have the necessary resources to undertake the significant trial work needed to re-evaluate current recommendations in harvest best practice. To achieve this there needs to be significant additional trials to better understand the relationship between fan speeds and cane loss when using the new generation extractor fans.

Publications:
Attachment 1 (HARVESTER CANE-LOSS TRIALS CONDUCTED FOR MACKAY SUGAR IN 2006)
CD Rom – HGP 004