

Final Report

Project No: MUL001

Title: Developing a new approach to extension for widespread adoption of Best Management Practice

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1.0 EXECUTIVE SUMMARY

MUL001 has sought to improve the uptake of research outcomes by the sugar industry's growing sector. It is recognised that the traditional one-to-one extension approach is no longer affordable and the current system was not adequately facilitating the uptake of research at a time when the industry needed to make every post a winner.

This project developed a group extension program in the Mulgrave region to promote the development and adoption of best management practice. 13 productivity groups were established which sought to involve 100% of growers. These groups utilise discussion type meetings and field demonstrations in order to enhance the individual knowledge and understanding of various aspects of sugarcane production, which are relevant to the management decisions faced at the time. Typically each group would meet 4 to 5 times each year. Emphasis is placed on learning from other growers as well as people with specialist knowledge in each particular field. Monitoring programs were also utilised to enhance the knowledge, understanding, skills and attitudes of individuals. Monitoring harnesses the power of learning-by-doing and has proven very effective. Monitoring programs for production constraints such as canegrubs, rats and weevil borer were coordinated by this project and strategically timed to enhance the effectiveness of group activities.

The group extension program has been in operation since March 2000 and continues to improve in effectiveness and grower participation. Throughout the project 89% of growers participated in the extension program and on average, 63% of cane production areas were represented at each group activity. Although it is difficult to objectively measure change in knowledge, understanding, skills and attitudes, there are numerous examples of subtle but visible change in the behaviour of farm managers, which could be attributed to the extension program. An important output of the project has been the development of a communication structure. This structure has proven invaluable to maintain information flow throughout all sectors of the industry and maintain a dialogue in an age of continuous change and uncertainty. This structure will be necessary to drive real and sustained change in the industry.

Broad industry acceptance of the group extension model developed by this project has already been achieved. CSR in their productivity initiative, Tully mill area and BSES in their PROSPER program are just some of the regions who have adopted the group extension model developed in this project. The benefits of such a model if successfully implemented are represented by the enhanced deliverability of research outcomes.

2.0 BACKGROUND

This project commenced in June 2000. At the time the sugar industry in the Mulgrave district was in crisis. The long-term viability was threatened by declining trends in CCS, sugar production, sugar quality and costs of production.

Previous research conducted by Mulgrave Central Mill and BSES in the district had demonstrated that these trends were mostly a result of increasing proportions of extraneous matter, suckers and pest damage in the cane supply. Pest damage was a primary causal factor of lower sugar production. 1999 research conducted and funded by Mulgrave Central Mill quantified the cost of pest damage to the area in terms of lost sugar revenue at \$8.2M. Mulgrave research (and subsequent SRDC funded sugar balance research) has also shown that there is a 4 to 5 unit difference between CCS potential and actual CCS realised at the mill. This difference contains the 'low CCS' problem that was plaguing the Far Northern region.

Best management practice strategies were being developed to address issues such as extraneous matter, harvesting losses, suckering and pest damage. However the extension system was inadequate to ensure the rapid uptake and widespread adoption of these and other research and development outcomes.

All stakeholders of the local industry agreed that a whole-of-industry development/extension thrust integrated and delivered through one focal point was essential for sustained viability. Any development/extension approach also required the capacity to address gaps in research and development as they arise, in order to fully integrate the extension approach.

3.0 OBJECTIVES:

The overall objective of MUL001 was to improve the quality and productivity of the Mulgrave district cane supply through development of an effective extension network to promote the on-farm participatory development and adoption of Best Management Practice. The phrase '*more and better cane*' became the central theme of the project. It is difficult to definitively judge the project's success relative to this objective, as there are many factors that impact on crop yields, which are not within the sphere of influence of farm management. However crop trends are encouraging with significant increases in yield and CCS each year since the project began in 2000. These trends are supported by more subjective observations in the district. Examples of these observations include the faster adoption of new grub control techniques, greater interest in Yield Decline Joint Venture outcomes, increased understanding and awareness of cane pests and their control strategies. The Mulgrave growers were able to come to terms with the unavailability of Organo-chlorine pesticides and look to other solutions much more rapidly than growers in other parts of the region. These trends are a reflection of the new development/extension approach and all contribute to sustained increases in quality cane production.

The second objective of the project was to implement an extension system, which targets 100% of growers. This objective was often described initially as over ambitious. However the stakeholders agreed that an extension system must be available for all growers and that a high rate of participation is important. This project achieved an 89% participation rate with an average attendance rate of 63% over the term of the project. It is especially pleasing to report that the participation rate was constant or increasing slightly at the completion of the project. While there

are still 20 to 30 cane production areas not participating in the program (for various reasons), there is evidence to suggest that most of these cane production areas benefit indirectly from the flow-on of information from other growers.

The specific objectives of this project were to provide monitoring and feedback on cane quality parameters (extraneous matter, CCS, pest damage) to growers collaborating in Best Management Practice development and extension. This element of the project illustrated the value to growers of on-farm monitoring. The initial intention of this objective was to monitor cane supply to the mill. However it became apparent that the time spent in the field would be of more value. Therefore the monitoring plan was altered to incorporate field monitoring during the growing season when most cane pests are active. This activity involved the participation of growers and sought to enhance their knowledge and understanding of key farm management issues. General field observations and other anecdotal evidence suggests that this component of the project contributed significantly to the primary objective of producing *more and better cane*

4.0 METHODOLOGY

Relevant methodology used in this project fits into two categories. Firstly the method of developing, implementing and evaluating a group extension system and secondly the methodology used to monitor the various aspects of sugarcane production.

4.1. Group extension system

4.1.1. Getting started

4.1.1.1. The Mulgrave cane-growing region was strategically divided into 13 groups of 15 to 30 cane production areas (CPAs). Consideration was given to the following factors in decreasing order of priority:

- ◆ Geographic location. Geographically based groups generally share similar production characteristics such as soil type and climate.
- ◆ Soil type
- ◆ Easily defined boundaries. Eg. Rivers or valleys
- ◆ Similarity of production characteristics
- ◆ Social structures and pre-existing groups

4.1.1.2. The membership of each proposed group was analysed. Potential grower leaders and also growers who would likely to be opposed to the concept were identified. These members were approached and informed of the intention to form a group, the objectives and potential outcomes. Their support for the concept was requested.

4.1.1.3. In March 2000, all members were contacted individually and invited to the first meeting. The agenda for this meeting centred on building a profile of the production characteristics of the group. Ie. the strengths and weaknesses. It finished with a comparison of the individual CPAs within the group in terms of sugar yield and gross return per hectare.

4.1.2. Keeping it going

4.1.2.1. Group meetings – 4 to 5 2-hour meetings have been held each year since the inaugural meeting in March 2000. In planning the meetings some basic guidelines have been used:

- ◆ Central location but in a farmer's environment
- ◆ 2 hours duration
- ◆ Agenda items should be relevant to the management decisions faced by growers at the time
- ◆ Encourage grower discussion and avoid lecture/presentation style information flow
- ◆ Give attendees something to take away from the meetings. Eg. Their farm ranking, fertiliser ready reckoner, variety guide etc.
- ◆ Invite relevant expertise from outside the area where possible and relevant
- ◆ Maximum of 3 agenda topics. One main topic and 2 minor topics.

4.1.2.2. Field demonstrations have been held to demonstrate new techniques or practices. Demonstrations offer the following advantages and will be utilised more often in future:

- ◆ More effective in terms of technology transfer
- ◆ More flexible for growers who have limited time. What one can see in 10 minutes is sometimes more useful than what someone can describe in 2 hours
- ◆ Less resources required to organise

4.1.2.3. Communication structure. An important aspect of an effective group extension system is a communication structure. There are two parts to the communication structure:

4.1.2.3.1. The means of notifying growers of group activities. Initially growers were informed of group activities via telephone. This was important as it gave the grower the opportunity to ask about the agenda and convince himself/herself of the value in attending. As growers became more accustomed with the new system, more passive medium such as a faxed notice was utilised. However it became apparent that growers needed a notice one to two weeks prior to the event and a reminder two to three days prior to the event. The current system involves a schedule of meeting times and venues on the regular Mill newsletters a week or two before the event and a faxed agenda and reminder notice two to three days before. In future E-mail and web sites would be more efficient as growers adopt this technology.

4.1.2.3.2. The communication flow. Using the above medium and the group activities the extension system has become a means to communicate local cane supply issues, upcoming events and also a medium through which growers can express their views of the industry and access researchers and other sources of expertise. Care was taken to maintain this communication structure and protect it from overuse.

4.1.3 Evaluation.

The objective of the extension program was to produce *more and better cane*. However evaluating to project's success in relation to this objective would be subjective at best. Perhaps evaluation of changes in the understanding, knowledge, attitudes and skills relevant to key aspects of sugarcane production would be more relevant. This evaluation was carried out by means of general observation and still very subjective. The main objective evaluation performed was that of measuring the level of attendance at group activities:

4.1.3.1. The *participation rate* refers to the percentage of farm managers who participated in at least one group activity in each calendar year. This was useful in evaluating the proportion of farm managers who saw some benefit in participating in the extension program.

4.1.3.2. The *attendance rate* refers to the proportion of cane production areas represented at each group activity.

A survey of growers was conducted to evaluate the effectiveness of group activities, identify potential improvements in the process and topics of interest for future activities.

4.2 Monitoring.

The main emphasis of monitoring was to involve the grower at every opportunity. The process was seen as more important than the actual monitoring results. This approach was taken when it became clear that actual involvement in monitoring had a greater impact on the individual than a presentation of results. The impact related directly to the grower's knowledge and understanding of the particular aspect or problem being monitored.

4.2.1. Cane quality parameters

The objective of this monitoring was to take a snapshot of the cane quality over the season. In the 2000 season the monitoring was carried out throughout the season at approximately 50 samples per week. In the second year (2001) the monitoring was carried out in the third, ninth and thirteenth weeks at approximately 810 samples per week. 10kg samples of chopped cane were taken from sampled rakes via the grab sampler at the Mill. Each sample was analysed to determine the proportion of the following components:

- ◆ Sound cane
- ◆ Weevil borer damaged cane
- ◆ Rat damaged cane
- ◆ Red rot or dead cane
- ◆ Extraneous matter

Sound billets from these samples were also analysed for billet length and quality.

4.2.2. Sugarcane weevil borer populations

Weevil borer populations were monitored on eight sites every two weeks from December 2000 to June 2002. The split billet trapping method was used. This

method is outlined in the *Best Management Practice for Sugarcane Weevil Borer* manual (Telford & McAvoy. 2002; p 27). The sugarcane damage levels in these sites were also sampled in conjunction with the BSES pest management program.

4.2.3. Canegrub distributions

The objective of the canegrub-monitoring program was to develop a simple and standard methodology and encourage growers to monitor the populations on their farms. Methodology used was a compromise between a statistically representative sampling procedure and a procedure which growers would be prepared to adopt. The main objective was grower participation with less emphasis on the actual monitoring results. Growers were given grub sampling demonstrations, a species identification key and a data sheet to record their results. They were asked to fax the result sheet back to the office for collation on the GIS layer.

The sampling methodology adopted is as follows:

- a) If grubs are not a known problem on the farm select a block which has the highest likelihood of grub incidence eg. Old ratoons, sandy soil, history, etc
- b) Select one stool in each corner of the block
- c) Dig a hole 300mm³ under the selected stool
- d) Record the species and lifecycle stage of each grub found in the soil from the hole.
- e) Retain all grubs collected and deliver to the Mill or BSES office for disease testing

4.2.4. Rat monitoring

The objective of rat monitoring was to develop and extend procedures as a component of integrated rat management (IPM). Again the emphasis was placed on growers developing the confidence to monitor rat populations on their own farms and use this data to base management decisions. The following methodology was used:

- a) Sites were selected based on the presence or history of rat activity
- b) 20 brake-back traps were set in a 20m² grid and baited with cardboard soaked in linseed oil.
- c) Growers collected the rats caught, recorded numbers and species and contacted project staff.
- d) Project staff conducted autopsies on each rat to determine diet, age, sex, health and breeding behaviour.
- e) Site conditions, such as the presence of weeds and proximity to harbourage were also recorded.

4.2.5. Rodenticide evaluation trials

Trials were conducted to demonstrate the effectiveness of the new rodenticide Rattoff[®]. This product was used under an emergency use permit and did not display the same evidence which growers were accustomed to expect from rodenticides. As an outcome of the group participatory process a trial was established to measure the effects of the rodenticide. Grower involvement was the key to gaining widespread confidence in the new product.

The following methodology was used:

- a) Growers selected a site which required a baiting treatment
- b) 20 active rat burrows were identified using talcum powder and marked
- c) The rodenticide was applied as per label
- d) The active burrows were monitored over 4 nights to determine if they were still active. The proportion of active burrows were recorded
- e) The baits were checked for evidence of uptake by rats and the proportion recorded.

4.2.6. Soil pH

Another outcome of the group participatory process was an investigation of the changes to soil pH over time following an application of mill mud. Growers were concerned about the pH implications on the effective control of Suscon Blue[®]. A standard field pH test kit was used to monitor soil pH on blocks after mill mud was applied. Monitoring was conducted at two-week intervals for 8 weeks and then at monthly intervals for the next 10 months.

4.2.7. Other field demonstration trials

Other field demonstration trials were conducted as a result of interest from one or more productivity groups. Trial design generally involved two replicates and two treatments where practical. Examples of these trials include:

- ◆ Chemical control options for weevil borers
- ◆ The use of Pheromones to control weevil borer distribution
- ◆ The use of a molasses and UREA blends for fertilising ratoons
- ◆ BioCane[®] for grub control
- ◆ Chemical pesticide options for grub control (Products and application methods).
- ◆ Silicon application in susceptible soils
- ◆ Strategic tillage options
- ◆ Row spacing comparisons

5.0 RESULTS

Results of monitoring and demonstration trials are summarised and attached (appendix 1 to 9) for general information. It is important to note that the actual results of monitoring activities are not as important as the level of grower involvement achieved in recording the results. The results of cane supply monitoring have also been used throughout the industry as a guide.

The participative action learning process adopted for this program is based on the 4-step process of planning, acting, observation and reflection. However this process is rarely completed in one meeting and sometimes not in one year. It is the continuous process of change in a region that is propelled by the actions of individuals. The group meetings simply take advantage of the initiatives of individuals by stimulating the observation and reflection process.

Group coordinators and the program manager are continuously seeking opportunities to expose group members to new ideas and developments or even old practices that

seem to have been relaxed or forgotten. These topics may be either an outcome of a researcher's work or a grower's attempt to implement in practice a research outcome. The purposes of the group activity is to stimulate dialogue in such a way which enables farm managers to fully appreciate the topic, visualise it in the context of their own farm situation and appraise the potential value to their farming system. The objective of the process is to lead members through the process so that they arrive at the stage of giving something a go (acting). Once an individual has attempted something, he will reflect on the experience. However the group process seeks to encourage others to also reflect on that experience and slowly the innovation or research outcome evolves into everyday practice that is adapted to each particular farming situation. This is a natural process that is occurring all the time. The group extension process simply seeks to accelerate the planning, acting, observation and reflection cycle.

On reflection, the least effective group activities tend to be those activities where there is least active discussion and dominated by lecture style presentations. This is comfortable for most people. It is how our school system works and it is what growers, extension officers and researchers are accustomed to. However for effective reflection and planning there must be dialogue. The constant challenge for group coordinators is to stimulate dialogue, to help members appreciate that they can learn from anyone (not just the researchers) and to teach researchers and other specialists to involve the group members in their presentations.

5.1 Change in knowledge, understanding, skills and attitudes

Change in knowledge, understanding, skills and attitude is the critical success factor underlying this project. While there has been no objective measurement of these attributes the following general observations are relevant:

- ◆ The rate of adoption of new techniques (eg. Grub control strategies) is more rapid than experienced before the project or in other neighbouring regions during the same period.
- ◆ Subtle change in management practices. Doing the simple things better.
- ◆ Other best management practice projects have been more successful in this region.
- ◆ More farm managers are conducting their own farm monitoring. This reflects enhanced understanding of the need to monitor and the increased confidence in their own monitoring ability.

5.2 Group activities

Results of a grower survey are attached in appendix 10. This survey was used to gauge the effectiveness of group meetings and identify ways improve future activities. The average attendance and participation rate for each group is summarised in table 1. Since the project commenced in March 2000, a total of 144 group activities have been held. The majority of these activities are in the form of a meeting, with the balance being a field walk/demonstration type activity.

In addition to the group activities summarised here, other industry seminars and workshops were also well attended by Mulgrave growers. This is a reflection on the interest in the seminars generated by the increased information flow, the communication structure developed as a result of this project and the relationships developed between coordinators of the group extension program and other industry

researchers and information providers. The strength of these linkages has been of great benefit to the industry.

Table 1: Summary of group attendance and grower participation

Group	Attendance rate (%)		Participation rate (%)	
	2001	2002	2001	2002
Nth Barron	43.5	71.1	92.1	94.7
Pine Ck	54.0	68.8	89.3	96.4
Greenhill	69.4	82.5	88.2	94.1
Inlet	44.8	50.0	91.9	83.8
Sandy Ck	77.1	72.4	86.7	93.3
Highleigh	79.2	86.1	87.5	93.8
Mackey Ck	72.1	68.6	88.2	100.0
Meringa	55.4	57.9	83.3	88.9
Sawmill Pkt	89.5	88.1	90.0	100.0
Behana	52.1	58.0	87.5	87.5
Little Mulgrave	53.3	39.6	87.5	91.7
Aloomba	43.5	47.8	87.0	91.3
Sth Mulgrave	62.9	75.0	84.6	84.6
AVERAGE	61.3	66.6	88.0	92.3

6.0 EXPECTED OUTCOMES

6.1 A new productivity services and extension structure

A major outcome of this project is the new cane protection and productivity services structure in the Mulgrave region. The productivity groups are a central foundation of the structure. Four grower representatives from the productivity groups and other BSES and Mulgrave Central Mill representatives now coordinate and direct the extension program and the function of the cane protection and productivity service. The former Cane Protection and Productivity Board is in the process of being wound up and its core functions will become the responsibility of Mulgrave Central Mill. The productivity groups structure developed as a result of this project has become essential and more formalised and as a result is here to stay beyond CP2002. A monthly newsletter is also produced as a responsibility of this new structure. This newsletter contributes further to the communication structure. An example of this newsletter is included in appendix 11.

A component of this structure is the industry communication structure developed during this project. This outcome will also be sustained and developed further into the future.

6.2. An extension model available to the wider industry

The project submission highlighted the benefits of developing an extension model for the entire sugar industry. This outcome has been largely achieved with most regions adopting the model or a variation of it. CSR in their productivity initiative, Tully mill area and BSES in their PROSPER program are just some of the regions who have adopted the group extension model developed in this project. Project staff have made numerous presentations to other interested regions and conducted facilitation workshops with other far northern regions.

6.3 Sustained improvement in farm management competence

As a result of continued information flow and monitoring there is evidence to suggest that the enhanced knowledge, understanding, skills and attitudes have been consolidated. There is now a greater tendency for farm managers to routinely consider more integrated approaches to their challenges and to monitor key aspects of crop production. This has effectively opened the pathway for future research outcomes and will also allow farm managers greater input into the deployment of research resources.

6.4 *More and better cane*

The Mulgrave region will continue to experience seasonal ups and downs. However, the outcomes described in 7.1, 7.2 and 7.3 will ensure that the local industry benefits from improved sugar quality, higher CCS, increased grower profitability and industry viability.

7.0 **FUTURE RESEARCH NEEDS**

The program now in place in Mulgrave has some important challenges to overcome in the process of continued improvement of a communication/extension structure:

7.1. Encourage the participation of women

The participation of women in the extension program has been extremely low. This is primarily because of the underlying culture of the area and that the program has largely focused on the technical aspect of cane production. It is recognised that another dimension to the program is required in order to increase the participation of women. The first step, I believe is to form a women's group with the aim of developing ways to increase the interest of women in the industry.

7.2. Seek ways to meet the needs of working (or weekend) farmers.

A significant proportion of farm managers are now in some form of off-farm employment and have little opportunity to attend group activities which are largely held during business hours. These people probably face different production constraints such as a greater limitation on available time and a difficulty to optimise the timeliness of operations. The number of people in this category is increasing and it is worth seeking ways to address this shortfall in the program. I believe that the regular newsletter will help these people somewhat but is probably insufficient to deliver significant improvements for this particular group.

7.3. Encourage farm managers to embrace environmental issues relevant to their operations.

Currently farm managers perceive that they have no capacity to contribute to the environmental debate that seems to be constantly waged in the media. There are conflicting claims reported by different parties with different agendas about what farm managers are doing or are not doing to the environment and especially the Great

Barrier Reef. Farm managers understand little of what is reported at a macro level and become increasingly anxious and defensive. There is no way for them to relate the issues to the micro level. What are the consequences of their own management practices on block 1 and block 2? What is the level of pesticides in the run-off water from these blocks and why? By changing management practices what improvement has been made?

One of the most satisfying outcomes of this project has been the improvement in understanding by farm managers of particular issues as a result of their involvement in farm monitoring. These people learn by doing and experiencing. This is the way forward in embracing the environmental issues. Farm managers need access to a monitoring program that allows them to monitor relevant environmental performance parameters on their own cane fields. Eg pesticide, nitrate, phosphate and BOD levels in the run-off water. A program would include access to relatively simple monitoring procedures, monitoring equipment, technical support and encouragement. Monitoring procedures need to be scientifically based but do not need to be as rigorous as what would be required for research purposes. The main objectives would be to demonstrate and develop farm managers' understanding of the nature of environmental issues. Understanding is an essential ingredient for change.

7.4. Implement programs to improve strategic business management skills

In the wake of the Hildebrand report, assistance packages and the level of change, perceived change or anticipated change in the industry, there is an urgent need for growers to assess the strategic management of their businesses. Growers who are not clear about their future in cane farming are less likely to embrace best practice management. The communication structure developed in Mulgrave has proved to be ideal for creating dialogue between growers. The focus of this dialogue needs to periodically centre on strategic business management. Strategic business management is generally an area outside the group coordinator's field of knowledge. The industry needs access to these specialist skills and knowledge and desperately needs to integrate them into the extension program.

8.0 RECOMMENDATIONS

The success of this project is a result of enhanced communication and the process of understanding through monitoring. This success could be achieved in other regions and in other fields in the Mulgrave region using the same two basic ingredients. I recommend this approach to all other regions. However commitment from all stakeholders to the process is essential.

Enhanced communication using the group process does require a basic level of group facilitation skills. I believe there is a skill gap in this area, which requires the attention of the industry. I recommend that a facilitation-training workshop attended by group coordinators of all regions that are adopting the group extension approach be held. Such a workshop would allow an opportunity for relevant staff and growers to learn some basic principles of adult learning and group dynamics and also to exchange ideas with people in similar situations from different regions.

The process of building understanding through monitoring can be a powerful change agent. I recommend that the industry exploit this technique as much as possible. Developing specific monitoring procedures would support this process. Traditionally the emphasis has been on developing monitoring/sampling/analytical procedures for

use by researchers to extend the current knowledge. I believe there is value in developing a parallel set of procedures for use by growers and extension staff with the objective of developing the level of understanding of the current knowledge. These procedures would be simple and inexpensive but meaningful and useful. In particular, I would start with environmental factors. It is essential for growers to understand the processes involved in their production system and its impact on the environment. I believe a monitoring program offers the best opportunity to achieve this objective. Preliminary investigation into the monitoring of run-off water leads me to believe that the availability and affordability of test equipment would be the most constraining factor in establishing an environmental monitoring program. Perhaps this is an area for further research.

9.0 REFERENCES

Telford, d.e. and McAvoy, C.A. (2002) *Best Management Practice for Sugarcane Weevil Borer* manual. BSES – Innisfail.