

**BUREAU OF SUGAR EXPERIMENT STATIONS
QUEENSLAND, AUSTRALIA**

**FINAL REPORT – SRDC PROJECT BSS224
IMPLEMENTATION OF MANAGEMENT
STRATEGIES FOR CONTROL OF SUGARCANE
WEEVIL BORER IN FAR NORTH QUEENSLAND**

by
**Debra Telford
and
Katie McAvoy
SD02019**

Principal Investigators:

**Debra Telford & Katie McAvoy
BSES Innisfail
P O Box 630
INNISFAIL QLD 4860
Telephone: 07 4061 1707**

Funding for this activity was provided by the sugar industry and the Commonwealth Government through SRDC, and is gratefully acknowledged.

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.

CONTENTS

	Page no.
EXECUTIVE SUMMARY	i
1.0 BACKGROUND	1
2.0 OBJECTIVES	1
3.0 METHODS	1
4.0 RESULTS AND DISCUSSION	3
4.1 Variety selection trials	4
4.1.1 Variety trial – Marano.....	4
4.1.2 Variety trial – Cali.....	4
4.1.3 Variety trial – Lissa.....	5
4.1.4 Variety trial – Mizzi.....	5
4.2 Chemical trials	6
4.2.1 Insecticides	6
4.2.2 Herbicides	6
4.3 Trash management trials	7
4.3.1 Trash raking trial.....	7
4.3.2 Ratooning disc trial.....	8
4.3.3 Agrovator trial.....	8
4.4 Nutrition trial	9
4.5 Pheromones	9
4.5.1 Pheromone traps	9
4.6 Borer monitoring	11
4.6.1 Mourilyan borer monitoring.....	12
4.6.2 Gordonvale borer monitoring.....	13
4.6.3 Silkwood borer monitoring	13
4.7 Project changes	14
4.7.1 Variety strip trial.....	16
4.7.2 Strategic versus conventional planting trial	17
4.7.3 K-Komplex trial.....	18
4.7.4 BioCane™ versus suSCon® Blue trial	19
5.0 OUTPUTS	19
6.0 EXPECTED OUTCOMES	19
7.0 FUTURE RESEARCH NEEDS	20
8.0 RECOMMENDATIONS	20
9.0 PUBLICATIONS	21
10.0 ACKNOWLEDGEMENTS	21
11.0 REFERENCES	21

APPENDICES

APPENDIX 1	WEEVIL BORER SURVEY - for growers
APPENDIX 2	COLLATED RESULTS FROM BORER SURVEY
APPENDIX 3	ISSUES THAT AFFECT PROFITABILITY. RESULTS FROM 1ST GROWER MEETINGS
APPENDIX 4	PRODUCTIVITY DISCUSSIONS. (RESULTS FROM 3RD GROWER MEETINGS)
APPENDIX 5	GROWER GROUP MEETINGS
APPENDIX 6	IMPORTANT FACTORS WHEN DECIDING WHICH VARIETY TO PLANT (RESULTS FROM 4TH GROWER MEETING)
APPENDIX 7	BEST MANAGEMENT PRACTICE FOR SUGARCANE WEEVIL BORER

EXECUTIVE SUMMARY

Sugarcane weevil borers are an introduced pest of sugarcane from New Guinea. They cause significant losses to CCS and may contribute to production of poor quality sugar crystals. The adoption of pre-harvest burning of cane in the 1940s saw a reduction of borer damage to low levels. This remained until the widespread adoption of green cane harvesting and trash blanketing in the 1980s.

Early studies have shown ways to reduce borer damage through the use of resistant varieties, improved farm hygiene (reduced cane loss and improved rat control), and chemical control. A reduction in borer damage will enhance viability of the northern sugar industry.

This project was designed to have a participatory approach with stakeholders affected by borers in the Queensland sugar industry and to demonstrate the effectiveness of implementing borer management strategies.

Borer damage was low during the project and it was difficult to draw conclusions from some trial results. In the variety and chemical trials, treatments that were tested did lower the level of borer damage; however, the economics to put this into practice in a low damage year do not justify the cost of the treatment.

It is difficult to conclude what contributed to the lower borer damage levels; it may be attributed to weather conditions, growers selecting more resistant varieties and improved harvesting practices. Whatever the reasons, it is just as difficult to predict the level of damage for coming seasons.

Low borer numbers throughout the duration of the project led to disappointing grower involvement and trial results but did lead to a positive change in project direction.

Early 2001, eight grower groups were established in addition to the two borer groups in the Innisfail/Babinda area. These groups met a number of times to discuss issues affecting grower profitability. A single issue was chosen by the group and best practice was demonstrated for management of this issue over the fifteen months remaining of the project. Participation in the broader group network was very good with between 120 and 180 growers participating throughout the meetings.

A good network had been established for two-way flow of information in the Innisfail/Babinda area. Grower participation has continued to be good over the fifteen months since the project changed direction. BSES, Bundaberg Sugar and local Cane Protection and Productivity Boards have been involved throughout this project and there is ongoing commitment from them to continue with these groups into the future. Development of a strong group base in the Innisfail/Babinda area has proved successful for the growers and industry advisory staff.

It is essential that growers are involved in the planning and decision making of the groups' direction in the formation of any future group work. This project has highlighted and supported the importance of group ownership. Initially, when the project was focused only on borers, grower motivation and participation was low, because they did not believe there to be a severe borer problem at the time. When the project changed direction and growers had the opportunity to decide on issues they wanted to focus on as a group, grower motivation and participation increased and have continued to remain high.

1.0 BACKGROUND

Sugarcane weevil borers are an introduced pest of sugarcane from New Guinea. They cause significant losses to ccs and may contribute to production of poor quality sugar crystals. In the Queensland sugar industry, borers were second only to greyback canegrub in importance until the adoption of pre-harvest burning of cane in the 1940s. This practice saw borer damage reduced to low levels until the widespread adoption of green cane harvesting and trash blanketing in the 1980s. The current levels of borer damage are high and presently impacting on grower profitability in borer susceptible areas of north Queensland.

Early studies have shown ways to reduce borer damage through the use of resistant varieties, improved farm hygiene (reduced cane loss and improved rat control), and chemical control. This project aimed to document and evaluate in economic terms these strategies and others currently being implemented by individual growers. A reduction in borer damage will enhance viability of the northern sugar industry.

2.0 OBJECTIVES

The objectives of this project were to:

- develop a best management strategy to reduce borer damage through industry consultation;
- demonstrate the profitability of implementing best management strategies via grower participation;
- reduce the level of borer damage in susceptible regions by the year 2002.

These objectives have been met using consultative grower group meetings and an on-farm participatory trial program in the Gordonvale to Innisfail area of far north Queensland.

3.0 METHODS

This project was designed to have a participatory approach with stakeholders affected by borers in the Queensland sugar industry.

The first stage was to collate best management practices (BMPs) currently in use or believed to be of some use in reducing borer damage levels. This was done through one-to-one consultations with industry stakeholders, not through group discussions as initially planned. This was because there had been an extensive use of group processes to develop sustainable practices for canegrowers in the Johnstone catchment by the Johnstone River Catchment Management Association. Growers had voiced their concern about being 'over grouped', so one-to-one consultations (Appendix 1) were

chosen as an alternative starting point. These ideas were then collated (Appendix 2) and taken back to identified stakeholder groups for discussion and testing.

Grower groups were formed in the Silkwood, Mourilyan and Gordonvale areas and the best management practices tested using on-farm participatory trials. Trial results were presented back to the grower groups for discussion and review of the practice as a management strategy to reduce borer damage. A BMP document for the reduction of borer damage was collated and reviewed by the grower groups at each subsequent meeting.

The establishment and management of each trial were left up to the grower conducting the trial. For each trial, the grower was given a trial protocol and diary. The trial protocol outlined the aim of the trial, trial layout and design, trial duration, and record keeping. The purpose of the diary was for the grower to record all operations conducted in the trial so an economic evaluation of the trial could be carried out. Cost of treatments in each trial has been based on a Machinery Costing Model developed by Lionel Tilley of BSES. These are operating costs only and do not take into consideration fixed costs. The assumptions are fuel = 0.49c/L (after diesel fuel rebate) and labour=\$13.95/hr.

All trials were established using the trial format decided on by the grower groups and documented in the BMP manual (Telford and McAvoy, 2002). The block selected for each trial was uniform in soil type, drainage, variety and ratoon age and harvested at the one time in the previous year. Each trial contained a control or untreated area and a borer susceptible cane was used as the standard in all trials (usually Q138). The trial layout was large enough to allow at least two but preferably three replicates of each treatment. Plot size was large enough to allow ccs and tonnage to be obtained at harvest through the mill. Borer damage was determined at or just prior to harvest by cutting the top off the cane stalk and slicing it down the middle (Berding, 1996). If the stalk was damaged, the numbers of bored internodes per stalk were recorded. Fifty cane stalks per plot were examined.

The grower and BSES staff working together conducted harvest and damage assessment of each trial. Dollars per hectare were calculated for each treatment on each trial using the following formula and assumptions:

$\$/\text{ha} = [0.009 \times \text{sugar price (ccs-4)} + 0.578 - \text{harvesting \& levies}] \times \text{tonnes cane per hectare}$, where 2000 sugar price = \$250; 2001 sugar price = \$335; harvesting & levies = \$6.50; and ccs = actual ccs.

Monitoring of borer populations was carried out in areas where trials were established using split-billet traps (Figure 1). Each trap contained five to six billets of sugarcane split in half lengthwise. These were wrapped in plastic or placed in a length of PVC pipe to prevent damage by rats. Traps were then placed in the row between stools of sugarcane to prevent disturbance of the trap by farm machinery. Eight to ten traps were placed in the field from November to February of each year and number of borers counted on a weekly basis. During this time, the split billets of cane were replaced before they dried out, every two to three weeks depending on weather conditions.



Figure 1 - Split billet traps used for monitoring adult sugarcane weevil borer populations

4.0 RESULTS AND DISCUSSION

A number of trials were determined and established through the grower groups that had been formed in Silkwood, Mourilyan and Gordonvale. Table 1 is a list of borer trials established during the project.

**Table 1
List of borer trials established**

Trial type	Management practice	Grower	Area
Variety selection	Q138 Q175 ^A Q178 ^A	Marano	Mourilyan
	Q138 Q158 Q166 ^A Q174 ^A	Cali	Mourilyan
	Q113 Q138 Q158 Q178 ^A	Mizzi	Mourilyan
	Q138 Q186 ^A Q187 ^A 85N1802	Lissa	Mourilyan
Chemical	Regent [®]	Strano	Silkwood
	Regent [®]	Downing	Gordonvale
	Paraquat	Morton	Gordonvale
Trash management	Ratooning disc	Ferrando	Gordonvale
	Agrovator	Ferrando	Gordonvale
	Rake trash off tops of stools	Downing	Gordonvale

Borer damage was low for both the 1999/2000 and 2000/2001 seasons.

Other work was conducted as part of the project and results were discussed with grower groups. This work included sampling of a nutrition trial for borer damage, pheromone trapping and adult borer population monitoring. The results for all this work are presented in the following pages.

4.1.1 Variety selection trials

Varieties fall into three categories for borer susceptibility. Those with minimal to no borer damage that can reduce the impact of borers in a block; those with moderate levels of borer damage but the loss in ccs is minimal; and those with severe borer damage and extreme losses. The four variety trials established in this project highlight the differences in borer susceptibility and the subsequent losses.

4.1.1 Variety trial - Marano

Table 2 shows the results of a trial comparing two varieties known to receive minimal borer damage. These varieties are generally not suited across the whole district but to localised areas with a high incidence of borer damage. These varieties are Q175^A and Q178^A. The plant crop had no borer damage and the first ratoon had less than 5% damage in the borer susceptible variety Q138.

Table 2
Mourilyan sands variety trial 1 – first ratoon (harvested 31/08/2001)

Variety	%Bored stalks	Number bored internodes per bored stalk	ccs	Tonnes cane per hectare	Net return \$/ha ¹
Q175 ^A	0	0	14.3	44.1	1107
Q138	2	2	14.4	35.9	912
Q178 ^A	3	1	14.1	30.2	742

¹ Throughout this entire document, \$/ha are calculated using the following formula and assumptions:
 $\$/ha = [0.009 \times \text{sugar price (ccs-4)} + 0.578 - \text{harvesting \& levies}] \times \text{tonnes cane per hectare}$, where 2000 sugar price = \$250, 2001 sugar price = \$335, harvesting & levies = \$6.50, ccs = actual ccs.

4.1.2 Variety trial - Cali

Table 3 shows the economic effect of growing varieties with different susceptibility to borer damage.

Table 3
Mourilyan sands variety trial 2 – plant cane (harvested 18/09/2000)

Variety	%Bored stalks	Number bored internodes per bored stalk	ccs	Tonnes cane per hectare	Net return \$/ha
Q174 ^A	19	3.5	14.7	73.9	1342
Q166 ^A	8	3.1	14.1	79.1	1329
Q138	22	2.6	12.3	67.9	858
Q158	1	2.0	13.0	57.8	828

Q174^A is an example of a variety that produces good results even when damaged by borers. Q158 was originally planted in preference to Q138 because it had lower levels of borer damage but it did not produce satisfactory tonnes cane and dollars per hectare.

4.1.3 Variety trial - Lissa

Table 4 shows the economic effect of growing varieties with different susceptibility to borer damage.

Table 4
Mourilyan sands variety trial 3 – plant cane (harvested 15/10/2001)

Variety	%Bored stalks	Number bored internodes per bored stalk	ccs	Tonnes cane per hectare	Net return \$/ha
Q187 ^A	17	4.4	16.5	65.9	2082
Q186 ^A	0	0.00	16.0	66.1	1995
85N1802	2	4.5	15.8	60.3	1788
Q138	12	1.5	14.5	65.6	1688

85N1802 is not due for industry release. Q187^A sustains a considerable amount of borer damage and was still the top performer in this trial. Q186^A is thought to be the better variety for the sands due to its tolerance to borer damage, and the fact that it does not encourage large numbers of borers to breed.

4.1.4 Variety trial - Mizzi

Table 5 shows the economic effect of growing varieties with different susceptibility to borer damage.

Table 5
Mourilyan sands variety trial 4 – first ratoon (harvested 06/09/2001)

Variety	%Bored stalks	Number bored internodes per bored stalk	ccs	Tonnes cane per hectare	Net return \$/ha
Q113	13	2.7	14.8	53.1	1407
Q138	7	3.1	14.6	51.0	1324
Q158	3	2.0	15.6	36.5	1061
Q178 ^A	1	2.0	15.2	19.4	540

Q113 can sustain high levels of borer damage but has shown to outperform all other varieties at this site. Both Q158 and Q178^A are known borer tolerant varieties but their performance has generally been poor.

Given the low levels of borer damage over the trial period, none of the trials harvested had borer damage in both plant and first ratoon. However, the trial results demonstrate that there are varieties available for planting that produce good returns for growers even though there is some borer damage present.

4.2 Chemical trials

4.2.1 Insecticides

Regent[®] is an insecticide marketed by Aventis CropScience Pty Ltd that has been shown to reduce borer damage in mature cane. A single spray of Regent[®] at the first millable internode stage of growth can result in an increase in ccs by at least 0.5 unit where borers are present.

Three trials were conducted in 2000 and 2001 as part of this project. Harvest results were unable to be obtained for all three trials. Damage assessments are summarised in Table 6. In all three trials, damage levels were very low. The cost of applying a single application of Regent[®] at 375 mL per hectare is \$137.04/ha (2001 costs). In years of low borer damage, an application of this chemical is difficult to justify.

One area where Regent[®] could be seen to give benefits beyond profitability would be in treating cane that is to be used for plants. The benefits of borer free plants cannot be measured in dollars.

Table 6
Sugarcane weevil borer damage levels for Regent[®] trials

Trial	Treatment	% Bored stalks	Number bored internodes per bored stalk
Q124 – 22//09/2000 Downing	Regent [®]	2	1.0
	Untreated	12	2.2
Q120 – 09/09/2000 Strano	Regent [®]	7	4.9
	Untreated	10	3.6
Q120 – 02/10/2001 Strano	Regent [®] full rate*	1	2.0
	Regent [®] 1/2 rate	3	3.7
	Untreated	7	4.1

* Regent[®] rate as per label recommendation

4.2.2 Herbicides

There was minimal borer damage in a paraquat trial during the 1999/2000 season. As a result, no tonnage figures were available and ccs was the same for both treatments (Table 7).

Table 7
Gordonvale paraquat trial (Morton) Q120 - 2nd ratoon (harvested 22/07/2000)

Treatment	% Bored stalks	Number bored internodes per bored stalk	ccs
Paraquat	4	2.5	12.3
Standard	8	1.8	12.3

4.3 Trash management trials

4.3.1 Trash raking trial

Modifying harvest residue to make sure pieces of tops, billets and stalks are smaller than 5 cm should help break the borer life cycle. The results in Table 8 show that the practice of trash raking has in this instance reduced the grower's profitability. A trash rake removes the trash from the top of the stool and this is best carried out immediately after harvest, before ratoons emerge (Figure 2). The extra trash raking practice increased costs and resulted in no increase in productivity or dollars per hectare.

Table 8
Gordonvale trash management trial (Downing)
Q124 - 3rd ratoon (harvested 02/09/2000)

Treatment	% Bored stalks	Number bored internodes per bored stalk	ccs	Tonnes cane per hectare	Net return \$/ha	Cost of treatment ² \$/ha
Trash rake	6	1.5	14.2	66.8	1142	23
Untreated	16	2.0	14.5	67.3	1191	0

²Throughout this entire document, cost of treatment has been based on a machinery costing model developed by Lionel Tilley of BSES. These are operating costs only and do not take into consideration fixed costs. Fuel = 0.49c/L (after diesel fuel rebate) and Labour = \$13.95/hr.



Figure 2 – Three-row trash rake

4.3.2 Ratooning disc trial

The results in Table 9 show no reduction in borer damage after using a ratooning disc. The ratooning disc consists of two offset pairs of three discs attached to a three-point linkage (Figure 3). This implement is pulled over the trash blanket after harvest. There was an increase in dollars per hectare due to the practice but only a slight increase in profitability when accounting for the cost of the extra pass over the block. Other impacts such as soil compaction would also have to be considered.



Figure 3 - Ratooning disc

4.3.3 Agrovator trial

Using an Agrovator did not reduce borer damage in the trial (Table 9) or substantially increase grower profitability. An Agrovator (Figure 4) can be dragged behind a fertiliser box or bar and consists of a drum with several spikes protruding from this drum (similar to a crumble roller bar but with spikes). The Agrovator rotates, breaking up trash as it moves along the interspace. This procedure is carried out after harvest. When the Agrovator is fitted to a fertiliser box, no additional pass is being carried out but the cost of the capital investment does need to be considered.

Table 9
Gordonvale trash management trial (Ferrando)
Q120 - 1st ratoon (harvested 10/07/2000)

Treatment	% Bored stalks	Number bored internodes per bored stalk	ccs	Tonnes cane per hectare	Net return \$/ha	Cost of treatment \$/ha
Ratooning disc	12	2.4	12.0	77.9	940	22
Agrovator	17	1.9	11.5	79.4	875	19
Untreated	7	2.9	11.7	74.8	850	0



Figure 4 - Agrovator

4.4 Nutrition trial

A nitrogen rate by variety trial (an already established BSES plant breeding trial) was sampled for borer damage on the 18th August 2000. The purpose of this was to see whether different application rates of nitrogen affected the incidence of borer damage. Five varieties were sampled (Q120, Q158, Q175^A, Q186^A and Q187^A) at varying rates of nitrogen (0 kg/ha, 60 kg/ha, 120 kg/ha and 180 kg/ha). No damage was observed due to low borer damage in the year of sampling, no damage was observed.

4.5 Pheromones

The use of pheromones to trap adult borers and reduce subsequent damage was a point of discussion with the grower groups. It has been demonstrated by BSES trial data (Sallam, unpublished 2001) that large numbers of adult borers can be attracted to pheromone traps. The trap design used in trial work has been that of either the Costa Rica trap or the water trap but growers had ideas of ways to improve the cost and efficiency of the pheromone trap design.

4.5.1 Pheromone traps

A pheromone trial was conducted on the Mourilyan sands to find the most effective trap design for capturing adult borers. Four trap designs were tested, including one that was designed by a Mulgrave canegrower. Each trap contained a packet of pheromone (rhynchophorol/octanol), a bottle of ethyl acetate (top of bottle was half unscrewed to allow the aromas to escape) and small pieces of split cane.

Details of the traps are as follows.

Water trap: A plastic 20 cm diameter pot (standard plant pot) was used that had a plastic inner lining (Figure 5). The top of the pot was covered with wire mesh to keep out animals such as cane toads. The pheromone and cane billets were enclosed in a small, ventilated container, which was suspended from the wire mesh down into the pot. The bottle of ethyl acetate was also suspended from the wire mesh down into the pot.

The pot was half filled with water and a few drops of detergent were added (detergent changes the surface tension of the water and causes the adult borers to drown). The inner plastic lining was pierced around the top section of the pot to allow excess water from rainfall to escape from the pot.

Dry trap: Same design as the water trap except no water was added to the pot. Instead, an insecticide was sprayed on the plastic lining, and the plastic lining was pierced so water from rainfall could escape from the pot.

Costa Rica trap: This trap was designed in Costa Rica. It is approximately 15 cm x 15 cm x 20 cm and consists of four ramp-like structures attached to the main frame (Figure 6). The ramps act as a landing pad for borers. Borers flying to the pheromone trap land on these ramps, crawl towards the pheromone and then fall into the base of the trap, which was sprayed with an insecticide. The pheromone packet and bottle of ethyl acetate were suspended from the top inside of the trap. Pieces of cane were placed inside the base of the trap.

Ron trap: This trap works on the same principle as the Costa Rica trap but on a larger scale (Figure 7). It consists of a 20 litre plastic drum (can be purchased from a hardware store), which was modified to make four ramp-like structures. A piece of carpet, soaked with an insecticide, was used to line the inner base of the trap. The pheromone packet and bottle of ethyl acetate were suspended from the top inside of the trap. Pieces of split cane were placed on the carpet.



Figure 5 - Water trap

Figure 6 - Costa Rica trap

Figure 7 - Ron trap

Number of borers in each trap was counted and recorded every second week (Figure 8).

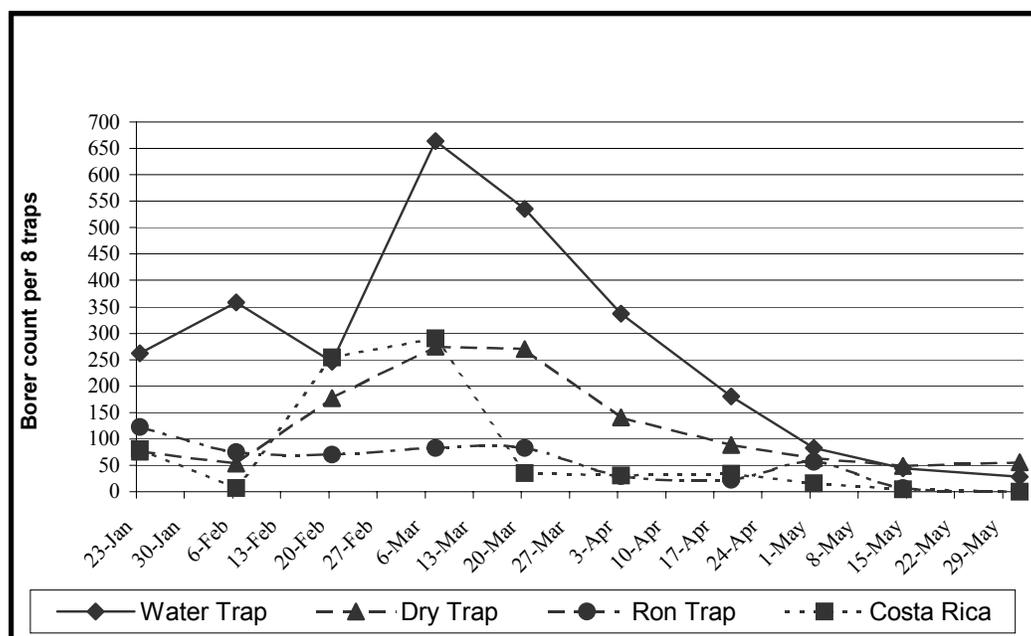


Figure 8 - Comparison between different pheromone trap designs – 2001 (Mourilyan)

The most effective trap for capturing adult borers was the water trap. On average, it captured 52% of the population, the other 48% captured between the other three trap designs (Table 10).

Table 10

Average number of borers caught per trap in a pheromone trap comparison trial

Pheromone trap designs comparison – Mourilyan				
	Water trap	Dry trap	Costa Rica trap	Ron trap
Average number of borers caught per trap	68.5	31.3	18.8	13.8

A trial was also carried out near Walsh's pyramid, Gordonvale to determine the distance over which borer adults are attracted by the pheromone. By knowing the area in which the pheromone is effective, the number of pheromone traps per hectare for mass trapping can be determined. No clear results were available but it is evident that borers are more attracted to the pheromone during December and January than they are in June and July. This may be due to the large areas of fermenting cane and juice present during the cane harvesting season which competes with the aggregation pheromone to attract borers.

4.6 Borer monitoring

Adult borers were monitored using split billet traps over the three seasons of the project (1999/2000, 2000/2001 and 2001/2002). Figures 9 and 10 show the borer population

during the year on the Mourilyan sands. Figure 11 shows the borer comparison between 1999 and 2002. During the three seasons, there was a population increase around January of each year.

4.6.1 Mourilyan borer monitoring

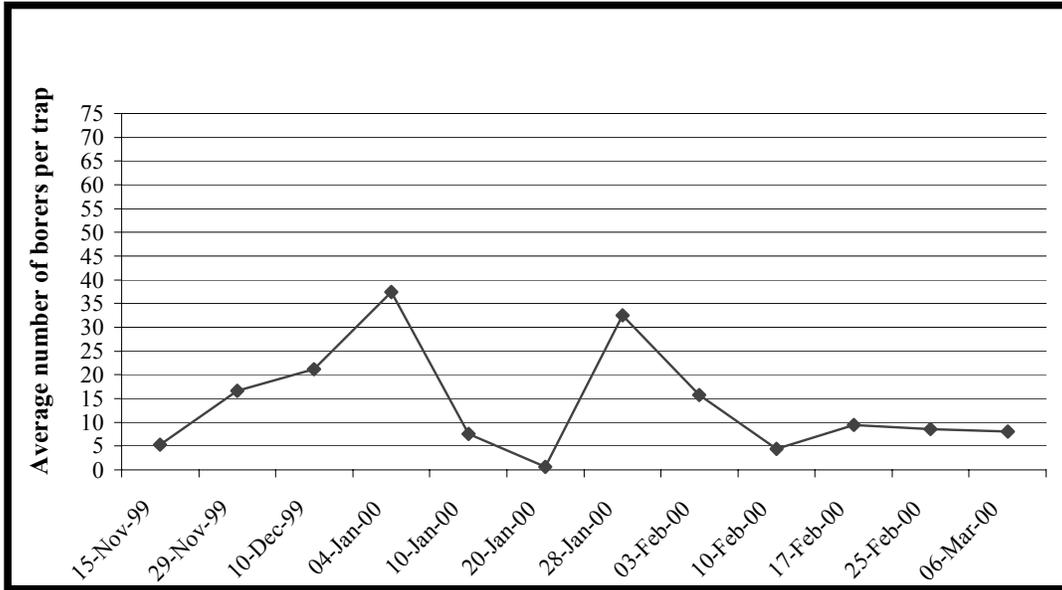


Figure 9 - Sugarcane weevil borer split billet trap monitoring November 1999 - March 2000 (Mourilyan)

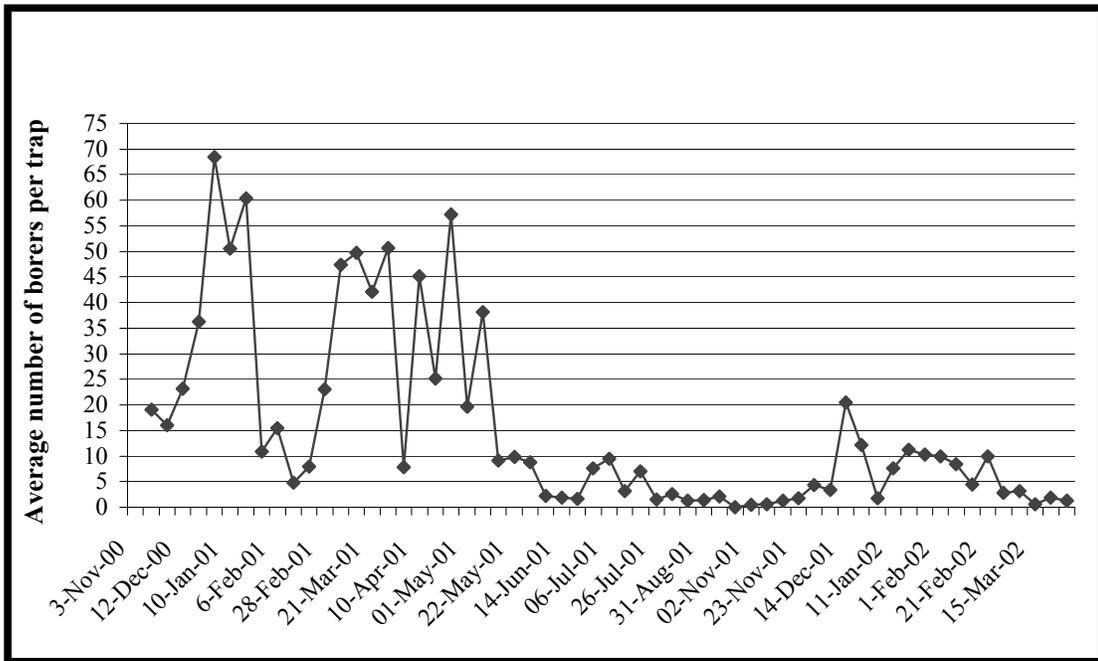


Figure 10 - Sugarcane weevil borer split billet trap monitoring November 2000 - March 2002 (Mourilyan)

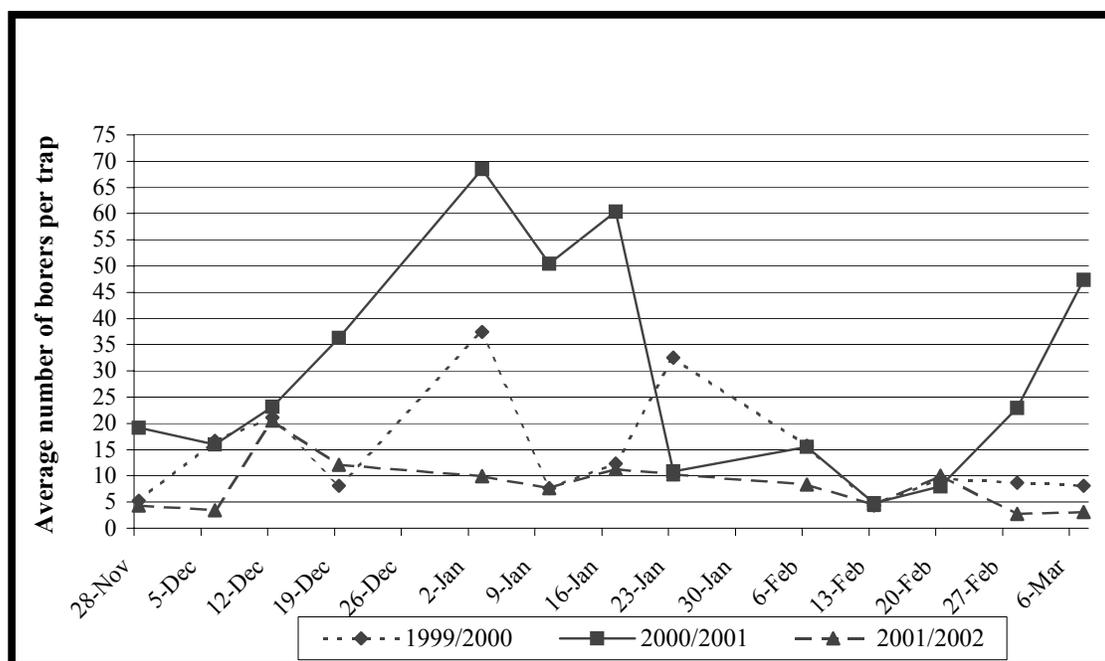


Figure 11 - Sugarcane weevil borer split billet trap monitoring population comparison between seasons 1999-2002 (Mourilyan)

4.6.2 Gordonvale borer monitoring

Monitoring was also carried out in Gordonvale (in conjunction with Mulgrave Mill). Eight sites were monitored from August 2001 to June 2002. Very few borer adults were captured in the split billet traps over the eight sites until the end of November 2001. Population numbers rose slightly with one site recording almost 30 borers per trap. Borer numbers quickly dropped down to less than 10 borers per trap and remained low at all sites until the end of February 2002. This is when a major peak in the population was recorded across all sites with one site recording in excess of 65 borers per trap. All sites were sampled for borer damage at harvest. The number of borers caught in split billet traps during the year and the amount of borer damage at harvest were compared. Results showed that there was no relationship between number of adults caught in traps and borer damage levels at harvest.

4.6.3 Silkwood borer monitoring

Monitoring was also carried out at some trial sites. In the Regent[®] trial at Silkwood, traps were placed in the treated and untreated strips, and borer numbers counted weekly from time of Regent[®] application in January until harvest time in September (Figure 12). Borer numbers per trap were similar in the two strips; again indicating that there is no relationship between the number of borers caught in the trap and damage at harvest.

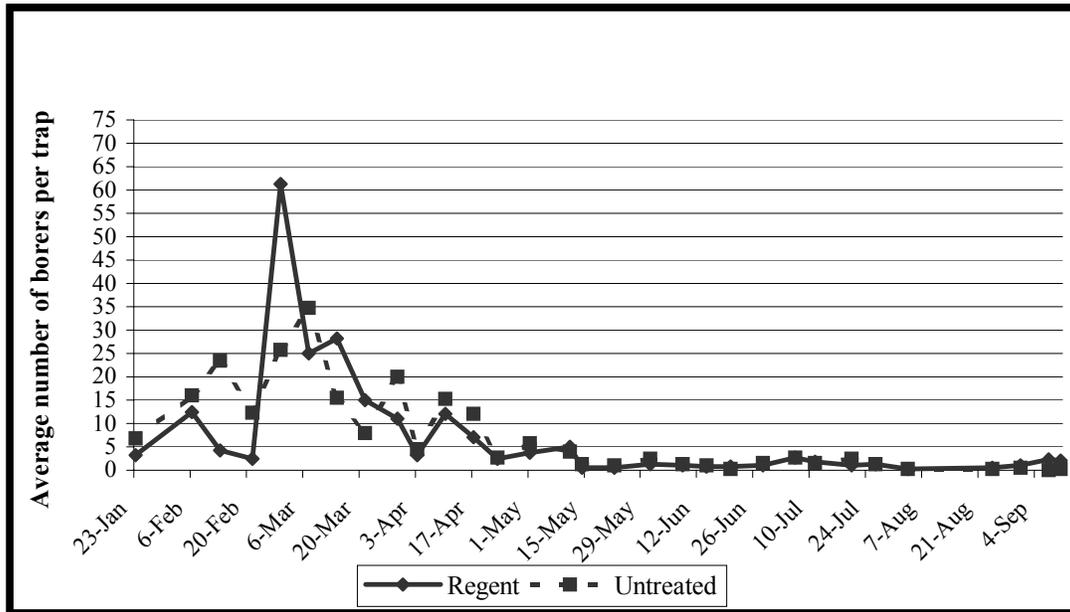


Figure 12 - Sugarcane weevil borer split billet trap monitoring Regent[®] versus Untreated (2001) - Q120 Silkwood

4.7 Project changes

Given the low levels of weevil borer damage during the 2000 season, it was difficult to draw conclusions from trial results and maintain grower participation and enthusiasm in the project. An SRDC review of the project in December 2000 led to the project being broadened to look at other important issues affecting growers in the Innisfail/Babinda area.

An additional eight grower groups to the two weevil borer groups were formed in the Innisfail/Babinda area. These groups met (March/April 2001) and raised issues affecting their profitability (Appendix 3). They were then asked to decide on a single topic that the group was capable of dealing with in the next 15 months (Table 11), and demonstrate best practice on individual farms for the issue they chose. Attendance was good at the meetings with approximately 180 growers participating.

**Table 11
Topics selected for grower groups in the Innisfail/Babinda area**

Topic	Area
Canegrub management	Garradunga, Innisfail, South Johnstone, Mena Creek and Silkwood
Soil health and nutrition	Bellenden Ker, Babinda, Mourilyan and Cowley
Variety management	Liverpool Creek

The groups then met a second time (May/June 2001) to decide on the specific issue within their topic that they wanted to focus on and the trials that would be established. Growers in each group established trials with the assistance of BSES staff (Table 12). Also at this meeting, growers were given a summary folder containing information on all the issues raised at the previous meeting.

Table 12
Grower group trials established in Innisfail/Babinda area

Trial	Why trial was established	Grower name
Variety strip trial Q138, Q166 ^A , Q174 ^A , Q186 ^A , Q187 ^A , Q198 ^A , Q199 ^A , Q200 ^A , Q201 ^A	Growers were confused with the number of varieties available. The group wanted to compare different varieties to find out which variety is the most economical to grow.	Zammit
Strategic vs conventional planting trial	Growers wanted to know if there is any negative effect on yield when using strategic tillage planting.	Rodman
Nutrition trials Application of various trace elements at different rates	Growers believe that the soil is lacking trace elements.	Di Marco Wilkins
Nutrition trial Broadcast potassium	Growers wanted to test if broadcasting large amounts of potassium achieves better productivity than banding the BSES recommended rates.	Nielsen
Zeolite trial	Growers have heard of this product and wanted to test if it increases productivity.	Tarditi
K-Komplex trial	Growers have heard of this product and wanted to test if it increases productivity.	Patane
Fallow (12mths) vs Fallow (6mths) vs Replant trial	Growers want to know the economic and biological advantage of fallow vs replant.	Lissa Cali

During September 2001, BSES conducted GrubPlan workshops in the Innisfail area. All growers from the five canegrub groups were invited to attend the workshops. From this, growers within the groups established whole-farm plans to manage greyback canegrub damage. These farms will be monitored for canegrub damage throughout the next few years.

The third round of meetings (January/February 2002) had a productivity focus where Bundaberg Sugar ranked each of the grower group assignments on a graph, comparing each farm's productivity and estimated net return against other assignments within the group. Each grower was assigned a code number so only they knew where they were situated on the graph. In some groups, there was a large difference between the top producer and the bottom producer. For example, in the Silkwood canegrub group, the number one grower in the group produced approximately \$2,150 per hectare compared to the bottom grower who produced approximately \$560 per hectare. Discussion focused on why there were differences between growers productivity (Appendix 4). Generally, most growers agreed that correct timing of farming operations was vital in achieving high productivity. 'Getting in early' with spraying, planting etc and 'not putting off until tomorrow what you can do today' will produce higher farm profits.

A number of other topics were also discussed at this round of meetings. Guest speakers were invited to discuss topics that each group had decided were of interest to them at the previous meeting. Each group had different discussion topics so a few weeks prior to the meetings growers were sent an agenda of all the groups and the topics to be covered (Appendix 5). Growers then had the choice of which meeting they would attend. A field walk was also conducted at each meeting to provide growers with the opportunity to observe and discuss the issues relevant to the group discussion.

The last round of grower group meetings occurred in April 2002. The major focus for this round of meetings was on variety selection. Each group was asked to list what they thought were important factors when deciding what variety to plant. Appendix 6 lists all the issues growers believe impact on their variety choice. At this meeting, growers were also shown how to calculate net dollars return when comparing varieties. A calculation sheet (Telford and McAvoy, 2002) was given to each grower so they could enter their own data, and compare varieties growing on their farm. The advantages of conducting a reliable variety strip trial were also explained to them.

Grower group meetings had continued good attendances. One of the reasons for this was growers decided on the issues they want to focus on as a group and growers therefore took ownership of their groups.

As trials were only established during 2001, no harvest results are available. Trials will be harvested during 2002 with growers, BSES and CPPB officers collecting the results. The following are preliminary results available for some trials.

4.7.1 Variety strip trial

Growers in the Liverpool Creek group were confused about which variety to plant. They believed there are too many varieties to choose from so a number of varieties were planted into a strip trial to help growers decide which variety best suits their area.

Shoot counts were recorded to compare germination of the various varieties (Table 13, Figure 13). BSES staff and CPPB staff will monitor the results of this trial over the next few years.

Table 13
Liverpool Creek variety strip trial (Zammit)
shoot count results

Average shoot counts per 5 metre plot (x8)					
	19/09/01	16/10/01	07/12/01	09/01/02	13/03/02
Q138	24.3	79.0	83.0	94.0	81.8
Q166 ^A	12.3	43.8	83.5	80.5	77.3
Q174 ^A	19.3	84.3	78.0	73.8	62.5
Q186 ^A	21.0	72.3	85.8	75.3	66.3
Q187 ^A	17.8	68.0	102.3	77.0	66.0
Q198 ^A	18.5	33.0	74.5	61.0	58.0
Q199 ^A	15.5	54.5	66.5	63.0	48.0
Q200 ^A	13.5	56.0	93.5	83.0	67.0
Q201 ^A	12.0	56.5	64.0	67.5	59.9

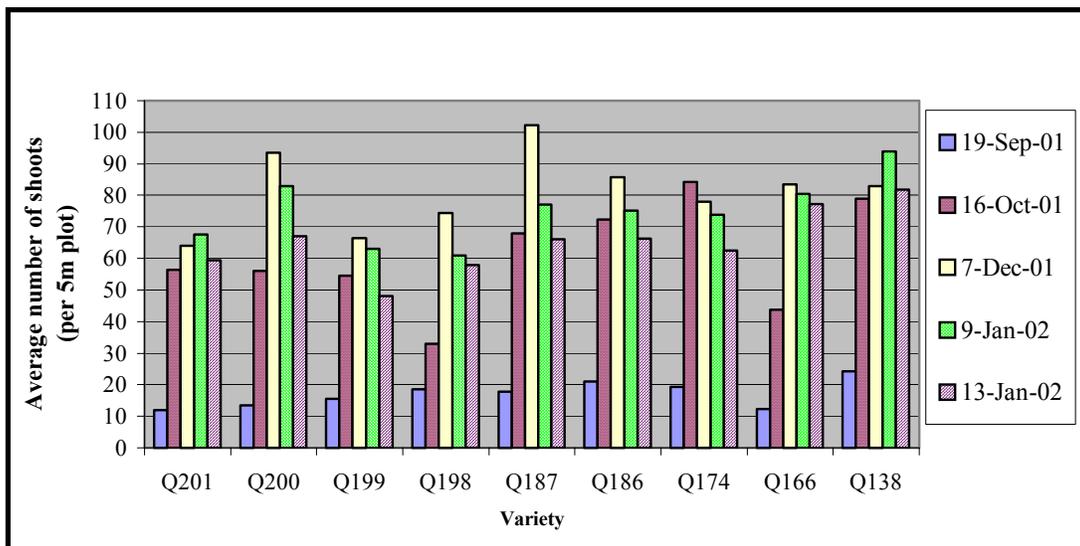


Figure 13 - Variety trial shoot count results (Sep 2001-Jan 2002)

4.7.2 Strategic versus conventional planting trial

Growers in Babinda wanted to test strategic tillage planting in their area. Shoot counts were recorded to compare germination and stalk numbers between strategic and conventional tillage planting (Table 14, Figure 14). BSES staff and CPPB staff will monitor the results of this trial over the next few years.

Table 14
Fig Tree Creek strategic tillage trial (Rodman) shoot count results

Average shoot counts per 6 metre plots (x8)						
	21/09/01	18/10/01	19/12/01	22/01/02	12/03/02	Average
Strategic	21.13	56.00	68.38	61.50	60.38	53.48
Conventional	23.13	52.75	72.88	61.75	61.38	54.38

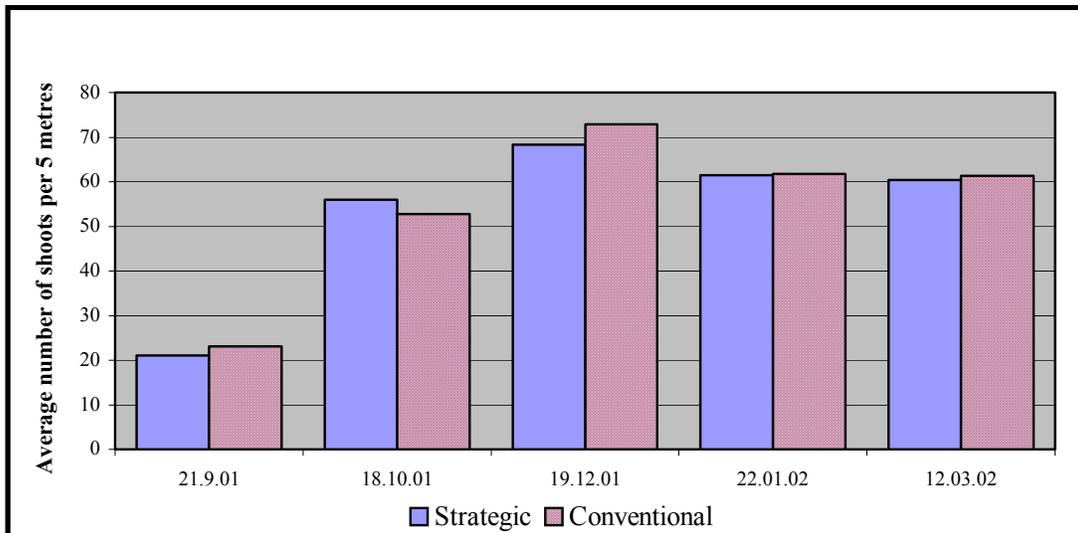


Figure 14 - Comparison of shoot numbers for strategic versus conventional planting trial (Sept 2001 - March 2002)

4.7.3 K-Komplex trial

K-Komplex is a product that is said to stimulate germination and speed of root growth in young cane. A strip of ratoon cane was treated with K-Komplex and compared to an untreated section. Numbers of shoots were counted in each strip and results (Table 15) showed no increase in plant germination when treated with K-Komplex.

Table 15
K-Komplex trial (Patane)
Q187^A Cowley - shoot count results

Average shoot count per 20 metre plot (x4)	
K-Komplex	363
Untreated	387

4.7.4 BioCane™ versus suSCon® Blue trial

Two growers in the canegrub groups are comparing BioCane™ and suSCon® Blue in plant cane as part of their whole-farm plan. Shoot numbers have been recorded (Table 16) at both sites.

Table 16
BioCane™ vs suSCon® Blue trial - shoot count results

Average shoot counts per 20 metre plot (x6)		
	Garradunga Q152 Sampled 02/11/01	Palmerston Q174^A Sampled 05/10/01
BioCane™	257	79.5
suSCon®	309	125.1

5.0 OUTPUTS

A best practice manual for sugarcane weevil borer has been developed as part of the original project. This takes two forms, one as a comprehensive manual designed more to assist industry advisors on the best method of management to reduce the impact of borer damage on an individual farm. The second form is a concise summary booklet (Appendix 7) that quickly highlights to growers the impact of borer damage and what action to take to help minimise the impact of borer damage on their farm.

The importance of having a topical issue that growers can take ownership of for group extension to be successful was highlighted in this project. The original sugarcane weevil borer project was difficult to conduct due to growers' lack of interest and enthusiasm for the topic. Weevil borer damage was extremely low during the course of this project. A positive outcome from this was that a review of the project recommended broadening the scope of the project, establishing more groups and having the groups decide on the issue they addressed over the next few months. Success of giving the group ownership over the topic could be seen in the initial number of growers that attended the meetings and the continued support for the project even after it has now been completed.

6.0 EXPECTED OUTCOMES

The presentation of trial results in dollars per hectare has proved very beneficial. A lot of discussion has been generated at group meetings as a result of this information. Growers have appreciated the opportunity to discuss these results with their peers. Growers are more aware now of how important it is to calculate net returns and determine what farm practice is more profitable on their farm.

Information delivered to grower groups as part of this project has provided growers with the skills and knowledge to conduct reliable trials on their farm. Growers should now

be able to compare different farm management practices on their own farm to meet their individual situations and determine the most profitable practice.

This project has seen the successful use of group extension to target a large number of growers in the Innisfail/Babinda area of north Queensland. The formation of these groups has provided an avenue to meet with larger numbers of growers more regularly than could be achieved on a one-to-one basis. This also provides an excellent opportunity for multi-agency input to discuss timely research and farming issues.

A review of the project in 2000 has seen a dramatic increase in the number of growers and industry personnel participating in the project. BSES extension officers are now keen to continue with the work already established in the second half of this project. Trials established during the project have the commitment of local staff to see them through to completion and there is already planning or continuing the group meetings after the 2002 harvest season.

The group process has provided growers with a forum to increase their communication and exchange of ideas between each other and advisory staff. This will result in quicker uptake of newer farming practices, leading to increased profits in the northern sugar industry.

7.0 FUTURE RESEARCH NEEDS

The new Farming Systems BMP project is a perfect complement to the now completed CP2002 BMP projects.

A large increase in borer damage levels may see a need to further test the documented management strategies for borer control. One weakness in the project was the extremely low levels of borer damage, which prevented rigid testing of the management strategies under heavy damage levels.

8.0 RECOMMENDATIONS

To succeed using group extension, and to have grower participation and enthusiasm this project has demonstrated the need to focus on an issue that is topical at that particular time. The original project proposal was not as successful as it could have been if borer damage was at much higher levels. Changing the project direction and allowing grower groups to decide on the issue they wanted to address saw an increase in participation and enthusiasm from the industry. Selecting a single issue to address over the life of a project is difficult for maintaining grower commitment because issues may change from year to year. In the case of this project, some issues were only decided on at a vote and then only won by a few votes. Many good topics were put forward but only one could be selected to address for the remainder of the project. It is already evident that if the groups were to decide on an issue to address now, there would not be five canegrub groups. It is important to choose an issue that is topical to keep grower participation

and enthusiasm for the project. It may be better to focus groups on issues relevant at the time of the meetings rather than a single issue over the life of the project. This is what the groups ended up doing towards the end of the project when they chose topics for discussion at the last few meetings.

Continuing group extension in the Innisfail/Babinda area will provide the industry with an avenue of communication to exchange ideas and technology. There is a commitment needed from all industry advisory staff to ensure the continued success of the established group extension network.

9.0 PUBLICATIONS

Best Management Practice for Sugarcane Weevil Borer 1999-2000.

- Manual: comprehensive document of management strategies and how best to implement them, distributed to industry research organisations and advisors.
- Summary Sheet: concise booklet that quickly highlights to growers the impact of borer damage and what action to take to help minimise the impact of borer damage on their farm, distributed to all growers in borer affected areas.

10.0 ACKNOWLEDGEMENTS

Funding for this activity was provided by the sugar industry and the Commonwealth Government through SRDC, and is gratefully acknowledged, together with the support and input from BSES staff, northern CPPB staff, Bundaberg Sugar and Mulgrave Mill.

In particular, we wish to acknowledge and thank Mohamed Sallam (BSES Meringa) for assistance in data collection and pheromone work; Innisfail and Gordonvale growers for their contribution to the project processes as well as allowing us to establish and sample trials on their properties; Steve Garrad (BSES Innisfail) for assistance with grower group processes; David Wallis (BSES Meringa) for assistance with variety management; BSES field labourers for field work and borer sampling; Kris Pierantozzi (BSES Innisfail) and Les Robertson (SRDC) for editing and formatting this document.

11.0 REFERENCES

Berding, N. (1996) Sugarcane weevil borer resistance: Breeding strategy development using survey data, Proceedings of The Australian Society of Sugar Cane Technologists 18:90-99.

Telford, DE and McAvoy, CA (2002) Best Management Practice for Sugarcane Weevil Borer 1999-2002, BSES/SRDC.

APPENDICES

APPENDIX 1

WEEVIL BORER SURVEY - for growers

1. Are borers as bad as they have been in the past or do they vary each year?
What do you think the cause of this is?
2. Do you think borer damage is worst on certain soils? Which ones?
3. Is borer damage worst or better in certain varieties? Which ones?
4. Are there any special techniques you use when working the soil to reduce borer problems?
5. At planting what do you do to reduce borer damage?
eg - insecticides, time of planting, selecting unbored cane, varieties.
6. Do you think weeds have an effect on borer damage?
eg - more weeds, more damage.
7. Do you use lime and how much fertiliser do you apply?
Does the amount of fertiliser applied have an effect on borer damage?
8. Have you tried chemical control to reduce borer damage?
eg - Regent®, and what results did you get?
9. Have you changed harvesters, groups or operators?
If yes, did you notice a change in levels of borer damage?
10. Do you generally have much cane left in the paddock after harvesting and have you found the more cane residue, the more borer damage?
11. What trash management practices after harvesting have you used and have some methods been better in reduction of borer damage?
12. Do you find crop class makes a difference to borer affected paddocks?
13. Do you have pest problems? eg - rats, cockatoos.
Do you think there is a relationship between damage and borers?
14. Is there anything that you can physically see that is common to all blocks of bored cane? eg - lodging.
15. Is there any other management practice you have tried on your farm to reduce borers?
16. When finding ways to reduce borers, why did you choose certain techniques and how did you measure their effectiveness?
17. Overall and regardless of cost, which management practices have you found to be the best in the reduction of borers?

WEELVIL BORER SURVEY - for sugar industry advisors

1. Are borers a problem in your mill area? If so which areas?
What soil type do these areas have?
2. Has borer damage varied in years? What do you think the cause of this is?
3. Is borer damage worst or better in certain varieties? Which ones?
4. What practices have you seen farmers use to reduce borer damage?
Have they worked?
eg - trash management practices, planting practices etc.
5. Do you think weeds have an effect on borer damage?
eg - more weeds, more borer damage.
6. What are your thoughts on chemical control for weevil borer?
7. From your experience, do you think the more cane residue left in a paddock, the more borer damage?
8. Do you think crop class makes a difference to borer affected paddocks?
9. Do you think there is a relationship between pests?
eg - rats and borer damage.
10. Is there anything you can physically see that is common to all blocks of bored cane? eg - lodging.
11. Overall, and regardless of cost, which management practice do you think is the best in the reduction of borers?
12. Do you think the whole idea of developing 'Best Management Practices' is a good idea? Do you believe it works?

APPENDIX 2

APPENDIX 2

COLLATED RESULTS FROM BORER SURVEY

Introduction

Weevil borers tend to vary from year to year. There are numerous reasons that growers identified with which may influence the variation of weevil borer damage.

These include: weather patterns; introduction of green cane trash blanket; borers' life cycle; change in variety selection; and level of crop damage from lodging.

Borers are found to be a problem on the lighter/drier, well drained soils such as the red earths in Mulgrave, sand in Mourilyan and black forest in Silkwood.

From the growers surveyed, the following varietal differences were found.

Worst varieties for borer damage	Better varieties for borer damage	Unsure of borer damage
Q113	Q113	Q166 ^A
Q120	Q152	Q181 ^A
Q138	Q158	
Q152	Q175 ^A	
Q174 ^A	Q178 ^A	

At planting

At planting, growers have a preference for selecting non-bored cane for use as plants however, they will use bored cane if no other cane is available. Generally they overlap the bored cane as it goes through the planter to achieve a better germination.

The following are ideas that may be performed at planting to help reduce the impact of borer damage.

- Select tolerant varieties
- Plant later in the season so cane is not as advanced during the borers' flight periods

In crop

Weeds: There are differences of opinion as to whether the amount of weeds in a crop and the subsequent level of borer damage are related. Some believed that the more weeds in a paddock, the more borer damage, because weeds attract other pests such as rats, which may in turn, attract borers to the fermenting cane. Others believed the two are not related because both very clean and dirty farms have been found to have bad borer damage.

Pests: Once again, there was varying opinion on the relationship between pests, such as rats and cockatoos, and borers. Some growers believe there is a relationship between the two. Pests damage the stalks, causing the cane to ferment and thus attracting borers. Some believe rats come before borers, while others believe the borer comes before the rat. Others believed there is no relationship between pest damage and borer damage because there has been no evidence, in some cases, of other pest damage in borer damaged cane.

Lodging: Growers believe cane that is lodged is more susceptible to borer attack. This is because the damaged, fermenting, lodged cane attracts borers. However there have been many cases where erect cane has had bad borer damage.

Fertiliser: Use of fertiliser has not been found to be related to subsequent borer damage. There were suggestions that an increase in fertiliser application may increase health of the cane and, therefore, decrease susceptibility of the cane, because borers need weak cane to bore into. Another suggestion is that increased fertiliser application means more vigorous cane and, therefore, more borer damage.

Chemical: Generally those farmers who have tried Regent[®] found it to have a noticeable reduction in borer damage without an increase in ccs or tonnage. Many believed the chemical would be better if it was economically viable and if there were not as many restrictions such as time of application. As yet, growers are to be convinced of the benefits from using Regent[®]. One suggestion was that Regent[®] may be good for keeping borers out of a seed source.

Harvesting

There was no direct evidence linking cane residue to increased borer damage. Most growers assumed this would be the case; however, found it hard to predict how much cane had been left under the trash blanket unless they looked for it specifically.

Few farmers believed that cane residue has nothing to do with borer damage. That cane is so smashed up after harvest and dries out quickly that it could not allow the borer breeding cycle to continue.

Some farmers are unsure if a shedder topper on a harvester makes a difference to borer damage.

Trash management

A variety of trash management practices have been trialled; however, the reduction of borer damage and economical viability of these practices are unknown. Trash management practices tested are as follows.

- Trash incorporation
- Centre bust
- Wheel rake to remove trash from the top of the stool
- Disc and roller
- Burning trash

Crop class

Growers differed between which crop class received more borer damage. Some believed plant cane was worst while others thought ratoon was worst. Some growers said there was no difference between crop class and it was the more vigorous, erect crops that were attacked by borers.

Additional ideas for control of weevil borer

- Spraying of Gramoxone®
- Neem
- Predatory tachinid fly
- Removal of all crop residue from paddocks

APPENDIX 3

APPENDIX 3

ISSUES THAT AFFECT PROFITABILITY RESULTS FROM 1ST GROWER MEETINGS

SOUTH JOHNSTONE MILL AREA

Issues raised at the South Johnstone, Mena Creek, Liverpool Creek and Silkwood grower groups meetings are as follows:

1. Pests:

- Management options for controlling canegrubs
- Cheaper options for canegrub control
- Predication of canegrub damage
- Difference in grub damage between a burnt system and green cane trash blanketing system
- Variety tolerant to grub control
- Weevil borer control
- Nematodes control
- Funnel ant control
- Rat control - RATTOFF[®] vs Racumin[®]

2. Disease:

- Ratoon stunting disease (RSD) control
- Chlorotic streak
- Orange rust

3. Varieties:

- Varieties suited to wet conditions
- Erect varieties
- Identify variety suitability to each block on farm
- Improve root system of varieties
- Good ratooning variety
- Variety suited to harvesting
- Variety tolerant to pests such as grubs
- Better varieties
- Confusion about too many varieties - don't know which one to plant
- Linking varieties with weather
- Varieties for low country

4. Soils:

- Improve nutrition of soil
- Effects of herbicides on cane and soil
- Unhealthy soil causes unhealthy cane

5. Nutrition:

- General soil nutrition
- Trace elements
- Fertiliser application in wet conditions
- Foliar application
- Timing of fertiliser application (multiple applications)
- Trace elements
- What does the cane plant require for growth

6. Planting:

- The long-term effects of fallow vs 100% cane (>15 yrs)
- Benefits of fallow
- Billet planters
- Planting material
- Better cane sett treatments
- Minimum tillage plant

7. Weeds:

- Effect of herbicides on cane growth
- Weed control using steam/hot water
- Declared weeds
- Herbicide costs and applications costs
- Resistance of weeds to chemical
- Weed control of problem weeds such as Guinea grass and calopo

8. Harvesting:

- Harvester speed
- Harvester equipment
- Knock down angle of harvester

9. Tillage:

- Types of cultivation practices and benefits
- Cultivation versus trash management

10. Financial:

- Data matrix – ccs versus tonnes
- Working out net return on cane
- Financial benching – the top 20%
- Value adding to cane production
- Sustainability of sugar industry – viable income?
- Costs of production
- Financial decisions and profitability–‘the bottom line’
- Bulk buying – purchasing power
- Reducing costs – fertilisers, poisons, harvesting
- Soil samples and fertiliser decisions – how to save money
- Split applications of fertilisers

11. Environmental:

- Soil erosion
- Future environmental controls imposed on the sugar industry

12. Miscellaneous:

- Cane ripeners
- Genetic engineering in cane
- Diversification options (both in cane and outside of cane)
- Use trash for other uses, eg co-generation
- Drainage
- GCTB – productivity decline (too wet)

MOURILYAN MILL AREA

Issues raised at the Innisfail, Mourilyan and Cowley grower groups meetings are as follows:

1. Pests:

- Canegrub
- Insecticides for canegrub control such as suSCon[®], BioCane[™] and Confidor[®]
- Type of farming practices to reduce canegrub damage
- Need cheaper alternatives for canegrub control
- Genetically modified cane for grub control
- Weevil borer
- Wallabies control

2. Disease:

- Leaf diseases such as yellow spot and orange rust
- Diseases in the soil

3. Varieties:

- Variety for low, poor draining soil type
- Tolerance of varieties to harvest damage (stool damage)
- Need source of clean seed in local area
- Historical varieties
- Need better varieties for sand
- Need better varieties
- Variety able to handle wet conditions
- Varieties do not have big enough canopy which leads to weed problems

4. Soils:

- Soil health
- Biology of the soil
- Soil compaction and water lodging
- Root structure of cane needs improvement

5. Nutrition:

- Band fertilising versus broad casting fertilising
- Trace elements
- Different types of fertiliser products available on market such as liquid fertiliser – are there any advantages of different types
- Soil lacking nutrients

6. Planting:

- Tolerance of varieties to billet planter
- Fallow versus replant (effects on weeds, \$ return)

7. Weeds:

- Timing and types of weed control
- Weeds are becoming resistance to chemicals
- Problem vines such as calopo, centro and mile-a-minute
- Problem weeds such as Guinea grass, hammel grass and vasey grass)
- Spread of weed seeds
- Increase weed problems since GCTB

8. Harvesting:

- Row spacing does not suit machinery
- Harvest payment system
- Ground speed of harvesters
- Pros & cons of large scale co-op harvesting

9. Tillage:

- Cultivation in trash blanket ratoons – does it help with ratoonability
- Tillage on poorly drained soils

10. Financial:

- Lack of finance for operations
- Co-operative farming for bulk purchasing
- Tonnes/ha and profit/ha

11. Miscellaneous:

- Drainage
- Weather forecasting
- Want more information of what is going on around the area

BABINDA MILL AREA

Issues raised at the Bellenden Ker, Babinda and Garradunga grower group meetings are as follows:

1. Pests:

- SuSCon[®] is not achieving canegrub control
- Are grubs attacking sick cane where soil is unhealthy?
- Need a replacement for SuSCon[®]
- Want more information about Confidor[®]
- Genetically modified cane for canegrub control
- Need to develop more grub tolerant varieties (larger root system)
- Information on organochlorines
- Why do cane beetles attack certain varieties or areas
- More information on canegrub biology
- Canegrubs seem to target high country
- The relationship between the weather and canegrub damage
- Cockatoos as pest of cane
- Rat control (rats not eating RATTOFF[®])

2. Varieties:

- Believe breeding varieties the wrong way
- Varieties should have good cover to stop weed growth and withstand wet conditions
- Varieties released with limited information about performance on local farms
- New varieties not performing well
- Need variety that can handle wet conditions
- Variety to withstand harvesting in wet conditions
- Varieties not providing enough coverage. Need to link variety to soil type (need a test)
- Need an all season variety
- Need a variety maturity curve showing maturity of varieties throughout the year
- Variety resistant to chemicals such as Round-up[®]
- Varieties for early sugar
- Varieties not performing in wet
- Genetically modified varieties

3. Weeds:

- Getting weeds from other industries (cattle) – a problem
- Cost-effective ways of dealing with weeds
- Ways of controlling vine such as calopo
- Alternative methods for weed control other than chemicals
- Hymenachne control (chemical expensive and farmer should not have to pay)
- Effect of pre-emergents on plant growth

4. Soil health:

- Need a soil solution for health of soil
- Compaction problems – working in wet conditions
- Interpretation of soil tests
- Dual row
- Measuring moisture content of soil before harvesting to avoid soil compaction
- Soil management – reverse the decline under cane
- Interpretation of soil and leaf tests
- Effects of fallowing on soils
- Soil – need a new approach to management (like Max Wilkins, Babinda canegrower)

5. Nutrition:

- Fertiliser application – broadcast vs band
- Trace elements
- Cane does not have healthy big root systems – what is the cause
- Fallowing (advantages and disadvantages)
- Leaf analysis with soil tests
- Foliar fertilising
- Timing and placement of fertiliser (eg stool-splitting)
- Fertiliser and relationship to stool tipping (health of root system)
- Broadcast potash at high amounts (not band application)

6. Harvesting:

- Compaction problem caused by harvesting
- How to minimise stool damage

7. Tillage:

- Should cane trash be worked into soil or left as green cane trash blanket
- Cultivation vs minimum tillage

8. Financial:

- Need to make a return on older ratoons
- Top performers not that far above the average, because all have poor margins

9. Environmental:

- Sugar industry is not standing up to Greenies
- Chemicals in waterways

10. Miscellaneous:

- Weather forecasting
- Alternative/rotation crops
- Cane ripeners
- Diversification into other crops
- Orange rust

APPENDIX 4

APPENDIX 4

PRODUCTIVITY DISCUSSIONS (RESULTS FROM 3RD GROWER MEETINGS)

What do farmers do to achieve high productivity?

Harvesting:

- ✓ Good harvest rotation
- ✓ Harvest low valued crop in wet
- ✓ Own harvester
- ✓ Harvest varieties at correct time, eg early and late ccs varieties

Pest and disease management:

- ✓ Good pest and disease control
- ✓ Zero or low amounts of pest and disease damage
- ✓ Fallow land to lower risk of diseases

General farm management:

- ✓ Farming practices carried out in a timely manner, eg 'Getting in early'
- ✓ Have young ratoons on farm
- ✓ Grow high tonnage
- ✓ Regular fallow/break crops
- ✓ Have a farm rotation plan
- ✓ No debt to pay off
- ✓ Spend time and effort on farm, attention to detail
- ✓ High level of farm management
- ✓ Good trash management
- ✓ Burning with good management
- ✓ Investment in drainage work
- ✓ Minimise erosion

Weed control:

- ✓ Control weeds early
- ✓ Correct timing of weed control

Soil and nutrition:

- ✓ Fertile soil
- ✓ Good nutrient management
- ✓ Regular soil tests
- ✓ Use of mill mud and ash
- ✓ Correct timing of fertilising, taking weather into consideration
- ✓ Correct placement of fertilisers
- ✓ Have a balance of nutrients, including good pH

Variety management:

- ✓ Select varieties to suit soil type
- ✓ Have a wide selection of varieties on farm
- ✓ Good seed management and selection
- ✓ Good variety knowledge, eg variety performance, a variety suitability to a billet planter etc.
- ✓ Plant strong ratooning varieties

Farmers also said that weather plays an important part in productivity. Variable weather conditions can have different effects on soil types and variety performances.

What farmers believe causes low productivity?

Exactly the opposite to the points listed in ‘What do farmers do to achieve high productivity?’ and also the following:

- ✓ Balancing farm work with other interests, eg another job
- ✓ Selecting seed that is convenient, eg planting a variety because it’s straight and standing rather than selecting the variety which is most suitable to the block
- ✓ Limited variety choice for certain soils
- ✓ Locked into harvest rotation without taking into consideration weather conditions

APPENDIX 5

GROWER GROUP MEETINGS - INNISFAIL/BABINDA AREA (April round)



AREA	GROUP	TOPICS	VENUE	DATE	TIME
Babinda	Soil Health & Nutrition	Making the best variety decision – checklist Variety comparison - how to calculate net return Productivity report - 2001 variety data	Guido Ghidella’s shed Boulders Road, Babinda	Friday 19 th April	8am
Bellenden Ker	Soil Health & Nutrition	Making the best variety decision – checklist Variety comparison - how to calculate net return Practical management of living soils	Bellenden Ker Hall Bellenden Ker	Monday 15 th April	1pm
Cowley	Soil Health & Nutrition	Making the best variety decision – checklist Variety comparison - how to calculate net return Practical management of living soils	Basil Micale’s shed Newman Road, Moresby	Tuesday 16 th April	8am
Garradunga	Grubs	GrubPlan Workshop (for growers who attended a GrubPlan workshop in September 2001)	Innisfail District Education Centre Goondi Road, Innisfail RSVP by Tuesday 23rd April	Wednesday 24 th April	8am
Innisfail	Grubs	GrubPlan Workshop (for growers who attended a GrubPlan workshop in September 2001)	Innisfail District Education Centre Goondi Road, Innisfail RSVP by Friday 19th April	Monday 22 nd April	1pm
Liverpool Creek	Variety	Making the best variety decision - checklist Variety comparison – how to calculate net return Is your soil holding your variety back from its full potential?	Sam Sardi’s shed No. 3 Branch Rd, Japoonvale	Monday 8 th April	1pm
Mena Creek	Grubs	GrubPlan Workshop (for growers who attended a GrubPlan workshop in September 2001)	Scout Hut, South Johnstone East Avenue (next to State School) RSVP by Tuesday 16th April	Wednesday 17 th April	8am
Mourilyan	Soil Health & Nutrition	Making the best variety decision - checklist Variety comparison - how to calculate net return How can a farming system approach look after your soil?	Tiger Lissa’s shed 15 Etty Bay Road, Mourilyan	Tuesday 16 th April	1pm
Silkwood	Grubs	GrubPlan Workshop (for growers who attended a GrubPlan workshop in September 2001)	The Gun Club Japoon Road, Silkwood RSVP by Monday 22nd April	Tuesday 23 rd April	1pm
South Johnstone	Grubs	GrubPlan Workshop (for growers who attended a GrubPlan workshop in September 2001)	Scout Hut, South Johnstone East Avenue (next to State School) RSVP by Tuesday 16th April	Wednesday 17 th April	8am
GrubPlan Workshop	All growers welcome to attend	GrubPlan Workshop (for growers who did not attend a GrubPlan workshop in September 2001)	Innisfail District Education Centre Goondi Road, Innisfail RSVP by Thursday 25th April	Friday 26 th April	8am
GrubPlan Workshop	All growers welcome to attend	GrubPlan Workshop (for growers who did not attend a GrubPlan workshop in September 2001)	Innisfail District Education Centre Goondi Road, Innisfail RSVP by Friday 26th April	Monday 29 th April	1pm

NOTE: Please RSVP to BSES Innisfail on 4061 1707



GROWER GROUP MEETINGS - INNISFAIL/BABINDA AREA (Jan/Feb Round)

AREA	GROUP	TOPICS	VENUE	DATE	TIME
Babinda	Soil Health & Nutrition	Productivity Broadcast and trace elements – grower trials Nitrogen rate trials <i>Nutrition field walk</i>	John Sacchetti's (Menzell) shed Bucklands Road Miriwinni	Wednesday 30 th January	8am
Bellenden Ker	Soil Health & Nutrition	Productivity Commercial laser levelling operations Cheap & easy headland drainage works Broadcast and band fertilizing trial results <i>Strategic tillage vs conventional planting field walk</i>	Ted Rodman's shed Fig Tree Creek	Wednesday 23 rd January	8am
Cowley	Soil Health & Nutrition	Productivity Weed control <i>Seed plot field walk</i>	Basil Micale's shed Newman Road Moresby	Monday 4 th February	8am
Garradunga	Grubs	Productivity Grub identification/monitoring Grub diseases <i>Variety strip trial field walk</i>	Frank Russo's shed Garradunga	Thursday 31 st January	8am
Innisfail	Grubs	Productivity Grub identification/monitoring Legume fallow <i>Legume field walk</i>	Steve Austin's shed See Poy Road Sundown	Thursday 24 th January	8am
Liverpool Creek	Variety	Productivity Variety information Grub identification/monitoring <i>Variety trial field walk</i>	Sam Sardi's shed Liverpool Creek (Please RSVP for this meeting, BSES - 40611 707)	Monday 21 st January	8 am
Mena Creek	Grubs	Productivity Grub identification/monitoring Minimum tillage planting Nitrogen rate trials <i>Minimum tillage vs conventional planting field walk</i>	Joe Zappala's shed Japoonvale Road Mena Creek	Friday 8 th February	8am
Mourilyan	Soil Health & Nutrition	Productivity Legume fallow <i>SYDJV soybean planter trial field walk</i>	Alf Cali's shed New Harbour Line Road Mourilyan	Friday 1 st February	8am
Silkwood	Grubs	Productivity Grub identification/monitoring Growers review of seasons weed control	The Gun Club Japoon Road Silkwood	Thursday 7 th February	8am
South Johnstone	Grubs	Productivity Grub identification/monitoring Farming & family - a different perspective Minimum tillage planting <i>Minimum tillage field walk</i>	Miles Darveniza's shed Henderson Drive South Johnstone	Tuesday 5 th February	8am

APPENDIX 6

APPENDIX 6

IMPORTANT FACTORS WHEN DECIDING WHICH VARIETY TO PLANT (RESULTS FROM 4TH GROWER MEETING)

Each group was asked to list what they thought were important factors when deciding on which variety to plant. Below is the list growers thought were important.

- ccs
- Early or late ccs variety – does it fit into your rotation?
- Cropping potential and tonnage
- Ratooning ability
- Suitability to soil type and block
- Condition of planting material
- Pest and disease susceptibility
- Good mix of varieties on farm – not too much of one variety
- Billet or whole stick – some varieties are better suited to a particular method
- Quick germination and good striking
- Vigour
- Erectness
- Canopy cover
- Economic return of variety
- Able to grow in wet conditions
- Suckering
- Side shooting
- Arrowing
- Free trashing so there is less extraneous matter
- Susceptibility to stool tipping

APPENDIX 7