SRDC Grower Group Innovation Project

Final Report

SRDC project number:	GGP030
Project title:	Utilising a predictive model for the monitoring and management of canegrubs in the Mackay region by the Mount Kinchant Growers Group
Group name:	Mount Kinchant Growers Group
Contact person:	Paul Vassallo
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Australian Government
Sugar Research and Development Corporation

EXECUTIVE SUMMARY

Of the nineteen canegrub species in Australia, greyback canegrub which occurs from Plane Creek northwards is the most important. Growers rely heavily on insecticides for greyback canegrub management, and effective insecticidal treatments are now available for both plant crops and ratoons. However these treatments are expensive, and there is no system that allows growers to strategically apply insecticides to only those fields which really need treatment.

The aim of this project was to test a system which would allow growers to vary their treatment decisions as circumstances changed. In a previous SRDC-funded project (BSS257), BSES Limited developed a set of models which predict numbers of greyback canegrubs one year ahead. Required information includes canegrub numbers in the current year and presence of visible grub damage in canefields. The Mt Kinchant Grower Group engaged BSES as a consultant to implement this system on Group farms, to test the predictive system and evaluate the costs and benefits of a grub-management consultancy that could be used by other growers in the industry.

BSES monitored each of the 10 farms within the Group from 2008-2010. Canefields were sampled for canegrubs by BSES in April-May of each year – 78 fields in 2008, 80 in 2009 and 46 in 2010. Twenty stools were dug in most of these fields and grubs identified and counted. A sample of at least 50 grubs was then reared to adult and causes of any deaths were diagnosed (identifiable pathogens are *Adelina*, *Metarhizium* and milky disease); disease levels were very low in both 2008 and 2009 while grubs from 2010 are still being reared. Fields were inspected before harvest and any visible damage recorded; aerial photographs were taken in 2008 and 2009 to help locate grub damage. Gappy ratoons that may indicate grub damage were recorded after harvest.

The locations of grub-infested stools and grub damage were recorded in a GIS layer. Maps were printed showing the status of fields on each farm in terms of current insecticidal protection, grub numbers (for sampled fields) and visible damage (for all fields on the farm). The risk of grub attack in the following year was quantified using the predictive models. Group members received a package each year that included the field-status maps, farm report and treatment recommendations.

There was general agreement between trends of actual and predicted grub numbers in 2009 and 2010 but with a lot of unexplained variation, particularly in 2010. Treatment decisions tended to err on the conservative side, which is not necessarily a bad thing. Damage was low on most farms during the project. Unexpected damage was only observed in a small number of fields, and that damage was localised and light in almost all cases.

This project allowed the Group to have input into the type of information that growers require from a canegrub-management service, and has allowed the service to be costed and its functionality evaluated. Data collected in the project will be used to fine-tune the predictive models.

BACKGROUND

Canegrubs are a serious problem for many cane growers. Grub losses in Queensland have been reported to exceed 700,000 tonnes of cane in bad years (e.g. 2001). There has been a change in the type of grub damage in the Mackay district in the last 10 years, with greyback grub becoming more prominent. Some of the grub control strategies that growers used previously for French's grub, such as cultivation before planting, may not be effective against greyback grub and new strategies are needed.

Growers currently rely heavily on insecticides for managing canegrubs. Many growers continue to apply suSCon to each plant crop, even when there has been no sign of damage for several years, and some are asking whether they can cut back on usage. Would treating ratoons as necessary with Confidor Guard be more economic? What will be the consequences if the sugar price continues to fall; must growers continue to treat fields as insurance or could they fall back on a partial treatment (parts of the farm or even parts of fields, as required)?

Growers need a system that allows them to vary their treatment decisions as circumstances change. BSES has developed a strategy for monitoring farms for greyback grub and predicting future infestations and the economics of treatment, based on work done in an SRDC project over the last 4 years. Our Group wished to test that system in this project.

Our Group includes growers with grub damage ranging from minimal to severe, and with treatment regimes ranging from fully treated to occasional use, as well as a mixture of grub species on at least one farm, so we could test the system under a variety of farm conditions.

AIMS

The main objective was to improve our grub management, by the following steps:

- Evaluating the feasibility of employing a consultant to improve our grub management, by the following steps:
    - Contracting a consultant to develop canegrub management plans for participating farms, based on results of monitoring grubs and grub damage, as well as economic considerations.
    - Testing these recommendations by implementing them in whole fields or in strips.
    - Evaluating the costs and benefits of the consultancy and the resulting grub management decisions.
    - Determining whether there is a place for this type of grub management strategy in the long-term on our farms.
- Using this information to promote strategic canegrub management in the sugar industry.

METHODOLOGY

A ‘consultant’ –an entomologist from BSES Limited (Dr Peter Samson) – was contracted to deliver a monitoring and advisory service for greyback canegrubs on our farms. Farms were monitored for canegrubs and damage in 2008 and 2009 and management advice given accordingly.

Table 1 sets out monitoring and advisory activity each year.

Table 1 Project activities to provide a canegrub monitoring and prediction service to growers

Activity	Month	Methodology
Beetle activity	January-February	Symptoms of beetle feeding on trees near canefields rated as follows 0 Nil 1 Trace on at least one leaf 2 Trace on most leaves (i.e. more than half) 3 Substantial chewing on most leaves 4 Heavy damage, almost defoliated.
Pre-season consultation	February-April	Grower input was obtained on: • Treatment history of all fields on farm • Plans for fields (fallow etc) • Priority fields for monitoring
Grub monitoring	April-May	A selection of fields (usually fields which were unprotected by insecticide and which were being considered for ratooning) were monitored by either of two different systems: 1. 'Full sampling' where grubs were counted under 20 stools per field, four in each corner and four near the middle. Corner stools were 40, 30, 20 and 10 m into the paddock in rows 4, 8, 12 and 16, respectively. The entire plant was dug up and a block of soil about 40 x 40 x 30 cm checked for grubs; the cane was then replanted. The field was characterised as having the calculated average number of grubs per stool. Grubs were collected in labelled containers. 2. A 'rapid sample' where sampling was stopped as soon as a grub was found to a maximum of 20 holes dug; the field was then characterised as having grubs 'present' or 'absent'
Grub disease assessment	April-November	Grubs were reared at BSES Tully or Meringa in individual containers in peat and fed slices of carrot every 1-2 weeks. They were checked for external symptoms of *Metarhizium* infection and unhealthy grubs were bled to check for spores of *Adelina* and milky disease.
Damage survey	May-July	Each farm was photographed from the air by fixed-wing aeroplane or helicopter and images examined for signs of damage. All fields were checked from the ground for visible signs of damage, with particular attention given to possible damage observed in the aerial photographs, and rated as follows: 0 No visible damage 1 Small patches of yellow or stressed cane; 2 Stool tipping and yellow leaves, stools easily pulled from ground; 3 Extensive patches of dead cane, no roots remaining

Gap survey	October-November	Gaps in ratoons checked after harvest for evidence of canegrub damage.
Mapping, prediction and report preparation	June-September	Maps were produced showing the insecticide protection of fields and the location of canegrub infestations and damage using MapInfo with data entry via ProdBasePlus, with considerable assistance from MAPS (Kevin Moore) and Mackay Sugar (John Markley). Detailed predictions were developed for the monitored fields using predictive models developed by BSES. A summary sheet was prepared for each farm containing the infestation maps, a risk profile and treatment advice for individual fields.
Reporting to growers	September-November	Farm reports and treatment recommendations were discussed with each grower.

Maps were created for each farm showing the location of grub infestations as determined by grub sampling and damage observations, and the location of current insecticide treatments.

Models developed in a previous SRDC-funded project BSS257 were used to develop predictions of greyback canegrub numbers in the next year based on the monitoring results. Two types of models were used, each with different data requirements. The first type, a regression model, predicted an actual grub density as number of grubs/stool. The second type, a discriminant model, predicted the likelihood of greyback grub densities falling into each of three density classes: 0.5 grubs/stool or less (low), more than 0.5 to 2 grubs/stool (moderate), and greater than 2 grubs/stool (high). Current infestation details for the field were input as either number of grubs per stool or as grub presence/absence, depending on whether full sampling or a rapid sampling method (described in table 1) was used. Input variables and an example of the output of these models are given in Tables 2 and 3. Both the regression and the appropriate discriminant model were run for each field (only the discriminant model could be used where fewer than 20 stools were dug using the rapid sampling scheme). Where predictions differed between the models for the same field, a balanced assessment was made of the likely grub risk to that field.

Table 2 Example of data input and resulting prediction for the regression model based on full sampling of a particular canefield

Predictor variables	**Full sampling**
Fallow = 1, Replant = 0	1
Ratoon=1, Plant crop = 0	1
Grubs/stool Yr0	0.2
Severity of damage (0-3) Yr0	1
Max severity within 400 m (0-3) Yr0	1
% *Adelina* regional average Yr0	0
Predicted grubs/stool Yr1	**0.31**

Table 3 Example of data input and resulting predictions for discriminant models based on either full sampling or rapid sampling of a particular canefield

Predictor variables	**Full sampling**	**Rapid sample**
Protected (suSCon 3 yrs, Confidor 1 yr) = 1, Unprotected = 0	0	0
Grubs/stool Yr0	0.2	
Grub presence Yr0 (present = 1, absent = 0)		1
Severity of damage (0-3) Yr0	1	1
Max severity within 400 m (0-3) Yr0	1	1
Grubs/stool regional average Yr0	0.11	0.11
% *Adelina* regional average Yr0	0	0
Predictions for each density class		
Probability (low)= %	21	25
Probability (moderate)= %	54	52
Probability (high)= %	25	23

Records were kept of the time spent on each activity.

RESULTS AND OUTPUTS

BSES Report

Beetle activity

A set of 33 trees was selected for monitoring the feeding activity of adult greyback cane beetles. Trees were mostly various species of figs and palms, mostly located between the Sarina-Homebush Road west to John Walker's farm (Group member) in the Brightly area plus several on the farm of Eddie Pace (Group member) at Pindi Pindi.

Average feeding damage ratings were as follows: 2008 – 1.6; 2009 – 1.4; 2010 – 2.0 (methodology described in Table 1). This suggests little change in beetle activity during the 3 years of monitoring.

Grub monitoring

A total of 31 fields were sampled for canegrubs with the fixed sampling scheme in 2008 up to 30 April, while the 47 fields sampled from 6 May onwards were sampled by the rapid scheme. Greyback canegrubs were detected in 32 of the 78 fields sampled. French's/negatoria canegrubs (specific identity unconfirmed, referred to hereafter as 'French's canegrub') were found in only five fields at a maximum density of 0.1/stool, but it should be noted that sampling was not done at the best time for detecting this species, while grata canegrubs were found in five fields with a highest density of 0.35 grubs/stool. The average density of greyback canegrubs in the 31 fields that were sampled by the fixed sampling scheme was 0.11/stool. Canegrub densities in fields sampled by the rapid sampling scheme were not included in the calculation of average density to avoid biasing the estimate.

In 2009, 39 fields were sampled with the fixed sampling scheme and 41 were sampled by the rapid scheme. In general, fields that had been sampled with the fixed sampling scheme in 2008 were

sampled again with the same scheme in 2009, assuming no treatment was applied, to test whether grub numbers in 2009 had been predicted accurately. Greyback canegrubs were detected in 34 of the 80 fields sampled. French's canegrubs were found in only two fields while grata canegrubs were found in one field. The average density of greyback canegrubs in the 39 fields that were sampled by the fixed sampling scheme was 0.19/stool, slightly more than was found in 2008.

In 2010, 46 fields were sampled, all with 20 stools each using the fixed sampling scheme. Greyback canegrubs were detected in 31 fields, French's canegrubs were found in only two fields while grata canegrubs were found in three fields. The average density of greyback canegrubs was 0.24/stool, slightly more than was found in 2008 and 2009.

Grub disease levels

A sample of greyback canegrubs that were collected from Group fields in 2008 and 2009 were sent to BSES at Tully or Meringa to check for diseases. Of 74 grubs that were received in 2008, only one died from an identifiable disease (*Metarhizium*); no *Adelina* or milky disease was detected. Of 111 grubs that were received in 2009, one died from milky disease and no *Adelina* or *Metarhizium* was detected. The proportion of grubs that successfully produced beetles was 54% and 57% in each of 2008 and 2009, respectively. These results confirm the very low incidence of known diseases in the Central region. Infection rates previously measured in another SRDC-funded project (BSS257) were low in every year from 2003-2007, with the highest rates in any one year being 5% for *Adelina* (2007), 8% for *Metarhizium* (2007) and 2% for milky disease (2006) (Fig. 1). The absence of *Adelina* from Group fields in 2008 and 2009 was taken into consideration when grub risk was assessed for the following year. Greyback canegrubs collected in 2010 are being reared to assess survival and incidence of pathogens but results will not be available until later in the year.

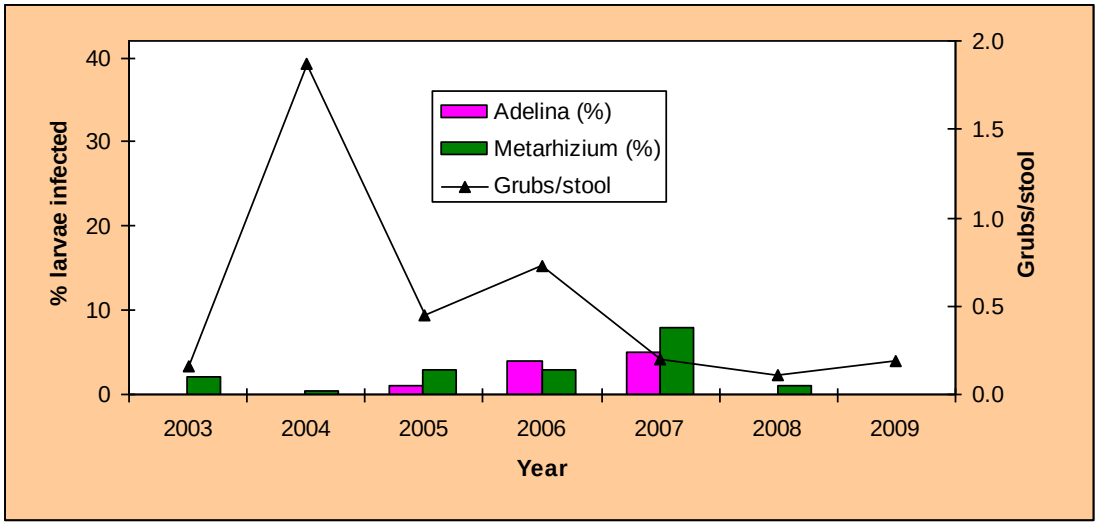


Figure 1 **Average numbers of greyback canegrubs and percentage infected by the diseases *Adelina* and *Metarhizium* on Central Region farms, in various districts at Plane Ck and Mackay from 2003-7 and at Mt Kinchant Group farms in 2008 and 2009**

Damage survey

Aerial surveys to detect canegrub damage were done in 2008 and 2009.

In 2008, the first survey in April used a pocket digital camera to shoot through a hole in the fuselage of a fixed-wing aircraft, and was operated by remote capture. Although this method gave good images of some fields (e.g. Fig. 2), it proved to be too difficult to ensure adequate coverage of each farm because of the fixed position of the camera. Another set of photographs were taken on 10 April from the aircraft, obliquely out of the passenger window. For a third survey in May, the pilot of the aircraft was unavailable due to illness so we used a helicopter. This enabled easy photography but was very expensive, and one farm (1285A) that was a considerable distance from the others could not be surveyed.

Figure 2 Image captured by digital camera shooting vertically beneath fuselage of fixed-wing aircraft

In 2009, an aerial survey of all farms was conducted in May by helicopter. Photographs were taken with a 10 MP digital SLR (Nikon D80) fitted with an 18-55 mm zoom lens with vibration reduction. CDs were distributed to participating growers and were also examined by BSES.

Ground surveys were then conducted in 2008-2010 just before harvest. These damage surveys were intended to be independent of the grub survey earlier in the year, so fields in which we had found grubs were not necessarily recorded as damaged. We inspected the whole of each farm from headlands, tow paths and available vantage points, and walked to any parts of fields that had looked suspicious in the aerial photographs. Damage was intended to reflect infestations in the current year, as evidenced by yellowing leaves and by stools sprawling or tipping and being easily pulled from the ground.

Although damage seen from the ground could usually also be seen in aerial photographs (e.g. Fig. 3), much of what we thought could have been grub damage in the photographs turned out not to be. Many patches of cane that looked unhealthy from the air were affected by weeds, particularly vines which had pulled the cane down.

Figure 3 Moderate canegrub damage near farm 3110A in 2009

Mapping, prediction and grower reports

A report was prepared for each farm in 2008 and 2009. An example of a farm report and associated maps is given for farm 3071A in 2008 on the following pages. These reports gave specific recommendations for fields which were sampled for canegrubs in that year, as well as general recommendations for grub risk across the farm in the coming year and grub management recommendations for non-sampled fields.

Farm#	3071A	**Mill**	Pleystowe
Grower	Vassallo, Andrew		
Year	2008		

Overall comment

Fourteen blocks were sampled for grubs in 2008. Greybacks were found in seven blocks, 1-2, 1-5, 1-8, 5-5, 6-1, 8-2, 9-1 and 11-1. No greybacks were found in the other seven (see table below). One French's canegrub was found in 5-1, which is of no concern.

Light grub damage was seen in 2008 on the western boundary of 5-1 and in the cane remaining on the southern side of 3-1. Moderate grub damage was present on a neighbouring farm to the east of 1-8 (across Olletts Rd). The grub counts and damage indicate some infestation pressure for 2009 across most of the farm except perhaps for the far western side.

We sampled four of the five blocks nominated for ploughout in 2008. Greyback grubs were found in three, 1-2, 1-8 and 11-1, while damage was seen in 5-1 although no grubs were found. The fifth block, 8-1, was not sampled but is adjacent to an infestation in 8-2. All of these blocks should be treated against grubs when planted.

Of the sampled blocks which are expected to be ratooned, treatment in 2008 is recommended for blocks 8-2 and 9-1 which are at low-moderate or moderate risk in 2009 when they will be third ratoons. Treatment is not recommended for the at-risk but older crops in 5-5 and 11-1. Other sampled blocks are predicted to be low-risk for 2009.

For blocks that were not sampled, treatment could be good insurance for crops that are at risk because of proximity to current damage or grub infestations and which are still relatively young ratoons. Other blocks for which ratoon treatment could be considered in 2008 are 2-1 and 9-3. However these will be second ratoons that may still receive some protection from the suSCon Maxi applied at planting, so treatment can probably be overlooked; however they should be monitored in 2009.

Fields sampled in 2008

Block no.	Crop class 2008	Treatment plant crop	Confidor 2007	Protected 2009	Est. yield 2009	Greybacks/ stool 2008	Grub damage 2008	Nearby damage *	Risk for 2009?
1-1	4R	Nil	No	No		0/20	Nil	Light	Low
	Recommendation:		*Do not treat ratoon in 2008 - low risk of damage next year.*						
1-2	5R	Nil	No	No	Ploughout 08	3/16	Nil	Light	Moderate-high
	Recommendation:		*Treat plant crop.*						
1-5	3R	suSCon Maxi	No	Yes		3/12	Nil	Nil	Low
	Recommendation:		*Do not treat ratoon in 2008 - low risk of damage next year.*						
1-8	4R	Nil	No	No	Ploughout 08	1/20	Nil	Light	Moderate-high
	Recommendation:		*Treat plant crop.*						
4-2	3R	suSCon Maxi	No	No		0/20	Nil	Light	Low
	Recommendation:		*Do not treat ratoon in 2008 - low risk of damage next year.*						
4-4	2R	suSCon Maxi	No	No		0/20	Nil	Light	Low
	Recommendation:		*Do not treat ratoon in 2008 - low risk of damage next year.*						
5-1	7R	Nil	No	No	Ploughout 08	0/20	Light	Light	Low-moderate
	Recommendation:		*Treat plant crop.*						
5-5	4R	Nil	No	No		1/4	Nil	Light	Moderate-high
	Recommendation:		*Do not treat ratoon in 2008 - moderate-high risk of damage next year but crop is old.*						
6-1	2R	suSCon Maxi	No	No		1/20	Nil	Nil	Low
	Recommendation:		*Do not treat ratoon in 2008 - low risk of damage next year.*						
7-3	3R	suSCon Maxi	No	No		0/20	Nil	Nil	Low
	Recommendation:		*Do not treat ratoon in 2008 - low risk of damage next year.*						
8-2	2R	suSCon Maxi	No	No		6/20	Nil	Nil	Moderate
	Recommendation:		*Treat ratoon in 2008 - moderate risk of damage next year.*						
9-1	2R	Nil	No	No		4/4	Nil	Nil	Low-moderate
	Recommendation:		*Treat ratoon in 2008 - low-moderate risk of damage next year.*						
11-1	4R	Nil	No	No	Ploughout 08	4/16	Nil	Light	Moderate
	Recommendation:		*Do not treat ratoon in 2008 - moderate risk of damage next year but crop is old.*						
12-1	2R	Nil	No	No		0/20	Nil	Nil	Low
	Recommendation:		*Treat plant crop.*						

Greyback canegrub status 2008- treatments, grub numbers and visible damage

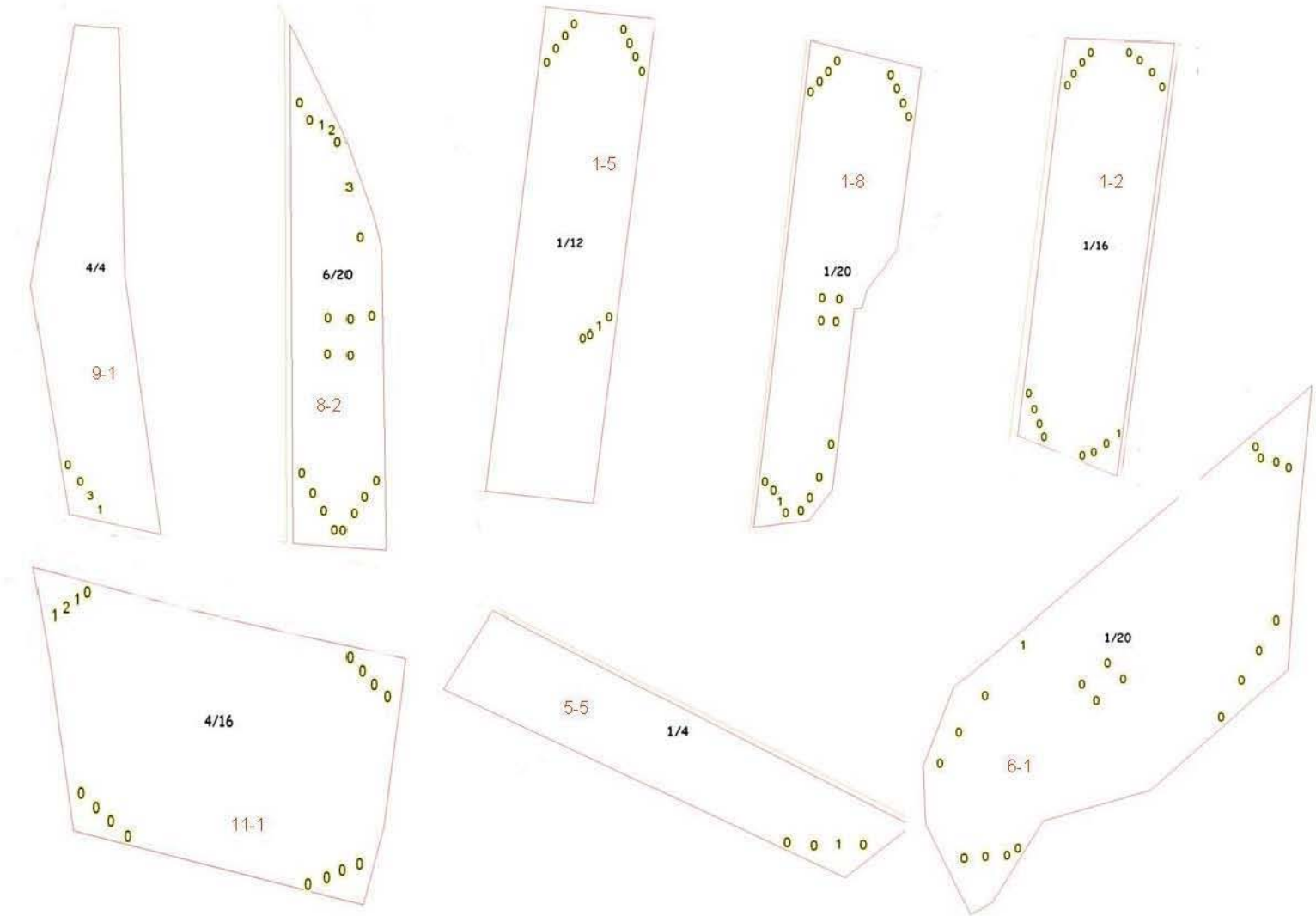
BSES Sugarcane for the future

maps mackay area productivity services

Australian Government Sugar Research and Development Corporation

A Vassallo 3071A

Greyback canegrub status 2008-greyback grub distribution in each infested block.



Andrew Vassallo 3071A

Grower implementation of recommendations

2008

Plant crop recommendations

Generally, treatment recommendations were not made for plant blocks as growers indicated at the outset that they were unlikely to risk not treating plant cane, particularly in 2008 with the need to increase planting of smut-resistant varieties. However, specific recommendations for not treating plant blocks were made for the following farms:

- 1285A. Treatment was not recommended for several fields in the northern part of the farm where grubs tend to be less of a problem, with the option to then monitor the plant crop in 2009 and treat after harvest if necessary. However, these fields did receive suSCon Blue.
- 3065A. Grub pressure was predicted to be low in 2009, and block 15-1 on heavier soil was not treated as per recommendation.
- 3083A. Block 3-1 was left untreated as per recommendation (heavy soil, no grubs in adjacent field in 2008); this was the first field not planted with suSCon in recent history of the farm.

Ratoon crop recommendations

Recommendations were made for all ratoon crops, based on risk assessed from results of grub counts in the actual fields or other fields on the farm together with observations of damage farm-wide, and with consideration of ratoon age and likely return on treatment.

- 1285A. Farm was assessed as low-risk for 2009; no ratoon treatment was recommended or applied.
- 3064A. Farm was fully protected in 2007; protection would have expired by 2009 but farm was judged low risk. Treatment was recommended for Block 1-2, a first ratoon which was not treated at planting and which had a light infestation in 2008, but this operation was left until late in the year and it became too wet to get onto the field.
- 3065A. Farm was assessed as low-risk for 2009; no ratoon treatment was recommended or applied.
- 3066A. Farm was assessed as mostly low-risk for 2009, although a few grubs were found in old ratoons that were judged not worth protecting; no ratoon treatment was recommended or applied.
- 3066C. Treatment was recommended for several fields near to a block (19-1) that had moderate grub damage in 2008; however this operation was left until late in the year and it became too wet to get onto the fields.
- 3068A. Some infestation pressure was expected in 2009. Two ratoon fields were recommended for treatment but this operation was left until late in the year and it became too wet to get onto the fields.
- 3071A. Some infestation pressure was expected on this farm in 2009 except perhaps for the far western side. Two third-ratoon fields were recommended for treatment due to low-moderate risk, but this operation was left until late in the year and it became too wet to get onto the fields.
- 3075A. Some infestation pressure was expected in 2009. Treatment was recommended for seven fields, of which four were wholly or partially treated by the grower. The other three fields were judged by the grower as low-risk or were scheduled for ploughout in 2009 and so were not treated. Ten fields for which treatment was <u>not</u> recommended were wholly or partially treated by the grower.
- 3083A. Minimal infestation pressure was expected in 2009; no ratoon treatment was recommended or applied.
- 3110A. Grubs were found in numerous fields in 2008 and light-moderate damage was seen before harvest. These observations indicated considerable grub pressure across most of the farm

in 2009 except in the northern blocks on the western boundary, with the potential for serious grub damage in coming years. Two damaged blocks were recommended for ploughout in 2008 but were allowed to ratoon, the grower instead opting to remove blocks containing the smut-susceptible variety Q157. Insecticide treatment was recommended for another five ratoon blocks but only one was treated, with the grower relying on cross-protection from adjacent treated fields or judging that protection would not generate an economic return.

Overview

Treatment recommendations in 2008 were frequently not implemented, particularly in ratoon crops. This occurred for several reasons:

- The urgent need to replace smut-susceptible varieties means that some fields that should have been ploughed out due to grub damage were left in, so that growers could remove smut-susceptible fields. Also, some blocks assessed as having a moderate-high risk of grubs in 2009 were not treated because they contained smut-susceptible varieties. This was a problem for a monitoring program that will disappear over time.
- Wet weather precluded treatment of some fields. This could be overcome by growers placing a higher priority on grub management, and by BSES supplying recommendations to growers earlier in the year.
- Grub-management philosophy differed between BSES and some growers. In particular, the grower on farm 3075A adopts a very active program of grub treatment in both plant crops and ratoons. His belief is that fields with visible damage must be treated, while fields with no visible damage do not need treatment (regardless of grub counts) because it will be at least two years before infestations develop sufficiently to cause economic damage. This strategy resulted in different decisions from the BSES monitoring program. In contrast, ratoon treatment has not been widely practiced by several of the other Group members in previous years, and this is probably reflected in the low frequency of ratoon treatment on these farms in 2008.

2009

Plant crop recommendations

As noted for 2008, specific recommendations were usually not made for plant crops, as the default position for growers in the Group is to treat plant crops. However, alternative recommendations were as follows:

- 1285A. Treatment was not recommended for blocks 19 and 20 in the northern part of the farm where grubs tend to be less of a problem, with the option to then monitor the plant crop in 2010 and treat after harvest if necessary. These fields did receive suSCon Maxi, as the grower has a strategy of having all plant crops treated.
- 3066A. Treatment was not recommended for 1-1, as it is on heavy soil and was not infested in the old ratoon; this block was not treated.
- 3083A. Treatment was not recommended for block 6-1 as it was distant from existing infestations and had no grubs in the old ratoon before ploughout; however it was treated because it has lighter soil and the grower did not want to risk grub damage.

Ratoon crop recommendations

- 1285A. Farm was assessed as low-risk for 2010; no ratoon treatment was recommended or applied in 2009.
- 3064A. Farm was assessed as low-risk for 2010; no ratoon treatment was recommended or applied in 2009.

- 3065A. Treatment was recommended for four ratoon blocks but only one was treated, 6-2. The other three – 5-1, 5-2 and 5-3 – were scheduled for future ploughout.
- 3066A. Farm was assessed as low-risk for 2010; no ratoon treatment was recommended or applied in 2009.
- 3066C. Block 20-1 was recommended for treatment but was not – cane was cut early and was too large when time and applicator became available.
- 3068A. Farm was assessed as low- or moderate-risk for 2010; no ratoon treatment was recommended or applied in 2009.
- 3071A. Farm was assessed as low- or moderate-risk for 2010 and unprotected at-risk ratoons were old; no ratoon treatment was recommended or applied in 2009.
- 3075A. Only one block, 35-4, was recommended for treatment, and it was treated. However, another seven ratoon blocks not recommended for treatment were also treated.
- 3083A. Farm was assessed as low-risk for 2010; no ratoon treatment was recommended or applied in 2009.
- 3110A. This farm was judged as likely to have heavy infestation pressure and treatment was recommended for three ratoon blocks that were relatively young and predicted as high-risk. Two were treated while the third was ploughed out and fallowed.

Overview

Treatment recommendations in 2009 were mostly implemented, but this could have been partly because they were not very controversial. There was a general agreement that plant crops would be treated unless there was very good justification for not doing so. The risk of canegrubs was predicted to be low on most farms so many ratoon blocks were not recommended for treatment, which fitted in with the usual practice and inclination of most growers. The notable exception was farm 3075A, where the grower was unwilling to take what he saw as a risk at the current cane price.

Accuracy of predictions

2008 predictions

The accuracy of predictions made in 2008 was assessed in 2009 by sampling untreated fields

Regression model

The regression model gave a fair prediction of numbers of grubs per stool in 2009 in the 32 fields that were fully sampled in both years (Fig. 4). For perfect prediction, the slope of this line should be 1. In fact the slope was 1.2, which is not too bad, but the R^2 value of 0.43 means that there was a lot of unexplained variation in the data (only 43% explained by the regression).

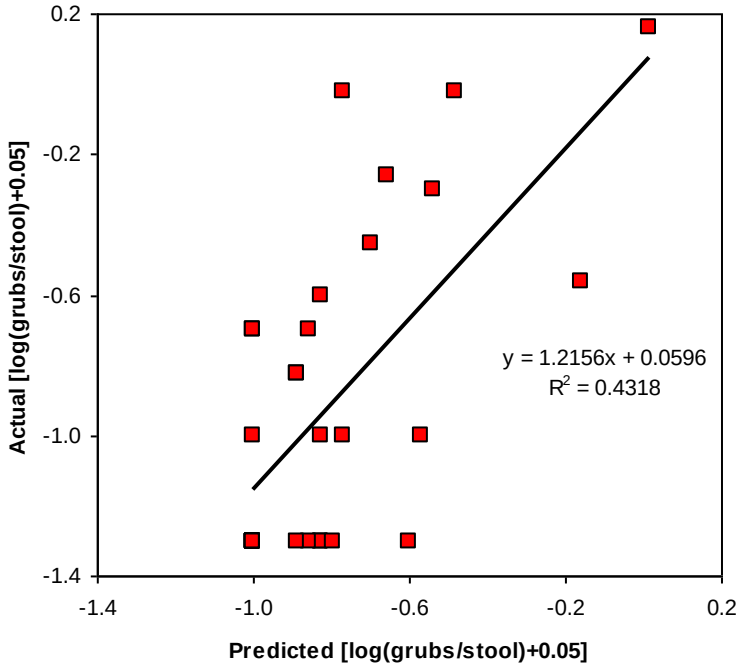


Figure 4 **Numbers of greyback canegrubs (log-transformed) in fields sampled in 2009 compared with predictions made for those fields based on sampling in 2008**

We also looked at how accurately the regression model predicted numbers of grubs falling into the low, moderate and high density categories that we used for the discriminant model. Of 30 fields predicted to be low density, 27 were low and three were moderate in 2009 (Table 4). Of two fields predicted to be moderate, one was moderate and one was low. No fields in 2009 were predicted to be high density and none were high in actuality. Therefore, these predictions were fairly sound.

Table 4 **Correspondence between numbers of fields predicted to fall into the density classes of low (<0.5 grubs/stool), moderate (0.5-2 grubs/stool) and high (>2 grubs/stool), using the regression model, and observed numbers in those classes in 2009**

Observed classes	**Predicted classes**		
	Low	**Moderate**	**High**
Low	**27**	1	0
Moderate	3	**1**	0
High	0	0	**0**
Total	30	2	0

Discriminant model

The discriminant function did a good job when fields were predicted as 'low risk'; all of those 22 fields did have a low number of grubs in 2009 (Table 5). However predictions of moderate- and high-risk fields tended to be conservative, i.e. numbers were lower than predicted in some fields, and it is noteworthy that the discriminant model gave more conservative predictions than the regression model (Table 5 compared with Table 4). Of the 11 fields predicted to be moderate by

the discriminant model, three were moderate and eight were low (Table 5). Of the five fields predicted to be high, two were moderate and three were low. This is probably not a bad thing, as it avoids unexpected damage and crop loss. Blocks 43-1 and 44-1 on farm 3075A were two fields where the risk was particularly overstated. The predicted high risk for these two blocks was based largely on what we judged as severe grub damage on a neighbour's property, and perhaps that damage was old or misidentified.

Table 5 Correspondence between numbers of fields predicted to fall into the density classes of low (<0.5 grubs/stool), moderate (0.5-2 grubs/stool) and high (>2 grubs/stool), using the discriminant model, and observed numbers in those classes in 2009

Observed classes	**Predicted classes**		
	Low	**Moderate**	**High**
Low	**22**	8	3
Moderate	0	**3**	2
High	0	0	**0**
Total	22	11	**5**

Damage in 2009 compared with treatment recommendations

No damage was seen on farms 1285A, 3064A, 3066A or 3071A in 2009. Observed damage on other farms and relationships to treatment recommendations in the damaged blocks are given in Table 6. Five fields had moderate or severe damage (Fig. 5) in 2009 and all of these had been recommended for either insecticide treatment or ploughout; these actions were not carried out in most cases (Table 6). Ten fields had mostly small patches of light damage and, of these, three had been recommended for insecticide treatment which was not implemented. The other seven were either not recommended for treatment because they were old ratoons (3110A block 21-1) or because they were predicted as low or low-moderate risk.

Thus some damage was seen in a small number of fields that had been recommended as 'no treatment needed', but the damage was only light and localised in all cases.

Table 6 Damage observed on Mt Kinchant Group farms in 2009 and treatment recommendations for those blocks the previous year

Farm	Damaged blocks in 2009	Sampled in 2008?	Recommended treatment in 2008
3065A	5-1, small patch light damage	No	Low risk, don't treat
	13-1, small patch light damage	Yes	Low risk, don't treat
3066C	19-1, small patch light damage	No	Treat (not done)
	20-3, small patch light damage	Yes	High risk, treat (not done)
3075A	9-2, many patches light damage	No	Nil
	35-1, small patch light damage	No	Nil
3083A	13-2, small patch light damage	Yes	Low risk, don't treat
3110A	1-1, patches light and moderate damage	Yes	High risk but old – ploughout (not done)
	3-1, patches light and moderate damage	Yes	Low-moderate risk, old crop – ploughout (not done)
	8-3, patch light damage	Yes	High risk, treat (not done)
	8-4, strips moderate damage	Yes	Moderate-high risk, treat (done in parts as trial)
	13-1, small patch light damage	Yes	Low-moderate risk, don't treat
	21-1, thin strip light damage	Yes	Moderate risk but old crop, don't treat
	23-1, large patch moderate damage	Yes	Moderate risk, treat (not done)
	23-6, extensive severe damage	Yes	Moderate risk, treat (not done)

Figure 5 Canegrub damage on farm 3110A, block 23-6, in 2009; this block was recommended for ratoon treatment in 2008 but was not treated

2009 predictions

Regression model

For the 38 fields fully sampled in both 2009 and 2010, the slope of the regression line between predicted and actual grub numbers in 2010 was 1.1 (Fig. 6), which is very close to the ideal value of

1. However, the R^2 of the regression was only 0.17, indicating that a very large amount of the variation in grub numbers (83%) in 2010 was not explained by the predictive model.

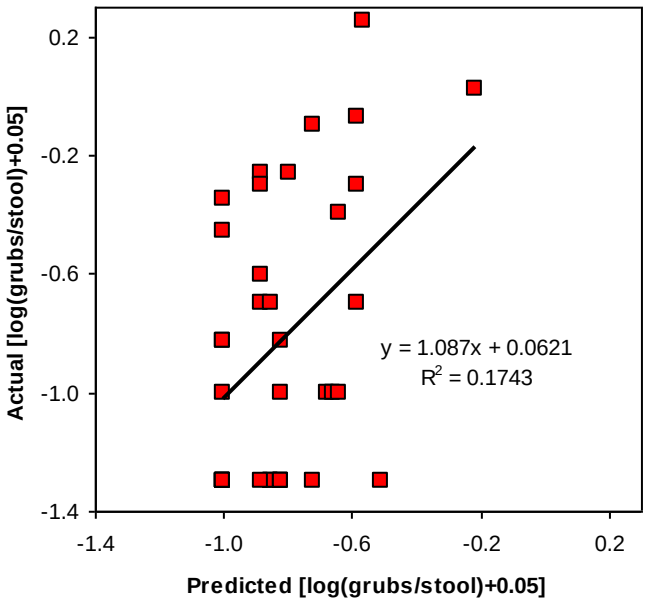


Figure 6 **Numbers of greyback canegrubs (log-transformed) in fields sampled in 2010 compared with predictions made for those fields based on sampling in 2009**

We grouped the predictions from the regression model into low-, moderate- and high-density classes, as we did for the 2008-2009 data series. Five of the 35 fields that were predicted to have a low density were estimated as moderate when sampled in 2010 (Table 7). The one field predicted to have a moderate density was moderate as predicted; no fields fell into the high-density category.

Table 7 **Correspondence between numbers of fields predicted to fall into the density classes of low (<0.5 grubs/stool), moderate (0.5-2 grubs/stool) and high (>2 grubs/stool), using the regression model, and observed numbers in those classes in 2010**

Observed classes	**Predicted classes**		
	Low	**Moderate**	**High**
Low	**30**	0	0
Moderate	5	**1**	0
High	0	0	**0**
Total	35	1	0

Discriminant model

As noted for the 2008-9 data series, the discriminant model gave more conservative predictions than the regression model: it predicted 12 fields to have a moderate density and two fields to have a high density (from 41 fields) compared with one and zero fields, respectively (from 36 fields) predicted by the regression model (Table 8 compared with Table 7). Of the 27 fields predicted to have a low

density, 24 were low and three were moderate in 2010 (Table 8). Of the 12 fields predicted to be moderate, four were moderate and eight were low. The two fields predicted to have a high density were low in 2010. Therefore predictions from the discriminant model were mostly conservative when compared with what was subsequently measured in each field.

Table 8 Correspondence between numbers of fields predicted to fall into the density classes of low (<0.5 grubs/stool), moderate (0.5-2 grubs/stool) and high (>2 grubs/stool), using the discriminant model, and observed numbers in those classes in 2010

Observed classes	Predicted classes		
	Low	**Moderate**	**High**
Low	**24**	8	2
Moderate	3	**4**	0
High	0	0	**0**
Total	27	12	2

Damage in 2010

No damage was seen on farms 1285A, 3064A, 3065A, 3066C, 3068A or 3083A in 2010. Three fields with light damage were found on other farms (Table 9). Of these, one had been predicted as a moderate risk (but treatment was not recommended due to the advanced age of ratoon) but the other two were predicted as low risk. In one field this was because suSCon Blue had been applied in 2008 and was expected to still be effective in 2010; apparently it was not. The only severe damage was on farm 3066A in block 6-1. There had been no serious nearby infestations the previous year to indicate a high risk to this field. However the damage was adjacent to the creek bank below a large cluster fig tree which may have aggregated beetles.

Table 9 Damage observed on Mt Kinchant Group farms in 2010 and treatment recommendations for those blocks the previous year

Farm	Damaged blocks in 2009	Sampled in 2009?	Recommended treatment in 2009
3066A	6-1, patch severe damage	No	Don't treat
3071A	8-2, extensive light damage	Yes	Don't treat (moderate risk but crop old)
3075A	8-1, small patch light damage	No	Don't treat (but Confidor was applied)
3110A	23-2, small patch light damage	No	Don't treat, suSCon Blue applied 2008

Summary

Numbers of greyback canegrubs were in broad agreement with predictions made the previous year. Canegrub damage was low on most farms throughout the project. There were a few cases of damage appearing in fields where it had not been predicted, but in almost all cases this damage was light and localised.

The two predictive models that were used sometimes gave different predictions for the same field: a discriminant model gave more conservative predictions than a regression model and also gave conservative predictions when compared with actual measurements. The results from both models were considered when assigning a risk value to each field and developing treatment

recommendations. The project used predictive models developed in BSS257. Dr Frank Drummond visited Australia in 2009 with assistance from SDRC (BSS327) and re-analysed monitoring data from 2003-7 with additional data from this project and from GGP029 at Mulgrave for the years 2008 and 2009. Those new models will be tested with monitoring data from 2009-2010 but there has not been time to do that within this project.

Cost of the monitoring and prediction service

The average time for a person to sample one stool for canegrubs was about 12 minutes (Table 10). This includes not just the time to physically dig out a stool and replant it but also travelling time between BSES and the farms, between fields within farms and between sampling points within fields, as well as time to meet the grower on arrival, identify and collect grubs, wash and sterilise shovels between farms, and take a rest when required.

The average cost to the Group for this sampling using the agreed payment formula, $90/hr for the team leader and $25/hr for each of three assistants, was $158/field (+GST), mostly for 20 holes per field.

Given the intensity of sampling in this project, the average cost per farm was $1100 (+GST) each year for an average of seven fields per farm. We concentrated on sampling high-priority fields – fields unprotected by insecticide which were intended for ratooning. We were unable to sample every such field in the time available. However, we believe we sampled sufficient fields to develop a good idea of the overall grub abundance across the farms each year, and we would have been able to detect a serious grub problem if one were developing.

Table 10 Time spent monitoring fields for canegrubs during 2008-2010 and estimated cost (+GST)

Year	Time (team-hours)	Charge[a] ($)	No. fields	No. holes	Time/hole (person-minutes)	Cost/ field ($)
2008	79	12994	79	1372	13.8	164
2009	74	12128	85	1616	10.9	143
2010	48	7846	47	951	12.1	167
Average					12.3	158

[a] For a four-person team, team leader $90/hr and each assistant $25/hr

Given the grub monitoring times and costs above, the estimated costs for a full canegrub monitoring and management consultancy service are given in Table 11. Times for grower consultations, one at the start of the year and one to deliver recommendations after the farm report is developed, and for a damage survey are based on actual times recorded in this project in 2008. The time for mapping and prediction is unknown. Electronic data entry was extremely time-consuming using the system available for this project and a stream-lined system would need to be developed for a commercial service to be economically viable. Report preparation once maps and predictions are developed is fairly quick and should take no more than 1 hour per farm. The total cost per farm is estimated at about $1,900 annually.

Table 11 Estimated times and costs for a commercial service to deliver grub management recommendations to one farm, assuming an average sampling intensity of seven fields and a consultancy charge of $90/hr (+GST)

Activity	Time (hours)	Cost ($) (+GST)
Consultation with growers	2.5	225
Ground survey: damage	2	180
Grub monitoring		1100
Mapping and prediction	Unknown, est. 3 hr	270
Report preparation	1	90
Total		1865

INTELLECTUAL PROPERTY AND CONFIDENTIALITY

Not applicable.

CAPACITY BUILDING

The Group has seen that canegrub management can be undertaken on a strategic basis rather than routinely treating plant crops with insecticide and allowing ratoons to take their chances. The project has allowed exchange of canegrub-management information among Group participants, and has also allowed the Group to achieve a close working relationship with BSES R&D staff. The project facilitated increased cooperation between industry R&D providers (BSES Limited, MAPS) to improve canegrub management.

OUTCOMES

Benefits are

- A pilot canegrub-management consultancy evaluated by growers and costed by the delivery agency (BSES Limited)
- Packages of canegrub-management information (infestation maps, farm summaries and treatment recommendations) developed by BSES and evaluated by growers
- Improved predictive models for canegrubs with input from BSS327
- Strategic application of insecticides
- Better capacity of Group participants to manage canegrubs
- Improved interaction and communication between growers and research providers (BSES, MAPS) with regard to canegrub management
- A possible district-wide early-warning system for canegrubs in the Mackay district (proposal to be prepared for the MAPS Board)

These align with the benefits indicated at project commencement.

ENVIRONMENTAL IMPACT

Strategic application of pesticides can reduce overall pesticide use by ensuring that such chemicals are used only when needed. Unnecessary cane loss can also be avoided by timely canegrub management, with reduced need for premature ploughout of fields and consequent inputs.

COMMUNICATION AND ADOPTION OF OUTPUTS

Information on the project was presented by Peter Samson (BSES) to industry advisors and cell group leaders at the Mackay Trial Information Day in April 2009 and again to advisors in November 2009.

An article outlining the project from the perspectives of both the grower participants and of BSES was published in the Mackay Canegrowers Newsletter in February 2010 (attached). The contribution of SRDC was acknowledged in that article.

Paul Vassallo and Peter Samson met with members of the Isis Grower Grub Group in Mackay on 17 February 2010 to discuss that Group's new project (GGP056) and pass on learnings from the Mt Kinchant project.

RECOMMENDATIONS

A regional monitoring program would serve as an early-warning system for the district as well as an aid for growers to make decisions on their farms. The MAPS Board has requested that BSES put forward a proposal for such a program to be implemented at Mackay. A proposal will be prepared during 2010. This will include the development of a grub-sampling scheme appropriate for estimating grub densities at the district rather than the field level, and which will therefore likely require fewer than the 20 stools per field that were sampled in this project.

Uptake of consultancy-based monitoring systems by individual growers will need to be on a user-pays basis and will be driven by demand. The procedure for developing grub maps for individual farms and developing predictions for individual fields would need to be streamlined to make such a service economical.

The predictive models used in this project still leave a large amount of unexplained variation in grub numbers. Predictions might be improved by better knowledge of:

- beetle movement, including movement distance, attraction to fields and the relationship between grub infestations and beetle feeding and roosting trees
- the suitability of different soil types for canegrub establishment, both between and within fields
- effect of climatic conditions on rates of population increase

Predictions could also be improved by more efficient methods for detecting grub infestations, e.g. by remote sensing.

PUBLICATIONS

Anon. 2010. Prediction of greyback canegrub damage could help lift yield. *Mackay Canegrowers Newsletter*, 11 February 2010.

Sallam MN and Samson P. 2007. Grub monitoring continues in the central district and in the far north. *BSES Bulletin* 15, 27.

Mackay Newsletter

CANEGROWERS

Mackay Canegrowers Limited ABN 24 111 817 559 Registered by Australia Post Publication No PP440348/003 11 February, 2010

Prediction of greyback canegrub damage could help lift yield

SRDC/BSES funded research project for Mt Kinchant Grower Group

One of the hidden enemies to the yield of sugar cane is the greyback canegrub.

Despite some research having been done, there is still not enough predictive information on where, when and to what extent crop damage will occur from this destructive cane root predator.

The problem was discussed at a BSES shed meeting in the Brightly area in 2007 at which a number of growers indicated their need for more information and from this a public meeting was called to garner other growers' interest in the subject.

At that meeting growers agreed to form the Mt Kinchant Grower Group to investigate, monitor and hopefully gain more information about the life cycle of the grub as well as some insight into predicting when and where growers could expect infestations.

The Mt Kinchant Grower Group is: Chairman Paul Vassallo, Secretary Andrew Vassallo and members Charles Vassallo, Mark Craig, Joe Muscat, Eddie Pace, John Walker, Fritz Attard and Julian Vassallo.

BSES Principal Entomologist Peter Samson and Research Technician Allen Eaton are working on the project while SRDC liaison is Joe Muscat.

Identifying the problem

"The Brightly area had severe infestations of canegrubs in 2004/05/06 and I noticed we lost about 20 per cent of our yield each year," Paul Vassallo said.

"We also noticed dead areas of cane in different blocks after harvest, indicating the grub's presence, but there was no rhyme or reason to its appearance.

"In some of the blocks, lines of cane were dead and in others it was in large circle areas.

"The grubs feed on the roots of the cane and eventually the cane falls over which makes it harder to harvest, and since it has stopped growing, it affects productivity and PRS.

"Previously we had no way of telling how bad the problem was, so we had to decide whether to treat all the plant and ratoon cane each year, or just some of it.

"It's a fairly expensive exercise to treat all the cane every year and although there are several products available to use, it's the time and cost involved that is prohibitive.

"When cane prices are low, as they have been for several years, you don't want to treat for grubs if you don't have to, but we had no definitive way of knowing whether we needed to treat or not."

Funding application

The group put together an application for funding from SRDC to make a predictive model for the monitoring and management of canegrubs in the Mackay region and was successful in receiving $80,000 over three years.

"The project has cost more than that, but of course we are all putting in our time and expertise as well as land set aside for trial blocks," Paul said.

"The group contracted for an aerial survey with photos of the approximately 1,120ha involved, but it was difficult to tell from the air whether the cane was just waterlogged or affected by canegrubs or vine patches.

The greyback canegrub could be digesting your profits.

Paul Vassallo digs at the cane roots to assess grub damage

"Peter Samson and Allen Eaton have done the technical work of scouting grub numbers and in trying to break the life cycle by interrupting it at the appropriate time, but as yet we haven't been able to identify the right time.

"It is my feeling we are creating a 'nursery' for the grubs under the cane trash blanket.

"The adult beetles mate in the trees then lay their eggs under the trash and the baby grubs eat the cane roots after they hatch.

"We need to break the cycle at either the mating or hatching stage to control the grubs."

Group secretary Andrew Vassallo said the research had followed the plan and he felt the group had a better understanding of the problem.

"But more trial work is needed," Andrew said.

"For instance, we need to identify the beetle's preferred trees.

"We've noticed the adult beetles attack fig and palm trees and will almost eat all the leaves off, so we need to find a way of monitoring that and identifying why certain trees attract the beetles.

"But our main focus has to be in identifying where they will attack, what attracts them, is it the wind that blows them into the area, or is it that they have been there before?

"We need to answer these questions before we can develop a really effective predictive strategy."

Andrew said the project had an unexpected benefit in encouraging farmers to talk to each other and network a lot more.

"The project funding will run until June this year with the final report due soon after," he said.

"But the networking will continue long after the project I'm sure."

Paul Vassallo shows the adult beetle which can cause a big drop in yield in both plant and ratoon cane.

Investigating canegrub infestation across the state

Growers have a range of products they can now use for control of greyback canegrub, the most important canegrub species in central and northern Queensland.

"Because all grub control products are expensive, it is important growers are able to target the fields that really need treatment, to avoid wasting chemicals on low-risk fields," said BSES Principal Entomologist Dr Peter Samson.

"At the same time, it is important that fields which are at risk of grub attack do get treated, to avoid unnecessary grub damage and crop loss."

Peter said there is no standard method which allows growers to determine the risk of grub attack and target treatments accordingly.

"We wanted to develop a system that would help growers decide which fields should be treated for canegrubs from year-to-year, where to invest time and money for the best return," Peter said.

Continued page 2

Mt Kinchant Grower project

(Continued from Page 1)

"To develop this system, BSES, with partial funding from the Sugar Research and Development Corporation (SRDC), conducted surveys of greyback canegrubs in canefields from Plane Creek to Mulgrave from 2003-2007, with the aim of determining what things could be measured and used as predictors of grub numbers the following year".

Dr Samson said previous infestation was the most important factor which determined where new infestations developed the following year.

Predictors which should be measured included canegrub numbers in some fields, health of the canegrub population (amount of disease) and grub damage in the current year across each farm.

"From these measurements, we developed statistical models that predicted numbers of greyback canegrubs one year ahead," Dr Samson said.

"In order to take this system further, SRDC funded two grower groups to test the validity of these models and assess their usefulness to growers," he said.

"One group is at Mount Kinchant near Mackay while there is a second group at Mulgrave in north Queensland.

"These groups started in 2007 and finish this year. However a new group will be starting this year in the Herbert."

Mt Kinchant project

For the 10 farms that make up the Mt Kinchant group, each year BSES staff have:

1. Sampled some fields on each farm for canegrubs during April-May, by digging 20 cane stools from each field.
2. Assessed grub damage in May-June by aerial photography and ground inspection.
3. Investigated gappy ratoons after harvest to see if canegrub damage is the cause.
4. Reared some grubs to measure how many died from various diseases.

"From these measurements and observations and with the assistance of AgriServ Central staff, maps have been produced each year showing the locations of canegrub damage and canegrub populations," Dr Samson said.

BSES developed a diagnosis and plan for each farm, giving the current canegrub status and treatment recommendations for individual fields.

Canegrub distribution maps and treatment recommendations were given to each of the Mt Kinchant growers in 2008 and 2009.

Prediction accuracy

Grub sampling in 2009 provided an opportunity for BSES to test the accuracy of the predictions that had been made in 2008.

According to Dr Samson, "All fields that had been predicted to have a low risk of grub attack did in fact have few grubs, justifying the recommendation of 'Don't treat'."

"And fields that had been predicted to have a moderate or high risk of grub attack mostly had more grubs than the low-risk fields."

"However, some fields predicted as high-risk did not have as many grubs as predicted, so recommendations to apply treatments were generally conservative; that is, treatment was sometimes recommended for fields that did not get attacked.

"But this is better than the reverse situation, where unexpected damage might occur."

The predictive models have been revised slightly this year with input from visiting scientist Dr Frank Drummond from Maine in the USA.

Research Technician Allen Eaton shows canegrub damage to the cane roots. Allen has led most of the field work on the Mt Kinchant project.

Dr Drummond spoke with group members late in 2009 and re-analysed the monitoring data.

Dr Samson notes that canegrub sampling this year will be another opportunity to test the predictions that had been made in 2009.

"Costs and benefits of the monitoring program will be assessed when the project concludes this year."

Peter Samson with equipment used for applying insecticides in canegrub trials.

Geoff's tips...

Did you know...

CGU will pay up to $5,000 if your Credit Card has been misused after it have been lost or stolen, or if it is fraudulently used on the internet.

For any Insurance related advice do not hesitate to contact Geoff.

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DATE CLAIMER

What: CANEGROWERS Fair Work Education and Information Seminar, 2010.
Who: For all Mackay/ Plane Creek cane growers, harvesting contractors, employees and others.
Where: Western Suburbs Leagues Club, Branscombe Drive, Walkerston,
When: /8.30am – 11.30am, Wednesday 24 March, 2010.
RSVP: Mackay office, 4944 2600 by 17 March.

Cane growers identify grain legume pest knowledge gap

An increasing number of cane farmers who are now growing summer crop grain legumes such as mungbeans and soybeans in sugar cane crop rotations are keen to learn more about Integrated Pest Management (IPM).

Queensland Primary Industries and Fisheries farm management systems officer Raylene Hansen said 15 growers attended a pre-season roadshow at Mackay last November coordinated by QPIF with support from the Australian Mungbean Association and Soy Australia.

To take these legume crops through to a profitable grain harvest, which is an added bonus for coastal canegrowers, insect monitoring and control has emerged as a management issue.

Ms Hansen said now was the time of year when growers were considering growing dryland or irrigated mungbeans or irrigated soybeans in the fallow phase of their sugar cane production system.

QPIF entomologist Hugh Brier, Kingaroy, said there was positive feedback from the growers who were keen to learn more about IPM and were seeking more direct contact with research and extension officers.

Oakenden district canegrower Joe Muscat said the workshop had given him the basic guidelines to help monitor legume crops for insect control.

Mr Muscat was also appreciative of the grains industry overview and marketing options presented by Denis M'Gee, SOYAustralia development and commercialisation manager, Newcastle and Pat McKey, manager of Bettacrop Pty Ltd, Emerald.

Local agricultural consultant Dave McCallum, new farming systems coordinator at Agriserv Central, said it was pleasing to see growers looking to the future to make the transition from growing green manure crops to producing soybean grain.

"IPM training is essential to enable growers to positively identify insects in their crops and be able to monitor pest populations for potential economic impacts on yield," Mr McCallum said.

Mt Vince grower Rodney Lamb with his soybean crop. Photo courtesy of DEEDI/QPIF

QPIF Mackay-based senior agronomist for FutureCane, John Hughes, said central region sugarcane growers now recognised the importance of integrating a legume crop into the fallow phase irrespective of the price of sugar.

"Interrupting soil borne disease cycles, soil health issues and reducing nitrogenous fertiliser inputs into subsequent plant cane remain good reasons to use legumes to boost the sustainability of the overall cropping system," Mr Hughes said.

The team of summer crop legume industry experts also took their summer crop roadshow presentation to grower meetings at Emerald and Moura on November 18.

** For more information on grain legume crops, visit the QPIF website at www.dpi.qld.gov.au or call the Business Information Centre on 13 25 23.*

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Grub monitoring continues in the Central district and in the Far North

> Mohamed Sallam and Peter Samson

Growers and researchers are working hand-in-hand in a BSES/SRDC initiative to implement the results of research into greyback canegrub management on their farms. Two grower groups funded by SRDC Grower Group Innovation Projects have been formed in the Central district and Mulgrave, with the aim of conducting thorough greyback canegrub monitoring at a district or farm level.

Every year, growers with properties prone to canegrub attack are faced with a tough choice: to treat or not to treat? If greyback beetles fly to an unprotected paddock then the grower may lose that crop. However, treatment of a paddock that was unlikely to be invaded by beetles results in an expense that the grower could have avoided. With sugar prices fluctuating and the cost of production always rising, growers need to make correct decisions that will save both their money and their crops.

Short of treating every paddock every year, there is always an element of risk when making treatment decisions. The aim of this latest research is to minimise the chances of getting it wrong.

Well-informed decisions require several things:

- information on the current canegrub status at district and farm level;
- a system to use that information for predicting the likely status of canegrubs in individual fields next year;
- an economic analysis to determine whether the likely benefits of treating a particular field will justify the cost of insecticide.

BSES has been monitoring greyback canegrubs in selected canefields in central and northern Queensland each year since 2003, as part of the GrubPlan initiative. We now have a large dataset on the history of canegrub damage and treatment, field location, harvest dates, levels of canegrub pathogens, and canegrub population trends. Patterns have emerged that can help predict the likelihood of canegrub infestations next year, based on recent history and on factors that can be measured in the current year; for example, whether or not canegrubs are currently present in the field and whether there is any damage this year in nearby fields.

The Grower Group projects follow on from the GrubPlan program, which established a good, solid base of cooperation between researchers, growers and productivity service staff. Results from the GrubPlan work will now be put to the test. This exercise will see greater grower involvement in the work, as they must ultimately be the ones to implement research recommendations if that research is to benefit the industry.

In Mulgrave, the canegrub monitoring work will continue on about 25 farms and on selected paddocks within these farms. A picture will then emerge on canegrub damage dynamics between and within farms. The information accumulated since 2003 will help to assess whether the risk of canegrub attack is likely to be more or less in the coming year.

Near Mackay, the 10 members of the Mount Kinchant Growers Group will work together to combat their common canegrub problem. They will employ a consultant to help them monitor and develop canegrub management plans. The group members will then test the recommendations by implementing them on their farms. Records will be kept of the costs and benefits of the monitoring: the time spent, the amount of insecticide used and estimated canegrub losses. Ultimately, the growers want to determine if this pro-active and flexible type of canegrub management is a worthwhile investment.

The only way an entire district can reduce canegrub damage is to follow a regional approach to monitoring and managing the problem. With a thorough monitoring program in place, growers are learning to judge the canegrub population trends so that they can ready themselves to tackle problems before they get out of hand.

BSES QCROPS
Growing your bottom line

A survey of the following questions was put to growers and below are there comments.

1. Did the grub monitoring and advisory program (the canegrub 'consultancy') change any of your grub management decisions? If yes, how? If not, why not?
2. Did the consultancy save you any money due to reduction in grub treatment or reduction in cane loss due to grubs? If yes, how much?
3. Did the consultancy have any other benefits, eg 'peace of mind' from knowing grub status across the farm?
4. Did group membership and the group process have any benefits to you, separate from the BSES consultancy?
5. How could a canegrub management consultancy be improved over what was offered within this project?
6. BSES has estimated the cost of a continuing monitoring and consultancy service as approximately $2,000 per farm per year, for
   - monitoring seven fields on the farm
   - developing maps showing currently active insecticide treatments, grub numbers in the sampled fields and visible damage
   - producing treatment recommendations and discussing with each grower.

   If such a service were offered, would you be willing to subscribe?
7. Any other comments?

Mark Craig

1 Yes another tool to make decisions still waiting to see how a field goes without treatment
2 Yes 5 ha suscon maxi
3 Grub movement still unknown still a bit of a risk not treating plant cane
4 Good to talk with other growers about their problems with grubs
5 Peter has done a great job, but the movement of grubs on our farm has been hard to track. We need to know how far they move and why.
6 Farmers with no experience with canegrubs would benefit from the consultancy. I would not pay for the service as it is still too big a risk not to treat plant cane once you know their in your area. As for growers that are not sure if grubs are moving into their area, the consultancy would be a good idea but I am not sure that they would they pay for it.

John Walker

1. Yes. It made me more aware of the problem.
2. Yes – lots.
3. Yes - their constant monitoring and my checking also enforced that the chemical I used was working.
4. Yes - Knowing the extent of the grub damage in our local area.
5. A project such as this needs to be done over a full crop cycle to assess the benefits.
6. Yes.
7. Extend the work already done over the current crop cycle so treatment applications can be monitored and adjusted where necessary.

Joe Muscat

Q1 Yes, one block which had no grub numbers or signs of any damage in the past.
Q2 Yes this block in (Q1) has a total of (7 ha) so that's a saving of approx $2800.
Q3 Knowing what is in the paddocks in grub numbers is beneficial.
Q4 Yes comparing grub numbers to those who have not treated and knowing that what I have been doing has been the only safe way and being open about what we do on our properties in a group.
Q5 Hard to answer but the only way to know is by doing grub counts on the blocks.

Q6 This would be only helpful to those growers that are reluctant to treat.

Eddie Pace

Due to the amount of grub pressure in the Mackay region, I have decided to continue to plant with grub control, regardless of the information that has been provided to me through Mount Kinchant Grub Group. However the consultant did give me a better indication on grub numbers in plant and ratoon crops on the farm. I have found our meetings to be a good avenue to learn about other farmer's ideas and solutions on grub protection. In regards to the $2000 cost per farm per year for consultancy I would rather put those funds towards a product for planting.

Fritz Attard

You asked for my thoughts on the grub monitoring program. The grub monitoring and advisory program did not change any of my grub management decisions. Grub infestation remained the same, therefore treatment cost remained the same. I would not subscribe to continued monitoring and consulting service as I am on the lookout continuously and carry out treatment where necessary. I think that the $2000 for monitoring and consultancy is just adding to the cost of the grub control.

Andrew Vassallo

1. The grub monitoring did not change any of my management decisions. Although the decisions from the consultancy program were to treat all plant cane anyhow.
2. The consultancy did not save me any money as the recommendation was to treat all plant cane.
3. I think knowing the grub status numbers across your farm is beneficial as down the track the more information we have the better the decision making and we can determine grub pressure if it is on the rise or decline.
4. The benefits to the group I believe apart from the consultancy were the regular networking opportunities amongst the group. We discussed a lot of matters related to grubs and some farming matters that everyone one was experiencing which was good.
5. Could the consultancy be improved? I don't think so, not with the information available at present. Maybe in the future with better technology predictions could be more precise. Information such as flight paths of the beetles, historical data and how beetles and grubs react to different weather patterns.
6. Probably not, even if the fee was less, as I feel it is a huge gamble not to treat. At present prices it cost $360 per hectare to treat and that cost is spread over two years, possibly three. So even over two years, at $180 per hectare, at current cane prices it is equivalent to approximately 4 to 5 tonne of cane. The problem with treating for cane grub is that you treat in say October for what could happen in May or June and when you notice infestation the damage has been done.

Paul Vassallo

Q 1: Yes it has. I treat plant cane with confidence, which over the last two years, tonnes have increased.
Q 2: No, but grub treatment has put money in the bank by increasing tonnes (500-1400 tonnes per year).
Q 3: Yes, peace of mind, sharing other farming information at meeting. Groups have different farming practices, also groups have different treatment programs.
Q 4: As in Q 3.
Q 5: Improvements? Ability to change membership of growers, as grubs move from area to area, up and down geographical valleys etc.
Q 6: If sugar price is maintained over $450.00/tonne, yes I am willing to subscribe.
Q 7: I believe satellite imagery is the key to a "Predictive" model, but more research is needed.