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QUEENSLAND, AUSTRALIA**

**FINAL REPORT - SRDC PROJECT BSS225
ENHANCED ADOPTION OF INTEGRATED PEST
MANAGEMENT IN SUGARCANE**

by

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ABSTRACT

The project focused on changing the way BSES engages clients in dealing with pest management issues, using the concept of participatory action-learning. Thirty-two small groups of canegrowers were formed around eight pest types. In addition, three major extension campaigns were delivered on the sugar industry's two most damaging pests, greyback canegrubs and cane rats. A roadshow integrated pest management (IPM) program on rats that was run in central and northern areas in 1999 contacted 480 growers. The wider-reaching initiative *Rat Attack* trained 2,700 growers in a program to raise awareness and understanding of rodent IPM in late 2000. The greyback canegrub program *GrubPlan* trained 906 growers and rural industry staff through 70 IPM workshops in late 2001. Training was an interactive process based on developing understanding and skills, leading to a change in practices. Results have been rewarding. Following the rat programs, damage to cane was reduced by around 21% (98,000 t) in 2000 and 58% (273,000 t) in 2001, in comparison with 1999. The *GrubPlan* program is also reaping dividends with around 60% of growers implementing 80% or more of the management plans they developed in the series. Visible damage to cane from greyback has subsequently declined, which will be confirmed by estimates of crop losses at the end of 2002. The project has been able to mitigate pest impact through achieving learnings with clients. It has also assisted extension and research staff to operate more effectively using good meeting process and extension planning, and has served to standardise IPM programs in industry.

SUMMARY

The management of pests in Queensland sugarcane has been heavily reliant upon use of pesticides to control outbreaks. These products did not eliminate the problem pests. In fact, one of their legacies was to suppress research into pest ecology and alternative methods of pest management. These chemical control methods, which included thallium sulphate against rats and the use of organochlorines such as dieldrin (soldier fly) and BHC and heptachlor (canegrubs), lulled the industry into a false sense of security. On the cessation of use and deregistration of these pesticides, there was the need to undertake research into new management strategies and then train both industry extension staff and growers in how integrated pest management (IPM) strategies could be used on specific pests.

This project targeted IPM program development and delivery against priority pests that had proved difficult to manage: greyback canegrubs, cane rats, feral pigs, canegrubs in southern Queensland (especially Childers canegrubs), soldier flies and armyworms.

The project was as focused on process as it was on developing and packaging IPM programs. The industry extension paradigm of 'one-to-one' extension using the traditional 'technology-transfer' extension model was being seen by some industry personnel as being too labour intensive and failing to deliver effective change in pest management. There was a considerable range of IPM tools being developed by research and development organisations, but grower understanding of what they were and how they could be combined and applied to affect change was not being realised.

A fact-finding mission at the beginning of the project showed a similar story in numerous other rural industries around Australia. This mission was undertaken to consult other industries about their methods for facilitating change towards IPM practices, and to determine what processes were successful and what impediments had been encountered. It was invaluable in recognising where and how maximum gains in IPM implementation could be realised, and helped BSES avoid some of the pitfalls that had befallen agencies of change in other industries.

Contemporary extension methodologies involving participatory small-group activities and structured workshopping programs were seen as the more effective means to facilitate changes in practices. Other factors also influenced the rate of grower change, particularly the need or urgency of the problem at hand, the existence of a tangible IPM program, and the process whereby industry staff were engaged and motivated to participate in the program.

Following the fact-finding mission, the project commenced to raise grower groups where there was a defined pest problem. The aim was to target localities where there was a likely need or motivation for action against a pest. A total of 32 groups had been formed by the closing stages of this project. Many of these have been successful and are ongoing, with participants exhibiting a high level of learning and application of IPM techniques in their farming operations. Six of these groups were failures, largely because of a lack of motivation to act against the pest; growers and local BSES and Cane Protection and Productivity Board (CPPB) staff did not see these issues as priorities. Also, there was a lack of grower confidence in the IPM programs being extended for certain pests (eg

soldier fly). Some of the other groups set up under the project exist now in a different form, having been absorbed into mill-area group extension programs.

Two significant pest crises struck the Queensland sugar industry during the project, cane rats in 1999 and 2000 and greyback canegrubs in 2000 and 2001. The rodent impact saw losses of over 850,000 t of sugarcane in the 1999 and 2000 crops. Greyback canegrubs inflicted over 1,000,000 t of cane losses in two seasons. These events, catastrophic to many individual growers and districts, provided the need and urgency for growers to act. IPM programs were developed for each pest and delivered on a broad scale across the affected central and northern districts. Collectively, the programs engaged over 4,000 grower participants. Results of both initiatives have been rewarding. Following the rat programs, cane loss was reduced by 21% (98,000 t) in 2000 and 58% (273,000 t) in 2001, in comparison with 1999. The *GrubPlan* program is also reaping dividends, with around 60% of growers implementing 80% or more of the management plans they developed in the series. Visual damage estimates indicate a decline in damage according to the majority of participants, which will be confirmed by estimates of crop loss after harvest in 2002.

This project demonstrated to industry extension and research staff the benefits of working with, and learning from, small groups of growers. The concept of working with small groups in an interactive, participatory manner has become so popular that numerous millers have engaged BSES to further develop this approach to deliver more rapid productivity advancements. The IPM coordinator Warren Hunt has become a specialist trainer in the field of workshop process and group facilitation, having trained 69 industry staff from BSES, CPPBs and mills in such processes. This project has also improved the understanding among change agents of the need to evaluate the outcomes of their programs.

1.0 BACKGROUND

Cane farmers, and the sugar industry generally, have become accustomed to 'quick-fix' solutions to pest problems. This approach is unsustainable for several reasons that are listed below.

- Many of the past pesticide options no longer exist, banned principally for their residual nature that had the potential for adverse environmental effects.
- Pesticides now registered in industry are less residual, more expensive and need better management skills to use effectively.
- The Australian sugar industry shares a close geographical location with urban and rural residents and with ecologically sensitive areas of world heritage significance. Unrestrained and poorly planned pesticide use can cause angst amongst the general population and draw damaging criticism to the industry. The industry also has a duty of care to assure that the public is not at risk from farmers' management practices.
- The Australian sugar industry is experiencing declining terms of trade. Cost-effective pest management programs are required to ensure that a critical mass of producers can remain viable in the industry.

To minimise losses caused by key sugarcane pests, it will be essential to adopt an integrated pest management (IPM) approach. IPM means the judicious use and integration of various pest control tactics while complementing biological and other natural controls. The resulting IPM program will be much more sustainable than any single pest control tactic such as a pesticide alone. IPM is accepted as the best approach to pest control in most agricultural systems.

For farmers to adopt IPM, they need to understand it and believe in it. After decades of a culture of reliance on pesticides, many farmers are not convinced that other approaches will work.

This project was aimed at creating an environment where farmers were willing to combine proven techniques into integrated programs, and to help develop or validate new techniques.

2.0 OBJECTIVES

The aim of this project was to champion the concept of IPM in the sugar industry. This would be done by:

- 1) establishing and maintaining participatory networks of stakeholders (farmers, researchers, advisors, industry where relevant) to develop IPM for high priority pests (eg greyback canegrub, Childers canegrub, weevil borer, soldier fly and rodents);
- 2) implementing participatory activities similar to those currently (1998) in the Burdekin canegrub program at a number of other locations;

- 3) maintaining good communication among participants, and documenting and evaluating the process and outcomes of the program;
- 4) continuing to promote IPM through industry meetings, workshops, extension materials and the media.

3.0 ACHIEVEMENT OF OBJECTIVES

This project has been able to champion the concept of IPM in the sugar industry. The success of activities has been strongly influenced by the urgency and scale of the particular pest situation. Participatory groups have been developed and maintained quite easily for high priority pests but have experienced more difficulty in situations where the pest urgency has not been critical.

- Fourteen groups remain viable for ongoing work.
- Another eight may reactivate if new technologies or specific needs emerge.
- Four based on greyback canegrub have been incorporated under the *GrubPlan* program and local mill area initiatives.
- Six groups failed outright.

The work within the groups has mainly involved action-learning, but some groups have firmly participated in action-research activities. The culture of working in participatory groups still requires much development in the sugar industry, because clients come from a background requiring only passive engagement at meetings. Additionally, many BSES and CPPB staff are conditioned to provide a passive environment for clients.

Improved linkages have been achieved between researchers, mill bodies, local CPPBs and agri-political organisations as a result of this project. The existence of these participatory groups has also led to growers being better able to influence the direction in which industry should move with pressing pest issues, eg the cane rat crisis of 1999-2000. The position of IPM coordinator has provided the infrastructure to maintain communication between stakeholders, and to draw together resources to implement timely and targeted pest management extension and research activities.

Two significant IPM extension packages now exist as a direct result of the project, *The Rat Pack* for management of rodents in cane and *GrubPlan* for managing greyback canegrub. Over 2,700 growers were trained under the *Rat Attack* training program in 2000. Ongoing regional monitoring of rodents by CPPBs and BSES is now occurring as a result of BSS225. This has supported the emergency use permits (EUPs) for the rodenticides RATTOFF® and Racumin®, but will remain as a useful early-warning tool for the industry. The project facilitated the development of a central database, the *Rat Monitor*, set up on the BSES web-site for CPPBs and BSES to input monitoring data. The *GrubPlan* workshop series of 2001 trained over 900 growers and industry agency staff in risk management strategies to combat greyback canegrub. A *Southern GrubPlan* package aimed at improving overall management of major southern canegrub species is being developed for pilot testing and deployment in late 2002. Also near completion is a BSES web-site focused on IPM issues on major pests. These types of targeted, industry-wide pest management initiatives have never been undertaken previously in the sugar industry,

and are a direct result of the IPM coordinator's position. This position will be an ongoing BSES appointment.

4.0 METHODS

4.1 Developing participatory groups of growers

The typical methodology with groups was to:

- (a) identify a target area where there was a potential motivation for action on a pest;
- (b) work in concert with local BSES, CPPB and grower champions to establish a group of growers that had a concern with the pest;
- (c) limit group size to a maximum of 20 participants;
- (d) provide a safe learning environment for participants in terms of location and meeting process;
- (e) ensure that facilitation and resource roles were clearly defined among staff involved;
- (f) encourage and maintain interaction;
- (g) deliver latest information on the pest and its management;
- (h) benchmark the range of management strategies currently employed;
- (i) ask growers "What could be done differently in their management of their problem?";
- (j) develop a number of activities for future work to be carried out by group members. (These were usually demonstration activities related to items discussed in meetings.);
- (k) ensure that activities were owned and implemented by growers;
- (l) assess the value of the outcomes from those previous activities through group discussion;
- (m) provide updates on current advances or contribute ideas that other groups were using (from the facilitator or an invited specialist);
- (n) determine, once the group participants had progressed through a cycle of learning, whether they wished to continue in the process of meeting and learning on the issue.

This is a continuous improvement model, where people carry out and then evaluate actions to increase their learning through a structured and ongoing process.

4.2 Coordinating industry-wide IPM programs

The methodology used for coordinating industry-wide programs was to:

- (a) ascertain the extent of the problem and make a judgement on the motivation of growers to implement change;
- (b) make a decision on whether there was sufficient motivation and reward for other industry stakeholders (ie BSES, CANEGROWERS, ACFA, CPPBs and pesticide companies) to work together to achieve an outcome;
- (c) determine if there was an existing IPM package, or if one could be formulated to address the problem at the farm level;
- (d) organise a 'whole-of-industry' approach to the problem, if the answers to the first three points were positive, using an effective meeting process to gain consensus for action;

- (e) develop and finetune the IPM package including production of materials and pilot workshops to formulate process and content issues;
- (f) decide whether the aim was to raise awareness and understanding or to go further and change skills and practices on-farm. This determined the strategy employed, whether through large forums or small group extension and training. (Complex issues such as IPM are often better addressed in an interactive small-group environment.);
- (g) implement the program across industry using the joint advocacy of participating organisations;
- (h) evaluate the training program;
- (i) evaluate achievements in damage reduction following the next harvest season;
- (j) review the need for ongoing training or servicing in pest management planning, and implement ongoing program work if required.

4.3 Developing effective and timely media campaigns

Comprehensive media programs are necessary to support extension efforts by raising awareness of an issue. However, print and electronic media cannot always be relied upon to deliver understanding about a particular issue, because they often use short grabs of information and may not portray the entire story.

The following method was used to devise and employ media campaigns in BSS225:

- (a) identify the windows of opportunity for management of a pest according to its associated IPM program;
- (b) coordinate timing of media efforts into these periods;
- (c) consider which print and electronic media resources would be best suited for contacting and informing target growers;
- (d) decide on what needed to be achieved (eg increasing awareness and understanding of the IPM program, countering misinformation present in the target group, publicising upcoming training events);
- (e) use the mainstream electronic and print media for general awareness;
- (f) consider industry magazines to better explain a subject to develop understanding of an issue;
- (g) build linkages with media assets (ie industry organisation media officers, TV journalists, ABC Rural Radio journalists);
- (h) execute media program;
- (i) evaluate if the message had been conveyed.

4.4 Developing IPM extension materials

The methodology used was straightforward as outlined below.

- (a) Develop IPM extension materials on a targeted basis, and not just for the sake of generating pamphlets.
- (b) Design the training exercises to work with the extension material in a logical and sequential process.
- (c) Printed extension materials should be concise, technically informative, but presented in easy-to-read language and layout:
 - good pictures and diagrams to transmit ideas;
 - about 20 pages maximum limit;
 - presented as a professional high-quality reference item.
- (d) Develop supporting PowerPoint presentation material:
 - work in tandem with the printed reference material;
 - 5-6 points per side, and 5–6 words per point;
 - high quality pictures.
- (e) Develop and utilise information technologies such as web-sites with appropriate linkages to further engage clients.

5.0 RESULTS

The results of the project can be evaluated by the criteria listed below.

1. The reduction in pest damage.
2. The achievements and status of grower groups.
3. The learnings of growers working in IPM groups.
4. The learnings of staff engaged in the project.

5.1 Reduction in pest damage

Reductions in pest damage as a result of activities conducted in BSS225 can be estimated for three different pests, cane rats, greyback canegrubs and feral pigs. Some of these assessments are at the industry level, while others are at the group level and are more subjective in their evaluation.

5.1.1 Cane rats

Rodent damage in 1999 destroyed around 475,000 t of sugarcane, costing the industry nearly \$10m in lost productivity. This onslaught continued in 2000 with the industry suffering another loss of 377,000 t of cane equating to around \$8m. The explosion in rodent numbers is thought to have occurred as a result of late winter-spring rains in 1998, which extended the breeding season and also resulted in large areas of stand-over cane (up to around 15% of total assigned land in some mill areas), providing a large harbourage for breeding as well as corridors for migration. The wet weather also provided an abundance of grass weeds due to farmers' limited opportunity to access fields. There was no early-warning monitoring system in place in industry, because monitoring had been abandoned by CPPBs several years earlier when rat populations were low. Additionally, the only registered rodenticide, Klerat®, had been withdrawn in late 1998 and its replacement,

Racumin®, was not authorised for use in cane until November 1999. Thus, all the ingredients for a disaster were present.

In late 1999, the IPM coordinator organised the first industry-wide pest initiative aimed at checking and reducing losses to rodents. Ten regional forums on rodent IPM were held across central and northern sugarcane areas. Cooperating with BSES were representatives from Bayer Australia and local CPPB officers. A total of 480 growers attended. The climate for this program was very heated and at times openly hostile. Compounding the situation was the registration restriction placed on Racumin® for its use only in bait stations, which was not only a radical change for growers used to random distribution of rodenticide but also made baits more awkward to deploy on a large scale. The major shift that growers were forced to recognise was that rodent management responsibilities, which had once belonged to the CPPBs under the abandoned aerial baiting campaigns, were now well and truly theirs. Following this extension exercise, damage from rodents in the 2000 crop was lower by 98,000 t compared with the previous season, a 21% improvement representing a saving of around \$2m to industry. Before attending these forums, the majority of growers did not have an understanding of the IPM program that existed for rats. This crisis had forced BSES to clearly define the package, and aggressively extend it to achieve change in practice in the grower community.

Concurrently, a number of IPM groups focused on rats were established in some of the worst affected areas in order to increase the likely rate of change in practice. Damage reduction was reported from all of these groups in the 2000 crop as a result of meeting and discussing issues in groups. Unfortunately, because of resource issues and the resistance of existing agencies, the entire affected area could not be engaged in small group extension activities at this time. However, the change in industry toward interactive small group-based extension may change this dynamic in the future. Observations in the groups indicated that many farms that had not been damaged in 1999 experienced damage in 2000. Conversely, growers who experienced problems in 1999 were motivated to implement IPM programs in 1999-2000 and reaped the reward of reduced losses in the 2000 crop. This first round of rodent IPM was essentially ‘bedding-in’ the concepts in industry.

In March 2000, the IPM coordinator, as a result of the engagement of participatory groups of growers, decided that BSES should seek to explore additional rodenticide tools that could be easily deployed without the bait station restriction imposed on Racumin®. There was also the motivation for a whole-of-industry approach to resolve the rodent problem. A symposium was organised by the IPM coordinator and hosted by CANEGROWERS in Brisbane. The actions decided upon were to:

- (a) engage in a whole-of-industry response to the issue;
- (b) carry out efficacy trials on zinc phosphide as a potential rodenticide;
- (c) conduct research on a temporary maximum residue limit (MRL) for Racumin® for broadcast use;
- (d) seek Emergency Use Permits (EUPs) from the National Registration Authority (NRA) for both products so they could be used as part of an IPM program.

This exercise assisted in developing an industry ownership of the problem, and reduced the friction and point-scoring between different organisations within the industry.

BSES in partnership with Animal Control Technologies Australia (ACTA) conducted rodenticide trials under laboratory conditions in Tully and under field conditions in the Mackay region. Zinc phosphide was demonstrated to be efficacious against both ground and climbing rats. At the same time, BSES cooperated with Bayer Australia on temporary MRL studies for Racumin®. These were successful, and so the product would be able to be deployed in-crop without bait stations when an EUP was approved.

In late 2000 the *Rat Attack* program was launched, comprising the BSES IPM program for rodents and a resource booklet called *The Rat Pack*, supported by two EUPs for Racumin® and the new zinc phosphide rodenticide RATTOFF®. The program engaged 2,700 growers in central and northern regions. Weed management in crops and harbourage areas improved markedly in most areas, and baiting programs were conducted strategically within the designated November-March window. This facilitated maximum potential knockdown of the pest. Rat monitoring was also officially reintroduced across the industry, with CPPBs and BSES monitoring sites for rodent populations pre- and post-baiting. Mill areas had to achieve capture thresholds, or certain levels of visual activity across a number of sites, in order to activate the EUP for their mill area. For the first time, growers were given permission by the Queensland Parks and Wildlife Service (QPWS) to use break-back traps for on-farm monitoring purposes. BSES strongly promoted self-monitoring for rodent populations during the prescribed baiting window.

Losses to rats in 2001 were estimated at 201,000 t of cane, a 47% reduction compared with 2000 and a 58% reduction compared with 1999. Total productivity savings in 2000 and 2001 compared with 1999 were greater than \$10m, and the rat management initiatives can take much of the credit for this.

An EUP permit for RATTOFF® was issued again in 2001. An improved monitoring program now exists with a centralised database, *Rat Monitor*, located on the BSES website for recording rodent numbers, fertility status etc. It is hoped this will minimise the likelihood of being taken unaware by the pest. The challenge will be to maintain CPPB participation in monitoring once RATTOFF® is registered and the regulatory requirement for monitoring no longer stands.

5.1.2 Greyback canegrubs

In 1999, greyback canegrubs inflicted about 250,000 t of damage to sugarcane across central and northern regions, mostly confined to the Burdekin region. In 2000 this rose to 350,000 t as damage became evident in other northern areas, and escalated further to over 740,000 t in 2001. The reason for this massive increase in damage is uncertain, but an increase in the proportion of older ratoons, which may have acted as a breeding ground, together with a decline in grower investment in crop protection and effective weed control due to low sugar prices, may have been partly responsible. The productivity losses to this pest in 2000 and 2001 approached \$30m, not including the costs of replanting damaged blocks and insecticide protection.

The rising level of damage saw the industry in uproar. It had just suffered and addressed a major pest issue with rats and was now affected by an even larger pest problem that was more complex in terms of management and, at this point, almost impossible to predict. An IPM package was only starting to become feasible as a result of nearly eight years of research in the Burdekin and northern regions.

As a result of the work with rodents, there was now a template to respond in a comprehensive and effective manner on an industry-wide level. The industry crystallised a response and set up a joint committee comprising BSES, CANEGROWERS, ACFA and millers. The committee canvassed stakeholders on techniques for greyback canegrub management. BSES presented and explained the tools that could be deployed and how they might fit together. What was of particular interest to the committee was how these tools could be incorporated into an extension package that would assist growers in developing farm management plans to reduce their risk to greyback damage in the next 12 months. The concept was developed with 45 growers in Mulgrave, and the extension process, content and materials were then pilot-tested with 70 Herbert growers in six workshops. The final product was named *GrubPlan* and a reference booklet for growers attending workshops was produced. The extension strategy aimed to target 1,000 growers in workshops of no greater than 20 people. The concepts for risk management were quite complex, and small groups provided for optimal delivery and for development of farm plans. A high staff-to-participant ratio of 1:5 was set as a minimum to ensure that individuals had sufficient access to staff during the planning phases of the workshops.

Prior to the execution of the workshop series, 30 BSES and CPPB staff from central and northern areas undertook a training course on the tools for greyback management, the process for workshops, and how to develop best-bet management plans with growers. Over 70 workshops were run subsequently, with 906 growers and industry professionals attending.

A post-workshop survey of participants was carried out in 2001 to assess their initial response to the program. Four hundred participants (44%) responded to the survey, which is a good sample. Of those attending, 76% had a current greyback canegrub problem and so there was strong motivation for participants to learn. The other 24% stated they did not currently have a problem, but 60% of this group feared they were likely to experience one in the near future. This suggests that growers recognise the need to be prepared for future infestations, and are willing to investigate means of mitigating their impact in a proactive fashion.

The survey indicated that 97% of participants intended to employ the farm plans and management strategies that they developed. However, it is unrealistic to expect this high level of adherence in any extension campaign, and so it later proved with *GrubPlan* (see below). Support for follow-up workshops was also strong, with 97% of participants indicating that they would be interested in future training and management planning in *GrubPlan*. Again, this sort of continuing patronage has proved to be over-optimistic.

Evaluation of the success of management plans developed in the 2001 *GrubPlan* workshops is not possible until the end of the 2002 harvest season. However, a survey of participants conducted in February-April 2002 indicates that there has been a high level of compliance to plans that growers developed in the workshops. Results are presented below in two separate analyses for the Burdekin region and the remaining districts. The Burdekin region has had an ongoing greyback problem for 10 years, and so any changes observed since 2001 can probably be attributed to *GrubPlan*. In non-Burdekin districts, there are other variables, particularly soil-borne canegrub diseases, which could confound interpretation of *GrubPlan* as the main factor. Hence, the Burdekin region was used as a benchmark site for measuring effects.

5.1.2.1 Burdekin region

Four hundred growers who attended *GrubPlan* workshops in the Burdekin were surveyed in February–March 2002. A total of 101 growers responded (25%).

During the *GrubPlan* workshops, growers developed farm plans to make improvements to their current grub management strategies and potentially reduce their grub problem. The survey showed that 25% of growers had fully complied with their plans (Fig. 1). Another 32% had applied 80% of the grub management strategies they developed during the workshop.

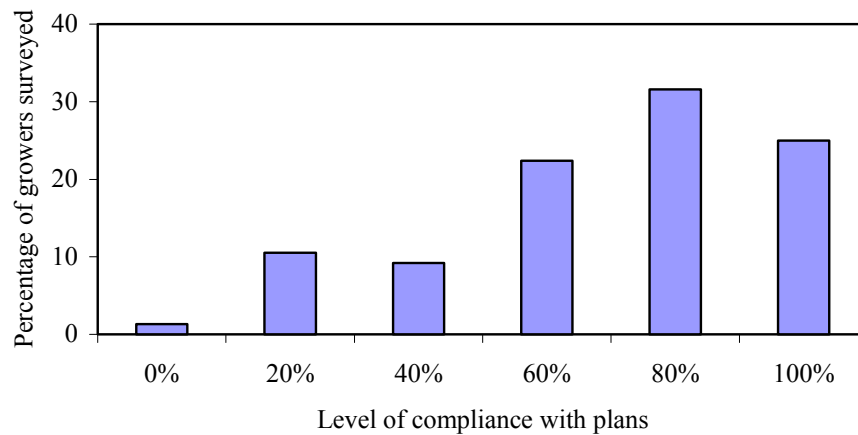


Figure 1: Level of compliance to plans by Burdekin growers participating in *GrubPlan* in 2001

The management tools used by growers are listed in Table 1.

Table 1: Practices used by Burdekin growers for greyback canegrub management in 2001

| Management practice | % growers using practice |
|----------------------------|---------------------------------|
| suSCon® Blue + acidifiers | 47 |
| suSCon® Plus | 74 |
| BioCane™ | 35 |
| Confidor® | 52 |
| Carbaryl® | 68 |
| Ploughing | 36 |
| Trap cropping | 51 |
| Late planting | 78 |
| Reduced tillage planting | 18 |
| Light trapping | 29 |

Growers were asked to estimate the level of damage on their farm compared with the previous year. Thirty-two per cent thought damage was less, 28% thought damage was about the same, and 8% thought damage was greater than in 2001. In hindsight, the surveys were sent out too early and should have probably have been left until April, because there were many non-committal responses from growers (32%).

As only 8% of growers are expecting more damage this year, it seems that positive results are being seen from the management strategies implemented in late 2001.

Participants were asked to give their two most important learnings from *GrubPlan*. Growers felt a strong need to work together and tackle the grub problem as a district rather than as individuals. They were concerned that there are no new chemicals in the pipeline to combat canegrubs, and if something were to happen to the present chemicals they would be unable to control the grub population. A large number of growers attended the *GrubPlan* workshops to learn about the new product Confidor® and how to apply it correctly. Many growers were interested in developing a farm plan to improve the efficiency of their current chemical usage, thus helping to reduce their cost of production. Growers were also interested in treating their early-plant crops with insecticides and employing them as trap-crops to maximise the effectiveness of the products and to reduce overall insecticide requirements.

Seventy-five per cent of growers thought that *GrubPlan* had helped them reconsider their farm management plans in relation to grub control. Sixty-eight per cent said that they would be interested in participating in the *GrubPlan* workshop series this year. Of growers who did not attend the *GrubPlan* workshops last season, 33% would be interested in attending this year, another 33% said that they would not attend the workshops, and 33% were still undecided.

2002 *GrubPlan* workshops are underway in the Burdekin as this report is being compiled.

5.1.2.2 Non-Burdekin regions

The non-Burdekin regions (Central, Herbert, Tully, Innisfail, Babinda, Mulgrave, Mossman and Atherton Tableland) were all surveyed in March–April 2002. One hundred and forty participants responded to the survey.

The level of compliance to plans developed in the workshop series was similar to Burdekin trends (Fig. 2).

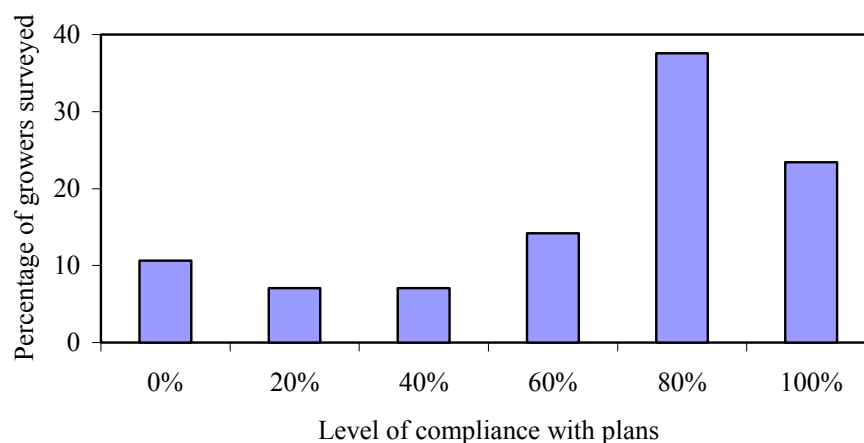


Figure 2: Level of compliance to plans by non-Burdekin growers participating in GrubPlan in 2001

Management practices used by growers were different outside the Burdekin (Table 2). suSCon® Plus was not a major component because of the absence of the high pH soils that rapidly deplete suSCon® Blue on many Burdekin farms. BioCane™ use was also low, again because suSCon® Blue continues to perform well outside the Burdekin but also because there has been much less promotion of the product in these regions.

Table 2: Practices used by non-Burdekin growers for greyback canegrub management in 2001

| Management practice | % growers using practice |
|--------------------------|--------------------------|
| suSCon® Blue | 88 |
| BioCane™ | 9 |
| Confidor® | 49 |
| Trap cropping | 37 |
| Late planting | 34 |
| Reduced tillage planting | 45 |

GrubPlan seems to have made a significant impact in these regions. Sixty-six per cent of growers believed that damage in 2002 was less than in the previous year, 20% believed it was about the same, and only 5% thought damage had increased. The number of growers undecided was low (9%) possibly because the survey was a month later than in the Burdekin region (greyback damage becomes more evident in April-May).

Learnings reported by survey respondents were many and varied. No single issue dominated but the more popular were:

- (a) greyback ecology and identification;
- (b) trap-cropping;
- (c) the effective use of suSCon® Blue;
- (d) the effective use of Confidor®;
- (e) area-wide management;
- (f) monitoring for early signs of damage;
- (g) the effective use of BioCane™

Eighty-eight per cent of respondents indicated that *GrubPlan* had made them reconsider how to manage greyback canegrubs on their farms. Eighty-four per cent indicated that they would continue in the *GrubPlan* program through attending follow-up workshops. However, *GrubPlan* in 2002 is only attracting 32% of last year's patronage in non-Burdekin areas (164 compared to 506). These workshops are still ongoing in Central districts, but attendance will not come near equalling the ground swell of participation achieved in 2001. Some of the comments filtering through grower networks that might assist us in understanding why are:

- “Grubs are no longer a problem, they have gone away”.
- “I can’t afford to apply treatments with the current low sugar price”.
- “I now know what to do, and I don’t need to attend follow-up workshops”.

The third point is encouraging, because it indicates that trainers are achieving an increase in understanding, skills and practice change in industry. However, the first two points declare either a level of complacency emerging, or perhaps a failure to fully understand the problem. Therefore, even though surveys are indicating strong levels of achievement with the *GrubPlan* program, maintaining future motivation and momentum with the program’s participants will be challenging.

The only deviation from the downward trend in attendance is in the Mackay region, where there are early signs of a large greyback outbreak developing. Damage is being detected in the Upper Pioneer, Homebush, Mt Jukes, Te Kowai and Sarina districts. Even though few of last year's participants have returned, there are a number of newcomers to the program, many of whom are incurring destruction of whole or part blocks of cane to greyback. Four workshops have been run at Mackay in 2002, training 49 growers and rural industry advisors. Several more workshops may be implemented in the next few months, once harvest commences and growers identify damage of which they were previously unaware.

It is very difficult to quantify the benefits of *GrubPlan* activities. However, if the industry had done nothing in the face of the greyback crisis, would it be in a worse situation with regard to damage this year? The answer is almost certainly yes. *GrubPlan* deserves credit for motivating and mobilising industry in an effective and coordinated manner. Final damage reporting following the 2002 crush will give a better measure of the effects of the program. However, the declining trend in visible damage is very positive. The challenge will be to maintain motivation for ongoing risk management. The sugar

industry is very reactive in pest management, and a paradigm shift is required in growers and staff to manage risk in a proactive manner.

5.1.3 Feral pigs

Significant damage reduction from feral pigs has not been achieved at an industry level, but success is happening among some of the small grower groups raised under the IPM project. There have been three longer-term pig groups established under the project, at Homebush and Pinevale (Mackay) and Hawkins Creek (Herbert). The groups were raised through the cooperation of BSES, CPPBs and the Department of Natural Resources (DNR). The most common and tangible measure growers use to evaluate these programs is the number of pigs caught. How this translates into damage reduction isn't clear-cut, but every group made a qualitative judgement that damage had been reduced.

The Homebush group of about 20 farms trapped more than 90 pigs until late 2000. There was still damage being reported, but less than before action was taken. Members of the group still have a number of traps in place, but the feral pig problem has not been as severe; a group-based campaign will only be activated again on a needs basis. The Pinevale group trapped or shot about 100 pigs during eight months until June 2000, and group members reported significant reductions in damage. Again, this group is only likely to be reactivated if feral pigs become a major concern in the future. The Hawkins Creek group of eight growers trapped a total of 261 pigs from November 1999 to January 2002, with participants reporting very large reductions in crop damage.

5.2 Achievements and status of individual groups

5.2.1 Cane rats

Twelve groups focussing on cane rats were established in the project (Table 3 p. 20). Each was selected in areas of high rat pressure where there was a perceived need for action. Group champions were identified and fostered in many cases, with these people often becoming the key contact and organiser. The rat groups have been collectively the most successful of the IPM groups. There are several likely reasons for this:

- rats are often viewed as a vile pest and as such are likely to raise people's emotions (*a strong motivator*);
- immediate benefit can be seen from some rat management strategies, eg dead rats after baiting (*a sense of satisfaction*). This is not the case with many other pests and control strategies, where results may not be seen until the following season;
- the farms were chronically affected by rats, and hence there was an ongoing motivation for people to be involved.

The first groups were formed in late 1999, and many of these have continued to meet for the duration of the project. New groups continued to form in 2001.

Initial formative meetings were conducted. The meeting process consisted of a purpose for the get-together, asking the group to set some basic ground rules on conduct and then getting peoples' expectations of the meeting. Participants were asked what control measures they were currently using and these were documented. Invited specialists then reviewed current best practice management and these points were discussed in earnest.

In 1999, the new rodenticide Racumin® was largely untested in the sugar industry, and expertise on the product was provided by a consultant from Bayer Australia. This commenced a long and profitable relationship between BSES, Bayer and growers. An offer was made to the grower groups to continue meeting and commence activities, and this was agreed upon in all cases. Action plans (eg grower demonstration trials) were formulated before this meeting closed. The concept of area-wide management was well received, and neighbours cooperated in many instances to minimise their collective risk in the following season. A technique that was accepted by many groups was monitoring for the presence of rat infestation. The use of break-back trapping proved useful for participants in deciding where they were going to allocate their expenditure on rodenticides. Growers gained a benefit from seeing reductions in populations from their own pre- and post-bait measurements. Improved baiting technique was also a major development. Changes were made from untimely haphazard baiting from the edges of cane blocks late in the season (April-June) to use of grid baiting in affected fields in November-January before populations increased. Other useful learnings included basic toxicology of different baits, the ecology and behaviour of rodents, the importance of effective in-crop weed control, and the identification and management of harbourage areas from which rats invade crops. The shared testimonials by growers in these groups helped make these groups so effective.

The importance of setting ground rules at the commencement of activities soon became obvious, to ensure smooth, constructive learning experiences. There was a lot of friction in the early stages of the 1999–2000 rat crisis. People were highly emotional and wanted scapegoats on which to vent their fury. Hence, good meeting process was paramount. Those people who were antagonistic toward working within ground rules soon left the groups, leaving genuinely committed individuals who had a common purpose.

The crystallisation of these groups' ideas and activities precipitated an industry-wide emergency response to rats and ongoing research into rodenticides. The learning and experience of these groups enabled BSES and the participating pesticide companies to carry out the *Rat Attack* program and achieve the high level of success it had in reducing damage.

5.2.2 Greyback canegrubs

The primary driver for staff and growers to develop groups for greyback canegrub was crisis. Around 15 greyback IPM groups were raised in 2000. Four were from the direct facilitation of Warren Hunt in Far North Queensland (South Mulgrave, Green Hill, Garradunga and Herbert), and the others were generated by Andrew Horsfield in the Burdekin region. The meetings allowed participants to decide what changes they could make in farming practice using current technologies, or what new methods and

technologies they could trial in action-research arrangements. What soon emerged was that there was a large range of understanding of management techniques among the groups of farmers. Hence, a good portion of the time in these early meetings was spent in developing a common level of understanding about the ecology of the pest and the use of the different tools for management such as suSCon® Blue. The latter was surprising, because suSCon® Blue had been in the industry for 15 years, but there was still a high level of ineffective use of the product so that growers were getting mixed results in greyback control.

The groups in the far north served as the first opportunity to raise demonstration sites with the products Confidor® and BioCane™. In the Burdekin, they served as the proving ground for trials into the components that would make up the IPM program *GrubPlan*.

By mid 2001 the objective was to raise an industry-wide response to the increasing damage occurring in the Burdekin and northern districts. New tools such as suSCon® Plus, Confidor® and trap cropping were available for incorporation into a comprehensive IPM program. The groups formed in Mulgrave helped to evolve the concept of whole-farm-planning for managing greyback risk. Forty-six individuals from the Mulgrave groups participated in a process where BSES and CPPB staff would assess the current farm risk of infestation and then develop strategies to manage that risk for the next season's crop. This was a learning process for both farmers and staff. Attempting to manage greyback had never been undertaken this way before. It involved the use of a combination of relatively new tools and understandings that were just being made available to industry. The concept was well regarded by Mulgrave growers, and the program was formalised as *GrubPlan*. The workshop delivery process used initially in Mulgrave was too resource intensive to be sustained, so it was finetuned in the Herbert in June 2001 during six workshops with 69 growers. This pilot testing assisted in adjusting the content and process. The program was then conducted across all regions from Sarina to Mossman, engaging over 900 participants in 70 workshops.

The greyback groups no longer exist in their original form, having been absorbed by the *GrubPlan* program. However, the change in extension activities in Mulgrave and CSR mill areas towards group-based extension has ensured that these same people will continue to be engaged about this pest, with *GrubPlan* being slotted into their activities at strategic times of the management cycle. In summary, the *GrubPlan* program content and process could not have been established and tested if it were not for the existence of the greyback-focused groups established in the last three years.

5.2.3 Feral pigs

Six groups comprising about 40 growers investigated feral pig management (Table 3). The motivation for growers to act came from rising incidence of pig damage in their crops. The growers had been acting individually using uncoordinated means to reduce damage; they had been unsuccessful and were looking for a better way of doing things. The groups were community focused, and their development was a credit to local CPPB

and BSES staff. Initial meetings led to ownership of the problem by the group, which then decided collectively on plans to mitigate damage and acted upon them. The IPM coordinator had direct contact with only two of the groups, Homebush and Little Mulgrave, but contributed ideas to the genesis of the other groups including the development of group ownership.

These groups were generally less antagonistic than those dealing with some other pest situations. However, two groups (Little Mulgrave and Julatten) experienced internal problems and consequently disintegrated.

There have been some remarkable successes with the other groups. These successful groups have also been able to build linkages with DNR staff who have specialised knowledge in the management of feral pigs.

The Homebush group commenced activities in October 1999 and continued into late 2000. It was very much a 'bottom-up' approach driven by concerned growers. Alan Royal of the Mackay CPPB facilitated the group involving 20 farms. A total of 45 traps was deployed in the exercise and over 90 pigs were trapped. Growers learnt much in the way of improved trap design and trapping techniques. Electric fencing used on a few individual farms assisted in channelling pigs in different directions. There was still damage being reported but less so than if no action had been taken. Members of the group still have a number of traps in place, but the feral pig problem has not been as severe. A group-based campaign will only be activated again on a needs basis.

The Pinevale group commenced activities in November 1999 and continued until June 2000. This group was facilitated by Chris Sarich, BSES Mackay. Around 100 pigs were trapped or shot in the group program and group members reported significant reductions in damage. Again, this group is only likely to be reactivated if feral pigs become a major concern in the future.

The Hawkins Creek group in the Herbert is the most successful of the pig groups and is perhaps one of the most effective of all the pest groups. It has assisted DNR and James Cook University in research activities into feral pigs. In the period from November 1999 to January 2002, the group deployed 10 pig traps and 10 km of electric fencing along World Heritage Area boundaries on eight consecutive farms. A total of 261 pigs has been trapped with participants reporting very large reductions in crop damage because of their efforts. The group is ongoing, and CPPB officer Aaron Cauchie, who is driving the initiative, is hoping that more growers will come on board.

5.2.4 Childers canegrubs

One group of around 20 growers is established in the Isis district of southern Queensland. There is a sound mix of IPM tools for use against the pest, but it was surprising to observe the wide range of grub knowledge, understanding and practice within the group.

This group has proven to be highly motivated and constructive. A formative meeting was held stating the purpose of the group proposal, and group expectations were taken on board. The group decided to work towards improving their Childers grub management, because members saw more benefit in talking and trying to learn about a situation than ignoring it or blaming someone else for their problems. So far there have not been any significant conflicts to resolve.

The group has had a number of successful learning experiences as listed below.

- (a) A presentation on the technologies and progress of genetically modified sugarcane.
- (b) Discussion with technical representatives from Crop Care on modifying liming practices to ensure the longevity of suSCon® Blue.
- (c) Establishment of variety comparison trials with newly released cultivars.
- (d) A presentation on population dynamics of Childers grub.
- (e) Recent farm walks where the value of monitoring was demonstrated first-hand in a very practical manner.
- (f) Discussion on the results of suSCon Ultra® trials in north Queensland.
- (g) Inspection of implements for applying strategic knockdown insecticides.
- (h) Discussion of outcomes of trials on different types of tillage and the effect on Childers grub.
- (i) Discussion of the use of a fallow to avoid ongoing infestation between crop cycles.
- (j) Discussion of resistance to suSCon® Blue.
- (k) Inspection of Confidor® trial sites and discussion of how this pesticide can fit in as an effective knockdown agent in ratoons.

This group will serve as a pilot test group for the upcoming *Southern GrubPlan* program in late 2002.

5.2.5 Soldier flies

Four groups were initiated with around 60 growers in total. These were located at Mackay in the upper reaches of the Pioneer Valley, Bundaberg in the Bingera mill area, Maryborough and Moreton.

The groups were established by approaching individual farmers who had a previous history of soldier fly damage. In the Moreton district, CPPB board members nominated the likely affected growers to approach for future involvement. Formative meetings were held in all locations and current local management was discussed, as well as current research results on the pest. Growers responded positively in all locations when asked if they wished to continue as groups. However, interest has since faded. In the Upper Pioneer, the second meeting of growers saw no value in pursuing the group approach. The Moreton group has also ceased to operate, and we speculate that interest in pursuing the work was associated with the low level of infestations at the time.

Maintenance of these groups has been difficult. This is principally because of growers' perception that BSES has an inadequate IPM program to extend. The common complaint is "*Tell us something new!*". In endemic soldier fly areas, some growers are informing us that they are using best-bet cultural practices (ie well-maintained breaks of eight months or longer, and choice of appropriate varieties), and they are not achieving more than two seasons of effective management before infestations again cause economic injury. Hence,

these people are frustrated at not being able to make any further practical progress against their problem. It must be recognised, however, that not all affected growers are using best-bet practices and hence some are failing to reap benefits that are achievable.

As a result of issues raised at the soldier fly group meetings, a research project is under way in a partnership arrangement between the University of Queensland, BSES, and the Bundaberg Productivity Committee, to investigate the mechanism whereby soldier fly larvae inhibit sugarcane ratooning. It is hoped that an understanding of the mechanism may show ways to alleviate the pest's impact, by efficient screening for tolerant varieties or by developing treatments to overcome the inhibition.

Generally speaking, the existing groups seem to be suffering from a fatigue or lack of hope towards finding solutions, and especially chemical control methods. Soldier fly is a minor pest in terms of industry-wide significance, and chemical companies are not excited about investing funds in research and registration for such markets. In addition, many years of insecticide research have offered little hope of an effective treatment. Growers find this hard to accept.

Activities have not been convincing enough to ensure ongoing cohesion in any of the groups. Some district variety trials have been planned but not initiated, largely due to negotiation difficulties between some participating growers and the local extension officer. A survey on the distribution of affected farms was carried out in Maryborough, which determined that soldier fly infestations were located principally on higher well-drained aspects. This is not new, and merely reinforced a recognised phenomenon. The groups have received updates on cultural practices, variety trials, insecticide bioassays and field trials, as results have become available.

The Bingera group is expected to meet again in 2002 to review results of the mechanism project on its completion.

5.2.6 Noxia canegrubs

A small group of eight growers met in Bundaberg in 2000 to discuss current management practices that growers were employing, the insect's lifecycle, best management practices and potential trial actions. Failure by local extension staff to regain the initiative with this group of growers has led to its folding.

5.2.7 Rhyparida

Two groups were formed in the Bundaberg and Isis districts. The groups have been developed as part of a wider SRDC initiative (BSS236) to understand the biology of the pest and develop management options. There was initially a definite motivation for action. However, group meetings have been few and enthusiasm waned very quickly once the incidence of the pest declined.

At the formative group meetings, there was some initial reluctance to become actively involved in the solutions, probably due to the pre-conditioned passive nature of some participants. Participation was not understood and explanations were required to make the process transparent.

The work has delivered a greater understanding of the *Rhyparida* lifecycle, which has been determined as one year with very small larvae present in autumn and winter. A large-scale farming systems survey has been undertaken for the past three years. Fields planted after a fallow of 3-10 months had significantly fewer *Rhyparida* than ploughout-replant fields. Several insecticides have been trialled over the past three years. One insecticide proved effective, but further testing is required for registration.

Closer relationships have been formed with growers that have had a historical problem with *Rhyparida*. Growers have been kept further informed by a quarterly newsletter. Local BSES research staff found that approaching interested growers in groups was an effective way of securing trial sites.

5.2.8 Armyworms

In the early stages, the armyworm group located at Rocky Point appeared very promising, with many ideas proposed by participants that were worth pursuing, but group activities stalled in the first year because of adverse wet conditions. Failure by local extension staff to regain the initiative following a waning in interest from the group led to its folding.

5.2.9 Current group status

Table 3 summarises the status of groups, whether ongoing, uncertain or failed, and plans of ongoing groups for further activities.

Table 3: Group status and ongoing plans

| Pest group | Avg. no. growers | Group continuation | | | Future activities |
|--------------------------|------------------|--------------------|---|----|--|
| | | Yes | ? | No | |
| Greyback canegrub | | | | | |
| Various groups | | ✓ | | | Subsumed by <i>GrubPlan</i> program |
| Rats | | | | | |
| Marian-Mackay | 15 | ✓ | | | Ongoing 2002 meetings |
| Nth Eton-Mackay | 8 | ✓ | | | |
| Woogoora-Mackay | 15 | | ✓ | | |
| Herbert | 7 | ✓ | | | Implementing harbourage management demonstration sites |
| Warrami | 8 | ✓ | | | Participation in rat monitoring program |
| Innisfail | 6 | | ✓ | | RATTOFF® palatability trials conducted February-March 2002 |
| Babinda | 8 | ✓ | | | Participation of group members in monitoring program |
| Southern Mulgrave | 15 | ✓ | | | Night vision footage of consumption of RATTOFF® during next baiting period |
| Pine Ck-Mulgrave | 8 | ✓ | | | Participation in rat monitoring program |
| Mossman | 10 | ✓ | | | Participation in rat monitoring program |
| Julatten | 10 | ✓ | | | Participation in rat monitoring program |
| Tableland | 10 | ✓ | | | Participation in rat monitoring program |
| Soldier fly | | | | | |
| Moreton | | | | ✓ | |
| Maryborough | 15 | | ✓ | | |
| Bingera | 15 | ✓ | | | Support for UQ/BSES project on the mechanism of soldier fly damage |
| Upper Pioneer | | | | ✓ | |
| Rhyparida | | | | | |
| Bundaberg | 12 | | ✓ | | Final review of research findings |
| Bingera | 12 | | ✓ | | Final review of research findings |
| Childers canegrub | | | | | |
| Childers | 15 | ✓ | | | Pilot run of <i>Southern GrubPlan</i> |
| Armyworms | | | | | |
| Moreton | | | | ✓ | |
| Rocky Pt | | | | ✓ | |
| Noxia canegrub | | | | | |
| Bundaberg | | | | ✓ | |
| Feral pigs | | | | | |
| Hawkins Ck-Herbert | 9 | ✓ | | | Assisting new groups Assisting JCU in studies |
| Halifax-Herbert | 2 | ✓ | | | Establishment phase - expansion of core to include neighbours |
| Little Mulgrave | 4 | | | ✓ | Internal barriers |
| Homebush-Mackay | 12 | | ✓ | | Possible reactivation on a needs basis |
| Pinevale-Mackay | 10 | | ✓ | | Reactivate only on a needs basis |
| Julatten | 6 | | ✓ | | Possible re-establishment if local grower differences can be resolved |
| Total Growers | 232 | | | | |

5.3 Learnings of growers in IPM groups

Formal surveys were conducted among a number of the ongoing groups in the project. Sixty-seven of 117 growers returned surveys (Table 4), and the high response rate (57%), suggests a strong validation of the responses being representative of growers' thoughts across the groups.

Table 4: Pest groups surveyed

| Pest group surveyed | No. respondents |
|--------------------------------|------------------------|
| Rats | |
| South Mulgrave | 14 |
| Pine Creek – Mulgrave | 9 |
| Warrami | 1 |
| Marian and North Eton - Mackay | 8 |
| Feral pigs | |
| Hawkins Creek - Herbert | 4 |
| Soldier fly | |
| Bingera | 10 |
| Childers canegrub | |
| Childers | 12 |
| Rhyparida | |
| Bundaberg and Bingera | 9 |
| TOTAL | 67 |

Eighty-one per cent of participants believed that meeting and discussing issues in groups had assisted them in managing their pest situation. Seventy-five per cent considered that the group approach dealt with pest management issues in different ways to what had been done before.

Grower participants were then asked what advantages were offered by meeting together in groups. Their responses were as follows (verbatim).

- Allows us to observe other growers' problems, compare to our own and discuss solutions.
- You get to hear first hand what other farmers' ideas are . . . you get to work out in a group the best possible way to deal with the problem.
- The opportunity to ask questions.
- Clarifying many questions that people are afraid to ask . . . questions are asked that haven't come to mind before.
- Meetings focused on positives.
- Hearing different points of view.
- Better understanding of the problem.
- Noting different results.
- Broadening your outlook.
- Finding out what is new and upcoming.
- Made you feel that you weren't alone.
- Increased awareness of the difficulties with the problem.
- Hands-on approach, frank and open discussion.
- Made aware of the impossible task of eradication.
- Generating more ideas for discussion.
- That everybody was serious about the issue.

- You get knowledge from other people that took a lot of effort to learn, and you need not make the same mistakes.
- Agreement for further trial work.
- Open forum where you can hear people's views.
- Farmer feedback . . . (to BSES, CPPBs and pesticide companies).
- More informal than large groups and therefore less intimidating.
- Best practice management decided upon and agreement reached by group to implement.

They were also requested to point out any disadvantages that they found in the group approach. These points are listed as follows.

- None.
- Too late.
- Some meetings would drag on too long.
- Focus can drift from the original point.
- Lack of new direction.
- Sometimes discussion can be controlled by the vocal participants.
- No satisfactory answers.
- Rehashing old information.
- Some meetings could be disorganised and disjointed . . . too much ground covered (ie in Mulgrave where pest discussions formed part of overall Mill and CPPB meetings).
- Keeping the group working together and getting people along to meetings.
- Those with 'verbal diarrhoea' should not be allowed to dominate discussion.

Group members then outlined the main points they learned with managing their respective pests. Obviously the learnings are specific to the pest and are listed (mainly verbatim) below.

Rat groups

- The components of the IPM strategy.
- The necessity to view the program holistically.
- Strategic baiting: behaviour patterns of rats in relation to feeding, and the IPM strategy.
- The significance and management of harbourage areas.
- The importance of in-crop weed management.
- The issue of neophobia (fear of new things) in baiting rats.
- The timing and methods for baiting.
- Getting in early (weed management and baiting).
- What baits are legally available for use.
- Rat feeding patterns.
- Cooperation between farms.
- Baiting harbourage areas (using Racumin® in bait stations) as the season progresses.

Soldier fly groups

- It is a difficult problem with limited answers at this point.

- The importance of fallow management.
- Some varieties offer an advantage.
- We know too little about the problem.

Childers canegrub group

- New chemicals are becoming available.
- Some growers are set in doing things the same way and are not prepared to engage IPM.
- The problem is difficult to appreciate (complex).
- Plough out canegrub damaged blocks.
- Pooling ideas.
- Monitor Childers grub very closely (for knockdown treatment October-November).

Feral pig groups

- Individuals brought forward ideas and methods they had used.
- We have a joint voice when approaching different bodies.
- There seems to be a lot of resistance from authorities.
- Use of trapping instead of dogs.

Rhyparida groups

- Learning what others were doing.
- No quick fixes.
- Some possible advantages with knockdown treatment of adults.

Growers were then asked how they liked to learn. This knowledge is important to BSES, because it may assist in determining future directions with research and extension programs. The types of learning method surveyed were as follows.

- (a) Reading.
- (b) Personal testimonies from other growers.
- (c) Discussion in groups.
- (d) Being lectured to.
- (e) Listening to the media.
- (f) Practical demonstration.
- (g) Own trial and error.

The most popular methods were in order:

1. discussion in groups;
2. practical demonstration;
3. grower's testimonies.

Group participants were asked to designate what they believed to be the main drivers for success with groups focused on pest management and select the three most important to them. The choices available were:

- (a) the need or urgency of the problem;
- (b) the way meetings were run;
- (c) the level of technical expertise of BSES/CPBP staff;
- (d) BSES having pest management programs that can be applied;
- (e) the length of time before results are seen from management actions;
- (f) effective two-way communication;
- (g) the willingness of group members to participate in activities;
- (h) practical exercises group members carried out, or demonstrations the group saw.

Grower's responses in order of priority were:

1. need or urgency of the problem;
2. BSES having pest management programs that can be applied;
3. technical expertise of staff;
4. effective two-way communication.

The last three were all closely ranked.

From the groups surveyed, there were a number of salient points. Firstly, grower motivation for action against pests must be present in order to achieve change. The next key ingredient is that growers want to be part of the decision-making process, especially in regard to what they want or need to learn, to make changes. Extension and research staff must achieve active participation with their client groups to best facilitate this change. Adults want control of their learning! Finally, there must be something to offer growers, ie a tangible and effective IPM program.

5.4 Learnings of staff involved in the project

5.4.1 Initial fact-finding mission to other industries

We conducted two fact-finding missions in May-June 1999 across plant and animal industries in Queensland and interstate. We also decided to benchmark BSES's own approach to participatory research and extension in the Burdekin canegrub projects. We interviewed eleven different research or extension entities. These included IPM experiences in cotton, sheep and wool, horticultural and nursery industries, grains and viticulture. We also interviewed the Director of the Rural Extension Centre at the University of Queensland's Gatton College.

Our primary interest was not in the technologies that these other industries were employing, but more in the process and methodologies they had used to conduct their

research and extension efforts. In particular, we were endeavouring to find out whether participatory extension and research methodologies had proven to be successful, and if so, where and how had they been used and why did they work? It should be noted that practitioners that were not employing participatory approaches were also interviewed.

This mission revealed a number of important issues with research, development and extension (RD&E) in IPM that would equally apply in the sugar industry as listed below.

- With many industries, there had been research and extension on IPM for years and there had been almost nil adoption of these technologies until a crisis situation emerged. Unless growers see a real need to make changes, they won't do it! Target situations carefully.
- It is critical to achieve industry *ownership* of the pest problem. Once this is accepted, actions on the ground will happen.
- There is a need to get industry to accept that there are no 'silver bullets'. Not all growers will be receptive or supportive of IPM concepts.
- Reinforcement is necessary with clients regarding existing IPM technologies, plus continual updates on new approaches. There is a need for *continuous improvement programs*.
- IPM has no end point, and there are no single, final solutions. Action against a pest cannot be delayed in the hope for a miracle cure to emerge, and client and service provider must continue to work together to further develop and fine-tune IPM practices.
- Growers want to access the researchers' expertise first hand, and not an advisor's interpretation of it.
- Effective IPM programs should be developed that can be delivered to clients in a workshop format.
- Effective content and process must be employed in IPM training programs or group meetings.

5.4.2 Learnings of staff within IPM groups

Both BSES and CPPB staff participating in the project were surveyed for their views on the effectiveness of the project in its impact on growers and staff. Fourteen out of twenty participating staff responded.

Eighty-six per cent believed that the project approached pest management issues in different ways to what had been done before. Their reasons for this were as follows.

- The group process standardised and focused an approach on a particular pest issue.
- Delivered a common message from all bodies (CPPBs, Mill staff, BSES).
- Enabled growers' frustrations to be aired and, if not dealt with, at least responded to.
- Provided a forum for growers to learn what other growers were doing and experiencing.
- Growers listen to growers' experiences more so than just listening to BSES staff.
- More interaction among growers is achieved in a small group situation.
- Became a more efficient forum for discussing specialised issues than one-to-one extension.
- Enabled more participation and interaction for quieter people as well as those who had lots to ask and say.
- Facilitated the turning of the pest problem from something that BSES (or the Government) should do something about, to a problem owned by the growers and manageable by their efforts.
- Delivered the concept that pest control can be achieved through the use of options complementing available chemical controls (IPM).
- Small groups encouraged grower ownership and participation in the solution, ie involving themselves in research or demonstration trials.
- The group process selected out those most interested in the pest.
- Allowed more in-depth coverage of the issue with participants.
- Provided an opportunity for the group to influence activities (eg introduction of RATTOFF® via an EUP).
- Provided more frequent contact between research and extension staff and interested growers.

The 14% of respondents who indicated that there was no advantage stated the following reasons.

- Group approaches have been done before on all other issues.
- Some groups differed little from shed meeting approaches (ie passive information meetings, little or no active participation by growers). There was limited success in participatory research.

Staff were also asked to identify their opinion of the main drivers for facilitating change in practice within industry. Their available choices were as follows.

- (a) The need or urgency perceived by clients.
- (b) The level of ownership of the problem by clients.
- (c) The level of technical expertise of BSES/CPPB staff assisting.
- (d) The existence of a tangible IPM program that could be extended on the pest problem.
- (e) The phenology of the pest and length of time before any results of actions are seen by growers.
- (f) Effective group process exercised by staff.
- (g) The willingness of growers to participate in activities.
- (h) The level of staff motivation.

The main drivers identified for facilitating change were:

1. the need or urgency perceived by clients;
2. the level of ownership of the problem by clients;
3. the willingness of growers to participate in activities.

Seventy-two per cent of staff said that they gained a benefit from working in the project. Benefits mentioned by BSES and CPPB staff were as follows.

- Found the processes good.
- Learning how to convene meetings and establish groups.
- Learning how to set a clear direction in meetings.
- Getting growers thinking about ownership and participation.
- Opportunity to share ideas and tee-up trials or farm visits.
- Opportunity for experiences to be explained from grower to grower, which isn't available in one-to-one extension.
- The group process facilitated improved BSES contact with interested growers.
- An achievement of a higher profile in the district about the problem.
- The groups acted as a 'proving ground' for the wider adoption of the group process in Mulgrave.
- Opportunity to have external personnel other than the local extension staff taking the 'flak' from growers during the pest outbreaks of 1999-2001. This protected the local officers from being perceived by industry as being against the farmers.
- How to present practical outcomes from research as an integrated package.
- Assisting officers to establish themselves in areas where they were new and largely unknown.
- Achieving closer association with growers who normally don't attend large meetings or request service.

The 28% that didn't gain a benefit from the group activities were asked why, and what might work better in their situation? Their responses were as follows.

- Growers want BSES to provide leadership and carry out activities.
- The group process is nothing new; have used it in the past.
- Meetings must achieve some sort of resolution related to the issue.
- A problem remains of poor participation by growers in a number of groups in actually initiating or carrying activities through. The theme of initiating activities at one meeting and then reflecting on what happened at future group meetings was not accepted or implemented in some groups.
- The client group has entrenched attitudes towards BSES, RD&E and IPM. There was a significant amount of baggage from issues such as suSCon® Blue failures. A whole-of-industry approach on pest issues (eg BSES, CANEGROWERS, CPPB, ACFA as seen in the rat and greyback responses) would be more effective.
- Each meeting with a given group should have a new message to deliver. Never rely on discussion alone being judged worthy of the time spent at the meeting by growers.

Finally, staff were asked to detail any achievements they believed group activity, the *Rat Attack* extension series or *GrubPlan* workshops had yielded in industry. Their responses are listed below.

- The development of tangible IPM training and educational materials (*The Rat Pack*, *GrubPlan* booklet and *GrubPlan* presentation CD).
- Improved understanding and skills of BSES and CPPB staff in IPM.
- A large number of growers were given the IPM messages at the one time.
- Improved working relations and a united front from partnerships with industry's representative bodies (CANEGROWERS and ACFA).
- A general acceptance in the sugar industry of the role grower groups can play in extension programs.
- Improved flow of research findings and innovations to the land managers.
- A measure of control of the disruptive element at meetings, allowing information to reach others who want to listen and learn.
- With workshops being implemented just before the problem needed to be addressed, it allowed growers to take the advice on board and act upon it.
- Increased confidence in suSCon® Blue and Plus by explaining the 'dos and don'ts'.
- Growers have become more aware of control strategies including group management of rat harbourage and coordinated baiting programs.
- The programs *Rat Attack* and *GrubPlan* have made growers more aware of pest problems and the method of addressing those problems. In many cases, growers have gone past the awareness stage and made changes to the operations of their farms.
- In the Burdekin, approximately 400 growers attended *GrubPlan* workshops. Many of these growers had not attended any BSES meetings for some time. Having Confidor® as a 'carrot' was highly effective.
- Standardising IPM knowledge among growers, agribusiness and advisory staff via these programs cannot be undervalued. Packaging information in *GrubPlan* was useful in achieving better knowledge of canegrub IPM. While it is based on a short-term approach, it is laying the foundation with stakeholders for future work.
- Growers are coming to accept that chemicals are not the sole answer to pest problems.
- Growers are looking for early-warning signs of imminent pest problems (eg rats in young ratoons).
- Growers are learning skills in the understanding of pest ecology and identification of pest species (eg ground rat versus climbing rat, greyback canegrub versus French's canegrub).
- A real effort has been made to define IPM programs, even if they are not perfect.
- Structures have been or are soon to be put in place for filling gaps in IPM systems.
- Monitoring for rats along with a centralised Internet database for recording data.
- Developing improved risk assessment and planning programs for greybacks.
- Developing a whole-of-farm management package (with booklet) for Childers grub.
- Researchers have had to be responsive to the needs of groups; groups in some cases have forced action that would otherwise not have occurred.

5.4.3 Staff training

The project also provided benefit to industry by running training courses to build skills in group leadership and facilitation, as well as training focused on technical and process

skills for conduct of *GrubPlan* workshops. A total of 69 BSES, CPPB and mill staff participated in these types of training organised and conducted by the IPM coordinator.

6.0 DISCUSSION OF THE GROUP PROCESS

6.1 Group methodologies

Working in groups has led to demonstrable improvements with IPM in Queensland sugar. Several types of group methodologies were used:

- (a) structured interactive workshops (eg *GrubPlan*);
- (b) action-learning, where growers have developed understandings and skills through discussing, using and evaluating proven management techniques;
- (c) action-research, which may not be rigorous scientific research, but is original thinking developed from and within the group's activities.

Each of these approaches has proven to be useful and effective for specific circumstances.

Structured interactive workshops are a valuable method the industry should continue to embrace, particularly where there is a definitive program already developed that involves complex concepts. The small group approach maximises interaction within the structured framework of learning about a complex issue. Workshop programs are also more favourable when there is a large patronage of potential participants as a result of a specific need (eg greyback grubs and *GrubPlan*).

Action-learning is an approach that should ideally be adopted by all mill-area productivity groups being developed in the industry. The method, if properly adhered to, will provide the appropriate structure for people (growers and staff alike) to work through specific issues, ie planning, acting, observing and reflecting in line with the action-learning cycle. It has proven to be an effective method of assisting localised groups to learn how to manage pest problems more effectively. This approach should continue with IPM in areas where there are either endemic pest problems or where isolated outbreaks occur. Pest practitioners must attempt to work in with existing local mill-area productivity groups as a vehicle, rather than creating separate entities.

Action-research has taken a less prominent position in this project, partly because of the extent and severity of two major pest crises. Action-research did occur in some groups where action-learning had taken place and participants were expressing interest in progressing new ideas (eg in the rat groups, deploying harbourage baiting techniques in difficult-to-manage areas, night-video proof of bait consumption from bait stations and neophobia). Developing ownership of the concept where participants work in true partnership with the change agency is the challenge. Many growers have assisted BSES with trial sites before, in a one-sided relationship in which BSES has taken over and done most or all of the relevant work. This cooperation by growers is appreciated and needs to be maintained for rigorous research efforts. However, there is an industry paradigm of ‘contracting-out’ any such work to BSES (ie “It’s the job of BSES, that’s why we pay a levy”). The aim of action-research is that growers would take a greater role in activities in order to facilitate more innovative and acceptable levels of change in practice. Action-research can be developed in situations where there is a thirst or desperate need to discover new management techniques. Certain situations currently exist in pest management that can be exploited (eg quantifying the effect of harbourage management and baiting strategies against rats). Much depends on the motivation of individuals to become involved, which is a function of need and their behaviour from past conditioning.

6.2 Perceptions

Effective participatory groups rely collectively on motivated growers and research and extension staff. If there is insufficient need then the groups will cease to function on that particular topic. Hence, particularly in the case of pest management, proactive efforts to address early stages of a pest outbreak can be met with limited enthusiasm and participation because people do not recognise a problem. This can be highly frustrating to research and extension staff attempting to avert a coming disaster. Similarly, staff who are not motivated to lead on an issue, even though there is a client interest, thwart progress on dealing with the problem in their district.

Early in the project, the concept of working in participatory groups was marginalised in BSES and even ridiculed by several extension practitioners. This could have been for several reasons:

- staff may have been possessive with clients, possibly claiming a form of ownership over them, and an external influence made them insecure;
- staff may have had limited confidence in the IPM coordinator personally, and did not want to jeopardise their relationship with their clients;
- there had been unsatisfactory experiences with other group exercises run by QDPI which were highly extractive and offered little back to growers;
- staff might not have perceived a need for pest management work with growers;
- most staff were not involved in the initial planning for the project and therefore felt the project was being imposed upon them. This needs to be changed with future RD&E project planning. The barriers between research and extension are being broken down towards a more seamless program delivery, but future cooperative project planning will assist further.

Groups can only be as good as the leaders, facilitators and participants working in those groups. Staff or even group participants can prosper and be more effective at these roles if they achieve appropriate training in group skills.

6.3 Navel gazing within groups

There is a risk that staff and growers working in groups can become introspective, and blind to what is happening in other areas. They can become accustomed to thinking that what they are doing or discussing in their group is best-practice management. Small group activities regularly need external challenge or introduction of ideas to avoid this trap. Outside guest speakers, trainers or facilitators (either from RD&E organisations or growers from other similar groups) can maintain the pattern of continuous learning. If external people can't be brought to the group, then the group can be taken to others (bus trips). Having a process model where external review is an annual or biannual event can also limit the risk of stagnation, by flagging issues that participants might have missed. This is an area where a deliberate, structured extension model departs from more *ad hoc* programs.

6.4 Resourcing

Many people envisage that working in groups is more resource-effective than one-to-one extension. On face value that is probably true, but good participatory group work requires significant time and resources in content and process preparation and delivery for each group activity. It requires a gathering and deployment of resource people for any single event (ie a facilitator, recorder, a specialist guest speaker or trainer etc.). Staff allotted to these programs, and even the groups themselves, need to have adequate financial resources to enable them to function effectively and achieve fulfilling outcomes.

6.5 Engaging clients in a passive manner

A danger with working in groups is that it is easy to slip back into a habit of engaging people in a passive nature. An example would be lecturing to them at meetings, trying to cover numerous subjects in a short period of time, and not allowing sufficient in-depth discussion for good learning to occur. There is a history of passive engagement of growers in the likes of shed meetings. To avoid slipping back into this paradigm, staff running activities could be critiqued by peers with specialist training in extension planning, group facilitation and adult-learning. This way, staff engage in a continuous learning process to increase their effectiveness.

6.6 Few groups can be expected to be autonomous

The self-motivated and self-directed group is usually the aspiration of facilitators. In reality, this rarely occurs and, if it does, can be difficult to maintain for long periods. Most of the groups under this project would not continue if leadership and facilitation from BSES, CPPBs or mills were removed. Staff who develop extension programs need to be aware that groups of growers are made up of people who each have different hopes and aspirations, various levels of individual farm-management skills, and unique interpersonal and social skills. If members are unaccustomed to meeting and working in a participatory manner, then they cannot be expected to be effective in groups immediately. The sugar industry has a history of passively engaging clients and it will take time for this

more interactive approach to be accepted by participants and staff. The skill of working in groups must be learnt either through experience or training. Skilled facilitators may have a greater chance of assisting groups to be more interactive and persistent. There is also the opportunity to provide group participants with formalised training to develop skills for more effective group functioning.

6.7 Not everyone likes working in groups, or can cope with change

It is well recognised with group dynamics that clients possess certain learning styles that influence their roles and level of participation in activities. The question is, do people have other innate or learned psychological persuasions that influence their ability to adjust to stresses in life or business?

Shrapnel and Davies (2000) quote psychiatric experience that suggests that people tend to fall into three major groups depending on their psychological resources.

- Group 1 consists of those who are able to cope despite adversity, because of underlying personality structure. They are self-aware and confident and possess a high measure of self-direction and cooperation. For this group, change is a challenge, which they are normally able to embrace effectively because they are predisposed to adapting and learning new ways. *These people are generally more effective in groups.*
- Group 2 have similar robust personality structures to Group 1 but, while normally able to cope, are temporarily emotionally incapacitated by virtue of a combination of severe stresses, eg illness, crop failure or death in the family. Change for this group is an extra stress that they find difficult to face up to in their vulnerable condition. Members of this group are temporarily low on psychological resources but will be capable of responding to the situation once their trauma has been dealt with. *These people may gain benefits from working in groups.*
- Group 3 represents those whose inherent psychological capacity is limited when it comes to coping with problems or change. They have a low measure of self-direction and cooperativeness and find it extremely difficult to effectively deal with other than routine challenges. Typically they are unable or unwilling to see the broader picture, are not open to learning new ways of approaching problems, and tend not to take responsibility for their difficulties, instead blaming external factors. *These people do not function well in groups.*

We could assume a similar distribution of behaviours among Queensland canegrowers, particularly in times of crisis (ie pest infestations, orange rust disease in the industry's dominant cane variety and low sugar prices).

Shrapnel and Davies believe that the absence of research into the role of personality has had two important implications for rural policy. The first is that State and Federal governments and RD&E organisations have assumed that the rural community is homogenous and a common set of assistance practices can be applied. The second is that, in implementing policies, it has been assumed that all individuals within a community are capable of changing their behaviour given the right circumstances. This thinking is flawed. Poor success rates in numerous programs have resulted in the growing recognition that there needs to be greater individual assessment within rural communities in order to better target government assistance.

This awareness then raises the following questions.

1. Can BSES make its participatory group extension methods more inclusive and effective for people with Group 2 or Group 3 behaviour?
2. Can we develop learnings with the Group 3 types through social development programs, or do we accept that those with the incapacity to change will disappear through natural attrition?
3. Is modern society impacting on the “community” in rural communities, and are those in Groups 2 and 3 suffering through decreased fellowship (eg in local sports clubs, Sunday church)? If they are, how do change agents recreate opportunities that provide empowerment and cross-pollination of ideas through personal interaction?

Even though participatory group methods are a very effective tool compared to a reliance on traditional extension techniques, they are not the panacea for the advancement of industry. The physical and technical issues relating to change are challenging enough. People are not homogenous in their coping or learning capacities. RD&E organisations need to consider this dimension in future research and extension planning.

7.0 RECOMMENDATIONS FOR FURTHER RD&E ACTIVITIES

There are seven main areas that require development for ongoing development of IPM in the Australian sugar industry.

7.1 Change in extension methodologies

To increase the adoption of more effective and sustainable pest management, extension methodologies, the sugar industry must continue to change from the classical technology-transfer model to interactive participatory small group approaches. This will allow local groups of growers to address endemic pest problems more effectively than they could through sporadic one-to-one approaches or larger passive forums. Interactive small group meetings have the potential to facilitate better learning and change in practice. Adopting a methodology based on the action-learning cycle will assist in adding rigour to this process. Failing to adhere to rigour in extension method, planning and techniques may spell the end of participatory small group activities in sugar in future years. IPM initiatives should be dovetailed with these groups. Local BSES and CPPB staff should be advised that IPM initiatives are priority issues that deserve attention even when symptoms of pest damage are not present.

7.2 Development of group and rural leadership skills

Group skills training can be targeted at three levels:

1. extension and research staff can develop or hone group facilitation, adult learning and extension planning skills through formal training accompanied by in-field experience;
2. motivated growers can learn special leadership skills to better assist their own groups. Numerous training avenues now exist for rural leaders to improve on these qualities and learn how to apply them for the greatest effect;
3. entire groups can participate in training that can assist individuals and the collective to be more understanding, tolerant of peers and cohesive, so that groups can be more

effective and sustainable in the longer term. This has been demonstrated in the Australian beef industry with the highly regarded '*Working in Groups*' program funded by the Meat Research Corporation.

7.3 Continued development and improvement of targeted IPM training programs on high priority pests

Targeted training programs are continuing with some pests. SRDC has given support to continue the successful *GrubPlan* program beyond 2002 through another project, *GrubPlan2*, to improve the risk assessment and management tools of the program and to attempt to develop a predictive capability for greyback management. BSES is also funding ongoing IPM extension on high priority pests (southern canegrubs, rats and feral pigs) via district productivity groups in affected areas. *Southern GrubPlan*, an IPM program targeting the six major southern canegrubs, will be commenced by BSES in September–October 2002. A future industry aim might be to develop a targeted industry-wide campaign on feral pig management in order to improve the management skills of growers. Feral pigs often rank as the third most significant pest in central and northern canegrowing regions. Considerable leverage and government support might be gained for such an initiative, because there would be additional environmental and human health benefits.

7.4 Funding for research into pest ecology and control measures

There are a number of gaps in treatment options for specific pests, eg soldier fly. Even where a range of options is available, eg greyback canegrub, or where pests are currently under good management, eg French's canegrub, research needs to continue on other management tactics including farming practices, biological control, and both synthetic and biological pesticides. A critical incident could eliminate any of the existing pesticides, while changes in farming systems may disrupt existing management programs. It cannot be assumed that a final solution will be reached for any of the current pest problems, and in fact the reverse is likely to be the case, that problems will continue to arise with both current and new pests.

7.5 Lobbying for changes to government policy

Developing policy formulation and lobbying skills within BSES will assist the sugar industry in engaging government more effectively on particular pest and environmental issues. Two that need to be addressed are:

1. regulations for monitoring and treatment of ground and climbing rats under the IPM strategy for managing rats in sugarcane. Both of these native species are protected under the Act. However, they also appear as secure species in QPWS documentation. The procedure for issuing permits covering research, monitoring, and damage mitigation purposes in sugarcane has been unwieldy and inconsistent across different departmental boundaries. Additionally, the timeliness of issue has been inadequate. There are grounds for significant development and improvement with QPWS on regulations governing these species;
2. the situation of feral pigs and their harbourage in state forest and national parklands adjoining sugarcane areas. There is a role for further developing mutually supportive programs between the sugar industry, DNR and QPWS in managing feral pigs in these areas. Parties are currently blaming each other for the problem and little progress is being made in sustained management of the pest. It would be far more constructive if the parties were working in concert in effective and coordinated management programs across regional boundaries. A nexus could be developed between environmental, human health and sugar industry needs to raise and initiate such a program.

There are current and future environmental issues relating to pesticide use in industry that will need to be addressed at a policy level. This policy development should have scientific input from a qualified RD&E organisation and not be left solely to agri-political bodies that may not understand the associated technical issues.

7.6 Funding for an industry weeds specialist

Industry-wide, weeds are a greater limitation to crop production than are pests. They also increase the prevalence of some pests, eg by increasing rodent fertility and fecundity and providing harbourage, and by enhancing the survival of first instar greyback canegrubs.

The position of a 'weeds specialist' would be to conduct coordinated weed management extension training and develop new weed management technologies in the Australian sugar industry. These technologies would incorporate herbicide research but would also include research into non-herbicide options such as hot water, steam, or gas-flame treatments and their incorporation into the cropping system. The aim would be to develop the world's best practice in effective and environmentally sound weed management.

7.7 Development of programs to engage growers with limited capacity to cope with change

Change in pest management or any other business operation will be severely hamstrung if a tier of potential clients is unable to cope. The issues flagged by Shrapnel and Davies (2000) may also be pertinent to the Queensland sugar industry. BSES currently does not have the skills to approach this issue as organisational resources stand. Massive change is about to be imposed upon participants in the sugar industry as a result of international market forces. For persons who do not have the underlying resources to cope with change, the burden will be difficult if not overwhelming. The implications of growers not adjusting to change could be:

1. many farms going out of production. This threatens the overall cane supply and turnover of some already marginal sugar mills. The maintenance of these processing units is integral to the maintenance of the employment and social fabric of much of the east coast of Queensland;
2. social problems with farmer depression and unemployment of farm-hands and associated industry workers, which may progress to substance abuse, domestic violence, family breakdown and rural suicide.

These points are major social and financial burdens to the community and there is ample evidence of similar situations associated with downturns in other rural industries. Hence, there is a window of opportunity for SRDC to sponsor the development of a program that might incorporate trained change-specialists and social counsellors, to work both individually and alongside local BSES, CPPB or mill staff. They would assist people in coping through the current dilemma and assist parties in making more effective decisions relating to their business and personal futures. Acting now and having the resources marshalled to use may be more productive than waiting for a wave of symptoms to appear that might be irreversible. The concept may sound radical and even alarmist, but the issue of managing change more effectively at the business and personal level must be addressed by this industry.

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