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SRDC Project Report BSS238 - Canegrowing and sustainability - A survey of Australian cane growers with particular reference to the Code of Practice for Sustainable Cane Growing in Queensland

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PROJECT REPORT
SRDC PROJECT BSS238
CANEGROWING AND SUSTAINABILITY
– A survey of Australian cane growers with particular reference to the Code of Practice for Sustainable Cane Growing in Queensland
by
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PR00004
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SUMMARY

In 1998, the *Code of Practice for Sustainable Cane Growing in Queensland* was provided to every Queensland canegrower. Developed by the industry and endorsed by the Queensland Minister for the Environment, this Code was one of the most significant signs of commitment to environmental management to be made by a rural industry. It also provided a means by which canegrowers could meet their obligations under the *Environmental Protection Act 1994*.

The New South Wales sugar industry has also been strongly proactive, in particular in the management of acid sulfate soils. The *Best Practice Guidelines for Acid Sulfate Soils* developed by that industry has gained considerable praise from all sectors of the community.

Questions are often raised as to how effective industry self-regulation is. In April/May 2000, a survey was undertaken to gauge how each of these guidelines was received by growers: the level of awareness, growers’ perceptions and whether farm practices reflected the recommendations. These findings will help set the direction of further extension activities in this project.

**Key Findings:**
- 79% of growers are aware of the Code of Practice.
- 62% of growers indicated that they have a copy of it.
- 85% of growers who have the Code consider it useful in making farm management decisions.
- Two-thirds of Queensland growers consider an industry Code to be a benefit.
- 95% of NSW growers consider it important to have best practice guidelines.
- Three-quarters of growers usually apply fertiliser below the surface.
- Irrigation scheduling is based mainly on crop condition, knowledge of the soil, water availability and weather.
- The use of evaporation mini-pans and moisture probes is low, even in the Burdekin where there had previously been a high use of mini-pans.
- Growers who have attended a chemical accreditation course are more likely to have good chemical storage practices and to triple rinse their chemical containers.
- Over 80% of growers maintain headlands by slashing, with less than 10% grading or cultivating headlands.
- Records are mainly kept for harvested yield, soil tests, fertiliser use and chemical use.
- Major environmental issues identified by growers were noxious weed and erosion and to a lesser degree water quality and soil quality. Fewer growers identified riparian zones and remnant vegetation as issues.
1.0 INTRODUCTION

The sustainable management of soil and water resources is crucial both for the productivity of sugarcane growing and for the protection of the environment. Canegrowers recognise the importance of maintaining the condition of the natural resource base for farm viability. Community concern over recent years has focused attention on the potential impacts of agricultural practices on the off-farm environment, particularly aquatic and marine ecosystems and regional biodiversity.

The Australian sugar industry has responded to these concerns by taking a proactive approach to environmental management. The *Code of Practice for Sustainable Cane Growing in Queensland* (CANEGROWERS, 1998) and the New South Wales (NSW) sugar industry’s *Best Practice Guidelines for Acid Sulfate Soils* are examples of the industry’s initiatives towards environmental management and self-regulation.

A survey of all cane farmers in Queensland and NSW was carried out in April 2000. The survey had several aims. Firstly, to benchmark awareness and opinions of the Queensland Code of Practice and the NSW Best Practice Guidelines. It also benchmarked current farming practices in relation to industry-accepted best practice, an indication of the level of adoption of the Code. Growers’ perceptions of environmental issues in cane farming areas were also sought. Additionally, the survey served as a prompter to cane farmers about the Code and Guidelines.

2.0 BACKGROUND

Sugar cane growing extends from Grafton in northern NSW some 2,100 km north to Mossman in far north Queensland. It has also recently commenced in the Ord River irrigation areas of northern Western Australia. Due to this wide geographical distribution, there is great variation in climate, soils and social pressures across the industry. Farms between Cardwell and Cairns experience the wettest climate in Australia (an average annual rainfall of 4,048 mm/yr in Tully) while farms in Wide Bay Burnett and in the Burdekin receive in the order of 1,100 mm rainfall/year.

Sugarcane production has been a part of the settlement of coastal Queensland and northern New South Wales for over 120 years. Today, almost 7,000 farming partnerships cultivate sugarcane on approximately 500,000 ha, supplying cane to 29 mills. Many of these farms are family enterprises. Farms vary in size, generally between 30 and 250 ha.

Today, the Australian community places increasing value on the natural environment. With rising awareness and understanding of the interactions between land management and natural ecosystems, farmers are expected to minimise adverse impacts on the natural resource base and the surrounding environment. The location of canegrowing regions along a narrow coastal strip adjacent to unique ecosystems including the Wet Tropics World Heritage Area and the Great Barrier Reef place the industry under particular scrutiny to minimise any risk of environmental harm. Growers recognise that the long-term viability of their farming enterprises is dependent on the condition of their soil and water resources. As many wish to pass their farms on to the next generation, the underlying concepts of sustainable development are already in place.
The industry has expressed a strong commitment to sustainable production. However, the Environmental Audit of the industry (GHD, 1996) identified a need for more information about environmental issues.

With the introduction of the *Environmental Protection Act 1994*, caring for the environment became a legal requirement, establishing for all Queenslanders a ‘duty of care’ to the environment. To meet this requirement, there was a need to define just what are ‘reasonable and practical measures to minimise risk of harm to the environment’ for an industry. Keen to avoid cumbersome environmental legislation as has been imposed on primary producers in Europe, Queensland’s farming groups advocated industry self-regulation. As a result, the *Environmental Protection Act 1994* makes provision for industries to develop Codes of Practice to be endorsed as subordinate legislation.

In 1995, CANEGROWERS and BSES initiated consultation towards the development of industry specific guidelines. Following substantial industry and government involvement, the *Code of Practice for Sustainable Cane Growing in Queensland* (‘the Code’) was endorsed in April 1998 by the Queensland Minister for the Environment. Although compliance with the Code is voluntary, demonstrated adoption of the recommendations of the Code will be a good first line of defence in the case of any legal action over farm activities.

One of the most important roles of the Code is in defining how cane growers can care for the environment while producing a profitable crop. It is now better understood that good farming practice can translate to good environmental management. The Code covers all aspects of farm management. Generally these are practices that good farmers are already employing or can readily adopt.

In New South Wales, the sugar industry has worked with growers, community groups and government agencies to develop *Best Practice Guidelines for Management of Acid Sulfate Soils* (NSW sugar industry, 2000) and farm management plans. This approach has seen a significant improvement in relations with the community and has been regarded as one of the most positive signs of affirmative environmental action to be made by a rural industry. By working with the community and government, the industry is able to address environmental concerns and ensure that cane farming can continue in harmony with the community and the environment.

Neither of these sets of recommendations represents simply added costs to growers. Many sustainable canegrowing practices offer not only environmental benefits but also financial or lifestyle incentives. Sustainable farming incorporates both economic and environmental sustainability. Nor are they an end-point, it is recognised that through research and innovation, farming practice undergoes constant refinement and improvement and therefore our definition of ‘best management practice’ will also change.

3.0 THE SURVEY

The survey was distributed by mail to all cane farmers along the eastern coast of Australia. The Queensland survey was modified a little to suit the NSW situation. The relatively new industry in Western Australia was not included in the study. In development of the survey form, input was sought from the project steering committee and several BSES and Cane Protection and Productivity Board (CPPB) extension officers.
located throughout the industry. The survey forms used for the Queensland and NSW sugar industries are shown in Appendices A and B.

The survey was completed and returned by 15.5% of growers, with respondents from all mill areas. This is regarded as a good response rate for a mail-out survey. A detailed explanation of the survey distribution, response rates and representativeness of respondents is provided in Appendix C. A thorough investigation of the patterns of response indicates that the results can be taken to be representative of the industry.

A discussion of answer rates is contained in Appendix D.

4.0 RESULTS

All survey responses were entered into a Microsoft® Access database for recording and analysis. The results of the survey are presented in two ways, for the whole of the industry as well as at district level. These districts, and the mill areas in each district, are shown in Table 1.

Table 1 Districts, and related mill areas, used as a basis for analysing survey results

<table>
<thead>
<tr>
<th>District</th>
<th>North</th>
<th>Herbert</th>
<th>Burdekin</th>
<th>Central</th>
<th>Southern</th>
<th>South-east Queensland</th>
<th>NSW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mill areas</td>
<td>Mossman</td>
<td>Macknade</td>
<td>Invicta</td>
<td>Proserpine</td>
<td>Fairymead</td>
<td>Moreton</td>
<td>Condong</td>
</tr>
<tr>
<td></td>
<td>Tableland</td>
<td>Victoria</td>
<td>Kalamia</td>
<td>Farleigh</td>
<td>Bingeria</td>
<td>Rocky Point</td>
<td>Broadwater</td>
</tr>
<tr>
<td></td>
<td>Mulgrave</td>
<td></td>
<td>Pioneer</td>
<td>Marian</td>
<td>Millaquin</td>
<td>Isis</td>
<td>Harwood</td>
</tr>
<tr>
<td></td>
<td>Babinda</td>
<td></td>
<td>Inkerman</td>
<td>Pleystowe</td>
<td>Racecourse</td>
<td>Maryborough</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mourilyan</td>
<td></td>
<td></td>
<td>Plane Creek</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>South Johnstone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tully</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Variations exist between regions in relation to the social, economic and environmental contexts in which cane farming takes place. To some extent, the grouping of mill areas on a district basis is a grouping of areas with similar characteristics, enabling comparisons between districts and between a district and the industry average.
4.1 Awareness and attitudes of Queensland canegrowers towards the Code of Practice

4.1.1 Awareness of the Code of Practice

The survey indicates widespread awareness among Queensland cane growers of the Code of Practice for Sustainable Cane Growing in Queensland, as shown in Figure 1. On average, 79% of canegrowers in Queensland are aware of the Code. This awareness is variable at district level, ranging from 69% in the Herbert to 90% in south-east Queensland.

Although 79% of growers are aware of the Code, there is not a corresponding rate of possession of the Code. An average of 62% of growers indicated that they have a copy of the Code of Practice (Figure 2), ranging from 51% in the Burdekin to 79% of growers in South-east Queensland. This result is despite all growers being sent a copy of the Code when it was launched in 1998. It may indicate that the Code is not highly valued by all cane farmers and may reflect the extent to which growers consider the Code to be a part, or not, of their farming enterprise. Alternatively, it may reflect on the mode of distribution (it was sent to growers with a June edition of the Australian Canegrower, a busy time for canegrowers with the start of the harvest season). In some cases, growers may be new to the industry or they may have recently taken over control of the farm and so have not received it. Additionally, 1998 was a very busy year with standover cane, rat damage and difficult weather conditions to contend with, possibly resulting in the Code being overlooked by some.

4.1.2 Agreement with the Code of Practice

Queensland growers were asked if they agree with the content of the Code of Practice. Figure 3 details the views expressed by all growers who answered this question. More than a third of respondents to this question either had not read the Code or did not know if they agreed with it. Half of the respondents partially agreed with it while 13%, completely agreed with Code. Few respondents (2%) indicated that they do not agree with the recommendations at all.

These results, however, differ when considered in terms of whether the respondents had
indicated at Question 2 (see survey form, Appendix A) that they have a copy of the Code. The large majority of growers who have the Code agree with it (Figure 4). As would be expected most growers who do not have a copy responded that they had not read it (Figure 5).

It is interesting to note that almost 20% of the respondents who indicated they do not have a copy of the Code provided an opinion on the content of the Code. If growers do not have a copy it is difficult to interpret the reality of their answers in relation to agreeing with its content. Perhaps they have seen it but no longer have a copy or perhaps they agree with the concept. Consequently, the results in Figure 4, while being based on the views of only 62% of the respondents (growers who have a copy), are more likely to reflect a reasoned opinion among cane farmers as to the content of the Code.

The survey results did not specifically ask the question whether or not people had read the Code. Having a copy of the Code does not necessarily mean it has been read. If those who do not have the Code were able to express an opinion about it, then it is also possible that the opinions expressed by those who do have a copy of the Code may not be based on having read the Code. Nevertheless, it is more likely that those who have the Code formed their opinions on the basis of having read it. The evidence that more people agree with the code than have a copy of it may be taken to indicate that the publicity and extension activities related to raising awareness and ownership of the Code have had a positive result. Further effort is needed to increase the number of growers reading (and adopting) the Code.

### 4.1.3 Usefulness of Code of Practice for farm management

A similar pattern of responses was seen for the question about the usefulness of the Code of Practice in making farm management decisions (Figures 6, 7 and 8). There is a marked difference between the views of those who do and those who do not have a copy of the Code. As with the question about the content of the Code, some of the people who do not have a copy were still willing to put forward an opinion.
In general, a third of growers do not know if the Code is useful in making farm management decisions. Growers who do not have a copy of the Code made the large majority of these “don’t know” responses. Only 7% of those who have a copy of the Code indicated a “don’t know” response compared with three-quarters of those who do not have a copy. Slightly more than half of all growers think that the Code is either somewhat or very useful for making farm management decisions. This indication of usefulness of the Code comprises 85% of the respondents who have the Code and 18% of those who do not. The proportion of growers who answered ‘not at all’ to this question remained similar, regardless whether they have a copy of the Code.

**Figure 6**

4.1.4 Usefulness of Code of Practice to the sugar industry

While there are varied opinions about the usefulness of the Code of Practice for making farm management decisions, there is general support for the notion of a Code of Practice for the industry. Growers were asked if they felt that having a Code of Practice for cane farming was a benefit, restriction or neither. These results are shown in Figure 9. Overall, two-thirds of growers thought it was a benefit, while 12% thought it was a restriction and 21% said it was neither. If growers have a copy of the Code they are more likely to consider it a benefit and less likely to think it is a restriction. Despite this, more than half of those growers who do not have a copy of the Code consider it to be a benefit. These results indicate that Queensland cane farmers consider it important to have industry guidelines for minimising the risk of harm to the environment and achieving sustainable canegrowing. A similar response was received from NSW growers as detailed below.
4.1.5 The Code of Practice and Environmental Protection

The **Code of Practice for Sustainable Cane Growing in Queensland** aims to assist farmers meet their ‘duty of care’ obligations under the *Environmental Protection Act (1994)*. That is, to take all reasonable measures to minimise the risk of harm to the environment. Growers were asked if they felt that the Code helped them understand how to achieve this. The response (Figure 10) indicates that Queensland cane farmers generally consider that the Code assists them in this regard. About a third of growers do not know if it assists while a small minority think it does not. The small proportion of growers who see the Code as unhelpful remains the same, whether or not they have a copy of the Code (Figures 11 and 12). As may be expected, a far greater proportion of those who do not have the Code indicated that they do not know whether it helps them in farm management (73%) whereas of those who have the Code, more than 80% see it as being of assistance. Interestingly, 20% of those who indicated they do not have a copy of the Code think it to be an aid in farm management.

![Figure 9: Usefulness of Code to Industry](image)

![Figure 10: Code Helps Growers Understand How to Minimise Risk of Environmental Harm](image)

4.2 Best Practice Guidelines for cane farming in NSW

The majority of NSW growers (95%) also think that it is important to have best practice guidelines. Two-thirds of NSW growers feel that the sugar industry should be responsible for developing these guidelines while the remainder think it would be important for the industry to do this together with government.

4.3 Farm practices
The survey contained thirteen questions about farm practices, including nutrition; water management; soil management; chemical use and storage; waste management; farm layout; and record keeping. These questions were to help gauge the attitudes to and adoption of the recommendations of the Code. Previous responses from focus groups with a few growers had indicated that while growers may agree with the recommendations (“it’s all common sense”), they may not have adopted them. The majority of these questions were the same on both the Queensland and NSW survey. The questions on irrigation were an exception, being replaced with drainage questions for NSW.

4.3.1 Nutrition

Two questions were asked on the topic of nutrition. These questions were the same on the Queensland and NSW surveys. One question related to the practices undertaken by farmers in determining how much fertiliser to use and the other was about the method of fertiliser application usually used on ratoons. Figures 13 to 20 show the percentage of growers, both overall and in each district, that use each of the methods identified in the question.

Overall, the three most often stated practices, in order, are ‘past experience’, ‘regular soil test results’ and ‘knowledge of that block’. ‘Past experience’ was identified among the top two practices in all districts, except Central where it is the fourth-most common practice. Similarly, ‘regular soil test results’ was identified among the top three practices in all districts, except NSW where it is the fourth-most common practice for determining the amount of fertiliser used.

The number of growers who have indicated that they use regular soil testing (69%) seems high. Figures from commercial soil testing laboratories indicate that one soil test is analysed for every 160 ha of caneland each year (Schroeder et al, 1998). Perhaps some are simply saying the ‘right thing’. Alternatively, the explanation may lie in the regularity of testing. A grower’s response that ‘regular soil test results are considered in deciding how much fertiliser to use’ may mean for some a regular soil test every crop cycle, while for others it may be used only occasionally or where a problem has been detected. A 1998 survey by the Mackay CPPB (Royal, 1998) indicated that, for growers in the central region, 57% soil test at the start of a crop cycle, 8% soil test if a problem appears, 29% soil test irregularly and 6% do not soil test at all. These figures match reasonably well with the response to this survey (82% of central region growers) – the regularity of soil testing being highly variable.
On average, the three least-used methods are ‘leaf tissue analysis’, ‘bit extra for peace of mind’ and ‘cost of fertiliser’. These are the same at district level, though the order differs in some districts from the overall average.
FACTORS INFLUENCING FERTILISER USE
(Burdekin)

% OF GROWERS

PRACTICE

Figure 16

FACTORS INFLUENCING FERTILISER USE
(Central)

% OF GROWERS

PRACTICE

Figure 17

FACTORS INFLUENCING FERTILISER USE
(Southern)

% OF GROWERS

PRACTICE

Figure 18
The survey also investigated the method of applying fertiliser - whether it is usually applied below the surface, on the surface or through fertigation. Overall and district results are shown in Figures 21 to 28. While most respondents indicated only their most commonly used method, as requested on the survey form, some indicated more than one method that they use. For this reason the results total more than 100%.
Three-quarters of growers usually apply fertiliser below the surface, a method that is generally regarded as the best practice. The extent to which subsurface application is used varies between districts from 98% in the Burdekin to 60% in the Central district and in the Herbert, subsurface application is less common than surface application.

Overall, a third of cane farmers apply fertiliser on the surface. This method is most commonly used in the Herbert where it is practised by 57% of growers. It is also a fairly common practice in the Central district where 50% of growers use this method. Farmers in the Northern and Southern districts are close to the overall average with 39% and 32%, respectively, using surface application of fertiliser. In NSW and South-east Queensland 15% and 13%, respectively, of cane farmers apply fertiliser on the surface, while only 2% of growers in the Burdekin use this method.

Climatic variations between districts could explain some of the patterns of fertiliser use. For example, over the 1998 season, regions from Sarina north experienced exceptionally wet conditions, which led to more growers applying fertiliser on the surface because soils were too wet for subsurface application. High rainfall and slow drainage in the Herbert may account in part for the relatively high rate of surface application due to the soils remaining wet for prolonged periods. Studies in the Herbert have indicated a high rate of leaching losses on some alluvial soils – broadcast and inter-row applications would likely further exaggerate such leaching losses on these soils.

Another influencing factor could be farm practices. The use of dunder and liquid one-shot in the Central district would likely account for this district’s high rate of surface application of fertiliser. In the Burdekin, where all farmers irrigate, predominantly with furrow irrigation, below surface fertiliser is particularly important to minimise fertiliser losses in run-off water. Burdekin growers clearly recognise the importance of sub-surface application and, with almost 100% using this method, are in line with the Code of Practice in relation to fertiliser application methods.

Fertigation is the practice of applying fertiliser through irrigation water and can be done through trickle or low pressure overhead systems. It is the least-used method of fertiliser application (2% of respondents). Not surprisingly it is not used in the Herbert, South-east Queensland and NSW where irrigation is uncommon. One percent of growers in the North and Burdekin districts and 2% of Central growers use fertigation. The higher adoption of fertigation (7% of growers) in the Southern district is likely linked to the higher usage of drip irrigation in this area.

More detailed information about the types of below surface and surface fertiliser application methods was also obtained. These results are shown in Figures 29 and 30.

Beside the stool is the most common method of applying fertiliser below the surface and split stool is fairly common in the Central and Burdekin districts. A small number of growers place their fertiliser in the centre of the inter-row. Where fertiliser is applied on the surface, methods are varied. Overall, approximately half of the people who use this method apply the fertiliser banded over the stool. However, there are variations between districts, ranging from 73% in the Central district to 4% in NSW. Again, the high rate in the Central district may be explained by the use of dunder and liquid one-shot. Slightly more than a quarter of growers applying fertiliser on the surface band it beside the stool.
Seventeen percent of growers applying fertiliser on the surface broadcast it. For both surface and sub-surface application, a small proportion of growers (3%) indicated that they apply fertilisers in the inter-row. This practice should be avoided because it leads to higher losses, and the plant does not access the nutrients well because root growth in the inter-row is limited. Losses from broadcast applications are also expected to be higher than from banding along or beside the stool.

Further investigation in each district is required to determine if the best possible practices for fertiliser application are being utilised by growers and to identify what programs/incentives are needed to achieve best practice. Fertiliser use surveys conducted by some CPPBs are valuable for this purpose.

4.3.2 Water management

Information obtained about water management on cane farms includes the number of growers who irrigate, the methods that are used to schedule irrigation and whether or not

![METHODS OF SUBSURFACE FERTILISER APPLICATION](image1)

![METHODS OF SURFACE FERTILISER APPLICATION](image2)
cane farmers have installed tailwater dams. The question about irrigation was only asked of Queensland growers because it was known that NSW cane farms are not irrigated. The tailwater question was asked of both Queensland and NSW growers. NSW growers were asked additional questions in relation to drainage management.

### 4.3.2.1 Irrigation

Figure 31 shows the percentage of growers who irrigate. In total, 65% of Queensland cane farmers indicated that they irrigate some or all of their crops. This is fairly consistent with other reports that indicate that 60% of total sugarcane production is dependent on some form of irrigation (Holden et al., 1998). The proportion of growers who irrigate varies between districts and ranges from 100% in the Burdekin to 8% in South-east Queensland.

Irrigation scheduling refers to the quantity and timing by which water is supplied to the plant’s root zone. In fully irrigated areas, growers can maximise crop production by scheduling irrigation to minimise water stress (Tilley and Chapman, 1999). In supplementary irrigation areas, scheduling helps to determine how best to use limited irrigation supplies through a season to minimise water stress to the plant. Farmers who irrigate use a variety of ways to schedule their irrigation as shown in Figure 32.

‘Crop condition’ is the most often used indicator to determine when to irrigate a crop, closely followed by ‘knowledge of farm soil’. For a bit less than half of irrigators, ‘availability of water’ is a deciding factor and about a third of irrigating cane farmers utilise ‘knowledge of local weather’. The use of physical measurements is fairly low. ‘Regular schedule/timing’ is used by slightly more than one-fifth of growers while ‘evaporation mini-pan’ and ‘soil probes/moisture sensors’ are used by 11% and 8% of
growers, respectively. A small number of growers (7%) use ‘stalk growth measurements’ to determine when to irrigate their cane.

Figures 33 to 38 shows the variation between districts in the rate of use of different methods for scheduling irrigation. These results are most useful to consider for the Burdekin, Central and Southern districts where most of the industry’s irrigation occurs.

In the Burdekin, the most commonly used method of scheduling irrigation is ‘knowledge of farm soil’. Central district growers indicated ‘crop condition’ and Southern district growers ‘availability of water’ as their main indicators influencing irrigation scheduling. Factors having least influence on irrigation decisions were ‘soil probes/moisture sensors’ in the Burdekin and ‘evaporation mini-pans’ in the south. Both of these factors as well as ‘stalk growth measurements’ were the least used in the Central district.

‘Crop condition’, one of the major factors used for scheduling irrigation, can be regarded as a visual assessment of the water requirement of a crop. In areas with limited irrigation water, this may be a reasonable basis for making irrigation decisions. However, water use efficiency and crop growth can generally be improved by the use of soil moisture or evaporation measurements to schedule irrigation. In particular, tensiometers are useful in determining the optimal time to recommence irrigation after rainfall events.

As stalk measurements are used to calibrate evaporation mini-pans, it is surprising to note the lower use of stalk measurements compared with mini-pans. Perhaps this indicates that growers are not continuing to calibrate their mini-pans. Alternatively, it may simply be that they assumed an affirmative response to the use of mini-pans would assume a corresponding use of stalk measurements. Another possible explanation may be that the stalk measurements to calibrate the mini-pan are performed by a BSES or CPPB extension officer for them.

The low use of evaporation mini-pans in supplementary irrigated areas such as Central and Southern districts is not surprising, because this form of scheduling is of little use where water supplies are limited due to the inability to meet crop demands. There have also been complications with using mini-pans in conjunction with the overhead irrigation systems that are common in these areas (Hardie et al., 2000).

However, the low use of evaporation mini-pans indicated by Burdekin growers is a surprise because it implies a significant decline from three years earlier. Holden and Mallon (1998) reported that in 1994-95, 70% of Burdekin River Irrigation Area (BRIA) growers and 4% of Delta growers utilised evaporation mini-pans. These figures increased to 83% of BRIA growers and 48% of Delta growers in 1996/97. So why is it that, despite a potential yield increase of 10-25% (Hardie et al, 2000) and a previous high rate of adoption, this survey indicates that Burdekin growers have stopped using evaporation mini-pans?
A few factors may contribute to this indicated decline in the use of evaporation mini-pans. One is the pattern of response to the survey. BSES extension staff have indicated that the greatest use of mini-pans currently is in the Invicta area, which are BRIA farms. However, the rate of return of survey forms from this area (6%) was the lowest in the state.
The highest rate of survey return from the Burdekin was from the Inkerman mill area. Inkerman and Kalamia farms, which also had a reasonable response rate, are predominantly in the Delta. Growers in the Delta area, which supports approximately 60% of the Burdekin cane supply, were indicated as lower users of mini-pans in the Holden and Mallon survey. This variability in survey return may account for some of the apparent loss of favour of mini-pans but not to the full extent.

Holden and Mallon’s survey was undertaken as a final stage in an intensive extension program promoting the use of irrigation scheduling. After this program ended, evaporation mini-pans were not promoted as heavily by extension staff. It appears that, even where a clear financial benefit has been demonstrated, growers will only continue to use this tool if it is continually promoted and supported by extension staff. Sutherland (pers. comm.) has suggested the need for tools such as mini-pans to be ‘championed’ by a local extension officer. He has indicated that in the Invicta mill area the CPPB officer has played this role in continuing to promote and service mini-pans. Sutherland believes that the rate of use of mini-pans is far higher in this mill area as a result. A part of this need for on-going support may be that some of the over 500 evaporation mini-pans provided to Burdekin growers have cracked and need replacement. The evaporation mini-pan is a simple tool constructed from a plastic 44 gallon drum, sawn in half, with a ruler attached, costing approximately $30. However, used drums are not readily available in the Burdekin and growers may simply see them as ‘too hard’ to replace. BSES has replaced approximately 30 drums for Burdekin growers.

Another plausible explanation may be that growers have used evaporation mini-pans for a few seasons to adjust their irrigation scheduling. After this time they may continue with the scheduling, without using the mini-pans to check. It should not be regarded from these conclusions that evaporation mini-pans are the only form of irrigation scheduling. In fact, tensiometers and neutron moisture probes are more effective in maximising water efficiency. However, the declining use of evaporation mini-pans has not been matched by a great increase in these other scheduling tools.

The declining use of evaporation mini-pans after the intensive extension program ceased, as indicated by these results, supports the need for on-going extension efforts in irrigation scheduling. Results from a survey currently underway for the Rural Water Use Efficiency Initiative will be able to test this theory. The Rural Water Use Efficiency Initiative supports irrigation extension officers throughout the state who will raise growers’ awareness and knowledge of the value and use of scheduling tools for irrigation. The question remains as to whether growers will continue to utilise these tools after the intensive extension program has ceased.

4.3.2.2 Tailwater dams/retention basins/artificial lagoons

Another water-related issue, not limited to irrigation, covered by the survey was whether
or not canegrowers have, or intend to have, tailwater dams/retention basins/artificial lagoons on their farm. Overall responses to this question are shown in Figure 39 with district level results shown in Figures 40 to 46.

Overall about a quarter of cane farmers have tailwater dams/retention basins/artificial lagoons to trap water from some or all of their farm. However, there are marked differences between districts with these structures more common in irrigation districts. Almost half of growers in the Burdekin and Southern district and a third of Central district growers have tailwater dams/retention basins/artificial lagoons. The slightly lower percentage of farms with these structures in the Central district may reflect the fact that not all farms in this district have irrigation, and where irrigation does exist it is supplementary only. The high value of the limited water supplies in the supplementary
irrigated Southern district may account for the high adoption of tailwater dams (47% of farms) in this area. In all other areas, the number of growers who have tailwater dams/retention basins/artificial lagoons is quite low, ranging from 4% in NSW to 14% in the Herbert.

It appears that growers see a relationship between the use of tailwater dams/retention basins/artificial lagoons and irrigation. Many respondents who answered no to this question often wrote on the survey form that the reason was because they did not irrigate. Further exploration of this issue provides meaningful results when considered in relation to whether or not respondents irrigate their crops (Figures 47 and 48).

Growers who irrigate are six times more likely to have a tailwater dam/retention basin/artificial lagoon than those who do not irrigate. Due to this relationship between these structures and irrigation, it appears that the other benefits of trapping runoff water, whether it be water from irrigation or rainfall, such as to trap sediment and nutrients, may not be widely understood.

Overall, 12% of respondents (both Queensland and NSW) did not answer this question (a high rate). Perhaps the wording of the question, ‘Do you have a tailwater dam/retention basin/artificial lagoon to catch run-off water so it can be stored/reused/filtered?’ and its positioning on the form after an irrigation question led growers to consider that the question was only related to those who irrigate. Alternatively, growers may consider that tailwater dams, retention basins and artificial lagoons are in fact only relevant for irrigators. There is a trend where if a high proportion of growers in a district have these dams then this question usually was answered. For example, in the districts where there are the most tailwater dams, the Burdekin and Southern districts, this question remained unanswered by only 1% and 2% of growers respectively. Where there is a low rate of having tailwater dams, such as the North and South-east Queensland, 27% and 32%, respectively, of growers did not answer this question. One anomaly in this pattern is in NSW where only 4% of growers have tailwater dams yet 95% of respondents answered this question.
It is possible that the low response rate to this question may indicate a reluctance to deal with the issue of tailwater dams in some areas, or that growers feel it is not relevant to them. It is plausible that this may mean that growers feel they should have a tailwater dam but do not and therefore are unwilling to say so.

This relationship between irrigation and tailwater dams, and the high rate of non-answering of this question in some areas, indicates that there is a need for further discussion and extension with growers on this issue. There may be a need for growers to receive further information about the multiple economic and environmental benefits of having a tailwater dam, retention basin or artificial lagoon.

### 4.3.2.3 Drain management in NSW

Due to the problem of acid sulfate soils in cane farming areas of NSW, drain maintenance is an issue that has received much attention over the past few years. The sugar industry in this area has developed best practice guidelines to address this issue. The guidelines were endorsed soon after this survey was undertaken. NSW growers were asked questions about their awareness and opinions of these guidelines. Information was also sought in relation to drain management practices.

95% of NSW cane farmers are aware of the *Best Practice Guidelines for Acid Sulfate Soils*. Figure 49 indicates the extent to which growers agree the recommended practices. One-third completely agree while nearly all others mostly agree with the recommendations. Only a small proportion of growers disagree with the content of the guidelines.

While growers generally agree with the drain management guidelines, the same proportion of growers do not think that a drainage management plan would be useful when cleaning drains (Figure 50). Almost one-third see such a plan as being not useful, while 22% ‘don’t know’. A bit less than half the growers would find a drainage management plan useful when cleaning drains. This result is not surprising as the majority of growers would have received at least an early draft of the ‘drain management guidelines’ but most would not yet have received their ‘drain management plan’ at the time of the survey.
Drain management practices

Growers were asked to identify which drain management practices they use in areas where there is potential acid sulfate soil (Figure 51). Thirteen percent said this question was not applicable to them. This means that potential acid sulfate soils are a consideration for almost all NSW cane farmers.

Almost three-quarters of growers do not deepen drains beyond the original depth and just over half apply lime to the spoil that is removed from the drains. Lime is also applied to the drain by just under a third of growers. When increasing the capacity of a drain, around a quarter of growers aim to achieve this through increasing the width rather than the depth. Soil tests are carried out before doing any works by a little more than 20% and just over 10% monitor the pH of the water in their drains.

Laser-grading and drainage

Laser-grading can assist the productivity of cane farming by improving drainage and removing low spots that can become waterlogged. It can be used in place of deep drains, reducing the risk of acid sulphate soil disturbance. A large proportion of NSW growers (78%) considers laser-grading to be a benefit. Twelve percent do not see it as a benefit while 10% are unsure. Figure 52 shows the extent to which farms have been laser-graded.
About a quarter of farms have had more than 75% of the area graded while less than 5% will not be graded at all. A third of growers intend to grade at least 25% of their farms and 10% will grade more than half. On less than 10% of farms laser-grading is considered uneconomical for most of the farm area.

A consequence of laser-grading can be that some drains, particularly smaller ones in the middle of blocks, are no longer required. Growers indicated that they have been able to reduce the number and size of drains on their farms (Figure 53). On more than half of the farms, the number of drains has been reduced as a result of them being completely filled in. Drains have been made shallower on a quarter of the farms, while on slightly more than a quarter, none have been filled as a result of laser-grading.

**Weed management in drains**

NSW growers were also asked about their weed management practices in drains. The various methods used are shown in Figure 54. Some growers use more than one method. Almost all growers practise chemical control of weeds in drains, many in combination with other techniques. About two-thirds use machinery. Just under a quarter use saltwater influx to control weeds and a few growers (4%) do so by planting trees to shade out weeds.

Either targeted (spot) spraying or blanket spraying is used for the chemical control of weeds. A few growers (Figure 55) use both techniques but the majority use spot spraying. Slightly more than a third of growers who use chemical control blanket spray.

Various types of machinery are used for mechanical weed control in drains (Figure 56). The most common is a slotted bucket (40%) while a weed rake and bucket are also used (each at 22%). The benefit of the slotted bucket and weed rake is that they cause the least soil disturbance. The category ‘other’ included a number of different types of machinery. About half of these were identified as a ‘drain spinner’, ‘mowing/slashing’ was also a common and a few growers use a ‘blade’. 
4.3.3 Soil and trash management

In the past, soil tillage was carried out far more frequently for weed control and to create a fine soil tilth. Reducing soil tillage is beneficial for soil structure and can represent a significant cost saving. It also reduces erosion hazard as freshly cultivated soils are at high risk of erosion. Cultivation in general has significantly reduced over recent years, most significantly with the adoption of green cane trash blanketing (GCTB) and herbicidal weed control. Under the GCTB system, cultivation is almost non-existent in ratoons. Plant cane now represents the highest risk period for erosion. Minimum tillage planting has been adopted in some areas. Cultivated fallows are being replaced by the use of spray out or cover crops.

In the main, almost three-quarters of cane farmers indicated that they carry out less cultivation now than they did 10 years ago, 10% work their land the same amount and 1% of growers cultivate more (Figure 57). Within the districts, the proportion of growers cultivating less ranges between 62% in the Southern district and 85% in the Burdekin. Growers working their land about the same amount ranges between 6% in the Central district and 17% in the Herbert. Only 1 or 2% of respondents indicated that they now cultivate more than they did 10 years ago.

An unexpectedly high number of growers (between 25% in the Southern district and 7% in the Burdekin) chose the ‘does not apply (cane farmer for less than 10 years)’ response to this question. This response rate appears too high to account for new growers, unfortunately it was not possible to obtain actual data about the percentage of new growers in the industry over the past 10 years. However, it may include growers who have taken over the farm from their parents. Perhaps also an unintended interpretation of the question may have led to some stating that it ‘does not apply’ because they were already using GCTB or other minimal tillage systems 10 years ago.
As would be expected, the survey indicates that trash management practices vary greatly between districts and also between fallow and ratoon crops. These variations take into account the vast differences that exist in cane growing areas in irrigation practices, climatic conditions and soil types.

Undisturbed trash blanket is the favoured management option in ratoon crops for the vast majority of growers, particularly those in the Herbert (94%), Central (72%) and Northern (56%) districts. However, very few growers in the Burdekin (4.5%) and NSW (7.9%) use this practice.

Burning cane and retaining tops is predominant in the Burdekin area, where it is practiced by about 70 per cent of growers for ratoon crops and 50 per cent of growers in fallow crops.

The practice of incorporating trash into the soil is carried out by a number of growers in all districts, particularly in fallow crops.

The practice of burning cane and tops is most prevalent in the Southern district and NSW. Only smaller numbers of growers in all districts centre-rip the trash blanket, mainly in ratoons.

A very small percentage of growers in the NSW and Southern districts rake and bale their trash for either removal or sale, usually as garden compost. Some NSW growers will have a new management option available to them from the start of the 2001 harvesting season, when both the billets and trash in some parts of the Condong mill area will be transported to the mill, where the trash will be separated and used for co-generation.

A number of growers commented that their trash management practices varied from year to year, depending on climatic and weather conditions. Several growers also indicated that they planted legume crops in fallow land or used chemicals to spray-out fallow before replanting. Only one respondent indicated that they did not fallow land.
CHANGES IN CULTIVATION PRACTICES IN PAST 10 YEARS

![Figure 57](image1)

![Figure 58](image2)

![Figure 59](image3)  
(Herbert)

![Figure 60](image4)  
(Burdekin)

![Figure 61](image5)  
(Central)

![Figure 62](image6)  
(Southern)

![Figure 63](image7)  
(South-east Qld)

![Figure 64](image8)  
(NSW)
Figure 65

Figure 66

Figure 67
4.3.4 Farm chemical use and storage

4.3.4.1 Chemical accreditation courses

The number of cane farmers who have attended a farm chemical accreditation course is shown in Table 2. On average, approximately three-quarters of cane farmers have attended a chemical course. Participation rates within districts range between 70% in the North to 90% in South-east Queensland.

Table 2 Participation in chemical accreditation courses

<table>
<thead>
<tr>
<th>District</th>
<th>Growers who have attended a farm chemical accreditation course</th>
</tr>
</thead>
<tbody>
<tr>
<td>North</td>
<td>70%</td>
</tr>
<tr>
<td>Herbert</td>
<td>74%</td>
</tr>
<tr>
<td>Burdekin</td>
<td>73%</td>
</tr>
<tr>
<td>Central</td>
<td>75%</td>
</tr>
<tr>
<td>Southern</td>
<td>72%</td>
</tr>
<tr>
<td>South-east</td>
<td>90%</td>
</tr>
<tr>
<td>Queensland</td>
<td></td>
</tr>
<tr>
<td>New South Wales</td>
<td>86%</td>
</tr>
<tr>
<td>Total</td>
<td>76%</td>
</tr>
</tbody>
</table>
4.3.4.2 Farm chemical use and handling practices

When applying farm chemicals, 90% or more of farmers read the label as well as take into account wind strength and direction and the possibility of rain (Figure 72). Almost 90% of growers regularly check their equipment and 76% wear safety gear. About half of farmers read the Material Safety Data Sheet (MSDS) and slightly more than a quarter notify neighbours when they are using chemicals.

At district level, the proportion of growers utilising each of these practices does not vary much from the overall average, except for the practice of notifying neighbours. On average 28% of growers notify neighbours when using chemicals, but this varies greatly between districts: 27% in the North, 48% in the Herbert, 44% in the Burdekin, 27% in Central, 19% in Southern, 13% in South-east Queensland and 23% in NSW. These figures are interesting as the communication with neighbours is greatest in areas which are predominantly sugarcane farms rather than in those areas where neighbours are less likely to be other cane farms.

The rate of adoption of these practices varies slightly in relation to whether or not growers have attended a chemical accreditation course (Figure 73 and 74). For all practices, if a cane farmer has not attended a chemical course they are less likely to have adopted recommended best practices for using and handling chemicals.
Notifying neighbours

Some comments from growers indicate that the low rate of neighbour notification could be because many farmers’ neighbours are also cane farmers. As the use of chemicals is a regular and expected part of growing cane, growers may not see any reason to notify their neighbours.

Notification may have been undertaken previously and therefore growers do not see the need to continue to do so. For example, in the Bundaberg region, negotiations between canegrowers and small crop farmers have resulted to an agreement by canegrowers not to utilise herbicides that impact on tomato crops. Because of this agreement, growers may see less need to notify neighbouring farmers before each spray operation.

It would be expected that in areas where only cane is grown there would be a low level of notifying neighbours and in areas where canegrowing is not the only land use, there would be more cause to notify neighbours. However, this is not the case. For example, in the Herbert and Burdekin districts, where canegrowing is the predominant land use, 48% and 45% of growers, respectively, notify their neighbours when using farm chemicals. Conversely, in South-east Queensland where, compared to other cane growing areas, there is a high population density and many non-cane growing land uses, only 13% of growers notify their neighbours. The variation in these results indicate that there may be several factors, likely to be district-specific, which influence whether or not a grower will notify their neighbours when using chemicals.

Wearing protective safety gear

While it is positive to see that 76% of growers wear safety gear while handling chemicals, it is concerning that the remaining quarter of growers risk their health by not taking protective precautions when handling and using farm chemicals. It may be useful to consider the role of chemical accreditation courses in influencing chemical use behaviour.

Looking at the wearing of safety gear from the perspective of whether or not a grower has attended a chemical course (Figure 75) indicates that those who have participated in a course are more likely to wear safety gear (79%) than those who have not (66%). The high use of safety gear for both course participants and non-participants indicates that people are learning about personal safety when using farm chemicals from areas other than the course.
Another factor in growers taking risks and not wearing protective safety gear when using chemicals could be related to the MSDS. The results indicate that only about half of growers read the MSDS. The importance of this information for managing risk when using chemicals may not be appreciated by some growers and could contribute to people not taking all possible precautions. Figure 76 shows the relationship between the wearing of safety gear and reading the MSDS. Of the growers who wear safety gear, a greater proportion read the MSDS compared to those who do not wear protective safety gear.

### 4.3.4.3 Chemical storage

The proportion of growers who follow recommended best practices for storing farm chemicals is shown in Figure 77. Overall, 74% of storage areas are well-ventilated, 50% are lockable, 71% are clear of flooding and 11% are bunded. The adoption of chemical storage best practices follows a similar pattern throughout the canegrowing districts. There are some variations from the average, as shown in Table 3. It appears that a large proportion of farmers are utilising best practice for some aspects of chemical storage, in particular, ventilation and being clear of flooding. These storages may be as simple as a meshed cage in a farm shed - sheds are generally located clear of flooding and are well ventilated.

Figure 78 investigates the value of chemical accreditation courses in improving chemical storage practices. As can be seen, attendance at a course does not necessarily lead to adoption of best chemical storage practices. However, as a general trend, a greater proportion of growers that have participated in a course have adopted these practices than those who have not. This is especially so in relation to bunding of storage areas where 92% of growers who have attended a
chemical course have a bunded storage area compared to 74% of those who have not attended the course. It is also evident that almost a quarter of growers who have not attended a chemical accreditation course are following recommended best practices in chemical storage. This may be due to the information provided in the accreditation course, or it may also partly be that those growers who take the time to attend such a course are also those more likely to adopt better practices. A combination of the two factors is likely to occur.

<table>
<thead>
<tr>
<th>Location</th>
<th>Well-ventilated</th>
<th>Lockable</th>
<th>Clear of flooding</th>
<th>Bunded</th>
</tr>
</thead>
<tbody>
<tr>
<td>North</td>
<td>75%</td>
<td>55%</td>
<td>79%</td>
<td>11%</td>
</tr>
<tr>
<td>Herbert</td>
<td>73%</td>
<td>45%</td>
<td>65%</td>
<td>11%</td>
</tr>
<tr>
<td>Burdekin</td>
<td>75%</td>
<td>47%</td>
<td>66%</td>
<td>11%</td>
</tr>
<tr>
<td>Central</td>
<td>72%</td>
<td>40%</td>
<td>71%</td>
<td>10%</td>
</tr>
<tr>
<td>Southern</td>
<td>75%</td>
<td>53%</td>
<td>70%</td>
<td>8%</td>
</tr>
<tr>
<td>South-east Qld</td>
<td>71%</td>
<td>56%</td>
<td>75%</td>
<td>12%</td>
</tr>
<tr>
<td>NSW</td>
<td>76%</td>
<td>62%</td>
<td>69%</td>
<td>13%</td>
</tr>
<tr>
<td>Total Area</td>
<td>72%</td>
<td>50%</td>
<td>71%</td>
<td>11%</td>
</tr>
</tbody>
</table>

Consideration of the extent to which storage areas are lockable and bunded may give a more realistic indication of the adoption of best practices for storing chemicals. That half of cane farmers’ chemical storage areas are lockable and just over 10% are bunded indicates that the commitment to best practice is more limited than indicated by the answers of ‘well-ventilated’ and ‘clear of flooding’. This could be because it costs money to ensure that a chemical storage area is lockable and bunded. The variation between rates of ‘lockable’ and ‘bunded’ could be interpreted to mean that efforts are made to protect human safety (the desire to ensure chemicals are locked and inaccessible) but less often to minimise environmental risk (bunding would contain a chemical spill which could contaminate soil and water). It could also be that it is simple to construct a lockable cage but it takes a little more effort to bund it.

4.3.5 Waste management

Growers were asked to identify how they dispose of various farm waste materials. The percentages of growers utilising each method are shown in Table 4. While this question was answered by 99% of respondents, all items were not always accounted for. That is, the disposal method for some of this waste material was left blank on the form and not identified in the category ‘other’. However, the majority of respondents answered most of the question. In some cases, more than one method was identified as a means of disposing of the various waste products.

Where possible, cane farmers reuse waste material on farm, however, there is variation in the types of items that are reused. Oil is the most common waste used in this way (by 43% of growers) and of the disposal methods identified, on-farm reuse is most often used for managing this waste. Approximately one-fifth of growers reuse items such as fertiliser
bags, tyres, scrap metal and chemical containers. There is no reuse value in items such as oil filters and batteries.

Table 4  Percentage of cane farmers using various waste disposal methods

<table>
<thead>
<tr>
<th></th>
<th>Tyres</th>
<th>Batteries</th>
<th>Oil</th>
<th>Oil filters</th>
<th>Scrap metal</th>
<th>Chemical containers</th>
<th>Fertiliser bags</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reuse on Farm</td>
<td>19%</td>
<td>2%</td>
<td>43%</td>
<td>0%</td>
<td>19%</td>
<td>17%</td>
<td>21%</td>
</tr>
<tr>
<td>Store on Farm</td>
<td>14%</td>
<td>11%</td>
<td>22%</td>
<td>6%</td>
<td>14%</td>
<td>9%</td>
<td>8%</td>
</tr>
<tr>
<td>Farm dump</td>
<td>6%</td>
<td>2%</td>
<td>2%</td>
<td>8%</td>
<td>4%</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Bury on farm</td>
<td>3%</td>
<td>1%</td>
<td>1%</td>
<td>5%</td>
<td>2%</td>
<td>2%</td>
<td>1%</td>
</tr>
<tr>
<td>Council landfills</td>
<td>25%</td>
<td>6%</td>
<td>3%</td>
<td>57%</td>
<td>8%</td>
<td>23%</td>
<td>10%</td>
</tr>
<tr>
<td>Recycling facilities</td>
<td>30%</td>
<td>72%</td>
<td>30%</td>
<td>15%</td>
<td>55%</td>
<td>51%</td>
<td>40%</td>
</tr>
</tbody>
</table>

Less than a quarter of farmers store any of these waste products on their farm, while less than 10% dispose of these materials in either a farm dump or by burying. Council landfills are a common means of disposing of waste, especially oil filters (used of 57% of growers), tyres (25%) and chemical containers (23%).

Recycling of materials is, overall, the most common method used by cane farmers to manage their farm waste. Almost three-quarters of growers dispose of batteries through recycling facilities, half of the scrap metal and chemical containers are recycled and 40% of fertiliser bags are recycled. This high rate of recycling for some items indicates that where facilities are available it is the preferred method of disposal. The situation is expected to improve with the increasing involvement of local councils in programs such as ‘DrumMUSTER’ to assist landholders to dispose of chemical containers.

Growers were also asked how often they triple-rinse their chemical containers. Triple rinsing is required before chemical drums will be accepted for recycling. These results are shown in Figure 79. Overall, 80% of growers always triple-rinse their chemical containers. At district level, the proportion of growers who always use this recommended practice ranges from 87% in the Central district to 71% in South-east Queensland. On average, another 14% usually triple-rinse their chemical containers and 1% never do.

Growers who have participated in a chemical
accreditation course more often responded that they triple-rinse their chemical containers (Figures 80 and 81). This indicates that involvement in such courses where growers are exposed to information on best practice farming can result in better environmental and safety outcomes.

![Figure 80](image1.png)

![Figure 81](image2.png)

### 4.3.6 Farm layout

#### 4.3.6.1 Farm plans

On average, 62% of cane farmers have a farm management plan (Figure 82). This proportion does not vary greatly between districts, ranging from 56% in South-east Queensland to 69% in NSW. The majority of farmers who indicated that they have a farm management plan do use it for farm planning. Only 2% of growers with a farm plan indicated that they do not use it.

![Figure 82](image3.png)
4.3.6.2 Headland maintenance

Headlands, the farm access roads, can play an important role in sediment movement from a farm. Erosion from bare or highly disturbed headlands can be a major source of sediment loss. Maintained grassed and slashed, they can act as filters, trapping sediment from run-off water and protecting the headlands themselves from erosion. In some areas, minor headlands are combined with drains as wide, grassy swales. The shoulder of these drains is generally used as the traffic zone. Slashing is important to keep grass growth low and stop grasses going to seed which would provide feed for rats. In areas where soils stay wet for prolonged periods, slashing of headlands can be difficult.

Information shown in Figures 83 to 90 details how cane farmers maintain their headlands. Some farmers use more than one method. The most common method is to slash, which is practised by 96% of growers. A similar rate is found in each district. The greatest number of growers who use slashing to maintain headlands is 99% of farmers in the Burdekin and lowest rates of 90% occurs in the Southern district. The second most often used technique is to spray headlands, which is done by 15% of growers. The district where this is most often practised is South-east Queensland (32% of growers) and it is used the least in the Burdekin and Central districts (11%). A small proportion of growers grade their headlands (on average 9%) ranging from 5% in the North to 13% of growers in South-east Queensland. A very small percentage of growers (less than 2%) cultivate their headlands and less than 1% do no maintenance at all.

![Figure 83](image1)

**Figure 83**

![Figure 84](image2)

**Figure 84**

![Figure 85](image3)

**Figure 85**
4.3.7 Record keeping

Keeping records of farm activities can assist in making farm management decisions. Rather than relying on memory, keeping records can be a useful tool for maximising efficiencies in farming. They can also assist in minimising the risk of harm to the environment.

Figure 91 shows the extent to which growers keep records of various farm activities. It should be noted that this question does not ask how readily the records can be retrieved or whether they are in fact used in making farm decisions. It simply asks if records, of some form, are kept.
Records that are most often kept are those of activities that relate directly to the inputs and outputs of the farming enterprise, in particular the harvested crop yield and the nutrients and chemicals applied. These are the simplest records to keep and are also likely to be perceived to be the most directly related to farm profitability.

These most commonly kept records can also assist in making farm management decisions which minimise the risk of harm to the environment. For example, a record of soil test results and nutrient inputs over several years can be invaluable when determining a suitable fertiliser rate (Figure 13). While this would lead to economic efficiencies there are also environmental benefits. It means that the chances of excess nutrients moving off-farm are being minimised and would therefore be reducing any potential harm to the environment.

The low percentage of growers keeping records for some farm activities does not necessarily indicate that risks are being taken in relation to these activities. These results are an average of responses from growers throughout the canegrowing areas of the east coast. While some activities are relevant to all farmers, some are not. For example, water use would only have relevance for 65% of the cane farming population, that is, those who irrigate. Similarly, keeping records of the pH in high risk acid sulfate soils would not be relevant to all cane farmers.

However, for some of the other activities for which a low proportion of growers keep records there are implications for managing the risk of harm to the environment. The number of growers who keep records of pest populations is also quite low (12% of growers). In contrast, many (60%) kept records of chemical use. As the question did not specify which chemicals are recorded, it is not possible to distinguish between chemicals used for weed control or control of other pests. It is unlikely that the small number of people keeping records of pest populations are the only farmers using chemicals to control pests. This implies that chemicals are possibly being used with limited knowledge of the extent of a problem. Monitoring pest populations, combined with knowledge of the pest’s biology, is critical for the strategic use of baits in an integrated pest management (IPM)
program. Monitoring and keeping records of pest populations are therefore important for effective, sustainable and economic pesticide usage. In some cases, pest monitoring may be undertaken by the CPPB, thus partly explaining the low rate of records of pest populations. However, it is generally valuable for growers to commence their own monitoring activities. With such a low rate of recording of pest populations, it could be regarded that pest control chemicals are being used as insurance rather than in response to a well understood pest problem.

This has implications for both the economics of farming and the environment. If there is a lack of understanding of pest populations this could result in pest control chemicals being used incorrectly. This could mean that money is spent and chemicals put into the farm and surrounding environment without any benefit. If a grower is to maximise economic returns and minimise the risk of harm to the environment, it is important that decisions are made with the most available information.

4.4 The environment in cane farming areas

Growers were asked to identify environmental issues that they consider to be of concern in their area and also to indicate if these issues affect their farm. They were also asked if they would like assistance in dealing with any of these issues.

4.4.1 Perceived environmental issues

The extents to which environmental issues are of concern to cane growers are shown in Figure 92. Overall, noxious weeds have been identified (by 73% of growers) as the issue of greatest concern. Remnant vegetation is the environmental issue of least concern to canegrowers (identified by 16%).

![Figure 92](image)

The perceived importance of each of these issues varies between districts, as shown in Figure 93.
As can be seen from the district responses, noxious weeds are considered the most important environmental issue in each district, except for the Burdekin and NSW where water quality is considered to be the greatest concern. It is likely that the concern over water quality in NSW may be attributed to the intense activities underway to raise awareness of acid sulfate soils. In the Burdekin, recent activities related to nitrates in groundwater may have been at least partly responsible for the recognition of water quality issues in this area.

When asked if these local area, environmental issues affected their farm, 69% of growers said they did, 26% said they did not and 5% did not know. The percentage of farmers who identified environmental issues affecting their farm is shown in Figure 94. More than a third of farms identified noxious weeds as an issue while erosion is a concern on a quarter of cane farms. Water quality and soil quality were of concern to a little less than 20% of cane farmers. Slightly more than 10% of farmers have concern about riparian zones on their farm and remnant vegetation is an issue on 5% of farms. Within the districts, there are variations as to the degree to which these issues affect farms, as shown in Figure 95.
In the northern district, less than 10% of growers consider that their farms are affected by any of these issues. Noxious weeds and erosion are more of a concern than the other issues. Water quality is the issue of least concern. In the Herbert, almost half of the growers considered noxious weeds, and a quarter erosion, to be affecting their farms. Riparian vegetation is also an issue of concern to some farmers (16%) in this area. In the Burdekin, water quality is the most important environmental issue (identified by a third of growers) and second to this is noxious weeds. Erosion and noxious weeds affect 36% and 34% of farms, respectively, in the Central district. In the Southern district, almost a third of growers are concerned about noxious weeds on their farm while water quality is an issue for almost a quarter. Similarly, noxious weeds followed by water quality are the most important environmental issues for growers in South-east Queensland. In NSW, water quality is the greatest concern, followed by noxious weeds and soil quality. In all districts except the North, remnant vegetation is the environmental issue of least concern to cane farmers.

### 4.4.2 Desire for assistance with environmental issues

While almost 70% of farmers indicated that their farms were affected by a range of environmental issues, only 32% say they would like assistance in dealing with these issues. Fifty eight per cent said they would not like assistance while 10% did not know (Figure 96). Noxious weeds is the environmental issue where the most assistance is requested, though even this is only by 12% of growers. Less than 2% of growers would like assistance in dealing with remnant vegetation.

The desire for assistance in dealing with environmental issues varies between
districts (Figure 97) and does not necessarily correlate with where there are perceived issues. In South-east Queensland, virtually no growers indicated a desire for assistance in dealing for any issue while in the Herbert growers would like help mainly in dealing with noxious weeds but also with erosion and riparian zones. The requirements of the other districts are indicated in Figure 90.

5.0 CONCLUSIONS

This survey has provided a considerable wealth of information about how canegrowers view environmental issues and industry self-regulation, and about their farm management practices. The responses about farming practices, particularly at a district level, provide valuable information for extension staff and funding agencies in planning future extension activities, and for the industry in benchmarking its current performance.

The level of awareness of the Code of Practice among Queensland growers and the Best Practice Guidelines in New South Wales is encouraging. Further extension efforts are needed to raise the rate of possession, readership and adoption of the Code. Training courses, such as the chemical accreditation course, appear to be beneficial in raising the implementation of best practices. The responses to the irrigation scheduling questions highlight the need for extension support to be on-going.

6.0 REFERENCES


7.0 ACKNOWLEDGEMENTS

This survey was undertaken as a part of an SRDC funded project ‘BS 238: Raising Awareness and Adoption of Sustainable Cane Growing Practices’. A steering committee comprising Queensland and NSW canegrowers and representatives of CANEGROWERS, SRDC, BSES, CPPBs and the Queensland Environment Protection Agency provides input to and direction of the project activities.

The authors are grateful to steering committee members and staff of BSES, CPPBs and CANEGROWERS for their assistance with this survey.


APPENDIX A
QLD SURVEY
20 March, 2000

DEAR CANE GROWER,

Growing cane depends on healthy natural resources. The quality of soil and water can be maintained or improved with good farm management practices. To assist growers in achieving the best management on their farm, and to meet their obligations under the Environmental Protection Act (1994), the sugar industry developed and distributed the Code of Practice for Sustainable Cane Growing in Queensland. The Code acknowledges that good farming practice is also good environmental management.

To support growers in the adoption of the Code, a SRDC-funded project is underway. The aim of this project is to assist growers in achieving good environmental management on their farms. To provide you with an opportunity for involvement in this project, a survey has been developed by growers and other industry representatives. The information you provide on the attached form will help direct future extension activities to meet the needs of growers in achieving best practice cane farming.

WIN A PRIZE FOR TAKING PART!

As a thanks for returning the survey, you will be entered into a draw for some great prizes: a trip to the Great Barrier Reef with airfares and accommodation at Airlie Beach; soil tests; the computer program CANEMAN; a chemical accreditation course; a soil and water testing kit; and, a triple-rinse-gun (your chance to win a prize depends on returning the survey, not how you answer the questions). To be entered in the prize-draw, return your survey by 30 April.

Help your industry by completing the survey (and competition entry form) and return it to BSES. The return address for the survey is pre-printed on the back of the form and a stamp is not required - just fold, staple and post. Good luck in the competition and thanks for participating.

Yours sincerely,

Christina O'Grady, Code of Practice Project Officer

Thanks to our sponsors for providing the great prizes:

If you have any queries, contact Christina O'Grady or Ingrid Christiansen at BSES on 07–49545100

Information provided in this survey is confidential and individual responses will not be identified when analysing the results. Feel free to make comments in relation to any of these issues, either on the form or attach additional pages. Return the survey by 30 APRIL to be in the prize-draw.

Your mill area: ..................................................

.............................................................. Farm size:

..............................................................
CODE OF PRACTICE
1. Before receiving this survey, did you know of the Code of Sustainable Cane Growing in Queensland? yes no

2. Do you have a copy of the Code of Practice? yes no

3. Do you agree with the recommendations completely partially in the Code? (✓ only one) not at all don’t know haven’t read

4. How useful is the Code when making farm management decisions? very somewhat (✓ only one) not at all (✓ only one) don’t know

5. Do you think having a Code of Practice for restriction cane farming is: (✓ only one) a benefit neither

NUTRITION
(see Section 2.3 on p.12 of the Code)

6. When applying fertiliser to your crop, which of the following factors influence how much you use? (✓ all that apply to your situation)
   regular soil test results
   fallow treatment
   use of mill mud, ash or dunder
   extension advice
   advice from fertiliser supplier
   leaf tissue analysis

7. How do you usually apply fertiliser to your ratoons? (✓ only one)
   below surface: ○ split stool ○ beside stool ○ inter-row centre
   surface applied: ○ banded over stool ○ banded beside stool ○ banded in inter-row ○ broadcast
   fertigation (fertilise through trickle or low pressure overhead irrigation)
   other (please describe)

WATER MANAGEMENT
(see Sections 1.4 on p.8 and 2.4 on p.15 of the Code)

8. Do you schedule your irrigation by using:
   (✓ all that apply to your situation)
   not applicable - do not irrigate
   knowledge of farm soil
   knowledge of local weather
   crop condition
   stalk growth measurements
   evaporation mini-pans
   soil probes/moisture sensors
   regular schedule/timing
   availability of water
   other (please describe)

9. Do you have a tailwater dam/retention basin/artificial lagoon to catch run-off water so it can
be stored/re-used/filtered?  (✓ only one)
yes (all blocks)
yes (some blocks)
have one/some , plan to have more
plan to have one/some
no
not possible because

SOIL MANAGEMENT
(see Section 2.3 on p.12 of the Code)

10. How does the number of less than
    cultivations you usually do the same
    per crop cycle compare with more than
    the number you did 10 years does not apply
    ago? (✓ only one) (cane farmer for
    less than 10 yrs)

11. How do you usually manage your trash? (indicate the approx. % of crop area)
    raton crop fallow
    ..... % ..... % undisturbed trash
    blanket
    ..... % ..... % rake trash from stool
    ..... % ..... % centre rip, trash
    blanket
    ..... % ..... % rake - bale to
    remove/sell
    ..... % ..... % incorporate trash into
    soil
    ..... % ..... % cut green, burn trash
    ..... % ..... % burn cane, retain
    tops
    ..... % ..... % burn cane, burn tops
    ..... % ..... % other (please describe)

CHEMICAL USE AND STORAGE
(see Section 2.9 on p.19 of the Code)

12. Have you attended a farm chemical course? yes  no
    ↓
    How was it useful?

13. Is your chemical storage area:
    (✓ all that apply to your situation)
    well-ventilated
    lockable/child-proof
    clear of potential flooding
    surrounded by a bund to contain spills
    do not store chemicals (only buy
    amount
    needed at time of use)

14. When applying farm chemicals do you:
    (✓ all that apply to you)
    read labels
    read Material Safety Data Sheet
    regularly check equipment
    wear protective safety gear
    take account of wind direction
    take account of wind strength
    take account of possibility of rain
    notify neighbours
    other (please describe)

WASTE MANAGEMENT
(see Section 2.10 on p.21 of the Code)

15. Do you triple rinse
    always
    all your chemical usually
    containers?
sometimes
    never

16. How do you dispose of farm waste material?
    (✓ the boxes that apply to you)
<table>
<thead>
<tr>
<th></th>
<th>tyres</th>
<th>batteries</th>
<th>oil</th>
<th>oil filters</th>
<th>scrap metal</th>
<th>chemical container</th>
<th>fertiliser bags</th>
</tr>
</thead>
<tbody>
<tr>
<td>re-use on farm</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>store on farm</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>on-farm dump</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>bury on farm</td>
<td></td>
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<tr>
<td>council landfills</td>
<td></td>
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<td></td>
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<tr>
<td>recycling facilities</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
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<tr>
<td>other: (please describe below)</td>
<td></td>
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<tr>
<td>other: .........................................................</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**FARM LAYOUT** *(see Section 1.2 on p.7 of the Code)*

17. Do you have a farm management plan?
   - yes
   - no

   Do you use it for farm planning?
   - yes
   - sometimes
   - no

18. How do you maintain your headlands? *(✓ only one)*
   - slash (grass)
   - spray (bare)
   - grade
   - cultivate
   - no maintenance
   - other (please describe)

**RECORD KEEPING** *(see Section 2.11 on p.21 of the Code)*

19. What farm activities do you keep records of:
   - ✓ all that apply to you
   - soil test results
   - fertiliser use
   - other inputs (eg. mill mud)
   - chemical use and conditions
   - water use
   - pH in high risk acid sulfate soils
   - water quality
   - ground water levels
   - pest populations
   - farm activities (eg. drain cleaning)
   - tonnage harvested
   - other (please describe)

20. Are any of the following environmental issues a concern in your local area? *(✓ the ones that apply)*
   - water quality
   - soil quality
   - erosion
   - noxious weeds
   - riparian zones
   - remnant vegetation
   - other (please specify)

   ..............................................................

21. Do any of the issues from Q. 20 affect your farm?
   - yes (please identify which one(s))

   ..............................................................
   - no
   - don’t know

22. Would you like assistance in dealing with any of the issues from Q.20?
   - yes (please identify which one(s))

   ..............................................................
   - no
   - don’t know

23. Does the Code of Practice for Sustainable Cane Growing in Queensland help you understand how to minimise the risk of harm to the environment when growing cane?
   - yes
   - no
   - don’t know

24. Do you understand your obligations under the Environmental Protection Act?
   - completely
   - mostly
   - partially
   - a little
   - not at all
25. What suggestions do you have for improving the Code of Practice for Sustainable Cane Growing in Queensland? (please attach another page if space is not enough)

……………………………………………………………………………………………………………………………………………………………………………………………………
……………………………………………………………………………………………………………………………………………………………………………………………………
……………………………………………………………………………………………………………………………………………………………………………………………………

26. What other comments would you like to make? (please attach another page if space is not enough)

……………………………………………………………………………………………………………………………………………………………………………………………………
……………………………………………………………………………………………………………………………………………………………………………………………………
……………………………………………………………………………………………………………………………………………………………………………………………………

Thank you for participating - your contributions will be valuable to achieving best practice cane farming.

SURVEY COMPETITION - Prizes to be drawn on May 22, 2000

Fill in your details overleaf (the competition entry form will be removed from the questionnaire and individual responses will not be identified in the results) and return the form by April 30 to be in the running for one of these great prizes:

- a trip to the Great Barrier Reef and accommodation at Airlie Beach (courtesy of Fantasea Cruises, Whitsunday Wanderers Resort and Sunstate Airlines)
- soil tests (courtesy of PIVOT)
- the farm management computer program CANEMAN
- a chemical accreditation course
- a soil and water kit to test for pH and salinity/conductivity
- a triple-rinse-gun for cleaning chemical containers

Terms and conditions as defined by prize sponsors will apply.

[___] STAPLE HERE
To return your completed survey: remove the cover letter, fold and staple where indicated, and put it in the post – a stamp is not required and the return address is printed for you.
NAME:  ………………………………………………………
ADDRESS: …………………………………………………

……………………………………………………
TELEPHONE: …………………………………………………

Don’t forget – to have a chance at winning a prize, return this form by 30th April.
APPENDIX B
NSW SURVEY
DEAR CANE GROWER,

Growing cane depends on healthy natural resources. The quality of soil and water can be maintained or improved with good farm management practices. Guidelines have been developed by the sugar industry in New South Wales and Queensland which demonstrate that good farming practice is also good environmental management.

Your industry is committed to a proactive approach to achieving best practice for environmentally sound, profitable sugar cane production. To help this, a new SRDC-funded project aims to support growers in achieving good environmental management on their farms. To provide you with an opportunity for involvement in this project, a survey has been developed by growers from NSW and Queensland as well as other industry representatives. The information you provide on the attached form will help direct extension activities.

WIN A PRIZE FOR TAKING PART!

As a thanks for returning the questionnaire, you will be entered into a draw for some great prizes: a trip to the Great Barrier Reef with airfares and accommodation at Airlie Beach; soil tests; the computer program CANEMAN; a chemical accreditation course; a soil and water testing kit; and, a chemical container triple-rinse-gun (your chance to win a prize depends on returning the questionnaire, not how you answer the questions). To be entered in the prize-draw, return your survey by 12 May.

Help your industry by completing the questionnaire (and competition entry form) and return it to BSES. The return address for the survey is pre-printed on the back of the form and a stamp is not required - just fold, staple and post. Good luck in the competition and thank you for participating.

Yours sincerely,

Christina O'Grady
Project Officer, BSES

Thanks to our sponsors for providing the great prizes:

If you have any queries, contact Christina O’Grady or Ingrid Christiansen at BSES on 07–49545100
INSERT NSW SURVEY FORM
1.0 SURVEY DISTRIBUTION AND RESPONSE

With the assistance of Cane Protection and Productivity Boards, CANEGROWERS and BSES district offices, surveys were distributed to all cane farmers throughout Queensland and New South Wales. The pattern of distribution is shown in Figure 1. The proportion of surveys distributed in each district reflects the number of cane farmers in those areas. Surveys were returned from all mill areas in all canegrowing districts. The responses from each district, as a proportion of the total returned, are shown in Figure 2.

Generally, the proportion of responses is similar to the proportion of growers in each district. However, there is some variation between districts in relation to representation within the responses. The proportion of responses from the North, Herbert and Burdekin districts is less than the proportion of growers in those areas, with the North showing the greatest variation of this type. In contrast, the proportion of responses from South-east Queensland and NSW is greater than the proportion of growers in those districts. In the Southern and Central districts, the proportion of responses is the same as the proportion of growers.

![Figure 1: Proportion of surveys distributed in each canegrowing district.](image1)

![Figure 2: Proportion of surveys returned from each canegrowing district.](image2)
2.0 RESPONSE RATES

This variation between districts in relation to the number of surveys distributed and returned produces different response rates throughout the survey area, as shown in Figure 3. Overall, 15.5% of people receiving the survey returned it. Response rates in the districts range between 12.4% in the North and 25% of growers in NSW.

Figure 3: Total and district response rates

Response rates also vary between mill areas as shown in Figure 4. In the North, the average response rate is 12.4% but range from 7% in Tully to 22% in Mulgrave. Similarly in the Burdekin, with a district average of 13.2%, response rates range from 6% in Invicta mill area to 17.5% in Inkerman. Due to the variation between mill areas, the survey information has not been analysed to this level. The results have been grouped to give district averages.

These variations in response rates may be a reflection of the situation in each area. The high response rates in South-east Queensland, NSW and Mulgrave may reflect a different level of awareness/interest in environmental management in these areas where sugarcane is not the predominant land use, population densities are high and the sugar industry is not the mainstay of the local economy. The acid sulfate soil management program in NSW may have stimulated greater interest in and acceptance of environmental issues.
FIGURE 4: Response rates in mill areas and districts.
3.0 REPRESENTATIVENESS OF RESPONDENTS

3.1 Potential bias in the results

In a mail out survey there are likely to be biases. Some issues to consider relate to literacy and language. It is known that adult literacy rates in Australia are below 100% so a written survey may exclude that part of the population with poor literacy skills. In addition to this, the ethnic diversity within the sugar industry means that for some growers the language of the survey, English, is a second language in which they may not be proficient. To minimise the effects of language and literacy on the survey results, most questions did not require written answers, just the ticking of a box. This system of obtaining answers would have enabled people uncomfortable with providing written answers to respond. Furthermore, on some of the surveys that were returned it could be seen that more than one person had completed the form. In some cases the more extensive written responses were in a different handwriting. This indicates that where literacy may have been a problem, other family members became involved in completing the form. This, together with the design of the survey would reduce possible biases in the results stemming from literacy and language problems.

Another possible bias is that respondents may only be that part of the population who have an interest in the issue to be investigated. Responses may be from those who are either strongly in support of or strongly opposed to an issue. Conducting a prize-draw to encourage return of the survey would have helped to reduce this bias. While this in itself could produce a bias whereby those interested to win a prize may be inclined to respond, this is less compromising of the results because the motivation to win a prize is not directly related to the content of the survey.

It is unlikely that the results of this survey are strongly affected by bias. The responses have been tested for randomness and found to be acceptable.

3.2 Randomness

To test that the respondents could be taken to be representative of the whole canegrowing population, tests were undertaken to determine if it was a random sample group. A random sample (one in five, or 20%) was selected from a database of assignment holders. The respondents were identified as being either part of that random sample or not. If every survey form had been returned, 100% of those in the random sample would have replied and they would, therefore, have comprised 20% of the responses. The overall response rate was 15.5%. For the replies to be considered a representative sample of the total population, 15.5% of the randomly selected group would need to have returned their surveys and 20% of all returned surveys would need to have been from the randomly selected sample. This process of randomly selecting 20% of the total population was repeated ten times to determine the representativeness. From these ten repetitions, an average of 16.0% of the randomly selected group returned their surveys and 21.7% of all returned surveys were from the randomly selected group. As this result is close to that expected (15.5% and 20%, respectively), the response rate can be considered to be random, and therefore representative of the population of cane farmers.

Another test for representativeness was based on farm size. Eight hundred and twenty eight of the 1,060 respondents provided information on the size of their farms. These
totalled 81,832 ha which gives an average of 98.8 hectares. According to the BSES grower database there are 7,227 cane assignments with a total area of 791,005 ha, an average of 109.5 ha per assignment. Given that the survey average is close to that of the industry average, this provides further indication that the survey responses can be considered to be representative of the cane farmers.
APPENDIX D ANSWER RATES

In some cases, forms were not entirely complete. Not every question was answered by every respondent. Some questions more than others were left unanswered. While most questions were completed by most respondents, there are some situations where there is a high rate of non-answering. Low response on some questions may indicate several things:

1. that growers are perhaps reluctant to discuss the issue raised by the question;
2. that the type of answer required is not appropriate to respondents (that is, open-ended answers which respondents compose themselves versus structured answers from a given list of answers); or,
3. that the question is not specific enough for respondents to easily frame an answer.

As some questions differed between the Queensland and NSW surveys, the issue of non-answering is looked at separately for these two regions (Table 5).

In the Queensland survey, 17 of the 26 questions were answered by more than 95% of respondents. Another four questions were answered by at least 90%. The questions which were most often left blank included Question 9 (tailwater dams), Question 23 (the Code assists to understand how to minimise the risk of harm to the environment), and Question 24 (understanding obligations under the EPA). The questions most often left unanswered were Questions 25 (improvements to the Code) and 26 (comments) where respondents were asked to write a response rather than simply tick a selection. In NSW, 18 of the 26 questions were answered by more than 95% of respondents, with another six questions being answered by between 90 and 95% of respondents. Again, the open questions had low response rates with Question 25 (issues important to include in best practice guidelines) unanswered on 26.4% of surveys and Question 26 (comments) unanswered by 77.9%.

In both Queensland and NSW, cane farmers seem somewhat reluctant to provide information about farm management plans (7.4% of growers in Queensland and 5.5% in NSW did not answer this question); environmental issues that are a concern in the local area (7.2% of Queensland respondents and 6.1% in NSW did not answer); whether these environmental issues affect the farm (not answered by 4.7% in Queensland and 5.5% in NSW); and, whether assistance is required in dealing with these issues (7.5% of Queensland growers and 8.0% in NSW left this question unanswered).

Differences between states in response rates to some questions may reflect how relevant the issue is viewed in each state. For example, the question about keeping farm records was not answered by 2.1% of Queensland respondents while 6.1% of NSW growers did not answer this question. In a reverse situation, the question on tailwater dams was not answered by 13.8% of Queensland cane farmers as compared to 4.9% of NSW surveys. This response indicates that NSW cane farmers are more comfortable answering a question about tailwater dams.
<table>
<thead>
<tr>
<th>Qld Question</th>
<th>% not answered – Qld forms</th>
<th>NSW Question</th>
<th>% not answered - NSW forms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Before receiving this survey, did you know of the Code of Practice for Sustainable Cane Growing in Queensland?</td>
<td>0.7%</td>
<td>6. When controlling weeds in farm drains, which methods do you use?</td>
<td>1.2%</td>
</tr>
<tr>
<td>2. Do you have a copy of the Code of Practice?</td>
<td>1.2%</td>
<td>7. When cleaning drains, would a drainage management plan be useful?</td>
<td>2.5%</td>
</tr>
<tr>
<td>3. Do you agree with the recommendations in the Code?</td>
<td>3.7%</td>
<td>10. Is laser grading a benefit?</td>
<td>3.7%</td>
</tr>
<tr>
<td>4. How useful is the Code when making farm management decisions?</td>
<td>3.7%</td>
<td>11. How much of your farm has been laser graded?</td>
<td>2.5%</td>
</tr>
<tr>
<td>5. Do you think having a Code of Practice for cane farming is:</td>
<td>5.7%</td>
<td>12. Have any of your drains been filled as a result of laser grading?</td>
<td>9.2%</td>
</tr>
<tr>
<td>6. When applying fertiliser to your crop, which of the following factors influence how much you use?</td>
<td>0.7%</td>
<td>1. When applying fertiliser to your crop, which of the following factors influence how much you use?</td>
<td>1.2%</td>
</tr>
<tr>
<td>7. How do you usually apply fertiliser to your ratoons?</td>
<td>0.4%</td>
<td>2. How do you usually apply fertiliser to your ratoons?</td>
<td>0.6%</td>
</tr>
<tr>
<td>8. Do you schedule your irrigation by using:</td>
<td>4.9%</td>
<td>8. Which drain management practices do you use in areas of potential acid sulfate soils (p.ASS)?</td>
<td>3.1%</td>
</tr>
<tr>
<td>9. Do you have a tailwater dam/retention basin/artificial lagoon to catch run-off water so it can be stored/reused/filtered?</td>
<td>13.5%</td>
<td>5. Do you have a tailwater dam/retention basin/artificial lagoon to catch run-off water so it can be stored/reused/filtered?</td>
<td>4.9%</td>
</tr>
<tr>
<td>10. How does the number of cultivations you usually do per crop cycle compare with the number you did 10 years ago?</td>
<td>1.7%</td>
<td>3. How does the number of cultivations you usually do per crop cycle compare with the number you did 10 years ago?</td>
<td>1.2%</td>
</tr>
<tr>
<td>11. How do you usually manage your trash?</td>
<td>0.4%</td>
<td>4. How do you usually manage your trash?</td>
<td>0.0%</td>
</tr>
<tr>
<td>12. Have you attended a farm chemical course?</td>
<td>1.3%</td>
<td>15. Have you attended a farm chemical course?</td>
<td>1.2%</td>
</tr>
<tr>
<td>13. Is your chemical storage area:</td>
<td>1.2%</td>
<td>14. Is your chemical storage area:</td>
<td>1.8%</td>
</tr>
<tr>
<td>14. When applying farm chemicals do you:</td>
<td>0.8%</td>
<td>16. When applying farm chemicals do you:</td>
<td>0.6%</td>
</tr>
<tr>
<td>15. Do you triple rinse all your chemical containers?</td>
<td>2.2%</td>
<td>18. Do you triple rinse all your chemical containers?</td>
<td>2.5%</td>
</tr>
<tr>
<td>16. How do you dispose of farm waste material?</td>
<td>1.0%</td>
<td>17. How do you dispose of farm waste material?</td>
<td>0.6%</td>
</tr>
<tr>
<td>17. Do you have a farm management plan?</td>
<td>7.4%</td>
<td>9. Do you have a farm management plan/map?</td>
<td>5.5%</td>
</tr>
<tr>
<td>18. How do you maintain your headlands?</td>
<td>1.0%</td>
<td>13. How do you maintain your headlands?</td>
<td>0.6%</td>
</tr>
<tr>
<td>19. What farm activities do you keep records of:</td>
<td>2.1%</td>
<td>19. What farm activities do you keep records of:</td>
<td>6.1%</td>
</tr>
<tr>
<td>20. Are any of the following environmental issues a concern in your local area?</td>
<td>7.2%</td>
<td>20. Are any of the following environmental issues a concern in your local area?</td>
<td>6.1%</td>
</tr>
<tr>
<td>21. Do any of the issues from Q.20 affect your farm?</td>
<td>4.7%</td>
<td>21. Do any of the issues from Q.20 affect your farm?</td>
<td>5.5%</td>
</tr>
<tr>
<td>22. Would you like assistance in dealing with any of the issues from Q.20?</td>
<td>7.5%</td>
<td>22. Would you like assistance in dealing with any of the issues from Q.20?</td>
<td>8.0%</td>
</tr>
<tr>
<td>23. Does the Code of Practice for Sustainable Cane Growing in Queensland help you to understand how to minimise the risk of harm to the environment when growing cane?</td>
<td>18.1%</td>
<td>23. Are you aware of best practice guidelines for managing acid sulfate soils?</td>
<td>4.3%</td>
</tr>
<tr>
<td>24. Do you understand your obligations under the Environmental Protection Act?</td>
<td>16.7%</td>
<td>24. Do you think it is important to have best practice guidelines for cane farming?</td>
<td>4.9%</td>
</tr>
<tr>
<td>25. What suggestions do you have for improving the Code of Practice for Sustainable Cane Growing in Queensland?</td>
<td>77.0%</td>
<td>25. Which aspects of cane farming would be important to include in best practice guidelines?</td>
<td>26.4%</td>
</tr>
<tr>
<td>26. What other comments would you like to make?</td>
<td>80.0%</td>
<td>26. What other comments would you like to make?</td>
<td>77.9%</td>
</tr>
</tbody>
</table>