SmartCane Principles of Best Management Practice
SmartCane Principles of Best Management Practice

by

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“

The SmartCane booklets will serve as a reference for growers and their advisors. They will also be used to demonstrate the commitment of the industry to profitable, yet sustainable sugarcane production.

”

2. GLOSSARY OF TECHNICAL TERMS

It is inevitable that specialist and technical words have to be used in this publication. To assist those not familiar with some of the words used, a list of technical terms has been included. This can be used as a reference source while reading the booklet.

Amelioration: The slow chemical and physical improvement of soil through the application of substances (ameliorants) such as lime, gypsum and mill byproducts.

Break crops: Alternative crops grown between crop cycles of sugarcane.

Green cane trash blanket (GCTB): The layer of sugarcane residue covering the ground after harvest of the crop that had not previously been burnt.

Improved cropping system: A sugarcane cropping system based on the concepts of reduced tillage, controlled traffic and legume break crops. It is often referred to as the “new farming system”.

Legume: Plants such as soybeans and cowpeas that can supply nitrogen to the soil through the process called fixation.

Productivity: The amount of sugar produced per hectare.

Ratoon: After a crop of sugarcane is harvested, it will germinate again from the original planted stool. This process of regrowth is called ratooning and will continue until the original planted cane stool is removed. Each subsequent crop after the plant cane crop is referred to as a ratoon.

Replant: Also referred to as plough out/replant. Replant is the plant crop of sugarcane that is established very soon after harvest of the last ratoon crop. It follows the previous sugarcane crop cycle without the benefit of an extended fallow period.

Sugarcane crop cycle: Successive crops of sugarcane that includes a plant crop and a number of ratoon crops (usually three to four). After the final ratoon, the regrowth will be destroyed either by herbicides or physical means.

Supplementary irrigation: Irrigation water applied to the crop to ‘top up’ water requirements not met by rainfall.

Sustainable sugarcane production: Profitable cane production achieved in combination with the maintenance of the soil, water and biodiversity resources onfarm and with minimal offsite effects.
3. INTRODUCTION AND BACKGROUND INFORMATION

Extent of the Australian sugar industry

Sugarcane is grown in Australia within a 500 000 ha area along the eastern seaboard of Queensland and northern New South Wales (NSW) and until recently in a localised area in the Ord River district of Western Australia. The Queensland and NSW industry stretches from Mossman (S16°30', E145°30') in the tropics to Harwood (S29°25', E153°14') in the sub tropics. Although this covers a distance of about 2200 km, the cane growing regions (Table 1) are often separated into distinct local districts based on the occurrence of suitable climate, soils and water availability. These districts are serviced by individual or a combination of sugar mills (Figure 1).

Table 1: 2008 listing of cane growing districts and mill areas within Australia.

<table>
<thead>
<tr>
<th>Region</th>
<th>District</th>
<th>Mill Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern</td>
<td>Mareeba/Dimbulah</td>
<td>Tablelands</td>
</tr>
<tr>
<td></td>
<td>Mossman</td>
<td>Mossman</td>
</tr>
<tr>
<td></td>
<td>Mulgrave</td>
<td>Mulgrave</td>
</tr>
<tr>
<td></td>
<td>Innisfail/Babinda</td>
<td>Babinda</td>
</tr>
<tr>
<td></td>
<td>Tully</td>
<td>Tully</td>
</tr>
<tr>
<td></td>
<td>Herbert</td>
<td>Macknade</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Victoria</td>
</tr>
<tr>
<td>Burdekin</td>
<td>Burdekin</td>
<td>Pioneer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kalamia</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Invicta</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inkerman</td>
</tr>
<tr>
<td>Central</td>
<td>Proserpine</td>
<td>Proserpine</td>
</tr>
<tr>
<td></td>
<td>Mackay</td>
<td>Marian</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pleystowe</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Racecourse</td>
</tr>
<tr>
<td></td>
<td>Sarina</td>
<td>Farleigh</td>
</tr>
<tr>
<td>Southern</td>
<td>Bundaberg</td>
<td>Bingera</td>
</tr>
<tr>
<td></td>
<td>Childers</td>
<td>Millaquin</td>
</tr>
<tr>
<td></td>
<td>Maryborough</td>
<td>Isis</td>
</tr>
<tr>
<td></td>
<td>Rocky Point</td>
<td>Maryborough</td>
</tr>
<tr>
<td></td>
<td>New South Wales</td>
<td>Rocky Point</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Broadwater</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Condong</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Harwood</td>
</tr>
</tbody>
</table>
A wide range of climatic conditions (rainfall and temperatures) occur within the industry (Table 2). Annual average rainfall and minimum and maximum temperatures for different parts of the industry are shown in Bureau of Meteorology rainfall and temperature maps for Queensland (Figures 2, 3 and 4).

The northern part of the Queensland industry (Tully to Mossman) is in the wet tropics and receives large amounts of rain annually. Innisfail/Babinda in particular receives in excess of 3500 mm annually, with mean maximum and minimum temperatures of 27.9°C and 19.3°C, respectively.

The annual rainfall generally decreases moving south down the Queensland coast.

While the Herbert district (surrounding Ingham) receives about 2000 mm of rain per annum, the Burdekin region (around the regional centre of Ayr) is in the dry tropics with an average annual rainfall of about 900 mm. Mean maximum and minimum temperatures for Ayr are 29.1°C and 17.9°C, respectively. In the dry tropics, as well as in the Mareeba/Dimbula area (west of Cairns), irrigation/supplementary irrigation is considered essential for sugarcane production.
In the Central region, the Mackay district receives approximately 1550 mm of rainfall per annum. Plane Creek, which is situated further south, receives less annual rainfall than Mackay. Temperatures within the Central region decrease from the north. The mean maximum and minimum temperatures for Proserpine and Plane Creek are 28.7°C and 17.6°C and 27°C and 17°C, respectively.

The Bundaberg, Isis (Childers) and Maryborough districts receive about 1050 mm of rainfall annually, with maximum and minimum temperatures of 26.8°C and 15.7°C, respectively.

Supplementary irrigation is often applied to cane in all districts from Proserpine south.

At Rocky Point (near Brisbane) conditions are somewhat different, with higher average annual rainfall (1440 mm) and lower maximum and minimum temperatures (25.1°C and 15.3°C) than in the other southern districts (Bundaberg, Isis and Maryborough).

In New South Wales, the environmental conditions can be described as being ‘mildly sub tropical’. Average annual rainfall ranges from about 1700 mm at Condong to 1300 mm at Harwood. Mean maximum and minimum temperatures for the NSW industry are 25.6°C and 13.4°C, respectively.

### Table 2: Average annual rainfall and temperatures for the various districts within the Australian sugar industry. (Bureau of Meteorology, 2007 and other sources)

<table>
<thead>
<tr>
<th>Site</th>
<th>Cane growing area</th>
<th>Annual mean rainfall (mm)</th>
<th>Mean temperatures (°C)</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td><strong>Queensland</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Port Douglas</td>
<td>Mossman</td>
<td>2010</td>
<td>20.6</td>
<td></td>
<td>27.9</td>
</tr>
<tr>
<td>Atherton</td>
<td>Tableland</td>
<td>1420</td>
<td>14.5</td>
<td></td>
<td>26.0</td>
</tr>
<tr>
<td>Mareeba</td>
<td>Mareeba/Dimbula</td>
<td>856</td>
<td>17.8</td>
<td></td>
<td>28.7</td>
</tr>
<tr>
<td>Meringa*</td>
<td>Mulgrave</td>
<td>1990</td>
<td>20.7</td>
<td></td>
<td>29.0</td>
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<tr>
<td>Innisfail</td>
<td>Innisfail/Babinda</td>
<td>3554</td>
<td>19.3</td>
<td></td>
<td>27.9</td>
</tr>
<tr>
<td>Tully*</td>
<td>Tully</td>
<td>4086</td>
<td>19.0</td>
<td></td>
<td>28.7</td>
</tr>
<tr>
<td>Ingham</td>
<td>Herbert</td>
<td>2026</td>
<td>18.9</td>
<td></td>
<td>29.2</td>
</tr>
<tr>
<td>Ayr</td>
<td>Burdekin</td>
<td>925</td>
<td>17.9</td>
<td></td>
<td>29.1</td>
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<tr>
<td>Proserpine</td>
<td>Proserpine</td>
<td>1384</td>
<td>17.6</td>
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<td>28.7</td>
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<tr>
<td>Mackay</td>
<td>Mackay</td>
<td>1572</td>
<td>19.0</td>
<td></td>
<td>26.4</td>
</tr>
<tr>
<td>Sarina*</td>
<td>Plane Creek</td>
<td>1480</td>
<td>17.0</td>
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<td>27.0</td>
</tr>
<tr>
<td>Bundaberg</td>
<td>Bundaberg</td>
<td>1005</td>
<td>16.2</td>
<td></td>
<td>26.6</td>
</tr>
<tr>
<td>Childers</td>
<td>Isis</td>
<td>1054</td>
<td>15.5</td>
<td></td>
<td>26.9</td>
</tr>
<tr>
<td>Maryborough</td>
<td>Maryborough</td>
<td>1150</td>
<td>15.3</td>
<td></td>
<td>26.9</td>
</tr>
<tr>
<td>Rocky Point*</td>
<td>Rocky Point</td>
<td>1441</td>
<td>15.3</td>
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<td>25.1</td>
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<tr>
<td><strong>New South Wales</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condong</td>
<td>Tweed</td>
<td>1726</td>
<td>12.9</td>
<td></td>
<td>25.7</td>
</tr>
<tr>
<td>Harwood</td>
<td>Clarence</td>
<td>1294</td>
<td>13.8</td>
<td></td>
<td>25.4</td>
</tr>
</tbody>
</table>

* Data not sourced from Bureau of Meteorology
** Data for Broadwater unavailable
Figure 2: Queensland average daily maximum temperatures. (Bureau of Meteorology, 2007)

Figure 3: Queensland average daily minimum temperatures. (Bureau of Meteorology, 2007)
Soils of the Australian sugar industry

The soils of the Australian sugar industry vary considerably within and across regions. This variability occurs due to various combinations of soil forming factors (parent material, climate, topography and drainage, time and living organisms) that influence the development of particular soils at different locations. As a result, the ‘sets’ of soils found in the wet, moist and dry tropical areas and those found in various parts of the sub tropical areas, are all different to each other.

Due to this diversity, no attempt will be made here to describe the different soil types found in each district. However several examples of typical landscapes showing the existence of different soil types are shown in Figures 5, 6, 7 and 8. These relate to the Johnstone, Herbert, Proserpine and Bundaberg districts, respectively.

Soil surveys have been conducted in many parts of the Australian sugar industry primarily by the Queensland Department of Natural Resources and Water and by CSIRO. The soil mapping has usually occurred at a scale of 1:50 000 or 1:100 000. Descriptions of soils within these maps are often based on soil mapping units that have names derived from local places or associations.

Recently, the knowledge of soils for guiding management decisions onfarm has been highlighted by the production of soil reference booklets for the sugar industry. These booklets are being progressively developed for the various Australian cane growing regions. Although the booklets are aimed at promoting best practice nutrient management, they also provide additional information on how knowledge of soils can guide other onfarm operations and inputs. Details of current booklets can be found in the “Further Reading” section of this booklet on page 21.
Figure 5: Typical landscape in the Johnstone catchment showing soils derived from basalt and alluvium. (BSES Limited, 2007)

Figure 6: Typical landscape in the Herbert district showing soils derived from alluvium and granite. (CRC Sugar, 2003)
Figure 7: Typical landscape in the Proserpine district showing soils derived from alluvium and sandstone. (BSES Limited, 2006)

Figure 8: Typical landscape in the Bundaberg district showing soils derived from volcanic rocks (basalt) and weathered sedimentary rocks. (BSES Limited, 2007)
Conditions within Queensland range from being typically wet tropical, through dry tropical to sub tropical. At Rocky Point and in New South Wales, conditions can be described as mildly sub tropical with lower temperatures, but with higher annual rainfall than the more classical sub tropical areas. This has resulted in the sugarcane production system being somewhat different at Rocky Point and in New South Wales compared to the remainder of Queensland. Whereas one year crops are grown in much of Queensland, 18 month to two year crops predominate in the more southerly areas.

The Queensland sugar industry began from humble beginnings in the latter part of the 19th century. By the 1940s, just less than 5 million tonnes (Mt) cane per year were produced in Queensland from about 96 000 ha. This equated to average cane yields of about 50 t/ha, with sugar yields of about 6 t/ha. During the 1970s, production rose to about 20 Mt cane per year (Figure 9) that was harvested from 250 000 ha (Figure 10). Average cane and sugar yields of 81 t/ha (Figure 11) and 11.3 t/ha (Figure 12) were being achieved, respectively.

Since then, annual production has increased to 35 Mt cane. The cane production area peaked in 2000 with cane harvested from 423 000 ha. The average cane yield over the period 2001 to 2005 was 86 t/ha. This has resulted in an average sugar yield of 12.1 t/ha over that period.

Studies show that improvements in commercial varieties, made possible by industry breeding programs, were a key contributing factor to the substantial increase in cane yield and sugar yield in the Queensland sugar industry.

Figure 9: Total annual Queensland cane production. (CANEGROWERS, 2006 & BSES Limited, 2008)
Figure 10: Annual area harvested in Queensland. (CANEGROWERS, 2006 & BSES Limited, 2008)

Figure 11: Queensland annual average sugarcane yields. (CANEGROWERS, 2006 & BSES Limited, 2008)

Figure 12: Queensland annual average sugar yields. (CANEGROWERS, 2006 & BSES Limited, 2008)
Scope of the booklets

Given the extent and variability of the Queensland sugar industry, best practice onfarm management cannot be defined within a set of ‘recipe-like’ guidelines. What is considered ‘best practice’ on one farm or in one area, may not necessarily be the appropriate best practice on another farm or in another area.

The objective of this SmartCane booklet series is, therefore, to bring together information from various sources on best practice principles for the Queensland sugar industry. Although these booklets will serve as a reference for growers and their advisors, they will also be used to demonstrate the commitment of the industry to profitable, yet sustainable sugarcane production.

This will be done by:

- Providing information on and the meaning of, ‘best management practice’.
- Describing the principles of sustainable sugarcane production.
- Presenting guidelines that will assist with the adoption of ‘best management practice’ onfarm.
- Providing a simple self evaluation in the form of a checklist to enable growers to assess their own performance in the adoption of best management principles.

These booklets cover the full range of activities and management issues associated with cane growing, such as soil health, nutrition and fertiliser use, planting, irrigation, drainage, pests and diseases, weeds and harvesting, but presented within the time frame of the cane production cycle (Figure 13). Some of the different stages of the production cycle are shown pictorially in Figure 14.

Each book has a different focus. A summary of the aspects of onfarm management that need to be considered during the last ratoon of a crop cycle and during the break/fallow cropping period (the topic of the SmartCane Fallow and Land Management Booklet) is shown in Figure 15.

Some of these activities are illustrated in Figure 16. Aspects of sugarcane management that need consideration at planting and during the plant crop (the topic of the SmartCane Plant Cane Establishment and Management Booklet) are shown in Figure 17 and some of the different crop establishment strategies are shown in Figure 18. Aspects of sugarcane management that need consideration during harvesting and the ratoon crops (the topic of the SmartCane Harvesting and Ratoon Management Booklet) are shown in Figure 19 and some are illustrated in Figure 20.

The management of riparian and wetland areas on a cane farm (the topic of the SmartCane Riparian and Wetland Areas on Cane Farms Booklet) is considered an integral part of the overall onfarm activities. It should not be seen in isolation from the cane production type activities when considering ‘best management practice’ options.

The SmartCane series is initially made up of six individual but linked booklets:

- SmartCane Principles of Best Management Practice.
- SmartCane Fallow and Land Management.
- SmartCane Plant Cane Establishment and Management.
- SmartCane Harvesting and Ratoon Management.
- SmartCane Farm Management.
- SmartCane Riparian and Wetland Areas.

The remainder of this booklet (SmartCane Principles of Best Management Practice) deals with the underlying principles of best management practice. In particular it covers:

- The philosophy of best management practice.
- A description of the current sugarcane farming system.
- A description of the improved farming system.
- A self evaluation of progress towards best management practice and sustainable sugarcane production.
- A summary of the content of the other booklets.
Figure 13: Scope of each booklet within the sugarcane cropping cycle.

Figure 14: Stages within the sugarcane cropping cycle.
SmartCane Fallow and Land Management

**Last Ratoon**
- Soil sample
- Lime/gypsum application
- Harvest green
- Incorporate trash
- Spray-out

**Fallow Management**
- Bare fallow
- Break crop
- Harvest break crop
- Incorporate green manure
- Retain stubble
- Retain entire break crop
- Drainage

**Preparedness**
- Pest incursions
- Disease threats
- Quarantine
- Disease screening (new varieties)
- Exotic pests and diseases

*Figure 15:* Aspects of onfarm management that need to be considered during the last ratoon of a crop cycle and during the break/fallow crop.

*Figure 16:* Aspects of managing the last ratoon and the fallow crop.
**SmartCane Plant Cane Establishment and Management**

### Establishment
- Direct drill into stubble
- Mound forming
- Conventional furrow hilling-up
- Row spacing/configuration
- Choice of variety
- Pest control
- Disease-free seed cane
- Double-disc / billet planting
- Nutrient management
- Use of mill byproducts

### Crop Management
- Weed control
- Irrigation
- Irrigation practices
- Water use efficiency
- Nutrient management
- Timing of operations
- Pest management
- Disease awareness
- Environmental issues
- Gap planting

**Figure 17**: Aspects of sugarcane management that need consideration at planting and during the plant crop.

**Figure 18**: Aspects of plant crop establishment.
**SmartCane Harvesting and Ratoon Management**

**Crop Management**
- Weed control
- Irrigation
- Irrigation practices
- Water use efficiency
- Leaf sampling
- Nutrient management
- Timing of operations
- Pest management
- Disease awareness
- Environmental issues
- Consider number of ratoons

**Harvesting**
- Optimise feed-train
- Set basecutter heights
- Minimise losses
- Harvest timing
- Controlled traffic
- Transport efficiency
- Green cane trash blanketing
- Season length

**Harvest** ➔ **Ratoons**

*Figure 19:* Aspects of sugarcane management that need consideration during harvesting and during ratoon crops.

*Figure 20:* Aspects of ratoon cane management and harvesting.
4. PHILOSOPHY OF BEST MANAGEMENT PRACTICE

Management of inputs and operations in sugarcane production should be aimed at sustainability. This means that profitable cane production needs to be achieved in combination with the maintenance of resources onfarm and with minimal offsite effects. In simple terms this means that growers should continue to consider their ‘back pockets’ when planning the application of inputs and execution of operations onfarm.

However, they should also be maintaining farm resources for future generations and be mindful of caring for the larger environment by neither applying excessive amounts of nutrients, ameliorants and pesticides nor conducting operations that may cause onsite degradation or offsite effects.

Best management practice means having the best chance of success in minimising the risk of losses in productivity (loss of yield), profitability (loss of income), applied inputs (leaching, run off and/or gaseous losses or nutrients, herbicides, pesticides etc) and soil resources (erosion and fertility losses).

Best management practice should, therefore, be considered across the entire farming system and cover the following key considerations:

- Soil management
- Crop and harvest management
- Water management
- Pest, disease and weed management
- Workplace health, safety and skills management
- Landscape and biodiversity management
- Business management

The basic philosophy is that there are no set ‘recipes’, but rather a recognition of onfarm management styles that allow for progress towards the adoption of an improved cropping system that is based on best practice principles.

Fundamental to this philosophy are the basic components of the ‘new farming system’ defined by the Sugarcane Yield Decline Joint Venture (SYDJV) that include breaking of the sugarcane monoculture through fallow cropping, controlled infield trafficking and the adoption of minimum tillage principles. It recognises that green cane trash blanketing should be practised when and wherever possible and that onfarm inputs and practices should be aimed at sustainability.

We also believe that knowledge of soils should be used as the basis for making many management decisions onfarm. These include: appropriate land preparation; amelioration of problem areas and planting practices; balanced and sustainable nutrient management; effective, yet sustainable weed control; efficient water management through appropriate irrigation and drainage practices; and best practice harvest scheduling. Best management practice also incorporates sustainable pest and disease management strategies and the need to adopt harvesting best practice.

Importantly, the concept of best management practice recognises that the sugarcane production system is continually evolving. It also recognises that the adoption of best management practice onfarm should be underpinned by appropriate farm management planning that incorporates economic assessments, good budgeting, effective record keeping and the need for workplace health and safety (WH&S).
5. CURRENT SUGARCANE CROPPING SYSTEMS

The current farming system has developed with time. It is a product of past practices that have been used for many years, together with some newer innovations. This system (or components thereof) has undergone modification with time. Research, development and extension (RD&E) programs have contributed to this development by initiating new (or alternative) techniques or philosophies and facilitating the incorporation of these into the evolving system. As indicated previously, the diversity of the industry has resulted in slightly different systems being in place according to local needs and experiences.

The continuum of onfarm operations and management styles may result in some ‘accepted’ practices being more compatible with agreed best practice options than others. The guidelines presented within the subsequent booklets aim to detail the most appropriate options available. However, it should be recognised that components of the overall best practice ‘system’ may be more suited to some circumstances than others. This reinforces the basic principle that there are no set ‘recipes’, but rather a set of guidelines that will allow for progress towards the adoption of various best management practices within a set of specific circumstances.

Fundamental aspects of the recommended sugarcane production system

The current recommended sugarcane production system has certain characteristics that are fundamental to the concept of best management practice. These include:

- The use of harvesting and other farm machinery/vehicles that match row spacing configurations.
- Planting of fallow break crops.
- Minimum cultivation necessary to suit available planters.
- Nutrient application rates within current guidelines.
- Use of mill byproducts as soil conditioners with account taken of nutrient inputs.
- Sub-surface applied fertiliser to plant and ratoon cane.
- Appropriate targeted pest, disease and weed control.
- Well presented crops for harvesting to ensure quality cane is delivered to the mill.
- Maintenance of trash after harvesting where appropriate.

These practices have been adopted, either fully or partially, on many sugarcane farms. However, there are still situations on some farms where best practice options need to be considered as alternatives to current practices.

Occurrences where best practice alternatives need to be considered

Where growers use the following practices, we encourage them to consider best practice alternatives:

- Row spacings that are incompatible with the width of current infield harvesters, machinery, and vehicles.
- Replanting without using fallow break crops.
- Limited fallows that may or may not contain volunteer cane.
- The burning of trash blankets after harvesting the last ratoon in a crop cycle prior to fallowing or replanting.
- Burning of cane prior to harvest. Harvesting crops without burning has positive benefits such as recycling nutrients and organic carbon, suppressing weeds and conserving soil moisture; so the need to burn cane should continue to be reassessed. Harvesting green may not be practical for some farms due to factors including soil types, amount of trash from some cane varieties, row lengths and flood irrigation. New technologies in the future may overcome some of these limitations.
- Excessive cultivation aimed at ‘full’ land preparation to suit current planters.
- Fertiliser rates in excess of the current guidelines.
- Use of mill byproducts without taking account of nutrient inputs.
- Sub-standard pest, disease and weed control.
6. IMPROVED SUGARCANE CROPPING SYSTEMS

By nature of the crop, the varying conditions and the extent of the Queensland sugar industry the adoption of best management practice should be seen as an ongoing and evolving process. There is general acceptance that although implementation of new systems or practices take time, the benefits of adoption will ultimately lead to change.

A number of examples exist:

- Wide adoption of green cane trash blanketing has occurred in ratoon cane. This practice not only returns organic matter to the soil, thereby improving soil health and nutrient status, but also reduces cultivation and erosion losses, allows for rationalisation of herbicide usage, and improves water use efficiency. However, many of the improvements in soil health/fertility arising from the change to green cane trash blanketing may take many years to become apparent.

- Adoption of the ‘improved cropping system’ (based on reduced tillage, controlled traffic and legume break crops) is providing improvements in soil health and reducing erosion.

- Adoption of soil specific nutrient management strategies is being encouraged. It will enable sustained productivity and profitability without compromising the wider environment.

- The awareness of impacts of nutrients and pesticide losses on the Great Barrier Reef is leading to more responsible use and application of fertilisers and chemicals.

- Grower willingness to incorporate wildlife corridors, wetland areas and riparian vegetation on their farms is enabling greater adoption of sustainable land use.

- Ongoing attendance by growers at workshops, training sessions and shed meetings is increasing the awareness and adoption of a wide range of best practice principles.

- It is important to recognise that in encouraging change, a diversity of farming systems and practices exist in the industry. The continuum in management styles also adds to the complexity of this process. Although a ‘quantum leap’ may be possible in some circumstances, economic reality will often favour a ‘step wise’ change in most situations.

"The guidelines presented within the subsequent booklets aim to detail the most appropriate options available."
7. SELF EVALUATION

Farm management differs from person to person and from farm to farm. A single ‘recipe’ for all situations is not possible. However, some growers are closer to best management than others. This self evaluation (Table 3) is aimed at identifying grower individual perception of best management practice and where improvements can be made in adopting best management principles and strategies.

In undertaking this self assessment it is important to distinguish between your attitude to a particular principle or strategy and the actual adoption onfarm. For example, although you may fully support the idea of best management practice and give it a rating of 5 (strongly agree), you may only give it a rating of 3 in terms of compliance/adoption.

For a more comprehensive self assessment of farm management practices, we recommend that growers complete a COMPASS program or undertake a Farm Productivity Assessment (FPA) or a Farm Productivity Improvement Plan (FPIP) through BSES Limited as part of the overall Farm Management Systems (FMS) initiative.

Table 3: Self evaluation for identifying best management practice.

<table>
<thead>
<tr>
<th>Rate each of these statements according to the scale of 1 to 5 in terms of attitude and on-farm adoption. 1 = strongly disagree / non compliance, 5 = strongly agree/full compliance</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Best management practice* is achievable on my farm.</td>
<td>Attitude</td>
<td>Adoption</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Best management practice will lead to sustainable sugarcane production.</td>
<td>Attitude</td>
<td>Adoption</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Best management practice requires all aspects of farm management to be assessed to identify where improvements can be made.</td>
<td>Attitude</td>
<td>Adoption</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soils should be managed according to their own specific properties.</td>
<td>Attitude</td>
<td>Adoption</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The sugarcane cropping system should include fallow break cropping, controlled infield trafficking, minimum tillage and trash retention.</td>
<td>Attitude</td>
<td>Adoption</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water management (irrigation and drainage) should be efficient, sustainable and environmentally responsible.</td>
<td>Attitude</td>
<td>Adoption</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pests, diseases and weeds should be managed within integrated and sustainable systems onfarm.</td>
<td>Attitude</td>
<td>Adoption</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harvesting operations should conform to the accepted harvesting best practice guidelines.</td>
<td>Attitude</td>
<td>Adoption</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All onfarm practices should conform to accepted WH&amp;S principles and workers should be suitably skilled to perform tasks.</td>
<td>Attitude</td>
<td>Adoption</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farm business should favour profitable and sustainable sugarcane production and include appropriate record keeping and budgeting.</td>
<td>Attitude</td>
<td>Adoption</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Best management practice means having the best chance of success in minimising the risk of losses in productivity (loss of yield), profitability (loss of income), applied inputs (leaching, runoff and/or gaseous losses or nutrients, herbicides, pesticides, etc) and soil resources (erosion and fertility losses).
8. BOOKLETS IN THE SERIES CONTENT SUMMARY

The following is a summary of the content of the initial SmartCane booklets in the series:

**SmartCane Principles of Best Management Practice**
- Introduction and background information
  - Extent of the Australian sugar industry
  - Climatic conditions within the Australian sugar industry
  - Soils of the Australian sugar industry
  - Queensland sugar production
  - Scope of the booklets
- Philosophy of best management practice
- Current sugarcane cropping systems
- Improved sugarcane cropping systems
- Summary of the contents of the booklet series

**SmartCane Fallow and Land Management**
- Introduction
- Philosophy of best management practice
- Current systems
- Improved farming systems
- Planning for the next crop
- Destruction of previous crop
- Land rectification
- Fallow management

**SmartCane Plant Cane Establishment and Management**
- Introduction
- Philosophy of best management practice
- Current systems
- Improved farming systems
- Soil analysis
- Land preparation
- Planting
- Pest control
- Weed control
- Cultivation of plant cane

**SmartCane Harvesting and Ratoon Management**
- Subsurface applied fertiliser to plant and ratoon cane
- Introduction
- Philosophy of best management practice
- Current systems
- Harvesting
- Managing the ratoon crop
- Nutrient management
- Weed management
- Irrigation
- Pest management

**SmartCane Farm Management**
- Introduction
- Record keeping
- Environmental impacts
- Overall farm management plans
- Economic assessment
- Succession planning
- Workplace health and safety (WH&S)

**SmartCane Riparian and Wetland Areas**
- Introduction
  - Best management practice objectives
  - Progress to date
  - Cane land expansion
- What are wetlands and riparian zones?
- How wetlands and riparian areas work
- Why manage wetlands on cane farms?
- Best management practice for wetland and riparian areas on cane farms
  - Riparian and aquatic weed control
  - Stream bank revegetation
  - Drainage discharges into wetlands
  - Constructing new wetlands
  - Fish habitat and migration
  - Feral animal control
- Legal requirements
- Technical support
9. FURTHER READING

The material covered in this booklet includes information drawn from various sources. This expertise and knowledge is gratefully acknowledged, particularly in relation to the following publications and/or reports. The list also provides details of some further reading options.


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- Return on investment

Minimise
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- Labour
- Financial Impact
  - with the cheapest "per year" cost of control

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