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Submission to the Productivity Commission on

"Industries in the Great Barrier Reef Catchment and Measures to Address Declining Water Quality"

Introduction

The following submission has been developed on behalf of Queensland's sugarcane growers by CANEGROWERS. CANEGROWERS provides representation and services to the cane growing industry with over 94% voluntary membership from approximately 5,500 mostly family farming enterprises. The cane growing industry is only one sector within a sugar industry that also includes harvesting, milling, refining and distilling sectors. The distilling sector includes an emerging ethanol industry.

In this submission we seek to address the Terms of Reference as provided by the Parliamentary Secretary under the *Productivity Commission Act 1998*. The submission will thus focus on the economic and social significance of the cane growing industry its commitment to improved environmental management and also the potential importance of the industry in 2010 and 2020.

However, our submission will also challenge some of the assumptions underpinning the Terms of Reference. In particular, we propose that there is little trend data available to support the belief that water quality entering the reef lagoon is indeed declining or that the Great Barrier Reef is suffering from poor water quality.

It is of concern to us that the Terms of Reference include neither:

1. Quantification of the extent of the problem of water quality decline, nor

2. Understanding the relative contribution of the different activities within the catchments to the overall pollution load.

The challenge for the Productivity Commission is to perhaps not only objectively assess the relative economic contributions of the different industries within the GBR catchments, but also to objectively assess the health of the reef, water quality data, and the relative contribution of the different industries to the overall pollution load entering the GBR catchments.

If government is serious about protecting water quality, it needs to objectively consider all potential impacts on water quality, including urban effluent and stormwater discharge, and then prioritise actions based on a transparent analysis of the relative contributions and associated risks.

Term of Reference No. 1.

The Economic and Social Importance of the Sugar Industry

Background Geography

The sugar industry was historically the main driver of settlement along the coast of Queensland. In the nineteenth century sugar mills were established on coastal waterways and cane farms cut from the surrounding forest. The industry expanded steadily through the twentieth century, although only two new mills were established in this time, one in Tully and one on the Atherton Tableland. Agronomic practices were subject to continuous change and improvement during the last century and with the adoption of mechanical cane harvesting in the 1970s saw the industry moved from cultivation on slopes to flatter ground.

While tourism, mining and horticulture are now also important industries in coastal Queensland, sugar remains a major agricultural industry in the GBR catchment in terms of employment, gross value of production (GVP) and economic dependants.

The last period of significant industry expansion occurred during the early to mid 1990s. This was in part a consequence of the repeal of the *Sugar Industry Act 1991,* which until 1991 had controlled and limited industry expansion. This expansion was encouraged and supported by Commonwealth and State Government funding for infrastructure development. The sugar industry currently occupies approximately 484,000 hectares in the GBR catchment and this figure has been relatively constant since 1996 (Figure 1). This is a relatively small percentage of the area of the GBR catchment, particularly relative to the grazing and timber industries (Table 1).

Figure 1. Total area of sugarcane 1991-2001

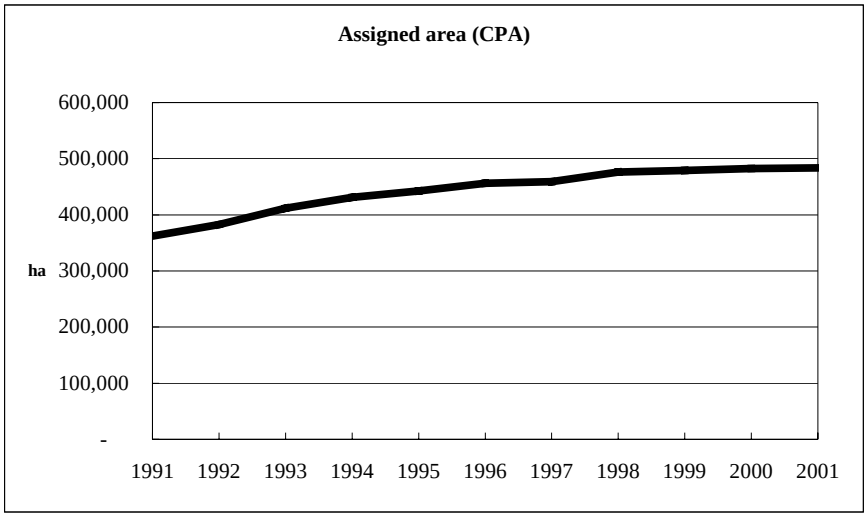


Table 1. Prominent land uses[1] in selected Queensland catchments draining to or near to the Great Barrier Marine Park from Rayment and Neil 1997.

Catchment	Area	% of catchment								
	'000 ha	Timber	Pristine	Graz-ing	Sugar	Banana s/ fruits	Vege	Grain	Other crops	Urban
Daintree	213	37.7	31.7	26.7	1.8	0.04	0.03	0	0	2.0
Mossman	49	30.4	11.0	44.6	10.0	0.07	0	0	0	3.9
Barron	218	36.4	2.0	47.7	2.1	0.55	0.80	3.2	0.18	6.9
Mulgrave/ Russell	202	16.9	25.1	38.9	13.1	0.15	0.02	0	0	5.8
Johnstone	233	25.3	12.8	41.6	14.8	0.89	0.01	0	0.20	4.4
Tully	169	62.5	2.1	20.7	9.6	1.53	0	0	0	3.7
Murray	114	32.9	27.3	29.6	6.1	0.88	0.02	0	0.01	3.3
Herbert	1,013	9.5	9.7	71.1	6.6	0	0	0	0.36	2.7
Black	108	18.0	9.3	67.4	0.7	0	0.40	0	0.04	4.2
Haughton	365	0.8	10.8	74.0	10.4	0.36	0.05	0	0.10	3.5
Burdekin	12,986	1.0	1.3	94.8	0.2	0.01	0.04	0.5	0.22	2.0
Don	389	0.2	2.6	91.3	1.1	0.05	1.63	0	0.03	3.1
Proserpine	249	9.6	4.0	74.6	7.5	0	0	0	0.01	4.3
O'Connell	244	7.6	4.4	70.5	11.1	0	0	0	0	6.5
Pioneer	149	22.7	6.1	48.5	17.9	0	0	0	0.05	4.7
Plane	267	4.3	2.9	67.4	21.0	0	0	0	0	4.4
Fitzroy	15,264	6.7	2.3	87.5	0	0.01	0	2.0	1.27	0.2
Baffle	386	12.2	4.4	75.9	0.4	0.09	0.03	0	0.34	6.7
Kolan	298	12.5	0	79.0	4.5	0.05	0.04	0	0.18	3.8
Burnett	3,315	12.9	0.4	79.9	0.8	0.11	0.05	1.6	1.03	3.2
Burrum	334	26.9	6.3	53.4	8.8	0.02	0.08	0	0	4.5
Mary	960	28.3	0.6	64.5	1.2	0.03	0.03	0	0.60	4.8

[1] Timber includes State forests and timber reserves; Pristine includes National Parks, National Park (scientific), Conservation Parks and Resource Reserves; Other crops include cotton, sunflower, peanuts, irrigated forage crops, etc.; Urban includes roads, railways, watercourses, dwellings, and aquaculture.

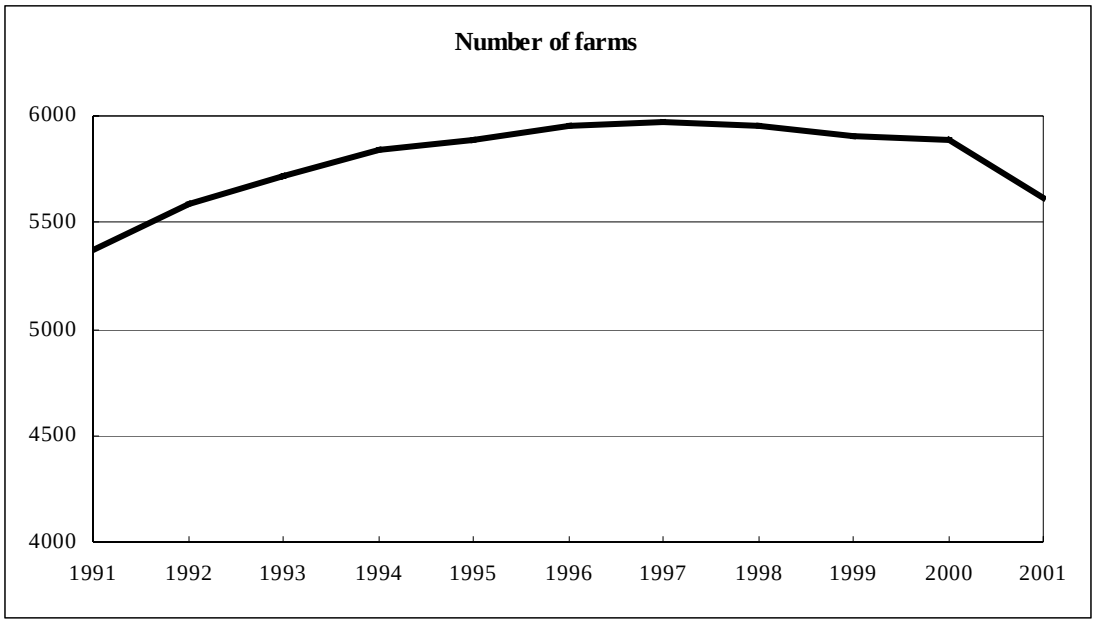
Economic Importance

For the purposes of addressing the economic importance of the industry in the context of this submission, cane growing areas within the GBR Catchment include all those areas between Mossman and Isis Mill area (Childers). Maryborough, Moreton (Nambour) and Rocky Point (Beenleigh) have all been excluded from the economic figures in this submission as has the Tableland Mill. Some cane processed in the Mossman area is grown in the Tableland Mill area to the west of the Great Divide. This has been included in the current figures, however, the effect of excluding them would be very small.

Cane farming in Queensland is characteristically a family-owned, farmer-operated enterprise with less than 2.5% of cane land operated by sugar milling companies. There are currently over 5,500 farming enterprises (Figure 2). The number of farms increased steadily early last decade but has since fallen (Figure 2).

Cane farmers employ little labour and that which is employed is usually seasonal at time of planting time. In a survey of canegrower members in 1999, 61% of farms indicated that, apart from the respondent and the spouse of the respondent, no other family members were working on the property full time. The milling and refining sector is a more significant regional employer.

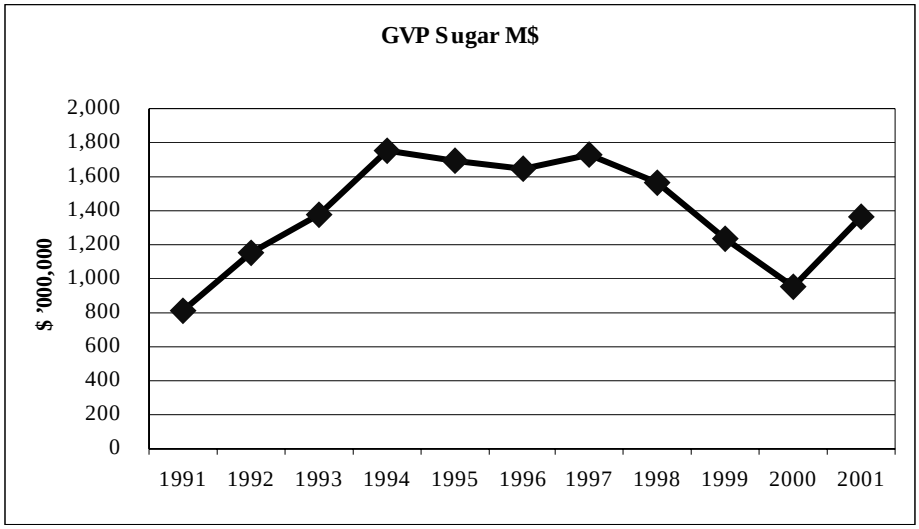
Figure 2. Number of farms for the period 1991-2001



Sugarcane as a stand-alone crop has no commercial value. It is only of value to a sugar mill and must be processed within sixteen hours of being cut. Sugar mills are located in the centre of cane growing areas and all sugarcane is therefore processed in the locality where it is grown. The value of the industry should therefore be considered as the gross value of production of the sugar rather than the sugarcane. It is the sugar that is important for regional economies and it is producing sugar that generates additional local employment over and above the value of the crop. Sugar mills and sugarcane growing go hand in hand; neither would exist without the other.

The value of production increased through the early 1990s, but poor crops and low prices since 1997 have seen industry incomes drop (Figure 3). The recovery in 2001 is not expected to be repeated in 2002 with incomes this year estimated to gross around $1,100M .

Figure 3. The value of sugar production for the period 1997 – 2001.



As a consequence of low prices and poor growing conditions, the value of the cane-growing sector has reduced. At the same time, input costs have tended to trend with CPI or above, particularly in the case of urea, the most significant fertiliser input for the industry (Table 2). The values in Table 2 were used in the construction of Figure 4, which shows the cane valued added for the period from 1991 to 2001. Over the last 10 years the value added has varied and was negative in 1999 and 2000. This is likely to be the case again this year. Data for value adding in the milling and refining sectors are not available.

Figure 4. Cane value added

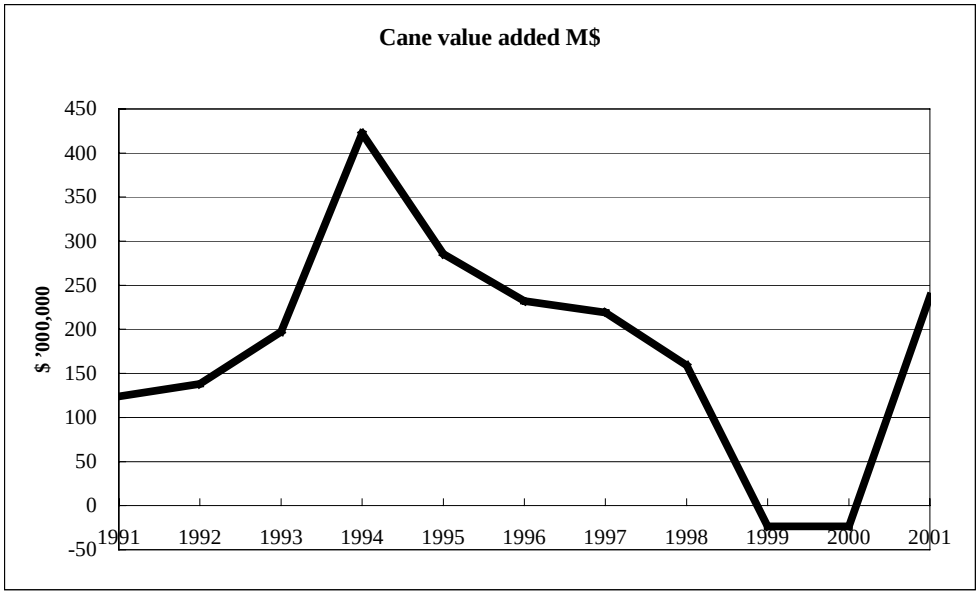


Table 2. Grower costs derived from the Queensland Sugar Cane Industry Survey (ABARE, 1996)

Grower costs	Per farm	Per tonne of cane
Statutory and Other Levies	3,833	$0.58
Wages & Workers Compensation	8,265	$1.26
Contract Charges and Plant Hire	33,873	$5.15
Chemicals and Sprays	3,517	$0.53
Fertiliser	31,050	$4.72
Fuels and Lubricants	12,573	$1.91
Repairs and Maintenance	22,230	$3.38
Rates & Land Rent (includes irrigation water charges)	9,736	$1.48
Motor Vehicle Reg. and Insurance	2,667	$0.41
Telephone, Office Expenses, all admin	1,213	$0.18
Electricity	3,883	$0.59
Bank, Legal and Accounting Expenses	2,365	$0.36
Interest & Lease Payments	13,638	$2.07
Other	2,700	$0.41
TOTAL	$151,543.00	$23.02

Social Importance

Anecdotal information points to an aging if not old cane growing population. CANEGROWERS has undertaken a number of grower surveys since 1991 and in each case, the 'decision maker' was asked to respond to a phone survey. The average age of these decision makers has been between 49 and 52 across three surveys over six years to 1999.

It does appear that ownership is a separate issue, with the ability or willingness of the 'older' owner to sell or pass over property limited by a number of factors. These may include willingness to sell, availability of finance for the younger grower, and the ability of the property to support the level of debt necessary to acquire the property. Anecdotal reports indicate that there is an absence of younger persons prepared to assume farming responsibilities. However whether this is because of lack of opportunity or incentive is not clear.

It is apparent that the income derived from many small farms is supplemented by off farm employment or investment income. That additional income could be regarded as sound diversification that underwrites farming operations during periods of poor production or very low prices. These farms could be considered more secure than an apparently larger scale operation, which may be supplying the sole revenue base for two or more families or partners. More data is needed to establish the balance between scale and sustainability.

In many towns, such as Innisfail, Tully, Ingham, Ayr and Home Hill, Proserpine and Mackay sugarcane is still by far the most important source of income. In many cane-growing regions, the industry provides the largest single source of local authority rates income and has historically driven business investment and shire development. Sugar further underpins business economies and development throughout these shires. Shire and city councils throughout the State have expressed great concern about the impact that the current industry downturn is having on employment and business health in their respective regions.

Term of Reference No. 2.

Current Management Approach by the Sugar Industry to Activities that Influence Water Quality

The Cane Growing Sector

The sugarcane growing industry is committed to continual improvement with respect to the environmental management of its activities. To this end, the industry has determined best management practices for the production of cane and these are summarised in the COMPASS Self Assessment Workbook (Azzopardi 2001).

By determining the generic potential impacts that may arise from a cane growing operation, it is possible to determine if best management practices exist to control the impact. The potential water quality impacts may be determined by using the recognised "source – pathway – receptor" model (Figure 5). We have identified potential sources of impact from cane farming activities including fertiliser and pesticide use, and the different pathways by which these activities may impact on water quality including for example, runoff, deep leaching and spray drift (Figure 5). Operational controls that limit the source or the pathway by which the impact reaches the receptor were determined with the activities recommended in COMPASS considered current best management practices.

The COMPASS program is delivered to cane growers in a facilitated workshop setting with the opportunity for clarification of meaning and intent of the best practices described in the workbook. Following the workshops, extension staff and mill productivity cell group coordinators will follow up on issues with individual growers as necessary. Since the program started earlier this year, over 700 growers have received certificates. The industry target is that 2,003 growers complete the program by the end of the year 2003.

By considering the conceptual model of farm-level potential impacts on aquatic systems from sugarcane growing (Figure 5) and the relevant sections in COMPASS (Appendix 1) it is evident that the cane growing industry is seeking to manage all potential impacts of its activities on water quality (Table 3). COMPASS has also introduced the concept of assessment and review of environmental management into the industry. As an industry we are now looking at building on this approach through the more formal adoption of an environmental management systems protocol based on the IS0 14001 standard.

Figure 5. Conceptual Model of Farm-Level Potential Impacts on Aquatic Systems from Growing of Sugarcane and Related Management System Components (Draft)

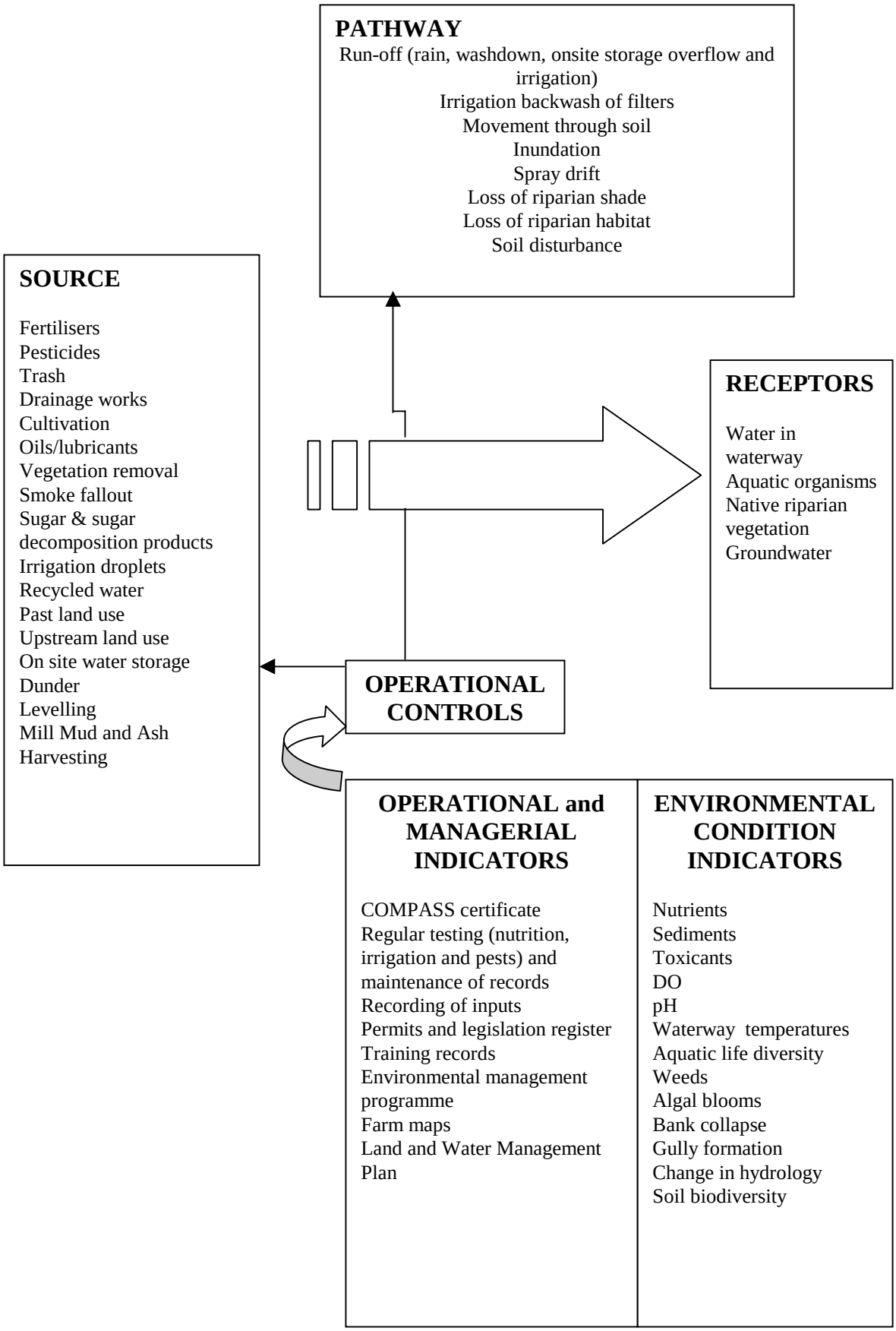


Table 3. Operational controls identified in the COMPASS Self-Assessment Workbook to minimise impacts on water quality when growing sugarcane.

Source	Pathway	Operational Control (Relevant section in COMPASS)
Fertilisers/pesticides Oils/lubricants	Run off	1.1- 1.6, 5.1, 5.2, 5.3, 6.1-6.4, 7.1-7.5, 9.1 – 9.16 (excl 9.4), chapter 3
Fertilisers/pesticides Oils/lubricants	Movement through soil	1.1- 1.6, 5.1, 5.2, 5.3, 6.1-6.4, 7.1-7.5, 9.1 – 9.16 (excl 9.4), chapter 3
Fertilisers/pesticides Oils/lubricants	Inundation	
Pesticides	Spray drift	5.1, 5.2, 5.3, 9.1, 9.2, 9.3, 9.11, 9.12, 9.13, 9.15
Trash	Run off	8.4, chapter 3
Drainage works	Soil disturbance	4.1-4.5
Cultivation	Soil disturbance	2.1-2.6
Harvesting	Soil disturbance	10.5
Smoke fallout	Run off	1.6
Sugar decomposition	Run off	1.6
Irrigation droplets	Spray drift	3.12
Irrigation droplets	Soil disturbance	2.1
Recycled water	Run off	3.1, 3.4, 3.5, 3.6, 3.7, 3.9, 3.12, 3.13
Recycled water	Movement through soil	3.1, 3.4, 3.5, 3.6, 3.7, 3.9, 3.12, 3.13
Recycled water	Irrigation backwash of filters	
Past land use	Soil disturbance	4.1-4.5, 2.1-2.6, 1.1, 3.13, 5.1, 5.2
Past land use	Runoff	1.1, 1.2
Upstream land use	Inundation	
Upstream land use	Run off (via irrigation)	Chapter 3
On site water storage	Run off	1.6
Dunder	Run off	1.4, 1.5, chapter 3
Dunder	Movement through soil	1.4, 1.5, chapter 3
Levelling	Soil disturbance	4.2
Mill Mud	Run off	1.3, chapter 3
Mill Mud	Movement through soil	1.3, chapter 3
Vegetation removal	Loss of riparian shade	6.1 –6.4
Vegetation removal	Loss of riparian habitat	6.1 –6.4
Vegetation removal	Soil disturbance	6.1 –6.4

The Milling Sector

Since the early 1960s sugar milling activities related to the discharge and quality of waste water have been regulated. In particular milling companies comply with the legislation administered by the Queensland Environmental Protection Agency currently the *Environmental Protection Act 1991*, Regulations and subsequent Amendments and Environmental Protection Policies for Air, Water, Noise and Waste Management.

Each milling company holds an Environmental Authority that contains environmental performance standards and management conditions for the Environmentally Relevant Activity -

Sugar Milling and Refining. The Authority is reviewed annually and progress with any Environmental Management Plans is discussed. Most milling companies have some for of formal environmental management system in place.

Over the last 15 years many mills have spent up to $8 million each to ensure compliance with the changing legislated standards and requirements. As a consequence the following changes have been made with respect to water emissions:

- Most mills are now "closed" systems where all water that comes in with the sugarcane being processed is recycled through cooling towers and used in boiler stack emission wet collectors That emission becomes an emission of clean water vapour to ambient air. Any variable excess to requirements from time to time is recycled through effluent treatment systems and subsequently used as irrigation water on pastures and cane landcs. The construction of effluent ponds has been a major commitment and has had considerable economic impact on sugar milling companies.

- Five of the twenty six mills in Queensland remain fully or partially "open" systems – taking in water from upstream, using the stream or river water for process cooling and subsequently discharging that same water downstream. Very strict standards for water discharge quality and monitoring systems are set out in the respective Environmental Authorities under the *Environmental Protection Act 1991* provisions.

- All mills now have Stormwater Management Systems including segregation and risk management protocols in place based on rainfall and factory operation history.

- Boiler ash and filter mud recycling from the cane milling/sugar manufacturing process (recycled to agricultural land) has operational and monitoring protocols that focus on mitigating the level of risk of discharge of nutrients and suspended solids to catchments. Research and development in this area continues as methods are sought to "reduce, recycle, reuse." There has been increased economic impact on the industry as a result of changed recycling practices.

- Risk management within a sugar mill site includes the provision for spill containment (bunding) around tanks and vessels containing potentially environmentally harmful liquids (e.g. petroleum products, process chemicals).

- Each company has constant monitoring and reporting through forms of Integrated Environmental Systems.

- There is increased focus on water conservation protocols, particularly for those mills that are "water negative" and require water makeup, usually from underground supplies.

Term of Reference No. 3

Economic Importance of the Sugar Industry in 2010 and 2020

Need for planning certainty

Industry growth in the past has been largely due to horizontal expansion. Changes in government policy and new legislation now limit the potential for further horizontal expansion in many regions. At a state level the *Vegetation Management Act 1999, Nature Conservation Act 1992, Fisheries Act 1994* and *Coastal Protection and Management Act 1995* all significantly limit the potential for land development in coastal Queensland.

The sugar industry is a price taker, with family farms competing against heavily subsidized operations in Europe and the USA that depress the world market price by around 40% in an average year. Given the limited potential for expansion, the industry is continually looking to reduce input costs. However, many State Government policies, particularly in the natural resource management area, add significantly to farm input and management costs but provide no obvious environmental benefits. The trend is one of deteriorating confidence in environmental legislation and regulation to the point that business confidence generally is impacted.

Water pricing is a case in point. For example, SunWater is holding approximately 10,000ML of water from the raising of Borumba Dam (Maryborough region). SunWater had initially indicated it would sell the water to irrigators for around $150/ML once uncertainly surrounding the Water Resource Planning process was resolved. These environmental and sustainability issues have now been resolved but SunWater is withholding the water and proposing a future price of $1,000/ML on the basis that this is the projected tradable price in 10 years assuming increased demand from Noosa and Hervey Bay Councils and possible new hemp and chicory industries.

If Queensland rural industries are to be internationally competitive, government needs to provide planning certainty and stop undermining the cost competitiveness of rural industries.

Furthermore, in Queensland there is a need to build on landholder stewardship activities and markedly increase the number of private landholders who take additional actions to protect, maintain and manage existing native vegetation. There is also a need to revegetate areas in need of protection, and to suitably assist those landholders who are already undertaking these actions.

Potential for vertical expansion

There is potential for considerable vertical expansion through implementation of new technologies (Table 4). However, the realisation of potential gains from these technologies will ultimately depend on the availability of capital to institute changes; including financial, structural and human capital. The industry is developing the human capital required through a process of establishing farmer cell groups with a focus on training. Cell groups are similar to “neighbourhood groups” in that they group growers by location to promote information sharing and provide support and training networks. However, these activities are currently not eligible for government funding support through the federal government’s FarmBis program.

Table 4. New technologies that could increase production per hectare

Technology	Description
Dual rows 1.8m centres.	Rows better suited to infield equipment and more able to take advantage of incident sunlight.
Quad row system.	Rows planted 0.47m apart on beds at 2.1 centres. Requires equipment with track width of 2.1m and footprint of 300mm.
Precision agriculture.	Data at levels less than block size on yield, nutrient and moisture status etc.
Variety improvement	Ongoing at 1% p.a.
Variety improvements using biotechnology	Unlikely to be implemented in next 5 years
Reduction loss of cane and sugar	Mass balance analysis shows that there is considerable loss (greater than 25%) of sugar between standing cane and a factory, particularly when cane is cut green and trash is left in the field.
Planting technology	Using effective planting technology can raise yields.
Yield decline amelioration	Use of soybean break crops to arrest yield decline and planting of a fallow legume crop
Integration of harvest & transport	Improved whole of industry systems to reduce losses

The future direction of world sugar prices will be an important determinant of future investment of the industry. Current world surpluses of sugar production, due mainly to expansion in Brazil, can be expected to continue for a number of years. However, in the second half of this decade, increase in ethanol demand from Brazil and other countries is projected to remove some of the expected surplus which may lead to a balancing of consumption and production. Various models are available for projecting world sugar prices into the future; including SUGABARE and the model at the Centre for International Economics.

Diversification into novel products

Sugarcane is one of the most efficient converters of sunlight into biomass. In an energy-hungry world this inherent capacity may be a significant determinant of the industry's future. Alternative products potentially include ethanol, bioplastics, novel sugars, drugs and fermentation feedstocks.

The industry is currently making a significant investment in biotechnology with 24 staff in the Bureau of Sugar Experiment Stations' Biotechnology Team based at the David North Plant Research Centre laboratory complex in Brisbane. It is CANEGROWERS policy to see this effort significantly expanded. The industry is currently supporting an application for a Cooperative Research Centre for Sugar Industry Innovation through Biotechnology with the Bureau of Sugar Experiment Stations (BSES), University of Queensland, CSIRO and DuPont as core participants. This application and information on the supporting scientists can be downloaded from www.bses.org.au. Key overarching objectives include:

1. To combine the world-class strengths that Australia has in molecular biology, agriculture and chemical engineering, to develop a value-added sugarcane industry.

2. To capture the benefits of this work through superior, IP-protected plant varieties, with reliable high yields of sugar and high-value biomaterials, from efficient and environmentally sustainable farming systems.

3. To develop novel processes for the extraction of renewable biomaterials, and for further value-adding in profitable new downstream industries.

4. To provide Australian graduates with world-class skills, and seed new strategic partnerships, through which Australia's rural communities can share strongly in the benefits of biotechnology

The Federal Government's recent announcement of a 38c per litre subsidy for the local production of ethanol for fuel is likely to provide incentive for commercial investment in significant ethanol production.

Sugar as the kidneys of coastal cities and towns

Population pressures are predicted to continue to increase in coastal Queensland. People generate waste and the Local Councils in fast growing regional centres are already struggling to upgrade sewerage facilities to meet minimum national standards.

Cane fields have the potential to operate as the kidneys of Queensland's coastal towns and cities. For instance, the Hervey Bay City Council in southeastern Queensland, working with the local sugar industry, has demonstrated that sewerage and water can be recycled onto cane lands achieving zero ocean discharge. The Hervey Bay Township now irrigates seven cane farms, two golf courses, one turf farm and one tea-tree trial plot under strict environment management guidelines. Similar schemes are underway or proposed in several other GBR districts including Mackay, Bundaberg and Cairns.

For example in the Mackay region, the volume of domestic sewage to be treated by two sewerage treatment plants in Mackay is projected to increase from 7,800 megalitres per year to 9,180 megalitres per year by 2020 (Connell Wagner 2002). An effluent reuse scheme is being considered as a partnership between Mackay city, the local cane growers and the Queensland Department of Natural Resources and Mines as a cost effective way of disposing of this urban generated waste. As part of the proposal, 4 000 hectares of cane land will receive waste water. Use of the recycled water will mean that underground bores will be able to be capped in an area currently affected by salt water intrusion.

A sustainability report (Connell Wagner 2002) on this project has recently been completed and concluded that the effluent reuse scheme:

- Disposes of waste water in a cost effective manner,
- Saves a considerable amount of money that would be used to treat water to the level required to allow dumping into the catchment, and
- There is potential for a considerable improvement in farm productivity.

The project will require:

- A large reticulation project incorporating low pressure delivery systems on farm,
- Some funding assistance to allow reticulation to be completed in a useful timeframe and independently of individual financial circumstances,
- Runoff mitigation works on a large scale, and
- Construction of large buffering storage.

The project may require:

- Cane growers to guarantee that a minimum quantity of water is consumed,
- Changed cane varietal adoption (eg better 'wet feet' varieties), and
- Change farming practices.

Term of Reference No. 4

Costs and Benefits of Policy Options for Addressing Declining Water Quality

The Great Barrier Reef

The Productivity Commission inquiry focuses on water quality decline. However, the importance of this decline to the government/Parliamentary Secretary to the Commonwealth Treasurer is clearly because of its perceived actual or potential impacts on the GBR. In order to evaluate options for addressing the issue of declining water quality it is important to understand what aspects of water quality are declining and the likely impact on reef health. Towards this end it is also important to have an understanding of the reef system.

The persistent assertion has been that damage to the coral reefs of the GBR is being caused by land runoff, especially by the sediments and potential pollutants which are included in river discharge plumes. Most of these assertions have been made in the public media, or in unpublished or limited circulation reports. Inflammatory headlines or statements are typical. Marohasy & Johns (2002) provide a comprehensive critique of the recent public discussion as to whether or not land runoff is currently damaging the GBR.

In contrast to the media headlines and conclusions from the unpublished reports, published oceanographic and geo-scientific data contradict the hypothesis that land runoff is causing regional sediment smothering of reefs, or is enhancing water turbidity to a damaging degree.

The contradiction is evident because historically, organisations that provide the background science and active management of the GBR and its hinterland are focused upon marine biology and resource management themes, and many of their employees are trained in these essentially biological disciplines. However, issues such as the environmental impact of land-runoff and water turbidity have regard to physical processes and change through time. Their understanding and management requires a thorough underpinning of physical and geological science.

Importantly in the policy context, and as Risk (1999) has remarked: *"a viewpoint that is exclusively biological misses the geological perspective which is the only meaningful way to assess decline in reefs over time".* Even should modern monitoring studies establish that a significant change has occurred to the condition of a reef, this can only be assessed as "deleterious" or not against a firm understanding of the past natural changes that typify similar reefs. We know that natural, and sometimes cyclic, changes occur in all near shore marine environments, worldwide. Tropical coasts are no exception, and assessments of reef "degradation" are meaningless unless they are made with a firm understanding of the nature and rate of natural system changes.

There is agreement amongst oceanographers and geoscientists that sedimentation and turbidity in inshore GBR waters is mostly controlled by wave resuspension and coastal currents (Woolfe &

Larcombe, 1998; Orpin et al., 1999; Larcombe, 2001), and will not be reduced by limiting the suspended sediment supplied by land runoff. It is also well understood that many fringing reefs have been severely affected by a late Holocene fall in sea-level (Hopley et al., 1983; Johnson & Carter, 1987) rather than human activity.

This knowledge tends to be ignored by government and statutory authorities in their policy, planning and management. As a consequence the current policy framework is not robust and is unlikely to stand the test of time.

Water Quality within Catchments

"Declining water quality" is a negative trend observed in measured water quality parameters over a period of time. The cane growing industry has sponsored the publication of reports on water quality monitoring data held by the Queensland Department of Natural Resources and Mines. These reports have included 18 sites within cane growing areas and values for pH, dissolved oxygen, turbidity, electrical conductivity, ammonia, nitrate, total nitrogen, and total phosphorus. Although these reports are a good start, the frequency of data collection is problematic and there is no data for many cane growing areas. Nevertheless it is apparent that the existing data do not indicate a trend of declining water quality in catchments. Indeed water quality is generally good and within national standards.

Water quality data is more complete for the reef lagoon and again this data does not support the ascertain that water quality is deteriorating (Wachenfeld 1998). Indeed the State of the Great Barrier Reef Report states that, “A number of parameters (salinity, nitrite, particulate nitrogen, dissolved organic phosphorus and chlorophyll) show seasonal differences in concentrations. Most of the observed seasonal and cross-shelf variability in nutrient and suspended matter concentrations is likely due to short lived event processes (upwelling, winds, resuspension) which largely affect local or regional nutrient distributions. Time series of water quality parameters in the well-sampled Cairns sector between 1989 and 1994 are characterised by distinct temporal variability, but lack an overall temporal trend.” In other words there is no evidence for declining water quality in the reef lagoon.

The sugar industry’s environmental vision is “to share responsibility for the long-term protection of our natural environment, alongside government, the community and other industries”. Good water quality monitoring data provides a starting point for understanding our environment and our potential impacts. The publishing and dissemination of this information provides a starting point for communicating issues and finding solutions. Because of the importance of protecting water quality within catchments, and as a consequence of our commitment to continual improvement, the cane growing industry supports the collection of more detailed information so stream health can be more comprehensively monitored and the quality of water leaving cane farms continuously assessed. Where water quality problems are identified, the cane growing industry has, and will continue to work to fast-track implementation of best management practices using the conceptual model detailed in Figure 5, through the COMPASS program and through the support of the industry’s farmer-cell group networks.

Recommendations

1. That the federal government objectively consider all potential impacts on water quality, including urban effluent discharge, and then prioritise actions based on a transparent analysis of the relative contributions and associated risks.

2. That government-sponsored water quality monitoring programs are increased in terms of both number of sites and frequency of measures and the quantitative results from the programs objectively and transparently communicated on a regular basis to industry and community groups.

3. That the federal government undertake an audit of the discipline balance (i.e. physical, chemical, geological and biological) which attaches to both current GBR research programmes, and also the employment of professional persons, including managers, in reef research and management agencies.

4. That the federal government provide landholders with planning certainty by assisting the integration of existing natural resource management regulatory frameworks including those in the areas of coastal management, water allocation and vegetation management.

5. That the federal government support sugar industry innovation and diversification initiatives including through support for the Cooperative Research Centre for Sugar Industry Innovation through Biotechnology.

6. That the federal government support the extension and adoption of best management practice technologies including through the modification of the FarmBis program to provide funding support to farmer cell groups and associated training initiatives.

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Appendix 1.

Chapter 1 Nutrition and Fertiliser Use

- 1.1 Identifying and rectifying nutrient deficiencies
- 1.2 Fertiliser selection and application
- 1.3 Use of Mill Mud and Ash
- 1.4 Application of Dunder and other fluid fertilisers
- 1.5 Storage of Dunder and other fluid fertilisers
- 1.6 Minimising losses – leaching and runoff (all nutrients)

Chapter 2 Soil Health and Conservation

- 2.1 Reducing soil erosion
- 2.2 Soil health
- 2.3 Knowledge of soils
- 2.4 Soil borne insects and diseases
- 2.5 Soil compaction
- 2.6 Saline and sodic soils

Chapter 3 Irrigation Best Management Practices

- 3.1 Scheduling method
- 3.4 Furrow irrigation – minimising deep drainage
- 3.5 Furrow irrigation – recycling and runoff
- 3.6 Overhead irrigation – maximising uniformity
- 3.7 Drip irrigation – minimising deep drainage
- 3.9 Weather and climate forecasting
- 3.11 Irrigating from bores
- 3.12 Irrigating with effluent water
- 3.13 Farm Plan

Chapter 4 Drainage

- 4.1 New drainage work
- 4.2 Laser levelling
- 4.3 Existing drainage
- 4.4 Drain maintenance
- 4.5 Acid sulfate soils

Chapter 5 The Business of Farming

- 5.1 Types of records kept
- 5.2 Record keeping system
- 5.3 Business management

Chapter 6 Management of Vegetation along Creeks and Rivers

- 6.1 Management of vegetation along creeks and rivers
- 6.2 Width of vegetation along creeks and rivers
- 6.3 Rehabilitation of vegetation along creeks and rivers
- 6.4 Protection of vegetation along creeks and rivers (buffer zones)

Chapter 7 Pest Management