The Secretary
Senate Standing Committee on Rural and
Regional Affairs and Transport
PO Box 6100
Parliament House
Canberra ACT 2600
23 July 2008

AUSTRALIAN SUGAR MILLING COUNCIL

Australian Sugar Milling Council Pty Limited
A.C.N. 010 779 496 A.B.N. 44 010 779 496
North Podium Level, 192 Ann Street, Brisbane Q 4000
GPO Box 945 Brisbane Q 4001 Australia
Telephone (07) 3231 5012
Facsimile (07) 3229 2113
Website www.asmc.com.au

Dear Sir/Madam,

A submission regarding the implementation, operation and administration of the legislation underpinning Carbon Sink Forests and any related matter.

The following is a submission made on behalf of the members of the Australian Sugar Milling Council for consideration by the Senate Committee appointed to examine the abovementioned matters.

The Australian Sugar Milling Council (ASMC) is a voluntary organisation, established in 1987 to represent Australian raw sugar mill owners. ASMC is the peak policy forum for mill owners. Ten companies that own and operate all twenty three raw sugar mills in Queensland are members of the Australian Sugar Milling Council.

The establishment of forests funded by investors in Managed Investment Schemes represents a serious threat to the ongoing sustainability of commercial farming and related processing industries in Northern and Central Queensland, in particular, the sugar industry.

Through this submission, the Milling Council seeks the support of this Committee to make recommendations to the Government to urgently review and revise the legislation relating to Managed Investment Schemes in Forestry.

Yours sincerely,

JA (Jim) Crane
for the General Manager
Phone - 0732315001
Email – jim.crane@asmc.com.au

INTRODUCTION

The Australian Sugar Milling Council submits that all taxation and Government assisted distortions favoring forestry investment in preference to commercial farming agriculture need to be removed. The particular application that is directed to carbon sequestration as Carbon Sink Forests is but one of these distortions providing selective exclusions and benefits to forestry investments with enormous land purchasing power. Consequences arising from continued application of these taxation and other distortions are devastating on valuable commercial agricultural industries and to regional communities where taxation assisted forestry is establishing in competition with commercial farming operations.

Many of the views expressed in this submission are repeated throughout the agricultural areas of Australia where tax assisted forestry has been established and has impacted on agricultural businesses and the economies of regional communities. The motivation for tax assisted forestry is not the pursuit of commercial agriculture in the sense that commercial agriculture makes profitable use of a land resource – the motivation for tax assisted forestry is the demand for taxation benefits which are preferentially provided to this particular investment model.

This submission suggests dismantling this damaging system to allow the market to allocate scarce resources more efficiently and competitively.

In doing so it draws the Committee's attention to the following.

- **The distortion created in the land market by the capacity of MIS promoters to offer short term tax benefits to high income investors resulting in large cash raisings for the purpose of establishing forests on prime agricultural land.**
- **The negative social and economic impacts on communities established around and reliant on the sugar industry in Coastal Queensland as forestry displaces commercial farming activities and the sugar industry is permanently impacted.**
- **The alienation of future food producing land and the lost future opportunities for renewable energy production in the form of electricity and ethanol from sugarcane if the sugar industry is forced to close unviable processing capacity.**
- **The need for the Australian Government to intervene and correct this damaging imbalance and subsequent permanent impacts.**
- **The need to have markets return to a situation where resources are allocated efficiently and competitively.**

Submission

This is the turbine hall of CSR's $150 million Pioneer Sugar Mill cogeneration facility commissioned in 2006. The opportunity for more such facilities across the sugar industry could be lost if taxation-favoured forestry continues to intrude on commercial sugarcane farming operations.

The ASMC wishes to place the following information regarding Forestry Managed Investment Schemes (MIS) and the threat posed by them to the continued sustainability of the Queensland Sugar Industry before the Senate's Rural and Regional Affairs and Transport Committee. This submission is made in the context of the Committee's current inquiry into the implementation, operation and administration of the legislation underpinning Carbon Sink Forests and any related matter. The ASMC believes the issue of MIS Forestry and its intrusion into commercial farming and food production areas is a related matter in that the adverse consequences of MIS forestry will be exacerbated by the matter under consideration of the Committee; namely, the extension of favourable taxation treatment to the establishment of carbon sink forests with the consequential loss of more food producing, good quality agricultural land to the detriment of jobs and local communities generally.

Background

During the past few years, the Queensland Sugar Industry has lost access to a significant area of commercial farming land as a result of land purchases by promoters of Forestry Managed Investment Schemes (MIS). This damaging effect of a tax assisted distortion in market power continues to impact on the industry. The ASMC recognises and supports the role that healthy competition for land use plays in ensuring a prosperous rural sector, and supports that competition on a level playing field when our use of the land is challenged. However we have consistently expressed our concern that **forestry MIS land use is driven not by economics, nor by any perceived environmental benefit that forestry proposes in comparison to sustainable, commercial farming uses, but primarily as a provider of short term tax offset benefits to high income investors.**

Recent events have brought this into alarming perspective, with a number of examples where farms purchased by MIS schemes have had valuable commercial sugarcane crops destroyed (over $500,000 worth of cane in the Tully mill area in a two week period in April this year) to expedite tree planting ahead of a taxation year end deadline. This highlights the fact that these investment schemes are responding to demand for tax minimisation offsets rather than attempting to maximise economic benefit from land use.

During the course of the past three years, more than 14,000 hectares of land previously growing and supplying sugar cane to Northern and Central district mills has been planted with trees associated with Managed Investment Schemes. The amount of land being sold to timber interests is of great concern to an industry which relies on mill throughput to maintain viability. While consequences of mill closure and job losses are more likely to occur first in areas where mill aggregation is an option, the greater structural impacts will be in areas where there is a single mill operation such as Tully, Proserpine and Sarina.

This image is from the Tully area and shows a fully grown crop of sugarcane that was being harvested and dropped on the ground to make way for the planting of an MIS forest by June this year – just weeks prior to the commencement of the 2008 crushing season. This particular block of cane abuts the Tully Mill cane railway (see rail track in foreground).

This is because a sugar mill needs a certain cane supply to remain sustainable. This quantity of cane can vary, dependent on sugar price, but as a rough rule of thumb individual mills would find a loss of more than 15% of their cane supply area impacting quite severely on their sustainability.

Of greatest concern is that the towns and communities that have established around these sugar mills and the cane growing industry will experience a collapse of their economies if the sugar mill were forced to close. In late 2007, the Australian Sugar Milling Council commissioned an independent study of the likely impact of the closure of sugar mills brought on by the loss of cane land to forestry.

Brent Borrell of The Centre for International Economics (The CIE) in Canberra was commissioned to do this work. His report (Attached) suggested that:

- If forestry continued to displace sugarcane land in Queensland, local economic activity (at a mill area level) will decline.
- Economic model results indicate local economies centred around a mill area could lose:
  - economic activity of between $32 million and $111 million a year;
  - between 500 and 1000 people, or between 200 and 400 households.
- For small sugar towns, such losses could have significant consequential impacts on schools, infrastructure and small businesses.
- Mills located around the Innisfail, Tully, Ingham. Proserpine and Sarina townships appeared to be most under threat at the time.
- These developments were putting sugar regions and towns under considerable adjustment pressures.

A solution must be found before it is too late!

It is clear that favourable taxation treatment for investors in Forestry MIS over commercial farming activities has created a **distortion in the market for quality agricultural land in the wet tropics of North Queensland**.

In the recent past, MIS promoters have centred their attention on the cane growing areas around Innisfail, Tully and Ingham, while maintaining a continuing interest in the Mackay region from Proserpine to Sarina. As mentioned previously, the area diverted from cane growing to Forestry MIS in the last three years in these areas of Queensland has escalated to in excess of 14,000 hectares and continues to gain momentum. This is equivalent to the area required to support a moderate sized Australian sugar mill producing 170,000 tonnes of export raw sugar with a value of over $55M per year. However, because the land diverted to forestry is spread across a number of cane growing regions, a number of mills are at risk, as their relatively fixed operating costs is recovered from ever reducing cane volumes.

The reduction in area of land available to grow high yielding crops of sugarcane for supply to sugar mills for processing into sugar and other renewable products threatens the longer term viability of this well established rural industry. Particularly concerning to the towns and communities around these sugar mills is that the timber plantations being established on this land will generate little or no economic activity between planting and harvest (up to 20 years) to replace the income currently produced by the sugar industry.

Proserpine Sugar Mill has been the cornerstone of the Proserpine economy and the backbone of its community since 1897. The taxation advantage given to investors in MIS Forestry projects has significantly distorted the market for sugarcane land in the region.

While the sugar industry has been characterised by cycles of highs and lows, for more than 100 years it has continued to sustain these regions. During this time, the rural communities of North Queensland have prospered on the foundation of a strong sugar industry, with milling infrastructure and operations providing employment and economic activity to support the economic returns from sugarcane grown on the farmlands surrounding the mills.

During the last ten years significant deregulation and rationalisation of the industry has occurred as the industry has adapted to global competitive pressures. While some more marginal cane growing country has gone out of production during this period, prime cane land changing hands was generally acquired by cane farmers looking to ‘scale up’ their farming activities and lower their unit production costs. The level of competition for land from MIS

schemes is making it almost impossible for cane growers to expand and compete effectively in the world market.

The favourable taxation arrangements available to investors in Forestry MIS (and not available to commercial farming operations) mean that the scheme promoters have significant sources of funds to purchase quality agricultural land, funds not available to others. The extremely long crop cycle of the forestry industry means that once land is planted to trees, it is highly unlikely to be returned to other higher economic intensity use until the trees are eventually harvested, despite the fact that commercial farming crops may demonstrably produce better economic returns.

It is worthy to note an emerging concern that was raised at the Australian Government's 2020 Summit earlier this year. Under the influence of climate change, the wet tropics in particular, and Northern Australia in general, appear certain to have an increasingly vital role in future food production for both this country and the Asian region.

April 2008 – Trees planted in the Proserpine area at Mt. Dan and Wandara in May/June 2006. The trees are overgrown with grass and volunteer cane and in very poor to dead condition raising questions over the longer-term commitment of the forestry companies.

Continuation of a tax policy that encourages investment in timber plantations on good quality agricultural land in a potential future food bowl ignores this identified national imperative and places unnecessary constraints on the medium term use of this crucial national resource. Those constraints could limit not only food production, but also the potential of sugar mills to positively contribute to climate change management through the beneficial expansion of renewable energy and biofuels sourced from the industry. A recently completed Australian bioenergy roadmap outlines a potential for up to 4,000 GWh of greenhouse friendly renewable electricity to be exported from Australian sugar mills. Sugar mills already export renewable electricity into the National Electricity Market which avoids an equivalent 1.1 million tones of carbon dioxide (CO_2e) that would otherwise be produced by coal fuels. There is potential to see significantly greater amount of CO_2e and positive climate change outcomes generated from an expansion of current generating capacity. The recently announced extension to the renewable energy target and the policy settings contained within the scheme moves mills closer to realising this potential. However, no sugar mill will be prepared to risk the substantial investment required with the threat that this investment will be lost

as throughputs are threatened by MIS forestry continuing to expand and replacing cane production.

Teak trees planted in the Tully area in 2007 on land previously used to grow sugarcane. In 2008, the native grasses, weeds and volunteer cane all appear to be making better progress than the trees.

Separately, and as evidenced by the specific matter for consideration by the Committee, there appears to be momentum building within some sectors of the Australian community towards planting trees as a means of offsetting/neutralising the carbon footprint of their emitting activities. With the types of MIS forestry evidenced by those examples recently established within the sugar producing regions of Queensland any verifiable scientific basis for such an offsetting proposition would be questionable at best. When accumulated against the social and economic value of those other activities displaced by the tax assisted ventures is considered, such activity must not be at the expense of prime agricultural land in areas such as coastal Central and Northern Queensland. **Whilst establishing additional areas of trees under properly managed and maintained long term control may provide a form of sequestration, it is illogical and socially irresponsible if it comes at a cost to Australia's commercial farming and food production, and the ability to provide more certain CO_{2e} offsets having greater benefits.**

Approaches were made by the sugar industry to the previous Australian Government to bring forward a review of the Forestry MIS taxation arrangements because of the consequence of the existing policy in distorting the land market place and causing instability in a well established and mature sugar industry.

This remains an urgent matter not only for the sugar industry but for the future food producing capabilities of Northern Australia and the ASMC seeks this Committee's support and possible intervention to remove the distortion in the market for agricultural land brought about by the favourable tax arrangements for MIS investors that has led to this rapid expansion of tree cropping in the midst of good quality agricultural land.

One option that the Committee could consider for recommendation to the Government would be to more closely define the eligibility criteria for MIS Forestry taxation arrangements in a way which ensured there is a valid national and regional benefit from such activities that justifies the diversion of taxation revenues supporting them.

An example may be where this activity is seen as remedial to land not suitable for commercial farming operations. Such an activity would require pre-approval validation and post establishment auditing for ensuring the integrity of a system which can otherwise not be justified.

Similar strict arrangements for the creation of economic benefits (Tradable Renewable Energy Certificates) only on the basis of results actually measured governs the ability of sugar mills to access incentives available under the MRET scheme, and could be adopted as a case example for such an activity. It should be noted that while there is an opportunity for sugar mills to make investments to access REC's (under strictly managed arrangements), there is no ability to access diverted taxation concessions to these projects in the same way as MIS forestry projects can.

Attached for your additional consideration of this important matter is a copy of the October 2007 **CIE report – *Sugar versus forestry in Queensland: regional impacts.***

Additional information for the Committee

The following images are of MIS 'Forests' planted over the past two years in the Herbert, Tully and Sarina to Proserpine areas. Some stands of trees are well established and appear to be thriving although there are sufficient examples in each area as depicted in the following selection of images where there has been a high failure rate of trees and obvious poor stewardship to have the local communities concerned about the longer term commitment of the MIS companies. Many local observers have come to the conclusion that the establishment of MIS 'Forests' is mostly about the tax and scarcely about the trees.

From the Herbert

From Tully

From Babinda

From the Central Region (Sarina to Proserpine)

REPORT

www.TheCIE.com.au

Sugar versus forestry in Queensland: regional impacts

Prepared for:

Australian Sugar Milling Council

CONFIDENTIAL

Centre for International Economics
Canberra & Sydney

October 2007

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CANBERRA

Centre for International Economics
Ian Potter House, Cnr Marcus Clarke Street & Edinburgh Avenue
Canberra ACT 2601

GPO Box 2203
Canberra ACT Australia 2601

Telephone +61 2 6245 7800 Facsimile +61 2 6245 7888
Email cie@TheCIE.com.au
Website www.TheCIE.com.au

SYDNEY

Centre for International Economics
Suite 2, Level 16, 1 York Street
Sydney NSW 2000

GPO Box 397
Sydney NSW Australia 2001

Telephone +61 2 9250 0800 Facsimile +61 2 9250 0888
Email ciesyd@TheCIE.com.au
Website www.TheCIE.com.au

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Boxes, charts and tables

Summary

The 2020 Vision for forestry has a target to rapidly increase the planting of plantation timber in Australia. Managed investment schemes (MISs) that attract tax concessions have been used to fund the establishment of such plantations.

- Increasing land values in Victoria (for instance) and failure of rainfall in Southern Australia have caused forestry MIS promoters to turn their attention to areas of the sugar industry in Queensland to establish both pulpwood and higher value cabinet timber plantations.
- About 11 000 hectares (3 per cent) of traditional sugarcane land has been sold to, or is under negotiation for sale to, forestry MISs since 2004.

Economies of sugar mill areas will decline with increased forestry

Sugar production is a far more input intensive enterprise than forestry. As such it generates considerably more local economic activity than forestry.

- If forestry continues to displace sugarcane land in Queensland, local economic activity (at a mill area level) will decline.
- Economic model results indicate local economies centred around a mill area could lose:
  - economic activity of between $32 million and $111 million a year;
  - between 500 and 1000 people, or between 200 and 400 households.
- For small sugar towns, such losses could have significant impacts on schools, infrastructure and small businesses.
- Mills located around the Innisfail, Tully, Ingham. Proserpine and Sarina townships appear to be most under threat at present.
- These developments are putting sugar regions and towns under considerable adjustment pressures.

Many mill areas may have only a narrow window of opportunity

The rate of loss of sugarcane land to forestry appears to be dependent on a number of factors.

- Despite the long lead times involved before obtaining a return from forestry, the considerably lower labour and capital input intensity of forestry may make it appear financially attractive relative to sugar production at current low sugar prices.
- The relative attractiveness of MISs to promoters to spread risks and to investors to obtain potential tax advantages, may add to the apparent popularity of forestry. However, the schemes face risks because they depend on:
  - a continual stream of new small investors being prepared to invest at apparently high risks and relatively low returns;
  - the long-term continuity of tax concessions attaching to MISs.
- The sugar industry would appear to have considerable scope to obtain productivity gains and potential exists for increases in world prices.
  - Targeted productivity gains are being pursued at the farm, harvesting and milling levels to further improve Australia's international competitiveness, but will require time to achieve.
  - The longer it takes to achieve the productivity gains and world prices to improve, the greater the in-roads forestry will make and the more difficult it will be for the sugar industry to compete.

A worst case scenario for towns built around the sugar industry would be to see:

- mills close before they can achieve the required changes;
- growers unable to recover their investment in their current sugar cane production cycle;
- forestry activity to drop off after a mill closure due to declining investor popularity of MISs;
- a recovery in sugar prices after an irreversible mill closure, stranded sugar producing assets, lost local economic activity, declining town populations and redundant town infrastructure.

1 Introduction

Queensland is one of the lowest cost sugar producers in the world, and around 80 per cent of production is exported. The industry is a significant Australian agricultural sector. The industry has faced and met many challenges over many decades. Its fortunes have fluctuated over the years with the notoriously cyclical and volatile world sugar price, but generally the industry has expanded and prospered for over a century. This prosperity and growth has been the lifeblood of many small towns that have similarly prospered and developed over that period. However, the industry and its dependent communities are facing a new challenge; that of managed investment schemes (MISs) for forestry plantations.

The growth of forestry MISs in Central and Northern coastal Queensland is increasing the competition for traditional cane growing land. And as more cane land is used for forestry, the production of sugar cane falls, straining the economies of size and economic viability of sugar mills. These developments raise many questions about the relative economic competitiveness of sugar and forestry, and their respective impacts on sugar regions.

Forestry is displacing cane

In what has been a relatively recent phenomenon, forestry MIS promoters have turned their attention to areas of the sugar industry in Queensland to establish both pulpwood and higher value cabinet timber plantations. The move north from southern States for these MIS scheme forests follow:

- an increase in land values on suitable land in Victoria and the failure of annual rainfall that is critical in growing high yielding forests;
- new taxation arrangements to encourage further investment in long rotation cabinet timber plantations which allow trading of MIS investments (DAFF 2007).

About 11 000 hectares of traditional sugar cane land has been sold to or is under negotiation for sale to forestry MISs since 2004. This represents approximately 3 per cent of total cane area harvested in the mill areas targeted by forestry MISs.

And the rate at which forestry is taking over from cane is increasing. In the next 12 months up to an additional 12 000 hectares of land could be lost to forestry. Over the next five to 10 years, it is plausible that MIS forestry plantations could increase their land holdings from a minimum of 40 000 to potentially over 100 000 hectares.

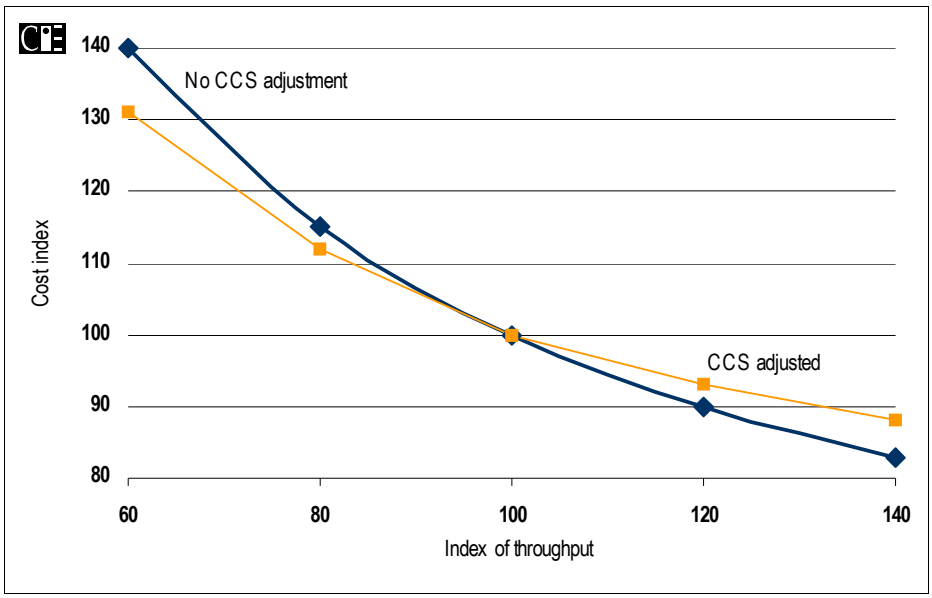
The growth of the MIS forestry sector in Queensland is part of the broader growth in forestry MISs associated with the 2020 Vision for forestry. The 2020 Vision has a notional target of trebling effective plantation areas over 1997 levels. The 2020 Vision notes that the area under plantations is only one measure of the success of the Vision. Significantly, it notes that success is dependent on the:

> …quality, product mix, location and management of the forestry plantation resource…to the delivery of maximum social, economic and environmental benefits to Australia (Plantations 2020, 1997).

The economics of milling, harvesting and growing

Sugar milling involves high fixed costs. A large throughput of cane is needed to make milling economically viable. With forestry plantations displacing cane, throughput at sugar mills will be reduced. And with declining throughput of cane the viability of mills is being threatened (chart 1.1). Potentially the closure of sugar mills may be forced. Moreover, the rapid deterioration of cane quality that occurs after harvest and the high costs of transporting cane over long distances to alternative mills, means mill rationalisation and consolidation is not always a viable response.

1.1 **Average industry economies of mill throughput**



Data source: CIE (2002).

If transporting cane to an alternative mill for crushing is not viable, when a mill closes, the remaining farms in the mill area are effectively forced to stop cane production. The immediate impact is that these growers would have to look for alternate sources of income and their investment in planting cane over the production system cycle would not be recovered.

This has adjustment consequences and flow-on effects with respect to land prices and local and regional employment and income levels.

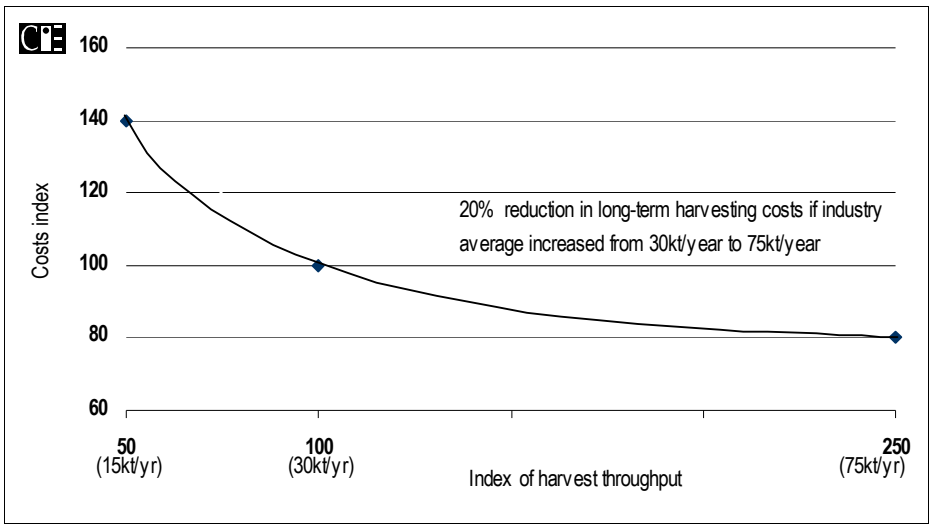
There are also economies of size in cane harvesting and farming — see charts 1.2 and 1.3.

Cane, once planted, typically yields several crops over five or more years. Usually cane farms are divided up into a number of blocks reflecting the different years of planting. One block will have new plantings having previously been fallowed, the next will have one-year old cane, another ratoon 1 [1], ratoon 2 etc up to ratoon 4 with five-year cane. The investment in planting a block of cane is recovered over a five to six year period.

Harvesting is highly capital intensive. The initial investment in a cane harvester is recovered over several years.

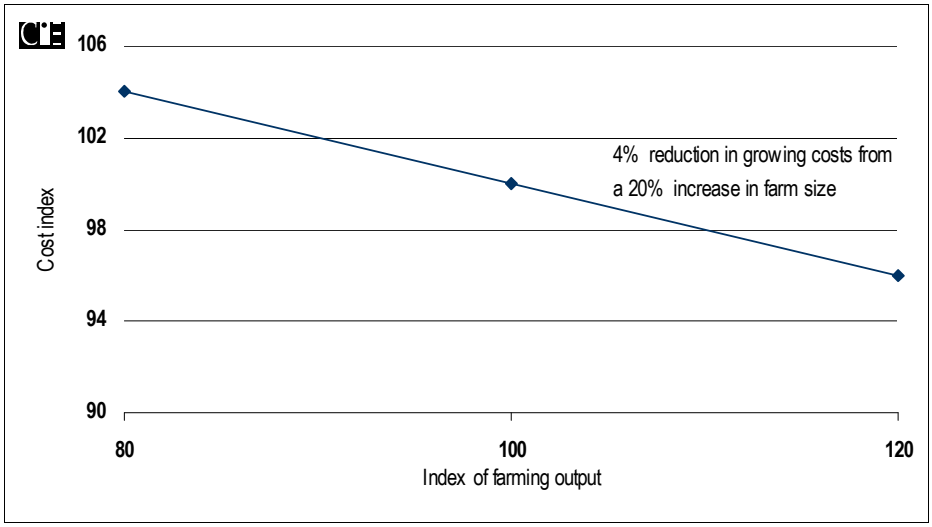
[1] Sugar cane is grown from setts (cuttings from mature cane stalks). Each sett can produce up to 12 stalks of cane per year for a number of years in a process called ratooning.

1.2 **Economies of throughput in harvesting**



Data source: CIE (2002).

1.3 **Economies of output in farming**



Data source: CIE (2002).

Broader economic impacts depend on the cost structures

How losses of land to forestry will affect the local, regional, state and national economies will depend on the economic intensity of the two sectors (sugar or forestry) and the extent of regional sourcing of the factors of production used in that particular region. Furthermore, given the 10+ year life spans of forestry plantations, the timing and frequency of forestry economic activity will further contribute to these differences. The price and productivity outlook for each industry will also have a large bearing on relative economic activity arising from the competing enterprises.

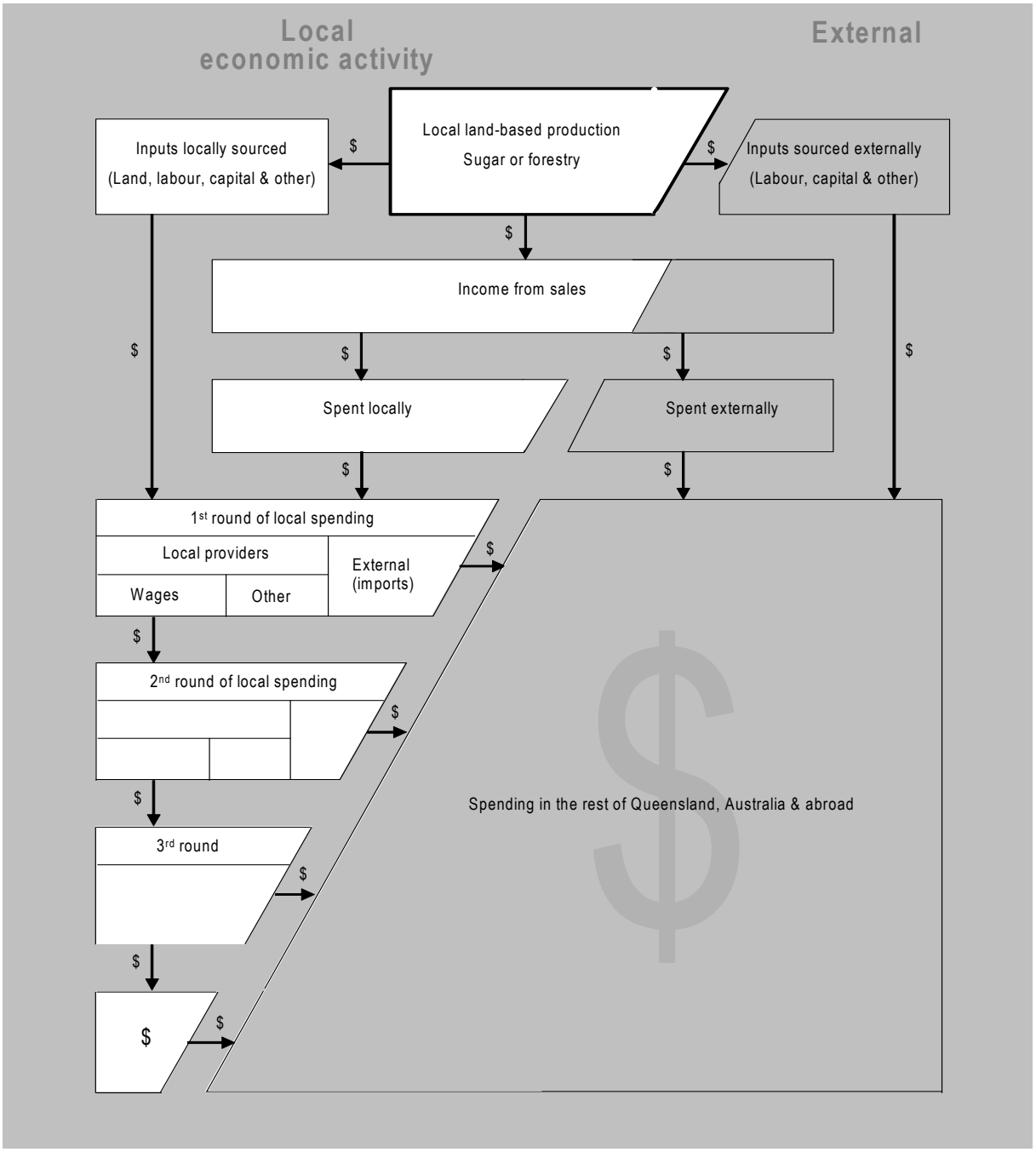
Differences in the level, source and timing of economic activity will have flow-on impacts on local communities. This is particularly the case when sugar mills are forced to close and the surrounding cane farmers have to change to other less profitable farming activities or find other work.

These impacts are not limited to the immediate farm level, and the differences can be significant, having a multiplicative impact on the broader community — second round, third round and further but diminishing round impacts. Differences in where and when cane or forestry income is spent can have a significant impact, particularly on small communities which are dependent on purchases of goods and services by cane farmers, harvesting contractors, mills and their employees . Changes in expenditure patterns in local communities can affect the viability of local stores and providers that service those sectors, which in turn has further compounding effects on local businesses.

The economic impacts of sugar and forestry industries are very different in the short and long term. Forestry and sugar have vastly different input use, in total, in intensity and through time. They also have different income generating capacities through time.

Chart 1.4 sets out the flows of local purchases and spending that needs to be tracked for both sugar and forestry to compare the overall impacts on local communities of these two competing enterprises.

1.4 **Where inputs are sourced from and revenues spent is crucial to local communities**



Data source: CIE.

This study

The objective of this study is to examine the consequences to economies of local communities and the broader economy of the shift from cane farming to forestry. This requires understanding the economics of both forestry and cane farming, and tracing through the pattern of spending and earnings from each.

Understanding these differences, risks and the potential changes is not simple. The economic attractiveness of the two enterprises (sugar and forestry) may be very different through time. The longer the forestry plantation period, the larger the required pay-off to both the forestry promoter and the forestry investor. Long lead times between investing and earning a return requires large payoffs to ensure economic viability. And the longer the time periods, the larger the risks — costs may change, prices may change, quality may change. Comparatively, sugar cane farming involves an annual crop, providing the opportunity to adjust to the changing circumstances, significantly reducing the future cost, price and quality risks.

Forestry with MISs may appear more attractive than sugar at the low point of sugar's price cycle and while forestry MISs continue to provide tax advantages.[2] But sugar may be more attractive in the long term.

The direction and magnitude of the impacts of future growth in forestry MISs requires consideration of the two sectors in a systematic way.

The best way of analysing and understanding the direct and flow-on effects of these changes is with an economic framework that has the capacity to quantify the implications at a regional level.

Using an economy-wide model a number of 'what if' questions can be answered by comparing the results from a number of scenarios. For the purpose of this study, we examine the following issues:

- the economics of cane farming and sugar production relative to forestry at a farm/land level;
- the profitability of sugar relative to forestry;
- the pattern of expenditure of sugar relative to forestry; and
- tracing through the spending impacts at a local community level.

[2] The tax concessions attaching to MISs for horticulture have recently been discontinued, demonstrating that the continued use of MISs is highly dependent on the vagaries of the political system.

For this study, specific regional models of sugar and forestry expenditure flows are developed and are used to identify how direct regional expenditure and revenue flows will change as sugarcane is displaced by forestry. Changes in direct flows are then imposed on an economy-wide regional model, TERM (The Enormous Regional Model of the Australian economy) to determine regional flow-on effects on income and employment. TERM includes 11 Queensland sub-regions and many separately identified industries (see appendix A). Four of the sub-regions produce sugar.

In chapter 2 expenditure and earning streams of MISs for forestry are examined. Chapter 3 examines comparable streams for the sugar industry. Chapter 4 sets out scenarios of a number of future factors affecting the MIS forestry and sugar sectors separately and reports the modelling results. Chapter 5 concludes.

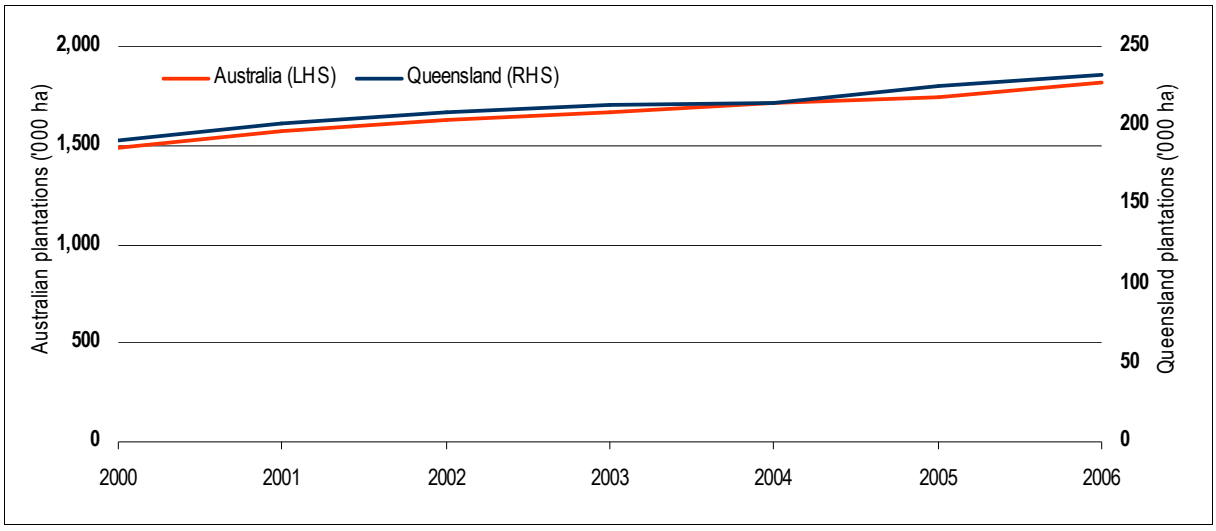
2 *Forestry and MISs in Queensland*

Forestry in Queensland and Australia is expanding, aided by the growth of forestry MISs.

Forestry in Queensland

Australia's and Queensland's forestry industries are both growing. In Queensland, 49 000 hectares of new forestry plantations have been established since 2001, increasing total land under forestry plantations by 22 per cent to 233 000 hectares in 2006. This is similar to the 22 per cent increase in plantations across Australia over the same period (chart 2.1). That said, Queensland has only 12.8 per cent of Australia's total forest plantations.

2.1 **Land under forestry plantations is increasing in Australia and Queensland**



Data source: ABARE (2007).

Patterns of expenditure and revenue for forestry plantations

The expenditure and revenue patterns for forestry plantations in Queensland vary by timber product. However, typically, the pattern is one of large expenditure in the year of planting, followed by smaller patterns of maintenance expenditure of between 10 and 20 years before large harvesting costs and revenues occur.

For pulpwood plantations, harvesting typically occurs around the 10 year mark, while for high value timbers such as red mahogany and teak, harvesting can occur as late as the 20th year of the plantation, although there is some limited activity during the forest's life when thinning of the forest can occur. These patterns of expenditure and revenue are outlined in charts 2.2 and 2.3 for pulpwood and red mahogany plantation types respectively. These patterns of expenditure and revenue flows come from published product disclosure statements (PDS). The ones shown here are from ITC, a major investor in Queensland forestry.[3]

The costs do not include an imputed cost of land. Land is assumed to be a non-depreciating asset owned by the enterprise[4]. The return from the enterprise should therefore be interpreted as a return to land as well as capital and risk.

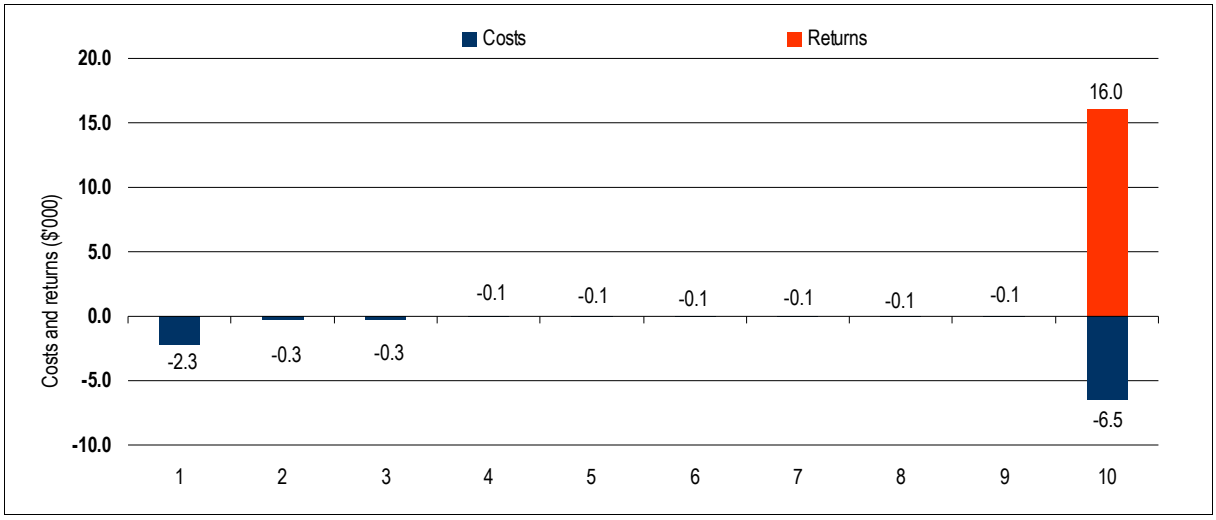
Costs are based on ITC's costs and GRO (1999). The revenue projections are based on expected yields and current wood prices published in the relevant PDS. Based on these numbers, the calculations indicate positive rates of return for the pulpwood plantations at discount rates below 13.8 per cent, while for the red mahogany plantation, positive rates of return are achieved for discount rates up to 18.4 per cent.

Using a discount rate of 7.5 per cent, the benefit to cost ratio is 1.29 to 1 and 2.36 to 1 for pulpwood and red mahogany plantations respectively.

[3] Note: all these costs are in real terms.

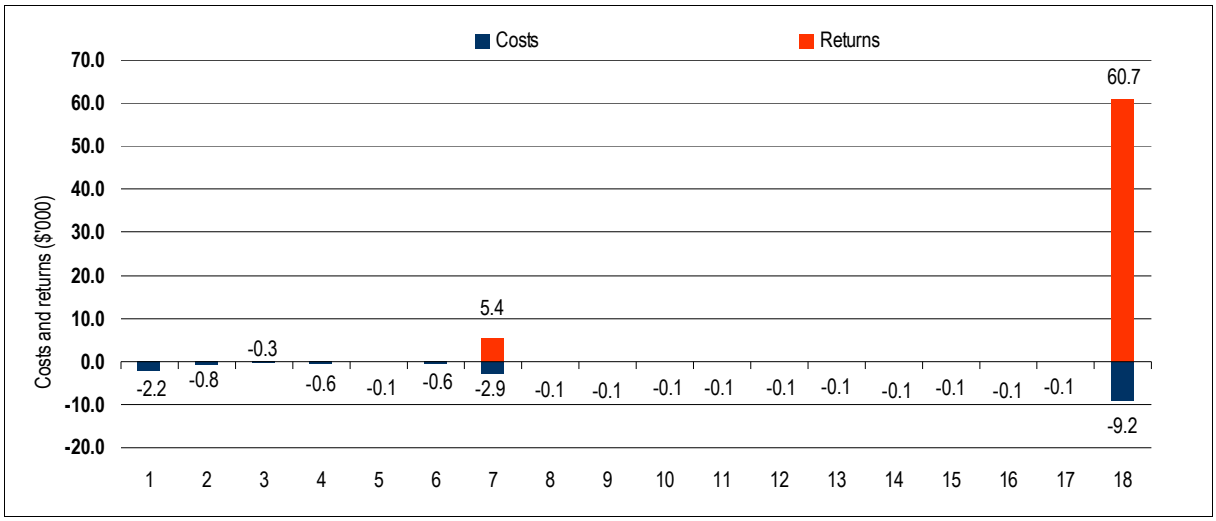
[4] The non-depreciating asset is assumed to be worth the same at the start of the project as at the end in net present value terms. As such there are no changes in land values assumed or affecting the analysis. In reality, land values could shift up or down in real present value terms, but to the extent they do, they will equally affect the relative economic competitiveness of both enterprises.

2.2 Pulpwood plantations' patterns of expenditure and earnings



Data source: ITC (2007) and GRO (1999).

2.3 Red mahogany plantations' patterns of expenditure and earnings



Data source: ITC (2007) and GRO (1999).

The actual costs spent on the ground are integral to understanding the resources flowing into management in the region, and are actual economic activities. There are also timing implications.

Initial costs associated with establishing a plantation include:

- soil survey and site analysis;
- a general clearing of the ground, including the establishment of fire protection and access tracks;

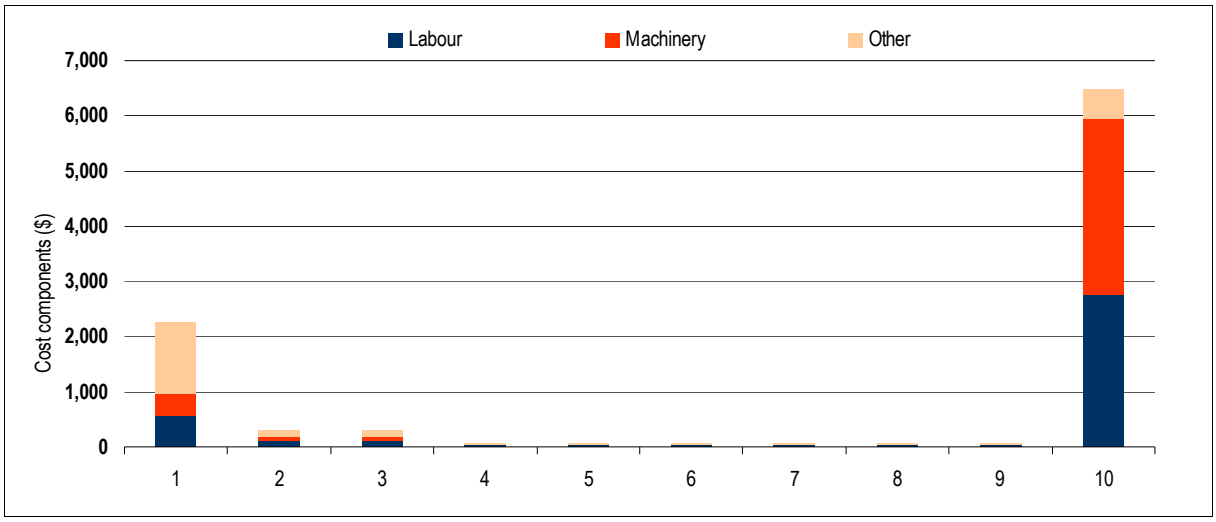
- cultivation costs;
- pre-planting weed control costs;
- the purchase of seedlings;
- seedling planting costs;
- fertiliser purchases and application; and
- post planting weed control costs.

Following planting, there are a number of other costs associated with maintenance, administration and thinning schedules, depending on plantation type. For pulpwood plantations, these costs include a general ongoing maintenance cost. For red mahogany plantations, on-going costs include annual maintenance costs and pruning costs in years two, four and six.

These patterns of expenditure employ different factors of production in different years. Charts 2.4 and 2.5 show the labour, machinery and other input costs for the two plantation types discussed above.

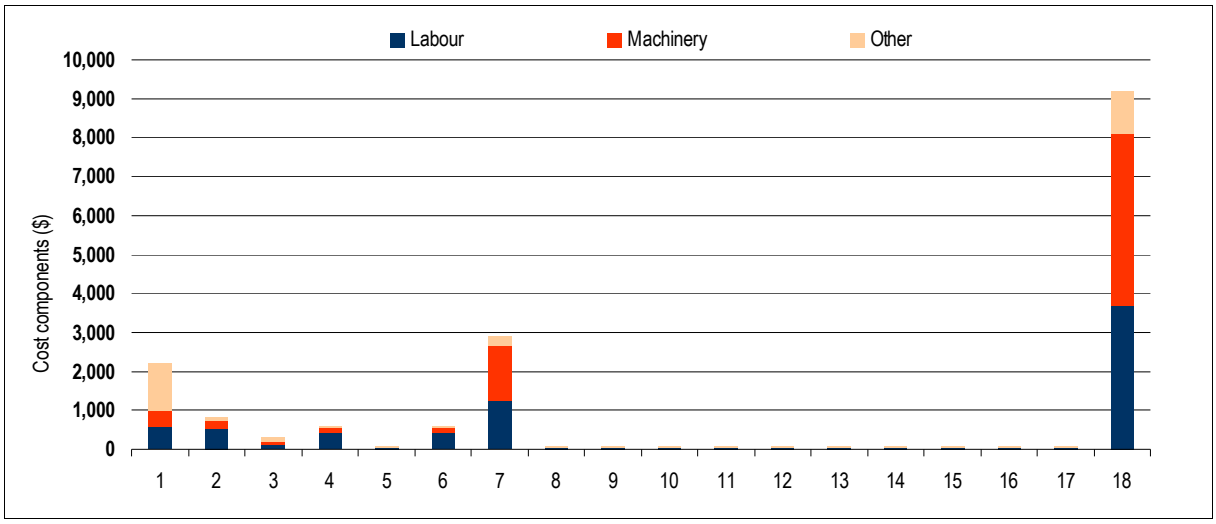
Revenue for a plantation is based on the stump price plus associated harvest and transport costs. Effectively, this values the logs at a post harvest point. However, for investors and promoters, their returns are determined prior to harvesting. For the purposes of tracking expenditure flows through the region we have needed to account for harvesting and transport costs and therefore valued the timber in charts 2.2 and 2.3 post harvest.

2.4 **Annual capital, labour and other input costs for 1 hectare of hardwood pulpwood plantation**



Data source: CIE analysis of GRO (1999).

2.5 **Annual capital, labour and other input costs for 1 hectare of red mahogany plantation**



Data source: CIE analysis of GRO (1999).

Profitability and returns to land, capital and risk

A commercial rate of return on these different forestry enterprises varies considerably. For pulpwood, the net present value return per hectare is $1 895 per hectare at discount rates of 7.5 per cent, assuming the opportunity cost of land is zero. This is equivalent to a present value rate of return of $190 per hectare per year over the ten year life of the plantation.

By contrast, a hectare of planted red mahogany provides a net present value return of $12 259 at a discount rate of 7.5 per cent, or an average of $681 per hectare per year over the 18 year life of the plantation. Again, this assumes the cost of land is zero. The annual net present value return therefore represents the return to land, capital and risk per hectare per year from the forestry venture.

However, these returns are not risk free. The longer the investment timeframe, the higher the risks associated with the future market. Demand may increase or contract, substitute products or competing products may expand or contract, government policy may change and the value of the Australian dollar may rise further. With forestry crops taking many years to reach harvesting stage, the risk of adverse weather (drought, cyclone, frost, hail, fire, flood), weed, nutrient, pest or disease events significantly reducing yield over the life of the crop is high relative to that of an annual crop where such risks are spread over many crops. Long-lived projects are also subject to management risks and the ability to retain appropriate staff.

With pay-off horizons relatively far into the future for forestry ventures, many price, cost, disease and weather variables are likely to impact on the actual return received. By one interpretation, the $12 259 return for red mahogany could be considered the expected return earned for taking these risks. How attractive this will be for individual investors will depend on their individual risk preferences.

To a large extent, the promoters of forestry schemes, those who understand the financial data and risks, and who have immediate control of the plantations, aim to shield themselves from much of risk through using MISs. Rather than have to wait to receive revenue from the timber in 18 year's time, the promoters shift much of the risk of this wait period to investors by seeking large upfront payment from them through MISs. Although exposed to some of the risk and price of final yield, promoter risk is mitigated by using MISs.

Managed investment schemes and profit sharing

MIS financing arrangements are established by forestry promoters when they sell shares of the investments in a proposed plantation. The promoter directly or indirectly manages the scheme on behalf of the investor.

How the profits from the schemes are shared depends on how the schemes are structured. The usual large upfront payments made by investors are used to cover the planting and maintenance costs of the plantation. The attraction of these schemes to the investor is that the upfront fee is, subject

to a number of conditions, immediately tax deductible in the year the investment is made.

This compares to more traditional investment options where tax deductions occur through depreciation or can be off-set against revenue when it is eventually earned.

Further factors affecting the attractiveness of MISs are discussed in box 2.6.

2.6 Factors affecting the attractiveness of MISs

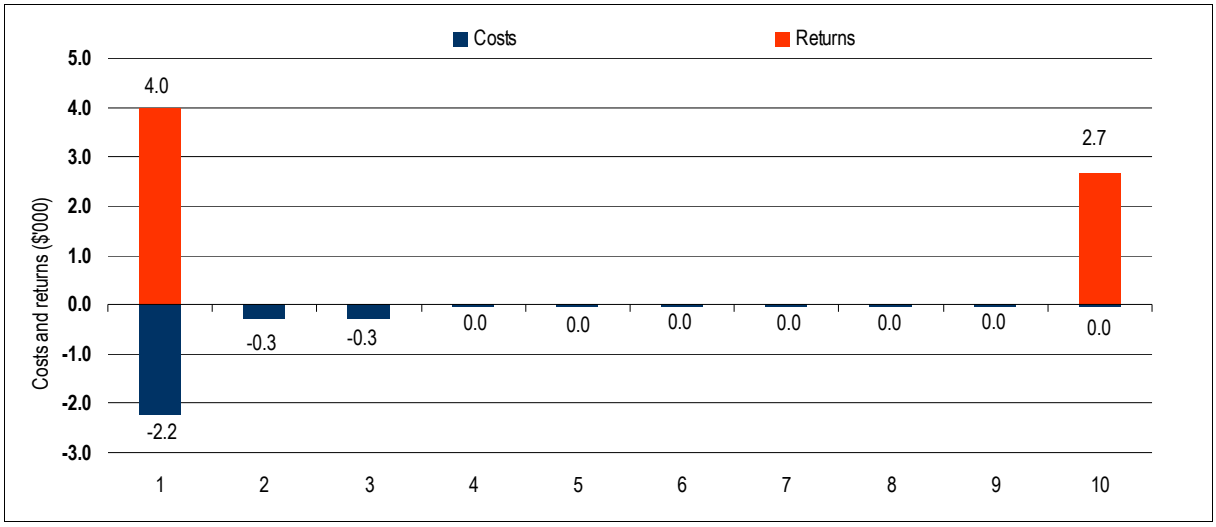
The longer the investment timeframe, the larger the final value the product has to be to cover the compounding effect of the initial investment. And the larger the final payment, the larger the tax bill to be paid on the revenue. Those that enter into MIS investments as a method of minimising tax need to understand the tax implications of the final payment. This is especially the case for those that will be at high marginal tax rates at the completion of the scheme, or those that are pushed into higher marginal tax rates due to the large, one-off payment.

As such, MISs are relatively more attractive than otherwise similar investments for investors. Further, the higher the marginal tax rate faced by the investor, the higher the relative attractiveness.

These schemes are marketed throughout Australia.

The promoter receives their share of the project returns by charging various fees. For the pulpwood project highlighted in chart 2.2, the cash flows for the investor and promoter are set out in charts 2.7 and 2.8. Similar cash flows are set out in charts 2.9 and 2.10 for red mahogany. These have been calculated from information available in the product disclosure documents. Because charts 2.7 and 2.8 assess the cash flows of just the investor and the promoter, they do not include the cash flows associated with harvest and transport shown in charts 2.2 and 2.3.

2.7 Pulpwood patterns of revenue and expenditure per hectare: promoter

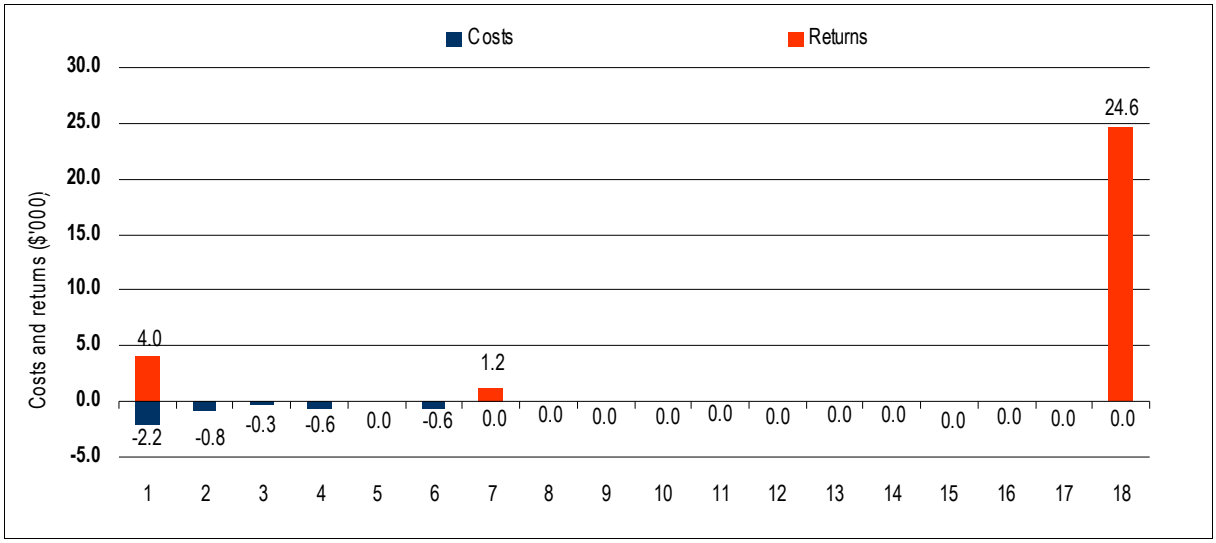


Data source: ITC (2007) and GRO (1999).

2.8 Pulpwood patterns of expenditure and revenue per hectare: investor

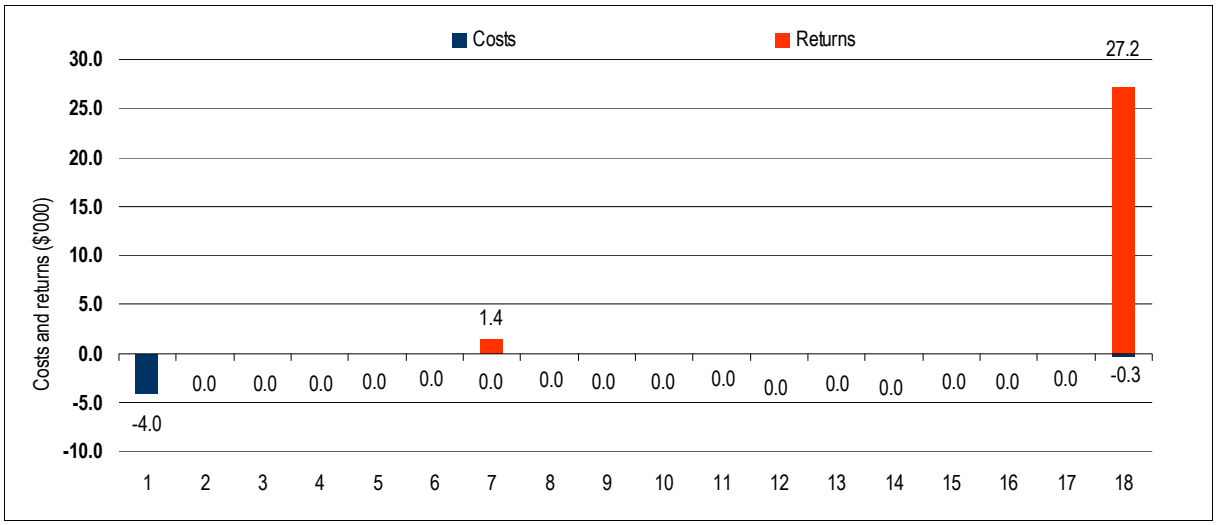
Note: These calculations do not include any tax benefits from MISs.
Data source: ITC (2007) and GRO (1999).

2.9 **Red mahogany patterns of revenue and expenditure per hectare: promoter**



Data source: ITC (2007) and GRO (1999).

2.10 **Red mahogany patterns of expenditure and revenue per hectare: investor**



Note: These calculations do not include any tax benefits from MISs.

Data source: ITC (2007) and GRO (1999).

The return to the investor depends on the discount rate. At a discount rate of 7.5 per cent, the investor's benefit to cost ratio is 0.86 to 1 for pulpwood plantations (implying a financial loss to the investor), while for the red mahogany plantation, the benefit to cost ratio is 2.02 to 1 over the life of the investment. This assumes the investor has the same marginal tax on entry and exit to the scheme. In both situations, the investor is able to increase their return if they are able to have a lower marginal tax rate when exiting the scheme relative to entry to the scheme. For instance, if a pulpwood

investor faces a 46.5 per cent marginal tax rate on entry but a 15 per cent rate on exit, the benefit-cost ratio would climb from 0.86 to 1 to 1.36 to 1.

The return to the promoter is positive due mostly to the large up front fee they receive from the investor, and the substantial share they receive from harvested timber. At a discount rate of 7.5 per cent, the promoter has a benefit to cost ratio of 1.86 to 1 for pulpwood plantations and 2.85 to 1 for red mahogany plantations.

These calculations are detailed in appendix B.

Regional impacts

Irrespective of how the profits are shared between the investor and the promoter, from a regional perspective, most of the returns will be distributed to investors and promoters who typically reside outside of the region. Consequently, a forestry MIS will not generally generate flow-on economic activity in the region from any scheme profits, though it is likely to generate economic activity elsewhere in the Australian economy. That said, the measure of return (profit) estimated here includes a return to land. How the returns to land are distributed is ambiguous. Land could be purchased or rented for forestry. Payment for purchase or rental could be retained in the region or spent elsewhere. Although it is probable that much would be spent elsewhere, as a conservative assumption, here we assume that around 9.0 per cent of the lump sum revenue from forestry is spent locally (and evenly) over the life of the forestry crop.

Some of the expenditure on inputs will be spent locally and will generate flow-on economic activity at the local level. Wages earned from ground preparation, planting and maintenance are likely to be spent in the region, leading to further flow-on impacts. However, inputs such as fuel and chemicals are likely to be sourced mostly from outside of the region, although delivery and transport of such inputs is likely to generate some local activity.

A breakdown of the expenditure flows by labour, machinery and other inputs is shown in charts 2.4 and 2.5 above. This is further broken down by proportions sourced locally, within the rest of Queensland, within the rest of Australia or imported (table 2.11).

2.11 **Forestry sources of inputs**

Source of input	*Labour expenditure*	*Machinery expenditure*	*Other inputs expenditure*	*Total*
Pulpwood plantation				
Locally sourced	22%	22%	13%	**58%**
Rest of Queensland sourced	15%	15%	9%	**38%**
Rest of Australia	2%	2%	1%	**4%**
Totals	**39%**	**38%**	**23%**	**100%**
Red mahogany plantation				
Locally sourced	27%	25%	12%	**64%**
Rest of Queensland sourced	13%	12%	6%	**31%**
Rest of Australia	2%	2%	1%	**5%**
Totals	**42%**	**39%**	**18%**	**100%**

Note*:* Further value adding such as milling and drying are assumed to take place outside the region as is current practice.

Source: CIE analysis of ITC (2007) and GRO (1999).

Uncertainties and outlook

The profitability of the forestry schemes will depend critically on future prices for timber, the yields actually harvested, the efficiency of input use and, for the investor, the attractiveness and tax concession status of the MISs.

Price

Prospects for future timber prices differ according to final use.

Pulpwood prices

The commercial value of Australian hardwood woodchip exports is driven by the use of woodchips in manufacturing printing and writing paper, primarily undertaken in Japan. Demand for paper products is expected to increase in the future as global incomes continue to increase, particularly across East Asia.

Hardwood woodchip prices have been relatively stable in real terms from the 1970s onwards, sitting between $150 and $200 per bone dry metric tonnes (ITC 2007). That said, ABARE (2003) reported that the world real price of hardwood chips has fallen at an average of 6.7 per cent a year since 1995.

Increases in pulpwood plantations in Australia, Chile and South Africa are expected to easily meet the increased demand, and may in fact lead to a further fall in the real price (ABARE 2003). The Australian Agribusiness Group (2006) suggests that the price outlook for hardwood chips is uncertain. One view is that the Australian hardwood industry has a difficult future ahead due to the potential oversupply of product and changing international markets. The other view is that if Japanese demand remains strong, the industry will continue in a strong position.

Tropical timbers

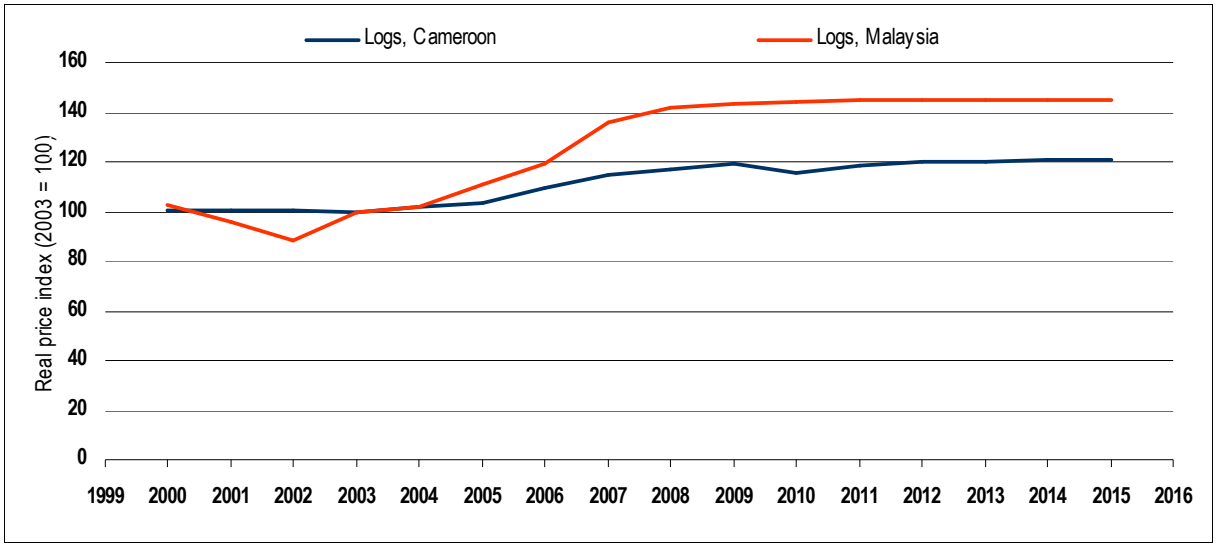
Tropical timbers, such as red mahogany, are used in high value cabinet making, including furniture, decking, flooring and joinery. Prices received differ according to the quality. Logs that are able to be used for veneer attract a price premium upwards of 100 per cent over sawlog prices (ITC 2007).

Over the last 15 years, Australian hardwood sawn timber prices for red mahogany have increased approximately 1 per cent a year in real terms (ITC 2007). From 2002 onwards, export prices for high value tropical timbers have increased approximately 50 per cent in nominal terms, in response to a continued shortage of suitable timber in the region (ITTO 2007). In real terms, this increase will be somewhat less.

The outlook for tropical timber prices will depend on how well the market responds to the current shortage in supply. The World Bank, in their Global Economic Prospects commodity projections, considers that future real prices of tropical timber in the Asia Pacific region will not significantly increase above current price levels (chart 2.12).

For both wood products, real increases in the price of the product will lead to an increase in the attractiveness of the schemes. However, while the attractiveness of the schemes may increase, the local spending per hectare of land developed will not increase, and may in fact fall due to economies of scale.

2.12 **Real prices for high value timbers are not expected to increase significantly in the medium term**



Note: These projections are for native timbers. We have used these as a proxy for plantation timber in the absence of other forecasts.
Data source: World Bank (2007).

Yield

Improvements in yields can be achieved by:

- selecting and breeding species that are most suited to the specific climate and soil types subject to rainfall and soil depth;
- improving the rates of survival during the early years of the plantation;
- improving harvesting techniques to reduce wastage; and
- aiding growth through improved maintenance and thinning schedules.

Of these possibilities, the majority relate to activities and actions that are taken in the very early years of a forestry plantation. That is, once a plantation is in the ground, there are only limited activities that can be taken to further improve yields. And as such, the majority of improvements made in the early years will not be realised until harvesting, up to 18 years off. But perhaps even more importantly, the benefit from increased yield from a productivity improvement (should it occur) will typically not be realised in the region because the profits will be spent outside the region.

Efficiency of input use

The scope for further cost reductions and rationalisation of costs in forestry plantations is limited. Forestry plantations are still reliant on considerable labour inputs throughout the life of the plantation. This includes hand planting, pruning, thinning and forestry management.

Cost savings are more likely to be made not with improvements in technology, but rather as a result of economies of scale. Increasing the area planted reduces the fixed costs associated with transporting equipment to and from the site.

However, it should be noted that any improvements in the efficiency of input use will reduce the local spend on resources associated with a given hectare of land. With the benefit of the cost reduction realised outside the region, input efficiencies further reduce the local income earned from forestry plantations.

Attractiveness and tax concessions

Given the apparently low rates of return for investors, there has to be some doubt as to the continuing attractiveness of forestry and MISs unless there are expectations about higher prices or higher yields.

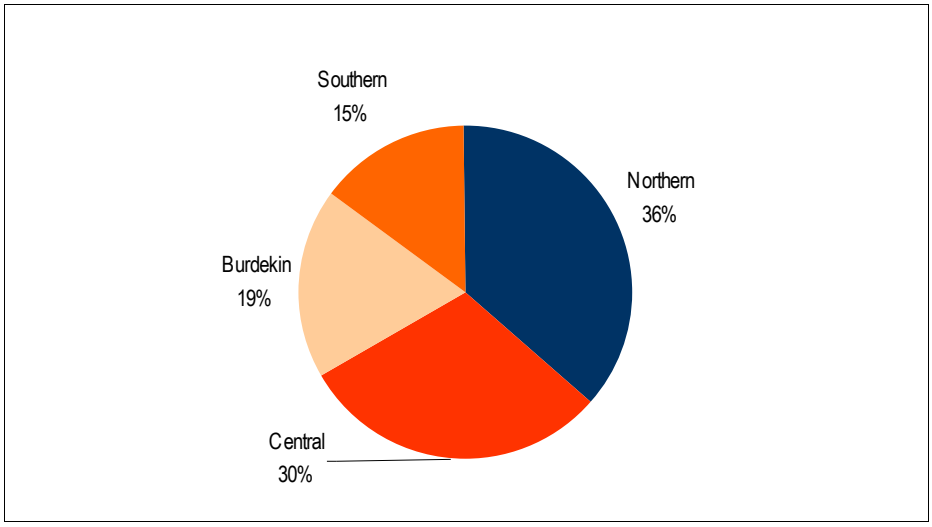
Based on expenditure and revenue flows shown in chart 2.7 for pulpwood, future prices would need to be 25 per cent higher than current prices for the scheme to break even (at a discount rate of 7.5 per cent) for investors. Alternatively, to achieve a rate of return 5 per cent higher than the discount rate, prices would have to be 95 per cent higher than current prices.

If the MISs become unattractive, the possibility is that sugar producing assets could become stranded. That is, should sufficient cane be displaced — forcing a mill closure — there is a distinct possibility that remaining cane land may not be converted to forestry.

3 *Sugar in Queensland*

In 2006, there were 379 000 hectares of cane harvested in four major coastal sugar regions in Queensland. The regional distribution of this land is shown in chart 3.1.

3.1 **Sugar cane land in Queensland**



Data source: Australian Sugar Milling Council (2007).

To date (end of July 2007) forestry MISs have captured around 11 000 hectares of traditional cane growing land. Significant activity has been noted in the Innisfail, Tully, Ingham, Proserpine and Sarina milling areas.

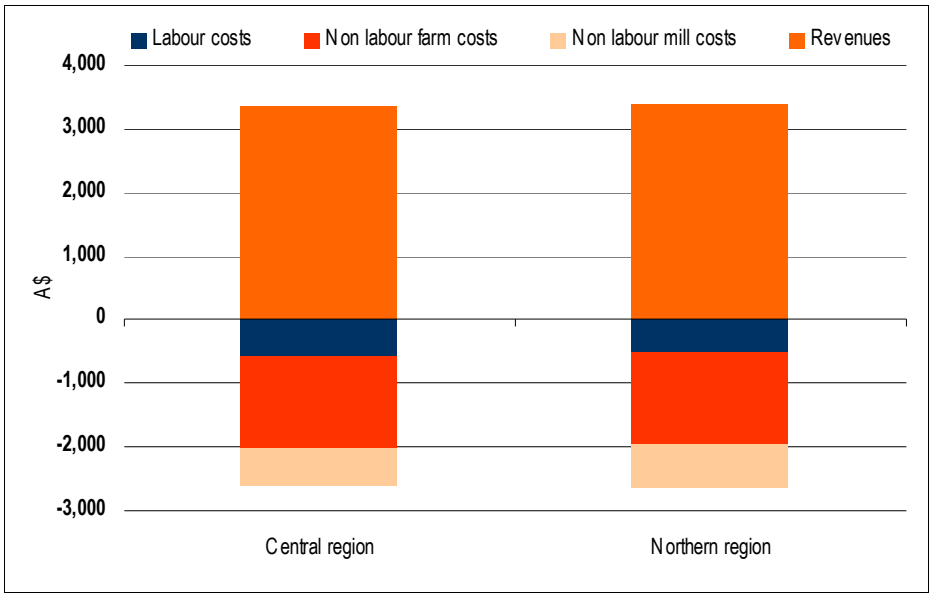
Proserpine is in what is known as the Central sugar producing area. Tully is in what is known as the Northern sugar producing area. These two areas provide case studies of the possible implications from increasing forestry plantings. What is happening in those areas could be replicated elsewhere.

For example, recent accelerated activity in the Herbert cane growing area of North Queensland by forestry MISs has created the threat of a future mill closure there. Approximately 1 500 hectares of land has been sold in the Herbert in the past year with up to 3 000 hectares believed to be under negotiation.

Patterns of expenditure and revenue for the sugar industry

The pattern of expenditure and revenue for the sugar cane industry is vastly different to that of forestry. Chart 3.2 shows the pattern of expenditure and revenue that would be generated from a hectare of cane in each year in a typical Central and Northern mill areas. Note that this includes farming, harvesting, milling and associated transportation costs and earnings from sugar in total, not just from cane. This assumes current low world sugar prices continue into the future and allowing for historical rates of productivity growth. This data is based on CIE (2004) and has been updated to reflect changes in prices, yields, productivity and costs since 2004. More detailed breakdowns of the revenue and expenditure patterns are set out in appendix C. The pattern of expenditure reflects current industry reactions to low prices. With low prices, maintenance, fertiliser application and cane replanting are kept to a minimum to keep costs as low as possible. Lower 'plant' cane means lower cane yields, but one compensating factor is that this can result in higher yields of sugar per tonne of cane due to shorter season lengths.

3.2 **Expenditure and revenue per hectare of cane land**

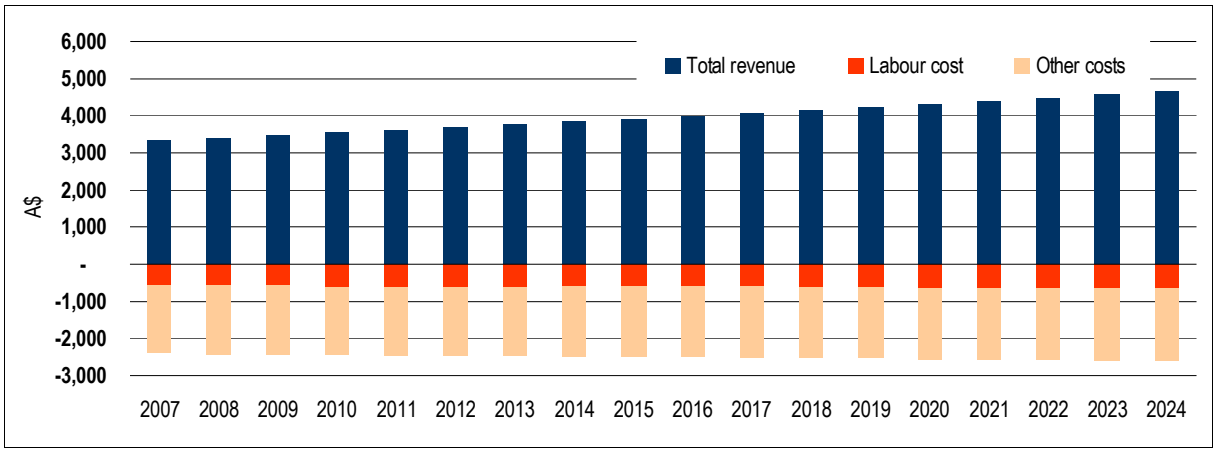


Note: Minimal maintenance is undertaken in response to low sugar prices. This lowers the capital expenditure.
Data source: CIE Sugar Model (2007).

As in chart 2.2 and 2.3 for pulpwood and red mahogany, here we assume a zero land price. The land is a non-depreciating asset that is owned, not rented, so the return per hectare includes a return to land.

Assuming a historical rate of productivity growth of 1 per cent a year, the breakdown of capital, labour and other input costs and revenue flows for the two mill areas are shown in charts 3.3 and 3.4. A point to note is that unlike forestry, there are considerable payments to locally employed labour per hectare every year over the 18 year period. Note that in these two charts, revenues are increasing as productivity increases.

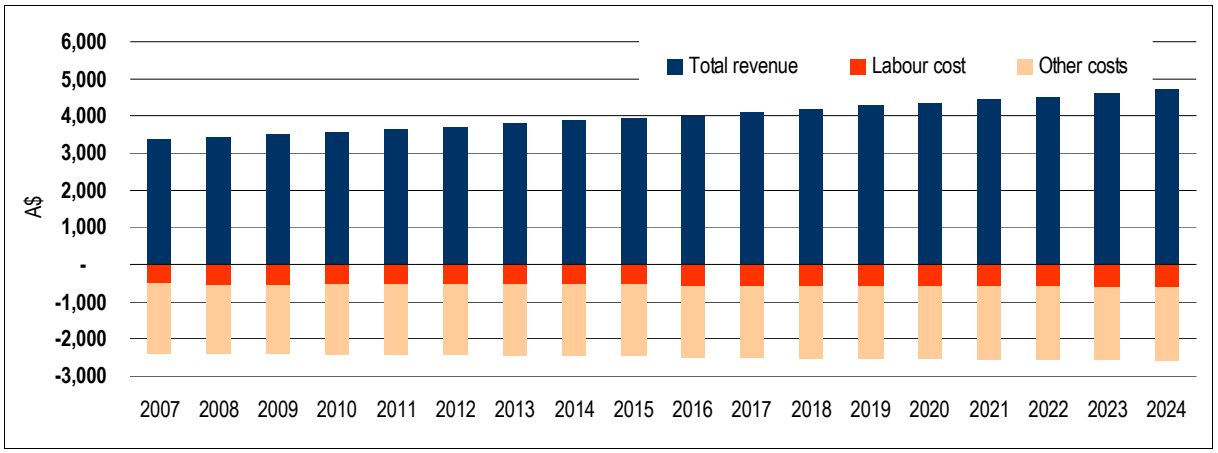
3.3 **Expenditure and revenue from a hectare of cane land in a typical Central mill area**



Note: These calculations are annual expenditures and revenues.

Data source: CIE Sugar Model (2007).

3.4 **Expenditure and revenue from a hectare of cane land in a typical Northern mill area**



Note: These calculations are annual expenditures and revenues.

Data source: CIE Sugar Model (2007).

Profitability and returns to land, capital, owner-operator labour and risk

Assuming current low sugar prices and normal rates of productivity growth continue for the next 18 years, sugar production is estimated to provide positive (although relatively low) returns to the primary factors of production (land, capital, owner-operator labour) and risk. The benefit-cost ratio on a hectare of cane land would appear to be around 1.57 and 1.55 in a typical Central mill area and a typical Northern mill area at a discount rate of 7.5 per cent. This compares with a 1.29 benefit-cost ratio for timber in a typical Central mill area and 2.36 benefit-cost ratio for timber in a typical Northern mill area at a discount rate of 7.5 per cent.

These sugar returns translate into average net present value per hectare returns of $783 a year in a typical Central mill area and $812 in a typical Northern mill area. These are the returns to land, owner operated labour, capital and risk in growing, harvesting and milling. They are not directly comparable with the rates of return from forestry, because that does not provide a return to an operator's own labour. The average annual net present value return per hectare from pulpwood was $190 and for red mahogany $681 (see chapter 2).

How attractive the returns are from sugar production relative to forestry will depend a lot on the opportunity cost of an owner operator's time and the owner's expectations of future sugar prices and risks. At returns of between $783 and $812 per hectare per year for all sugar producing assets, growers' share of that return to cover returns to land, their own labour and risk is probably regarded as only a subsistence rate of return.

Although the world sugar price is volatile, the risks faced by sugar are very different than those for timber. Over an eighteen year period, there are 18 crops of sugar, with each potentially receiving a different price which will average out through time. Each crop will also be differentially affected by weather and disease. However, for timber, it is only the price, in one year (generally 18 years from planting, although the harvest can be bought forward or drift backwards to try to control price fluctuations) that is received and weather and disease risks accumulate over the long growing period. As such, sugar spreads its price risk over eighteen years, while timber is at the mercy of a single year on price, either good or bad, and accumulating production risks.

Further, sugar has the benefit of a very active futures market, which also allows for risk spreading. Forestry does not have such an advantage.

Regional impacts

For cane growing, 47.5 per cent of all inputs are sourced locally, while for sugar milling, 82.5 per cent of all inputs are sourced locally (table 3.5).

Furthermore, a large proportion of the returns (most) earned by cane farmers are spent in the local region. In addition, about 40 per cent of milling profits are retained locally on average as many mills are grower owned.

3.5 **The majority of sugar growing and milling costs are locally sourced**

Source of input	*Labour expenditure*	*Other inputs expenditure*	*Total*
Central cane region			
Sugar cane growing			
Locally sourced	30%	18%	**48%**
Sourced from outside of region	0%	52%	**52%**
Totals	**30%**	**70%**	**100%**
Sugar milling			
Locally sourced	15%	68%	**83%**
Sourced from outside of region	5%	11%	**17%**
Totals	**20%**	**80%**	**100%**
Northern cane region			
Sugar cane growing			
Locally sourced	28%	19%	**47%**
Sourced from outside of region	0%	53%	**53%**
Totals	**28%**	**72%**	**100%**
Sugar milling (1)			
Locally sourced	15%	67%	**82%**
Sourced from outside of region	5%	12%	**18%**
Totals	**21%**	**79%**	**100%**

(1) Includes cane purchases.

Source: CIE Sugar Model (2007).

Uncertainties and outlook

A number of factors influence the future price, yield and productivity outlook for sugar.

Price

The sugar market is typically a volatile one and prices have fluctuated enormously over many decades. The sugar price is cyclical, partly due to government interventions around the world and protection in the world sugar market. The distribution of prices is not normal. In some years sugar receives very high prices when global shortages occur. Although not frequent, spikes in the world sugar price provide considerable upside potential to the long run Australian producer price.

Ultimately, the long run world price is influenced by the costs of production of the more efficient producers, such as Australia and Brazil. Over time, productivity growth in Australia, Brazil and other efficient exporting countries has had some downward impact on the world price.

That said, the increasing demand for ethanol as a clean alternative fuel has introduced a new influence on the world sugar price. It means that the sugar price has increasingly become linked to the world oil price. This is due to the fact that ethanol is a substitute for oil. Brazil has the capacity to produce either sugar or ethanol from sugar cane. As the oil price rises, the ethanol price is correspondingly rising. As this happens, Brazilian producers have an incentive to switch production from sugar to ethanol. This in turn places upward pressure on the sugar price.

Thailand and India, two large producers, are also looking at new ethanol producing options. And as ethanol production increases in Thailand and India, less sugar will be available to supply to the world market, placing further upward pressure on prices.

Another factor providing some prospects for higher global sugar prices is agricultural trade reform. Sugar is one of the most highly protected agricultural products in the European Union, the United States and Japan. Were the protection removed, estimates are that world prices could rise by over 30 per cent and provide economic benefits to the Australian sugar industry of nearly $0.75 billion a year (Borrell and Pearce 2004).

It is difficult to predict the exact path of future sugar prices. However, currently, sugar prices are low relative to the costs of the most efficient producers and relative to fuel and ethanol prices. To reflect costs of production in efficient producing countries and the relative attractiveness of ethanol price, there is a convincing argument that long term world sugar prices will rise relative to recent prices (year to date average) of around USc11.1/lb.

At a price of USc14.0/lb, the benefit–cost ratio of return on sugar land in a typical Central and Northern mill area is around 2.4 compared with around 1.5 under current prices.

Yield and efficiency of input use

A study done in 2002 by the CIE entitled *Cleaning up the Act* identified that regulation in the sugar industry was holding back the industry. That report identified considerable scope for productivity increases in the cane growing and milling sectors.

For example:

- Land productivity variations due to management alone suggest average productivity may be only 75 per cent of potential.
- With larger farms, Brazil is achieving cane growing costs 30 to 40 per cent below Australia's. *(Rationalisation and currency movement since 2004 has seen Australia's cane growing costs become more closely aligned with those in Brazil.)*
- Cane harvester productivity of over 120 000 tonnes a year can be achieved working around the clock, but the industry average is less than 30 000 tonnes. *(By 2006, the average harvester group size in the industry had risen to above 40,000 tonnes and further rationalisation is underway.)*
- Restricted cane cutting times required up to 50 per cent more bins to be employed in a mill's tramway system. *(With the advent of larger harvesting groups, the practice of multi-shift harvesting is being adopted across greater sections of the industry leading to greater efficiencies in the cane harvest and transport sectors with less bins required as cane storage units.)*
- Poor harvesting practices cause 5 to 25 per cent of sugar to be left in the field. *(Cane loss through harvest is still a factor but extensive research into the problem and changes to farming systems such as controlled traffic and wider row spacing are resulting in a significant reduction in these losses – now thought to be limited to between 6 and 10 per cent in efficient operations.)*
- In an average season, Australian mills crush for only around 21 weeks a year compared with 30 to 35 weeks for Brazilian mills, putting Australian milling capital at a 30 to 40 per cent productivity disadvantage.

In 2005, regulatory change was enacted to remove these impediments. This change has started a process of industry rationalisation and small, less efficient operators in all sectors have started to leave the industry. As this

happens, the rate of productivity improvement is likely to increase relative to historic levels or around 1 per cent a year.

Productivity improvement programs have been rolled out in all cane growing regions as part of the regional improvement plans developed as a condition of the Federal Government's Sugar Industry Reform Program 2004.[5] CIE (2002) showed that with such reforms and prices ranging between $270 per tonne and $335 per tonne for sugar the industry could be highly profitable and would expand.

Other future possibilities include significant yield improvements and pest resistance from new genetically modified cane varieties

Were the rate of productivity growth to be double, say at 2 per cent a year and the sugar price recovers to USc14.0/lb, the rate of return of a hectare of cane land in the Central mill area would be $1 336 per hectare per year. For the equivalent land in a Northern mill area the figure would be $1 370 per hectare per year.

As discussed in chapter 1, sugar milling involves high fixed costs. As such, sugar milling requires a large throughput of cane in order to make it economically viable. Improvements in on-farm productivity discussed above will feed through to higher throughput at a mill level (chart 1.1). This will improve the performance of the sector as a whole.

For the purpose of this study, we have assumed that long term productivity growth rates are, as a base case, 1 per cent a year. As highlighted, the scope for productivity improvement is large with the recent round of policy reforms undertaken, allowing the industry to move forward.

[5] Details of the Regional Reform Plans can be found on the Federal Department of Agriculture, Fisheries and Forestry Website.

4 *Impact on sugarcane regions: scenarios*

To demonstrate the regional economic impacts of forestry displacing cane-land we develop four scenarios for a typical Central mill area and a typical Northern mill area. All scenarios are run out to the year 2035 to allow the forestry industry to reach a steady state. All scenarios are denominated in real 2007 dollar terms. An Australian/US exchange rate of 0.80 is assumed throughout. All scenarios allow for an underlying increase in national GDP to stabilise at 3 per cent a year.

Rate of loss of cane land and mill closures

In each scenario for the typical Central mill area we assume that pulpwood displaces all cane land over a 10 year forestry crop cycle, implying an annual loss of 2 500 hectares a year and forced mill closure after 4 years. We also assume that once 10 000 hectares is lost the mill is forced to close.

In the case of the typical Northern mill area we assume that high value timber displaces all sugarcane land over an 18 year forestry crop cycle. This implies a loss of 1 388 hectares a year to forestry.

- It is worth noting that 10 000 hectares is an arbitrary figure, and is arguably a very conservative cut-off.
  - There were 22 mills operating in Queensland in 2006 crushing cane from 379 000 hectares, giving an average area harvested per mill of a little under 18 000[6]hectares.
  - Not many mills could survive were they to lose 10 000 hectares (over half their crop area) unless sugar prices were substantially higher than now.
    - … In reality, the cut-off throughput point would vary depending on the size of the mill concerned, and its proximity to other mills.

[6] Our examples of mills with 25 000 hectares are therefore larger than the average.

… Losses of as little as 2 000–3 000 hectares could force mill closures.

- More realistically, mill closures could become a possibility once more than 20 per cent of cane is lost.

The four scenarios are designed to cover a wide range of plausible market possibilities.

- Scenario 1 is a business as usual scenario that assumes current market conditions remain constant into the future.
- Scenario 2 is a best-bet scenario incorporating expected market changes into the future.
- Scenario 3 is a deliberately optimistic scenario for sugar assuming a set of favourable, but plausible, future market conditions for sugar but only business as usual assumptions for forestry.
- Scenario 4 is a deliberately optimistic scenario for forestry assuming a set of favourable, but plausible, market conditions for forestry but only business as usual assumptions for sugar.

Price and productivity

The business as usual scenario, assumes:

- constant current sugar and forestry prices;
- one per cent productivity growth rates for each sugar area (split between cost reductions and yield improvements); and
- no change in productivity in forestry.

The best-bet scenario assumes:

- sugar price stabilises around USc12.2/lb, up 10 per cent from current prices;
- real timber prices rise by 30 per cent relative to 2006 based on World Bank projections; and
- sugar sector productivity increases to 1.5 per cent due to reform in the industry while forestry increases by 1 per cent;

The optimistic sugar scenario assumes:

- the real price of sugar increases to USc14.0/lb;
- sugar sector productivity increases to 2 per cent a year; and
- the forestry sector has business as usual assumptions.

The optimistic forestry scenario assumes:

- forestry sector productivity increases to 1.5 per cent a year;
- real timber prices rise 30 per cent relative to 2006; and
- the sugar sector has business as usual assumptions.

Modelling the impacts

Changes in input and output expenditures are determined based on specific economic models of sugar and forestry activities for both a typical Central and Northern mill area. This allows for a consistent and comprehensive assessment of the direct changes in economic activity. Changes in patterns of expenditure are then imposed on the TERM model to determine indirect flow-on impacts on regional economic activity.

Results: business as usual

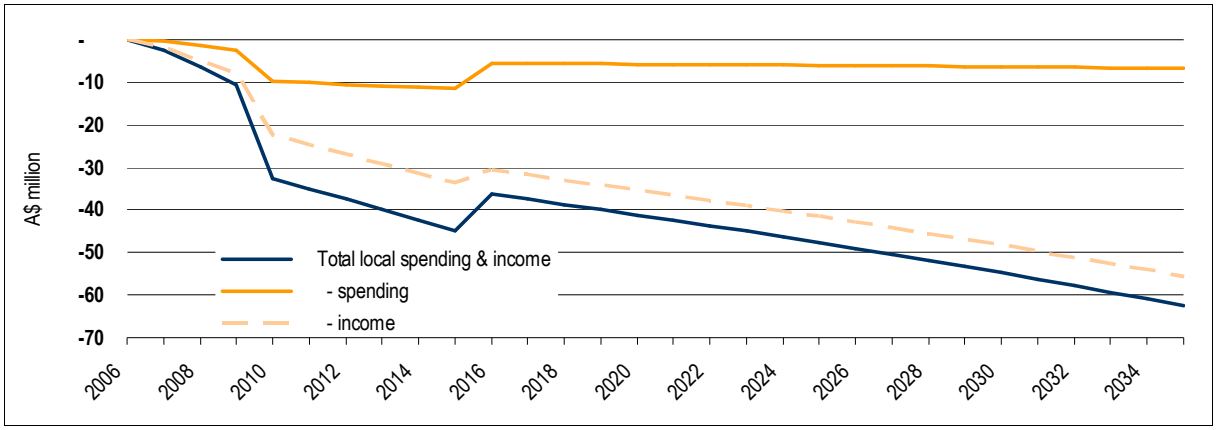
Charts 4.1 and 4.2 show the direct changes in local spending (expenditures on inputs other than labour cost) and income (labour income and operating surplus) of shifting sugarcane to forestry in a typical Central mill area and a typical Northern mill area for the business as usual scenarios.

Total spending

In both mill areas the switch to forestry causes steady declines in total regional expenditure. At first the decline is relatively small but it accelerates once the mill closes. In a typical Central mill area this occurs in 2010. In a typical Northern mill area it occurs in 2014 due to the faster crop cycle of pulpwood. Losses in both areas reach about $30 million after mill closures. In the cases of the high-value timber in a typical Northern area, thinning starting at year 7 slows the decline in spending until the mill closes.

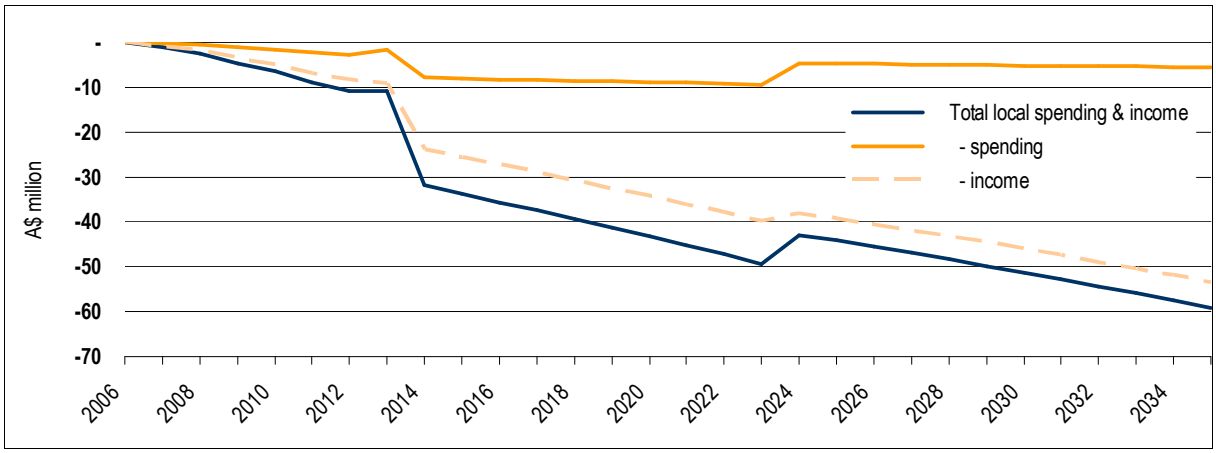
The reduction in expenditure occurs because forestry employs less people than the sugar industry per hectare of land and there is no revenue stream from forestry until harvesting occurs, and even then what profits are made are likely not to be spent in the region. That said, local spending does pick up once harvesting commences after 18 years in the case of red mahogany in a typical Northern mill area and after 10 years for pulpwood in a typical Central mill area. However, even after harvesting commences total local spending and income continues to decline due to loss of increasing income that would arise from sugar due to productivity increases through time.

4.1 **Change in local spending and income of shifting sugarcane growing to forestry in a typical Central mill area**



Data source: TERM.

4.2 **Change in local spending and income of shifting sugarcane growing to forestry in a typical Northern mill area**



Data source: TERM.

Indirect flow-on impacts

Charts 4.3 and 4.4 show the impacts on local area employment from switching cane land to forestry. Total impact on employment is smaller than the direct impact implied by the switching. This is simply because some of the jobs lost in the sugar industry will be re-employed by other industries in the region.

- Major events — shutting down mills, and starting thinning and harvesting — mark the turning points in the time path of employment change.

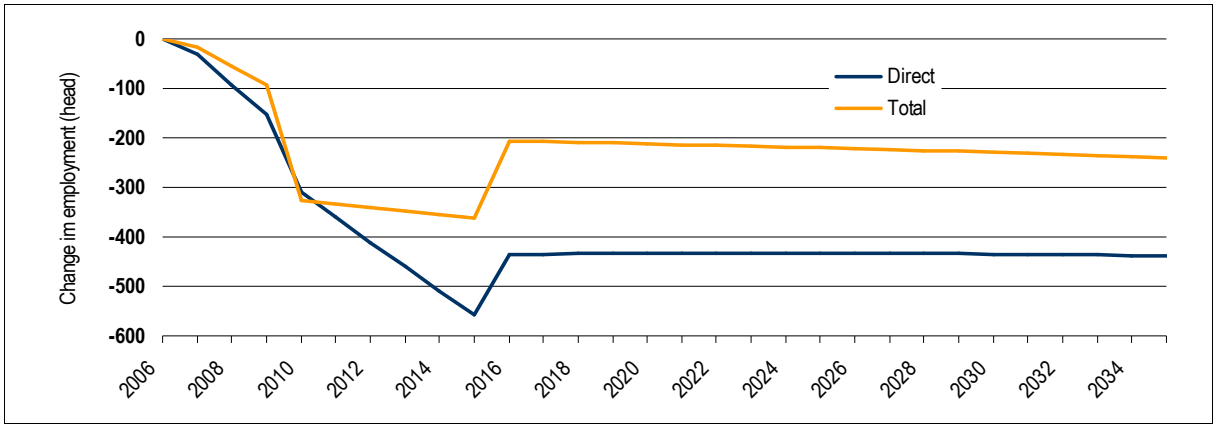
- In the steady state — after 2016 for a typical Central mill area and after 2024 for a typical Northern mill area — total employment impact is proportionally smaller than the direct impact.
- In the transitional stage, direct and total employment impacts are disproportional. This is because, in the transitional stage, the combination of sugarcane growing and milling, alternative agriculture and forestry varies over time, which has different implications for local spending and income. This in turn leads to different employment impacts.
  - After a mill closes, direct jobs continue to be lost because even land used in other agricultural activities requires more labour than forestry.
  - As forestry displaces other agricultural uses, direct job losses continue to occur until timber harvesting commences.

In total, net direct job losses reach well over 300 full time equivalent positions. On average there are about 500 full time positions (in growing, harvesting and milling) per mill area in Queensland. With a mill closure most of these can be expected to be lost. Forestry will create new jobs, but the increase in forestry jobs will be far fewer than the losses in sugar jobs. Model results indicate net losses of between 260 and 360 fulltime equivalent positions per mill area.

In Australia there are roughly 1.5 dependents per full time equivalent job. Was the loss of 300 jobs to cause 300 workers to seek employment elsewhere and leave a mill area, this could result in around 750 people (workers with their families) leaving a milling region. This could have major adverse impacts on small sugar towns. That said, the total loss of jobs is likely to be less than the direct effect, as some people find alternative employment over time in other areas. Total loss of jobs and people might be only half that indicated by direct losses.

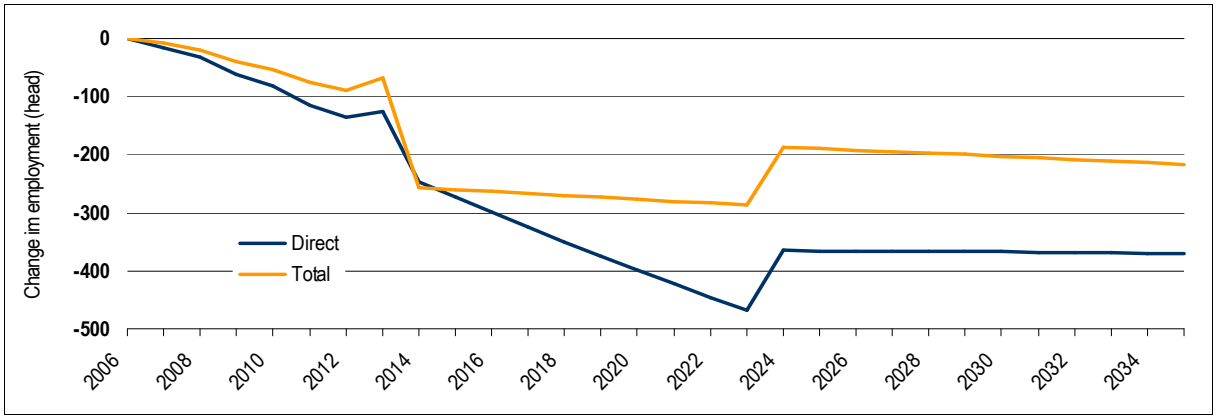
Chart 4.5 shows changes in nominal gross regional product of shifting from sugarcane to forestry. Large changes in the time profile of gross regional product are caused by major events such as closing mills, starting thinning and harvesting.

4.3 Impact on employment in a typical Central mill area



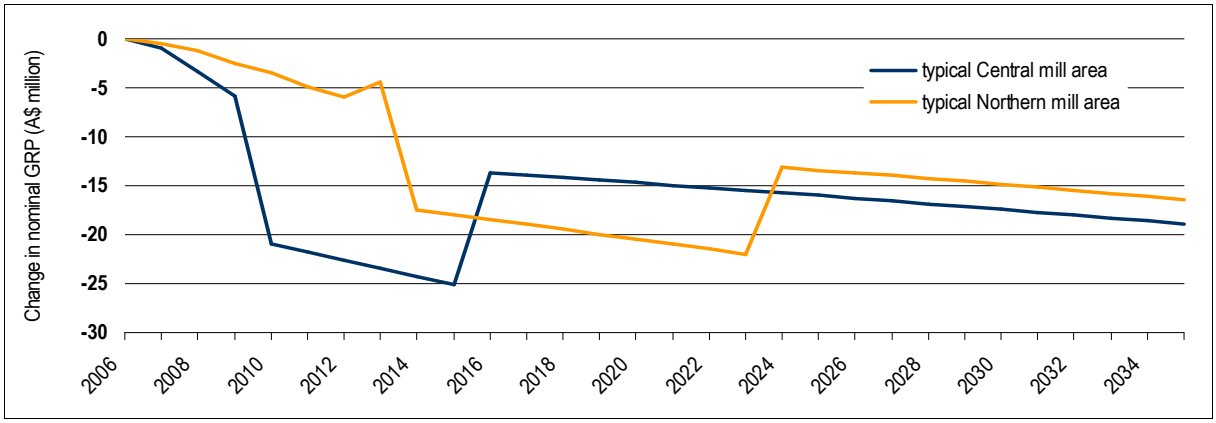
Data source: TERM.

4.4 Impact on employment in a typical Northern mill area



Data source: TERM.

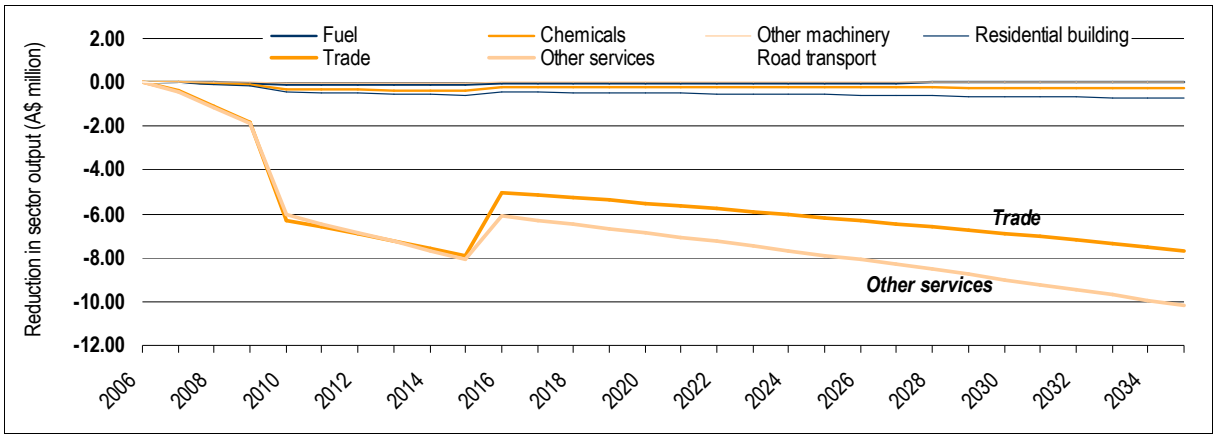
4.5 Impact on nominal gross regional product



Data source: TERM.

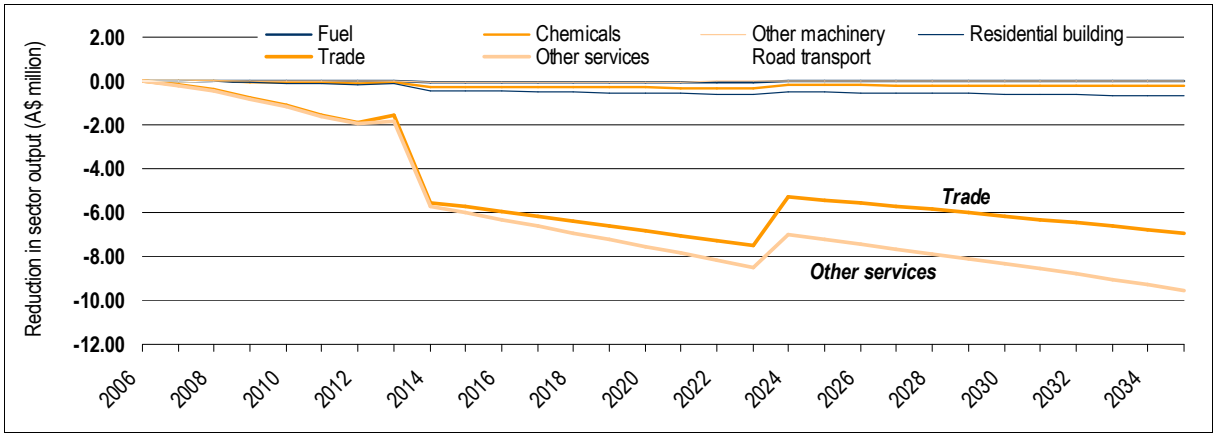
Charts 4.6 and 4.7 show what effects switching has on other sectors in the region. The other services sector, which includes education, hospital, business and financial services and other government services, incurs the biggest drop in output. This is followed by the trade sector which includes wholesaling and retailing.

4.6 **Sectoral impact in typical Central mill area**



Data source: TERM.

4.7 **Sectoral impact in a typical Northern mill area**



Data source: TERM.

Results: all scenarios

Tables 4.8 and 4.9 repeat some of the results for the business as usual scenario discussed above for a typical Central and Northern mill area respectively. They also present comparable results for the other three scenarios. In all four scenarios, the regional economic impacts of the switching of sugarcane land to forestry are negative. Reductions in total spending range from around $32 million per mill area immediately after mill closures to as high as $110 million a year. Losses of jobs range roughly from 250 to 500.

4.8 Results for a typical Central mill area

		Scenarios			
		Business as usual	*Best guess*	*Optimistic sugar*	*Optimistic forestry*
Annual average income	$A/ha				
Sugar		782.79	1113.64	1336.21	782.79
Forestry		189.53	557.36	189.53	620.83
Reduction in local spending and income	$A million				
2010		-32.56	-38.26	-41.68	-32.69
2014		-42.50	-54.00	-61.98	-42.79
2024		-46.33	-68.88	-92.36	-46.94
2028		-51.87	-79.67	-111.60	-52.60
Reduction in employment	Number of people				
2010	Direct	-309	-315	-318	-312
	Total	-327	-345	-494	-329
2014	Direct	-509	-516	-514	-516
	Total	-354	-391	-540	-358
2024	Direct	-433	-447	-445	-448
	Total	-218	-288	-455	-224
2028	Direct	-434	-454	-457	-452
	Total	-225	-311	-491	-232

Source: TERM.

4.9 Results for a typical Northern mill area

		Scenarios			
		Business as usual	*Best guess*	*Optimistic sugar*	*Optimistic forestry*
Annual average income	$A/ha				
Sugar		812.13	1144.51	1369.52	812.13
Forestry		681.07	1305.87	681.07	1461.30
Reduction in local spending and income	$A million				
2010		-6.49	-7.84	-8.91	-6.65
2014		-31.87	-43.42	-53.12	-32.27
2024		-42.81	-65.57	-90.69	-43.75
2028		-48.36	-76.43	-109.98	-49.48
Reduction in employment	Number of people				
2010	Direct	-82	-84	-82	-85
	Total	-55	-60	-96	-57
2014	Direct	-247	-261	-265	-255
	Total	-257	-294	-462	-261
2024	Direct	-365	-383	-378	-386
	Total	-188	-260	-445	-195
2028	Direct	-367	-391	-390	-390
	Total	-197	-285	-484	-205

Source: TERM.

5 Conclusions

Sugar production is a far more input intensive enterprise than forestry. As such it generates considerably more local economic activity than forestry. As a result, if forestry continues to displace sugarcane land in Queensland, local economic activity (at a mill area level) will decline markedly. Less will be spent on inputs locally and less income will be earned and spent in the region. This appears to be true under a wide range of market scenarios for both forestry and sugar. Moreover, what income is earned from forestry will only be available after harvesting, many years later. When it is, typically, it will be distributed to investors and promoters outside the region.

Economies of sugar towns will decline with increased forestry

Loss of sugarcane land will reduce throughput at mills and reduce economies of size. Once throughput declines below some critical threshold level, mills will be forced to close. What this critical threshold level is will vary from one mill to the next, and will be heavily dependent on the price outlook for sugar at the time, however for some mills under lower sugar price scenarios, it could occur with the loss of a relatively small area in the near future. Until this point, economic activity will drop off slowly, but once a mill closes, local economic activity will decline sharply.

For <u>each mill</u> that closes, it is possible that local economies centred around the mill area could lose:

- ***economic activity of between $32 million and $111 million a year depending on the future economic prosperity of the sugar industry;***
- ***between 500 and 1000 people, or between 200 and 400 households.***

For small sugar towns, such losses could have major adverse impacts on schools, infrastructure and small businesses. Mills located around the Innisfail, Tully, Ingham, Proserpine and Sarina townships appear to be most under threat at present, putting these regions and towns under considerable adjustment pressures.

Rate of loss of sugarcane land depends on sugar/forestry outlook

The rate of loss of sugarcane land to forestry appears to be dependent on a number of factors. At currently low sugar prices, returns from sugar would appear to offer canegrowers relatively low rates of return to their own labour, capital and land. Rates of return on milling capital are also very low. Despite the long lead times involved before obtaining a return from forestry, the considerably lower labour and capital input intensity of forestry may make it appear attractive relative to sugar production at low prices. Moreover, the relative attractiveness of MISs to promoters to spread risks and to investors to obtain potential tax advantages, may add to the apparent competitiveness of forestry.

The outlook for many sugar mill areas may depend on the rate at which they achieve productivity growth and what happens to world sugar prices in the medium to long-term.

At one level, the sugar industry would appear to have considerable scope to obtain productivity gains, but this will be considerably more difficult when throughput volumes are declining, and may require considerable investment and leadership to achieve. Removal of regulatory impediments in recent years may have helped open up opportunities in this area. Certainly the significant productivity and sustainability improvements achieved in the dairy industry following deregulation give rise to some confidence that similar targeted improvements in the sugar industry could be achieved.

Many mill areas may have only a narrow window of opportunity

Just how quickly the industry can respond and how long it takes for improvements in the world sugar price may be critical. The longer it takes and the greater the in-roads made by forestry, the more difficult it will be for the sugar industry to compete.

Loss of throughput in the first instance lowers productivity making change more difficult to achieve.

However, once a mill is closed, it is unlikely to be reopened leaving potentially viable sugar producing assets stranded.

Even though this is likely to cause falls in land prices, there can be no guarantee the vacated land will be taken up by forestry.

Many risks face forestry schemes and the more popular they become the more scrutiny will be given to evaluating them. Such schemes appear to be highly dependent on:

- a continual stream of new small investors being prepared to invest at apparently high risks and relatively low returns;
- the long-term continuity of tax concessions attaching to MISs.

The in-roads being made by forestry place strong pressures on the sugar industry to achieve large productivity gains to take advantage of any up turn in sugar prices when it occurs. These productivity gains are being achieved, but it may require up to five years to fully achieve existing targets given normal crop cycles.

A worst case scenario for sugar mill areas would be to see:

- ***mills close before the local industries built around them can achieve the required changes;***
- ***growers unable to recover their investment in their current sugar cane production cycle;***
- ***forestry activity to drop off after a mill closure due to declining investor popularity of MISs;***
- ***a recovery in sugar prices after a mill closure, stranded sugar producing assets, lost local economic activity, declining town populations and redundant town infrastructure.***

Appendixes

A TERM

Introduction

TERM (The Enormous Regional Model) is a derivative of the ORANI and Monash models that are used by economic policy agencies. It was developed by the Centre of Policy Studies at Monash University.

TERM is a regional computable general equilibrium (CGE) model that provides a highly disaggregated representation of the Australian economy. It uses a 'bottoms up' approach that explicitly represents the economy of each region. However, it has the advantage over other regional models of being specifically created to allow regional CGE analysis without being overly burdensome computationally. [7]

Using TERM, an analyst is able to assess a large number of regions or sectors. TERM's database has 58 regions (statistical division) and 167 sectors, and can be aggregated depending upon the focus of the analysis.[8] In other words, each region can be defined either as an individual statistical division or a summation of statistical divisions. This study uses an aggregated version of the TERM model, which keeps the details of Queensland regions and mining sectors (table A.1).

TERM's extensive disaggregation of the Australian economy allows each region to be independently modelled via the regional input-output tables. The region-specific input-output tables, containing significant industry detail, were originally published in 1996–97. A major modelling work of this study is to update the database to the current level as closely as possible (see discussion below).

[7] TERM has a more compact data structure which gives it greater computational efficiency relative to its predecessor models (eg, MMRF).

[8] In practice, however, it is generally recommended that combined number of sectors and regions be aggregated to involve no more than 100.

A.1 **Region and sector classification in TERM-Queensland Mining**

Regions	***Sectors***		
Brisbane	Sheep	Beef Products	Transport Equipment (ships, boats, railway equipment and aircraft)
Moreton	Wheat	Other Food Products	
Wide Bay Burnett	Barley	Fruit and Vegetable Products	Electronic Equipment
Darling Downs	Other Crops		Agricultural and Mining Machinery
Southwest Queensland	Beef Cattle	Confectionary	
Fitzroy	Dairy, Pigs and Poultry	Sugar Milling and Refining	Other Machinery
Central West Queensland	Cotton		Prefab Building
Mackay	Fruit and Nuts	Soft Drinks	Furniture
Northern Queensland	Vegetables	Alcohol and Tobacco	Other Manufacturing
Far North Queensland	Sugar Cane	Textile, Clothing, Footwear and Leather	Electricity, Gas and Water
Northwest Queensland	Agricultural Services	Timber Products	
	Forestry Logs	Paints, Pharmaceuticals, Plastic Products etc	Residential Building
Rest of Australia	Fishing		Other Construction
	Black Coal	Fuel	Trade
	Other Mining	Chemicals	Other Services
	Non-ferrous Metal Ore	Non-metal Mineral Products	Road Transportation
			Rail Transportation
		Metal Products	Other Transportation
		Basic Non-ferrous Metal	
		Motor Vehicle and Parts and Other Transport Equipment	

Source: TERM-Queensland Mining database

The linkages between regions are established through trade and primary factor flows. Each region trades commodities with other regions and with the world market. Importantly, TERM captures the demand for and supply of commodities, as well as their movement from producer to purchaser via various transport modes and wholesale and retail trade.

TERM is capable of modelling region-specific, demand or supply-side shocks (that is, change in the status quo) and its effect on region-specific prices and quantities. TERM's responsiveness to exogenous shocks is dependent upon the three key elements:

- the economic structure represented by the database (that is, input-output tables for each region);
- choice of behavioural parameters (that is, how demanders of commodities minimise costs); and
- choice of closure (that is, combination of exogenous and endogenous variables in the model).

The following provides more detail of the various elements of TERM. A more in-depth discussion of the equation structure and database of the TERM model can be found in Horridge et al (2004).

Behavioural parameters

Within each region, TERM models four types of final demand. They are:

- households
- investors (relating to capital formation which can be industry specific)
- government
- export demand.

Producers of goods and services account for intermediate demand.

The behaviour of these demanders is based on a series of equations that allow demand to be guided by user-specific purchaser prices. Essentially, the equations allow users and consumers to 'make choices' with the objective of cost minimisation. At a high level, users choose between imported and domestic commodities. At a more detailed level, sourcing decisions are then based on the price of commodities. Demanders substitute (generally via a constant elasticity of substitution demand specification) between different sources of goods based on price.

While the model accounts for four different types of final demanders, it uses common sourcing assumptions for goods in a region. The sourcing assumptions mean that all users of a particular good in a particular region source their good from other regions according to common proportions. TERM models each region as having a 'broker' who decides for all users (in that region) where supplies will be obtained.

The behavioural equations determine:

- users' (both industry and final demanders) choice between domestic and imported goods — as already discussed, these equations allow users to substitute between domestic and imported good based on relative price changes;
- each industry's choice of the skill profile of their workforce. The equation captures each industry's substitution among labour skills so as to minimise costs, subject to wage rates and an overall labour requirement;

- industry demands for primary factors (that is, labour in total, capital, and land), allowing producers to substitute between them to minimise costs subject to an aggregate primary factor requirement;
- industry demands for aggregate primary factor and intermediate inputs. Output is produced using a combination of primary inputs and intermediate goods. TERM models industry demand for aggregate primary factor as proportional to total output and technological terms. Demand for intermediate inputs (each of which, as previously mentioned, is a composite of domestic and imported varieties) is also proportional to total output and technological terms, but with substitution driven by relative prices;
- the manner in which production taxes are introduced to industry costs, as ad-valorem taxes on the value of output. An extensive array of input taxes is also included in the model; and
- the level of activity of each industry (via zero-pure-profits conditions) and the price of commodities (via market clearing conditions).

Flow of goods and services

TERM values flow between regions according to three methods:

- *basic value* which equates to output prices (domestically produced goods) or CIF prices (for imports);
- *delivered value* which reflects basic plus margins[9]; and
- *purchasers' values* based on combined elements of basic, margins and tax (that is, delivered plus tax).

Accounting for these components allows the TERM to capture the full value of flows of goods within and between regions.

[9] Industries involved in meeting the demand for services to move commodities around, such as the transport of commodities from the factory, are often referred to as margin industries. Measures of the demand for these services are commonly referred to as the demand for margins.

B Forestry

B.1 Forestry revenues and costs

Year	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
	$ / ha	$ / ha	$ / ha	$ / ha	$ / ha	$ / ha	$ / ha	$ / ha	$ / ha	$ / ha
Pulpwood										
Overall										
Costs	-2 267	-305	-305	-67	-67	-67	-67	-67	-67	-6 481
Returns	0	0	0	0	0	0	0	0	0	16 037
Net return	-2 267	-305	-305	-67	-67	-67	-67	-67	-67	9 556
IRR										
Investor										
Costs	-4 031	-31	-31	-31	-31	-31	-31	-31	-31	-83
Returns	0	0	0	0	0	0	0	0	0	7 014
Net return	-4 031	-31	-31	-31	-31	-31	-31	-31	-31	6 931
IRR										
Promoter										
Costs	-2 236	-274	-274	-36	-36	-36	-36	-36	-36	-36
Returns	4 000	0	0	0	0	0	0	0	0	2 661
Net return	1 764	-274	-274	-36	-36	-36	-36	-36	-36	2 624
IRR										
Red mahogany										
Overall										
Costs	-2,187	-831	-302	-593	-64	-593	-2,892	-64	-64	-64
Returns	0	0	0	0	0	0	5,428	0	0	0
Net return	-2,187	-831	-302	-593	-64	-593	2,536	-64	-64	-64
IRR										
Investor										
Costs	-4,028	-28	-28	-28	-28	-28	-28	-28	-28	-28
Returns	0	0	0	0	0	0	1,365	0	0	0
Net return	-4,028	-28	-28	-28	-28	-28	1,337	-28	-28	-28
IRR										
Promoter										
Costs	-2,159	-803	-274	-565	-36	-565	-36	-36	-36	-36
Returns	4,000	0	0	0	0	0	1,235	0	0	0
Net return	1,841	-803	-274	-565	-36	-565	1,199	-36	-36	-36
IRR										

B.1 **Forestry revenues and costs** continued

Year	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*		*Total @ 7.5% rate*
	$ / ha	$ / ha	$ / ha	$ / ha	$ / ha	$ / ha	$ / ha	$ / ha	$ / ha	$ / ha
Pulpwood										
Overall										
Costs										**-6 469**
Returns										**8 365**
Net return										**1 896**
IRR										**13.8%**
Investor										
Costs										**-4 256**
Returns										**3 659**
Net return										**-597**
IRR										**5.7%**
Promoter										
Costs										**-2 895**
Returns										**5 388**
Net return										**2 493**
IRR										**n/a**
Red mahogany										
Overall										
Costs	-64	-64	-64	-64	-64	-64	-64	-9 220		**-9 017**
Returns	0	0	0	0	0	0	0	60 726		**21 276**
Net return	-64	-64	-64	-64	-64	-64	-64	51 506		**12 259**
IRR										**18.4%**
Investor										
Costs	-28	-28	-28	-28	-28	-28	-28	-325		**-4 379**
Returns	0	0	0	0	0	0	0	27 230		**8 848**
Net return	-28	-28	-28	-28	-28	-28	-28	26 905		**4 469**
IRR										**12.7%**
Promoter										
Costs	-36	-36	-36	-36	-36	-36	-36	-36		**-4 215**
Returns	0	0	0	0	0	0	0	24 637		**12 005**
Net return	-36	-36	-36	-36	-36	-36	-36	24 600		**7 790**
IRR										**n/a**

Note: Pulpwood overall costs in year 10 and red mahogany overall costs in year 18 include harvesting costs. As such, overall returns in years 10 and 18 for the two plantations respectively have also been inflated by the harvest costs. For investors and promoters, it is assumed the plantations are sold at its stump price (the promoter and investor sell the trees before harvesting). The harvesting costs are included in the overall costs to ensure the local spend component of the harvesting costs is included in the analysis.

C Sugar

C.1 Sugar growing and milling costs in 2007

	Central region	*Northern region*
Assumptions		
Sugar price ($ / tonne)	298.54	298.54
Cane price ($ / tonne)	27.45	25.32
Yield (tonnes / ha)	75.00	80.00
Cane growing	$ / ha	$ / ha
Revenues		
Production	75.00	80.00
Revenue	**2,058.53**	**2,025.95**
Costs		
Labour – hired labour	147.80	86.09
Labour – owner operator	-	-
Machinery/Depreciation & harvesting	458.73	514.53
Fertiliser, chemicals & fuel	360.56	393.19
Other cost	622.07	550.91
Total cost	**1,589.17**	**1,544.72**
Growing surplus	**469.36**	**481.23**
Milling		
Revenues		
Production – raw sugar	10.76	10.84
Production – molasses	2.25	2.40
Revenue	**3,346.30**	**3,378.82**
Costs		
Cane cost	2,058.53	2,025.95
Labour – operations	343.30	346.44
Labour – fixed administration	85.83	86.61
Renewals and maintenance	-	-
Chemicals, fuel & materials	369.62	415.94
Transport	239.63	241.38
Total production cost	1,038.38	1,090.36
Total cost	**3,096.91**	**3,116.31**
Profit of milling	**249.39**	**262.50**
Total return	**718.75**	**743.74**

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